Indianapolis Airport Authority



## **Specifications**

FEBRUARY 13, 2018

Indianapolis International Airport

**STORMWATER AND DEICING CAPACITY PROJECTS** IAA Project No I-17-077

## Issued for BIDDING

WESSLER ENGINEERING, INC. 6219 South East Street Indianapolis, IN 46227

> -CE SOLUTIONS, INC. 10 Shoshone Drive Carmel, IN 46032

-KHAFRA ENGINEERING MANAGERS, INC. 445 North Pennsylvania Street, Ste. 325 Indianapolis, IN 46204

-POWERS ENGINEERING, INC. 915 Main Street, Ste. 306 Evansville, IN 47708

WESSLER ENGINEERING, INC.	WESSLER ENGINEERING, INC.
Brent A. Siebenthal P.E. No. 19800332	William J. Leber P.E. No. 10303127
CE SOLUTIONS, INC.	KHAFRA ENGINEERING MANAGERS, INC.
No. Steven P. Osborn   19853 02350   State of 02351   03100 03300   Mon 03381   05531 07161	Dietrich Bankhead P.E. No. 10606139 STATE OF 03410 05500 05511
POWERS ENGINEERING, INC. Cherylynn C. Schilling P.E. No. 11200302 STATE OF No. 11200302 STATE OF NO. 11200302 STATE OF NO. 11200302 STATE OF NO. 11200302 STATE OF SIONAL STATE OF SIONAL SIONAL SIONAL STATE OF SIONAL STATE OF SIONAL SIONA	

## **INDIANAPOLIS AIRPORT AUTHORITY**

### INDIANAPOLIS INTERNATIONAL AIRPORT STORMWATER AND DEICING CAPACITY PROJECTS Project No. I-12-077

#### **TABLE OF CONTENTS**

GP/TC-1 THROUGH GP/90-4

FEDERAL PROVISIONS

**GENERAL PROVISIONS** 

STANDARD TECHNICAL PROVISIONS

SPECIAL TECHNICAL PROVISIONS

SPECIAL PROVISIONS

APPENDIX A – IAA ATTACHMENTS

- INDIANAPOLIS AIRPORT SAFETY PROGRAM
- IAA WORK PERMIT POLICY
- IAA WORK PERMIT APPLICATION

TABLE OF CONTENTS

TOC, SP-1 THROUGH SP-41

TOC, FP-1 THROUGH FP-24

TOC, M-102-1 THROUGH L-115-8

TOC, 01090-1 THROUGH 15080-11

1

#### APPENDIX B - SRF DOCUMENTS

- FRONT END DOCUMENT CERTIFICATION
- DAVIS BACON WAGE DETERMINATION
- ATTACHMENT A FORM W-347
- ATTACHMENT B REQUIRED CONTRACT PROVISIONS RELATED TO DAVIS-BACON ACT AND RELATED ACTS
- ATTACHMENT C REQUIRED CONTRACT PROVISIONS RELATED TO WAGE-FRINGE BENEFIT CERTIFICATION
- ATTACHMENT D IFA WAGE/FRINGE BENEFIT CERTIFICATION FORM
- ATTACHMENT E REQUIRED CONTRACT PROVISION RELATED TO SUSPENSION AND DEBARMENT
- ATTACHMENT F- REQUIRED BID INSTRUCTION RELATED TO GPR COMPONENTS
- ATTACHMENT G GPR BID BREAKDOWN
- ATTACHMENT H GPR FINAL BID SUMMARY
- ATTACHMENT I REQUIRED CONTRACT PROVISIONS RELATED TO AMERICAN IRON AND STEEL
- ATTACMENT J REQUIRED CERTIFICATION FROM CONTRACT RELATED TO AMERICAN IRON AND STEEL

#### APPENDIX C - INDOT DOCUMENTS

- HIGHWAY SETTLEMENT MONITORING PLANS
- INDOT UTILITY ACCOMMODATION POLICY
- INDOT PERMIT BOND

#### APPENDIX D – GEOTECHNICAL REPORTS

- GEOTECHNICAL INVESTIGATION BY CTL ENGINEERING, INC. DATED JANUARY 27, 2018
- SOIL BORINGS BRIDGE PLANS FOR SPANS OVER 20' ROUTE, HIGH SCHOOL ROAD, PROJECT NO. IM-70-3

# **GENERAL PROVISIONS**

#### INDIANAPOLIS AIRPORT PROGRAM GENERAL PROVISIONS TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
Section 10	Definition of Terms	GP/10-1
Section 20	Not Used	
Section 30	Award and Execution of Contract	
30-01	Compliance with E-Verify Program	GP/30-1
30-02	Non-Discrimination	GP/30-1
Section 40	Scope of Work	
40-01	Intent of Contract	GP/40-1
40-02	Alteration of Work and Quantities	GP/40-1
40-03	Extra Work	GP/40-1
40-04	Maintenance of Traffic	GP/40-1
40-05	Removal of Existing Structures	GP/40-2
40-06	Rights In and Use of Materials Found in the Work	GP/40-3
40-07	Final Cleaning Up	GP/40-3
Section 50	Control of Work	
50-01	Authority of the Engineer	GP/50-1
50-02	Conformity with Plans and Specifications	GP/50-1
50-03	Coordination of Contract, Plans and Specifications	GP/50-1
50-03-01	Shop Drawings	GP/50-2
50-03-02	Meetings	GP/50-3
50-04	Cooperation of Contractor	GP/50-4
50-05	Construction Layout and Stakes	GP/50-5
50-06	Authority and Duties of Inspectors	GP/50-5
50-07	Inspection of the Work	GP/50-5
50-08	Removal of Unacceptable and Unauthorized Work	GP/50-6
50-09	Use of Roads and Streets	GP/50-6
50-10	Maintenance During Construction	GP/50-7
50-11	Failure to Maintain the Work	GP/50-7
50-12	Final Acceptance	GP/50-7
50-13	Claims and Adjustments for Disputes	GP/50-7
50-14	Subcontractors	GP/50-8
50-15	Record Drawings	GP/50-8
50-16	Protection of Public Service Structures	GP/50-8
50-17	Protecting Existing Structures	GP/50-8
50-18	Landmarks and Monuments	GP/50-8
50-19	Water Supply	GP/50-8
50-20	Salvageable Items	GP/50-9
50-21	Contractor's Staging Area	GP/50-9
Section 60	Control of Materials	
60-01	Source of Supply and Quality Requirements	GP/60-1
60-02	Samples, Tests, and Cited Specifications	GP/60-1
60-03	Certification of Compliance	GP/60-2
60-04	Plant Inspection	GP/60-2
60-05	Engineer's Field Office and Laboratory	GP/60-3
60-06	Storage of Materials	GP/60-4
60-07	Unacceptable Materials	GP/60-4
60-08	Owner Furnished Materials	GP/60-4

#### INDIANAPOLIS AIRPORT PROGRAM GENERAL PROVISIONS TABLE OF CONTENTS

Section		Page
60-09	Shipments of Equipment and Materials	GP/60-5
60-10	Security of Materials, Tools and Equipment	GP/60-5
60-11	Protection of Equipment	GP/60-5
60-12	Temporary Light and Heat	GP/60-5
Section 70	Legal Relations and Responsibility to the Public	
70-01	Laws to be Observed	GP/70-1
70-02	Permits and Licenses	GP/70-1
70-03	Patented Devices, Materials, and Processes	GP/70-1
70-04	Restoration of Surfaces Disturbed by Others	GP/70-1
70-05	Federal Aid Participation	GP/70-1
70-05-01	Certified Payrolls	GP/70-2
70-06	Sanitary, Health, and Safety Provisions	GP/70-2
70-07	Public Convenience and Safety	GP/70-2
70-08	Barricades, Warning Signs, and Hazard Markings	GP/70-2
70-09	Use of Explosives	GP/70-3
70-10	Protection and Restoration of Property and Landscape	GP/70-3
70-11	Insurance	GP/70-3
70-12	Third Party Beneficiary Claim	GP/70-4
70-13	Opening Sections of the Work to Traffic	GP/70-4
70-14	Contractor's Responsibility for Work	GP/70-5
70-15	Contractor's Responsibility for Utility Service and Facilities of Others	GP/70-5
70-16	Furnishing Rights-of-Way	GP/70-6
70-17	Personal Liability of Public Officials	GP/70-7
70-18	No Waiver of Legal Rights	GP/70-7
70-19	Environmental Protection	GP/70-7
70-20	Archaeological and Historical Findings	GP/70-10
70-21	Clean Air and Water Pollution Control	GP/70-10
70-22	Under Age Personnel	GP/70-11
70-23	Security	GP/70-11
Section 80	Execution and Progress	
80-01	Subletting on Contract	GP/80-1
80-02	Schedule of Work	GP/80-1
80-03	Limitation of Operations	GP/80-2
80-04	Operational Safety on Airport During Construction	GP/80-3
80-05	Character of Workers, Methods and Equipment	GP/80-3
80-06	Temporary Suspension of the Work	GP/80-4
80-07	Determination and Extension of Contract Time	GP/80-4
80-08	Failure to Complete on Time	GP/80-5
80-09	Default and Termination of Contract	GP/80-6
80-10	Termination for National Emergencies	GP/80-6
80-11	Work Area, Storage Area and Sequence of Operations	GP/80-6

#### INDIANAPOLIS AIRPORT PROGRAM GENERAL PROVISIONS TABLE OF CONTENTS

Section		Page
Section 90	Measurement and Payment	
90-01	Payment for Extra and Force Account Work	GP/90-1
90-02	Payment for Materials on Hand	GP/90-2
90-03	Construction Warranty	GP/90-3
90-04	Project Closeout	GP/90-4
90-13	Waiver of Claims	GP/90-4

Whenever the following terms are used in these specifications, in the contract, in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows:

<u>10-01 AASHTO</u>. The American Association of State Highway and Transportation Officials, which is the successor association to AASHTO.

<u>10-02 ACCESS ROAD</u>. The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public highway.

<u>10-03 ADVERTISEMENT</u>. A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

<u>10-04 Airport Improvement Program (AIP)</u>. A grant-in-aid program administered by the Federal Aviation Administration (FAA).

<u>10-05 AIR OPERATIONS AREA</u>. For the purpose of these specifications, the term air operations area (AOA) shall mean any area of the airport used, or intended to be used, for the landing, takeoff or surface maneuvering of aircraft. An air operations area shall include such paved or unpaved areas that are used, or intended to be used, for the unobstructed movement of aircraft in addition to its associated runway, taxiway or apron.

<u>10-06 AIRPORT</u>. Airport means an area of land or water, which is used, or intended to be used, for the landing and takeoff of aircraft; an appurtenance area used or intended to be used for airport buildings or other airport facilities or rights of way; and airport buildings and facilities located in any of these areas, and includes a heliport.

<u>10-07 ASTM International (ASTM)</u>. Formerly known as the American Society for Testing and Materials (ASTM).

<u>10-08 AWARD</u>. The notice by the Board of the Indianapolis Airport Authority to the successful Construction Manager of the acceptance of the submitted proposal.

<u>10-09 BIDDER</u>. Any individual or entity, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

<u>10-10 BUILDING AREA</u>. An area on the airport to be used, considered, or intended to be used, for airport buildings or other airport facilities or rights-of-way, together with all airport buildings and facilities located thereon.

<u>10-11 CALENDAR DAY</u>. Every day shown on the calendar.

<u>10-12 CHANGE ORDER</u>. A written order to the Contractor covering changes in the plans, specifications or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, shall be within the scope of the contract.

<u>10-13 CONTRACT</u>. The written agreement covering the work to be performed. The awarded contract shall include, but is not limited to: Advertisement, Contract Form, Proposal, Performance Bond,

Payment Bond, any required insurance certificates, Specifications, Plans, and any addenda issued to bidders.

<u>10-14 CONTRACT ITEM (PAY ITEM)</u>. A specific unit of work for which a price is provided in the contract.

<u>10-15 CONTRACT TIME</u>. The number of calendar days or working days, stated in the contract documents, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

<u>10-16 CONTRACTOR</u>. The individual or entity primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work, who acts directly or through lawful agents or employees to complete the contract work. For these General Provisions, the terms "Contractor" and "Construction Manager" shall be interchangeable.

10-17 <u>CONTRACTOR's LABORATORY</u>. The Contractor's quality control organization in accordance with the Contractor Quality Control Program.

10-18 <u>CONSTRUCTION SAFETY AND PHASING PLAN (CSPP</u>). The overall plan for safety and phasing of a construction project developed by the airport operator or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.

<u>10-19 DRAINAGE SYSTEM</u>. The system of pipes, ditches and structures by which surface or subsurface waters are collected and conducted from the airport area.

<u>10-20 ENGINEER</u>. The Indianapolis Airport Authority or the individual, partnership, firm or corporation duly authorized by the Indianapolis Airport Authority to be responsible for engineering, inspection, or observation of contract work and activing directly or through an authorized representative.

<u>10-21 EQUIPMENT</u>. All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

<u>10-22 EXTRA WORK</u>. An item of work not provided for in the awarded contract as modified by change order, but which is found by the Engineer to be necessary to complete the work within the intended scope of the contract as modified.

<u>10-23 FAA</u>. The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his or her duly authorized representative.

<u>10-24 FEDERAL SPECIFICATIONS</u>. The Federal Specifications and Standards, Commercial Item Descriptions, and supplements, amendments and indices thereto, prepared and issued by the General Services Administration of the Federal Government.

10-25 FORCE ACCOUNT. Extra work in the contract for which the Contractor and the Owner cannot

reach agreement on the unit price or lump sum price prior to performing the work. Settlement will be made upon receipt and approval of documents substantiating and truly representing the allowable costs incurred by the Contractor for performing such extra work as outlined in the specifications.

<u>10-26 FINAL PAYMENT</u>. The final payment is the final amount of money requested by the Contractor and approved by the Engineer for satisfactory completion of 100% of the contract items as originally proposed, amended or changed by contract change order.

<u>10-27 INSPECTOR</u>. An authorized representative of the Engineer assigned to make all necessary inspections, observations, and/or tests or observations of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

<u>10-28 INTENTION OF TERMS</u>. Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of the like import are used, it shall be understood that the direction, requirement, permission, order, designation or prescription of the Engineer is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer subject in each case to the final determination of the Owner. Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

<u>10-29 LABORATORY</u>. The official testing laboratories of the Owner or such other laboratories designated by the Engineer. Also referred to as "Engineer's Laboratory" or "quality assurance laboratory."

<u>10-30 LIGHTING</u>. A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

<u>10-31 MAJOR AND MINOR CONTRACT ITEMS</u>. A major contract item shall be any item that is listed in an itemized proposal, the total cost of which is equal to or greater than twenty percent (20%) of the total amount of the awarded contract. All other items shall be considered minor contract items.

<u>10-32 MATERIALS</u>. Any substance specified for use in the construction of the contract work.

<u>10-33 NOTICE TO PROCEED (NTP)</u>. A written notice to the Contractor to begin the actual contract work. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

<u>10-34 OWNER (SPONSOR)</u>. The Indianapolis Airport Authority or such other individual or entity otherwise identified by the Indianapolis Airport Authority. For AIP contracts, the term "sponsor" shall have the same meaning as the term "Owner".

<u>10-35 PASSENGER FACILITY CHARGE (PFC).</u> Per 14 CFR Part 158 and 49 USC § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls."

<u>10-36 PAVEMENT</u>. The combined surface course, base course, and sub-base course, if any, considered as a single unit.

<u>10-37 PAYMENT BOND</u>. The approved form of security furnished by the Contractor and his or her surety as a guaranty that he will pay, in full, all bills and accounts for materials and labor used in the construction of the work.

<u>10-38 PERFORMANCE BOND</u>. The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

<u>10-39 PLANS</u>. The official drawings or exact reproductions that show the location, character, dimensions and details of the airport and the work to be done, and which, are to be considered as a part of the contract.

<u>10-40 PROJECT</u>. The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

<u>10-41 PROPOSAL</u>. The written offer by a bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary material in accordance with the provision of the plans and specification.

<u>10-42 PROPOSAL GUARANTY</u>. The certified check or bid bond in the amount specified in the proposal form furnished with a proposal to guarantee that the bidder will enter into a contract if his or her proposal is accepted by the Owner.

<u>10-43 RUNWAY</u>. The area on the airport prepared for the landing and takeoff of aircraft.

<u>10-44 SPECIFICATIONS</u>. A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

<u>10-45 SPONSOR</u>. A Sponsor is defined in 49 USC 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.

<u>10-46 STRUCTURES</u>. Airport facilities, such as bridges; culverts; catch basins; inlets; retaining walls; cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts; manholes; handholes; lighting fixtures and bases; transformers; flexible and rigid pavements; navigation aids; buildings; vaults; and other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

<u>10-47 SUBGRADE</u>. The soil that forms the pavement foundation or other structure.

<u>10-48 SUBSTANTIAL COMPLETION</u>. "Substantial Completion" refers to the date as determined by the Owner when the construction of a structure is sufficiently completed, in accordance with the plans and specifications, as modified by any complete change orders agreed to by the parties, so that it can be occupied for the use for which it was intended.

<u>10-49 SUPERINTENDENT</u>. The Contractor's representative who is present on the work during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the construction.

<u>10-50 SURETY</u>. The individual or entity, other than the Contractor, providing the payment or performance bonds which are furnished to the Owner by the Contractor.

<u>10-51 TAXIWAY</u>. For the purpose of this document, the term "taxiway" means the portion of the air operations area of an airport that has been designated by the Owner for movement of aircraft to and from the airport's runways or aircraft parking areas.

<u>10-52 WORK</u>. The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.

#### **END OF SECTION**

#### Section 30 Award and Execution of Contract

<u>30-01 COMPLIANCE WITH E-VERIFY PROGRAM</u>. Pursuant to Indiana Code § 22-5-1.7, the Contractor shall enroll in and verify the work eligibility status of all newly-hired employees of Contractor through the E-Verify Program ("Program"). The Contractor is not required to verify the work eligibility status of all newly-hired employees through the Program, if the Program no longer exists.

The Contractor and its subcontractors shall not knowingly employ or contract with an unauthorized alien or retain an employee or contract with a person that the Contractor or subcontractor subsequently learns is an unauthorized alien. If the Contractor violates this Subsection 30-01, the Owner shall require the Contractor to remedy the violation not later than thirty (30) days after the Owner notifies the Contractor. If the Contractor fails to remedy the violation within the thirty (30) day period, the Owner shall terminate the contract for breach of contract. If the Owner terminates the contract, the Contractor shall, in addition to any other contractual remedies, be liable to the Owner for actual damages. There is a rebuttable presumption that the Contractor did not knowingly employ an unauthorized alien if the Contractor verified the work eligibility status of the employee through the Program.

If the Contractor employs or contracts with an unauthorized alien, but the Owner determines that terminating the contract would be detrimental to the public interest or public property, the Owner may allow the contract to remain in effect until the Owner procures a new contractor.

The Contractor shall, prior to performing any work, require each subcontractor to certify to the Contractor that the subcontractor does not knowingly employ or contract with an unauthorized alien and has enrolled in the Program. The Contractor shall maintain, on file, a certification from each subcontractor throughout the duration of the project. If the Contractor determines that a subcontractor is in violation of this Subsection 30-01, the Contractor may terminate its contract with the subcontractor for such violation. Such termination may not be considered a breach of contract by the Contractor or the subcontractor.

This Subsection 30-01 may not apply to certain contracts.

<u>30-02 NON-DISCRIMINATION</u>. The Contractor, sub-recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of the contract. Contractor shall carry out the applicable requirements of 49 CFR Part 26 in the award and administration of Department of Transportation (DOT) assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of the contract, which may result in the termination of the contract or such other remedy as the Owner deems appropriate. The foregoing language of this Section 30-02 shall be part of and incorporated into each contract between the Owner and Contractor (and each subcontract between the Contractor and a subcontractor).

#### **END OF SECTION**

<u>40-01 INTENT OF CONTRACT</u>. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

<u>40-02 ALTERATION OF WORK AND QUANTITIES</u>. The Owner reserves, and shall have the right to make, such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner in accordance with Indiana Code § 36-1-12-18. The Engineer shall be and is hereby authorized to make such alterations in the work. Alterations shall not invalidate the contract nor release the surety, and the Contractor agrees to accept payment for such alterations as if the altered work had been a part of the original contract. Alterations of work shall be covered by "Change Orders" issued by the Engineer. Change orders for altered work shall include extensions of contract time where, in the Engineer's opinion, such extensions are commensurate with the amount and difficulty of added work.

<u>40-03 EXTRA WORK</u>. Should acceptable completion of the contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original contract or previously issued change orders, the same shall be called "Extra Work". Extra work that is within the general scope of the contract shall be covered by written change order. Change orders for such extra work shall contain mutually agreed pricing for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the Engineer's opinion, is necessary for completion of such extra work.

When determined by the Engineer to be in the Owner's best interest, he may order the Contractor to proceed with extra work by force account as provided in the subsection entitled "PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK" of Section 90.

Any claim for payment of extra work that is not covered by written change order or force account may be rejected by the Owner.

<u>40-04 MAINTENANCE OF TRAFFIC</u>. It is the explicit intention of the contract that the safety of aircraft, the general public, as well as the Contractor's equipment and personnel, is the most important consideration.

- a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport with respect to his or her own operations and the operations of any and all subcontractors, as specified in the subsection entitled "LIMITATION OF OPERATIONS" of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from and upon the airport, as specified in the subsection entitled "CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS" in Section 70.
- b. With respect to his or her own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting and other acceptable means of identifying: personnel; equipment; vehicles; storage areas; and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport.

c. When the contract requires the maintenance of vehicular or pedestrian traffic on an existing road, street or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans and specifications, the Contractor shall keep such road, street or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The contractor shall be responsible for any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect and maintain barricades, warning signs, flagmen and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic Control Devices(MUTCD) (http://mutch.fhwa.dot.gov/), unless otherwise specified herein. The Contractor shall also construct and maintain, in a safe condition, any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street or highway.

Unless otherwise specified, the Contractor shall make his or her own estimate of all labor, materials, equipment and incidentals necessary for providing the maintenance of aircraft and vehicular traffic, as specified in this Subsection 40-05.

The Contractor shall construct and maintain all haul roads, as may be required on airport property, in bringing materials to the site. Haul roads and staging areas are to be removed, regraded and restored to original condition unless specified to remain in place, and shall be regraded to provide positive drainage. The measurement and cost of items identified hereinbefore, under this Subsection 40-05, will not be required. This Subsection 40-05 shall be incidental to the work and spread throughout the various Contract items, unless a separate item for "Maintenance of Traffic" is identified in the itemized proposal.

The Contractor shall maintain a pavement cleaning operation in all air operations areas affected by the construction whenever work is going on. All debris deposited on the pavement due to construction activities shall be removed immediately. Methods for removal of large debris, such as gravel, dirt clods, concrete pieces, material containers, etc., shall be subject to the approval of the Engineer. Dust control for debris, such as sand, concrete sawing residue, cement, mud, etc., shall be performed with hand tools and self-propelled truck-type vacuum cleaners, as approved by the Engineer.

<u>40-05 REMOVAL OF EXISTING STRUCTURES</u>. All existing structures encountered within the established lines, grades or grading sections, shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work, or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, unless a specific item is included in the itemized proposal, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract.

Except as provided in the subsection entitled "RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK" of this Section 40, it is intended that all existing materials or structures that may be encountered (within the lines, grades or grading sections established for completion of the work) shall be utilized in the work as otherwise provided for in the contract and shall remain the property of the Owner when so utilized in the work.

<u>40-06 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK</u>. Should the Contractor encounter any materials, such as (but not restricted to) sand, stone, gravel, slag or concrete slabs, within the established lines, grades or grading sections, the use of which is intended by the terms of the contract to be either embankment or waste, then he may, at his or her option, either:

- a. Use such materials in another contract item, providing such use is approved by the Engineer and is in conformance with the contract specifications applicable to such use;
- b. Remove such material from the site, upon written approval of the Engineer;
- c. Use such material for Contractor's own temporary construction on site; or,
- d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option "(a)", "(b)" or "(c)" above, then the Contractor shall request the Engineer's approval in advance of such use.

Should the Engineer approve the Contractor's request to exercise option "(a)", "(b)" or "(c)" above, then the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at his or her own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material so used in the work or removed from the site.

Should the Engineer approve the Contractor's exercise of option "(a)" above, then the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his or her exercise of option "(a)", "(b)", or "(c)" above.

All waste, pipes, wood, wire, brick, etc., shall be properly disposed of off the airport property. The Contractor shall notify the Owner of the disposal location. A release from the property owner will be required if this is not a permitted landfill.

The Contractor shall not excavate, remove or otherwise disturb any material, structure or part of a structure which is located outside the lines, grades or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

<u>40-07 FINAL CLEAN UP</u>. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site, adjacent property, the work limits, borrow pits, storage area, and all ground occupied by the Contractor in connection with the work, all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition and waterways left unobstructed. The Contractor shall restore, in an acceptable manner, all property, both public and private, which he may have damaged in the execution of the work, and all parts of the work shall be left in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of such from the property Owner.

#### **END OF SECTION**

<u>50-01 AUTHORITY OF THE ENGINEER</u>. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. The Engineer shall decide all questions which may arise as to the interpretation of the specifications or plans relating to the work. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for under the contract.

For AIP projects, the Engineer does not have the authority to accept pavements that do not conform to FAA specification requirements.

<u>50-02 CONFORMITY WITH PLANS AND SPECIFICATIONS</u>. All work and materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross sections, dimensions, material requirements and testing requirements that are specified (including specified tolerances) in the contract, plans, or specifications.

If the Engineer finds that the materials furnished, work performed, or the finished product are not within reasonably close conformity with the plans and specifications, but that the portion of the work affected will, in his or her opinion, result in a finished product having a level of safety, economy, durability and workmanship acceptable to the Owner, the Engineer will advise the Owner of his or her determination that the affected work be accepted and remain in place. In this event, the Engineer will document the determination and recommend to the Owner a basis of acceptance which will provide for an adjustment in the contract price for the affected portion of the work. The Engineer's determination and recommended contract price adjustments will be based on sound engineering judgment, and such tests or retests of the affected work as are, in the Engineer's opinion, needed. Changes in the contract price shall be covered by contract change order, as applicable.

If the Engineer finds that the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and the specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by, and at the expense of, the Contractor, in accordance with the Engineer's written orders.

For the purpose of this subsection, the term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the Engineer's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the work.

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Engineer with the authority to use good engineering judgment in his or her determinations as to acceptance of work that is not in strict conformity but will provide a finished product equal to or better than that intended by the requirements of the contract, plans, and specifications.

The Engineer will not be responsible for the Contractor's means, methods, techniques, sequences or procedures of construction, or for the safety precautions incident thereto.

<u>50-03 COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS</u>. The contract, plans, specifications, and all referenced standards cited, are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be

complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited FAA advisory circulars; contract general provisions shall govern over plans, cited standards for materials or testing and cited FAA advisory circulars; plans shall govern over cited standards for materials or testing and cited FAA advisory circulars; plans shall govern over cited standards for materials or testing and cited FAA advisory circulars; large scale detail plan shall take precedence over general plan sheet. Shop drawings shall govern all details of the work, taking precedence over all other drawings unless shop drawings include scope items in conflict with the contract scope (see article 50-03-1 below). If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specification, cited standards for materials or testing, and cited FAA advisory circulars, the Special Provision shall govern.

From time to time, discrepancies within cited standards for testing occur due to the timing of changing, editing, and replacing of standards. In the event that the Contractor discovers any apparent discrepancy within standard test methods, he shall immediately call upon the Engineer for an interpretation and decision, and such decision shall be final.

The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event that the Contractor discovers any apparent error or discrepancy, he shall immediately call upon the Engineer, in writing, for his interpretation and decision, and such decision shall be final.

<u>50-03-1 SHOP DRAWINGS</u>. No later than ten (10) days after the award of contract, the Contractor shall, at his own expense, prior to the manufacture or fabrication of any materials which he is to furnish and which are not built from detailed designs shown in the contract documents, submit for the review for compliance of the Engineer. When the number of required shop drawing submittals is too extensive to be produced within ten (10) days after award of contract, the Contractor shall provide a schedule for all required submittals within ten (10) days of award of contract. This schedule shall indicate expected submittal dates, and identify any submittal reviews deemed critical to contract execution. One copy of each shop drawing submittals shall be submitted electronically. If a physical sample is needed as part of the shop drawing submittal, a minimum of one (1) sample shall be provided.

These drawings shall be accurate and distinct, and shall give all working dimensions, kinds of material to be used, kinds of machine work, finish to be applied, and all like information. The review and approval of the shop drawings will be provided electronically. If required by the Engineer, the drawings shall be revised, and the revised drawings shall be submitted electronically until the review for compliance of the Engineer has been obtained.

If shop drawings show variations from the work required by the contract, because of standard shop practice or other similar reasons, the Contractor shall make specific mention of such variation in his or her "letter of transmittal", in order that, if acceptable, suitable action may be taken by the Engineer for proper price adjustment; otherwise, the Contractor will not be relieved of his or her responsibility for executing the work in accordance with the contract, even though such shop drawings are reviewed for compliance by the Engineer.

The review for compliance of such drawings by the Engineer relate only to the requirements for strength and detail, and such review for compliance will not relieve the Contractor from responsibility for errors or responsibility for the adequacy or safety or falsework, cofferdams or other temporary work. Authorized alterations will be endorsed on review for compliance plans or shown on supplementary

sheets. Any work done, or material ordered, prior to the review for compliance of such plans and drawings, shall be at the Contractor's sole risk.

Detailed shop drawings shall be required for all equipment specified for the project. When detailed plans are required, they shall be submitted to the Engineer for review for compliance, and they shall be signed by, and bear the seal of, a Registered Professional Engineer, where specified.

The Contractor is responsible for dimensions which shall be confirmed and correlated at the site; fabrication processes and techniques of construction; coordination of his or her work with that of all other trades; and the satisfactory performance of his or her work. Each submittal shall be provided with the Contractor's stamp, initialed or signed, certifying the review of submittal, verification of field measurements, and compliance with the plans and specifications.

The Contractor shall review and approve shop drawings, product data, and samples prior to submission.

Wherever possible, the Contractor shall verify:

- a. Field Measurements;
- b. Field Construction Criteria; and
- c. Catalog Numbers and Similar Data.

The Contractor shall coordinate each submittal with requirements of the work and of the plans and specifications.

The Contractor's responsibility for errors and omissions in submittals is not relieved by the Engineer's review of submittals.

The Contractor's responsibility for deviations in submittals from requirements of the plans and specifications is not relieved by the Engineer's review of submittals. The Contractor may submit specific deviations to the Engineer for review, but such deviations will require the Engineer's written approval for the specific deviation.

Where shop drawings prepared by one trade require cross-checking with the shop drawings of some other trade(s), then the Contractor shall assemble the shop drawings of all interdependent trades, cross-check and coordinate them, require corrections as necessary from the various trade(s), and then present the corrected drawings in one submission. As an alternate to this procedure, the Contractor may make composite drawings showing the interrelation of the concerned trades and subsequent shop drawings of these trades shall be required to conform to these reviewed composite drawings. Fragmentary or piecemeal transmittals of shop drawings for individual trades, in violation of this requirement, will be returned to the Contractor unchecked and will not be accepted.

It shall be the Contractor's responsibility to distribute copies of the submittals to his or her subcontractors and vendors following the Engineer's review and return of submittals to the Contractor.

<u>50-03-02 MEETINGS.</u> PRE-CONSTRUCTION MEETING: Upon receipt of the executed contract, bond(s), and insurance from the Contractor, the Construction Manager will schedule the "Pre-Construction Meeting", and the attendees shall be:

IAA Engineer Construction Manager Subcontractors (as appropriate).

The agenda for the Pre-Construction Meeting shall include but not be limited to:

Introduction of Team Members Scope Review Schedule Review Procedures Review Payment Process Review Questions and Answers.

<u>Weekly General Coordination:</u> "Weekly Owner and Construction Manager Coordination Meetings" will be held at the on-site Field Office. It is mandatory that all meetings be attended by Contractor's representative(s) involved with construction, planning, coordination and performance of the work. The Owner may specify if the general coordination meetings are to be held at a lesser frequency.

Meeting will cover:

- Contractor's present and future needs, including interface requirements, time, sequences, deliveries, access, site utilization, services, hours of work, hazards and risks, housekeeping;
- Documentation of information for pay requests;
- Progress update of work; is each element of work ahead of schedule, on time, or behind schedule in relation to master progress schedule;
- If work is behind schedule, determine if the work requires expediting, and secure commitment;
- Discuss whether schedule revisions are required to ensure that current work, and subsequent work, will be completed within the contract time; and.
- Review everything of significance which could affect the progress of the work.

<u>50-04 COOPERATION OF CONTRACTOR</u>. The Contractor will be supplied with five sets and an electronic copy of complete "issued for construction" copies of the plans and specifications. The Contractor shall have available on the work, at all times, one copy each of the plans, specifications, and addenda. Additional copies of the plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work in order to facilitate the progress thereof, and shall cooperate at all times with the Engineer and his or her inspectors and with other contractors in every way possible. The Engineer shall allocate the work and designate the sequence of construction in case of controversy between contractors and other third parties.

The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his agent on the work. The superintendent shall be capable of reading and thoroughly understanding the

plans and specifications, and shall receive and fulfill instructions from the Engineer or his or her authorized representative.

<u>50-05 CONSTRUCTION LAYOUT AND STAKES</u>. The Engineer will furnish reference points for horizontal and vertical control, and any additional information, upon request of the Contractor, necessary to lay-out and construct the work, but will not do construction staking. The Contractor will set construction stakes establishing lines, slopes and continuous profile grade work, centerline and bench marks for culverts and other accessory structures and appurtenances, as he may deem necessary, and will furnish stakes and markers necessary for field control in accordance with which the Contractor shall govern and execute the work.

The Engineer may check such information, but the Contractor shall be responsible for accuracy other than primary benchmarks and alignment points furnished by the Engineer. No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

In case of error on the part of the Contractor, or his/her employees, resulting in establishing grades and/or alignment that are not in accordance with the plans or established by the Engineer, all construction not in accordance with the established grades and/or alignment shall be replaced without additional cost to the Owner.

<u>50-06 AUTHORITY AND DUTIES OF INSPECTORS</u>. Inspectors shall be authorized to inspect all work done and all material(s) furnished. Such inspection may extend to all or any part of the work, and to the preparation, fabrication or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter or waive any provision of the contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications, or to act as foreman for the Contractor.

Inspectors employed by the Owner are authorized to notify the Contractor or his or her representative of any failure of the work or materials to conform to the requirements of the contract, plans or specifications, and to reject such nonconforming material(s) in question until such issues can be referred to the Engineer for a decision.

<u>50-07 INSPECTION OF THE WORK</u>. All materials, and each part or detail of the work, shall be subject to inspection. The Engineer shall be allowed access to all parts of the work, and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering or removing, and the replacing of the covering or making good of the parts removed, will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering or removing, and the replacing of the covering or making good of the parts removed, will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering or removing, and the replacing of the covering or making good of the parts removed, will be at the Contractor's sole expense.

Any work done, or materials used, without the knowledge of an authorized representative of the Owner, may be ordered removed and replaced at the Contractor's expense, unless the Owner's representative failed to inspect after having been given reasonable notice, in writing, that the work was to be performed. Should the contract work include relocation, adjustment or any other modification to existing facilities,

not the property of the IAA, authorized representatives of the owner of such facilities shall have the right to inspect such work. Such inspection shall, in no event, make any facility owner a party to the contract, and shall, in no way, interfere with the rights of the parties to the contract.

<u>50-8 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK</u>. All work which does not conform to the requirements of the contract, plans, and specifications, will be considered unacceptable, unless otherwise determined acceptable by the Engineer as provided in the subsection entitled "CONFORMITY WITH PLANS AND SPECIFICATIONS" of this Section 50.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause, found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the subsection entitled "CONTRACTOR'S RESPONSIBILITY FOR WORK" of Section 70.

Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as given, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced, at the Contractor's sole expense.

Upon failure on the part of the Contractor to comply forthwith with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to suspend further work activity by the Contractor, and/or to cause unacceptable work to be remedied or removed, and replaced, and unauthorized work to be removed, and to deduct the costs incurred by the Owner from any monies due or to become due to the Contractor.

<u>50-9 USE OF ROADS AND STREETS</u>. The Contractor shall make ample provisions for the maintenance of both vehicular and foot traffic on all local public sidewalks, streets and alleys, and any other public walkway or thoroughfare, and shall indemnify, defend and save the Engineer, the Construction Managers, the Owner, and their respective officers, agents, members, representatives, and employees, harmless from and against any and all costs and expenses whatsoever, due to his or her operations over said roadways. Gutters and waterways must be kept open, or other provisions made, for the removal of storm water.

Streets intersected by pipe lines may be blocked out one-half (1/2) at a time, and the Contractor shall lay and maintain temporary driveways, bridges and crossings, such as in the opinion of the Engineer are necessary to reasonably accommodate the public. In the event of the Contractor's failure to comply with these provisions, the Owner may cause the same to be done, and will deduct the cost of this work from any monies to become due the Contractor under the contract, but the performance of such work by the Owner, or at its insistence, shall in no way serve to release the Contractor from his or her general or particular liability for the safety of the public or the work.

The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage or loss which may result from the moving of material(s) or equipment.

The operation of equipment of such weight, or so loaded as to cause damage to structures or to any other type of construction, will not be permitted. Hauling of materials over the subgrade base course or surface course under construction shall be limited, as directed. No loads will be permitted on a concrete pavement, floor, base or structure before the expiration of the curing period. The Contractor shall be

responsible for any and all damage done by his or her hauling equipment, and shall correct such damage at his or her own expense.

<u>50-10 MAINTENANCE DURING CONSTRUCTION</u>. The Contractor shall maintain the work during construction and until the work is accepted. This maintenance shall constitute continuous and effective work prosecuted day-by-day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction, and before the project is accepted, shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

<u>50-11 FAILURE TO MAINTAIN THE WORK</u>. Should the Contractor, at any time, fail to maintain the work as provided in the subsection entitled "MAINTENANCE DURING CONSTRUCTION" of this Section 50, the Engineer shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Engineer's notification, the Engineer may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due, or to become due, to the Contractor.

<u>50-12 FINAL ACCEPTANCE</u>. Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer will make final inspection. If all construction provided for, and contemplated by, the contract is found to be completed in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor, in writing, of final acceptance as of the date of the final inspection or reinspection if corrective measures are required.

If the final inspection discloses any work, in whole or in part, as being incomplete or unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same, and the Contractor shall immediately comply with and execute such instructions. Upon correction of any unsatisfactory work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of the final inspection. After final acceptance, the Contractor shall submit the application for the final progress payment in accordance with Section 90-09.

<u>50-13 CLAIMS FOR ADJUSTMENT AND DISPUTES</u>. If, for any reason, the Contractor deems that addition compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the Engineer, in writing, of his or her intention to claim such additional compensation before he begins the work on which he bases the claim. Such notice by the Contractor, and the fact that the Engineer has kept account of the cost of the work, shall not, in any way, be construed as providing or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the

Contractor shall submit a written claim to the Engineer, who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this Subsection 50-13 shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

<u>50-14 SUBCONTRACTORS</u>. A complete list of all subcontractors will be required, and it shall be submitted within ten (10) calendar days after award. The list of subcontractors shall not be changed without written permission by the Owner.

The Contractor shall be fully responsible to the Owner for the portions of the work performed by his or her subcontractors, and for the acts and omissions of his or her subcontractors and of persons either directly or indirectly employed by the subcontractor, as he is for the portions of the work performed by, and acts and omissions of, persons directly employed by the Contractor. The review by the Owner of the selection of subcontractors shall not relieve the Contractor from such responsibility.

Nothing contained in the contract shall create any contractual relation between any subcontractor and the Owner. The Owner shall not have any obligation to pay, or to see to the payment of, any monies to any subcontractor, except as may otherwise be required by law.

<u>50-15 RECORD OF CONSTRUCTION DRAWINGS</u>. The Contractor shall be responsible for keeping a legible and accurate field set of "Record Drawings". These drawings shall be submitted to the Engineer upon completion of the project. Upon completion of the Record Drawings by the Engineer, the field set may be returned to the Contractor.

<u>50-16 PROTECTION OF PUBLIC SERVICE STRUCTURES</u>. The Contractor shall assume all risk and liability for any and all inconvenience, delay or expense that may be occasioned by public utilities or other public or private property within the limits of the proposed improvements, whether or not such property is shown on the plans, and shall do no work which will injure or damage any such property until arrangements satisfactory to the Owner have been made for its protection.

The Contractor shall give notice to the owners of various utilities in sufficient time so that the owners may take means beyond those provisions described above to protect their respective property.

<u>50-17 PROTECTING EXISTING STRUCTURES</u>. The Contractor shall, at his or her own expense, shore-up and protect any buildings, bridges, tracks or other public or private structures which may be encountered or endangered in the execution of the work unless otherwise provided for, and he shall repair and make good any damage caused to any such property by reason of his or her operations. No extra payment will be made for said work or material(s).

<u>50-18 LANDMARKS AND MONUMENTS</u>. The Contractor, or any of his or her employees, shall not molest, disturb, damage or remove any monuments or landmarks, without the written consent of the Owner. Any monument or landmark so removed will be replaced by the Owner, at the sole expense of the Contractor. The cost thereof shall be retained from the monies due, or to become due, to the Contractor under the contract.

<u>50-19 WATER SUPPLY</u>. On projects where water is accessible through a water utility pipe, the Contractor may obtain water from the water utility, subject to rules, regulations and rates governing this utility; otherwise, the Contractor shall furnish the water for the work from other sources. Except for any

water line extensions which may be included in the contract, the Contractor shall assume the entire cost of conveying water about the work.

<u>50-20 SALVAGEABLE ITEMS</u>. Any existing item encountered on the project that, in the opinion of the Engineer, is of value worth salvaging or using on the project, will be dismantled and used or delivered to an appropriate location on Airport property, as directed by the Engineer. Any salvageable item encountered shall become the sole property of the Owner.

<u>50-21 CONTRACTOR'S STAGING AREA</u>. The Contractor will be assigned a staging area. Field offices, materials and equipment remaining on the airport overnight will be moved to this location. Employee's vehicles will also be parked in this area during working hours only. The Contractor shall keep equipment and materials off the existing runways and taxiways, and shall keep the drives and streets clean. After completion of the project, the staging area shall be restored to its original condition.

#### **END OF SECTION**

#### Section 60 Control of Materials

<u>60-01 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS</u>. The materials used on the work shall conform to the requirements of the contract, plans, and specifications.

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition and manufacture of all materials to be used in the work. Such statements shall be furnished promptly after execution of the contract, but, in all cases, prior to delivery of such materials.

At the Engineer's option, materials may be approved at the source of supply before delivery is started. If it is found, after trial, that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that conforms to the requirements of cited materials specifications. In addition, where an FAA specification for airport lighting equipment is cited in the plans or specifications, the Contractor shall furnish such equipment that is:

- a. Listed in the FAA Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, that is in effect on the date of advertisement; and
- b. Produced by the manufacturer qualified (by FAA) to produce such specified and listed equipment.

<u>60-02 SAMPLES, TESTS, AND CITED SPECIFICATIONS</u>. All materials used in the work may be inspected, tested and accepted by the Engineer before incorporation in the work. Any work in which untested materials are used without approval or written permission of the Engineer, shall be performed at the Contractor's sole risk. Materials found to be unacceptable and unauthorized will not be paid for, and, if directed by the Engineer, shall be removed at the Contractor's sole expense.

Unless otherwise designated, tests in accordance with the cited standard methods of American Association of State Highway and Transportation Officials (AASHTO), ASTM, Federal Specifications, Commercial Item Descriptions, and all other cited methods which are current on the date of advertisement for bids, will be made by, and at the expense of, the Owner.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel, including the Contractor's representative at his or her request. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the Engineer. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the Engineer.

The Contractor shall employ a testing organization to perform all of Contractor required Quality Control tests. The Contractor shall submit to the Engineer resumes on all testing organizations and individual persons who will be performing the tests. The Engineer will determine if such persons are qualified. All the test data shall be reported to the Engineer after the results are known. A legible, handwritten copy of all test data, shall be given to the Engineer daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report, in electronic form, to the Engineer, showing all test data reports, plus an analysis of all results showing ranges, averages and corrective action taken on all failing tests.

#### Section 60 Control of Materials

<u>60-03 CERTIFICATION OF COMPLIANCE</u>. The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time, and, if found not to be in conformity with contract requirements, will be subject to rejection, whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Engineer.

When a material or assembly is specified by "brand name or equal", and the Contractor elects to furnish the specified "brand name," then the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered, and shall certify as to:

- a. Conformance to the specified performance, testing, quality or dimensional requirements; and
- b. Suitability of the material or assembly for the use intended in the contract work.

Should the Contractor propose to furnish an "or equal" material or assembly, then he shall furnish the manufacturer's certificates of compliance, as hereinbefore described, for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The Engineer reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

<u>60-04 PLANT INSPECTION</u>. The Engineer, or his or her authorized representative, may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected, from time to time, for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work, and to obtain samples required for acceptance of the material or assembly.

Should the Engineer conduct plant inspections, then the following conditions shall exist:

- a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials;
- b. The Engineer shall have full entry, at all reasonable times, to such parts of the plant that concern the manufacture or production of the materials being furnished; and
- c. If required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material which has been tested and approved at the source of supply after it has been delivered to the site. The Engineer shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.
# Section 60 Control of Materials

<u>60-05 ENGINEER'S FIELD OFFICE AND LABORATORY</u>. The Owner shall designate a suite of offices in an Owner building located on the Airport property that shall be used as field offices for the Engineer, certain members of the Construction Manager's staff and certain members of the Designer's staff. It is the Owner's intent that these offices be provided to the Contractor rent free.

The Contractor shall furnish a building for the exclusive use of the Engineer as a field office and/or field testing laboratory. The building shall be furnished and maintained by the Contractor as specified herein, and shall become property of the Contractor when the contract work is completed.

Unless otherwise specified, the office shall meet the following minimum requirements:

- 1.1 Minimum dimensions shall be 12 feet wide, 56 feet in length, 7 feet high (floor to ceiling), 650 square feet of floor area;
- 1.2 There shall be at least ten (10) hinged or sliding windows with theft-deterrent locks;
- 1.3 There shall be at least two (2) exterior doors with heavy duty locksets and anti break-in plates. Keys shall be furnished in the number requested by the Engineer;
- 1.4 Satisfactory floor and weatherproof roof shall provide dust-proof and wind-tight enclosure;
- 1.5 All doors and windows shall be furnished with adequate screens. Interior sun shades shall be provided at all windows;
- 1.6 Lighting, heating and air conditioning equipment shall be furnished to provide a comfortable working area;
- 1.7 At least twelve (12) duplex electric outlets shall be provided;
- 1.8 The unit is to have two (2) offices and one (1) conference room. Each office to have:
- 1.8.1 one office desk (36x72) with center drawer and side drawers on each side;
- 1.8.2 one high-back office chair;
- 1.8.3 two visitors chairs;
- 1.8.4 one desk height back table (42x96);
- 1.8.5 one free-standing plan rack, with racks, and wheels;
- 1.8.6 one steel legal size, fire resistant four-drawer filing cabinet, with lock, and is to have a fire rating of Class D (or higher) classification established by Underwriters Laboratories;
- 1.8.7 one 60"x48" bookcase with four (4) adjustable shelves;
- 1.8.8 one large waste basket with continuous supply of trash bags;
- 1.9 The conference room is to have folding tables and chairs to accommodate at least twenty five (25) people around the table, two (2) large waste baskets with trash bags as noted for the office, two (2) brooms with dust pans;
- 1.10 Suitable sanitary facilities shall be provided and maintained for the duration of the project;
- 1.11 A continuous supply of commercial bottled water shall be provided for the duration of the project;
- 1.12 A stand-alone laser copier with three (3) paper feeds (letter, legal and tabloid), black-and-white printing, black-and-white copying, color scanning, automatic duplex printing, 256mb memory, wireless connectivity. Include paper toner and service for duration of project;

# Section 60 Control of Materials

- 1.13 Two portable ABC fire extinguishers, including service, for duration of project;
- 1.14 A wall-mounted OSHA approved first aid kit;
- 1.15 The field office shall meet with the approval of the Engineer;
- 1.16 It is intended for this office trailer to be located in close proximity to other office and parking facilities the Contractor will use for construction of the Work of the Hanna Basin Facility to allow common usage of parking surfaces. If this can't be accomplished, a gravel lot sufficient to park four (4) vehicles at this office will be provided.

The field office shall be the property of the Contractor, who shall maintain the office and provide necessary utilities for the duration of the contract. The office shall be located at the job site within five (5) days after the notice to proceed of the work at the Hanna Basin, and removed within ten (10) days after the date of final acceptance of the work.

<u>60-06 STORAGE OF MATERIALS</u>. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Engineer. Materials to be stored on airport property shall not create an obstruction to air navigation, nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans, the storage of materials, and the location of the Contractor's plant and parked equipment or vehicles, shall be as directed by the Engineer. Private property shall not be used for storage purposes without the written permission of the Owner or lessee of such property. The Contractor shall make all arrangements, and bear all expenses, for the storage of materials on private property. The Contractor shall furnish the Engineer with a copy of the property owner's permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor, at his or her sole expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

No shanties, garages, buildings for storage of materials, or any other purpose shall be erected on land owned or leased by the Owner, unless a permit, in writing, is secured from the Owner, allowing their construction. Should permission be asked and granted, the Contractor must comply with all of the local laws and regulations regarding the construction and maintenance of such buildings.

<u>60-07 UNACCEPTABLE MATERIALS</u>. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable, and shall be rejected. The Contractor shall remove any and all rejected material or assembly from the site of the work, unless otherwise instructed by the Engineer.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the Engineer has approved its use in the work.

<u>60-08 OWNER-FURNISHED MATERIALS</u>. The Contractor shall furnish all materials required to complete the work, except those specified to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified herein.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials, shall be included in the contract as a cost of the Work.

# Section 60 Control of Materials

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss or other deficiencies which may occur during the Contractor's handling, storage or use of such Owner-furnished material. The Owner will deduct from any monies due, or to become due, to the Contractor, any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage or use of Owner-furnished materials.

<u>60-09 SHIPMENTS OF EQUIPMENT AND MATERIALS</u>. Shipments of materials to be used by the Contractor, or any subcontractor, shall be delivered to the job site. Advance notice of 72 hours to the Engineer may be required for certain larger deliveries to the site for coordination with Airport operations. All shipments, and shipping papers, shall be addressed and consigned to the Contractor. Under no circumstances shall shipments be directed to, or in the care of, the Owner or his or her representatives.

<u>60-10 SECURITY OF MATERIALS, TOOLS AND EQUIPMENT</u>. The Owner shall not be responsible for the loss or security of the materials, tools or equipment of the Contractor or subcontractors during transit, while stored onsite or in the execution of the Work.

<u>60-11 PROTECTION OF EQUIPMENT</u>. The Contractor shall furnish and maintain satisfactory protection, both during and after installation, to all materials and equipment, against injury by weather, flooding or breakage, thereby permitting all work to be left in a perfect condition at the completion of the contract. No extra payment will be made for this work, but the entire cost of the same shall be included in the unit or lump sum prices stipulated for the various items of the work to be done under the contract.

<u>60-12 TEMPORARY LIGHT AND HEAT</u>. The Contractor shall supply all temporary heat and light, at Contractor's sole expense, for such periods of time, and to maintain such temperature, as is required for the proper protection and execution of the work included in the contract.

# **END OF SECTION**

<u>70-01 LAWS TO BE OBSERVED</u>. The Contractor shall keep fully informed of all federal, state and local laws, ordinances, rules and regulations, as well as all orders and decrees of bodies or tribunals having any jurisdiction or authority, which, in any manner, affect those engaged or employed on the work, or which, in any way, affect the conduct of the work. The Contractor shall, at all times, observe and comply with all such laws, ordinances, rules, regulations, orders and decrees; and shall protect and indemnify the Owner and all its officers, agents, representatives and employees from and against any and all claims and liability arising out of, from, or based on, the violation of any such law, ordinance, rule, regulation, order or decree, whether by the Contractor or Contractor's employees.

<u>70-02 PERMITS AND LICENSES</u>. The Contactor shall be procure all permits and licenses, pay all charges, fee and taxes, and give all notices necessary and incidental to the due and lawful execution of the work. Copies of all permits must be forwarded to the Engineer prior to the Contractor commencing any of the work.

The Contractor will be required to furnish a certificate from the Workers Compensation Board of the State of Indiana, as evidence that he has complied with the provisions of the "Indiana Workmen's Compensation Act," and also the "Indiana Workmen's Occupational Diseases Act," Chapter 69 of the Acts of the Indiana General Assembly, 1937.

<u>70-03 PATENTED DEVICES, MATERIALS, AND PROCESSES</u>. If the Contractor is required, or desires, to use any design, device, material or process covered by letters of patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or owner thereof. Responsibility to provide agreement for any device, design, material, or process that is shown on the bidding documents shall rest with the Designer of record. The Contractor, and the surety, shall indemnify and save harmless the Owner, any third party and any political subdivision, from and against any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify and save harmless the Owner for any and all costs, expenses and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

<u>70-04 RESTORATION OF SURFACES DISTURBED BY OTHERS</u>. The Owner reserves the right to authorize the construction, reconstruction or maintenance of any public or private utility service, FAA, or National Oceanic and Atmospheric Administration ("NOAA") facility, or a utility service of another government agency, at any time during the progress of the work.

The Contractor shall not permit any individual or entity to excavate, or otherwise disturb, such utility service or facilities located within the limits of the work, without the written permission of the Engineer.

Should the owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency, be authorized to construct, reconstruct or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such owners by arranging and performing the work in the contract so as to facilitate such construction, reconstruction or maintenance.

<u>70-05 FEDERAL AID PARTICIPATION</u>. For Airport Improvement Program (AIP) contracts, the United States Government has agreed to reimburse the Owner for some portion of the contract costs. Such reimbursement is made, from time to time, upon the Owner's request to the FAA. In consideration of the United States Government's (FAA's) agreement with the Owner, the Owner has included

provisions in the contract pursuant to the requirements of Title 49 of the United States Code ("USC") and the rules and regulations of the FAA that pertain to the work.

As required by the USC, the contract work is subject to the inspection and approval of duly authorized representatives of the Administrator, FAA, and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the USC, the rules and regulations implementing the USC, or the contract, shall be construed as making the United States Government a party to the contract, nor will any such requirement interfere, in any way, with the rights of either party to the contract.

<u>70-05-01 CERTIFIED PAYROLL</u>. Certified payrolls shall be submitted weekly, and are due on or before the Wednesday of the following week. The Contractor is responsible to submit, and keep current, the submissions for its own payroll, as well as that of its subcontractors and lower-tier companies. Both Federal Forms WH347 and WH348, or equivalent, shall be used. Submitting one form or equivalent without the other shall be considered an incomplete submission. Certified payrolls are required starting the first week, or partial week, an entity performs work. Once an entity begins work, a report is required every week, even if no work is performed that week. Reports confirming zero (0) hours are required for any weeks where no work is done. The final report for each entity shall be marked "final". Until a "final report" is received, certified payroll submissions are required. In the event that an entity performs work on the project after submitting a "final report", certified payroll submission must begin again.

<u>70-06 SANITARY, HEALTH, AND SAFETY PROVISIONS</u>. The Contractor shall provide and maintain, in a neat, sanitary condition, such accommodations for the use of his or her employees as may be necessary to comply with the requirements of any state and local board of health, or of other bodies or tribunals having jurisdiction. Attention is directed to federal, state and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings, or under conditions, which are unsanitary, hazardous or dangerous to his/her health or safety. No airport facilities are to be used by Contractor's personnel.

<u>70-07 PUBLIC CONVENIENCE AND SAFETY</u>. The Contractor shall control his or her operations, and those of his or her subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration. The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his or her own operations and those of his or her subcontractors and all suppliers, in accordance with the subsection entitled "MAINTENANCE OF TRAFFIC" of Section 40, and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection entitled "LIMITATION OF OPERATIONS" of Section 80.

<u>70-08 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS</u>. The Contractor shall furnish, erect and maintain all barricades, warning signs and markings for hazards which are necessary to protect the public and the work. When used during periods of darkness, such barricades, warning signs and hazard markings shall be suitably illuminated. Unless otherwise specified, barricades, warning signs and markings for hazards that are in the air operations area shall be a maximum of 18 inches high. Unless otherwise specified, barricades shall be spaced not more than twenty five (25) feet apart.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic Control Devices.

When the work requires closing an air operations area of the airport or portion of such area, the Contractor shall furnish, erect and maintain temporary markings and associated lighting conforming to the requirements of FAA Advisory Circular 150/5340-1, Standards for Airport Markings. The Contractor shall furnish, erect and maintain markings and associated lighting of open trenches, excavations, temporary stock piles, and Contractor's parked construction equipment that may be hazardous to the operation of emergency fire rescue or maintenance vehicles on the airport in reasonable conformance to FAA Advisory Circular 150/5370-2, Operational Safety on Airports During Construction Activity.

The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to FAA Advisory Circular 150/5370-2. All construction vehicles in use on the construction site shall also be marked with the Contractor's name or logo. Only vehicles covered by the Contractor's insurance will be allowed within the construction area. No personally-owned vehicles will be allowed within the Contractor's employee parking will be allowed within the Contractor's staging area.

The Contractor shall furnish and erect all barricades, warning signs and markings for hazards prior to commencing work which requires such erection, and shall maintain the barricades, warning signs and markings for hazards until their dismantling is directed by the Engineer.

Open-flame type lights shall not be permitted.

70-09 USE OF EXPLOSIVES. The use of explosives will not be permitted.

<u>70-10 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE</u>. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property marks until the Engineer has witnessed or otherwise referenced their location, and shall not move them until directed. The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project is completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at his or her sole expense, such property to a condition substantially similar or equal to that existing before such damage or injury was done, by repairing, rebuilding or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

<u>70-11 INSURANCE</u>. The Contractor shall indemnify and save harmless the Engineer and the Owner, and their respective officers and employees, (individually and collectively, the "Indemnified Parties"), from and against any and all suits, judgments, actions, claims and liabilities, of any character, brought because of or arising out of any personal or bodily injury or damage received or sustained by any person(s) or property on account of the operations of the Contractor; or on account of, or in consequence of, any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect or misconduct of said Contractor; or because of any claims or amounts recovered from any infringement(s) of patent, trademark or copyright; or from any

claims or amounts arising or recovered under the "Workmen's Compensation Act", or any other law, ordinance, order or decree. Money due to the Contractor under and by virtue of its contract as may be considered necessary by the Owner for such purpose may be retained for the use of the Owner, or, in case no money is due, his or her surety may be held until such suits, judgments, actions, claims or liabilities for injuries or damages as aforesaid, shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due to the Contactor will not be withheld when the Contractor produces satisfactory evidence that it is adequately protected by public liability and/or property damage insurance, as applicable, in accordance with the coverages outlined in the Appendix E of the Construction Manager's contract.

The Owner, the Engineer, and the Construction Managers, and their respective officers, directors, employees, representatives and agents shall be named as an "additional insured", using Contractors Endorsement (CG2010 Ed. 11-85 or its equivalent) or a comparable Blanket Additional Insured Endorsement "which includes completed operations coverage".

Coverage provided to the Owner, the Engineer, and the Construction Managers, as additional insureds under the contractors' liability policy, shall apply on a primary and non-contributory basis.

Before commencing any work on the project, Contractor shall furnish to the Owner, the Engineers, and the Construction Managers, and any other persons designated by the Owner, certificates issued by the company or companies issuing such insurance, evidencing that such insurance is in full force and effect and expressly providing that no such insurance may be cancelled or changed without at least thirty (30) days' prior written notice thereof by certified mail, return receipt requested, to:

Indianapolis Airport Authority 7800 Col. H. Weir Cook Memorial Drive Indianapolis, Indiana 46241

In addition, if requested by the Owner, the Engineer, or the Construction Managers, duplicate policies shall be furnished. At the request of the Owner, the Engineer, or the Construction Managers, the Contractor also shall promptly cause any and all government agencies and political subdivisions having an interest in the project, or any part thereof, to be named as additional insured parties under all of the aforesaid liability and casualty insurance policies, and shall furnish insurance certificates to them. The Contractor shall not commence or permit any subcontractor to commence any work until each has fully complied with the insurance requirements set forth herein.

<u>70-12 THIRD PARTY BENEFICIARY CLAUSE</u>. It is agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create any third party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage under, in connection with, or pursuant to the terms or provisions of the contract.

<u>70-13 OPENING SECTIONS OF THE WORK TO TRAFFIC</u>. Should it be necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work shall be specified and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified.

A phasing schedule, when applicable, will be indicated on the plans or in the special provisions of the specifications.

Upon completion of any portion of the work listed above, such portions shall be accepted by the Owner in accordance with the subsection entitled "PARTIAL ACCEPTANCE" of Section 50.

No portion of the work may be opened by the Contractor for public use until ordered by the Engineer, in writing. Should it become necessary to open a portion of the work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner, shall be repaired by the Contractor at his sole expense.

The Contractor shall make his or her own estimate of the inherent difficulties involved in completing the work under the conditions herein described, and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

Contractor shall be required to conform to safety standards contained in AC 150/5370-2.

Contractor shall refer to the approved Construction Safety Phasing Plan (CSPP) to identify barricade requirements and other safety requirements prior to opening up sections of work to traffic.

<u>70-14 CONTRACTOR'S RESPONSIBILITY FOR WORK</u>. Until the Engineer's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with the subsection entitled "PARTIAL ACCEPTANCE" of Section 50, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of, and without the fault or negligence of, the Contractor, including, but not restricted to, acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of governmental authorities.

If the work is suspended by the Contractor for any cause whatever, the Contractor shall be responsible for the work, and shall take such precautions as necessary to prevent damage to the work. The Contractor shall provide for normal drainage, and shall erect necessary temporary structures, signs or other facilities, at his or her sole expense. During such period of suspension of work, the Contractor shall properly and continuously maintain, in an acceptable growing condition, all living material in established plantings, seedings and soddings furnished under the contract, and shall take adequate precautions to protect tree growth and other important vegetative growth against injury.

#### 70-15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF

<u>OTHERS</u>. As provided in the subsection entitled "RESTORATION OF SURFACES DISTURBED BY OTHERS" of this Section 70, the Contractor shall cooperate with the owner of any public or private utility service, FAA, NOAA, or a utility service of another government agency that may be authorized by the owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control his or her operations to prevent the unscheduled interruption of such utility services and facilities. To the extent that such public or private utility

services, FAA, or NOAA facilities, or utility services of another governmental agency, are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and the owners are indicated.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the owners of all utility services or other facilities, of his plan of operations. Such notification shall be in writing. A copy of each notification shall be given to the Engineer.

In addition to the general written notification hereinbefore provided, it shall be the responsibility of the Contractor to keep such individual owners advised of changes in his plan of operations that would affect such owners.

Prior to commencing the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such owner of his or her plan of operation. If, in the Contractor's opinion, the owner's assistance is needed to locate the utility service or facility, or the presence of a representative of the owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's "PERSON TO CONTACT" no later than two (2) normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the Engineer.

The Contractor's failure to give the two (2) days' notice shall be cause for the Engineer to suspend the Contractor's operations in the general vicinity of a utility service or facility. Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use excavation methods acceptable to the Engineer within three (3) feet of such outside limits, at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, he shall immediately notify the proper authority and the Engineer, and shall then take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to his operations, whether or not due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due, or which may become due, to the Contractor or his surety.

<u>70-16 FURNISHING RIGHTS-OF-WAY</u>. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed, in advance of the Contractor's operations.

<u>70-17 PERSONAL LIABILITY OF PUBLIC OFFICIALS</u>. In carrying out any of the contract provisions or in exercising any power or authority granted by the contract, there shall be no liability upon the

Engineer, his or her authorized representatives, or any official or employee of the Owner, either personally or as an official or employee of the Owner. It is understood that, in such matters, they act solely as agents and representatives of the Owner.

<u>70-18 NO WAIVER OR LEGAL RIGHTS</u>. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or estop the Owner from correcting any measurement, estimate or certificate made before or after completion of the work, nor shall the Owner be precluded or estopped from recovering from the Contractor or his or her surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his or her obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract, shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

<u>70-19 ENVIRONMENTAL PROTECTION</u>. The contractor shall comply with all Federal, state, and local laws and regulation controlling pollution of the environment. The contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds and reservoirs with fuels, oils, bitumens, chemicals or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter. To minimize the adverse environmental effects of construction operations, the following restrictions will be placed upon the contractors carrying out the work:

All drilling apparatus which may be necessary to carry out the work will be equipped with water or chemical dust controlling systems.

Minimum areas of land will be exposed for minimum lengths of time reasonably necessary to carry out the construction processes.

Temporary mulch, with or without seeding, will be used on disturbed earth areas.

The use of water sprinkler trucks may be required during certain periods, if reasonably necessary to control the amount of dust raised during the earthwork items.

The use of dust palliatives and penetration asphalt may be required on temporary or construction roads.

Application rates of herbicides will be restricted to recommend dosages and will be applied consistent with manufacturer's directions.

Construction materials will be covered when not in use to protect the materials from the natural elements, and to protect the surrounding areas from pollution run off due to escape of the materials.

Application equipment and empty containers will not be rinsed or discharged in a place or manner so as to pollute natural or underground water channels of flows.

Bituminous mixing plants will be equipped with a dust collector, which will waste or uniformly return to the hot elevator, all or any part of the material so collected.

Construction operations may be delayed during adverse weather conditions until climate and wind conditions will reasonably dissipate or inhibit the potential pollutants in a manner satisfactory to the Engineer.

Appropriate gradients will be selected for backslopes and channels, and proper provisions of berms, drainage features, soil stabilization, pavement and turf will be made, to control or prevent erosion due to wind or water.

Construction of berms, dikes, dams, drains and sediment basins, or use of fiber mats, woven plastic filter cloths, gravel, mulches, quick growing grasses, sod, bituminous spray and other erosion control devices will be required where necessary to reasonably ensure that soil erosion that might cause water pollution is kept to a minimum.

The Contractor will be required to submit to the Engineer for acceptance, schedules for accomplishment of temporary erosion and pollution control work. The Contractor will also be required to submit for acceptance by the Engineer, his or her proposed method of operation for control of erosion on construction or haul roads and borrow pits, and his or her plan for disposal of waste materials or erosion control details for other potential sources of pollution.

The Contractor will be required to complete all permanent erosion control features at the earliest practicable time. The Contractor will also be required to conduct inspections consistent with the checklist provided by the Owner not only weekly but also subsequent to each qualifying precipitation event (i.e., greater than 0.5" of precipitation).

Temporary pollution control features and measures will be used to correct unforeseen conditions that occur during construction or those that are needed prior to completion of the permanent measures.

The surface area of erodible earth material to be exposed by clearing and grubbing, excavation, or borrow and fill operations will be limited to reasonable areas.

Notwithstanding any measure referenced in this Section 70-19, the Contractor shall comply with all provisions of any applicable stormwater and/or drainage related permit(s).

The Owner reserves the right to employ outside assistance to provide necessary corrective pollution control measures in case of repeated failures on the part of the Contractor to do so.

The erosion control features installed by the Contractor will be acceptably maintained by the Contractor during the time that construction work is being done.

Temporary bridges over surface watercourses will be required wherever crossing would otherwise adversely affect sediment levels and an appreciable number of watercourse crossings are necessary. Temporary bridges will not permanently disturb existing vegetation or stream bank or channel in a riparian corridor.

All waterways will be kept free by the Contractor of falsework, piling, debris or other obstructions during construction work, and not a part of the approved finished work.

Water from aggregate washing or other operation containing sediment will be treated by filtration, a settling basin, or other means sufficient to reduce the sediment content to not more than that of the water that otherwise enters the waterway.

Pollutants, such as fuels, lubricants, bitumen, raw sewage and other harmful materials, will not be discharged into or near surface waterways or into natural or manmade channels leading thereto. Wash water or waste from concrete mixing or curing operations will not be allowed to enter the waterways.

Any materials hauled offsite will be disposed of in a proper manner consistent with applicable solid waste management laws and regulations. All reasonable efforts should be made to reuse or recycle any materials. Total materials hauled offsite, and total materials recycled or reused, shall be documented in reasonable detail, and said information provided to the Owner upon request.

<u>Spill Prevention Control and Counter Measure Plan (SPCC)</u>: Contractor shall comply with the following spill procedures while conducting activities on-site. All spills must be reported to the Owner, as outlined below.

If a spill consisting of any regulated substance (wet or dry) should occur on-site, the Contractor must report it immediately to the Owner.

- <u>Small spills</u> consisting of five (5) gallons (wet) or ten (10) pounds (dry) or less, shall be cleaned-up at the time of occurrence. Waste products shall be drummed and stored for disposal. Contractor shall dispose of waste products in an IDEM Certified Landfill or at other appropriate location approved by the Owner consistent with regulatory authorities. Contractor shall notify Owner of the spill in writing, identifying materials spilled and action taken. This notice shall be filed no later than forty eight (48) hours after the occurrence. Waste disposal documents must be submitted to the Owner for all waste products disposed of off-site.
- 2. <u>Medium spills</u> consisting of five (5) to fifty five (55) gallons (wet), or ten (10) to 100 pounds (dry), shall be cleaned-up at the time of occurrence. Waste products shall be drummed and stored for disposal. Contractor shall dispose of waste products in an IDEM Certified Landfill or at other appropriate location approved by the Owner consistent with regulatory authorities. Contractor shall notify the Owner of the spill in writing, identifying materials spilled and action taken. This notice shall be filed no later than forty eight (48) hours after the occurrence. A testing firm selected by the Owner will obtain soil samples at the area of the occurrence. The cost of this sampling and laboratory analysis will be the responsibility of the Contractor. Disposal documents must be provided to the Owner to verify waste disposal.
- 3. <u>Large spills</u> over fifty five (55) gallons (wet), or one hundred (100) pounds (dry), must be contained immediately. Recoverable material shall be recycled or reused. Non-recoverable material must be remediated. All waste material must be removed, characterized for waste disposal and transported to an IDEM Certified Landfill or at other appropriate location approved by the Owner consistent with regulatory authorities. A testing firm selected by the Owner will obtain soil samples at the area of occurrence. The cost of this sampling and

laboratory analysis will be the responsibility of the Contractor. The Contractor is responsible for removing all spilled and contaminated waste material. Contractor shall notify the Owner by phone at time of occurrence. Contractor shall provide a written report of the spill occurrence cause and remediation activity no later than fifteen (15) days after clean-up is completed to the Owner. All disposal documents must be included as part of the report.

The Contractor shall comply with the reporting sequence, as follows:

- 1. Contractor worker observes Spill:
  - a. Note material, time and date, and quantity of spill;
  - b. Note how much of the spill has been contained or clean-up; and
  - c. Contact the Contractor's supervisor.
- 2. Contractor's supervisor receives report:
  - a. Take appropriate information, noted above;
  - b. Verify spills;
  - c. Follow contract procedure for spill recovery;
  - d. Contact the Owner verbally; and
  - e. Follow-up with written report to the Owner.

In the event of a conflict between these requirements and pollution control laws, rules or regulations of other federal, state or local agencies, the more restrictive laws, rules or regulations will apply.

<u>70-20 ARCHAEOLOGICAL AND HISTORICAL FINDINGS</u>. The Contractor is advised that the site of the work is not within any property, district or site, and does not contain any building, structure or object listed in the current National Register of Historic Places, as published by the United States Department of Interior.

Should the Contractor encounter, during his or her operations, any building, part of a building, structure or object which is incongruous with its surroundings, he shall immediately cease operations in that location and notify the Engineer. The Engineer will immediately investigate the Contractor's finding, and will direct the Contractor to either resume operations or to suspend operations.

Should the Engineer order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract modification (change order or supplemental agreement) as provided in the subsection entitled "EXTRA WORK" of Section 40 and/or the subsection entitled "PAYMENT FOR EXTRA WORK AND FORCE ACCOUNT WORK" of Section 90. If appropriate, the contract modification shall include an extension of contract time in accordance with the subsection entitled "DETERMINATION AND EXTENSION OF CONTRACT TIME" of Section 80.

#### 70-21 CLEAN AIR AND WATER POLLUTION CONTROL

- 1. The Contractor (and subcontractors) agrees that any facility to be utilized in the performance of any non-exempt contract or subcontract is not listed on the EPA List of Violating Facilities pursuant to Paragraph 15.20 of 40 CFR, as of the date of contract award.
- 2. The Contractor agrees to comply with all the requirements of Section 114 of the Clean Air Act, as amended, 42 USC. 1857 <u>et seq</u>., and Section 308 of the Federal Water

Pollution Control Act, as amended, 33 USC. 1251 <u>et seq</u>., relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in Section 114 and Section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder after the award of the contract.

- 3. The Contractor agrees that he shall notify the awarding official of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency, indicating that a facility to be utilized for the contract is under consideration to be listed on the EPA list of Violating Facilities.
- 4. The Contractor agrees that he will include, or cause to be included, the criteria and requirements in Paragraph (1) through (4) hereof, in every non-exempt subcontract and requiring that the Contractor will take such action as the United States Government may direct as a means of enforcing such provisions.

<u>70-22 UNDER-AGE PERSONNEL</u>. All employees of the Contractor shall be of legal age, as set out in the federal, state or local laws, as applicable. Only those persons associated with the construction of the project will be permitted on the construction site. No under-age persons will be allowed on the site under any circumstances. The Engineer shall have the authority to ask these persons to leave the site. Any person not directly affiliated with the construction of the project may meet at the Contractor's or Engineer's office. This person/persons may be escorted on the construction site, but only after authorization by the Engineer.

<u>70-23 SECURITY</u>. The Contractor assures that no action by his or her operation will cause a safety and/or security violation of the "Airport Certification Manual", "Airport Security Program," or FAA or Transportation Security Administration (TSA) regulations. Any fines and/or penalty costs incurred as a result of the Contractor's failure to comply with Airport, FAA, or TSA regulations, shall be the sole responsibility of the Contractor.

The Contractor must provide sufficient Owner Approved Security Firms or badged construction personnel as **Security Personnel** at designated locations to ensure that the security of the security-controlled areas (Airport Operations Area (AOA), Sterile Area of Terminal, or Security Identification Area (SIDA)) is maintained at all times. The Contractor must coordinate the number of and location of security personnel at least one (1) work day in advance with the Owner to demonstrate compliance with the project security requirements.

The following entities are Owner Approved Security Firms at the Indianapolis International Airport:

Securatex	Securitas	Protection Plus	American Global Management
5401 S. East St, Ste. 120	2 Campus Drive	2345 S. Lynhurst, Suite 200	6628 Westland Drive
Indianapolis, IN 46227	Parsippany, NJ 07054	Indianapolis, IN 46241	Brownsburg, IN 46112
317.916.2285	(317) 260-6267	317-244-7569	317.225.7801
Jason Jones	Ben Marth	Raymond Stanley	Henry Maye
jjones@securatex.com	Benjamin.marth@securitasinc.com	rstanley@protectionplus.net	henry@americanglobalmgmt.com

#### Owner Approved Security Firms

The Owner Approved Security Firms <u>must</u> be used for the following Security Personnel responsibilities:

- Gate Guard Security personnel controlling access through the approved construction access gate per construction documents. The Gate Guard is responsible to verify that all persons entering through the gate are on the approved access control roster or are approved Airport employees.
- Flagperson Security personnel at designated locations where vehicular traffic crosses active movement areas (taxiways). When required, these "Flagpersons" must confirm, by personnel observation, that no aircraft is approaching their position when giving clearance to cross the movement area.
- Vehicle Escort Driver Security personnel authorized to drive an appropriate marked vehicle in the AOA to move a maximum of two (2) vehicles at a time through the AOA. The Vehicle Escort Driver must verify the movement/position of all escorted vehicles at any given time. Vehicle Escort Drivers must also confirm by personnel observation, that no aircraft is approaching their position when given clearance to cross the movement area.

The Owner Approved Security Firms can also be used for the following security personnel responsibilities:

- Crew Guard Security personnel responsible to provide <u>full-time</u> visual surveillance of all contractor or subcontractor personnel. The ratio of construction personnel to Crew Guards shall not exceed 6:1 and must be within 500 feet and continuous visual contact of the Crew Guard. In addition, if a worker within the designated work limits needs to leave for any reason, they must be escorted out of the area by approved security personnel. In the event that a Crew Guard is also approved to escort personnel to and from the worksite, the Crew Guard may lead the individual out of the area only if the required number of Crew Guards remains available within the work limits.
- Area Guard Area Security personnel located around the perimeter of the work zone, such that an Area Guard is within 500 feet of every unbadged contractor or subcontractor employee. The Area Guard will be responsible to provide <u>full-time</u> visual surveillance of all unbadged construction employees. Use of Area Guards in place of Crew Guards must be approved by the Owner.

Badged construction personnel may be used for the following security personnel responsibilities defined above in place of or in addition to Owner Approved Security Firms:

- Crew Guard
- Area Guard

Badged construction employees will only be allowed to act as Crew or Area Guards for persons directly employed by the contractor or subcontractor utilized for the specific job within the worksite or under contract with the Owner for the project.

Costs to badge construction personnel shall be the responsibility of the Contractor. Construction personnel to be badged must meet the requirements as included in "Airport Identification" in the Attachments. Contractor may badge a sufficient number of construction personnel to act as a Crew or Area Guards. The requested number of construction personnel to be badged shall be provided to the Owner for approval, along with the names of the proposed construction personnel to be badged. The authorization to issue these badges and the number of badges allotted will be at the discretion of the Airport Security Coordinator (ASC) or designee.

Badges will be valid until the completion of individual project and must be forfeited upon project completion or earlier at the request of the ASC.

Any contractors on-site, in security-controlled areas, must be escorted to and from the jobsite. If the work zone is not adjacent to the gate, the on-site contractors must be escorted to the work zone by a Vehicle Escort Driver. At no time shall contractor personnel proceed unescorted into a security-controlled area. Appropriate security personnel must accompany the contractor personnel at all times that contractor personnel are in the security-controlled areas in order to assure that security is not compromised and proper airside security procedures are followed.

When notified by the Owner, the Contractor shall provide security personnel to escort representatives of a union requesting access to any project located within airport security-controlled areas for the conduct of official union business. Union representatives escorted and/or supervised by security personnel at all times when they are within security-controlled areas.

The Contractor shall be responsible for completing daily "Secure Area Access Control and Secure Area Vehicle Control Rosters," listing all personnel and vehicles that will be operating on the project for that day. These lists will then be delivered to the Owner's Access Systems Manager by fax (317-487-5325) or email (<u>badging@ind.com</u>) prior to the start of each workday. After review and approval by the Owner, a copy of this list will also be forwarded to Gate Guard by the Owner, where it will be used as the approved access control roster for that day. Approved access control rosters are valid only for the workday on which they were signed, and, as such, will expire at the end of that same workday. (Note: Weekly access control rosters may be authorized, on an as-needed basis, at the discretion of the Owner's Access Systems Manager).

Any employee of a contractor or subcontractor who may be a risk to public safety, as determined by the Owner, will be prohibited from entering a "secured area" of the airport.

Additionally, the Contractor will complete the "Escort Notification Form," listing security personnel to be used on the project and his/her security role, and also identify any additional access control points or measures needed. This list will also be sent the Owner's Access Systems Manager on a daily or weekly basis, as required.

Access to the job site by all contractor and subcontractor personnel will be restricted to those gates identified in the construction documents. Only those gates identified in the construction documents will be used for construction-related access to security-controlled areas. All access gates will only be opened by Airport personnel. The Gate Guard will be responsible for ensuring that only those personnel and vehicles properly documented on the approved access control roster submitted to the Access Control Manager are allowed to access the security-controlled area. All personnel entering a security controlled area of the airport are subject to search of his or her person, accessible property and vehicle by the TSA, pursuant to title 49 USC 44903.

Throughout the project, the perimeter of the airfield must be secured at all times in accordance with TSA standards and/or requirements. During periods of non-work, in case the integrity of the secure perimeter fence is compromised (i.e., does not comply with Federal Aviation Regulation (FAR) standards, concrete secured posts, 6' minimum fabric height, top-rail, and barbed wire), the Contractor must erect a sufficient physical barrier, fabric, wire or other adequate barrier to restrict access to the compromised area and supply appropriate on-site security personnel to prevent unauthorized entry into secured areas.

All Security Personnel must comply with the following requirements of Section 900 of the Owner's Airport Security Program.

- Only individuals' possessing valid Airport issued or Airport approved identification media with ESCORT privileges have the authority to supervise non-badged individuals in the security-controlled area.
- Properly badged individuals with ESCORT privileges are permitted to provide security supervision for up to six unbadged personnel at one time within the work zone.
- The ASC may grant exemptions to the 6:1 ratio in special circumstances to accommodate special events and/or activities if adequate security supervision personnel are provided to properly control the movement of all unbadged individuals. (Use of Area Guards)
- The security personnel must maintain positive control of all personnel under their supervision, including continuous visual contact, and will ensure that the supervised individual engages only in those activities for which access was granted.
- The security personnel must be able to immediately contact the Airport Operations Center (AOC) at 317-487-5089.
- The security personnel will immediately contact the AOC in the event an individual under supervision engages in any activity other than that for which access was granted.
- In the event of separation from the supervised party(s), the security supervision escort and/or vehicle driver escort will immediately contact the AOC. Once positive control of the individual is regained, the individual will be removed from the Area and immediately returned to a public area.

ASC or designee may audit construction companies periodically to ensure construction personnel with airport issued identification are still valid employees and still require airport access. If discrepancies are found during these audits, it may cause all airport identification media issued for that company to be recalled.

#### Access Control Procedures (Airfield Construction Projects) Revised July 2014

- 1) <u>All vehicles will be stopped</u> at the access gate prior to being granted access into any restricted area or SIDA (*Including marked Airport vehicles*). Every vehicle will be required to have:
  - Company Logo or other form of company identification, prominently visible on the vehicle;
  - Yellow flashing light is displayed on vehicle, such that it is visible for 360° or vehicle has an orange and white checkered flag prominently displayed;
  - Airport vehicles may have strobe lights at all four corners of vehicle, instead of yellow light or flag;
  - Valid vehicle identification tag matching daily Vehicle Control Roster (Contractor vehicles);

In some rare exceptions, vehicles entering and exiting the worksite multiple times during the day may be issued a color-coded placard to identify them as being "checked-in" against the required access control lists for that day. These placards are to be forfeited at the end of each work day and are valid only for the day they are issued. TSA will be informed if these placards will be used for a specific project.

- 2) <u>All individuals will be stopped prior to entering airfield</u> to ensure the following: (Physical contact must be made of ALL ID's):
  - <u>Contractors</u>
    - o Name and picture on Driver's License or Government ID matches name on daily Access Control Roster and person presenting ID; and
    - o Last four digits of Driver's License match those listed on daily Access Control Roster.
  - <u>Airport Personnel</u>
    - o Picture on Airport ID matches person presenting ID; and
    - o Name listed on ID is not on latest "Stop list".
  - <u>Passengers in Airport Vehicles</u>
    - o Airport personnel identification shall be validated as above;
    - o Non-airport personnel will be required to present valid Driver's License or other valid government issued picture identification; and
    - o Gate guards shall maintain a list of all non-airport employees escorted by or accompanying airport employees. List must include the following:
      - a. Individuals name;
      - b. Type of identification media presented and ID number;
      - c. Name of airport personnel providing escort; and
      - d. Vehicle number in which the individual is traveling (if applicable).
  - <u>Security Personnel</u>
    - o Picture on Airport ID matches person presenting ID;
    - o Name and last four digits of Driver's License match those listed on daily Access Control Roster; and
    - o Name listed on ID is not on latest "Stop list".

## 3) <u>Emergencies</u>

- If an unauthorized person should gain access, the AOC should be contacted IMMEDIATELY @ 317-487-5089;
- In the event that a person attempts to gain improper access, the person should be denied access and the AOC notified immediately @ 317-487-5089; and
- ALL emergencies of any type should be immediately reported to the AOC @ 317-487-5089

#### **END OF SECTION**

<u>80-01 SUBLETTING OF CONTRACT</u>. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times, when work is in progress, be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

Should the Contractor elect to assign or sublet his or her contract, said assignment or subletting shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be effective only on the written approval of the Owner. In case of approval, the Contractor shall file copies of all assignments and/or subcontracts with the Engineer.

<u>80-02 SCHEDULE OF WORK</u> The construction schedule must identify the areas of the work, each integral item of work, start dates, times to complete, finish dates, and total completion of the project. This schedule will be used to coordinate the work. Periodic updates of this schedule will be necessary. The Contractor shall provide the work force and equipment required to maintain the schedule.

- A. <u>General Description</u>: The Contractor shall provide an initial and regularly updated construction progress schedules for the work to the Engineer. The schedule will contain all the activities that are essential to the progress of the work, and shall be based on a critical path analysis of the activities and sequence of performance.
- B. <u>Schedule Description and Contents</u>: The schedule shall be a computerized critical path method ("CPM") network using the precedence diagramming method with a time scale, and shall include the following:
  - 1. Activities: Identify with number and name, define duration, responsibility, the crafts and equipment employed, the area of the work, earliest and latest start and finish dates, float times, relations with other activities. Activities will be defined so that closure or interference with any airfield operations will be specially identified. Activities will be sufficiently detailed to show the plan for completing each phase of the work within the specified time. Milestone activities will be established showing the completion date for each phase of the work.

#### C. <u>Schedule and Updates</u>:

- 1. At least five (5) days prior to each application for payment, a revised progress schedule and corresponding data will be furnished by the Contractor. The revision will indicate actual start and finish dates, actual work hours progress of each activity, scheduled start and finish dates, and a comparison of actual progress with scheduled progress. The update will be accompanied by a narrative report as necessary, to address any problem areas, their impact on the schedule, and the corrective actions required; and any changes to activities relationships, durations, contents, criticality, etc.
- 2. Once each week, the Contractor shall provide a detailed, projected schedule for the two (2) weeks ahead. The interval will be the next week ahead and the week thereafter. This schedule will show all activities, durations, work hours by craft and responsibility, and especially note any planned interference with airfield operations.

# D. <u>Submittals</u>:

- 1. Schedules and supporting data will be received by the Engineer for approval in the time frames indicated above. The Contractor shall revise the schedules as directed by the Engineer, and resubmit them for approval within five (5) days after receipt of comments.
- Schedules shall be submitted in the form of horizontal bar charts and time scaled logic diagrams on 11" x 17" sheets and listings of supporting data on 8-1/2" x 11" sheets. Schedule shall be submitted electronically, in PDF format.
- 3. The schedule shall be accomplished using any suitable, commonly available Windows-based project management program.
- E. <u>Daily Construction Reports</u>:
  - 1. The Contractor shall submit Daily Construction Reports, itemizing the work performed, crews, man-hours, work-force breakdown, equipment used, production quantities where appropriate, weather, events, visitors to the site, etc., for the preceding day. Reports can be combined and submitted to the Engineer on a weekly basis covering the preceding week's work activities.
  - 2. The Contractor may use its standard form, as long as that form provides the information noted above.

<u>80-03 LIMITATION OF OPERATIONS</u>. The Contractor shall control his or her operations and the operations of his or her subcontractors and all suppliers so as to provide for the free and unobstructed movement of aircraft in the air operations area of the airport.

When the work requires the Contractor to conduct his or her operations within an air operations area of the airport, the work shall be coordinated with the Owner (through the Engineer) at least forty eight (48) hours prior to commencement of such work. The Contractor shall not close an air operations area (AOA) until so authorized by the Engineer, and until the necessary temporary marking and associated lighting is in place, as provided in the subsection entitled "BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS" of Section 70.

When the contract work requires the Contractor to operate within an air operations area of the airport on an intermittent basis (intermittent opening and closing of the air operations area (AOA)), the Contractor shall maintain constant communication as hereinafter specified; immediately obey all instructions to vacate the air operations area; immediately obey all instructions to resume work in such air operations area. Failure to maintain the specified communications, or to obey instructions, shall be cause for suspension of the Contractor's operations in the air operations area until the satisfactory conditions are provided.

When, in the judgment of the Engineer, the Contractor has obstructed or closed a greater portion of the work than is necessary for proper construction, or is carrying on operations to the prejudice of work already started, the Engineer may require the Contractor to finish that portion of work which is in progress before any additional portions are started. Work shall be conducted with minimum inconvenience to traffic.

Except as hereafter specified, no loads of material for any construction shall be dispatched from cars or plants so late in the day that it cannot be placed, finished and protected within the specifications' limits and provisions during actual daylight of that same day. When it is important that construction be pushed to early completion, the Engineer may permit it after daylight hours, provided that sufficient artificial illumination is available and that the work performed under these conditions complies in every respect with the terms and conditions of the contract.

The Contractor shall not commence work that would be prejudicial to work already started.

<u>80-04 OPERATIONAL SAFETY ON AIRPORT DURING CONSTRUCTION.</u> All Contractors' operations shall be conducted in accordance with the project Construction Safety and Phasing Plan (CSPP) and the provisions set forth within the current version of AC 150/5370-2. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a Safety Plan Compliance Document that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP unless approved in writing by the Owner or Engineer.

<u>80-05 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT</u>. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to its full completion in the manner and time required by the contract, plans, and specifications. Suitable number of foremen and supervisors shall be available on the job to ensure proper execution and coordination of the work. All workers shall have sufficient skill and experience to properly perform the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work, and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor, or by any subcontractor, who violates any operational regulations, and, in the opinion of the Engineer, does not perform his or her work in a proper and skillful manner or is intemperate or disorderly, shall, at the written request of the Engineer, be removed, forthwith, by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the Engineer.

Should the Contractor fail to remove such person or persons, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the Engineer may suspend the work by written notice, until compliance with such orders.

All equipment which is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing airport facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, he may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change.

If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the contract items involved, nor in contract time, as a result of authorizing a change in methods or equipment under this Subsection 80-05.

<u>80-06 TEMPORARY SUSPENSION OF THE WORK</u>. The Engineer shall have the authority to suspend the work wholly, or in part, for such period or periods as the Owner may deem necessary, due to unsuitable weather, or due to such other conditions as are considered unfavorable for the execution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or to perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Engineer, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended in the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Engineer's order to suspend work to the effective date of the Engineer's order to resume the work. Claims for such compensation shall be filed with the Engineer within the time period stated in the Engineer's order to resume work. The Contractor shall submit, with his or her claim, any information substantiating the amount shown on the claim. The Engineer will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision herein shall be construed as entitling the Contractor, or for any other delays due to inclement weather, for suspensions made at the request of the Contractor, or for any other delay provided for in the contract, plans, or specifications.

If it should become necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction, nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures when necessary to provide for traffic on, to, or from the airport.

<u>80-07 DETERMINATION AND EXTENSION OF CONTRACT TIME.</u> When the contract time is a specified date(s), it shall be the date on which all the contract work shall be substantially completed.

If the Contractor finds it impossible, for reasons beyond his/her control, to complete the work within the contract time as specified or as extended in accordance with the provisions of this subsection, he may, at any time prior to the expiration of the contract time as extended, make a written request to the Engineer for an extension of time setting forth the reasons which he believes will justify the granting of his/her request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control, and without the fault, of the Contractor, he may extend the time for completion in such amount as the conditions justify. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

80-08 FAILURE TO COMPLETE ON TIME. For each calendar day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection entitled "DETERMINATION AND EXTENSION OF CONTRACT TIME" of this Section 80), the sum specified in the contract as liquidated damages, or noted herein, will be deducted from any money due, or to become due, to the Contractor or his/her surety. The Contractor understands and agrees that, if work remains uncompleted after the contract time, the Owner will incur substantial damages and losses which are, and will hereafter, be difficult or impossible to quantify, ascertain and prove as actual damages for such delay. Such damages are foreseen to include, without limitation, extended or additional costs for observation, inspection, engineering, utilities, insurance, administration, and also indeterminate damages, hindrance, or inconvenience to members of the public, deprivation of use and operation, and impairment of financing. Accordingly, and in lieu of actual damages, the Contractor and his or her surety shall be liable to the Owner, and the Owner shall be entitled to collect and recover such liquidated damages from the Contractor and his or her surety, in lieu of actual damages and not as a penalty, in the respective amounts per day for each calendar day that the work is delayed beyond the contract time (see below). Neither partial acceptance, nor occupancy or use of portions of the work by the Owner prior to completion of the entire work, shall defeat or impair the Owner's rights in respect to liquidated damages as provided in this Subsection 80-08.

The original contract price shall be deemed to include adequate consideration and payment to compensate the Contractor for the risk of liability imposed upon the Contractor under this Subsection 80-08 in respect of liquidated damages, and the Contractor acknowledges and agrees that the respective amounts of such liquidated damages are reasonable with due consideration for the type, nature and extent of the work and the contract price, and that such liquidated damages fairly approximate the nature and amount of actual damages which the Owner may incur as a result of delayed completion, and that such liquidated damages may be assessed and recovered by the Owner without proof or evidence concerning the types or amounts of such actual damages.

The liquidated damages provided by Article 16.17 of the Construction Manager contract shall apply equally to the delay in the achievement of substantial completion following abandonment of the work by the Contractor or termination by the Owner because of the Contractor's default, to the extent that such delays are caused, in whole or in part, by such abandonment, termination, default, or other acts or omissions for which the Contractor is responsible. No delay or forebearance by the Owner in enforcing any rights or remedies under the contract, including, but not limited to, the right to termination of the Contractor's right to proceed and the right to engage other contractors to complete the work, shall constitute a waiver by the Owner or deprive the Owner of its right to retain, receive and recover such liquidated damages from the Contractor and his or her surety or diminish the period of delayed completion from which such liquidated damages are to be determined.

Permitting the Contractor to continue and finish the work (or any part of it) after the time fixed for its completion (<u>e.g.</u>, contract time), or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the Owner of any of its rights or remedies under the contract.

<u>80-09 DEFAULT AND TERMINATION OF CONTRACT</u>. The Contractor shall be considered in default of his or her contract, and such default will be considered as cause for the Owner to terminate the contract for reasons as defined in section 12.2.1.1 of the Construction Manager's contract.

Should the Engineer consider the Contractor in default of the contract for any reason hereinbefore, he shall immediately give written notice to the Contractor and to its surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due, or which may become due, to the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Owner the amount of such excess.

<u>80-10 TERMINATION FOR NATIONAL EMERGENCIES</u>. The Owner shall terminate the contract, or portion thereof, by written notice, when the Contractor is prevented from proceeding with the contract as a direct result of an Executive Order of the President of the United States, with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses (when not otherwise included in the contract), and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work, shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designed by the Engineer.

Termination of the contract, or a portion thereof, shall neither relieve the Contractor of his or her responsibilities for the complete work, nor shall it relieve his or her surety of its obligation for and concerning any just claim arising out of the work performed.

<u>80-11 WORK AREA, STORAGE AREA AND SEQUENCE OF OPERATIONS.</u> The Contractor shall obtain approval from the Engineer prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate his or her work in such a manner as to ensure safety and a minimum of hindrance to flight operations.

# **END OF SECTION**

Indianapolis Airport Program GP/80-6 <u>90-01 PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK</u>. Extra work, performed in accordance with the subsection entitled "EXTRA WORK" of Section 40, will be paid for at the contract price or agreed price specified in the change order authorizing such extra work. When the change order authorizing the extra work requires that it be done by force account, for the purpose of this Subsection 90-05, the term "Contractor" shall mean the entity performing the actual work covered by the force account. Each Contractor (general or sub) shall be compensated for only the force account work directly performed by their entity and in accordance with the allowances stated in the following subsections:

- a. <u>Labor</u>: For all labor (skilled and unskilled) and foremen in direct charge of a specific force account item, the Contractor shall receive the rate of wage (or scale) for every hour that such labor or foreman is actually engaged in the specified force account work. Such wage (or scale) shall be agreed upon in writing before beginning the work. The entity(s) performing the actual work covered by the force account shall receive the actual costs paid to, or in behalf of, workers by reason of subsistence and travel allowance, health and welfare benefits, pension fund benefits or other benefits, when such amounts are required by collective bargaining agreement or other employment contract generally applicable to the classes of labor employed on the work. A certified statement of these above-mentioned payments shall be made to the Engineer. An amount equal to fifteen percent (15%) of the sum of the above items will also be paid to the Contractor.
- b. <u>Insurance and Taxes</u>. For property damage, liability, and workmen's compensation insurance premiums, unemployment insurance contributions, and social security taxes on the force account work, the Contractor shall receive the actual cost, to which cost (sum) five percent (5%) will be added. The Contractor shall furnish satisfactory evidence of the rate(s) paid for such insurance and taxes.
- c. <u>Materials</u>. For materials accepted by the Engineer and used, the Contractor shall receive the actual cost of such materials delivered on the work, including transportation charges paid (exclusive of machinery rentals as hereinafter set forth), to which cost (sum) fifteen percent (15%) will be added.
- d. <u>Equipment</u>. For any machinery or special equipment (other than small tools), including fuel and lubricants, plus transportation costs, the use of which has been authorized by the Engineer, the Contractor shall receive the rental rates agreed upon, in writing, before such work is begun, for the actual time that such equipment is committed to the work, to which rental sum fifteen percent (15%) will be added. Rental rates shall reflect the lower rates that are generally paid for equipment being used on-site for extended periods of time.
- e. <u>Miscellaneous</u>. No additional allowance will be made for general superintendent, the use of small tools (hand tools or other tools commonly required by tradesmen in the execution of their work with a value of \$300 or less), or other costs for which no specific allowance is herein provided.
- f. <u>Comparison of Records</u>. The Contractor and the Engineer shall compare records of the cost of force account work at the end of each day. Agreement shall be indicated by the signature of the Contractor and Engineer, or their duly authorized representatives.

- g. In the event that all of the required force account work is performed by a lower tier subcontractor, the prime contractor will be compensated in an amount of five percent (5%) of the subcontractor's force account costs.
- h. <u>Statements</u>. No payment will be made for work performed on a force account basis until the Contractor has furnished the Engineer with duplicate itemized statements of the cost of such force account work, detailed as follows:
  - 1. Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman;
  - 2. Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and equipment;
  - 3. Quantities of materials, prices and extensions;
  - 4. Transportation of materials; and
  - 5. Cost of property damage, liability and workmen's compensation insurance premiums, unemployment insurance contributions, and social security tax.

Statements shall be accompanied and supported by receipted invoice for any and all materials used, and transportation charges. However, if materials used on the force account work are not specifically purchased for such work but are taken from the Contractor's stock, then, in lieu of the invoices, the Contractor shall furnish an affidavit certifying that such materials were taken from his or her stock, that the quantity claimed was actually used, and that the price and transportation claimed represent the actual cost to the Contractor.

The additional payment, based on the percentages specified above, shall constitute full compensation for all items of expense not specifically provided for the force account work. The total payment made, as provided above, shall constitute full compensation for such work.

<u>90-02 PAYMENT FOR MATERIALS ON HAND</u>. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications, and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

- a. The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site;
- b. The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials;
- c. The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid;
- d. The Contractor has furnished the Owner with good legal title (free of any and all liens or encumbrances of any kind) to the material so stored or stockpiled; and

e. The Contractor has furnished the Owner with evidence that the material so stored or stockpiled is insured against loss by damage to, or disappearance of, such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title to, and the Owner's payment for such stored or stockpiled materials, shall in no way relieve the Contractor of his or her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used. No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this Subsection 90-07.

<u>90-03 CONSTRUCTION WARRANTY.</u> Contractor's obligation to perform the work, and complete the work, in accordance with the contract documents, shall be absolute. Neither approval of any progress or final payment by the Engineer, nor the issuance of a certificate of substantial completion, nor any payments by the Owner to the Contractor under the contract documents, nor any use or occupancy of the project or any part thereof by the Owner, nor any act of acceptance by the Owner nor any failure to do so, nor any correction of defective work by the Owner, shall constitute an acceptance of work not in accordance with the contract documents.

- a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.
- b. This warranty shall continue for a period of one year from the date of final acceptance of the work, except in those instances where a longer warranty period is specifically identified for a portion of the project. The written guarantee shall be submitted with the Final Payment. The guarantee shall not nullify the requirement of the contract bonds specified in Subsection 30-05.
- c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of:
  - (1) The Contractor's failure to conform to contract requirements; or
  - (2) Any defect of equipment, material, workmanship, or design furnished by the Contractor.
- d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.
- e. The Owner will notify the Contractor, in writing, after the discovery of any failure, defect, or damage.
- f. If the Contractor fails to remedy any failure, defect, or damage within 14 days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

- g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.
- h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

<u>90-04 PROJECT CLOSEOUT.</u> Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the Engineer approves the Contractor's final submittal. The Contractor shall:

- a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.
- b. Provide weekly payroll records (not previously received) from the Contractor and all subcontractors.
- c. Complete final cleanup in accordance with subsection 40-08, FINAL CLEANUP.
- d. Complete all punch list items identified during the Final Inspection.
- e. Provide complete release of all claims for labor and material arising out of the Contract.
- f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.
- g. When applicable per state requirements, return copies of sales tax completion forms.
- h. Manufacturer's certifications for all items incorporated in the work.
- i. All required record drawings, as-built drawings or as-constructed drawings.
- j. Project Operation and Maintenance (O&M) Manual.
- k. Security for Construction Warranty, if required by specific reference.
- 1. Equipment commissioning documentation submitted, if required.

<u>90-05 WAIVER OF CLAIMS</u>. The making and acceptance of final payment shall constitute:

- a. A waiver of all claims by the Owner against the Contractor other than those arising from unsettled liens, from defective work appearing after final inspection, from failure to comply with the requirements of the contract documents or the terms of any special guarantees specified therein, and a waiver of all claims by the Contractor against the Owner other than those previously made in writing and still unsettled.
- b. A waiver of all claims by the Contractor against the Owner, other than those previously made in writing and still unsettled.

#### **END OF SECTION**

# **FEDERAL PROVISIONS**

#### CONTRACT REQUIREMENTS FOR FEDERAL AID PROJECTS <u>TABLE OF CONTENTS</u>

1.	ACCESS TO RECORDS AND REPORTS. (Reference: 2 CFR § 200.333, 2 CFR § 200.336, FAA Order 5100.38)
2.	AFFIRMATIVE ACTION REQUIREMENT. (Reference: 41 CFR part 60-4, Executive Order 11246)
3.	BREACH OF CONTRACT TERMS. (Reference: 2 CFR § 200 Appendix II (A))2
4.	BUY AMERICAN PREFERENCE. (Reference: 49 USC § 50101)
5.	CIVIL RIGHTS - GENERAL. (Reference: 49 USC § 47123)
6.	CIVIL RIGHTS – TITLE VI ASSURANCES
7.	CLEAN AIR AND WATER POLLUTION CONTROL. (Reference: 2 CFR § 200 Appendix II(G))9
8.	CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS. (Reference: 2 CFR § 200 Appendix II (E))
9.	COPELAND "ANTI-KICKBACK" ACT (Reference: 2 CFR § 200 Appendix II(D), 29 CFR parts 3 & 5)10
10.	DAVIS-BACON REQUIREMENTS. (Reference: 2 CFR § 200 Appendix II(D), 29 CFR part 5)11
11.	DEBARMENT AND SUSPENSION (NON-PROCUREMENT). (Reference: 2 CFR part 180 (Subpart C), 2 CFR part 1200, DOT Order 4200.5 DOT Suspension & Debarment Procedures & Ineligibility)
12.	DISADVANTAGED BUSINESS ENTERPRISE. (Reference: 49 CFR part 26)
13.	DISTRACTED DRIVING (References: Executive Order 13513, and DOT Order 3902.10)18
14.	ENERGY CONSERVATION REQUIREMENTS. (Reference 2 CFR § 200 Appendix II(H))18
15.	EQUAL OPPORTUNITY CLAUSE AND SPECIFICATIONS. (Reference 2 CFR 200, Appendix II(C), 41 CFR § 60-1.4, 41 CFR § 60-4.3, Executive Order 11246)
16.	FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE) (Reference: 29 USC § 201, et seq.)
17.	LOBBYING AND INFLUENCING FEDERAL EMPLOYEES. (Reference: 31 U.S.C. § 1352 – Byrd Anti- Lobbying Amendment, 2 CFR part 200, Appendix II(J), 49 CFR part 20, Appendix A)
18.	PROHIBITION of SEGREGATED FACILITIES. (Reference: 41 CFR § 60)
19.	OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 (Reference 20 CFR part 1910)26
20.	PROCUREMENT OF RECOVERED MATERIALS
(Ref	Perence 2 CFR § 200.322, 40 CFR part 247)
21.	RIGHT TO INVENTIONS. (Reference 2 CFR § 200 Appendix II(F), 37 CFR §401)
22.	TERMINATION OF CONTRACT. (Reference 2 CFR § 200 Appendix II(B), FAA Advisory Circular 150/5370-10, Section 80-09)
23.	TRADE RESTRICTION (Reference: 49 USC § 50104, 49 CFR part 30)
24.	VETERAN'S PREFERENCE (Reference: 49 USC § 47112(c))

#### 1. ACCESS TO RECORDS AND REPORTS.

(Reference: 2 CFR § 200.333, 2 CFR § 200.336, FAA Order 5100.38)

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Sponsor, the Federal Aviation Administration, and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers, and records of the contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

#### 2. AFFIRMATIVE ACTION REQUIREMENT.

(Reference: 41 CFR part 60-4, Executive Order 11246)

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

- A. Timetables
- B. Goals for minority participation for each trade 12.5%
- C. Goals for female participation in each trade (6.9%)

These goals are applicable to all of the contractor's construction work (whether or not it is Federal or federally-assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor is also subject to the goals for both federally funded and non-federally funded construction. The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training shall be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project, for the sole purpose of meeting the contractor's goals, shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs (OFCCP), within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is Hancock, Hendricks and Marion County, Indiana.

# 3. BREACH OF CONTRACT TERMS.

(Reference: 2 CFR § 200 Appendix II (A))

Any violation or breach of terms of this contract on the part of the contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

Owner will provide contractor written notice that describes the nature of the breach and corrective actions the contractor must undertake in order to avoid termination of the contract. Owner reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Owner elects to terminate the contract. The Owner's notice will identify a specific date by which the contractor must correct the breach. Owner may proceed with termination of the contract if the contractor fails to correct the breach by deadline indicated in the Owner's notice.

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

# 4. BUY AMERICAN PREFERENCE.

(Reference: 49 USC § 50101)

The contractor agrees to comply with 49 USC § 50101, which provides that Federal funds may not be obligated unless all steel and manufactured goods used in AIP-funded projects are produced in the United States, unless the FAA has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list.

A bidder or offeror must complete and submit the appropriate Buy America certification included herein with all bids or offers on AIP funded projects. The owner will reject as nonresponsive any bid or offer that does not include a completed Certificate of Buy American Compliance.

# Type of Certification is based on Type of Project:

There are two types of Buy American certifications.

- For projects for a facility, the Certificate of Compliance Based on Total Facility (Terminal or Building Project) must be submitted.
- For all other projects, the Certificate of Compliance Based on Equipment and Materials Used on the Project (Non-building construction projects such as runway or roadway construction; or equipment acquisition projects) must be submitted.
## Certificate of Buy American Compliance for Total Facility

(Buildings such as Terminal, SRE, ARFF, etc.)

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with their proposal. The bidder or offeror must indicate how they intend to comply with 49 USC § 50101 by selecting one of the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (i.e. not both) by inserting a checkmark ( $\checkmark$ ) or the letter "X".

Bidder or offeror hereby certifies that it will comply with 49 USC. 50101 by:

- a) Only installing steel and manufactured products produced in the United States; or
- b) Installing manufactured products for which the FAA has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or
- c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

- 1. To provide to the Owner evidence that documents the source and origin of the steel and manufactured product.
- 2. To faithfully comply with providing US domestic products
- 3. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.
- □ The bidder or offeror hereby certifies it cannot comply with the 100% Buy American Preferences of 49 USC § 50101(a) but may qualify for either a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:
  - 1. To the submit to the Owner within 15 calendar days of the bid opening, a formal waiver request and required documentation that support the type of waiver being requested.
  - 2. That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination that may result in rejection of the proposal.
  - 3. To faithfully comply with providing US domestic products at or above the approved US domestic content percentage as approved by the FAA.
  - 4. To furnish US domestic product for any waiver request that the FAA rejects.
  - 5. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

## **Required Documentation**

**Type 3 Waiver -** The cost of components and subcomponents produced in the United States is more that 60% of the cost of all components and subcomponents of the "facility". The required documentation for a type 3 waiver is:

a) Listing of all manufactured products that are not comprised of 100% US domestic content (Excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108;

products of unknown origin must be considered as non-domestic products in their entirety)

- b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly and installation at project location.
- c) Percentage of non-domestic component and subcomponent cost as compared to total "facility" component and subcomponent costs, excluding labor costs associated with final assembly and installation at project location.

**Type 4 Waiver** – Total cost of project using US domestic source product exceeds the total project cost using non-domestic product by 25%. The required documentation for a type 4 of waiver is:

- a) Detailed cost information for total project using US domestic product
- b) Detailed cost information for total project using non-domestic product

**False Statements**: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

Date

Signature

Company Name

Title

## **Certificate of Buy American Compliance for Manufactured Products**

(Non-building construction projects, equipment acquisition projects)

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with their proposal. The bidder or offeror must indicate how they intend to comply with 49 USC § 50101 by selecting one on the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (not both) by inserting a checkmark ( $\checkmark$ ) or the letter "X".

□ Bidder or offeror hereby certifies that it will comply with 49 USC § 50101 by:

- a) Only installing steel and manufactured products produced in the United States, or;
- b) Installing manufactured products for which the FAA has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing, or;
- c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

- 1. To provide to the Owner evidence that documents the source and origin of the steel and manufactured product.
- 2. To faithfully comply with providing US domestic product
- 3. To furnish US domestic product for any waiver request that the FAA rejects
- 4. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.
- □ The bidder or offeror hereby certifies it cannot comply with the 100% Buy American Preferences of 49 USC § 50101(a) but may qualify for either a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:
  - 1. To the submit to the Owner within 15 calendar days of the bid opening, a formal waiver request and required documentation that support the type of waiver being requested.
  - 2. That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination may result in rejection of the proposal.
  - 3. To faithfully comply with providing US domestic products at or above the approved US domestic content percentage as approved by the FAA.
  - 4. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

## **Required Documentation**

**Type 3 Waiver -** The cost of the item components and subcomponents produced in the United States is more that 60% of the cost of all components and subcomponents of the "item". The required documentation for a type 3 waiver is:

 a) Listing of all product components and subcomponents that are not comprised of 100% US domestic content (Excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety)

- b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly at place of manufacture.
- c) Percentage of non-domestic component and subcomponent cost as compared to total "item" component and subcomponent costs, excluding labor costs associated with final assembly at place of manufacture.

**Type 4 Waiver** – Total cost of project using US domestic source product exceeds the total project cost using non-domestic product by 25%. The required documentation for a type 4 of waiver is:

- a) Detailed cost information for total project using US domestic product
- b) Detailed cost information for total project using non-domestic product

**False Statements**: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

Date

Signature

Company Name

Title

## 5. CIVIL RIGHTS - GENERAL.

(Reference: 49 USC § 47123)

The contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the contractor and subtier contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

## 6. CIVIL RIGHTS - TITLE VI ASSURANCES.

(Reference 49 USC § 47123, FAA Order 1400.11)

#### **Compliance with Nondiscrimination Requirements**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

- 1. Compliance with Regulations: The contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Statutes and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
- 2. Non-discrimination: The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts, and Authorities (including without limitation the Regulations,) including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.
- **3.** Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Nondiscrimination Acts and Authorities (including without limitation the Regulations) on the grounds of race, color, or national origin.
- 4. Information and Reports: The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts, and Authorities (including without limitation the Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of

another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of a contractor's noncompliance with the Nondiscrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

a. Withholding payments to the contractor under the contract until the contractor complies; and/or

- b. Cancelling, terminating, or suspending a contract, in whole or in part.
- 6. Incorporation of Provisions: The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

#### Title VI List of Pertinent Nondiscrimination Authorities

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination In Federally-Assisted Programs of The Department of Transportation—Effectuation of Title VI of The Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 *et seq.*), as amended, (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 *et seq.*), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 12189) as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

## 7. CLEAN AIR AND WATER POLLUTION CONTROL.

(Reference: 2 CFR § 200 Appendix II(G))

Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act (42 U.S.C. § 740-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. § 1251-1387). The Contractor agrees to report any violation to the Owner immediately upon discovery. The Owner assumes responsibility for notifying the Environmental Protection Agency (EPA) and the Federal Aviation Administration.

Contractor must include this requirement in all subcontracts that exceeds \$150,000.

# 8. CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS. (Reference: 2 CFR § 200 Appendix II (E))

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) above, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this clause.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration or the Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this clause.

4. Subcontractors.

The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this clause.

## 9. COPELAND "ANTI-KICKBACK" ACT

(Reference: 2 CFR § 200 Appendix II(D), 29 CFR parts 3 & 5)

Contractor must comply with the requirements of the Copeland "Anti-Kickback" Act (18 U.S.C. 874 and 40 U.S.C. 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Owner, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Owner must report any violations of the Act to the Federal Aviation Administration.

#### **10. DAVIS-BACON REQUIREMENTS.**

(Reference: 2 CFR § 200 Appendix II(D), 29 CFR part 5)

#### 1. Minimum Wages

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards

Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

#### 2. Withholding.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

#### 3. Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., a)the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(i), the appropriate information is being maintained under 29 CFR § 5.5(a)(3)(i) and that such information is correct and complete;

(2) That each laborer and mechanic (including each helper, apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

#### 4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage

rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance With Copeland Act Requirements.

The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

#### 6. Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance With Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

## **11. DEBARMENT AND SUSPENSION (NON-PROCUREMENT).**

(Reference: 2 CFR part 180 (Subpart C), 2 CFR part 1200, DOT Order 4200.5 DOT Suspension & Debarment Procedures & Ineligibility)

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that at the time the bidder or offeror submits its proposal that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

## CERTIFICATION OF LOWER TIER CONTRACTORS REGARDING DEBARMENT

The successful bidder, by administering each lower tier subcontract that exceeds \$25,000 as a "covered transaction", must verify each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

- 1. Checking the System for Award Management at website: http://www.sam.gov
- 2. Collecting a certification statement similar to the Certificate Regarding Debarment and Suspension (Bidder or Offeror), above.
- 3. Inserting a clause or condition in the covered transaction with the lower tier contract

If the FAA later determines that a lower tier participant failed to tell a higher tier participant that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedies, including suspension and debarment of the non-compliant participant.

#### 12. DISADVANTAGED BUSINESS ENTERPRISE.

(Reference: 49 CFR part 26)

**Contract Assurance (§ 26.13)** - The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the recipient deems appropriate.

**Prompt Payment (§26.29)**- The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than 30 days from the receipt of each payment the prime contractor receives from the Indianapolis Airport Authority. The prime contractor agrees further to return retainage payments to each subcontractor within 30 days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Indianapolis Airport Authority. This clause applies to both DBE and non-DBE subcontractors.

The requirements of 49 CFR part 26 apply to this contract. It is the policy of the Indianapolis Airport Authority to practice nondiscrimination based on race, color, sex or national origin in the award or performance of this contract. The Owner encourages participation by all firms qualifying under this solicitation regardless of business size or ownership.

#### **13. DISTRACTED DRIVING**

(References: Executive Order 13513, and DOT Order 3902.10)

#### **Texting While Driving**

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving" (10/1/2009) and DOT Order 3902.10 "Text Messaging While Driving" (12/30/2009), FAA encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or sub-grant.

In support of this initiative, the Owner encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding \$3,500 and involve driving a motor vehicle in performance of work activities associated with the project.

#### 14. ENERGY CONSERVATION REQUIREMENTS.

(Reference 2 CFR § 200 Appendix II(H))

The contractor and subcontractor agree to comply with mandatory standards and policies relating to energy efficiency as contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6201*et seq*).

## **15. EQUAL OPPORTUNITY CLAUSE AND SPECIFICATIONS.**

(Reference 2 CFR 200, Appendix II(C), 41 CFR § 60-1.4, 41 CFR § 60-4.3, Executive Order 11246)

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identify or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering

agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however*, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

## STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

d. "Minority" includes:

(1) Black (all) persons having origins in any of the Black African racial groups not of Hispanic origin);

(2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);

(3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or

subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the contractor has a collective bargaining agreement to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246 or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the contractor during the training period and the contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such

individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a minority person or female sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such a superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

1. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally,) the contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

# 16. FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

(Reference: 29 USC § 201, et seq.)

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers.

The contractor has full responsibility to monitor compliance to the referenced statute or regulation. The contractor must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division

## **17. LOBBYING AND INFLUENCING FEDERAL EMPLOYEES.**

(Reference: 31 U.S.C. § 1352 – Byrd Anti-Lobbying Amendment, 2 CFR part 200, Appendix II(J), 49 CFR part 20, Appendix A)

The bidder or offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

- 1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the bidder or offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- 2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- 3) The undersigned shall require that the language of this certificate be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

## **18. PROHIBITION of SEGREGATED FACILITIES.**

(Reference: 41 CFR § 60)

a) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.

(b) "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

#### 19. OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 (Deference 20 CER next 1010)

(Reference 20 CFR part 1910)

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). Contractor must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

## 20. PROCUREMENT OF RECOVERED MATERIALS.

(Reference 2 CFR § 200.322, 40 CFR part 247)

Contractor and subcontractor agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors are to use of products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247 whenever:

- a) The contract requires procurement of \$10,000 or more of a designated item during the fiscal year; or,
- b) The contractor has procured \$10,000 or more of a designated item using Federal funding during the previous fiscal year.

The list of EPA-designated items is available at www.epa.gov/epawaste/conserve/tools/cpg/products/.

Section 6002(c) establishes exceptions to the preference for recovery of EPA-designated products if the contractor can demonstrate the item is:

- a) Not reasonably available within a timeframe providing for compliance with the contract performance schedule;
- b) Fails to meet reasonable contract performance requirements; or
- c) Is only available at an unreasonable price.

## **21. RIGHT TO INVENTIONS.**

(Reference 2 CFR § 200 Appendix II(F), 37 CFR §401)

Contracts or agreements that include the performance of experimental, developmental, or research work must provide for the rights of the Federal Government and the Owner in any resulting invention as established by 37 CFR part 401, Rights to Inventions Made by Non-profit Organizations and Small Business Firms under Government Grants, Contracts, and Cooperative Agreements. This contract

incorporates by reference the patent and inventions rights as specified within in the 37 CFR §401.14. Contractor must include this requirement in all sub-tier contracts involving experimental, developmental or research work.

## 22. TERMINATION OF CONTRACT.

(Reference 2 CFR § 200 Appendix II(B), FAA Advisory Circular 150/5370-10, Section 80-09)

#### **Termination for Convenience**

The Owner may terminate this contract in whole or in part at any time by providing written notice to the Contractor. Such action may be without cause and without prejudice to any other right or remedy of Owner. Upon receipt of a written notice of termination, except as explicitly directed by the Owner, the Contractor shall immediately proceed with the following obligations regardless of any delay in determining or adjusting amounts due under this clause:

- 1. Contractor must immediately discontinue work as specified in the written notice.
- 2. Terminate all subcontracts to the extent they relate to the work terminated under the notice.
- 3. Discontinue orders for materials and services except as directed by the written notice.
- 4. Deliver to the owner all fabricated and partially fabricated parts, completed and partially completed work, supplies, equipment and materials acquired prior to termination of the work and as directed in the written notice.
- 5. Complete performance of the work not terminated by the notice.
- 6. Take action as directed by the owner to protect and preserve property and work related to this contract that Owner will take possession.

Owner agrees to pay Contractor for:

- c) completed and acceptable work executed in accordance with the contract documents prior to the effective date of termination;
- d) documented expenses sustained prior to the effective date of termination in performing work and furnishing labor, materials, or equipment as required by the contract documents in connection with uncompleted work;
- e) reasonable and substantiated claims, costs and damages incurred in settlement of terminated contracts with Subcontractors and Suppliers; and
- f) reasonable and substantiated expenses to the contractor directly attributable to Owner's termination action

Owner will not pay Contractor for loss of anticipated profits or revenue or other economic loss arising out of or resulting from the Owner's termination action.

The rights and remedies this clause provides are in addition to any other rights and remedies provided by law or under this contract.

#### **Termination for Default**

Section 80-09 of FAA Advisory Circular 150/5370-10 establishes conditions, rights and remedies associated with Owner termination of this contract due default of the Contractor.

## **23. TRADE RESTRICTION**

(Reference: 49 USC § 50104, 49 CFR part 30)

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror:

a. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);

b. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the U.S.T.R; and

c. has not entered into any subcontract for any product to be used on the project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the U.S.T.R.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to an Offeror or subcontractor:

- (1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the U.S.T.R. or
- (2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such U.S.T.R. list or
- (3) who incorporates in the public works project any product of a foreign country on such U.S.T.R. list;

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by U.S.T.R, unless the Offeror has knowledge that the certification is erroneous.

This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the FAA.

#### 24. VETERAN'S PREFERENCE

(Reference: 49 USC § 47112(c))

In the employment of labor (excluding executive, administrative, and supervisory positions), the contractor and all sub-tier contractors must give preference to covered veterans as defined within Title 49 United States Code Section 47112. Covered veterans include Vietnam-era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 U.S.C. 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

# STANDARD TECHNICAL PROVISIONS

#### STANDARD TECHNICAL PROVISIONS INDIANAPOLIS INTERNATIONAL AIRPORT STORMWATER AND DEICING CAPACITY PROJECTS Project No. I-17-077

#### TABLE OF CONTENTS

<u>NO.</u>	<u>SECTION</u>	<b>PAGES</b>
M-102	Maintenance of Traffic	M-102-1 - M-102-2
M-103	Construction Engineering	M-103-1 - M-103-2
M-104	Project Security	M-104-1 - M-104-2
P-151	Clearing and Grubbing	P-151-1 - P-151-2
P-153	Watering	P-153-1 - P-153-2
P-156	Temporary Air and Water Pollution, Soil Erosion, and Siltation Control	P-156-1 – P-156-8
P-209	Crushed Aggregate Base Course	P-209-1 - P-209-4
D-705	Pipe Underdrains for Airports	D-705-1 - D-705-4
D-753	Rip Rap	D-753-1 - D-753-2
F-162	Chain-Link Fence	F-162-1 – F-162-4
T-901	Seeding	T-901-1 - T-901-4
T-905	Topsoiling	T-905-1 - T-905-2
T-908	Mulch	T-908-1 - T-908-4
L-110	Airport Underground Electrical Duct Banks and Conduits	L-110-1 - L-110-8
L-115	Electrical Manholes and Junction Structures	L-115-1 – L-115-8

STANDARD TECHNICAL PROVISIONS

## M-102 MAINTENANCE OF TRAFFIC

#### GENERAL REQUIREMENTS

**102-1** The Contractor shall erect and maintain all traffic control devices - signs, barricades, closure crosses, etc., as indicated on the plans and in the special provisions.

Unless specified otherwise, the following standards for traffic control will be applicable:

- 1. Manual of Uniform Traffic Control Devices for Streets and Highways, latest edition.
- 2. FAA AC 150/5370-2, latest edition. The AC is included as an attachment in the specifications.

The Contractor shall phase his operations as indicated on the plans and in the special provisions.

The number and placement of barricades may be altered as determined by the Engineer at no additional cost to the Authority.

#### METHOD OF MEASUREMENT

102-2 The items of Maintenance of Traffic will be measured for payment per month or fraction thereof based on a 30 day month.

#### BASIS OF PAYMENT

**102-3** Payment for Maintenance of Traffic will be at the contract unit price for which payment shall be full compensation for furnishing all labor, equipment and materials necessary to complete the item.

Payment will be made under:

Item No. \_\_\_\_ M-102 Maintenance of Traffic -- per month

END OF SECTION

## M-102 MAINTENANCE OF TRAFFIC

## THIS PAGE INTENTIONALLY LEFT BLANK

#### M-103 CONSTRUCTION ENGINEERING

#### DESCRIPTION

**103-1.1** The Contractor shall perform the construction engineering, including layout. Construction engineering shall include reestablishing the survey points and survey centerlines; re-referencing the necessary control points; running a level circuit to check or re-establish plan bench marks; setting stakes for right-of-way, culverts, slopes, subbase, surface drains, paving, subgrade, and any other stakes required for control lines and grades; and setting vertical control elevations, such as screed elevations. Construction engineering also encompasses record drawings and their associated requirements.

#### CONSTRUCTION

**103-2.1** The Contractor shall furnish all stakes, templates, straightedges, and other devices necessary for checking, marking and maintaining points, lines, and grades. The level circuit to check the plan bench marks shall be run the length of the contract. Field notes shall be kept in standard field note books in a clear, orderly, and neat manner consistent with standard engineering practices including titles, number, and indexes. The field books shall become the property of the Authority upon completion of the work. The field books may be inspected by the project personnel at any time.

**103-2.2** All grade stakes and finish "blue top" hubs shall be placed at a maximum spacing of twenty-five (25) feet unless an alternate spacing is approved by the Engineer. If automatic slope controlled equipment is NOT used to fine grade the subgrade then "blue tops" or grade stakes shall be placed on the center line of crowned pavement sections.

Staking for grade of non-paved areas shall be sufficient to meet the requirements of Section 152-2.9 Tolerances, however, in no case shall the spacing between adjacent stakes exceed 100 feet.

**103-2.3** When staking culverts, the Contractor shall perform the necessary checking to establish the proper location and grade to fit best the conditions on the site. The Contractor will not be responsible to verify that the culvert is of adequate opening.

**103-2.4** The Engineer will make all measurements and surveys that involve the determination of final pay quantities. Measurements of original and final cross sections for earthwork will only be made if additions or deletions are made to the construction plans and authorized by the Engineer. The Engineer may check the accuracy of the construction engineering layout or the final result of construction accuracy. All inspection and testing will be the responsibility of the Authority.

**103-2.5** The supervision of the Contractor's construction Engineering personnel shall be the responsibility of the Contractor, and any errors resulting from the operations of such personnel shall be corrected at the expense of the Contractor and at no additional cost to the Authority.

**103-2.6 RECORD DRAWINGS.** The Contractor shall furnish, upon completion of the work, a red-lined set of record drawings to the Engineer. The record drawing set shall include all field adjustments, found utilities, structures, obstructions, etc. which occurred throughout the course of the work. The Engineer will maintain a concurrent set of red-lined record drawings. In no instance shall the Engineer's drawings be accepted in lieu of the Contractor-produced set.

In addition to the red-lined record drawings, the Contractor shall furnish and submit a record drawing survey in accordance with Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-18, current edition. Similar to the red-lined record drawings, data shall be obtained by the Contractor for all new pavement, terrain grading, equipment, pipe, conduit, cable, signs, lights, utilities, etc. installed as a part of this work. In addition, any found existing utilities (active or abandoned) not shown or otherwise noted on the plan set shall be obtained and submitted by the Contractor during construction. Data for airfield Navigational Aids (Navaids), guidance signs, lights, etc. shall also include a detailed description which includes unique identification designation (i.e. airport specific sign or light number). Record drawing survey coordinates and elevations shall be consistent with the survey control information provided in the construction plan set.

Record drawing survey data shall be signed and sealed by a registered land surveyor in the state in which the work was completed.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

#### M-103 CONSTRUCTION ENGINEERING

#### METHOD OF MEASUREMENT

**103-3.1** Construction Engineering, as specified herein, shall be measured as a lump sum item.

#### BASIS OF PAYMENT

**103-4.1** Construction Engineering shall be paid for based upon the approximate amount of this work actually completed, but in no case shall more than 30% of this item be paid on the first progress payment. This work shall include furnishing all necessary personnel, equipment, and supplies to accomplish the work.

Payment will be made under:

Item No. \_\_\_\_ M-103 Construction Engineering -- per lump sum

END OF SECTION
# M-104 PROJECT SECURITY

### DESCRIPTION

**104-1.1** The Contractor shall provide all facilities and personnel to provide security for the project as required. All movements into the project site shall be controlled by a uniformed security guard who shall be employed by the Contractor. A guard house shall be provided by the Contractor and located in the approximate vicinity of the entrance gate. The guard house shall have a telephone for communications, working heat in the winter and air conditioning in the summer. The security guard shall be present at all times when a security gate is open while work is being done. Minimum requirements of a security guard shall be to check the identification of each person wanting access through the gate against a list, provided by the Contractor's Project Superintendent only. Denial of access shall be given to any individual who is not on the Contractor's list. The Airport Authority shall designate specific companies of which employees may obtain access through the gate with proper identification. When an escort is required, the escort's vehicle must be covered under the contractor's umbrella insurance policy.

Any fines levied on the Authority or Airport Tenant resulting from inadequate security operations by the Contractor shall be deducted from the Contractor's progress payments.

See General Provision 70-23 SECURITY for additional security requirements.

### METHOD OF MEASUREMENT

**104-2.1** Project security shall be measured by the month or fraction thereof from one progress payment to the next for the period that project security is required by the Engineer.

#### BASIS OF PAYMENT

**104-3.1** Project security shall be paid for at the contract unit price, per month or fraction there of based on a 30 day month, which shall be full compensation for all materials, equipment, labor, transportation, operations, and other items incidental to and necessary for completion of this item.

Payment will be made under:

Item No.\_\_\_\_\_ M-104 Project Security -- per month

# THIS PAGE INTENTIONALLY LEFT BLANK

# P-151 CLEARING AND GRUBBING

### GENERAL

**151-1.1 DESCRIPTION.** This item shall consist of clearing and grubbing, including the disposal of materials, for all areas within the project limits designated or as required by the Engineer.

Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, debris and rubbish of any nature, natural obstructions or such material which in the opinion of the Engineer is unsuitable for the foundations, pavements, or other required structures, including the grubbing of stumps, roots, matted roots, and the disposal from the project of all spoil materials resulting from clearing and grubbing by burning or otherwise.

**151-1.2** During the progress of this work, only approved subcontractors will be permitted on the project site. No other person or corporation will be allowed to handle or remove any material.

151-1.3 All ashes and rubbish or other unacceptable materials derived from this contract shall be hauled off-site.

### CONSTRUCTION METHODS

**151-2.1 GENERAL.** The areas to be cleared and grubbed under this item shall be as shown on the plans as well as all other areas as required within the construction limits.

In addition to the areas designated on the plans, this work item shall consist of clearing and grubbing; removing and disposing of all vegetation and debris; and removal and satisfactory disposal of all buildings, fences, structures, and any other obstructions within the construction limits.

If debris is disposed of on private property, other than a commercial landfill the Engineer must approve of the disposal site and a property release must be obtained from the owner of record. All spoil materials removed by clearing and grubbing shall be disposed of by removal to approved disposal areas off of airport property or by burning if requested in writing by the

Contractor and approved by the Authority. Burning will only be allowed if a certificate of operation is obtained from the Marion County Air Pollution Control Division. The Contractor will be responsible for obtaining the certificate of operation for burning.

Burning, if approved, must meet the following minimum requirements:

- 1. An air curtain incinerator, approved by the Engineer, must be used.
- 2. Burning must be in an excavated pit. Dimensions shall be as recommended by the manufacturer of the air curtain.
- 3. Burning will be allowed only in cleared, open areas where damage to trees, vegetation or other objects will not occur.
- 4. Ashes from burning operations must be removed from the pits and disposed of off airport property.

5. Pits must be backfilled with suitable cohesive soils, in lifts not to exceed 8 inches in depth, and compacted as directed by the Engineer.

The Contractor will be responsible for controlling fires in compliance with all Federal and State laws and regulations relative to building fires at the site.

If, during the burning operation, smoke or particulate matter become excessive, either the Indianapolis Airport Authority or the Marion County Air Pollution Control Division will have the Authority to stop the burning until conditions improve to acceptable levels.

# P-151 CLEARING AND GRUBBING

Neither the cutting of wood to firewood length nor the selling of firewood will be permitted on Airport property. No individual other than employees of the contractor or his subcontractors working specifically on this project will be allowed to remove wood from Airport property. No privately owned vehicles will be allowed on Airport property for the purpose of hauling wood.

The relocation of existing utilities required to permit orderly progress of work shall be accomplished by local agencies. Whenever a telephone or telegraph pole, pipeline, conduit, sewer, or other utility is encountered and must be relocated, the contractor shall advise the Engineer who will notify the proper local authority or owner and attempt to secure prompt action.

**151-2.2 CLEARING AND GRUBBING.** In areas designated to be cleared and grubbed, all trees, stumps, roots, buried logs, brush, grass, and other unsatisfactory materials shall be removed. Tap roots and other projections over 1 1/2" in diameter shall be grubbed out to a depth of at least 12" below the finished grade, subgrade or slope elevation. Shearing or splitting of stumps will not be allowed. Stumps must be removed whole with the root ball attached. All holes remaining after the grubbing operation shall be completely filled with acceptable material, moistened and properly compacted.

## METHOD OF MEASUREMENT

**151-3.1** The clearing and grubbing areas as shown by the limits on the plans shall each be measured for payment on a number of acres or fraction thereof basis.

## BASIS OF PAYMENT

**151-4.1** Payment shall be made at the contract unit price per acre for each area of clearing and grubbing. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item. Clearing and grubbing in areas other than those designated but within the construction limits shall not be paid for separately but be included in the cost of other items.

 Item No.
 P-151 Clear and Grub Area \_\_\_\_\_ -- per acre.

 Item No.
 P-151 Clear and Grub (Group) \_\_\_\_\_ -- per lump sum

 Item No.
 P-151 Clear and Grub (isolated tree) \_\_\_\_\_ -- per Each

# P-153 WATERING

**153-1.1 DESCRIPTION**. This item shall consist of furnishing and applying water required in the compaction of embankments, subgrades, subbases, base courses, and for other purposes in accordance with the requirements of these specifications or as directed by the Engineer.

Watering will be ordered to be applied to haul roads, excavation, embankment, borrow and staging areas when, in the opinion of the Engineer, airborne dust is excessive.

**153-2.1 CONSTRUCTION METHODS.** Water, when required, shall be applied at the locations, in the amounts, and during the hours, including nights, as directed by the Engineer. An adequate water supply shall be provided by the Contractor. The equipment used for watering shall be of ample capacity and of such design as to assure uniform application of water in the amounts directed by the Engineer. Failure to control airborne dust as directed by the Engineer will be cause for suspension of the work.

153-3.1 METHOD OF MEASUREMENT. No measurement will be made of this item.

**153-4.1 BASIS OF PAYMENT**. No direct payment will be made for this item. The performance of this work shall not be paid for directly but shall be considered as a subsidiary obligation of the Contractor covered under other contract items.

# THIS PAGE INTENTIONALLY LEFT BLANK

#### DESCRIPTION

**156-1.1** This item shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of a contract to control water pollution, soil erosion, and siltation through the use of silt fence, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, temporary seeding, slope drains, and other erosion control devices or methods.

The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment, and material storage sites, waste areas, and temporary plant sites.

#### MATERIALS

**156-2.1 TEMPORARY SEED MIXTURE.** Unvegetated areas that are scheduled or likely to be left inactive for fifteen (15) days or more must be temporarily or permanently stabilized with measures appropriate for the season to minimize erosion potential. A temporary seed mixture shall be used to establish a temporary cover for disturbed soil during the construction operations. Temporary mixtures shall be placed as directed and be subject to seasonal limitations as defined herein. The mix shall be mulched in accordance with section T-908 when slopes exceed 3:1. From December 1 to March 14 and from June 16 to August 31, mulching alone shall be used to stabilize the soil.

a. Spring Mix. Spring mix shall be used from March 15 through June 15. This mixture shall be applied at the rate of 150 lb/acre (168 kg/ha). The mix shall consist of oats.

b. Fall Mix. Fall mix shall be used from September 1 through November 30. This mixture shall be applied at the rate of 150 lb/acre (168 kg/ha). The mix shall consist of winter wheat.

**156-2.2 MULCHES.** Mulch material used for temporary erosion control shall be in accordance with section T-908. All ground cover shall be held secure to prevent blowing by wind, jet blast, etc.

**156-2.3 FERTILIZER.** Fertilizer shall be a standard commercial fertilizer with an analysis of 12-12-12. Tests will not be required, but fertilizer standards shall be governed by the rulings of the Indiana State Seed Commissioner.

**156-2.4 SLOPE DRAINS.** Slope drains may be constructed of pipe, fiber mats, rubber, portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

**156-2.5 SILT FENCE.** Fabric shall meet the requirements of Section 918.04 from the latest edition of the INDOT Standard Specifications. Posts for silt fence shall be wood, and shall be 48" in length and spaced a maximum of 6' apart.

**156-2.6 FABRIC DROP INLET PROTECTION.** Fabric shall meet the requirement of Section 918.04 from the latest edition of the INDOT Standard Specifications.

Wooden stakes shall also be supplied. They shall be 2" x 2" x 36" and sharpened to a point. Cross-bracing shall be installed diagonally between the tops of the stakes. Fabric shall be attached to the stakes at each corner and also attached approximately every 3 ft in between.

**156-2.7 STRAW BALE CHECK DAMS.** Straw bales shall be 3' x 1'-2" x 1'-6" tall, and shall not weigh less than 35 lb (16 kg). Bales shall be bound with wire or nylon twine, and shall be staked with 2" x 2" x 30" wooden stakes sharpened to a point. Geotextile mat shall meet the requirement of Section 918.02 from the latest edition of the INDOT Standard Specifications.

**156-2.8 RIPRAP.** Riprap for erosion control measures shall meet the requirements of Section 904.04 from the latest edition of the INDOT Standard Specifications. The type of riprap shall be revetment, unless otherwise indicated. Filter fabric for riprap shall meet the requirements of Section 918.02 from the latest edition of the INDOT Standard Specifications.

**156-2.9 OTHER.** All other materials shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project.

#### CONSTRUCTION REQUIREMENTS

**156-3.1 GENERAL.** In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

All erosion control measures shall meet the design criteria, standards and specifications for erosion control measures established in the 'Indiana Storm Water Quality Manual' from the Indiana Department of Environmental Management (IDEM) and the 'Field Office Technical Guide' from the National Resources Conservation Service (NRCS).

Erosion control measures include but are not limited to:

- No storm water shall be discharged from the site in a manner causing erosion in the receiving channel at the point of discharge.
- Sediment being tracked from the site onto roadways shall be minimized. Roadways shall be kept cleared of accumulated sediment. Bulk clearing of accumulated sediment shall not include flushing the area with water.
- All on-site storm drain inlets shall be protected against sedimentation with filter fabric or equivalent barriers meeting accepted design criteria, standards and specifications for that purpose.

The Engineer shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

**156-3.2 SCHEDULE.** Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing, grading, construction, paving, and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operations for the applicable construction have been accepted by the Engineer.

**156-3.3 AUTHORITY OF ENGINEER.** The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, to limit the surface area of erodible earth material exposed by excavation, borrow, and fill operations, and to direct the Contractor to provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment.

**156-3.4 CONSTRUCTION DETAILS.** The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design state; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices but are not associated with permanent control features on the project.

Where erosion is likely to be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, temporary erosion control measures may be required between successive construction stages.

The Engineer will limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as part of the work as scheduled or are ordered by the Engineer, such work shall be performed by the Contractor at his/her own expense.

Failure of the Contractor to provide temporary erosion and pollution control measures as identified in the approved schedule, or required by the contractor's negligence, will be considered noncompliance of the contract.

The Engineer may increase or decrease the area of erodible earth material to be exposed at one time as determined by analysis of project conditions.

The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, and such crossings will adversely affect the sediment levels, temporary structures shall be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into or near rivers, streams, and impoundments or into natural or man-made channels leading thereto.

**156-3.5 INSPECTION OF EROSION CONTROL MEASURES.** All erosion control measures outlined in the plans and specifications shall be subject to the following additional requirements.

a. <u>Inspection</u>: All erosion and sediment control measures as specified in the erosion control plan shall be inspected by the Contractor as follows:

1. An inspection of erosion control measures in place shall be made at least once every seven (7) days.

2. All erosion control measures in place shall be inspected within 24 hours after any storm event greater than 0.5 inches of rain per 24 hour period.

3. Qualified personnel shall conduct a weekly inspection of the construction site to identify areas contributing to storm water discharges associated with construction activity.

4. Disturbed areas, material storage and equipment storage areas that are exposed to precipitation shall be inspected on a regular basis for evidence of, or the potential for, pollutants entering the drainage system.

5. Storm water discharge locations shall be inspected to determine if erosion control measures are effective in preventing significant impacts to receiving waters.

6. Erosion control devices installed as specified shall be observed to ensure that they are operating properly.

7. Haul routes and construction entrances to work areas shall be periodically inspected for evidence of off-site vehicle tracking of mud and dirt.

8. The Contractor's staging area shall be inspected to ensure that solid and liquid wastes are being properly disposed of and not allowed to be discharged into storm water runoff.

b. <u>Inspection Reports</u>: A report shall be completed summarizing the results of each inspection. The report shall include the name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the erosion control plan and a certification that the facility is in compliance with the plan and identify any incidents of non-compliance.

The attached inspection report form shall be used to record information obtained from field investigations of the erosion control measures. The record and certification shall be signed in accordance with the signatory requirements of the permit.

Inspection reports shall be maintained by the Contractor for two (2) years following IAA Board approval of final payment.

Copies of the reports shall be submitted to the Engineer with each invoice.

c. <u>Maintenance</u>: All erosion control measures shall be maintained throughout the project and until such time as the disturbed areas have been completely stabilized or other provisions have altered the need for these measures.

The Contractor shall:

1. Replace mulch materials to their original level when the level has been substantially reduced due to decomposition of the organic mulches and displacement or disappearance of both the organic and inorganic mulches.

2. Remove rubbish and channel obstructions from bare and vegetated channels within the project limits. The Contractor shall repair damage from scour or bank failure, rodent holes and breaching of diversion structures. Excessive wear, movement, or failure of erosion control blankets shall be repaired immediately. Deposits of sediment shall be removed from the channel.

3. Repair any damage to silt fence barriers immediately and monitor barriers daily during prolonged rainfall.

4. Repair or replace any silt fence fabric which has decomposed or become ineffective prior to its expected usable life.

5. Remove sediment deposits after each storm event. Sediment must be removed when deposits reach approximately half the height of the silt fence barrier.

6. Till and smooth to conform with the existing grade and reseed any sediment deposits remaining in place after the silt fence barrier is no longer required.

7. Maintain the construction entrances in a condition which will prevent tracking or flowing of sediment onto roads. This could require periodic top dressing with additional surface materials as conditions demand. Repair and clean out any features used to trap sediment and remove all sediment spilled, dropped, washed or tracked on road and return to the point of likely origin.

8. All temporary erosion and sediment control practices shall be removed and disposed of within thirty (30) days after final site stabilization is achieved or after the temporary practices are no longer needed. Trapped sediment shall be permanently stabilized to prevent further erosion.

#### METHOD OF MEASUREMENT

**156-4.1** Control work performed for protection of construction areas including areas within construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor with costs included in the contract prices bid for the items to which they apply.

**156-4.2** Temporary erosion and pollution control work required which is not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls will be performed as scheduled or ordered by the Engineer. Completed and accepted work will be measured as follows:

- a. Silt Fence will be measured by the linear foot (meter).
- b. Temporary slope drains will be measured by the linear foot (meter).

c. Temporary benches, dikes, dams, and sediment basins will be measured by the cubic yard (cubic meter) of excavation performed, including necessary cleaning of sediment basins, and the cubic yard (cubic meter) of embankment placed at the direction of the Engineer, in excess of plan lines and elevations.

- d. Temporary mulching will be measured by the ton (kilogram).
- e. Temporary seeding will be measured by the square yard (square meter).
- f. Fabric drop inlet protectors will be measured per each unit installed.
- g. Riprap will be measured by the ton (kilogram).
- h. Straw bale check dams will be measured by the linear foot (meter).

### BASIS OF PAYMENT

**156-5.1** Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the Engineer and measured as provided in paragraph 156-4.2 will be paid for under:

- Item No. \_\_\_\_ P-156 Silt Fence per linear foot (meter)
- Item No. \_\_\_\_ P-156 Temporary Slope Drain per linear foot (meter)
- Item No. \_\_\_\_ P-156 Temporary Bench, Dike, Dam, or Sediment Basin per cubic yard (cubic meter)
- Item No. \_\_\_\_ P-156 Temporary Mulching per ton (kilogram)
- Item No. \_\_\_\_ P-156 Temporary Seeding per square yard (square meter)
- Item No. \_\_\_\_ P-156 Fabric Drop Inlet Protector per each
- Item No. \_\_\_\_ P-156 Riprap per ton (kilogram)
- Item No. \_\_\_\_ P-156 Straw Bale Check Dam per linear foot (meter)

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.

Temporary control features not covered by contract items that are ordered by the Engineer will be paid for in accordance with Section 90-05.

## INDIANAPOLIS AIRPORT AUTHORITY <u>EROSION CONTROL PLAN</u> <u>INSPECTION REPORT</u>

Date:		
Name:		
Firm:		
Title:		
Rain Event - 24 hour total as reported by		
Observations:		
Erosion and sediment control measures are/are not in cor Action needed:	npliance with the Erosion Control Plan.	
The following erosion and sediment control measures we	ould increase the efficiency of the Erosion	Control Plan:
"I certify under penalty of law that this document and supervision in accordance with a system designed to evaluated the information submitted. Based on my inqu those persons directly responsible for gathering the info knowledge and belief, true, accurate, and complete. I an false information, including the possibility of fine and im	d all attachments were prepared under m assure that qualified personnel properly airy of the person or persons who manage prmation, the information submitted is, to a ware that there are significant penalties aprisonment for knowing violations."	y direction or gathered and the system, or the best of my for submitting
Inspector's Signature		
Authorized Representative Signature		

Owner/Agent

# THIS PAGE INTENTIONALLY LEFT BLANK

#### DESCRIPTION

**209-1.1** This item consists of a base course composed of crushed aggregates constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross sections shown on the plans.

#### MATERIALS

**209-2.1 AGGREGATE.** Aggregates shall consist of clean, sound, durable particles of crushed stone or crushed slag and shall be free from coatings of clay, silt, vegetable matter, and other objectionable materials and shall contain no clay balls. Fine aggregate passing the number 4 (9.5 mm) sieve shall consist of fines from the operation of crushing the coarse aggregate. If necessary, fine aggregate may be added to produce the correct gradation. The fine aggregate shall be produced by crushing stone or slag that meet the requirements for wear and soundness specified for coarse aggregate.

The crushed slag shall be an air-cooled, blast furnace slag and shall have a unit weight of not less than 70 pounds per cubic foot (1.12 Mg/cubic meter) when tested in accordance with ASTM C 29.

The coarse aggregate portion, defined as the material retained on the No. 4 (4.75 mm) sieve and larger, shall contain not more than 15 percent, by weight, of flat or elongated pieces as defined in ASTM D 693 and shall have at least 90 percent by weight of particles with at least two fractured faces and 100 percent with at least one fractured face. The area of each face shall be equal to at least 75 percent of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

The percentage of wear shall not be greater than 45 percent when tested in accordance with ASTM C 131. The sodium sulfate soundness loss shall not exceed 12 percent, after 5 cycles, when tested in accordance with ASTM C 88.

The fraction passing the No. 40 (0.42 mm) sieve shall have a liquid limit no greater than 25 and a plasticity index of not more than 4 when tested in accordance with ASTM D 4318. The fine aggregate shall have a minimum sand equivalent value of 35 when tested in accordance with ASTM D 2419.

a. **Sampling and Testing.** Aggregates for preliminary testing shall be furnished by the Contractor prior to the start of production. All tests for initial aggregate submittals necessary to determine compliance with the specification requirements will be made by the Engineer at no expense to the Contractor.

Samples of aggregates shall be furnished by the Contractor at the start of production and at intervals during production. The sampling points and intervals will be designated by the Engineer. The samples will be the basis of approval of specific lots of aggregates from the standpoint of the quality requirements of this section.

In lieu of testing, the Engineer may accept certified state test results indicating that the aggregate meets specification requirements. Certified test results shall be less than 6 months old.

Samples of aggregates to check gradation shall be taken by the Engineer at least two per lot. The lot will be consistent with acceptable sampling for density. The samples shall be taken from the in-place, compacted material. Sampling shall be in accordance with ASTM D 75, and testing shall be in accordance with ASTM C 136 and C 117.

b. **Gradation Requirements.** The gradation (job mix) of the final mixture shall fall within the design range indicated in Table 209-1 when tested in accordance with ASTM C 117 and C 136. The final gradation shall be continuously well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on an adjacent sieve or vice versa.

	Design Range INDOT #53
Sieve Size	% by Weight Passing Sieves
1 1/2" (37.5 mm)	100
1" (25 mm)	80 - 100
3/4" (19 mm)	70 - 90
1/2" (12.5 mm)	55 - 80
3/8" (9.5 mm)	
No. 4 (4.75 mm)	35 - 60
No. 8 (2.36 mm)	25 - 50
No. 30 (0.60 mm)	12 - 30
No. 200 (0.075 mm) \2\	5 - 10

#### TABLE 209-1 REQUIREMENTS FOR GRADATION OF AGGREGATE \1\

\1\ Where environmental conditions (temperature and availability of free moisture) indicate potential damage due to frost action, the maximum percent of material, by weight, of particles smaller than 0.02 mm shall be 3 percent when tested in accordance with ASTM D 422. It also may be necessary to have a lower percentage of material passing the No. 200 sieve to help control the percentage of particles smaller than 0.02mm (maximum limit of 5 percent is recommended).

\2\ Includes the total amount passing the No. 200 sieve as determined by AASHTO T 11 and T 27.

The fraction of the final mixture that passes the No. 200 sieve shall not exceed 60% the fraction passing the No. 30 sieve. The liquid limit shall not exceed 25 (35 if slag) and the plasticity index shall not exceed 5. The liquid limit shall be determined in accordance with AASHTO T 89 and the plasticity index in accordance with AASHTO T 90.

#### CONSTRUCTION METHODS

**209-3.1 PREPARING UNDERLYING COURSE.** The underlying course shall be checked and accepted by the Engineer before placing and spreading operations are started. Any ruts or soft yielding places caused by improper drainage conditions, hauling, or any other cause shall be corrected at the Contractor's expense before the base course is placed thereon. Material shall not be placed on frozen subgrade.

**209-3.2 MIXING.** The aggregate shall be uniformly blended during crushing operations or mixed in a plant. The plant shall blend and mix the materials to meet the specifications and to secure the proper moisture content for compaction.

**209-3.3 PLACING.** The crushed aggregate base material shall be placed on the moistened subgrade in layers of uniform thickness with a mechanical spreader.

The maximum depth of a compacted layer shall be 6 inches (150 mm). If the total depth of the compacted material is more than 6 inches, it shall be constructed in two or more layers. In multi-layer construction, the base course shall be placed in approximately equal-depth layers.

The previously constructed layer should be cleaned of loose and foreign material prior to placing the next layer. The surface of the compacted material shall be kept moist until covered with the next layer.

**209-3.4 COMPACTION.** Immediately upon completion of the spreading operations, the crushed aggregate shall be thoroughly compacted. The number, type, and weight of rollers shall be sufficient to compact the material to the required density.

The moisture content of the material during placing operations shall not be below, nor more than 2 percentage points above the optimum moisture content as determined by ASTM D 1557.

**209-3.5 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY.** Aggregate base course shall be accepted for density on a lot basis. A lot will consist of one day's production where it is not expected to exceed 2,400 square yards. A lot will consist of one-half day's production where a day's production is expected to consist of between 2,400 and 4,800 square yards.

Each lot shall be divided into two equal sublots. One test shall be made for each sublot. Sampling locations will be determined by the Engineer on a random basis in accordance with statistical procedures contained in ASTM D 3665.

Each lot will be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens prepared from samples of the base course material delivered to the job site. The specimens shall be compacted and tested in accordance with ASTM D 1557. The in-place field density shall be determined in accordance with ASTM D 1556 or D 2167. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached.

In lieu of the core method of field density determination, acceptance testing may be accomplished using a nuclear gage in accordance with ASTM D 2922 and ASTM D 3017. The gage should be field calibrated in accordance with paragraph 4 of ASTM D 2922. Calibration tests shall be conducted on the first lot of material placed that meets the density requirements.

Use of ASTM D 2922 results in a wet unit weight, and when using this method, ASTM D 3017 shall be used to determine the moisture content of the material. The calibration curves furnished with the moisture gages shall be checked as described in paragraph 7 of ASTM D 3017. The calibration checks of both the density and moisture gages shall be made at the beginning of a job and at intervals as determined by the Engineer.

If a nuclear gage is used for density determination, two random readings shall be made for each sublot.

**209-3.6 FINISHING.** The surface of the aggregate base course shall be finished by blading or with automated equipment especially designed for this purpose.

In no case will the addition of thin layers of material be added to the top layer of base course to meet grade. If the elevation of the top layer is 1/2 inch or more below grade, the top layer of base shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and recompacted to bring it to grade. If the finished surface is above plan grade, it shall be cut back to grade and rerolled.

**209-3.7 SURFACE TOLERANCE.** The finished surface shall not vary more than 3/8 inch (9 mm) when tested with a 16-foot (4.8 m) straightedge applied parallel with or at right angles to the centerline. Any deviation in excess of this amount shall be corrected by the Contractor at the Contractor's expense.

**209-3.8 THICKNESS CONTROL.** The completed thickness of the base course shall be within 1/2 inch (12 mm) of the design thickness. Four determinations of thickness shall be made for each lot of material placed. The lot size shall be consistent with that specified in paragraph 3.5. Each lot shall be divided into four equal sublots. One test shall be made for each sublot. Sampling locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D 3665. Where the thickness is deficient by more than 1/2 inch, the Contractor shall correct such areas at no additional cost by excavating to the required depth and replacing with new material. Additional test holes may be required to identify the limits of deficient areas.

**209-3.9 MAINTENANCE.** The base course shall be maintained in a condition that will meet all specification requirements until the work is accepted. Equipment used in the construction of an adjoining section may be routed over completed portions of the base course, provided no damage results and provided that the equipment is routed over the full width of the base course to avoid rutting or uneven compaction. The Contractor shall remove all survey and grade hubs from the base course prior to placing any bituminous surface course.

#### METHOD OF MEASUREMENT

**209-4.1** The quantity of crushed aggregate base course to be paid for will be determined by measurement of the number of square yards of material actually constructed and accepted by the Engineer as complying with the plans and specifications.

#### BASIS OF PAYMENT

**209-5.1** Payment shall be made at the contract unit price per square yard for crushed aggregate base course. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item No. P-209 Crushed Aggregate Base Course -- per square yard

#### TESTING REQUIREMENTS

ASTM C 29	Unit Weight of Aggregate
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	Materials Finer than 75µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	Resistance to Degradation of Small-Size Coarse Aggregate by abrasion and impact in the Los Angeles Machine
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	Sampling Aggregate
ASTM D 422	Particle Size Analysis of Soils
ASTM D 693	Crushed Aggregate for Macadam Pavements
ASTM D 698	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb (2.49-kg) Rammer and 12-in (305mm) Drop
ASTM D 1556	Density of Soil in Place by the Sand-Cone Method
ASTM D 1557	Test for Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D 2167	Density and Unit Weight of Soil in Place by the Rubber Ballon Method
ASTM D 2419	Sand Equivalent Value of Soils and Fine Aggregate
ASTM D 2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods
ASTM D 3017	Water Content of Soil and Rock in Place by Nuclear Methods
ASTM D 3665	Random Sampling of Construction Materials
ASTM D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils END OF SECTION

#### DESCRIPTION

**705-1.1** This item shall consist of pipe underdrains (subsurface drains) of the type, classes, sizes, and dimensions required on the plans, furnished and installed at the places designated on the plans and profiles, or by the Engineer, in accordance with these specifications and with the lines and grades given.

The item shall include in the bid price per linear foot of pipe in place, the cost of excavation, the cost of furnishing and installing all pipe and fittings, as shown on the plans, and disposal of excess excavated material and the cost of furnishing and installing porous granular backfill.

#### MATERIALS

ASTM F 949

AASHTO M 252

705-2.1 GENERAL. Materials shall meet the requirements shown on the plans and specified below.

**705-2.2 PIPE.** The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following specifications:

Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings Corrugated Polyethylene Pipe

The minimum pipe stiffness for either material shall be 50 psi.

### 705-2.3 JOINT MORTAR. N/A

705-2.4 ELASTOMERIC SEALS. Elastomeric seals shall conform to the requirements of ASTM F 477.

**705-2.5 POROUS BACKFILL.** Porous backfill shall be washed gravel conforming to the gradation of Table 705-1 when tested in accordance with ASTM C 136, and shall be free of clay, humus, or other objectionable matter.

### TABLE 705-1

INDOT No. 8 Coarse Aggregate Backfill for Underdrains

Sieve Size	Percent Passing
1"	100
3/4"	75-95
1/2"	40-70
3/8"	20-50
No. 4	0-15
No. 8	0-10
Decant	0-3

**705-2.6 GRANULAR MATERIAL.** Granular material used for backfilling shall conform to the requirements of ASTM D 2321 for Class IA, IB, or II materials, or shall meet the requirements of AASHTO Standard Specification for Highway Bridges Section 30.

#### 705-2.7 FILTER FABRIC. N/A

**705-2.8 CONTROLLED LOW STRENGTH MATERIAL (CLSM).** Controlled low strength material shall conform to the requirements of Item P-153. When CLSM is used all joints shall have elastomeric seals.

### CONSTRUCTION METHODS

**705-3.1 EQUIPMENT.** All equipment necessary and required for the proper construction of pipe underdrains shall be on the project, in first-class working condition, and approved by the Engineer before construction is permitted to start. The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and backfill, as specified.

**705-3.2 EXCAVATION.** The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but shall not be less than the external diameter of the pipe plus 6 inches (150 mm) on each side. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 4 inches (100 mm). The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches (150 mm) in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determined the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

Excavated material not required or acceptable for backfill shall be disposed of by the Contractor as directed by the Engineer. The excavation shall not be carried below the required depth; when this is done, the trench shall be backfilled at the Contractor's expense with material approved by the Engineer and compacted to the density of the surrounding earth material.

The bed for the pipe shall be so shaped that at least the lower quarter of the pipe shall be in continuous contact with the bottom of the trench. Spaces for the pipe bell shall be excavated accurately to size to clear the bell so that the barrel supports the entire weight of the pipe.

The Contractor shall do such trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to governing laws. Unless otherwise provided, the bracing, sheathing, or shoring shall be removed by the Contractor after the completion of the backfill to at least 12 inches (300 mm) over the top of the pipe. The sheathing or shoring shall be pulled as the granular backfill is placed and compacted to avoid any unfilled spaces between the trench wall and the backfill material. The cost of bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per foot (meter) for the pipe.

### 705-3.3 LAYING AND INSTALLING PIPE

a. <u>PVC or Polyethylene Pipe</u>. PVC or polyethylene pipe shall be installed in accordance with the requirements of ASTM D 2321 or AASHTO Standard Specification for Highway Bridges Section 30. Perforations shall meet the requirements of AASHTO M 252 or M 294 Class 2, unless otherwise indicated on the plans. The pipe shall be laid accurately to line and grade.

b. <u>All Types of Pipe</u>. The upgrade end of pipelines, not terminating in a structure, shall be plugged or capped as approved by the Engineer.

Unless otherwise shown on the plans, a 4-inch (100 mm) bed of granular backfill material shall be spread in the bottom of the trench throughout the entire length under all perforated pipe underdrains.

Pipe outlets for the underdrains shall be constructed when required or shown on the plans. The pipe shall be laid with tight-fitting joints. Porous backfill is not required around or over pipe outlets for underdrains. All connections to other drainage pipes or structures shall be made as required and in a satisfactory manner. If connections are not made to other pipes or structures, the outlets shall be protected and constructed as shown on the plans.

#### 705-3.4 MORTAR. N/A

#### 705-3.5 JOINTS IN CONCRETE PIPE. N/A

#### 705-3.6 BACKFILLING.

a. **Earth.** Earth backfill shall only be used for non-perforated sections of underdrain. All trenches and excavations shall be backfilled within a reasonable time after the pipes are installed, unless other protection of the pipe is directed. The backfill material shall be selected material from excavation or borrow; material which is placed within a nominal pipe diameter distance at the sides of the pipe and 1 foot (30 cm) over the top shall be material that can be readily compacted. It shall not contain stones retained on a 3-inch (75 mm) sieve, frozen lumps, chunks of highly plastic clay, or any other material that is objectionable to the Engineer. The material shall be moistened or dried, if necessary to be compacted by the method in use. Backfill material shall be approved by the Engineer. Special care shall be taken in placing the backfill. Great care shall be used to obtain thorough compaction under the haunches and along the sides to the top of the pipe.

The backfill shall be placed in loose layers not exceeding 6 inches (150 mm) in depth under and around the pipe, and not exceeding 8 inches (200 mm) over the pipe. Successive layers shall be added and thoroughly compacted by hand and pneumatic tampers, approved by the Engineer, until the trench is completely filled and brought to the proper elevation. Backfilling shall be done in a manner to avoid injurious top or side pressures on the pipe.

In embankments and for other areas outside of pavements, the backfill shall be compacted to the density required for embankments in unpaved areas under Item P-152. Under paved areas, the subgrade and any backfill shall be compacted to the density required for embankments for paved areas under Item P-152.

b. **Granular Material.** When granular backfill is required, its placement in the trench and about the pipe shall be as shown on the plans. Special care shall be taken in placing the backfill. The granular backfill shall not contain a damaging amount of foreign matter, nor shall earth from the sides of the trench or from the windrow be allowed to filter into the backfill. The backfill shall be placed in loose layers not exceeding 6 inches in depth and compacted by hand and pneumatic tampers to the requirements as given for earth backfill. Backfilling shall be done in a manner to avoid injurious top or side pressures on the pipe. The granular backfill shall be made to the elevation of the trench, as shown on the plans.

When perforated pipe is specified, granular backfill material shall be placed along the full length of the pipe. The position of the granular material shall be as shown on the plans.

When granular backfill is to be placed in paved or adjacent areas prior to the completion of grading or subgrade operations, the backfill material shall be placed immediately after laying the pipe. The depth of this granular backfill shall be not less than 12 inches, measured from the top of the underdrain. During subsequent construction operations, this minimum backfill of 12 inches of depth shall not be disturbed until such time as the underdrains are to be completed. When the Underdrains are to be completed, the unsuitable material shall be removed until the granular backfill is exposed. That part of the granular backfill which contains objectionable material shall be removed and replaced with suitable material. The cost of removing and replacing any such unsuitable material shall be borne by the Contractor.

Whenever a granular subbase blanket course is to be used under pavements which extend several feet beyond the edge of paving to the outside edge of the underdrain trench, the granular backfill material over the underdrains shall be placed in the trench up to an elevation of 2 inches above the bottom surface of the granular subbase blanket course. Immediately prior to the placing of the granular subbase blanket course, the Contractor shall blade this excess trench backfill from the top of the trench onto the adjacent subgrade where it can be incorporated into the granular subbase blanket course. Any unsuitable material which remains over the underdrain trench shall be removed and replaced. The subbase material shall be placed to provide clean contact between the subbase material and the underdrain granular backfill material for the full width of the underdrain trench.

c. Controlled Low Strength Material (CLSM). Controlled low strength material shall conform to the requirements of Item P-153.

d. **Deflection Testing.** The Engineer may at any time, not withstanding previous material acceptance, reject or require re-installation of pipe that exceeds 5 percent deflection when measured in accordance with ASTM D 2321, including Appendices.

**705-3.7CONNECTIONS.** When the plans call for connections to existing or proposed pipe or structures, these connections shall be cut out with a saw, watertight and made so that a smooth, uniform flow line will be obtained throughout the drainage system.

**705-3.8 CLEANING AND RESTORATION OF SITE.** After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as ordered by the Engineer. Except for paved areas of the airport, the Contractor shall restore all disturbed areas to their original condition.

After all work is completed, the Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

Performance of the work described in this section is not payable directly but shall be considered as a subsidiary obligation of the Contractor, covered under the contract unit price for the underdrain.

#### METHOD OF MEASUREMENT

**705-4.1** The quantity of pipe underdrains to be paid shall be the number of linear feet of underdrain installation including pipe and backfill in place, completed, and approved. Measurements shall be along the centerline of the pipe from end or inside face of structure to end or inside face of structure. Each different pipe size installation will be measured separately. No additional measurement will be given for y-fittings, tees, elbows or straight reducer fittings.

#### BASIS OF PAYMENT

**705-5.1** Payment will be made at the contract unit price per linear foot of underdrain installation for each size of pipe indicated. These prices shall be full compensation for providing all labor, equipment, and materials necessary to complete this item of work.

Payment will be made under:

Item No. \_\_\_ D-705 \_\_\_\_ inch \_\_\_\_ pipe -- per linear foot size kind

#### MATERIAL REQUIREMENTS

ASTM D 2321	Underground Installation of Flexible Thermoplastic Sewer Pipe
ASTM F 949	PolyVinyl Chloride (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
AASHTO M 252	Corrugated Polyethylene Pipe
ASTM F 477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

### END OF SECTION

# **D-753 RIPRAP**

**753-1.1 DESCRIPTION** This work shall consist of placing protective coatings of broken stone in accordance with these specifications and in conformity with the lines, grades and thicknesses shown on the plans.

### MATERIALS

**753-2.1 GENERAL** Stones shall be hard quarry or field stone and shall be of such quality that they will not disintegrate on exposure to water for weathering. The stone shall be suitable in all respects for the purpose intended. Pieces shall be unfractured and meet the size specifications shown below.

**753-2.2 RIPRAP** Riprap aggregate shall consist of pieces, except spalls, no less than 1/10 cubic foot in volume for 6 inch riprap and no less than 1/3 cubic foot in volume for 12 inch riprap. All riprap shall have no less than 3 inches in the least dimension. The width of these pieces shall be no less than 6 inches for 6 inch riprap and no less than 12 inches for 12 inch riprap.

**753-2.3 FILTER FABRIC** The material used shall consist of strong, rot resistant, chemically stable long-chain synthetic polymer material dimensionally stable with distinct and measurable openings. The plastic yarn or fibers used in the geotextile, shall consist of any long-chain synthetic polymer composed of at least 85 percent by weight of polyolefins, polyesters, or polyamides, and shall contain stabilizers and inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure. The geotextile shall be calendered or otherwise finished so that the yarns or fibers will retain their relative position with respect to each other.

The geotextile shall meet the following physical requirements:

	TEST	REQUIREMENTS
Tensile Strength	ASTM D 4632	200 lbs
Elongation	ASTM D 4632	35%
Bursting Strength	ASTM D 3736	360 PSI
Puncture Strength	ASTM D 4833	40 lbs
Abrasion resistance		55 lbs
Apparent Opening Size	ASTM D 4751 AOS	30-70
Permeability, gal/min/ft2		60
Water Perm., K, cm/sec		0.1
% Strength Retention for Mild. Rot Resistance		100
Insect, Rodent Resistance		100

**753-2.4 BEDDING MATERIAL** The bedding material shall be #53 Class A or B aggregate in accordance with Indiana Department of Transportation Standard Specification, latest edition.

**753-2.5 SECURING PINS** Securing pins for anchoring the fabric shall be 3/16 inch steel bars, pointed at one end and fabricated with a head to retain a steel washer having an outside diameter of not less than 1.5 inches. The pin length shall be not less than 18 inches. U-shaped pins shall be an acceptable option.

### CONSTRUCTION REQUIREMENTS

**753-3.1 PLACING HAND LAID RIPRAP** Unless otherwise directed, the slope or bed which riprap is to be placed shall conform with the cross section shown on the plans. The thickness of riprap shall be no less than 2 times the median stone measured perpendicular to the slope. Laying along slopes shall begin in a trench below the toe of the slope or as shown on the plans. It shall progress upward, with each piece being laid perpendicular to the slope. It shall be firmly embedded against the slope and the adjoining piece with the sides in contact and with well broken joints. The spaces between the larger pieces shall be filled with spalls of suitable size which shall be thoroughly rammed into place. The finished-surface shall present an even, tight surface, true to line, grade and section.

**753-3.2 PLACING FILTER FABRIC** The engineering fabric shall be installed in accordance with the plans. Overlaps when necessary shall be 18 inches minimum. Securing pins shall be used when necessary to insure proper anchoring of the engineering fabric, with securing pins spaced at 3 to 5 foot centers.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 D-753-1

# **D-753 RIPRAP**

**753-4.1 METHODS OF MEASUREMENT** Hand laid riprap will be measured in square yards parallel to the slope and at the depth shown on the plans.

**753-4.2** Engineering fabric shall be measured for payment by the square yard in place. Measurement will be the nearest square yard. No allowance will be made for material in laps and seams.

**753-4.3** Bedding Material will be measured by the ton.

**753-5.1 BASIS OF PAYMENT** Riprap will be paid for at the contract unit price per square yard at the depth shown on the plans, which price and payment shall be full compensation for furnishing all materials, tools, labor, and incidentals necessary to complete the work.

**753-5.2** Engineering fabric shall be paid for at the contract unit price for Filter Fabric for Riprap, which price and payment shall constitute full compensation for furnishing all labor, material and equipment, and performing all operations in connection with placing the Filter Fabric for Riprap as shown on the contract plans. No payment will be included for securing pins, and all costs incidental thereto shall be included in the contract unit price for Filter Fabric for Riprap. No payment will be made for Filter Fabric for Riprap due to either contamination or damage due to either the fault or negligence of the Contractor.

**753-5.3** Bedding material will be paid for at the contract unit price per ton, and shall be full compensation for furnishing all materials, tools labor, and incidentals necessary to complete the work.

Payment will be made under:

Item No. D-7536-inch hand laid Riprap (12 inch deep) per square yard.Item No. D-75312-inch hand laid Riprap (24 inch deep) per square yard.Item No. D-753Filter Fabric for Riprap per square yard.Item No. D-753No. 53, Type O Aggregate per ton.

For Testing and Material Requirements, see Materials.

**162-1.1 DESCRIPTION.** This item covers the requirements for furnishing materials and constructing new chain-link fences and gates in accordance with the details included herein and as shown on the plans. The class of fence to be erected shall be as indicated on the plans and in the bid proposal.

The fence shall be the product of a manufacturer who has demonstrated by actual installations of a similar nature that its product is of the type required. The Contractor shall include all supplementary parts necessary or required for a complete and satisfactory installation within the true meaning and intent of the drawings. All runs of the fence shall present the same general appearance and the product of one manufacturer only will be accepted, except for items which do not influence the appearance of the completed fence. No used, rerolled, or open-seam steel shall be permitted in posts, gate frames, rails or braces.

#### MATERIALS

**162-2.1 FABRIC.** The fabric shall be woven with a 9-gauge wire in a 2 inch mesh and shall meet the requirements as shown on the plans, in the special provisions, and as specified below:

Galvanized Steel Fabric ASTM A392, Class II

**162-2.2 BARBED WIRE**. Barbed wire shall be 2 strand, 12-1/2 gauge wire with 4 point barbs, and shall conform to the following requirements:

Zinc Coated Barbed Wire ASTM A121, Class III

162-2.3 POSTS, RAILS AND BRACES. Posts, rails, and braces furnished for use in conjunction with zinc-coated steel fabric or with aluminum-coated steel fabric shall be of zinc-coated steel or acrylic-coated steel pipe.

The dimensions for the posts, rails and braces shall be in accordance with Tables I through III of Fed. Spec. RR-F-191/3.

Line posts, rails and braces shall conform to the requirements of:

Galvanized Steel Pipe ASTM F1083

**162-2.4 GATES.** Gate frames shall conform to the specifications for the same material under paragraph 162-2.3. The fabric shall be of the same type material as used in the fence.

**162-3.1 CONSTRUCTION METHODS.** The fence shall be constructed in accordance with the details on the plans and as specified herein using new materials, and all work shall be performed in a workmanlike manner satisfactory to the Engineer. The layout of the fence alignment and profile shall be by the Contractor in accordance with the plans. The work shall be covered under Construction Engineering.

The use of barbed wire to span openings at ditches, swales, etc., which exceed the clearance tolerance between the ground line and bottom of fence, will not be allowed unless specifically directed by the Engineer. The new fence shall be permanently tied to the terminals of existing fences whenever required by the Engineer. The finished fence shall be plumb, taut, true to line, and complete in every detail.

When directed, the Contractor shall be required to stake down the chain-link fence at several points between posts.

To provide for airport security, the Contractor shall arrange for a security guard to be on duty when the security fence is unsecured. The length of unfenced section at any time shall not exceed more than the Contractor can complete during that day. The work shall progress in this manner and at the close of the working day the newly constructed fence shall be secured to the existing fence. No additional compensation for security, temporary fence installation or removal for closures will be made.

**162-3.2 CLEARING FENCE LINE.** The site of the fence shall be sufficiently cleared of obstructions, and surface irregularities shall be graded so that the fence will conform to the general contour of the ground. The fence line shall be cleared to a minimum width of 10 feet on each side of the centerline of the fence, or as designated on the drawings. This clearing shall consist of the

removal of all stumps, brush, rocks, trees, or other obstructions which will interfere with proper construction of the same fence. Stumps within the cleared area of the fence line shall be grubbed or excavated. The bottom of the fence shall be placed a uniform distance above the ground, as specified on the plans. When shown on the plans or as directed by the Engineer, the existing fences which coincide with, or are in a position to interfere with, the new fence location shall be removed by the Contractor as a part of the construction work, unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stumps removal shall be refilled with suitable soil, gravel, or other material acceptable to the Engineer and shall be compacted properly with tampers.

The work shall include the handling and disposal of all material cleared, excavated, or removed, regardless of the type, character, composition, or condition of such material encountered.

The soil along the fence line will be sterilized one (1) foot on each side a depth of four (4) inches for the prevention of the growth of grass and weeds.

If the ground is not level, the upgrade gate post shall be set first to get the proper height for the downgrade gate post. The concrete bases for end, corner, pull, brace, and gate posts shall be placed first and allowed to cure for 5 days. The concrete bases for line posts shall be allowed to cure for 3 days. Stretcher bar bands and truss bands as specified on the plans shall be spread and slipped on end, corner, pull, brace and gate posts as the next operation. Post tops are then inserted on all other posts. No extra compensation shall be made for rock excavation. Rock excavation shall not be grounds for extension of time.

**162-3.3 INSTALLING POSTS.** All posts shall be spaced not more than 10 feet apart as shown on the plans. Posts shall be set 36 inches in concrete bases as shown on the plans. Holes of full depth and size for the concrete bases for posts shall be dug to the size and depth as shown on the plans. Blasting of rock or other obstructions shall be done if necessary. All post settings shall be done carefully so that all posts shall be vertical and in true alignment and rigidly secured in position.

On terminal (end, corner, pull, and brace) and gate posts, the post tops and brace rail clamps around the posts shall be placed before setting the posts in concrete bases. In setting the gate posts, great care must be taken to make sure that gate posts are set the exact distance apart as shown on the plans. For example, posts for a 6-foot gate must be set so as to leave an opening exactly 6 feet wide. A line drawn across from the top of one gate post to the other must be level, regardless of the grade at the ground line.

**162-3.4 INSTALLING TOP RAILS.** To start the installation, a length of top rail shall be run through the first couple of post tops; a rail clamp shall be assembled on the end, corner, or gate post, as the case may be. The end of the rail already placed shall be butted into the clamp and fastened. The top rail shall be installed along the run of the fence and the various sections joined with sleeve couplings. At not more than every 100 feet an expansion coupling shall be clamped in the end, corner, or gate post at the end of the run of the installation of top rail.

**162-3.5 INSTALLING BRACES.** All horizontal braces shall be attached together with truss rods at all terminal (end, corner, and pull) and gate posts to the brace posts as shown on the plans.

**162-3.6 INSTALLING FABRIC.** The fabric shall be unrolled on the outside of the fence line with the bottom edge of the fabric against the posts. The various rolls shall be spliced by bringing the ends close together and weaving in a picket in such a way that it will engage both of the roll ends and catch with each twist each separate mesh of the end pickets of both rolls of fabric. The fabric shall be raised and tied loosely to the top rail with a temporary tie wire at intervals of about 20 feet. The fabric shall be installed by a method approved by the Engineer. One method used is given below.

a. At end, corner, or gate posts, the stretcher bar shall be slipped through the end picket of the fabric and the stretcher bar bands at the same time. Then the bolts in the stretcher bar bands shall be tightened. Additional rolls of fabric shall be spliced and placed as the erection progresses along the fence

b. In long sections, the fence shall be stretched at interval of about 100 feet. After the stretching is complete, the fabric shall be tied to the top rails with No. 9 gauge wire clips securely clinched at the back of the rail. The fastenings shall be spaced not more than 24 inches on centers for the top rail.

c. The fabric shall be attached to the line posts with No. 9 gauge wire clips securely clinched to the back of the line posts. The fastenings shall be spaced not more than 14 inches on centers for line posts. The topmost clip shall be placed on the line post as near the top of the fabric as possible and the lowest clip as near the bottom of the fabric as possible.

d. At terminal (end, corner, and pull) and gate posts the fabric shall be fastened with stretcher bars and bands. The fastenings shall be spaced not more than 14 inches on centers for terminal (end, corner, and pull) and gate posts. The topmost band shall be placed on these posts as near the top of the fabric as possible and the lowest band as near the bottom of the fabric as possible.

Standard chain-link fence stretching equipment shall be provided for stretching the fabric before tying it to the rails and posts. The stretching and tying operations shall be repeated about every 100 feet until the run of fence is completed. Equipment of one type for performing the stretching operation may be composed of four pieces of lumber (2 X 4's or larger) cut into a slightly shorter length than the width of the fabric. The pieces shall be bored for six bolts of about 1/2 or 5/8-inch diameter and shall be assembled as shown on the plans. One pair shall be used for stretching the fabric and both pairs shall be used for making a closure of a run of the fence.

Before making a closure, the other end of the run shall be fastened to the end, corner, or gate post as described previously. The operation of making a closure of a run shall be as follows. The stretching equipment as described above shall be clamped on the ends of the fabric parallel to each other and about 5 feet apart when the tension is first applied. The stretching shall continue until the slack has been removed from both sections of the fabric.

If the ends overlap, the fabric shall be cut to match. The ends shall be joined by the insertion of a picket similar to the method of connecting two rolls of fabric.

**162-3.7 INSTALLING GATES.** The gates shall be hung on gate fittings as shown on the plans. The lower hinge (ball and socket type) shall be placed on top of the concrete footing in which the gate post is set; the concrete in the footing shall extend up to the bottom of the lower hinge. The sockets for the cane or foot bolts shall be set in concrete so that the plunger pin will fit perfectly in the socket when the gate is in a closed position. Gates shall be erected to swing in the direction indicated and shall be provided with gate stops as specified or as shown on the plans. All hardware shall be thoroughly secured, properly adjusted, and left in perfect working order. Hinges and diagonal bracing in gates shall be adjusted so that the gates will hang level.

**162-3.8 EXISTING FENCE CONNECTIONS.** Wherever the new fence joins an existing fence, either at a corner or at the intersection of straight fence lines, a corner post with a brace post shall be set at the junction and braced the same as herein described for corner posts or as shown on the plans.

If the connection is made at other than the corner of the new fence, the first span of the old fence shall contain a brace span.

The Contractor, where called for on the plans, will carefully remove the existing fence fabric and roll into neat rolls, the associated hardware and store in an area designated by the owner. Items which are designated by the owner as damaged beyond repair and unsalvageable will be disposed of by the Contractor. The Contractor will dispose of all fence posts.

**162-4.1 METHOD OF MEASUREMENT.** Fences shall be measured in place from outside to outside of end posts or corner posts and shall be the length of fence actually constructed, except the space occupied by the gates.

All gates shall be measured in units for each gate installed and accepted. The length dimension shall be the net opening excluding posts, hinges, etc.

**162-5.1 BASIS OF PAYMENT.** Payment will be made at the contract unit price per linear foot for chain-link fence. This price shall be full compensation for furnishing all materials and for all preparation, erection, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made at the contract unit price per each for driveway or for walkway gates. This price shall be full compensation for furnishing all materials, and for all preparation, erection, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item No.F-162 \_\_\_\_\_Chain-Link Fence -- per lineal foot Height Item No.F-162 \_\_\_\_\_X \_\_\_\_Swing Gate per each Height x Length Single/Double

Item No.F-162 x Cantilever per each Height x Length Single/Double Slide Gate --

MATERIAL REQUIREMENTS	
ASTM A 121	Zinc-coated (Galvanized) Steel Barbed Wire
ASTM A 123	Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Gorged Steel Shapes,
	Plates, Bars, and Strip
ASTM A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 392	Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A 491	Aluminum-Coated Steel Chain-Link Fence Fabric
ASTM A 569	Steel, Carbon (0.15 Maximum, Percent), Hot Rolled Sheet and Strip Commercial Quality
ASTM A 570	Hot-Rolled Carbon Steel Sheet and Strip Structural Quality
ASTM A 572	High-Strength, Low-Alloy Columbium-Vanadium Steels of Structural Quality
ASTM A 585	Aluminum-Coated Steel Barbed Wire
ASTM B 221	Aluminum-Alloy Extruded Bars, Rods, Wire Shapes and Tubes
ASTM F 668	Poly (Vinyl Chloride) (PVC) - Coated Steel Chain-Link Fence
ASTM F 1083	Pipe, Steel, Hot-dipped Zinc-coated (galvanized) Welded, for Fence Structures
ASTM F 1183	Aluminum Alloy Chain Link Fence Fabric
ASTM F 1234	Protective Coatings on Steel Framework for Fences
Fed. Spec.	Fencing, Wire and Post, Metal (Chain-Link RR-F-191/3 Fence Posts, Top Rails, and Brackets)
Fed. Spec.	Fencing, Wire and Post, Metal (Chain-Link RR-F-191/4 Fence Accessories)

## T-901 SEEDING

#### DESCRIPTION

**901-1.1** This item shall consist of seeding the areas shown on the plans or as directed by the Engineer in accordance with these specifications.

#### MATERIALS

**901-2.1 GENERAL.** All materials as noted shall be in accordance with section 621 of the Indiana Department of Highways Standard Specifications most current edition and revisions. Seeding shall be accomplished between April 15 and June 1 or between August 15 and October 30, unless otherwise approved by the Engineer. The Contractor is responsible for providing a stand of grass, satisfactory to the Authority, over 100% of the seeded area.

**901-2.2 SEED.** Seed shall be Type "R" per Indiana Department of Transportation Specifications. Seed shall be purchased from sources of supply that have been sampled, tested, and reported by the Indiana State Seed Commissioner and found to be satisfactory. Seed which has been tested by the State Seed Commissioner may be used without further testing provided each bag of seed bears a tag showing the seed meets the requirements of the INDOT specifications.

**901-2.3 LIME.** Lime, if required, shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. All liming materials shall conform to the requirements of ASTM C 602.

**901-2.4 FERTILIZER.** Fertilizer shall be a standard commercial fertilizer with an analysis of 12-12-12. Tests will not be required, but fertilizer standards shall be governed by the rulings of the Indiana State Seed Commissioner.

901-2.5 MULCH. Mulch when required for seeding shall be per section T-908 herein specified.

**901-2.6 SOIL FOR REPAIRS.** The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

#### CONSTRUCTION METHODS

**901-3.1 ADVANCE PREPARATION AND CLEANUP.** After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris which might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches as a result of grading operations and, if immediately prior to seeding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

However, when the area to be seeded is sparsely sodded, weedy, barren, and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches. Clods shall be broken, and the top 3 inches of soil shall be worked into a satisfactory seedbed by discing, or by the use of

cultipackers, rollers, drags, harrows, or other appropriate means.

**901-3.2 DRY APPLICATION METHOD.** This method of seeding may be used where the total project area to be seeded is less than, or equal to, 20,000 square feet (0.46 acres). On any project in which the total area to be seeded is greater than 20,000 square feet (0.46 acres) the "Wet Application Method" shall be used.

a. <u>Liming</u>. If required, lime, applied at the rate of 1,000 lbs/acre, shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds which have previously been prepared as described above. The lime shall then be worked into the top 3 inches of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.

b. <u>Fertilizing</u>. Following advance preparations and cleanup and liming, fertilizer shall be uniformly spread at a rate of 800 lbs/acre.

c. <u>Seeding</u>. Pure live grass seed shall be sown at the minimum rate of 125 pounds per acre immediately after fertilizing, and the fertilizer and seed shall be raked. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant.

d. <u>Rolling</u>. After the seed has been properly covered, the seedbed shall be immediately compacted by means of any approved lawnroller, weighing 40 to 65 pounds per foot of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot of width for sandy or light soils.

## 901-3.3 WET APPLICATION METHOD

a. <u>General</u>. The Contractor shall apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be the same as specified for "Dry Application Method".

b. <u>Spraying Equipment</u>. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 pounds per square inch. The pump shall be mounted in a line which will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8-inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distances varying from 20 feet to 100 feet. One shall be a close-range ribbon nozzle, and one a long-range jet nozzle. For ease of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

a. <u>Mixtures</u>. Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids

## T-901 SEEDING

shall be added to and mixed with each 100 gallons of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify to the Engineer all sources of water at least two weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source which is disapproved by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two hours from the time they were mixed or they shall be wasted and disposed of at locations acceptable to the Engineer.

b. <u>Spraying</u>. Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches, after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray which shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to insure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area. Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces which are to be mulched as indicated by the plans or designated by the Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

**901-3.4 MAINTENANCE OF SEEDED AREAS.** The Contractor shall be responsible for the germination of the seed and any erosion damage to the surface of the ground through the one year warranty period. Repairs shall be made by regrading, reseeding, and remulching as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

The Contractor shall not be responsible for damage to any seeded areas resulting from public traffic after final acceptance of the project.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. If at the time when the contract has been otherwise completed it is not possible to make an adequate determination of the color, density, and uniformity of such stand of grass, payment for the unaccepted portions of the areas seeded out of season will be withheld until such time as these requirements have been met.

### METHOD OF MEASUREMENT

**901-4.1** The quantity of seeding to be paid for shall be the number of units of 1,000 square feet, measured on the ground surface, completed and accepted.

# T-901 SEEDING

### BASIS OF PAYMENT

**901-5.1** The quantity, determined as provided above, will be paid for at the contract unit price per 1,000 square feet, or fraction thereof, for the pay item listed below, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item No. \_\_\_\_ T-901 Seeding -- per 1,000 square feet

### MATERIAL REQUIREMENTS

ASTM C 602	Agricultural Liming Materials
ASTM D 977	Emulsified Asphalt
FED SPEC A-A-1909	Fertilizer
FED SPEC A-A-2671	Seeds, Agriculture

## **T-905 TOPSOILING**

#### DESCRIPTION

**905-1.1** This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site, or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

#### MATERIALS

**905-2.1 TOPSOIL.** Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones, clay lumps, or similar objects. Brush and other vegetation which will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sods and herbaceous growth such as grass and weeds are not to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 5% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C 117. Topsoil shall be pulverized and screened.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

**905-2.2 INSPECTION AND TESTS.** Within 10 days following acceptance of the bid, the Engineer shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths for testing purposes as specified in 905-2.1.

#### CONSTRUCTION METHODS

**905-3.1 GENERAL.** Areas to be topsoiled shall be areas requiring seeding and borrow areas, if used. If topsoil is available on the site, the location areas to be stripped of topsoil, and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

**905-3.2 PREPARING THE GROUND SURFACE.** Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2 inches to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations, shall receive special scarification.

Grades on the area to be topsoiled shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and properly compacted condition to prevent, insofar as practical, the formation of low places or pockets where water will stand.

**905-3.3 OBTAINING TOPSOIL.** Prior to the stripping of topsoil from designated areas any vegetation, briars, stumps, large roots, rubbish, or stones found on such areas which may interfere with subsequent operations shall be removed using methods approved by the Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means,

# T-905 TOPSOILING

shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the Engineer. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoiling purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

**905-3.4 PLACING TOPSOIL.** The topsoil shall be evenly spread on the prepared areas to a uniform minimum depth of 2 inches after compaction, unless otherwise shown on the plans. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks, roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. After spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross sections. Any topsoil or other dirt falling upon pavements as a result of hauling of topsoil shall be promptly removed.

#### METHOD OF MEASUREMENT

905-4.1 The yardage of topsoil will not be considered as a quantity measured separately, but shall be a part of Item P-152, Unclassified Excavation.

#### BASIS OF PAYMENT

905-5.1 Payment will be made part of Item P-152 Unclassified Excavation.

#### **TESTING REQUIREMENTS**

ASTM C 117 Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing

## T-908 MULCH

#### DESCRIPTION

**908-1.1** This item shall consist of furnishing, hauling, placing, and securing mulch on all seeded surfaces indicated or designated by the Engineer.

#### MATERIALS

**908-2.1 MULCH MATERIAL.** Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Low grade, musty, spoiled, partially rotted hay, straw, or other materials unfit for animal consumption will be acceptable. Mulch materials which contain matured seed of species which would volunteer and be detrimental to the proposed over-seeding, or to surrounding farm land, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advanced stage of decomposition as to smother or retard the planted grass, will not be acceptable.

a. <u>Straw</u>. Straw shall be the threshed plant residue of oats, wheat, barley, rye, or rice from which grain has been removed.

b. <u>Excelsior Mulch</u>. Excelsior mulch shall consist of wood fibers cut from sound green timber. The average length of the fibers shall be 4 in. to 6 in. (100 mm to 150 mm). The cut shall be made in such a manner as to provide maximum strength of fiber, but at a slight angle to the natural grain of the wood so as to cause splintering of the fibers when weathering in order to provide adherence to each other and to the soil.

c. <u>Wood Cellulose Fiber</u>. Wood cellulose fiber mulch shall be made from wood chip particles manufactured particularly for discharging uniformly on the ground surface when disbursed by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend with grass seed, and fertilizer when permitted, to form a homogeneous slurry. The mulch fibers shall intertwine physically to form a strong moisture holding mat on the ground surface. The mulch shall be heat processed so as to contain no germination or growth inhibiting factors. It shall be non-toxic and colored green.

d. <u>Asphalt Binder</u>. Asphalt binder material shall conform to the requirements of AASHTO M 140, Type RS-1, as appropriate.

e. <u>Mulch Binder</u>. Mulch binder shall be a commercially produced mulch binder which is in accordance with all applicable State and Federal regulations. The product shall contain a coverage indicator to facilitate visual inspection for evenness of application. A change in the mulch binder may be requested by the Engineer at no additional cost.

f. Plastic Net. Plastic net shall consist of photodegradable, longchain synthetic polymer plastic yarn, either extruded oriented or woven into a net with the yarns fixed at each intersection such that they retain their relative positions with respect to each other. The plastic net shall have a square mesh opening of approximately 3/4 inch by 3/4 inch (19 mm by 19 mm). The plastic net shall have a minimum tensile strength of 20 lb (89 N) over a 3 in. (75 mm) width in the machine direction and 15 lb (67 N) over a 3 in. (75 mm) width in the transverse direction. The plastic net shall have a nominal mass of  $2.8 \pm 0.4$  lb per 1000 sq ft ( $15.6 \pm 2.2$  g per m<sup>2</sup>). The plastic net shall be furnished in rolls which can be easily handled and the rolls shall be packaged in a suitable protection for outdoor storage at a construction site, which protects the material from degradation prior to use. Roll sizes shall have a minimum width of 6 ft (1.8 m). Plastic net shall be accompanied by a manufacturer's certification that the material is in accordance with this specification.

#### g. Mulch Blankets.

1. <u>Excelsior Blanket</u>. Excelsior blanket shall consist of a machine produced mat of wood excelsior with 80% of the fibers to be 6 in. (150 mm) or longer. The wood from which the excelsior is cut shall be properly cured to achieve curled and barbed fibers. The blanket shall have a consistent thickness, with the fibers evenly distributed over the entire area of the blanket. The excelsior blanket shall be covered on the top side with a 3 in. by 1 in. (75 mm by 25 mm) leno weave, twisted kraft paper yarn netting having a high wet strength, or a biodegradable extruded plastic mesh netting having an approximate minimum

## T-908 MULCH

opening of 5/8 in. by 5/8 in. (16 mm by 16 mm) to an approximate maximum opening of 2 in. by 1 in. (50 mm by 25 mm). The netting shall be entwined with the excelsior mat for maximum strength and ease of handling. The minimum roll width shall be 4 ft (1.2 m). The mass of the material shall be not less then 0.7 lb/sq yd (0.4 kg/m2), constant mass, air dry. The rolls shall be packaged with suitable protection for outdoor storage on the project site in a manner which protects them from biodegradation prior to use.

2. <u>Paper Mat.</u> Paper mat shall consist of a knitted construction of photodegradable, polypropylene yarn with uniform openings interwoven with strips of biodegradable paper. The rolls shall be packaged with suitable protection for outdoor storage at the construction site in a manner which protects them from biodegradation prior to use. The mass of the paper shall be a minimum of 0.125 lb/sq yd (0.069 kg/m2). Roll sizes shall have a minimum width of 5 ft (1.5 m).

3. <u>Straw Mat.</u> Straw mat shall consist of a machine produced mat consisting of at least 90% of the total dry mass being clean straw from agricultural crops, with the exception that up to 30% of the dry mass may be coconut fibers in lieu of an equal percentage of straw. Paper or paper related products shall not be permitted as component in the straw mat. The straw shall be evenly distributed throughout the mat to form a thickness of  $\frac{1}{2}$  in.  $\frac{1}{8}$  in. (13 mm  $\frac{1}{-3}$  mm). The top side of the mat shall be covered with a photodegradable/biodegradable plastic mesh which shall be substantially adhered to the straw by a knitting process using photodegradable/biodegradable thread. The rolls shall be packaged with suitable protection for outdoor storage at the construction site in a manner which protects them from biodegradation prior to use. The average dry mass of the straw shall not be less than 0.7 lb/sq yd (0.4 kg/m2). The minimum roll width shall be 6 ft (1.8 m).

h. Staples for anchoring plastic net and blankets to the ground shall be biodegradable.

**908-2.2 INSPECTION.** Within five days after acceptance of the bid, the Engineer shall be notified of sources and quantities of mulch materials available and the Contractor shall furnish him with representative samples of the materials to be used. These samples may be used as standards with the approval of the Engineer, and any materials brought on the site which do not meet these standards shall be rejected.

### CONSTRUCTION METHODS

**908-3.1 MULCHING.** Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. The spreading of the mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

Mulch material shall be furnished, hauled, and evenly applied on the area shown on the plans or designated by the Engineer. Straw shall be spread over the surface to a uniform thickness at the rate of 2 to 3 tons per acre to provide a loose depth of not less than 1-1/2 inches nor more than 3 inches. Other organic material shall be spread at the rate directed by the Engineer. Mulch may be blown on the slopes, and the use of cutters in the equipment for this purpose will be permitted to the extent that at least 95% of the mulch in place on the slope shall be 6 inches or more in length. When mulches applied by the blowing method are cut, the loose depth in place shall be not less than 1 inch nor more than 2 inches.

**908-3.2 SECURING MULCH.** The mulch shall be held in place by light discing, spiking, biodegradable mesh, a very thin covering of topsoil, stakes, asphalt binder, or other adhesive material approved by the Engineer. Where mulches have been secured by either of the asphalt binder methods, it will not be permissible to walk on the slopes after the binder has been applied. The Contractor is warned that in the application of asphalt binder material, he must take every precaution to guard against damaging or disfiguring structures or property on or adjacent to the areas worked and that he will be held responsible for any such damage resulting from his operations. Within 50 feet of runways and taxiways or other Aircraft Operations Areas, mulch shall be secured with an approved method which will prevent mulch from being displaced by aircraft engine blast. Mulch shall be secured by one of the following methods, or as indicated on the plans.

a. <u>Asphalt Spray Method.</u> All mulched surfaces shall be sprayed with asphalt binder material so that the surface has a uniform appearance. The binder shall be uniformly applied to the mulch at the rate of approximately 8.0 gallons per 1,000 square feet, or as directed by the Engineer, with a minimum of 6.0 gallons and a maximum of 10 gallons per 1,000 square feet depending
## T-908 MULCH

on the type of mulch and the effectiveness of the binder securing it. Bituminous binder material may be sprayed on the mulched slope areas from either the top or the bottom of the slope. An approved spray nozzle shall be used. The nozzle shall be operated at a distance of not less than 4 feet from the surface of the mulch, and uniform distribution of the bituminous material shall be required. A pump or an air compressor of adequate capacity shall be used to insure uniform distribution of the bituminous material.

b. <u>Asphalt Mix Method</u>. The mulch shall be applied by blowing, and the asphalt binder material shall be sprayed into the mulch as it leaves the blower. The binder shall be uniformly applied to the mulch at the rate of approximately 8.0 gallons per 1,000 gallons and a maximum of 10 gallons per 1,000 square feet depending on the type of mulch and the effectiveness of the binder securing it.

c. <u>Mulch Binder Method.</u> A commercially produced mulch binder shall be applied per manufacturer's written instructions. A copy of the written instructions shall be supplied to the Engineer prior to the seeding work. If the mulch fails to stay in place, the Contractor shall repair all damaged areas at no additional cost to the Owner. A change in the mulch binder may be requested by the Engineer at no additional cost.

d. Peg and String Method. The mulch shall be held in place with binder twine fastened down with wooden pegs not less than 6 in. (150 mm) long spaced 4 ft (1.2 m) apart. The twine shall be placed parallel to and also at 60° with the pavement edge in both directions. The distance between the intersections of the diagonal strands measured along the strands shall be 12 ft (3.7 m). The strand parallel to the pavement shall cross the diagonal strands at their intersections to form equilateral triangles 12 ft (3.7 m) on a side.

e. Polymeric Plastic Net. The mulch shall be held in place with a polymeric plastic net. The plastic net shall be unrolled such that it lays out flat, evenly, and smoothly, without stretching the material. The plastic net shall be held in place by means of biodegradable staples. The staples shall be driven at a  $90^{\circ}$  angle to the plane of the soil slope. Staples shall be spaced not more than 4 ft (1.2 m) apart with rows alternately spaced. The plastic net shall be secured along the top and bottom of the soil slope with staples spaced not more than 1 ft (0.3 m) on center. The ends and edges of the plastic net shall be overlapped approximately 4 in. (100 mm) and stapled. Overlaps running parallel to the slope shall be stapled at least 3 ft (0.9 m) on center. The plastic net shall be placed with the length running from top of slope to toe of slope, or the plastic net shall be placed with the length running horizontally or parallel to the contour.

f. Mulch Blankets. Mulch blankets shall be laid on the seeded area so that they are in continuous contact with the soil with each up-slope or up-stream blanket overlapping the down-slope or down-stream blanket by at least eight inches, or follow manufacturer's recommendations. Tuck the uppermost edge of the upper blankets into a check slot (slit trench), backfill with soil and tamp down. In certain applications, the manufacturer may require additional check slots at specific locations down slope from the uppermost edge of the upper blankets. Anchor the blankets in place by driving staples, pins, or stakes through the blanket and into the underlying soil. Follow an anchoring pattern appropriate for the site conditions and as recommended by the manufacturer.

For placement in ditch line, the mat shall be unrolled parallel to the centerline of the ditch. Place the mat so that there are no longitudinal seams within 24 inches of the bottom centerline of the ditch. In ditch lines, place 6 staples at uniform spacing across the upstream end of each roll.

#### 908-3.3 CARE AND REPAIR.

a. After procedures for holding the mulch in place have been completed, mulch, other than when applied by a hydroseeder, shall be watered thoroughly. The seed and soil beneath it shall not be displaced. The mulching material shall be maintained in place satisfactorily until final completion and acceptance of the contract. When seeding is performed between June 1 and August 15, a second thorough watering shall be applied approximately 21 days after seeding.

b. The Contractor shall care for the mulched area until final acceptance of the project. Such care shall consist of providing protection against traffic or other use by placing warning signs, as approved by the Engineer, and erecting any barricades that may be shown on the plans before or immediately after mulching has been completed on the designated areas.

# T-908 MULCH

c. The Contractor shall be required to repair or replace any mulching that is defective or becomes damaged until the project is finally accepted. When, in the judgement of the Engineer, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the Contractor. However, once the Contractor has completed the mulching of any area in accordance with the provisions of the specifications and to the satisfaction of the Engineer, no additional work at his expense will be required, but subsequent repairs and replacements deemed necessary by the Engineer shall be made by the Contractor and will be paid for as additional or extra work.

#### METHOD OF MEASUREMENT

**908-4.1** Mulching will not be considered as a quantity measured separately, but shall be part of the quantities for measurement under T-901 Seeding.

#### BASIS OF PAYMENT

**908-5.1** Payment will be made part of T-901 Seeding.

#### MATERIAL REQUIREMENTS

ASTM D 977

Emulsified Asphalt

## END OF SECTION

#### DESCRIPTION

**110-1.1** This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete) installed in accordance with this specification at the locations and in accordance with the dimensions, designs, and details shown in the plans. This item shall include the installation of all underground electrical ducts or underground conduits. It shall also include all trenching, backfilling, removal, and restoration of any turfed and paved areas; concrete encasement, mandreling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables, in accordance with the plans and specifications and to the satisfaction of the Engineer. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

#### EQUIPMENT AND MATERIALS

#### 110-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor shall submit all shop drawings per the requirements in the general provisions. All submittals shall be tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**110-2.2 STEEL CONDUIT.** Rigid galvanized steel conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriter's Laboratories Standard 6, 514B, and 1242.

**110-2.3 PLASTIC CONDUIT.** Plastic conduit and fittings-shall conform to the requirements of Fed. Spec. W--C-1094, Underwriters Laboratories Standards UL-651 and Article 347 of the current National Electrical Code shall be one of the following, as shown on the plans:

- a. Type I–Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.
- b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

The type of adhesive shall be as recommended by the conduit/fitting manufacturer.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

**110-2.6 CONCRETE.** Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using #8 coarse. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A 615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

**110-2.7 FLOWABLE BACKFILL.** Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153 "Controlled Low Strength Material".

**110-2.8 DETECTABLE WARNING TAPE.** Plastic, detectable, color as noted magnetic tape shall be polyethylene film with a metallized foil core and shall be 4-6 inches (75-150 MM) wide. Detectable tape is incidental to the respective bid item.

#### CONSTRUCTION METHODS

**110-3.1 GENERAL.** The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated in the plans or specifications. Where no size is indicated in the plans or specifications, the ducts shall be not less than 2 inches inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches per 100 feet. On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or duct ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 inches below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches below the subgrade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An ironshod mandrel, not more than 1/4 inch smaller than the bore of the duct shall be pushed or pulled through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the duct hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc. interiors <u>IMMEDIATELY</u> prior to pulling cable. Once cleaned and swabbed the base cans, manhole, pull boxes, etc. and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc. is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminate from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet.

Unless otherwise shown on the plans, concrete encased duct banks shall be utilized when crossing under pavements expected to carry aircraft loads.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench. When rock is encountered, the rock shall be removed to a depth of at least 3 inches below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch sieve. Flowable backfill may alternatively be used The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under Item P-152.

Underground electrical warning (caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located six inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared in accordance with the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet.

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed in accordance with Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

All excavation shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, in accordance with Federal, State, and Local requirements is incidental to its respective pay item as a part of Item L-110. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-110 Item.

Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of off site.

Any excess excavation shall be filled with suitable material approved by the Engineer and compacted in accordance with item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall insure that these cable(s) are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

1. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred

2. Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 DUCT BANKS. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (45 cm) below the bottom of the base or stabilized base course layers where installed

under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (45 cm) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (90 cm) beyond the edges of the pavement or 3 feet (90 cm) beyond any underdrains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, proper provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. Where two or more conduits in the duct bank are intended to carry conductors of equivalent voltage insulation rating, the Contractor shall space the conduits not less than 1-1/2 inches (37 mm) apart (measured from outside wall to outside wall). Where two or more conduits in the duct bank are intended to carry conductors of differing voltage insulation rating, the Contractor shall space the conduits not less than 3 inches apart (measured from outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. End bells or couplings shall be installed flush with the concrete encasement at access points.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5 - foot intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5 foot (150 cm) intervals. All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 4-6 inch (75-150mm) wide tape 8 inches (200mm) minimum below grade above all underground conduit or duct lines not installed under pavement.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

**110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT.** Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide, and the trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits are at least 18 inches (45 cm) below the finished grade.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 2 inches (50 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench

without concrete encasement, they shall spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5 -foot intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

**110-3.4 MARKERS.** The Contractor shall install in-pavement brass markers at the edge of the pavement where duct banks or conduit exits under pavement area. The brass marker shall be 3 inches in diameter and 1/4 inch thick with a 3 inch #3 rebar used to install the marker in the pavement.

The marker shall indicate the number, size, and user of ducts installed beneath the marker. The marker shall also indicate the direction the duct bank or conduit runs. The marker shall indicate the depth of the duct bank or conduit if the duct bank or conduit is more than 36 inches below the top of pavement.

Markers outside the pavement area shall be marked by a concrete slab impressed with the work 'Duct' or 'Conduit' and conform to specification section L-108-3.4 Cable Markers.

The Contractor shall submit a sample engraved duct marker to the Engineer for approval prior to installation of marker.

**110-3.5 BACKFILLING FOR CONDUITS.** For conduits, 8 inches (200 cm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted in accordance with Item P-152 "Excavation and Embankment" except that material used for back fill shall be select material not larger than 4 inches in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface: except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of in accordance with instructions issued by the Engineer.

**110-3.6 BACKFILLING FOR DUCT BANKS.** After the concrete has cured, the remaining trench shall be backfilled and compacted in accordance with Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface: except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of in accordance with instructions issued by the Engineer.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

**110-3.7 RESTORATION**. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include the topsoiling, fertilizing, liming, sodding, seeding and/or mulching as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions and compaction shall meet the requirements of Item P-152. All restoration shall be considered incidental to the respective L-110 pay item.

#### METHOD OF MEASUREMENT

**110-4.1** Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated, resolution, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

#### BASIS OF PAYMENT

**110-5.1** Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

Payment will be made under:

Item No. \_\_\_\_ L-110 \_\_\_\_ inch (PVC, Steel) Conduit -- per lft (size)

Item No. \_\_\_\_L-110 \_\_\_\_ inch \_\_\_ Way Duct, Concrete Encased -- per lft (size) (no.)

Item No. \_\_\_\_L-110 \_\_\_\_ inch PVC Split Duct, Concrete Encased -- per lft (size)

#### MATERIAL REQUIREMENTS

Fed.Spec.W-C-1094	Conduit and Conduit Fittings; Plastic, Rigid (cancelled; replaced by UL 514 Boxes, Nonmetallic Outlet, Flush Device Boxes, & Covers, and UL 651 Standard for Conduit & Hope Conduit, Type EB & A Rigid PVC)
Underwriters Laboratories Standard 6	Rigid Metal Conduit
Underwriters Laboratories Standard 514B	Fittings for Cable and Conduit
Underwriters Laboratories Standard 1242	Intermediate Metal Conduit

Underwriters Laboratories Standard 651 Schedule 40 and 80 Rigid PVC Conduit (for Direct Burial)

Underwriters Laboratories Standard 651A Type EB and A Rigid PVC Conduit and HDPE Conduit (for concrete encasement)

# END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

#### DESCRIPTION

**115-1.1** This item shall consist of electrical manholes and junction structures (handholes, pullboxes, junction cans, etc.) installed in accordance with this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

#### EQUIPMENT AND MATERIALS

#### 115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor shall submit all shop drawings per the requirements in the general provisions. All submittals shall be tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**115-2.2 CONCRETE STRUCTURES.** Cast-in-place concrete structures shall conform to the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand the criteria shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review in accordance with the process defined in the General Provisions.

**115-2.3 JUNCTION CANS.** Junction Cans shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) cans encased in concrete. The cans shall have a galvanized steel blank cover, gasket, and stainless steel hardware. Covers shall be 3/8" thickness for L-867 and 3/4" thickness for L-868.

**115-2.4 MORTAR.** The mortar shall be composed of one part of portland cement and two parts of mortar sand, by volume. The portland cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15 percent of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C 6. The water shall be clean and free of deleterious amounts of acid, alkalies or organic material. If the water is of questionable quality, it shall be tested in accordance with AASHTO T-26.

**115-2.5 CONCRETE.** All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

- a. Gray iron castings shall meet the requirements of ASTM A 48.
- b. Malleable iron castings shall meet the requirements of ASTM A 47.
- c. Steel castings shall meet the requirements of ASTM A 27.
- d. Structural steel for frames shall conform to the requirements of ASTM A-283, Grade D.
- e. Ductile iron castings shall conform to the requirements of ASTM A 536.
- f. Austempered ductile iron castings shall conform to the requirements of ASTM A 897.

All castings specified shall be as specified in the plans.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A 123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

**115-2.7 LADDERS.** Ladders, if specified, shall be galvanized steel or as shown on the plans.

**115-2.8 REINFORCING STEEL.** All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A 615, Grade 60.

115-2.9 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

**115-2.10 FLOWABLE BACKFILL.** Flowable material used to backfill shall conform to the requirements of Item P-153 "Controlled Low Strength Material".

**115-2.11 CABLE TRAYS.** Cable trays shall be of galvanized steel, plastic, or aluminum. Cable trays shall be located as shown on the plans.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

**115-2.12 PLASTIC CONDUIT.** Plastic conduit shall comply with Item L-110 - Airport Underground Electrical Duct Banks and Conduits.

**115-2.13 CONDUIT TERMINATORS.** Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

**115-2.14 PULLING-IN IRONS.** Pulling-in irons shall be manufactured with 7/8-inch (22mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2-inch diameter with an ultimate strength of 270,000 psi). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

**115-2.15 GROUND RODS.** Ground rods shall be one piece, copper clad. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8-feet (240 cm) long nor less than 5/8 inch (15 mm) in diameter.

#### CONSTRUCTION METHODS

**115-3.1 UNCLASSIFIED EXCAVATION.** It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, in accordance with Federal, State, and Local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements

specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

**115-3.3 PRECAST UNIT INSTALLATIONS.** Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

**115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS.** All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

**115-3.5 INSTALLATION OF LADDERS.** Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.

**115-3.6 REMOVAL OF SHEETING AND BRACING.** In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than six (6) inches of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

**115-3.7 BACKFILLING.** After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

**115-3.8 CONNECTION OF DUCT BANKS.** To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

**115-3.9 GROUNDING.** A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (154 mm) above the floor. The ground rod shall be installed within 1 foot of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4-inch diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of 1 foot above the floor of the structure and separate from other cables. No. 2 AWG bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. Hardware connections may be mechanical, using a lug designed for that purpose.

**115-3.10 CLEANUP AND REPAIR.** After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound conforming MIL-P-21035. Surfaces shall be prepared and compound applied in accordance with manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

**115-3.11 RESTORATION.** After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

**115-3.12 INSPECTION.** Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested utilizing the fall-of-potential ground impedance test as described by ANSI IEEE Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

**115-3.13 MANHOLE ELEVATION ADJUSTMENTS.** The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

**115-3.14 DUCT EXTENSION TO EXISTING DUCTS.** Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard

manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

#### METHOD OF MEASUREMENT

**115-4.1** Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit.

- All Required Excavation, Dewatering
- Sheeting and Bracing
- All Required Backfilling with On-Site Materials
- Restoration of All Surfaces and Finished Grading, Sodding
- All Required Connections
- Dewatering If Required
- Temporary Cables and Connections
- Ground Rod Testing

**115-4.2 Manhole elevation adjustments** shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

#### BASIS OF PAYMENT

**115-5.1** The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

**115-5.2** Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the Engineer.

Payment will be made under:

Item No	L-115	Electrical Manhole [size and type] -Per Each
Item No	L-115	Electrical Junction Structure [size and type] -Per Each
Item No	L-115	Existing Electrical Manhole/Junction Structure Elevation Adjustment [size and type] – Per Each

#### MATERIAL REQUIREMENTS

ANSI/IEEE Std 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System	
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits	
AC 150/5345-26	Specification for L-823 Plug and Receptacle Cable Connectors	
FED SPEC J-C-30	Cable and Wire, Electrical Power, Fixed Installation (cancelled; replaced by AA-59544 Cable and Wire, Electrical (Power, Fixed Installation))	
ASTM B.3	Soft or Annealed Copper Wire	
ASTM B.8	Concentric-Lay-Stranded Copper Conductor, Hard, Medium-Hard, or Soft	

# END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

# SPECIAL TECHNICAL PROVISIONS

## SPECIAL TECHNICAL PROVISIONS INDIANAPOLIS INTERNATIONAL AIRPORT STORMWATER AND DEICING CAPACITY PROJECTS Project No. I-17-077

## TABLE OF CONTENTS

<u>NO.</u>	SECTION	PAGES
	<u>Division 1 – General Requirements</u>	
01090	Reference Standards	01090-1 - 01090-3
01650	Starting of Systems	01650-1 - 01650-3
	Division 2 – Site Work	
02050	Demolition	02050-1-02050-2
02102	Material Handling and Spill Prevention Plan	02102-1-02102-8
02111	Recording of Construction Areas	02111-1-02111-4
02140	Dewatering	02140-1 - 02140-6
02200	Earthwork	02200-1 - 02200-8
02220	Trenching, Backfilling, and Compaction for Utilities	02220-1-02220-8
02224	Trenchless Excavation – Horizontal Borings	02224 - 1 - 02224 - 5
02226	Trenchless Excavation – Directional Drilling	02226-1 - 02226-6
02275	Geocomposite Drainage Layer	02275 - 1 - 02275 - 6
02350	Micropiles	02350-1 - 02350-12
02351	Rammed Aggregate Piers	02351 - 1 - 02351 - 10
02503	Prestressed Concrete Cylinder Pipe and Fittings	02503-1-02503-11
02535	Pavement Repair and Resurfacing	02535-1-02535-6
02583	Pavement Marking	02583 - 1 - 02583 - 2
02671	Monitoring Wells	02671 - 1 - 02671 - 4
02720	Storm Sewer Systems	02720-1 - 02720-6
02725	Centrifugally Cast Fiberglass Reinforced Polymer Mortar	
	Pipe (CCFRPM)	02725-1-02725-5
02729	Gravity Sanitary Sewer Systems	02729-1 - 02729-8
02730	Force Main Sewer Systems	02730-1 - 02730-6
02731	Cured-in-Place Pipe for Mainline Renewal	02731-1-02731-9
02732	Sewer Cleaning and Televising	02732-1-02732-6
02733	Sanitary Sewer and Force Main Testing	02733-1-02733-4
02734	Bypass Pumping	02734-1-02734-2
02776	Reinforced Polypropylene (RPP) Liner	02776-1 - 02776-10
02777	Geopolymer Lining System	02777 - 1 - 02777 - 23

#### STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

SPECIAL TECHNICAL PROVISIONS

<u>NO.</u>	SECTION	PAGES
	Division 3 - Concrete	
03100	Concrete Formwork	03100-1 - 03100-5
03200	Concrete Reinforcement	03200-1 - 03200-5
03300	Cast-In-Place Concrete	03300-1 - 03300-21
03310	Site Work Concrete	03310-1-03310-6
03381	Unbonded Post-Tensioned Concrete	03381-1-03381-10
03410	Precast Structural Concrete	03410-1 - 03410-19
	<b>Division 5 - Metals</b>	
05120	Structural Steel	05120-1 - 05120-6
05500	Metal Fabricators	05500-1-05500-9
05511	Metal Stairs	05511-1 -05511-7
05531	Bar Gratings	05531-1-05531-8
05532	Aluminum Hatches	05532-1-05532-6
	<b>Division 7 – Thermal and Moisture Protection</b>	
07161	Crystalline Waterproofing	07161-1-07161-3
07900	Joint Sealers	07900-1 - 07900-12
	<u>Division 11 – Equipment</u>	
11285	Slide Gates	11285-1 - 11285-8
11303	Stormwater Treatment Device	11303-1 - 11303-5
	<u>Division 15 – Mechanical</u>	
15010	General Provisions	15010-1 - 15010-3
15060	Process and Yard Piping	15060-1 - 15060-13
15080	Valves	15080-1 - 15080-11

-END-

SPECIAL TECHNICAL PROVISIONS

# **DIVISION 1 – GENERAL REQUIREMENTS**

# SECTION 01090 - REFERENCE STANDARDS

## PART 1 - GENERAL

## 1.01 Summary

- A. Section Includes
  - 1. General reference standards, rules and regulations that govern construction work, alterations, repairs, mechanical installations and appliances connected therewith
  - 2. Abbreviations used in these Specifications
- 1.02 Quality Control
  - A. Regulatory Requirements: Work shall comply with the following:
    - 1. Occupational Safety and Health Act
    - 2. Indiana State Construction Industry Safety Code
    - 3. State Building rules and regulations of the Indiana Department of Homeland Security Fire and Building Safety Division
    - 4. Indiana State Fire Marshal
    - 5. Indiana Department of Environmental Management
    - 6. Indiana Department of Natural Resources
    - 7. Army Corps of Engineers
    - 8. National Electric Code
    - 9. National Electric Safety Code
    - 10. Uniform Building Code
    - 11. Life Safety Code
    - 12. Utility regulations
    - 13. Local ordinances, state, and federal rules and regulations pertaining to the Work
  - B. Such rules, regulations and ordinances are to be considered part of these Specifications.
  - C. Fees for licenses shall be paid by the Contractor.

## 1.03 Reference Abbreviations

- A. Reference to a technical society, trade association or standards setting organization may be made in the Specifications by abbreviations in accordance with the following list:
  - AABC Associated Air Balance Council
  - AAR Association of American Railroads

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 REFERENCE STANDARDS

AAMA American Architectural Manufacturers Association AASHTO American Association of State Highway and Transportation Officials AATCC American Association of Textile Chemists and Colorists ACI American Concrete Institute ADC Air Diffusion Council AFBMA Anti-Friction Bearing Manufacturers Association A-E Architect/Engineer American Gas Association AGA Association of Home Appliance Manufacturers AHAM AIA American Institute of Architects American Institute of Steel Construction AISC AISI American Iron and Steel Institute AMCA Air Movement and Control Association International, Inc. ANSI American National Standards Institute APA The Engineered Wood Association ARI American Refrigeration Institute American Society of Civil Engineers ASCE ASLA American Society of Landscape Architects American Society of Mechanical Engineers ASME ASSE American Society of Safety Engineers ASTM American Society for Testing and Materials Architectural Woodwork Institute AW/I AWPA American Wood Protection Association AWS American Welding Society American Water Works Association AWWA BHMA **Builders Hardware Manufacturers Association** BIA **Brick Industry Association** Council of American Building Officials CABO Compressed Air and Gas Institute CAGL Cast Iron Soil Pipe Institute CISPI CTI **Cooling Tower Institute** DHI Door and Hardware Institute DOH Department of Health Department of Transportation DOT Federal Specifications FS FHWA Federal Highway Administration, Department of Transportation Associated Factory Mutual Laboratories FM Glass Association of North America GANA **HPVA** Hardwood Plywood and Veneer Association Insulated Cable Engineers Association ICEA Indiana Department of Environmental Management IDEM IEEE Institute of Electrical and Electronics Engineers Industrial Fasteners Institute IFI IGCC Insulating Glass Certification Council Indiana Department of Transportation INDOT IPCEA Insulated Power Cable Engineers Association **ISPC** Indiana State Plumbing Code Military Specifications MIL Manufacturer's Standardization Society MSS

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 REFERENCE STANDARDS

NAAMM National Association of Architectural Metal Manufacturers NACM National Association of Chain Manufacturers North American Insulation Manufacturers Association NAIMA NAVFAC U.S. Naval Facilities Engineering Command NEBB National Environmental Balancing Bureau NEC National Electrical Code NEMA National Electrical Manufacturers Association InterNational Electrical Testing Association NETA NFPA National Fire Protection Association National Forest Products Association NFPA NIST National Institute of Standards and Technology NSF National Sanitation Foundation OSHA Occupational Safety and Health Administration Precast Prestressed Concrete Institute PCI PDI Plumbing and Drainage Institute **Pipe Fabricators Institute** PFI Society of Automotive Engineers SAE SPECS Specifications SMACNA Sheet Metal and Air Conditioning Contractors' National Association SPI Society of the Plastics Industry SSPC The Society for Protective Coatings STI Steel Tank Institute TCNA Tile Council of North America Underwriter's Laboratories, Inc. UL USBR **US Bureau of Reclamation** WWPA Western Wood Products Association

# PART 2 - PRODUCTS

Not Used.

# PART 3 - EXECUTION

Not Used.

-END-

REFERENCE STANDARDS

# SECTION 01650 - STARTING OF SYSTEMS

PART 1 - GENERAL

## 1.01 Summary

- A. Section Includes:
  - 1. Starting of equipment and systems
  - 2. Demonstration, training and instructions
  - 3. Acceptance of Equipment

## 1.02 Submittals

- A. Submit O&M Manuals to the Engineer for review prior to system start up for each respective system or piece of equipment.
- B. Provide an abstract or outline of the start-up, testing and training procedures to the Engineer at least five (5) days prior to the scheduled start-up.
- C. Following start-up, a typed, bound Start-Up Certification Report covering the manufacturer's representative's findings shall be submitted to the Engineer for review and approval. The report shall certify that the equipment is properly installed and functioning for the purpose intended. The report shall include the following:
  - 1. Type of inspections performed;
  - 2. A description of the start-up procedures taken;
  - 3. Detailed description of any deficiencies observed along with the corrective measures taken;
  - 4. The results of all field tests, including necessary graphs, charts, tables, etc., specified in the detailed Specification or required by the referenced standards.

## PART 2 - PRODUCTS

Not Used.

## PART 3 - EXECUTION

- 3.01 Examination
  - A. Verification of Conditions
    - 1. Verify that each piece of equipment for system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
    - 2. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 STARTING OF SYSTEMS

- 3. Verify that wiring and support components for equipment are complete and tested.
- 3.02 Preparation
  - A. Coordinate schedule for start-up of various equipment and systems.
  - B. Notify Engineer seven days prior to start-up of each item. Coordinate system or equipment start-up with Owner and Engineer.
- 3.03 Field Quality Control
  - A. Manufacturers Field Service
    - 1. Execute start-up under supervision of applicable manufacturer's representative and Contractor's personnel and in accordance with manufacturer's instructions. When indicated in individual Specification sections, require manufacturer to provide an authorized representative to be present at the site.
    - 2. Manufacturer's services shall be furnished at the Contractor's expense.
    - 3. The services provided shall be by a qualified representative for the specified period of time and for the specified number of trips. A working day is defined as a normal 8-hour working day on the job and does not include travel time.
    - 4. Manufacturer's services shall include:
      - a. Inspect the complete installation of the equipment.
      - b. Place the equipment in operation and make any necessary adjustments.
      - c. Perform tests specified in the detailed Specification and as recommended by the equipment manufacturer.
      - d. Instruct Owner's personnel in the proper operation and maintenance of the equipment (training).
    - 5. The purpose of these services is to demonstrate to the Owner's and Engineer's complete satisfaction that the equipment has been properly installed and will satisfactorily perform the functions for which it is intended.
  - B. If equipment or systems are not completed for proper start-up and training procedures, the representative shall schedule another visit at no additional cost to the Owner. The Contractor shall bear all expenses associated with the start-up, testing and training procedures, and required reporting, including labor, transportation, lodging and material costs.
- 3.04 Demonstration, Training and Instructions
  - A. Training will not be permitted without prior start-up and operation of the equipment. Training shall be performed separate and distinct from start-up and testing tasks. Manufacturer's O&M Manuals and materials shall be incorporated in the training procedures, with emphasis on items or materials of greatest importance.
  - B. Demonstrate project equipment and instruct in a classroom environment located at the plant site. Instruction shall be by a manufacturer's representative who is knowledgeable about the equipment and its application to the project.

- C. Utilize O&M Manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- D. Demonstrate start-up, operation, control, adjustments, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time at equipment location.
- E. Prepare and insert additional data in O&M Manuals when need for additional data becomes apparent during instruction.
- F. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.
- G. Provide demonstration such that the Owner may video the training if so desired.

## 3.05 Acceptance of Equipment

- A. Acceptance of equipment shall be defined as that point in time when the following requirements have been fulfilled and the equipment is placed in operation:
  - 1. All required submittals and documentation have been submitted and are acceptable to the Engineer.
  - 2. All start-up and training procedures have been satisfactorily performed and the Start-Up Certification Report has been submitted, and is acceptable, to the Engineer.
  - 3. All equipment O&M Manuals and materials have been submitted and are acceptable to the Engineer.
  - 4. All spare parts have been provided to the Owner.
- B. The manufacturer's and Contractor's warranty for each item of equipment shall not begin until the equipment is placed into permanent operation, as determined by the Date of Acceptance established for each piece of equipment.

-END-

# **DIVISION 2 – SITE WORK**

# SECTION 02050 - DEMOLITION

## PART 1 - GENERAL

## 1.01 Summary

- A. The work of this section shall include all demolition required.
- B. The work generally includes, but is not limited to demolition, wholly or in part, and disposal of structures, concrete walls, basin lining systems, buildings, equipment, materials, piping, pavement, fences, guard-rails, and related items as necessary to complete the Work shown or specified.

## 1.02 Related Sections

A. Section 02200 - Earthwork

## PART 2 - PRODUCTS

Not Used.

## PART 3 - EXECUTION

## 3.01 Concrete Removal

- A. Concrete shall be removed to the next adjacent joint whenever possible.
- B. All concrete to be removed shall be sawed at all locations where it is adjacent to existing concrete and cannot be removed to a straight line.
- C. When removing concrete adjacent to buildings, care shall be taken to not damage the building. Any damage incurred to the building shall be repaired by the Contractor with no additional compensation. It is the Contractor's responsibility to determine the best way to remove concrete at buildings. If the existing sidewalk is an integral part of the building, the Contractor shall save the pavement as close to the building as possible, at the direction of the Engineer.
- 3.02 Pavement, Sidewalks, Curbs, and Gutters
  - A. Completely remove pavement, sidewalk, curbs, and gutters which are designated to be removed.
  - B. Use methods to remove pavement, sidewalks, curbs, and gutters that will assure breaks in pavement, sidewalks, curbs, and gutters not removed are along straight

DEMOLITION

lines. The faces of the remaining pavement, sidewalk, curb, and gutter faces shall be approximately vertical

- 3.03 Inlets & Manholes
  - A. Where inlets and manholes are removed, the void shall be backfilled with granular backfill in accordance with Section 02200.
- 3.04 Equipment Removal
  - A. Contractor shall coordinate all work with Owner's Representative to assure a minimum of interruptions with ongoing operations.
  - B. Removed equipment and materials shall first be offered to the Owner for salvage and stored as directed by the Owner. Equipment and materials that Owner does not claim for salvage shall become the property of the Contractor, and Contractor shall immediately remove from the site and dispose of in accordance with all local, state, and federal rules, regulations, and ordinances.
  - C. All removals and demolition shall be completed to the approval of the Owner and the Engineer.
- 3.05 Disposal
  - A. The Contractor shall remove all materials from the site on a daily basis.
  - B. All material shall be disposed of in accordance with local and state regulations. The contractor shall obtain any permits necessary to dispose of materials.
  - C. Inlet castings and grates which are not broken shall be set aside for pick up by the Owner. If the Owner does not claim the inlet castings and grates they shall become the property of the Contractor, and the Contractor shall immediately remove them from the site. All broken inlets and grates are to be disposed of as described in Paragraph B.
  - D. Demolition materials onsite that are exposed to rain and weather shall be protected and contained. The contractor is solely responsible for the release of any oils, chemicals, or other materials that may cause adverse effects to the environment within the project area or adjacent properties.

-END-

# SECTION 02102 – MATERIAL HANDLING AND SPILL PREVENTION PLAN

## PART 1 - GENERAL

## 1.01 Summary

- A. Section includes a plan outlining procedures to:
  - 1. Help protect the health and safety of those working at the project site as well as the environment
  - 2. Prevent the contamination of stormwater runoff by onsite pollutants
  - 3. Help prevent fuel and chemical spills
  - 4. Provide a response procedure should a spill occur
- B. Related Sections
  - 1. Section 02140 Dewatering

## 1.02 References

- A. 327 IAC 2-6.1 Spills; Reporting, Containment, and Response
- B. 327 IAC 2-10 Secondary Containment of Aboveground Storage Tanks Containing Hazardous Materials
- 1.03 Definitions
  - A. Minor Spill: Approximately 10 gallons or less of pollutant with no contamination of ground or surface waters. Minor spills can generally be controlled by the first responder with help from other site personnel.
  - B. Major or Hazardous Spill: More than 10 gallons with the potential for death, injury, or illness to humans or animals or has the potential for surface or groundwater pollution.
  - C. Pollutants generated onsite may include gasoline, diesel fuel, oils, grease, paints, pesticides, nutrients, concrete washout, soil, solvents, paper, plastic, Styrofoam, metals, glass, and other forms of liquid or solid wastes.

## 1.04 Quality Control

- A. Regulatory Requirements
  - 1. Ensure material handling and storage associated with construction activity complies with the spill prevention and spill response requirements in Indiana Administrative Code 327 IAC 2-6.1.
  - 2. Ensure aboveground storage tanks containing hazardous materials are stored appropriately according to the requirements in Indiana Administrative Code 327 IAC 2-10.

- 3. Dispose of contaminated soils, absorbents and spill cleanup materials in accordance with all Federal, State, and local regulations.
- 4. Do not use water to flush spilled material unless authorized by a Federal, State, or local agency.
- 5. Additional regulation or requirements may be required. Consult a spill response professional to ensure all appropriate and required steps have been taken.
- 6. Do not remove contaminated material from the site until approval is given by Emergency Response (when emergency response is required).

# PART 2 - PRODUCTS

Not Used.

# PART 3 - EXECUTION

## 3.01 Preparedness

- A. Prepare a contact list of First Responders and the chain of command in the event of a spill on the site. Include names, contact numbers and information on circumstances requiring the initiation of the contact list and chain of command.
- B. Maintain a list of qualified contractors, vacuum trucks, tank pumpers, and other equipment and businesses qualified to perform cleanup operations.
- C. Provide a list and quantity of absorbent materials and supplies the Contractor will make available onsite in sufficient quantities to address minor spills.
- D. Train construction personnel, equipment operators, subcontractors and other employees on proper fueling procedures, prevention of spills, spill response procedures, and communication procedures.

# 3.02 Spill Response

## A. Minor Spills

- 1. Contain the spill to prevent material from entering the waterways and the storm or groundwater systems. Immediately clean up the spill with absorbent materials.
- 2. Do not flush with water, bury or allow soaking in to the ground.
- 3. Tarps can be used to cover spilled material during rain events on land.
- 4. Use absorbent material to cleanup spills on land.
  - a. Contain spills on impervious surfaces with a dry absorbent.
  - b. Contain spills on clayey soils by constructing an earthen dike and dispose of as soon as possible to prevent migration deeper into the soil and groundwater. Remove contaminated soils.

- 5. Use containment booms to prevent the migration of spills on water.
  - a. Contain spills on water with a containment boom and absorb with an oilonly boom, mechanical skimmer or other similar device.
  - b. Outside agencies will determine additional cleanup measures.
  - c. Report oil spills that cause a sheen upon the waters to local and State authorities.
- 6. Place contaminated absorbents and soils into a container for later disposal. Ensure the lid is closed and mark or label the container for identification purposes.
- 7. Contact 911 if the spill could be a safety issue.
- 8. Contact Owner, supervisors and designated inspectors immediately.
- 9. Dispose of waste appropriately.
- B. Major or Hazardous Spills
  - 1. Control or contain the spill without risking bodily harm.
  - 2. Temporarily plug or cover storm drains if possible to prevent migration of the spill into the stormwater system.
  - 3. Use containment booms to prevent the migration of spills on water.
    - a. Contain spills on water with a containment boom and absorb with an oilonly boom, mechanical skimmer or other similar device.
    - b. Outside agencies will determine additional cleanup measures.
    - c. Report oil spills that cause a sheen upon the waters.
  - 4. Immediately contact the local Fire Department at 911 to report any hazardous material spill.
  - 5. Contact Owner, supervisors and designated inspectors immediately. Contact county or municipal officials responsible for stormwater facilities. The Contractor is responsible for having these contact numbers available at the job site. Submit a written report to the Owner as soon as possible.
  - Contact the Indiana Department of Environmental Management (IDEM), Office of Emergency Response as soon as possible, but within 2 hours of discovery at 1-888-233-7745. Note the following information for future reports to the IDEM or the National Response Center (1-800-424-8802):
    - a. Name, address and phone number of person making the spill report
    - b. The location of the spill
    - c. The date and time of the spill
    - d. Identification of the spilled substance
    - e. Cause of the spill
    - f. Approximate quantity of the substance that has been spilled or may be further spilled and the amount recovered
    - g. The duration and source of the spill
    - h. Name and location of the damaged waters
    - i. Name of spill response organization
    - j. Measures taken in the spill response
    - k. Other pertinent information

## 3.03 Spill Prevention and Material Handling Practices

- A. Vehicle and Equipment Fueling
  - 1. Purpose: To prevent fuel spills and leaks and to reduce or eliminate contamination of stormwater and waterways.
  - 2. Implementation
    - a. Use offsite commercial fueling stations when possible. Use onsite vehicle and equipment fueling only where it is impractical to send vehicles and equipment offsite to a commercial fueling station.
    - b. When performing fueling onsite provide a designated fueling area.
    - c. Do not "top-off" fuel tanks.
    - d. Keep available absorbent spill cleanup materials and spill kits in fueling areas and on fueling trucks.
    - e. Use drip pans or absorbent pads during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
    - f. Inspect vehicles and equipment daily for leaks. Repair leaks immediately or remove them from the project site.
    - g. Protect dedicated fueling areas from stormwater run-on and runoff, and locate them at least 50 feet away from the downstream drainage facilities, stormwater conveyances or waterways.
    - h. Perform fueling on level-grade areas.
    - i. Protect fueling areas with berms and dikes to contain spills.
    - j. Equip nozzles used in vehicle and equipment fueling with an automatic shut off.
    - k. Do not leave fueling operations unattended.
    - I. Avoid mobile refueling of construction equipment; rather transport the equipment to the designated fueling area.
    - m. Store all petroleum products in tightly sealed containers which are clearly labeled.
    - n. Observe Federal, State, and local regulations for any stationary above ground storage tank.
- B. Vehicle Maintenance Areas
  - 1. Purpose: To prevent spills during the normal maintenance of construction machinery.
  - 2. Implementation:
    - a. As feasible, perform maintenance offsite in a covered facility with an impervious floor.
    - b. Use a dedicated site for machinery maintenance.
    - c. Locate maintenance areas at least 50 feet from stormwater inlets or water bodies.
    - d. Maintain spill kits and absorbent materials next to maintenance areas. Utilize drip pans and absorbent pads to prevent oils or other maintenance fluids from reaching the soil surfaces.
    - e. Inspect equipment daily for leaks or worn hoses. Repair or replace as needed to prevent onsite spills.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 MATERIAL HANDLING AND SPILL PREVENTION PLAN
- f. Properly dispose of all spilled fluids and fluids removed from machinery.
- C. Solid Waste Management
  - 1. Purpose: To prevent or reduce the discharge of pollutants to waterways or stormwater from construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.
  - 2. Suitable Applications: Suitable for construction sites where the following wastes are generated or stored:
    - a. Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
    - b. Packaging materials including wood, paper and plastic
    - c. Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
    - d. Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
    - e. Construction waste including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, Styrofoam, plastic and other packaging for construction materials
    - f. Sediments and other materials collected in erosion and sediment control measures (silt fence, inlet protection, catch basin sumps, etc.)
    - g. Natural debris such as excess soil, stone, sand, leaves, branches, brush or wood
  - 3. Implementation:
    - a. Develop a plan for proper waste disposal including excess soil and excavated material. Refer to the Storm Water Pollution Prevention Plan for soil stockpile management.
    - b. Select designated waste collection areas onsite.
    - c. Inform trash-hauling contractors that only watertight dumpsters are acceptable for onsite use.
    - d. Inspect dumpsters for leaks, and repair dumpsters that are not watertight.
    - e. Provide an adequate number of containers with lids or covers to prevent loss of wastes from wind and to prevent the collection of rainwater.
    - f. Collect site trash daily or more frequent if needed during demolition work. Do not allow containers to overflow. Clean up immediately if a container spills, leaks or overflows.
    - g. Remove solid waste promptly from erosion and sediment control devices.
    - h. Ensure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acid, pesticides, additives, curing compounds) are not disposed of in dumpsters designed for construction debris.
    - i. Do not hose out dumpsters on the construction site.
    - j. Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas. Do not locate solid waste storage areas in areas prone to flooding or ponding.
    - k. Locate solid waste dumpsters a minimum of 50 feet away from waterways, stormwater inlets or other drainage facilities.
    - I. Minimize the potential for spills or leaks to drain immediately into a waterway or drainage facility.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 MATERIAL HANDLING AND SPILL PREVENTION PLAN

- m. Do not bury construction waste onsite.
- n. Cover construction material hauled from the site in dump trucks with a tarpaulin.
- o. Inspect construction waste areas regularly.
- D. Fluids, Paints, Solvents and Other Chemicals Storage and Use
  - 1. Purpose: To prevent spills during the use and storage of the materials.
  - 2. Implementation
    - a. Store materials in manufacturer's containers.
    - b. Maintain Material Safety Data Sheets (MSDS) or Safety Data Sheets (SDS) on all products.
    - c. Store materials in a weather proof/vandal resistant locker or building.
    - d. Keep materials away from flammable sources.
    - e. Follow manufacturer's instructions for the proper use and storage of all materials.
    - f. Do not perform washout of solvent from paint supplies near or into a waterway or stormwater inlet. Wash water is to be disposed of as wastewater.
    - g. Tightly seal and store paint containers and curing compounds when not required for use.
    - h. Do not discharge excess paint to a waterway or storm system. Properly dispose of excess paint according to the manufacturer's instructions and in accordance with all Federal, State, and local regulations.
- E. Secondary Containment
  - 1. Provide secondary containment for aboveground storage tanks or storage areas containing hazardous materials that are located outside.
  - 2. Provide secondary containment consistent with good engineering standards.
  - 3. Provide secondary containment that is compatible with the hazardous materials being stored.
  - 4. Provide secondary containment that will prevent a release from entering waters.
  - 5. Secondary containment must meet one of the following:
    - a. Double-walled tank,
    - b. Dikes, berms, retaining walls, trenches, or
    - c. Diversionary system
  - 6. Provide secondary containment with a capacity to contain at least 110% of the volume of the largest aboveground tank or the volume of the largest aboveground tank plus enough freeboard to contain precipitation generated by a 25 year/24 hour rain event.
  - 7. Provide secondary containment with a minimum 120-gallon capacity for storage area holding two or more drums.
  - 8. Maintain the secondary containment to protect the integrity and capacity of the area.
  - Remove collected liquid in the secondary containment area within 72 hours of its discovery to maintain the capacity. Remove ice as soon as weather permits. Liquid that collects within the secondary containment area must meet all

applicable requirements of the Water Quality Standards if discharged to waters of the state.

- F. Disposal of Sediment-Laden Water
  - 1. Purpose: To prevent the purposeful discharge of sediment-laden water from the project site.
  - 2. Implementation:
    - a. Do not discharge sediment-laden water from pumping operations into or near stormwater conveyances, wetlands, rivers, streams, waterways and impoundments or into natural or manmade channels leading thereto.
    - b. Discharge sediment-laden water from dewatering of trenches, or other excavations by means of a pump or similar means into a manufactured pumping bag for filtering in accordance with the manufacturer's recommendations unless the pumped water is routed through another erosion control measure such as a sediment trap to outlet onto a wellestablished vegetated area without eroding where settling or filtering will occur.
    - c. Pumping operations moving clean water through a site are not required to have a pumping bag or similar device at the outlet.
    - d. Protect the point of discharge to prevent soil erosion.
    - e. Follow Specification 02140 for dewatering requirements.
- G. Concrete Washout Area
  - 1. Provide a designated concrete washout area for use of washing out concrete trucks, chutes, containers, or tool in order to contain potential stormwater pollutants. Use one of the following methods:
    - a. Construct a minimum 10-foot by 10-foot by 3-foot deep area (or larger as required to contain liquid and solid waste from concrete washout operations) with a polyethylene lining. Construct and prepare the base of the system so that it is free of rocks and other debris that may cause tears or punctures in the polyethylene lining.
    - b. Install and maintain a pre-fabricated containment system in accordance with the manufacturer's instructions.
    - c. Use a polyethylene-lined roll-off dumpster when other methods are not practicable.
    - d. Subcontract with a concrete supplier that collects all washout water and pumps it back into the mixer drum for proper disposal off-site. In this instance, a concrete washout area would not be required.
  - 2. Install orange safety fencing around concrete washout area perimeter. Post signage directing contractors and suppliers to the designated concrete washout location.
  - 3. Locate washout areas at least 50 feet from storm drains, open ditches, or water bodies.
  - 4. Inspect system daily and after each storm event. Inspect the integrity of the overall structure including, where applicable, the containment system. Inspect the system for leaks, spills, and tracking of soil by equipment. Inspect the polyethylene liner for failure. The liner may need to be replaced after every

cleaning if removal of material has damaged the liner. Repair the concrete washout structure, as needed, or construct a new system.

- 5. Allow concrete wastes to set. Break up and properly dispose of hardened wastes. Liquid that collects in the washout area could be high in alkalinity and could contain pollutants. Liquid must be disposed of as wastewater. Upon removal of waste, inspect the structure.
- 6. Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose of in the trash.
- 7. Discuss the concrete management techniques (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
- 8. Incorporate requirements for concrete waste management into material supplier and subcontractors' agreements. Inspect construction activities on a regular basis to ensure suppliers, contractors, and others are utilizing designated washout areas. If concrete waste is being disposed of improperly, identify the violators and take appropriate action.
- 9. Perform washout of concrete trucks in designated areas only. Never dispose of washout from concrete trucks in a ditch, stream, wetland, waterway, or stormwater conveyance.
- 10. Do not dump excess concrete onsite, except in designated areas.
- 11. When concrete washout systems are no longer required, close the concrete washout systems. Dispose of all hardened concrete and other materials used to construct the system. Backfill, grade, and stabilize any holes, depressions, and other land disturbances associated with the system.
- H. Fertilizers
  - 1. Apply fertilizers only in the minimum amounts recommended by the manufacturer and as determined through soil testing.
  - 2. Work fertilizers into the soil to limit exposure to stormwater.
  - 3. Store fertilizers in a covered area and transfer partially used bags to a sealable container to avoid spills.

-END-

# SECTION 02111 – RECORDING OF CONSTRUCTION AREAS

## PART 1 - GENERAL

#### 1.01 Summary

- A. Prior to construction, walk each work site with Owner's Representative and Engineer to record existing site conditions. Provide one copy of audio-visual DVD recordings of all site conditions located within the construction area shown on the Drawings and as specified herein.
- B. Before beginning construction activities, provide all labor, materials, equipment, services and perform all operations necessary to furnish the Owner and Engineer a complete color DVD recording of the surface features and conditions within the proposed construction zone of influence.
- C. The audio-visual DVD recording shall include all DVD's, DVD storage cases, DVD index labels and run sheet logs. The purpose of this coverage shall be to accurately document the pre-construction conditions of the surface features.
- D. The pre-construction videotape documentation shall be done by a responsible commercial firm known to be skilled and regularly engaged in the business of color audio-video construction documentation. The firm shall furnish such information as the Owner and Engineer deems necessary to determine the ability of the firm to produce professional video in accordance with Contract Specifications.

## PART 2 - PRODUCTS

## 2.01 Equipment

- A. Recordings shall be still frame capable, color, DVD format videodiscs. The recorded videodiscs shall be compatible for playback with any Standard DVD player or on personal computer. The discs shall be new.
- B. The camcorder used for the recordings shall be high quality color camcorder with 1/4", 1/3", or 1/2" charged coupled device-imaging system. Camera must have optical stabilization; electronic stabilization is not acceptable. Camera must be capable of 20x minimum optical magnification. Camera must be capable of producing NTSC 525 lines resolution/60 fields/30 frames per second. Minimum illumination capabilities of at least 3-lux.

## PART 3 - EXECUTION

- 3.01 Information to be Included
  - A. The zone of influence shall be defined as the area located within the permanent and temporary construction easement, the area 30 feet beyond either side of the

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 RECORDING OF CONSTRUCTION AREAS

centerline of the construction area, the road Right-of-Way, and shall also include those areas adjacent to these areas which may be affected by routine construction operations or as requested by the Owner or the Engineer.

- B. The surface features within the construction zone of influence include, but are not limited to, all visible roadways, pavements, curbs, driveways, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, trees, shrubbery and fences.
- C. Provide a runsheet log that accurately catalogs the contents of each videodisc. Information in the runsheet must include:
  - 1. Street name, easement, or address.
  - 2. Drawing sheet number or numbers relative to the line entry of a particular area of coverage.
  - 3. Roll numbers.
  - 4. Real time code indexing for each segment of the project. Real time code indexing will indicate hours, minutes, and seconds to cross reference with playback equipment to locate specific points of interest on the project.
  - 5. Direction of travel for each specific segment.
  - 6. Viewing side for each specific segment.
  - 7. Starting point for each specific segment.
  - 8. Ending point for each specific segment.
  - 9. Project information, i.e., project title, owner, date.
- D. Label all DVD's with appropriate project information and cross-reference with runsheets. Information on videodisc labels shall include:
  - 1. Roll number
  - 2. Project Title
  - 3. Location of project
  - 4. Month and year of coverage
  - 5. As multiple copies of each videodisc will be made available, DVD's must be marked as sets, i.e.: Engineer's set, Owner's set, Contractor's set
  - 6. Quick reference list of contents of a particular videodisc
- 3.02 Miscellaneous Details
  - A. The recording of the project shall take place prior to the placement of equipment and materials on the jobsite. All videodiscs shall be logged and presented to the Engineer and Owner before the actual construction is started for their review. Particular and detailed attention shall be given to any defects noted, such as cracks, disturbed areas, damaged items, or as may be required by Owner and Engineer. It is the intent of this coverage to accurately and clearly document preexisting conditions and especially any items that may result in construction claims.
  - B. To preclude the possibility of tampering or editing in any manner, all recordings must, by electronic means, display continuously and simultaneously generated transparent digital information to include the date and time of recordings, as well

RECORDING OF CONSTRUCTION AREAS

as the corresponding engineering stationing numbers. The date information will contain the month, day and year.

C. Accompanying the recording shall be a corresponding and simultaneously recorded audio track containing the commentary of the camera operator. Each disc shall begin with the current date, project name, municipality, and the general location, i.e., name of street, viewing side, and direction of progress. The commentary shall assist in the maintenance of viewer orientation, identification of surface features, and objective description of the points of interest being shown on the video portion of the recording.

## 3.03 Recording

- A. Conduct all recordings during times of good visibility. Do not record during periods of visible precipitation, or when more than 10 percent of the ground area is covered with snow, unless authorized by the Owner or Engineer.
- B. Identify houses and buildings visually by house number, when visible, in such a manner that structures of the proposed system, i.e., manholes on a sewer system, gate valves and hydrants on a water system can be located by reference. In all instances, identify locations by audio or visual means at intervals not to exceed 100 linear feet.
- C. To produce the proper detail and perspective, provide adequate lighting to fill in the shadow area caused by trees, utility poles, road signs, and other such objects in residential areas or as directed by the Engineer.
- D. The rate of speed in the general direction of travel of the conveyance used during taping shall be directly proportional to the number, size, and value of the surface features within that construction area's zone of influence. The rate of speed shall not exceed 48 feet per minute in residential areas, or 100 feet per minute in non-residential areas. The rate of travel for Haul Routes, Rainfall Studies, and Road Surface View shall be approximately five (5) miles per hour. Panning rates and zoom-in, zoom-out rates shall be electronically or manually controlled sufficiently such that during playback will produce clarity of the object viewed. The playback picture shall be in focus and be of extreme clarity at all times.
- E. Where conventional wheeled vehicles are used, mount camera securely to produce steady viewing. Camera lens is to be a minimum of eight (8) feet from ground of viewing area, or at a level to facilitate best perspective and line of sight. Vehicles used while performing documentation must be plainly marked with Company name and phone number. Caution signs, flags, and strobes may be utilized on vehicle as necessary.
- F. Contractor shall be able to televise and tape areas with paved roads, along coowned easements through parks, lawns, and open fields. If recording on private property, give the Owner sufficient prior notice of such entry so property owners may be advised of, and their permission obtained for, the work. If permission is denied, runsheet log will be duly noted.

RECORDING OF CONSTRUCTION AREAS

- G. The Owner and Engineer shall have the authority to designate what area may be omitted or added for recording.
- H. The Owner and Engineer shall have the authority to reject all or any portion of the recording not conforming to Specifications.

-END-

# SECTION 02140 – DEWATERING

PART 1 – GENERAL

#### 1.01 Summary

- A. Section Includes
  - 1. Dewatering system
  - 2. Surface water control system
  - 3. Monitoring wells
  - 4. System operation and maintenance
  - 5. Water disposal.
- B. Related Sections
  - 1. Section 02102 Material Handling & Spill Prevention
  - 2. Section 02200 Earthwork
  - 3. Section 02220 Trenching Backfilling & Compaction for Utilities

## 1.02 References

- A. 312 IAC 13-8-4 Dewatering wells
- B. 312 IAC 13-10-2 (e)(8) sand (9) Permanent abandonment of dewatering wells
- C. IC 14-25-7-15 Significant water withdrawal facilities
- D. 327 IAC 5-2-2 Requirement to have a permit

## 1.03 Definitions

- A. Dewatering includes the following:
  - 1. Lowering of groundwater table and intercepting horizontal water seepage to prevent groundwater from entering excavations and tunnels.
  - 2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations and tunnels.
  - 3. Disposing of removed water.
- B. Surface Water Control: Removal of surface water within open excavations.

## 1.04 System Description

- A. Provide dewatering and surface water control systems to permit work to be completed on dry and stable subgrade.
- B. Provide monitoring wells and monitoring equipment as necessary to obtain meaningful observations and conditions affecting excavation.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 DEWATERING

## 1.05 Performance Requirements

- A. Furnish, operate, and maintain pumps, pumping equipment, well points, inspection tubes, and similar dewatering devices to properly dewater and maintain excavations and depressions free from standing water. Lower the natural groundwater table before start of excavation, and to a sufficient depth to ensure excavations, construction, and backfill below the elevation of the natural groundwater table can be performed and completed in a dry condition. It is the Contractor's responsibility to ensure that dewatering is provided for proper completion of the Work and protection of its equipment and materials.
- B. During periods when the subgrade area within perimeter walls of structures is exposed to elements and deleterious effects of construction operations, subgrade area shall be maintained through use of ditching, pumping, grading, or back-blading to minimize subgrade deterioration and promote natural drainage.
- C. In silty and sandy soils where water is present at established subgrade level, water shall temporarily be removed by drawing water away from excavation. Dewatering methods shall consist of constructing drainage ditches at perimeter of excavation, sump pits adjacent to and near excavation, or placing well points around perimeter of excavation. Method employed should not disturb density of subgrade. Activate dewatering methods to lower water level not less than two (2) feet below subgrade before excavation has reached established subgrade level, and maintain until concrete (if used) has attained sufficient density and strength not to be affected by water and until backfilling around foundations has been completed.
- D. Design dewatering systems to:
  - 1. Lower water table within areas of excavation to permit Work to be completed on dry and stable subgrade.
  - 2. Relieve hydrostatic pressures in confined water bearing strata below excavation to eliminate risk of uplift or other instability of excavation.
  - 3. Prevent damage to adjacent properties, buildings, structures, utilities, and facilities from construction operations.
  - 4. Prevent loss of fines, quick condition, or softening of foundation subgrade.
  - 5. Maintain stability of sides and bottoms of excavations.
  - 6. Comply with local, State, and other regulations.
- E. Design surface water control systems to collect and remove surface water and seepage entering excavation.

## 1.06 Submittals

- A. Shop Drawings:
  - 1. Indicate dewatering system layout, well depths, well screen lengths, dewatering pump locations, pipe sizes and capacities, grades, filter sand gradations, surface water control devices, valves, and water disposal method and location.

- 2. Indicate primary power system location and capacity.
- 3. Indicate layout and depth of monitoring wells, piezometers, and flow measuring devices for system performance measurement.
- 4. Include detailed description of dewatering and monitoring system installation procedures and maintenance of equipment.
- 5. Include description of emergency procedures to follow when problems arise.
- B. The Owner shall obtain Indiana Department of Environmental Management (IDEM) approval for discharge of groundwater from dewatering well(s) to surface water (runoff):
  - 1. Temporary Dewatering Wells for Construction (less than 1 year) Approval by providing the following information in a letter to IDEM Office of Water Quality, Permits Section:
    - a. Purpose of the request.
    - b. Receiving stream.
    - c. Flow in MGD.
    - d. Length of Time discharge will occur.
    - e. Characterization that will be discharged (concentration/mass of pollutants known or believed to be present); contact IDEM for guidance for which pollutants to monitor for.
  - Permanent Dewatering Wells Complete National Pollutant Discharge Elimination System (NPDES) Permit Application Package 2E for permit to discharge wastewater proposed or existing non-process wastewater (State Form 55639).
- C. The water well driller shall submit a completed well log to Indiana Department of Natural Resources (IDNR) within 30 days of completion of the dewatering well.
- D. Significant Water Withdrawal Facility
  - 1. The Owner shall apply to the IDNR for a Significant Water Withdrawal Facility (SWWF) registration if the groundwater pump(s) have a capacity of 100,000 GPD pump rate or greater in accordance with IC 14-25-7-15.
  - 2. The SWWF registration is required for temporary dewatering wells.
  - 3. Underdrain systems for removing groundwater from underneath lined basins require SWWF registration.
- 1.07 Closeout Submittals
  - A. Record Drawings: Record actual locations and depths of capped dewatering wells and piping abandoned in place.
  - B. The Contractor is responsible for notifying the IDNR in writing of a dewatering well abandonment within thirty (30) days after plugging is completed.
- 1.08 Coordination
  - A. Coordinate Work to ensure all construction operations are completed on dry, stable substrate.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

## PART 2 - PRODUCTS

## 2.01 Dewatering Equipment

A. Select dewatering equipment to meet performance requirements based on soil conditions and dewatering methods selected.

## PART 3 - EXECUTION

## 3.01 Examination

A. Conduct additional borings and investigations to supplement subsurface investigations provided as required to complete dewatering system design.

## 3.02 Preparation

A. Protect existing adjacent buildings, structures, and improvements from damage caused by dewatering operations.

## 3.03 Construction

- A. A dewatering well shall be equipped with casing having a nominal diameter of at least one and one-fourth (1¼) inches. The casing shall be clean and free of grease, oil, or other contaminants that would impact water quality.
- B. Upon installation, a dewatering well must be fitted with a temporary cap which remains in place until pumping equipment is installed. The cap shall be of a type that prevents vermin or other potential contaminants from entering the well.
- C. Earthen materials shall be placed around the well casing to drain surface water away from the dewatering well.

# 3.04 Dewatering System

- A. Install dewatering system in accordance with the drawings and as specified.
- B. Locate system components to allow continuous dewatering operations without interfering with installation of permanent Work and existing public right-of-way, sidewalks, and adjacent buildings, structures, and improvements.

## 3.05 Surface Water Control System

- A. Provide ditches, berms, and other devices to divert and drain surface water from excavation area as specified in P-156.
- B. Divert surface water and seepage water within excavation areas into sumps and pump water into settling basins or a filtering area in accordance with requirements of agencies having jurisdiction.

C. Control and remove unanticipated water seepage into excavation.

## 3.06 System Operation and Maintenance

- A. Provide continuous supervision of dewatering system when operating by personnel skilled in operation, maintenance, and replacement of system components.
- B. Conduct daily observation of dewatering system and monitoring system. Make required repairs and perform scheduled maintenance.
- C. Fill fuel tanks before tanks reach 25 percent capacity.
- D. Start emergency generators at least twice each week.
- E. When dewatering system cannot control water within excavation, notify Engineer and stop excavation work.
  - 1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
  - 2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.
- F. Modify dewatering and surface water control systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.
- G. Correct unanticipated pressure conditions affecting dewatering system performance.
- 3.07 Water Disposal
  - A. Discharge water into settling basins, a vegetated area for settling and filtering, or into a manufactured filter bag provided by Contractor in accordance with the manufacturer's recommendations or IDEM and IDNR standards. No water containing settleable solids shall be discharged into an open ditch, stream, wetland, stormwater conveyance, or street.

## 3.08 System Removal

- A. Remove dewatering and surface water control systems after dewatering operations are discontinued.
- B. If a dewatering well casing is removed following use the remaining borehole shall initially be filled with granular, pelletized, medium grade, or coarse grade crushed bentonite a minimum of one (1) foot thick. The remainder of the borehole shall be:
  - 1. Filled with natural earth materials obtained during the drilling process to the ground surface; and
  - 2. Thoroughly tamped to minimize settling.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- C. If a dewatering well casing is removed following use and the well site will be excavated as part of the construction project, the remaining borehole shall be:
  - 1. Filled with natural earth materials obtained during the drilling process to the ground surface; and
  - 2. Thoroughly tamped to minimize settling.
- D. Repair damage caused by dewatering and surface water control systems or resulting from failure of systems to protect property.

-END-

# SECTION 02200 - EARTHWORK

- PART 1 GENERAL
- 1.01 Summary
  - A. Section includes:
    - 1. Stripping, storage and redistribution of topsoil, cut and fill operations, and rough and finish grading.
    - 2. Excavation, backfilling, compaction, hauling, and disposal of materials
    - 3. Dewatering operations
  - B. Related Sections
    - 1. Section 02101 Stormwater Pollution Prevention and Erosion Control
    - 2. Section 02220 Trenching Backfilling & Compaction for Utilities
    - 3. Section 03300 Cast-in-Place Concrete
- 1.02 References
  - A. Appendix D Geotechnical Data
  - B. ASTM D 1557- Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
  - C. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition
  - D. Unified Soil Classification System ASTM D 2487-06
- 1.03 Definitions
  - A. Pavement/Structure Loading Zone: The area within 5 feet of any edge of pavement, curb, gutter, sidewalk, building, structure, vault, tank, pad or other load bearing feature.
  - B. Structural Pad: The area within an imaginary line that extends downward from the outside edge of a footing, foundation, mat or other load bearing feature at a 1H:2V slope.
  - C. Structural Fill: Defined under 2.01 B. for support of structural loads.
  - D. Plastic Clay: Soil type CH with a Liquid Limit above 50.
  - E. Common Excavation: All excavation not classified as rock excavation or excavation that is otherwise classified.

- F. Rock Excavation
  - 1. Igneous, metamorphic, and sedimentary rock which cannot be excavated without blasting, or the use of a modern power shovel of no less than one cubic yard capacity, properly used, having adequate power and in good running condition, or the use of other equivalent power equipment.
  - 2. Boulders or detached stones each having a volume of one half (1/2) cubic yard or more.
- G. Unclassified Excavation: Excavation of all materials of whatever character encountered in the work.
- H. Borrow: Approved material required for the construction of embankments or other portions of the work, and obtained from offsite.
- I. Unsuitable Material: Include frozen soil, relatively soft material, relatively wet material, deleterious material, plastic clays, or soils that exhibit a high organic content.
- 1.04 Submittals
  - A. Test Results
    - 1. Structural fill material testing and classification results, including: material source, natural and optimum moisture content, sieve analysis, maximum dry density, classification, and plasticity index and liquid limit as applicable.
    - 2. Field compaction test results
    - 3. Subgrade evaluations
- 1.05 Quality Control
  - A. Provide the services of a qualified testing laboratory to perform all laboratory tests and evaluations.
  - B. Provide the services of a qualified testing agency experienced in geotechnical engineering and field determinations of soil suitability for the evaluation of foundations, pavements, and structures subgrade soils and conditions.

## 1.06 Warranty

- A. Refill and restore to the original grade settlement in the backfill which takes place within the warranty period at no additional cost to the Owner. Restore the surface area where settlement has occurred, including, but not limited to seeding, fertilizing, erosion control and restoration of streets, drives, yards, and sidewalks.
- B. Guarantee survival of all disturbed and replaced trees and shrubs during the warranty period.

## PART 2 - PRODUCTS

- 2.01 Materials
  - A. Regular Backfill
    - 1. Clean material free of organic material, debris, deleterious materials, frozen soils, rocks and other debris larger than 2 inches, or other extraneous material.
  - B. Structural Fill
    - 1. Clean, well-graded coarse-grained granular material free of organic material, debris, deleterious materials, or frozen soils.
      - a. Coarse-Grained Granular Material
        - 1) Less than 5%, by weight, passing a No. 200 sieve.
        - 2) 100% passing a 3/4" sieve.
        - 3) Coarse sands and gravel-sand mixtures, including variously graded sands and gravels Soil types GW, GP, SW and SP are included in this class.
    - 2. Flowable Fill See Section 02220
  - C. Topsoil
    - 1. Natural, fertile, agricultural soil, capable of sustaining vigorous plant and lawn growth.
    - 2. Uniform composition throughout, without admixture of subsoil.
    - 3. Free of stones, lumps, clods and sticks larger than 1-inch, live plants and their roots, sticks and other extraneous matter.

## PART 3 - EXECUTION

- 3.01 Preparation
  - A. Clear areas as required..
  - B. Remove all topsoil at construction areas. Stockpile topsoil for use in finish grading operation. Do not use topsoil for fill.
  - C. Do not place fill materials until the subgrade and construction have been inspected by the Engineer.
- 3.02 Excavation
  - A. Keep open excavations free of water.
    - 1. Use diversion ditches, dikes or other suitable means to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.

- 2. Provide and maintain adequate pumping and other dewatering equipment to remove and dispose of surface and ground water entering excavations.
- 3. Filter the water from dewatering operations to remove sediment before discharge.
- B. Protect open excavations by roping areas off, or with barricades or railings to prevent injury to personnel. Comply with all applicable Occupational Safety and Health Administration (OSHA) regulations.
- C. Excavate true to line and grade, and elevation at bottom of the excavation. Excavate to undisturbed structurally stable subsoil. Notify Engineer where excavation, in order to reach such subsoil, must continue deeper than required by the elevations indicated on the Drawings. No additional payments will be made for unauthorized excess excavation.
- D. Excavate to the dimensions indicated for new construction plus sufficient space as applicable to permit erection of forms, shoring, masonry, foundations, structure installations, and excavation inspections.
- E. Excavate below structures, slabs, and pavement to permit placement of subbase material.
- F. Provide shoring or piling as required to protect excavation bank.
- G. Boulders, if encountered, must be disposed of outside of the construction area.

## 3.03 Subgrade Evaluation

- A. Prepare all areas that will support foundations, floors, pavements, or newly placed structural fill prior to subgrade evaluation. Remove all loose surficial soil, topsoil, and other unsuitable materials.
- B. Once excavations have reached the required elevations and dimensions, notify the Engineer and testing agency so the subgrade can be evaluated. Do not place fill material until the subgrade and construction has been inspected and approved by the Engineer and testing agency.
- C. Foundation subgrade evaluation
  - 1. The testing agency will check the exposed subgrade to confirm that a bearing surface of adequate strength has been reached.
  - 2. Further excavate any localized soft soil zones encountered at the bearing elevation until adequate support soils are encountered, or the minimum undercut depths are achieved, whichever is greater.
  - 3. Replace the undercuts with compacted structural fill.
- D. Paved and slab area subgrade evaluation
  - 1. Under observation of the Engineer and testing agency, proof-roll the subgrade in the location of new pavement and structures. Proof rolling shall consist of

repeated passes of a loaded pneumatic-tired vehicle such as a tandem-axle dump truck or scraper.

- 2. Any areas found to rut, pump, or deflect excessively must be compacted in place or undercut and replaced with compacted structural fill, as directed by the Engineer.
- E. Minimum undercut depths to be provided if unsuitable soils, plastic clays, or other unsuitable subgrade conditions are encountered shall be as follows:
  - 1. Subgrade under foundation: minimum 24" undercut
  - 2. Subgrade under slabs: minimum 18" undercut
  - 3. Subgrade under paved areas: minimum 12" undercut
- 3.04 Filling and Backfilling
  - A. General
    - 1. Once the subgrade has been approved by the testing agency and the Engineer, fill and/or backfill the excavations to the required grades as shown on the Drawings.
    - 2. Suspend earthwork operations when satisfactory results cannot be obtained because of rain, freezing weather or other unsatisfactory conditions in the field.
    - 3. Material shall be of the proper moisture content before compaction. Do not perform filling or backfill if the material is too wet to permit proper compaction.
    - 4. Place layers in the deepest portion of the fill first. As placement progresses, construct layers approximately parallel to the finished grade line.
    - 5. Place layers in successive horizontal layers for the full width of the section and at the loose lift thickness specified.
    - 6. The Contractor is responsible for the stability of the fill above the top of footings. Do not backfill until walls are braced or shored and the Engineer has reviewed the backfilling operation. If fill is to be provided on both sides of walls, fill on both sides at same time.
  - B. Install vapor barrier on drainage fill prior to installing slabs. Place drainage fill under floor slabs, slabs on grade, walks and paving to indicated depths but not less than four (4) inches in depth.

## 3.05 Compaction

- A. General
  - 1. Compact fill using equipment capable of compacting each lift its full depth. Maintain moisture at optimum content during compaction operations.
  - 2. Provide compacting equipment of the design, weight and quantity to obtain the required soil compaction. Under no circumstances will a bulldozer or similar tracked vehicle be used as compacting equipment.
  - 3. Use water distribution equipment with suitable sprinkling devices to add moisture to the soil if required.

- 4. Compact areas inaccessible to a roller by mechanical tampers. Operate the equipment in such a manner that hardpan, cemented gravel, clay, or other chunky soil material are broken up into small particles and become incorporated with the material in the layer.
- 5. Compaction by flooding is not acceptable.
- 6. If a fill area excavation extends beyond the limits of that fill area definition, continue with the same fill material and compaction across the entire excavation unless approved by Engineer.
- B. Degree of Compaction
  - 1. Compact to the limits specified below.
  - 2. Fill areas beneath footings, foundations, and mats (within the Structural Pad):
    - a. From bottom of fill to within 12" of top of fill: Place structural fill in 8" maximum loose lifts and compact each layer to 95% of the material's Modified Proctor maximum dry density as determined by ASTM D 1557.
    - b. Final 12" of fill: Place structural fill in 6" maximum loose lifts and compact each lift to 95% of the material's Modified Proctor maximum dry density as determined by ASTM D 1557.
  - 3. Fill areas beneath floor slabs, adjacent to and within 5' of foundations, and over foundation (outside the Structural Pad but within the Structure Loading Zone):
    - a. From bottom of fill to within 12" of top of fill: Place structural fill in 8" maximum loose lifts and compact each lift to 95% of the material's Modified Proctor maximum dry density as determined by ASTM D 1557.
    - b. Final 12" of fill: Place structural fill in 6" maximum loose lifts and compact each lift to 95% of the material's Modified Proctor maximum dry density as determined by ASTM D 1557.
  - 4. Fill areas within the Pavement Loading Zone:
    - a. From bottom of fill to top of fill: Place structural fill in 8" maximum loose lifts and compact each layer to 95% of the material's Modified Proctor maximum dry density as determined by ASTM D 1557.
  - 5. For all other fill areas: Place regular backfill in 12" maximum loose lifts and compact each layer to 90% of the material's Modified Proctor maximum dry density as determined by ASTM D 1557.

# 3.06 Proof Rolling of Fills

- A. Perform proof rolling operations using a pneumatic tire roller conforming to the requirements of INDOT Specification 203.26.
- B. Perform a minimum of two complete coverages.
- C. Correct all roller marks, irregularities, and failures.
- D. After completion of filling and compaction operation, proof roll area with smooth wheel vehicle to leave a smooth surface sealed to shed all water.

# 3.07 Grading

- A. Furnish, operate, and maintain equipment necessary to control uniform layers, section, and smoothness of grade for maximum compaction and drainage.
- B. Rough Grading
  - 1. Evenly grade to an elevation 6 inches below the finish grade elevations indicated.
  - 2. Protect all constructed items during grading operations, and repair if damaged.
  - 3. All areas in the project, including excavated and filled sections and adjacent transition areas, shall be reasonably smooth, compacted, and free from irregular surface changes.
  - 4. Provide a finish grade ordinarily obtainable from either blade-grader or scraper operations, unless otherwise specified.
  - 5. The finished subgrade surface generally shall be not more than 0.3 feet above or below the established grade or approved cross-section, with due allowance for topsoil and seeding or sod as applicable.
  - 6. The tolerance for areas within 10 feet of buildings shall not exceed 0.15 feet above or below the established sub-grade.
  - 7. All ditches, swales and gutters as applicable shall be finished to drain readily.
  - 8. Evenly slope the subgrade to provide drainage away from the structure walls in all directions at a grade not less than  $\frac{1}{2}$ -inch per foot.
  - 9. Provide grade rounding at top and bottom of banks and at other breaks in grade.
- C. Protection
  - 1. Protect newly graded areas from the action of the elements.
  - 2. Repair settlement or washing that occurs prior to acceptance of the work, and reestablish grades to the required elevations and slopes.
  - 3. Fill to required subgrade levels any areas where settlement occurs.
- D. Finish Grading
  - 1. Proceed to finish elevations shown on Drawings with a tolerance of plus or minus .04 ft. (1/2 inch).
  - 2. Rake subsoil clean of stones and debris. Scarify to a depth of 3 inches.
  - 3. Spread stockpiled topsoil over prepared subgrade to a minimum depth of six (6) inches, and roll until suitable for seeding or placement of sod as applicable.
  - 4. Maintain surfaces and replace additional topsoil necessary to repair erosion.

-END-

# SECTION 02220 - TRENCHING, BACKFILLING AND COMPACTION FOR UTILITIES

PART 1 - GENERAL

- 1.01 Summary
  - A. Section Includes: Performing surface preparation and excavation work as required for the installation of utilities and appurtenances including excavation, trenching, bedding, backfilling and other related work.
  - B. Related Sections
    - 1. Section 02720 Storm Sewer Systems
    - 2. Section 02729 Gravity Sanitary Sewer Systems
    - 3. Section 02730 Force Main Sewer Systems

## 1.02 References

- A. American Society for Testing and Materials (ASTM), latest editions
  - 1. ASTM C 403 Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance (flowable fill)
  - 2. ASTM D 1557- Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
  - 3. ASTM D 6024 Standard Test Method for Ball Drop on Controlled Low Strength Material (CLSM) to Determine Suitability for Load Application (flowable fill)
  - 4. ASTM D 6103 Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM) (flowable fill)
- B. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition
  - 1. Section 213 Flowable Backfill (flowable fill)
  - 2. Section 904 Aggregates
- C. Occupational Safety & Health Administration (OSHA) Regulations (Standards 29 CFR), latest editions
  - 1. Part 1926 Safety and Health Regulations for Construction (excavations >20 feet deep)
- 1.03 Definitions
  - A. Bedding Granular material placed beneath the pipe to establish line and grade and to provide pipe support.

- B. Final (Trench) Backfill Granular or other specified material placed from the top of the Initial Backfill to the top of the trench, or to just beneath the surface that is to be restored.
- C. Granular Backfill Class 1 or Class 2 material as described in 2.01 A and B.
- D. Haunching Granular or other specified material placed from the top of the bedding to the springline (center) of the pipe, installed uniformly in lifts on each side of the pipe, and shoveled under the sides of the pipe to provide resistance against soil and traffic loading.
- E. Initial Backfill Granular or other specified material placed from the springline of the pipe to the specified height above the crown of the pipe, to provide adequate pipe support and to protect the pipe from damage due to compaction of the final backfill.
- F. Pavement/Structure Loading Zone the area within 5 feet of any edge of pavement, curb, gutter, sidewalk, building, or other structure.
- 1.04 Submittals
  - A. Product Data
    - 1. Class I material source and gradation
    - 2. Class II material source and gradation
    - 3. Flowable Fill Mix Design
      - a. Provide mix design which includes:
        - 1) List of all ingredients
        - 2) Source of the materials
        - 3) Gradation of aggregates
        - 4) Names of admixtures and dosage rates
        - 5) Batch weights
        - 6) Mix design designation number
      - b. If requested, provide a trial batch demonstration.
      - c. Provide test data from a laboratory inspected by the Cement and Concrete Reference Laboratory that shows the proposed mix design is in accordance with the requirements listed in this specification.
  - B. Quality Control Submittals
    - 1. Backfill Compaction Test Results
    - 2. Flowable Fill Test Results
      - a. Unconfined Compressive Strength
      - b. Flow Consistency
      - c. Setting and Early Strength
    - 3. Delivery Tickets

- 1.05 Quality Control
  - A. Qualifications
    - 1. Provide the services of a qualified, independent testing laboratory to perform all field tests.
- 1.06 Warranty
  - A. Refill and restore to the original grade settlement in the backfill which takes place within the 1-year warranty period at no additional cost to the Owner. Restore the surface area where settlement has occurred, including, but not limited to seeding, fertilizing, erosion control and restoration of streets, drives, yards, and sidewalks.
  - B. Guarantee all disturbed and replaced trees and shrubs for a period of 1 year from date of substantial completion of project.

# PART 2 - PRODUCTS

- 2.01 Bedding and Backfill Material Classifications
  - A. Class I: Angular, 6 to 40 millimeters (1/4 to 1-1/2 inches) graded stone such as crushed stone. No. 8 gravel possessing a minimum 50 percent mechanical crush count, and meeting the following nominal sizes and percentages passing will be considered an equivalent Class I material:
    - 1. 100 percent passing 1-inch sieve
    - 2. 75-95 percent passing 3/4-inch sieve
    - 3. 40-70 percent passing 1/2-inch sieve
    - 4. 0-8 percent passing No. 4 sieve
  - B. Class II: Coarse sands and gravel-sand mixtures with a maximum particle size of 40 millimeters (1-1/2 inches), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class. Provide Class II material which meets the requirements of INDOT Standard Specifications Section 904 classification for Structure Backfill.
  - C. Excavated Material: Excavated material suitable for use as trench backfill must be clean and free of rocks and frozen soil lumps larger than 6 inches, wood, debris, or other extraneous material.
  - D. Flowable Fill: Removable, self-leveling, self-compacting, flowable material with a minimum unconfined compressive strength (28 day) of 50 psi and a maximum unconfined compressive strength of 150 psi. Provide Removable Flowable Backfill material which meets the requirements of INDOT Standard Specifications Section 213 and Section 904 classification for Type 4 Structure Backfill.

# 2.02 Sheeting and Bracing

A. Provide sheeting, shoring and bracing capable of sustaining the lateral forces of the trench and pit banks and that comply with all applicable OSHA requirements. Protective systems for excavations 20 feet deep or greater must be designed and certified by a registered Professional Engineer.

# PART 3 - EXECUTION

# 3.01 Preparation

# A. Planning

- 1. Maintain traffic flow at all streets and service drives during construction.
- 2. Do not cut farm fences when gates are available within a reasonable distance to move equipment from one field to another.
- 3. Comply with the terms and limits of easements. Obtain property access permission prior to accessing or traversing yards or fields outside easements.
- B. Protection
  - 1. Before any excavation is started, provide adequate protection for all lawns, trees, landscape work, shrubs, fences, hydrants, sidewalks, utility poles, and other objects that are to remain in place.
  - 2. Maintain such protection for as long as necessary to prevent damage from operations.
  - 3. Movable items such as mailboxes and roadway signs may be temporarily relocated during construction unless shown otherwise on the Drawings. Reinstall movable items in their original location immediately after backfilling and compacting is complete. Replace movable items damaged during construction with new items at the Contractor's expense.
  - 4. Verify the location of existing storm sewers, sanitary sewers, water mains, gas mains, electric ducts, telephone ducts, utility services, and other underground structures. Determine the exact location of and the means of protection for these facilities and structures. Protect, support and maintain operation of these facilities during construction.
- C. Site Preparation
  - 1. Complete site clearing and grubbing.
  - 2. Remove existing pavement and walks from the areas of excavation.
  - 3. Strip topsoil and vegetation from the areas of excavation.
    - a. Clean topsoil may be stockpiled for reuse.
    - b. Do not mix grass, weeds, roots, brush, and stones larger than 1-inch in diameter with stockpiled topsoil. Dispose of root contaminated topsoil.

## 3.02 Excavating

- A. Excavate carefully and cautiously to avoid damaging existing underground utilities and structures.
  - 1. Repair, or have repaired, existing utilities and structures broken or otherwise damaged during construction.
  - Immediately bring to the attention of the Engineer any unforeseen conflicts with existing utilities exposed during excavation and preparation of trenches and pits.
  - 3. If proposed utility cannot be installed at locations shown on the Drawings, make adjustments in its alignment or relocate the existing utilities as approved by the Engineer.
- B. Store excavated materials suitable and necessary for backfilling in a neat pile adjacent to the excavation in a manner that will not interfere with traffic. Do not place such materials at heights or within the proximity of excavations where they may cause earth slides or cave-ins. Do not stockpile excavated material closer than 2 feet from the top edge of the excavation wall at ground surface.
- C. Remove excavated material not suitable for backfilling and excess suitable material from the job site. Dispose of the materials in accordance with all local, state, and federal regulations.
- D. Provide and maintain adequate dewatering equipment to remove and dispose of surface and ground water entering excavations. Use appropriate measures to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Filter water from dewatering operations to remove sediment before discharge in accordance with Section 02101.
- 3.03 Sheeting and Bracing
  - A. Properly shore, sheet, brace, or cut back at the proper slope, all excavations to safely install utilities and to protect adjacent streets and structures.
  - B. The Contractor is responsible and accountable for all sheeting and bracing used and for damages to persons or property resulting from the improper quality, strength, placement, maintenance and removal of the sheeting, shoring, and bracing, including damage to trees, shrubs, walkways and other property.
- 3.04 Trenching
  - A. Excavate trenches to the depths and widths shown or as required for the proper installation of the pipe and appurtenances.
  - B. Excavate trenches for concrete box sections only as wide as is necessary to facilitate proper compaction of backfill material, provided the adjacent embankment material is structurally adequate to provide the necessary side support. Verification of sufficient bearing strength of underlying soil foundation

material, based upon manufacturer's recommendations, shall be required for all reinforced concrete box section installations.

- C. Excavate trenches in straight lines. Keep sides of trenches as near vertical as possible and properly sheet and/or brace, if required. Perform open cut excavation except where otherwise approved or noted on Drawings.
- D. Provide a continuous, uniform bearing support for the pipe on bedding within the trench, dished to provide circumferential support to the lower third of each pipe. Dig out holes to receive pipe bells.
- E. Remove rock and soft material encountered in the trench which, in the opinion of the Engineer is incapable of providing adequate bearing to support the pipe. Remove material to accommodate the minimum specified bedding depth below the required elevation and fill with Class I or Class II material as specified. Field measure with the Engineer the locations where additional granular backfill is required due to rock or soft material, prior to backfilling.
- F. Do not open more than 50 feet of trench in advance of the installed pipe, unless otherwise directed or permitted by the Engineer. Excavate the trench within 6 inches of full depth for a distance of at least 30 feet in advance of the pipe installation, unless otherwise directed or permitted.
- G. Support all sewer, gas, water or other pipes or conduits crossing the trench to prevent damage and service interruptions. The manner of supporting such pipes or conduits will be subject to the approval of the Owner and/or the inspector of the Utility involved.
- H. Provide adequate sheeting and bracing in trenches and pits to protect life, property and the Work. Renew and maintain sheeting, planking, timbering, shoring, bracing, and bridging, and do not remove until sufficient backfill has been placed to protect the pipe.
- I. Where rock is encountered in excavations, remove the rock by mechanical means. Use a rock trencher which produces excavated material commensurate to granular backfill, which can then be used as bedding for pipe in areas of rock excavation.

## 3.05 Trench Backfill

- A. Specifications regarding trench backfilling also apply to excavated pits.
- B. Do not backfill trenches until all piping and utilities have been inspected by the Engineer.
- C. Backfill all trenches within State Highway right-of-way in accordance with INDOT Specifications. Backfill all trenches within the right-of-way of other public authorities having jurisdiction in accordance with requirements of the public authority.

- D. For any trench that intersects any portion of the pavement loading zone use Class I or flowable fill backfill materials.
- E. For any utility located in proximity to a building foundation use the Geotechnical recommendations or use 2:1 structure loading zone rule for the placement of compacted bedding and backfill materials.
- F. Comply with details shown on the Drawings for the placement of bedding and backfill materials for each pipe material.
- G. Placement and Compaction Requirements:
  - 1. Place Bedding, Haunching, and Initial Backfill materials in 6 to 8-inch balanced lifts to ensure proper compaction and filling of all voids.
  - 2. Use procedures and equipment for the Modified Proctor compaction test in accordance with ASTM D 1557.
  - 3. Outside the pavement/structure loading zone:
    - a. Place final backfill in maximum 12-inch lifts.
    - b. Compact each layer to a minimum of 90 percent of the material's Modified Proctor maximum dry density.
    - c. Provide additional compaction if required to minimize settling. Limited mounding of backfill above finish grade may be performed to compensate for settlement with the approval of the Engineer.
    - d. Place 6 inches of topsoil over areas to be seeded.
  - 4. Within the pavement/structure loading zone:
    - a. Place final backfill in 6 to 8-inch lifts, except place final 12 inches in 6-inch lifts.
    - b. Compact each layer to 95 percent of the material's Modified Proctor maximum dry density, except the final 12 inches under pavement, compact each 6-inch lift to 100 percent of the material's Modified Proctor maximum dry density.
    - c. Prepare upper portion of trench for pavement replacement as applicable.
  - 5. Stone and unpaved driveways and alleys:
    - a. Place final backfill in 6 to 8-inch lifts.
    - b. Compact each layer to 95 percent of the material's Modified Proctor maximum dry density.
    - c. Replace the last 12 inches of surface with the same material as the original surface unless otherwise specified and compact to 100 percent of the material's Modified Proctor maximum dry density.
- H. Compaction Procedures
  - 1. Place trench backfill in balanced lifts to ensure proper compaction and filling of all voids.
  - 2. Class I material: Shovel slice or otherwise carefully place; walk or hand tamp into place.
  - 3. Class II material: For the first 24 inches of backfill over the pipe, use handoperated tamping devices. Use standard mechanical methods (powered tampers, vibrators, etc.) for the remainder of the trench.

- 4. Do not flood or puddle with water to consolidate backfill.
- 5. When compaction test results are unsatisfactory, re-excavate, re-compact the backfill and retest until the specified compaction is obtained.
- I. Flowable Fill
  - 1. Discharge the mixture from mixing equipment into the space to be filled. Do not float pipe when placing flowable fill. Bring the flowable fill up uniformly to the fill line. Keep each filling stage continuous.
  - 2. Protect flowable fill from freezing until the material has stiffened and bleeding water has subsided. As the temperature nears freezing, additional curing time may be needed.
  - 3. Concrete may be placed on the flowable fill as soon as bleeding water has subsided. Place all pavements on flowable fill according to manufacturer's recommendations.
- J. Maintain backfilled trenches in a smooth and uniform condition until paving or seeding operations are completed.
- 3.06 Field Quality Control
  - A. Tests
    - 1. Class II Compaction Tests: Perform compaction tests for Class II trench backfill material in accordance with ASTM D 1557 and as follows:
      - a. At each road crossing: vertically at 2-foot intervals in the trench
      - b. At every 1,000 feet longitudinally in roadways along the pipe alignment and vertically at 2-foot intervals in the trench
      - c. Notify the Engineer 24 hours prior to the tests so that he may be present for the compaction tests.
      - d. No additional payment will be made for compaction tests. Compaction tests are considered incidental to the Work.
    - 2. Flowable Fill Tests: Perform the following tests for flowable fill:
      - a. Unconfined Compressive Strength
      - b. Flow Test: Conduct flow consistency testing in accordance with ASTM D 6103 by filling a 3-inch diameter by 6-inch high open-ended cylinder placed on a smooth, nonporous, level surface. Pull the cylinder straight up within 5 seconds and measure the spread of the fill. The diameter of the spread shall be 8 inches or more with no noticeable segregation.
      - c. Setting and Early Strength Test: Determine whether the flowable fill has hardened sufficiently for loads to be applied and construction activities to continue by conducting one of the following tests:
        - 1) Penetration Resistance test in accordance with ASTM C 403 minimum value of 500 psi required for loading
        - 2) Ball Drop test in accordance with ASTM D 6024 maximum indentation diameter of less than 3 inches required for loading

-END-

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 TRENCHING, BACKFILLING AND COMPACTION FOR UTILITIES

# SECTION 02224 - TRENCHLESS EXCAVATION - HORIZONTAL BORINGS

## PART 1 - GENERAL

- 1.01 Summary
  - A. Furnish and install casing pipes beneath highways, and other locations as shown on the drawings.
  - B. Install welded steel pipe casings in accordance with approved jacking and boring methods. Maintain the exact lines and grades shown, for the entire length of the steel casing. Before beginning any work, submit to the Engineer plans and details describing the materials and methods proposed to be used. Do not proceed with the work until such plans and methods have been reviewed by the Engineer for conformity with the drawings. The review by the Engineer of any plan or method shall not relieve the Contractor of his responsibility in any way.
  - C. Codes, specifications, and standards referred to by number or title shall form a part of this specification. Latest revisions shall apply, unless otherwise shown or specified.
- 1.02 Related Sections
  - A. Section 02200 Earthwork
  - B. Section 02220 Trenching, Backfilling and Compaction for Utilities
  - C. Section 02226 Trenchless Excavation Directional Drilling
  - D. Section 02730 Force Main Sewer Systems
  - E. P-156 Temporary Air and Water Pollution, Soil Erosion, and Siltation Control
  - F. SP-40 Trenchless Construction Under Interstate 70
- 1.03 Permits

Horizontal borings performed under Interstate 70 shall meet the INDOT requirements detailed in SP-40 – Trenchless Construction Under Interstate 70.

The Contractor shall give notification to the applicable agency or officials prior to the start of the work. Do not start work until all arrangements are completed and permission to start work is given by the INDOT District Highway Engineer, City of Indianapolis, or other applicable authorized representatives.

- 1.04 Submittals
  - A. Submittals shall be as specified in the General Provisions.
  - B. Submit the following:
    - 1. Manufacturer's Certificate of Compliance certifying compliance with the referenced specifications and standards.

- 2. Certified copies of reports of factory tests specified in this Section and required by the referenced standards.
- 3. Plans and details describing materials and methods proposed by the Contractor for use in special crossings.
- 4. Experience Documentation:
  - a. Provide documentation showing successful completion of at least 10,000 L.F. of horizontal bore installation of piping, or obtain the services of an experienced subcontractor to supervise the installation prior to commencing any work. Conventional trenching shall not be considered as applicable experience.
  - b. All supervisory personnel shall be adequately trained and have at least four years' experience in this trenchless installation method. Submit the names and resumes of all supervisory field personnel for review by the Engineer prior to commencing any work.

# 1.05 General Procedures

- A. Attend all meetings and provide all necessary data, reports, information, details, and construction schedules as requested by the governing officials.
- B. Notify the Engineer and the Owner when each individual boring and receiving pit has been staked in the field. The drawings show the profile along the length of each individual boring location. Do not proceed with the work until the survey information is obtained for the respective boring location and is approved by the Engineer).
- C. The Construction Manager shall review and modify as necessary the scheduling of any and all construction activities under the highway right-of-way in order to prevent interruption to traffic. The Contractor shall include the cost for such procedures in his bid and shall not be entitled to any change in contract amount on account of such procedures.
- D. <u>Boring under stage highways:</u> Permits for the proposed boring(s) under Interstate I-70: No deviation will be allowed without the approval of the INDOT Permit inspector.
- E. Notify the proper officials before beginning the installation of casing pipe on each individual boring.
- F. All work shall be done in a careful, workmanlike manner to the satisfaction of the proper officials, as well as the Engineer.

## 1.06 Experience

A. The Contractor shall demonstrate experience and expertise in horizontal boring methods by providing a list of six utility references for whom similar work has been performed prior to commencing any work. These references shall include a name and telephone number may verify the claims.

- B. The Contractor shall provide documentation showing successful completion of at least 10,000 linear feet of horizontal boring or shall obtain the services of an experienced horizontal boring subcontractor to supervise the installation prior to commencing any work. Conventional trenching shall not be considered as applicable experience.
- C. All supervisory personnel shall be adequately trained and shall have at least four years of experience in horizontal boring. The Contractor shall also submit the names and resumes of all supervisory field personnel for review by the Engineer prior to commencing any work.

# PART 2 - PRODUCTS

# 2.01 Steel Casing

- A. The casing pipe and joints shall be of steel construction. The casing pipe and joints shall be capable of withstanding the load of traffic or the load of pavement, subgrade, and traffic, as applicable. The casing pipe and joints shall be constructed to prevent leakage of any matter from the casing or conduit throughout its entire length including the ends of the casing pipe which shall be plugged watertight.
- B. The casing pipe shall be welded steel pipe, new and unused material in accordance with current ASTM Specifications A-139 Grade B for "Electric Fusion of Welded Steel Pipe" with a minimum yield of 35,000 psi. The inside diameter shall be at least 6 inches greater than the largest bell diameter of the conduits main joint.
- C. The minimum wall thickness of the casing pipe shall be as shown in the following table:

Diameter	<u>Minimum Wall Thickness (Inches)</u>	
of Casing	<u>Under Highway</u>	Under Railroad
Under 14"	0.250	0.188
14"	0.250	0.219
16"	0.250	0.219
18"	0.250	0.250
20"	0.375	0.281
22"	0.375	0.312
24"	0.375	0.344
26"	0.375	0.375
28"	0.500	0.406
30"	0.500	0.406
32"	0.500	0.438
34"	0.500	0.469
36"	0.500	0.469
38" – 42"	0.500	0.500

- D. The exterior walls of casing shall be coated with protective coal tar or bitumastic material, after the welding of each joint has been completed.
- E. When casing is installed without benefit of a protective coating and the casing is not cathodically protected, the wall thickness shown above shall be increased to the nearest standard size, which is a minimum of 0.063 inch greater than the thickness shown except for diameter under 12-3/4 inches.
- F. The diameter, gauge, ASTM specification and manufacturer's name must be marked on the exterior of each pipe length.
- G. Install casing pipe spacers to provide uniform support throughout the entire length of the casing. Casing pipe spacers shall have stainless steel bands and risers, plastic liner and runners as manufactured by Cascade Waterworks Manufacturing Company or approved equal.
- 2.02 The ends of the casing shall be suitably protected against the entrance of foreign material which might prevent ready removal of the conduit.
- 2.03 Casing Spacers
  - A. Casing spacers shall have stainless steel bands and risers, EPDM or PVC liner, and plastic runners. Spacers shall be Advance Projects and System, Inc., Model SSI, or equal. Spacers shall be spaced at a maximum of 5'-0".

# PART 3 - EXECUTION

- 3.01 Installation of Casing Pipe
  - A. The casing operation and installing shall proceed from a pit, excavated at a minimum distance from the edge of pavement as shown on the drawings and shall be constructed without interruption to traffic.
  - B. The conduit shall be installed inside a casing pipe of the length indicated on the drawings. The casing pipe shall be bored or jacked into place to satisfactory alignment and grade for its entire length.
  - C. The jacking pipe shall be constructed to provide not less than 30 feet clearance between the side of the pit adjacent to the road and the edge of pavement of the road measured at right angles. Open trenches shall be properly sheeted and braced in accordance with all applicable OSHA requirements, when and where sheeting is necessary to provide safe working conditions and protection for highway, roads, structures, and utilities.
  - D. Provide, maintain during casing and conduit installation, and backfill pits. Excavation for pits shall be sheeted as necessary, in accordance with all applicable OSHA requirements. Excavation and backfilling shall be as specified in Sections 02200 and 02220.

- E. Remove all excavated material and replace or change existing structures or utilities encountered to the satisfaction of the Engineer.
- F. Install casing pipe by Directional Drilling under highways at the required locations and elevations shown on the Drawings as specified in Section 02226. All work shall be in strict accordance with the authority having jurisdiction. Contractor shall not proceed with work until notified that crossing permits are approved.
- G. Ends of casing pipe shall be blocked up in such a way as to prevent the entrance of foreign material, but shall not be tightly sealed. Grouting of the void space between the casing and the pipe shall not be required unless otherwise directed
- H. After casings are installed, push successive lengths of pipe through and make connections. Ends of casing pipe shall be blocked up in such a way as to prevent the entrance of foreign material, but shall not be tightly sealed. Grouting of the void space between the casing and the pipe shall not be required.
- 3.02 Construction of Casing Pipe by Methods Other Than Jacking or Boring

The installation of the casing pipe by methods other than the jacking method must be performed in a manner which meets with prior approval of the authorities. Any expense incurred in connection with the construction of the crossing, removal, replacement, or maintenance resulting from the construction of the casing pipe and the conduit shall be at the expense of the Contractor.

-END-
# SECTION 02226 - TRENCHLESS EXCAVATION - DIRECTIONAL DRILLING

# PART 1 - GENERAL

- 1.01 Summary
  - A. Section Includes: Installation of force main by the directional drilling method within the limits indicated on the Drawings and performing all related work necessary to complete work shown and specified.
  - B. Before beginning any work, submit to the Owner plans and details describing the materials and methods proposed. Do not proceed with the work until such drawings and methods have been reviewed by the Engineer. The review by the Engineer of any drawings or method shall not relieve the Contractor of responsibility in any way.
  - C. Related Sections
    - 1. Section 02200 Earthwork
    - 2. Section 02220 Trenching Backfilling and Compaction for Utilities
    - 3. Section 02730 Force Main Sewer Systems
    - 4. P-156 Temporary Air and Water Pollution, Soil Erosion, and Siltation Control
    - 5. SP-40 Trenchless Construction Under Interstate 70

#### 1.02 References

- A. ASTM D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
- B. Codes, specifications and standards referred to by number or title shall form a part of this specification. Latest revisions shall apply, unless otherwise shown or specified.
- 1.03 Quality Control
  - A. Submittals
    - 1. Manufacturer's Certificate of Compliance certifying compliance with the referenced specifications and standards
    - 2. Certified copies of reports of factory tests specified in this Section and required by the referenced standards
    - 3. Details of equipment and written procedure with working drawings describing in detail the proposed boring method and the entire operation to be used as described
  - B. Qualifications
    - 1. Demonstrate experience and expertise in trenchless excavation methods by providing a list of 6 references for whom similar work has been performed prior

to commencing any work. Include a name and telephone number for each contact.

- 2. Provide documentation showing successful completion of at least 50,000 linear feet of directional drilling or obtain the services of an experienced directional drilling subcontractor meeting the experience requirements of this section to supervise the installation prior to commencing any work. Conventional trenching is not considered as applicable experience.
- 3. Adequately train all supervisory personnel and ensure they have at least 4 years of experience in directional drilling. Submit the names and resumes of all supervisory field personnel for review by the Engineer prior to commencing any work.

# C. Permits

- 1. Perform all directional drilling work in accordance with laws, permits, requirements and regulations of the authority having jurisdiction of the Rights-of-Way.
- 2. Horizontal directional drilling performed under Interstate 70 shall meet the INDOT requirements detailed in SP-40 Trenchless Construction Under Interstate 70.
- 3. The Contractor shall give notification to the applicable agency or officials prior to the start of the work. Do not start work until all arrangements are completed and permission to start work is given by the INDOT District Highway Engineer, City of Indianapolis, or other applicable authorized representatives.
- D. General Procedures
  - 1. Attend all meetings and provide all necessary data, reports, information, details and construction schedules as requested by the Engineer.
  - 2. Complete all work in a careful, workmanlike manner to the satisfaction of the Engineer and the Owner.

# PART 2 - PRODUCTS

- 2.01 Carrier Pipe
  - A. Meet the requirements as specified in Section 02730.
- 2.02 Pipe
  - A. Force main pipe shall meet the requirements as specified in Section 02730.

# PART 3 - EXECUTION

### 3.01 Examination

- A. Verify the location of all known and unknown utilities and structures by test pitting prior to any boring or drilling. These utilities and structures may include, but are not limited to:
  - 1. Underground utilities such as, but not limited to:
    - a. Storm drains
    - b. Electric cables
    - c. Water mains
    - d. Sewer lines and septic systems
    - e. Gas lines
    - f. Telephone lines
    - g. Fiber optic lines
    - h. Cable television lines
    - i. Wells
    - j. Field drain tiles
  - 2. Above-ground utilities and other obstructions such as, but not limited to:
    - a. Electric and telephone poles
    - b. Buildings
    - c. Trees
    - d. Existing road signs
- B. Be responsible for inspecting the site, for conducting investigations, surveys and tests, including subsurface investigations and tests that are necessary for the complete execution of all the work under this Contract.

### 3.02 Installation

- A. Equipment
  - 1. The directional drilling system to be used must have the following features:
    - a. The system shall be remotely steerable and permit electronic monitoring of tunnel depth and location. The system shall be able to control the depth and direction of the pipe and must be accurate to a window of  $\pm 2$  inches.
    - b. The system shall utilize a fluid-cutting process, using a liquid clay such as bentonite. This clay shall be totally inert and contain no risk to the environment.
    - c. The liquid clay shall remain in the tunnel to increase the stability of the tunnel and to provide a lubricant to reduce frictional drag when the pipe is installed.
    - d. Recover spoils by use of a vacuum system mounted on a vehicle for removal of the spoils. Do not discharge spoils into sewers or storm drains. Properly dispose of all spoil material.
    - e. Equipment shall be fitted with a permanent alarm system capable of detecting an electrical current. The system will have an audible alarm to warn the operator when the drill head nears electrified cables within a safe

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 TRENCHLESS EXCAVATION DIRECTIONAL DRILLING operating distance. Refer to paragraph 3.02B for additional safety requirements.

- B. Safety
  - 1. Mechanical, pneumatic or water-jetting methods are not acceptable due to the risk of surface subsidence and damage.
  - 2. Upon completion of drilling and pipe installation, remove all spoils from starting and termination pits. Restore pits to their original condition.
  - 3. Where manholes or air release valves are to be installed, use adequate protection in the form of steel plates in traffic areas and timber shutters in other areas until such times as the manhole or air release valve is installed, and the pit is backfilled and stabilized. Be responsible for maintaining these areas.
  - 4. Because directional drilling may be performed while existing buried electrical cable is energized; meet the following safety requirements:
    - a. Include a permanent, inherent alarm system capable of detecting an electrical current on all drilling equipment. Equip the ground system with an audible alarm to warn the operator when the drill head nears electrified cable within a safe operating distance.
    - b. Provide all crews with grounded safety mats, heavy gauge ground cables with connectors, hot boots and gloves.
    - c. Adequately train all supervisor personnel having direct supervisory experience in directional drilling.
- C. General
  - 1. Before beginning any work, submit to the Engineer plans and details describing the materials and methods which are proposed for use. Do not proceed with the work until such drawings and methods have been reviewed for conformity with the approved permit by the Engineer. The review by the Engineer of any drawings or method shall not relieve the Contractor of his responsibility in any way.
  - 2. Notify the Engineer and Owner 48 hours in advance of starting directional drilling work. Do not begin the directional drilling until the Engineer Owner, or his authorized representative, is present at the job site and proper preparations for the operation have been made. The Engineer's consensus for beginning the installation shall in no way relieve the Contractor of the responsibility for the satisfactory completion of the work as authorized under the Contract.
  - 3. Do not cut or disturb pavement, asphalt or excavate within the relative limits of the roadway surface to retrieve any lost boring appurtenances or equipment.
  - 4. Maintain a log of drilling operations which includes vertical depths of the pipe at established horizontal intervals every 25 feet except within INDOT right-of-way.
  - 5. All directional drilling work performed must be in accordance with laws, permits, requirements and regulations of the authority having jurisdiction of the Rights-of-Way.

- D. Drilling Procedure
  - 1. Prior to any alterations to the work site, video tape the entire work area, including entry and exit points as specified in Section 02111. Give one copy of the video to the Engineer and keep one copy for a period of 1 year following the completion of the project.
  - 2. Grade or fill the work site as indicated on the drawings, within the right-of-way, to provide a level working area. Make no alterations beyond what is required for operations. Confine all activities to the designated work areas and construction limits.
  - 3. Accurately survey the entire drill path and place entry and exit stakes in the appropriate locations within the areas indicated on the drawings. If the Contractor is using a magnetic guidance system, survey the drill path for any surface geo-magnetic variations or anomalies.
  - 4. Place environmental protection necessary to contain any hydraulic or drilling fluid spills as needed, including berms, liners, turbidity curtains and other erosion control measures as specified in Section P-156. Adhere to all applicable environmental regulations. Do not store fuel and oil in bulk containers within 200 feet of any water-body or wetland.
  - 5. Place pipe resting on paved or hardened surfaces (i.e., sidewalks, asphalt, concrete, gravel, etc.) on pipe rollers before being pulled into the drill hole with rollers spaced close enough to prevent excessive sagging and dragging of the pipe upon rough surfaces which could scar the pipe.
  - 6. Calibrate the directional drilling head locator at the start of the day and at each new directional drilling operation. Keep a daily calibration log for the Engineer's review.
  - 7. Ensure the directional drilling operator has full control of the direction of the drilling tool at all times. Abandon and fill shallow, misdirected or other unsuccessful drills at the direction of the Engineer and at own expense.
  - 8. The maximum drill angle shall be 15 degrees measured perpendicular to grade to the design depth elevation.
  - 9. Drill a pilot hole on the drill path with no deviations greater than 5 percent of depth over a length of 100 feet. In the event that the pilot hole does deviate from the drill path more than 5 percent of depth in 100 feet, notify the Engineer and the Engineer may require pull back and re-drill from the location along the drill path before the deviation.
  - 10. In the event of a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes. If mud fracture or returns loss continues, cease operations and notify the Engineer. The Engineer, Owner, and Contractor will discuss options and work will then proceed accordingly.
  - 11. Upon successful completion of the pilot hole, ream the drill hole to a minimum of 25 percent greater than the outside diameter of the pipe using the appropriate tools. Do not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.
  - 12. After successfully reaming the drill hole to the required diameter, pull the pipe through the drill hole. In front of the pipe will be a swiveling mandrel. Once pull-

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 TRENCHLESS EXCAVATION DIRECTIONAL DRILLING back operations have commenced, operations must continue without interruption until the pipe is completely pulled into the drill hole. Do not apply more than the maximum safe pipe pull pressure at any time during pull-back operations.

- 13. Pull back 2 strands of tracer wire with the pipe. Tracer wire shall be Copperhead Direct Burial #12 AWG Solid, steel core hard drawn extra high strength horizontal directional drill tracer wire, 1150# average tensile break load, 45 mil high molecular weight-high density yellow polyethylene jacket complying with ASTM D1248, 30-volt rating or approved equal. Include the tracer wire in the cost of the pipe.
- 14. In the event the pipe becomes stuck during pull-back, cease pulling operations to allow any potential hydro-lock to subside and then commence pulling operations. If the pipe remains stuck, notify the Engineer Owner. The Engineer, Owner, and the Contractor will discuss options and then work will proceed accordingly.
- 15. At all drill pits and directional drilling entrances and exits to the surface, use a backhoe or equivalent to gradually return the bore depth to the prescribed depth.
- 16. Backfill and compact all drill pits and directional drilling entrances and exits to the surface as specified in Section 02220.
- 3.03 Field Quality Control
  - A. Maintain a daily calibration log of the directional drilling head locator. Provide completed forms or computer-generated output to the Engineer on a daily basis for checking line and grade of the drilling operation.
  - B. Dig test/pressure relief holes (potholes) every 25 feet (except within Interstate 70 right-of-way) along the bore route to confirm alignment and grade, and to relieve subsurface pressure.
  - C. Pressure test the installed sewer as specified in Section 02733.

-END-

# SECTION 02275 - GEOCOMPOSITE DRAINAGE LAYER

### PART 1 - GENERAL

- 1.01 Summary
  - A. The work consists of furnishing and installing a Geocomposite Drainage Layer for the Hanna Avenue basins as shown on the Drawings. All work shall be done in strict accordance with the Drawings and Specifications.
  - B. Related Sections
    - 1. Section P-152 Excavation and Embankment
    - 2. Section 02776 Reinforced Polypropylene Liner

#### 1.02 References

- A. American Society for Testing and Materials (ASTM)
  - 1. D1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
  - 2. D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique
  - 3. D1603 Standard Test Method for Carbon Black in Olefin Plastics
  - 4. D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
  - 5. D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
  - 6. D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
  - D4716 Standard Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
  - 8. D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile
  - 9. D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
  - 10. D5035 Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
  - 11. D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
  - 12. D5261 Standard Test Method for Measuring the Mass per Unit Area of Geotextiles
  - 13. D7005 Standard Test Method for Determining the Bond Strength (Ply-Adhesion) of Geocomposites

### 1.03 Definitions

- A. Geocomposite Manufacturer (Manufacturer)- The party responsible for manufacturing the geocomposite rolls.
- B. Geosynthetic Quality Assurance Laboratory (Testing Laboratory)-Party, independent from the Manufacturer and Installer, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing, usually under the direction of the Owner or Engineer.
- C. Installer- Party responsible for field handling, transporting, storing and deploying the geocomposite.
- D. Lot- A quantity of resin (usually the capacity of one rail car) used to manufacture polyethylene geocomposite rolls. The finished rolls will be identified by a roll number traceable to the resin lot.

### 1.04 Submittals

- A. Product data for each manufactured product proposed for use on this Project
- B. Shop Drawings
- C. Samples for each product proposed for use on this Project

### 1.05 Quality Assurance

- A. Manufacturer
  - 1. Manufacturer shall have manufactured a minimum of 10,000,000 square feet of polyethylene geocomposite material during the last year.
- B. Installer
  - 1. Installer shall have installed a minimum of 1,000,000 square feet of geocomposite in the last year.
  - 2. Installer shall have worked in a similar capacity on at least five projects similar in complexity to the project described in the contract documents.
  - 3. The Installation Supervisor shall have worked in a similar capacity on projects similar in size and complexity to the project described in the Contract Documents.
- 1.06 Delivery, Storage and Handling
  - A. Each roll delivered to the site shall be wrapped and labeled by the Manufacturer. The label will identify manufacturer's name, product identification, length, width and roll number.
  - B. Rolls will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 GEOCOMPOSITE DRAINAGE LAYER

- C. The on-site storage location provided shall protect the geonet from abrasions, excessive dirt and moisture. The area shall be level, smooth, dry and adjacent to the area being lined.
- D. Materials shall be handled in such a manner to ensure they are not damaged in any way. The Contractor shall take any necessary precautions to prevent damage to underlying layers during placement of the drainage material.

### 1.07 Warranty

- A. Material shall be warranted against defects for a period of 1-year from the date of the geocomposite installation.
- B. Installation shall be warranted against defects in workmanship for a period of 1year from the date of geocomposite completion.

# PART 2 - PRODUCTS

## 2.01 Manufacturers

A. Subject to compliance with requirements of this Section, provide geocomposite material manufactured by GSE Lining Technology, Inc., Tensar International Corp., or approved equal

# 2.02 Geocomposite Properties

A. The geocomposite specified shall have properties that meet or exceed the values listed in the following table:

Parameter	Test Method	Minimum Average Values			
Geocomposite	·				
Transmissivity (m²/sec)	ASTM D4716- 00 <sup>(a)</sup>	9 x 10 <sup>-4</sup>			
Ply Adhesion (lb/in. minimum)	GRI GC-7	0.5			
Ply Adhesion (lb/in. average)	GRI GC-7	1.0			
Geonet core (prior to lamination)					
Thickness mil (mm)	ASTM D5199	300 (7.6)			
Transmissivity (m²/sec)	ASTM D4716- 00 <sup>(a)</sup>	8 x 10 <sup>-3</sup>			
Density (g/cm <sup>3</sup> )	ASTM D1505	0.94			
Tensile Strength (MD) (lb/in.) (N/mm)	ASTM D5035	45 (7.9)			
Carbon Black Content (%)	ASTM D1603	2.0 - 3.0			
Geotextile (prior to lamination)					
Mass (oz/yd²) (g/m²)		8.0 (270)			
Thickness (mil) (mm)	ASTM D5199	90 (2.2)			
Grab Tensile (lb) (N)	ASTM D4632	220 (975)			
Puncture Strength (lb) (N)	ASTM D4833	135 (600)			
AOS, US sieve (mm)	ASTM D4751	80 (0.15)			
Flow Rate (gpm/ft <sup>2</sup> )(lpm/m <sup>2</sup> )	ASTM D4491	90 (3675)			

B. Resin

1. Resin shall be new first quality, compounded polyethylene resin.

GEOCOMPOSITE DRAINAGE LAYER

2. Natural resin (without carbon black) shall meet the following additional minimum requirements:

### Table 02621-3 – Sample Table

Property	Test Method	Value
Density (g/cm3)	ASTM D 1505	>0.94
Melt Flow Index (g/10 min)	ASTM D 1238	<u>&lt; 1.0</u>

- 2.03 Manufacturing Quality Control
  - A. The geocomposite shall be manufactured in accordance with the Manufacturer's Quality Control Plan submitted to the Engineer.
  - B. The geocomposite shall be tested according to the test methods and frequencies listed below:

### Table 02621-4 Manufacturing Quality Control Test Frequencies

Characteristics	Test Method	Units	FREQUENCY
			Bi-Planar
Resin			
Polymer Density	ASTM D 1505	g/cm <sup>3</sup>	Once Per Lot
Melt Flow Index	ASTM D 1238	g/10 min	Once Per Lot
Geonet Test			
Carbon Black	ASTM D 1603	%	1/50,000 ft <sup>2</sup>
Tensile Strength, MD	ASTM D 5035	lb/ ft	1/50,000 ft <sup>2</sup>
Density	ASTM D 1505	g/cm <sup>3</sup>	1/50,000 ft <sup>2</sup>
Geotextile Tests			
Mass per Unit Area	ASTM D 5261	oz/yd <sup>2</sup>	1/90,000 ft <sup>2</sup>
Grab Tensile	ASTM D 4632	lb	1/90,000 ft <sup>2</sup>
Puncture	ASTM D 4833	lb	1/90,000 ft <sup>2</sup>
AOS, US Sieve	ASTM D 4751	mm	1/540,000 ft <sup>2</sup>
Water Flow Rate	ASTM D 4491	gpm/ft <sup>2</sup>	1/540,000 ft <sup>2</sup>
UV Resistance	ASTM D 4355	% retained	Once per resin formulation
	(after 500 hours)		
Geocomposite Tests			
Ply Adhesion	ASTM D7005	lb/in	1/50,000 ft <sup>2</sup>
Transmissivity	ASTM D 4716	m²/sec	1/540,000 ft <sup>2</sup>

### PART 3 - EXECUTION

### 3.01 General

A. Prior to implementing any of the work in the Section to be lined, carefully inspect the installed work of all other Sections and verify that all work is complete to the point where the installation of the Geocomposite material may properly commence without adverse impact.

- 3.02 Installation
  - A. The geocomposite roll should be installed in the direction of the slope and in the intended direction of flow. If the project contains long, steep slopes, special care should be taken so that only full length rolls are used at the top of the slope.
  - B. In the presence of wind, all geocomposites shall be weighted down with sandbags or the equivalent. Such sandbags shall be used during placement and remain until replaced with cover material.
- 3.03 Seams and Overlaps
  - A. Each component of the geocomposite will be secured or seamed to the like component at overlaps.
  - B. Geonet Components
    - 1. Adjacent edges of the geonet along the length of the geocomposite roll shall be placed with the edges of each geonet butted against each other.
    - 2. The overlaps shall be joined by tying the geonet structure with cable ties. These ties shall be spaced every 5 feet along the roll length. The top geotextiles shall also be fully overlapped and sewn or thermally bonded to prevent separation, extending to the edge of the geocomposite in the anchor trench.
    - 3. Adjoining geocomposite rolls (end to end) across the roll width shall be shingled down in the direction of the slope, with the geonet portion of the top overlapping the geonet portion of the bottom geocomposite a minimum of 12 inches across the roll width.
    - 4. The geonet portion should be tied every 6 inches in the anchor trench or as specified by the Engineer.

### 3.04 Repair

- A. Prior to covering the deployed geocomposite, each roll shall be inspected for damage resulting from construction.
- B. Any rips, tears or damaged areas on the deployed geocomposite shall be removed and patched. The patch shall be secured to the original geonet by tying every 6 inches with the approved tying devices. If the area to be repaired is more than 50 percent of the width of the panel, the damaged area shall be cut out and the two portions of the geonet shall be cut out and the two portions of the geonet shall be cut out and the two portions of the geonet shall be joined in accordance with Subsection 3.03.

-END-

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 GEOCOMPOSITE DRAINAGE LAYER

# SECTION 02350 - MICROPILES

# PART 1 - GENERAL

### 1.1 PURPOSE OF SPECIFICATION

A. The purpose of the specification is to outline the design, labor, equipment, materials and the operations necessary for the successful installation of the micropile system as indicated on drawings.

# 1.2 SCOPE OF WORK

A. The contractor shall examine the project drawings, soil borings and other data to determine the site conditions under which the micropile system will be installed. The contractor shall select the appropriate micropile size and lengths considering the structural loads shown on the drawings and available soil boring data. The contractor shall determine the actual bottom elevations of the micropiles after the load test(s) have been completed.

### 1.3 SYSTEM DESCRIPTION

- A. The micropile system is the self-drilling anchor (SDA). The SDA consists of a fully threaded hollow-core steel bar which can be drilled and grouted into loose or collapsing ground without casing. The SDA acts as a reinforcing element and features a hollow core for transferring the air, water or grout used for drilling. The SDA can be drilled and post grouted or installed using simultaneous drilling and grouting to create the micropile. The SDA is manufactured with a continuous left-hand thread (Rope or Trapezoidal thread) and can be extended by the use of couplings. Standard drilling adapters are used to connect to the rotary percussion drilling equipment. The rotation and impact energy is transferred through the SDA down to the drill bit to advance it through the soil or rock.
- B. The standard bar length of the SDA system is 3 m (9.8 ft). A nominal length of 10 ft is to be used in the estimation of material quantities and contract unit price. The bars shall be manufactured using special fine grain, high alloy, seamless steel tubing. The steel quality and the thread type shall meet and exceed the physical properties and requirements of ASTM A615, grade 75 steel bars.
- C. The grout is injected under pressure (3000 psi minimum) through the hollow-core bar and exits through holes in the sides and bottom of the sacrificed drill bits.
- D. The installation procedure shall be selected based on the anticipated soil conditions. As a minimum, the installation procedure shall allow the installation of the micropile by stabilizing the drill hole, penetrate and improve the surrounding soil with grout, and remove cuttings from around the bar as the micropile is advanced to its planned length.

### 1.4 DESIGN REQUIREMENTS

A. The micropile system shall be designed by a Professional Engineer, retained by the Contractor, registered in the State of the project with not less than five (5) years of

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

experience in such construction. The micropile designer shall prepare detailed documents for the proposed systems and shall sign and seal all documents complying with the regulations of the State. The micro-pile designer shall be responsible for the following:

- 1. Design and selection of micropile diameter and length in accordance with applicable building codes. If no code is specified, the design of the micropile shall be designed in accordance with the publication FHWA NHI-05-039, December 2005 "Micropile Design and Construction Guidelines."
- 2. Provide the design of the micropile to foundation connection based on the loads shown on the project plans.
- 3. Provide the final grout mix design.
- 4. Verify the installation procedure and equipment.
- B. Micropile System:
  - 1. The micropile system shall be designed to support the vertical and/or horizontal loads shown on the plans in compliance with the applicable design code. Micropiles shall terminate in the pile caps as shown on structural plans.
  - 2. Loads and deflection limits for the micropile system:
    - a. Refer to structural plans for schedule of loads.
    - b. Maximum vertical deflection under full service load: 1 in.
    - c. Maximum differential deflection between any two piles:  $\frac{1}{2}$  in.

### 1.5 QUALITY CONTROL

- A. Reference Standards:
  - 1. American Petroleum Institute (API).
  - 2. ASTM International (ASTM).
  - 3. FHWA NHI-05-039, December 2005, "Micropile Design and Construction Guidelines".
- B. Testing, Laboratory, Inspection and Field Supervision:
  - 1. All grout used in conjunction with the micropile work shall be in accordance with the requirements of the mix design.
  - 2. The micropile system shall be installed under the direct supervision of a qualified inspector, employed by the Contractor.

- 3. An accurate record shall be kept of each micropile installation. Records shall show top and bottom elevations, drilling time, amount of grout, size of bar, diameter and type of drill bit used. Records shall be made and signed by the project foreman/superintendent and the inspector and distributed to the engineer of record on a daily basis.
- C. Subsurface Soil Data:
  - 1. A subsurface soil investigation is critical for the accurate design of the micropile system. If a subsurface soil investigation is not included as part of the project scope, the contractor shall be responsible for obtaining the necessary soil data for the contractor's professional engineer to design the micropile system. As a minimum the soil borings should be extended such that they exceed the maximum anticipated length of the micropile system.
  - 2. Where a subsurface soil investigation has been provided by the Owner, this investigation may be used by the contractor and contractor's professional engineer to design the micropile system. The scope of the subsurface investigation report does not represent all conditions that may be encountered. If the provided subsurface investigation report is not adequate for an accurate design of the micropile system, the contractor shall be responsible for developing design conclusions and/or for obtaining any other necessary soil information necessary.

# 1.6 MICROPILE CONTRACTOR'S EXPERIENCE REQUIREMENTS AND SUBMITTALS

- A. The micropile contractor shall be experienced in the construction and load testing of micropiles and have at least 2 years of experience and constructed at least five projects of similar size and capacity to those required in these plans and specifications. If the contractor does not have adequate experience, the contractor may employ the micropile manufacturer or manufacturer's representative to train and certify the contractor as experienced in the installation of the micropile system for the scope of the project. This may require the manufacturer's representative to be present on site during the micropile installation.
- B. The on-site foremen and drill rig operators shall also have experience on at least three projects over the past 5 years installing the micropile system.
- C. The micropile design engineer may be either an employee of the contractor or a separate consultant design engineer meeting the stated experience requirements.
- D. Work shall not be started, nor materials ordered, until the Engineer's written approval of the contractor's experience qualifications is given. The engineer may suspend the work if the contractor uses non-approved personnel. If work is suspended, the contractor shall be fully liable for all resulting costs and no adjustment in contract time will result from the suspension.

# 1.7 SUBMITTALS

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- A. Shop Drawings:
  - 1. Shop drawings showing complete details of the installation, including, but not limited to:
    - a. Number and spacing of micropiles,
    - b. Micropile numbering plan.
    - c. Micropile size, type, strength and manufacturer.
    - d. Pile-to-footing connection details.
  - 2. Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to assure quality control. This step-by-step procedure shall be shown on the working drawings in sufficient detail to allow the engineer of record to monitor the construction and quality of the micropiles.
    - a. Information on headroom and space requirements for installation equipment that verify the proposed equipment can perform at the site.
    - b. Plan for the placement of concrete and reinforcing steel in cold weather.
  - 3. Proposed start date, time schedule, and micropile installation schedule providing the following:
    - a. Micropile Number.
    - b. Micropile Design Load.
    - c. Type and Size of Reinforcing Steel.
    - d. Minimum Grouted Length.
    - e. Total Micropile Length.
  - 4. Proposed Grouting Plan. The grouting plan shall include complete descriptions, details, and supporting calculations for the following:
    - a. Grout mix design and type of materials to be used in the grout, including certified test data and trial batch reports.
    - b. Methods and equipment for accurately monitoring and recording the grout depth, grout volume and grout pressure as the grout is being placed.
    - c. Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout may be submitted for initial verification, acceptance and start of production work. During production, grout shall be tested in accordance with applicable ASTM standards.
    - d. Procedure and equipment for Contractor monitoring of grout quality.
  - 5. Detailed plans for the proposed micropile load testing method.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

a. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity, equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads, and pile top movements in accordance with Pile Load Test Section.

# B. Calculations

- 1. Complete design calculations shall include but not be limited to the following items:
  - a. A written summary report which describes the overall micropile design.
  - b. Applicable code requirements and design references.
  - c. Critical design cross-section(s) geometry including soil / rock strata, piezometric levels and location, magnitude and direction of design, applied loadings including slope or external surcharge loads.
  - d. Design criteria, including soil / rock shear strengths (friction angle and cohesion), unit weights, ground-grout bond values and micropile drill hole diameter assumptions for each soil / rock strata.
  - e. Factors of safety and allowable stresses used in the design on the groundto-grout bond values, surcharges, soil / rock and material unit weights, steel, grout, and concrete materials.
  - f. Design calculation sheets (both static and seismic (if required)) with the project number, micropile structure location, designation, date of preparation, initials of designer and checker and page number at the top of each page. Provide an index page with the design calculations.
  - g. Design notes, including an explanation of any symbols and computer programs used in the design.
  - h. Pile-to-footing connection calculations.
- D. Certifications
  - 1. Experience certification for installing contractor and micropile designer.
    - a. Project reference list shall include a brief project description with the owner's name, current phone number and load test reports.
    - b. The personnel list shall identify the micropile system design engineer (if applicable), supervising project engineer, drill rig operators, and on-site foremen to be assigned to the project.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- c. The personnel list shall contain a summary of each individual's experience for the Engineer to determine whether each individual satisfies the required qualifications.
- 2. Submit the proposed welding procedure, including a test weld to qualify procedure, by a qualified welding specialist.
- 3. Certified mill test reports for the reinforcing steel or coupon test results for permanent casing without mill certification. The ultimate strength, yield strength, elongation, and material properties composition shall be included. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.
- E. Installation and Test Reports
  - 1. Details of proposed methods for testing and monitoring the installation.
  - 2. Records showing the exact details of the micropiles as installed, including steel and grout certifications and records.
  - 3. Calibration reports and data for each test jack, pressure gauge, master pressure gauge, and electronic load cell to be used. The calibration tests shall be performed by an independent testing laboratory, and tests shall have been performed within 90 calendar days of the date submitted. Testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge, and electronic load cell calibration data.
  - 4. Pile report indicating the following:
    - a. Micropile number
    - b. Date of installation
    - c. Drilling time
    - d. Tip and cutoff elevations
    - e. Quantity of grout used
    - f. Size of bar
    - g. Type and diameter of drill bit used

# PART 2 - EQUIPMENT AND MATERIALS

# 2.1 DRILLING

- A. A hydraulic rotary or rotary/percussion drill shall be selected to accommodate the selected bar size, drill bit, and drilling conditions.
- B. Type of drill selected should be appropriate for the anticipated soil conditions to be encountered at the project site.
- 2.2 GROUT MIXER AND PUMP
  - A. High shear colloidal mixer with separate holding tank and water and cement dosing system to assure continuous grouting independent from mixing.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

# 2.3 STRESSING JACK FOR TESTING

- A. A Calibrated hollow ram jack with a load capacity of at least 80% of the gross ultimate SDA bar rating. The hollow ram jack should utilize a pressure gauge with a load capacity of at least the ultimate capacity of the bar with a maximum increment scale of 100 psi.
- B. Dial gauges accurate to 0.001" shall be used for monitoring the movement of the pile/anchor and the elongation of the bar during load testing.

# 2.4 MATERIALS

- A. Hollow Bars and Accessories:
  - 1. Nominal length of bar = 10 ft. Allow bar to meet or exceed ASTM A615 requirements.
  - 2. Detailed design and bar strength information may be found on the manufacturer's product information sheets.
- B. Reinforcing Bars:
  - 1. If used, reinforcing steel shall be deformed bars in accordance with ASTM A615, of appropriate grade. When a bearing plate and nut are required to be threaded onto the top end of the reinforcing bars for the pile top-to-footing anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, the next larger bar number designation from that shown on the plans shall be provided at no additional cost. Bar tendon couplers, if required, shall develop the ultimate tensile strength of the bars without evidence of any failure.
- C. Centralizers and Spacers:
  - 1. Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used.

# 2.5 GROUT

- A. Selection of the grout proportions is the responsibility of the contractor. The following minimum grout properties and material shall be confirmed by the contractor's micropile design engineer.
- B. Grout mix shall be a neat cement grout, using Portland Cement Type I, II, or III conforming to ASTM C150. The grout shall be prepared with a water/cement ratio (W/C) equal to 0.70 for drilling and flushing. A W/C equal to 0.44 is recommended for final grout. An approved drilling fluid may be used in lieu of the W/C = 0.7 drilling and

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

flushing grout. Final grout (W/C = 0.44) to have a minimum 28-day strength of 3,000 psi. An approved drilling fluid may be used in lieu of the drilling and flushing grout. The use of drilling fluid containing bentonite is not allowed.

- C. If admixtures are used, details of the admixtures shall be submitted to the engineer of record for approval before the work begins. The use of admixtures shall be in accordance with the manufacturer's instructions.
- D. The grout shall be sampled and tested in accordance with ASTM C109. If the grout cubes do not satisfy the required strength criteria, the contractor shall provide any necessary additional work and corrective means to the micropile installation in accordance with the engineer of record.
- E. The grout shall be sampled with a mud balance scale prior to pumping to verify specific gravity of grout mixture. A target specific gravity correlating to the required 28-day strength shall be calculated prior to mixing grout.

### PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Equipment: Verify all equipment is in good working order prior to starting work. Verify equipment selection is appropriate for the job conditions and site access.
- B. Materials: Have required number of bars counted and stored on site with one coupler placed on each bar. The lead bar shall be equipped with the appropriate drill bit. Verify that the hollow bars are free of dirt & debris inside to prevent blockage during grouting.

### 3.2 MICROPILE ALLOWABLE CONSTRUCTION TOLERANCES

- A. Centerline of piling shall not be more than 2 in. from indicated plan location.
- B. Pile shall be installed to the inclinations shown on the plans within 2 percent of total-length plan alignment.
- C. Top elevation of pile shall be +0.75 in. or -1.75 in. maximum from vertical elevation indicated.
- D. Centerline of reinforcing steel shall not be more than 0.75 in. from indicated location.

### 3.3 INSTALLATION

- A. One step Drilling/Flushing/Grouting:
  - 1. Connect hollow bar to swivel and thread on drill bit.
  - 2. Mix sufficient flushing grout (w/c=0.7) or drilling fluid and pump into holding tank.
  - 3. Start pumping to assure that grout will exit drill bit.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 MICROPILES

SECTION NO. 02350 - 8

- 4. Start rotary drilling while pumping grout continuously out of the holding tank. Grout in holding tank to be agitated throughout. Grout shall flush constantly out of the drill hole.
- 5. Generally advance rotary drilling no faster than 3 to 4 ft per minute using a rotation speed of approximately 60 to 120 RPM. If harder ground, boulders or rock is encountered, use top hammer as well. Raise and lower the bar in and out of the drill hole several times for each 10 ft length of nail or pile installed. If rock is encountered change grout to water flushing or drilling fluid as necessary.
- 6. When final depth is reached, change to final grout (w/c 0.44), under constant rotation and working hollow bars in and out of the drill hole 5 ft to 10 ft while pumping final grout.
- 7. To prevent down drag on piles, install a PVC or steel pipe over the hollow bar in the upper length of the micropile as determined by the geotechnical engineer of record. The pipe can be drilled and installed with the final length of the bar or pushed in using the drilling equipment if the soil conditions allow.
- B. Drilling:
  - 1. The micropile contractor shall select the drilling method, the grouting procedure, and the grouting pressure used for the installation of the micropiles. The micropile contractor shall also verify the final micropile casing size (if applicable), final drill hole diameter and bond length, and central reinforcement steel sizing necessary to develop the specified load capacities and load testing requirements. The micropile contractor is also responsible for estimating the grout take.
    - a. Grout overruns to be the micropile contractor's responsibility up to 1.5 times the calculated volume of the pile; then at unit rate per CYD thereafeter.
    - b. The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to any overlying or adjacent structures or services. The drill hole must be open along its full length to at least the design minimum drill hole diameter prior to placing grout and reinforcement.
    - c. Temporary casing or other approved method of pile drill hole support will be required in caving or unstable ground to permit the pile shaft to be formed to the minimum design drill hole diameter. The Contractor's proposed method(s) to provide drill hole support and to prevent detrimental ground movements shall be reviewed by the engineer of record. Detrimental ground movement is defined as movement which requires remedial repair measures.
    - d. Costs of removal or remedial measures due to encountering

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

unanticipated subsurface obstructions will be paid for as extra work.

- e. If the micropiles are spaced greater than 3 x D (diameter of the pile), they may be installed immediately upon installation completion of the adjacent pile. For micropile spacing closer than 3 x D, the contractor should wait a minimum of 24-hours prior to installing the adjacent micropile.
- 2. Ground Heave, Subsidence and Grout Migration:
  - a. During construction, the contractor shall observe the conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave, subsidence and the migration of grout into the adjacent waterway. Immediately notify the engineer of record if signs of movements are observed.
  - b. Contractor shall immediately suspend or modify drilling or grouting operations if ground heave, subsidence or grout migration is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the engineer of record determines that the movements require corrective action, the contractor shall take corrective actions necessary to stop the movement or perform repairs.
  - c. When due to the contractor's methods or operations or failure to follow the specified /approved construction sequence, as determined by the engineer of record, the costs of providing corrective actions will be responsibility of the contractor. When due to differing site conditions, as determined by the engineer of record, the costs of providing corrective actions will be paid as Extra Work.
- 3. Pipe Casing, Reinforcing Bar Placement and Splicing:
  - a. Reinforcement may be placed either prior to grouting or placed into the grout-filled drill hole before temporary casing (if used) is withdrawn. Surfaces of the reinforcement (bars and casings) shall be free of substances, such as soil, mud, grease or oil that might contaminate the grout or coat the reinforcement and impair bond. Pile cages and reinforcement groups, if used, shall be sufficiently robust to withstand the installation and grouting process and the withdrawal of the drill casings without damage or disturbance.
  - b. The Contractor shall check pile top elevations and adjust all installed micropiles to the planned elevations.
  - c. Centralizers and spacers (if used) shall be located as required to maintain reinforcement within specified tolerance. However, spacing shall not be greater than 10 ft (maximum). The upper and lower most centralizer shall be located a maximum of 5 ft from the top and bottom

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

of the micropile. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The central reinforcement bars with centralizers shall be lowered into the stabilized drill hole and set. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. The contractor shall re-drill and reinsert reinforcing steel when necessary to expedite installation.

- d. Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axis of the two lengths to be spliced. Splices and threaded joints shall meet the Requirements of Materials Section. Threaded pipe casing joints shall be located at least two casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, the bar splices shall be staggered at least 1 ft.
- 4. Grouting:
  - a. Micropiles shall be primary grouted the same day the load transfer bond length is drilled. The grouting equipment used shall be equipment with a colloidal mixer to produce a grout free of lumps and undispersed cement. The contractor shall have means and methods of measuring the grout quantity. The grout shall be kept in agitation prior to mixing. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation.
  - b. The grout shall be injected from the lowest point possible of the drill hole and injection shall continue until uncontaminated grout flows from the top of the drill hole. The grout may be pumped through grout tubes, casing, or drill rods. Temporary casing, if used, shall be extracted in stages ensuring that after each length of casing is removed, the grout level is brought back up to the ground level before the next length is removed. The grout pressures and grout take shall be controlled to prevent excessive heave or fracturing of rock or soil formations.
  - c. Grout within the micropiles shall be allowed to attain the required design strength prior to being loaded.

# 3.4 TESTING

- A. Grout Testing:
  - 1. Grout within the micropile verification and proof test piles shall attain the minimum required 3-day compressive strength of 1500 psi prior to load testing. Previous test results for the proposed grout mix completed within one year of the start of work may be submitted for initial verification of the required compressive strengths for installation. During production, micropile grout shall be tested by

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

the contractor for compressive strength in accordance with ASTM C109 at a frequency of no less than one set of three 2 in. grout cubes from each grout plant each day of operation or per every 10 piles, whichever occurs more frequently. The compressive strength shall be the average of the three cubes tested.

- 2. Grout consistency, as measured by grout density, shall be determined by the contractor per ASTM C188 or API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout.
- 3. The contractor shall prepare and submit to the engineer of record the full-length installation records for each micropile installed. The records shall be submitted within one work after that pile installation is completed. The data shall be recorded on the contractor's micropile installation log. A separate log shall be provided for each micropile.
- B. Pile Load Tests:
  - 1. Perform verification and proof testing of piles at the locations specified herein and as noted on the Drawings. Perform compression load testing in accord with ASTM D1143 or tension load testing in accord with ASTM D3689.
    - a. Perform a minimum of five (5) proof testing of the piles as noted on the Drawings. These piles are sacrificial piles and should be loaded to 2.0 x specified compression load of the pile.
    - b. Perform a minimum of ten (10) verification testing of the piles as noted on the Drawings. These piles may production piles and should be loaded to 1.0 x specified compression load of the pile.

-END-

# SECTION 02351 – RAMMED AGGREGATE PIERS

### PART 1: GENERAL REQUIREMENTS

#### 1.01 Description

Work shall consist of designing, furnishing and installing Rammed Aggregate Pier foundations to the lines and grades designated on the project foundation plan and as specified herein. The aggregate piers shall be constructed by either augering a cavity or driving a hollow mandrel to the design depth and vertically ramming lifts of aggregate using the specially designed tamper head and high-energy impact densification equipment to create the compacted aggregate pier. The Rammed Aggregate Pier elements shall be in a columnar-type configuration and shall be used to produce an intermediate foundation system for support of foundation loads.

#### 1.02 Work Included

- A. Provision of all equipment, material, labor, and supervision to design and install Rammed Aggregate Pier elements. Design shall rely on subsurface information presented in the project geotechnical report. Layout of Rammed Aggregate Pier elements, spoil removal (as required), footing excavations, and subgrade preparation following aggregate pier installation is not included.
- B. The Rammed Aggregate Pier design and installation shall adhere to all methods and standards described in this Specification.
- 1.03 Approved Installers
  - A. The Rammed Aggregate Pier Installer (the Installer) shall be approved by the Owner's Engineer prior to bid opening. Without exception, no alternate installer will be accepted unless approved by the Owner's Engineer at least two (2) weeks prior to bid opening.
  - B. Installers of Rammed Aggregate Pier foundation systems shall have a minimum of 5 years of experience with the installation of Rammed Aggregate Pier systems and shall have completed at least 50 projects.
  - C. Installers licensed by the Geopier Foundation Company, Inc. (<u>www.geopier.com</u>) will be accepted as approved installer.
  - D. Without exception, no alternate installer will be accepted unless approved by Owner's Engineer and Geopier Foundation Company, Inc.
  - E. Installers currently approved for these works are:

Peterson Contractors, Inc. 104 Blackhawk Street

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 RAMMED AGGREGATE PIERS

SECTION NO. 02351 - 1

P.O. Box A Reinbeck, Iowa 50669 Attn: Alma Dizdarevic Phone: 319-345-2716, ext. 210 Fax: 319-345-2658 e-mail: <u>alma@petersoncontractors.com</u>

Helical Drilling 630 Granite Street, Suite 101 Braintree, MA 02184 Attn: Colin Dahlen Phone: 781-848-2110 Fax: 781-849-2065 e-mail: cdahlen@helicaldrilling.com

GeoConstructors 413 Browning Court Purcellville, VA 20132 Attn: Matt Gradishar Phone: 703-771-9844 Fax: 703-771-9847 e-mail: mgradishar@geostructures.com

PPI Engineering and Construction Services, LLC Attn: Tommy Williamson 920 Memorial City Way, Suite 900 Houston, TX 77024 Phone: 281-381-6209 Email: tommy.williamson@cardno.com

Geopier-Northwest Attn: David VanThiel 40 Lake Bellevue, Suite 100 Bellevue, WA 98005 Phone: 425-646-2995 Email: dvantheil@geopiernorthwest.com

### 1.04 Reference Standards

- A. Design
  - 1. "Control of Settlement and Uplift of Structures Using Short Aggregate Piers," by Evert C. Lawton (Assoc. Prof., Dept. of Civil Eng., Univ. of Utah), Nathaniel S. Fox (President, Geopier Foundation Co., Inc.), and Richard L. Handy (Distinguished Prof. Emeritus, Iowa State Univ., Dept. of Civil Eng.), reprinted from *IN-SITU DEEP SOIL IMPROVEMENT*, *Proceedings of sessions sponsored by the Geotechnical Engineering*

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 RAMMED AGGREGATE PIERS

SECTION NO. 02351 - 2

Division/ASCE in conjunction with the ASCE National Convention held October 9-13, 1994, Atlanta, Georgia.

- 2. "Settlement of Structures Supported on Marginal or Inadequate Soils Stiffened with Short Aggregate Piers," by Evert C. Lawton and Nathaniel S. Fox. *Geotechnical Special Publication No. 40: Vertical and Horizontal Deformations of Foundations and Embankments,* ASCE, 2, 962-974.
- 3. "Behavior of Geopier<sup>®</sup>-Supported Foundation Systems during Seismic Events," by Kord Wissmann, Evert C. Lawton, and Tom Farrell. Geopier Foundation Company, Inc. Blacksburg, VA ©1999.
- B. Modulus and Uplift Testing
  - 1. ASTM D 1143 Pile Load Test Procedures
  - 2. ASTM D 1194 Spread Footing Load Test
  - 3. ASTM D 3689 Static Axial Tensile Load Testing Procedures
- C. Materials and Inspection
  - 1. ASTM D 1241 Aggregate Quality
  - 2. ASTM D 422 Gradation of Soils
- D. Where specifications and reference documents conflict, the Rammed Aggregate Pier Designer shall make the final determination of the applicable document.
- 1.05 Certifications and Submittals
  - A. Design Calculations The Installer shall submit detailed design calculations and construction drawings prepared by the Rammed Aggregate Pier Designer (the Designer) for review and approval by the Owner or Owner's Engineer. All plans shall be sealed by a Professional Engineer in the State in which the project is constructed.
  - B. Professional Liability Insurance The Rammed Aggregate Pier Designer shall have Errors and Omissions design insurance for the work. The insurance policy should provide a minimum coverage of \$3 million per occurrence.
  - C. Modulus and Uplift Test Reports A modulus test(s) and uplift test(s) is performed on non-production Rammed Aggregate Pier elements as required by the Rammed Aggregate Pier Designer to verify the design assumptions. The Installer shall furnish the Contractor a description of the installation equipment, installation records, complete test data, analysis of the test data and verification of the design parameter values based on the modulus test results. The report shall be prepared under direction of a Registered Professional Engineer.
  - D. Daily Rammed Aggregate Pier Progress Reports The Installer shall furnish a complete and accurate record of Rammed Aggregate Pier installation to the

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 RAMMED AGGREGATE PIERS

Owner, Engineer and Contractor. The record shall indicate the pier location, length, volume of aggregate used or number of lifts, densification forces during installation, and final elevations or depths of the base and top of piers. The record shall also indicate the type and size of the installation equipment used, and the type of aggregate used. The Installer shall immediately report any unusual conditions encountered during installation to the Owner, Engineer and Contractor, to the Designer and to the Testing Agency.

### PART 2: MATERIALS

### 2.01 Aggregate

- A. Aggregate used by the Rammed Aggregate Pier Installer for pier construction shall be pre-approved by the Designer and shall demonstrate suitable performance during modulus testing. Typical aggregate consists of Type 1 Grade B in accordance with ASTM D-1241-68, No. 57 stone, recycled concrete or other graded aggregate approved by the Designer.
- B. Potable water or other suitable source shall be used to increase aggregate moisture content where required. The Contractor shall provide such water to the Installer.
- 2.02 Uplift Anchors
  - A. Uplift anchor material used in Rammed Aggregate Pier construction shall be approved by the Designer and demonstrate the ultimate uplift demand requirements during the uplift test. Suitable corrosion protection needs to be included. Materials shall be as specified in the Design Submittal.

# PART 3: DESIGN REQUIREMENTS

- 3.01 Rammed Aggregate Pier Design
  - A. The design of the Rammed Aggregate Pier system shall be based on the service load bearing pressure and the allowable total and differential settlement criteria of all footings indicated by the design team for support by the Rammed Aggregate Pier system. Rammed Aggregate Pier elements containing uplift anchors shall be included at specified locations to provide foundation uplift resistance. The Rammed Aggregate Pier system shall be designed in accordance with generally-accepted engineering practice and the methods described in Section 1 of these Specifications. The design life of the structure shall be 50 years.
  - B. The design shall meet the following criteria.

Maximum Allowable Bearing Pressure for Footings supported by Rammed Aggregate Pier Reinforced Soils 4,000

4,000 psf

STORMWATER & DEICING CAPACITY PROJECTS RAMMED AGGREGATE PIERS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 SECTION NO. 02351 - 4

Maximum Compression Force per Rammed Aggregate Pier	125 kips (as indicated on	s / 75 kips drawings)
Estimated Total Long-Term Settlem	≤ 1-inch	
Estimated Long-Term Differential S Adjacent Footings:	≤ ½-inch	
Allowable Uplift Capacity:		45 kips

C. The Rammed Aggregate Pier elements shall be designed using a Rammed Aggregate Pier stiffness modulus to be verified by the results of the modulus test described in Section 5.02 of these specifications.

### 3.02 Design Submittal

The Installer shall submit detailed design calculations, construction drawings, and shop drawings, (the Design Submittal), for approval at least 3 week(s) prior to the beginning of construction. A detailed explanation of the design parameters for settlement calculations and uplift resistance shall be included in the Design Submittal. Additionally, the quality control test program for Aggregate Pier system, meeting these design requirements, shall be submitted. All computer-generated calculations and drawings shall be prepared and sealed by a Professional Engineer, licensed in the State or Province where the piers are to be built. Submittals will be submitted electronically only unless otherwise required by specific submittal instructions.

### PART 4: EXECUTION

4.01 Approved Installation Procedures

The following sections provide general criteria for the construction of the Rammed Aggregate Pier elements. Unless otherwise approved by the Designer, the installation method used for Rammed Aggregate Pier construction shall be that as used in the construction of the successful modulus test.

- A. Augered Rammed Aggregate Pier systems
  - 1. Augered Rammed Aggregate Pier system shall be pre-augered using mechanical drilling or excavation equipment.
  - 2. If cave-ins exceeding 10% of the lift volume occur during excavation such that the sidewalls of the hole are deemed to be unstable, steel casing shall be used to stabilize the cavity or a displacement Rammed Aggregate Pier system may be used.
  - 3. Aggregate shall be placed in the augered cavity in lift thicknesses as determined by the Rammed Aggregate Pier Designer.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 RAMMED AGGREGATE PIERS

- 4. A specially-designed beveled tamper and high-energy impact densification apparatus shall be employed to densify lifts of aggregate during installation. The apparatus shall apply direct downward impact energy to each lift of aggregate. Compaction equipment that induces horizontal vibratory energy (such as Vibroflot equipment) is not permitted.
- 5. Uplift anchors shall be installed at depths and locations specified in the Design Submittal.
- 6. Rammed aggregate piers may be installed immediately upon installation completion of the adjacent pier.
- 4.02 Plan Location and Elevation of Rammed Aggregate Pier Elements

The as-built center of each pier shall be within 6 inches of the locations indicated on the plans. Piers installed outside of the above tolerances and deemed not acceptable shall be rebuilt at no additional expense to the Owner.

4.03 Rejected Rammed Aggregate Pier Elements

Rammed Aggregate Pier elements installed beyond the maximum allowable tolerances shall be abandoned and replaced with new piers, unless the Designer approves the condition or provides other remedial measures. All material and labor required to replace rejected piers shall be provided at no additional cost to the Owner, unless the cause of rejection is due to an obstruction or mislocation.

# PART 5: QUALITY CONTROL

5.01 Control Technician

The Installer shall have a full-time, on-site Control Technician to verify and report all installation procedures. The Installer shall immediately report any unusual conditions encountered during installation to the Rammed Aggregate Pier Designer, the Contractor, the Engineer and to the Testing Agency.

5.02 Rammed Aggregate Pier Modulus Test

As required by the RAP designer, a Rammed Aggregate Pier Modulus Test(s) will be performed at locations agreed upon by the Rammed Aggregate Pier Designer and the Testing Agency to verify or modify Rammed Aggregate Pier designs. Modulus Test Procedures shall utilize appropriate portions of ASTM D 1143 and ASTM D 1194, as outlined in the Rammed Aggregate Pier design submittal.

5.03 Rammed Aggregate Pier Uplift Test

As required by the RAP designer, a Rammed Aggregate Pier Uplift Test(s) will be performed at a location agreed upon by the Rammed Aggregate Pier Designer and the

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 RAMMED AGGREGATE PIERS

SECTION NO. 02351 - 6

Owner's Testing Agency to verify or modify Rammed Aggregate Pier uplift designs. Uplift Test Procedures shall utilize appropriate portions of ASTM D 3687, as outlined in the Rammed Aggregate Pier design submittal.

5.04 Bottom Stabilization Testing (BSTs) / Crowd Stabilization Testing (CSTs)

Bottom stabilization testing (BSTs) or Crowd stabilization testing (CSTs) shall be performed by the Control Technician during the installation of the modulus test pier. Additional testing as required by the Rammed Aggregate Pier Designer shall be performed on selected production Rammed Aggregate Pier elements to compare results with the modulus test pier.

- PART 6: QUALITY ASSURANCE
- 6.01 Contractor's Testing Agency

The Rammed Aggregate Pier Installer shall provide full-time monitoring of Rammed Aggregate Pier construction activities. The Contractor is responsible for retaining an independent engineering testing firm to provide Quality Control services.

- 6.02 Responsibilities of Independent Engineering Testing Agency
  - A. The Testing Agency shall monitor the modulus test pier installation and testing. The Installer shall provide and install all dial indicators and other measuring devices.
  - B. The Testing Agency shall monitor the installation of Rammed Aggregate Pier elements to verify that the production installation practices are similar to those used during the installation of the modulus test elements.
  - C. The Testing Agency shall report any discrepancies to the Installer, Contractor and Engineer immediately.
  - D. The Testing Agency shall observe the excavation, compaction and placement of the foundations as described in Section 7.05. Dynamic Cone Penetration testing may be performed to evaluate the footing bottom condition as determined by the Testing Agency.

# PART 7: RESPONSIBILITIES OF THE CONTRACTOR

- 7.01 Site Preparation and Protection
  - A. The Contractor shall locate and protect underground and aboveground utilities and other structures from damage during installation of the Rammed Aggregate Pier elements.
  - B. Site grades for Rammed Aggregate Pier installation shall be within 1 foot of the top of footing elevation or finished grade elevation to minimize Rammed

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 RAMMED AGGREGATE PIERS

Aggregate Pier installation depths. Ground elevations and bottom of footing elevations shall be provided to the Rammed Aggregate Pier Installer in sufficient detail to estimate installation depth elevations to within 3 inches.

- C. The Contractor will provide site access to the Installer, after earthwork in the area has been completed. A working surface shall be established and maintained by the Contractor to provide wet weather protection of the subgrade and to provide access for efficient operation of the Rammed Aggregate Pier installation.
- D. Prior to, during and following Rammed Aggregate Pier installation, the Contractor shall provide positive drainage to protect the site from wet weather and surface ponding of water.
- E. If spoils are generated by Rammed Aggregate Pier installation, spoil removal from the Rammed Aggregate Pier work area in a timely manner to prevent interruption of Rammed Aggregate Pier installation is required.
- 7.02 Rammed Aggregate Pier Layout

The location of Rammed Aggregate Pier-supported foundations for this project, including layout of individual Rammed Aggregate Pier elements, shall be marked in the field using survey stakes or similar means at locations shown on the drawings.

7.03 Owner's Independent Testing Agency (Owner's Quality Assurance)

The Owner is responsible for acquiring an Independent Testing Agency (Quality Assurance) as required. Testing Agency roles are as described in Part 6 of this specification. The Aggregate Pier Installer will provide Quality Control services as described in Part 5 of this specification.

- 7.04 Excavations of Obstructions
  - A. Should any obstruction be encountered during Rammed Aggregate Pier installation, the Contractor shall be responsible for promptly removing such obstruction, or the pier shall be relocated or abandoned. Obstructions include, but are not limited to, boulders, timbers, concrete, bricks, utility lines, etc., which shall prevent placing the piers to the required depth, or shall cause the pier to drift from the required location.
  - B. Dense natural rock or weathered rock layers shall not be deemed obstructions, and piers may be terminated short of design lengths on such materials.
- 7.05 Utility Excavations

The Contractor shall coordinate all excavations made subsequent to Rammed Aggregate Pier installations so that excavations do not encroach on the piers as shown in the Rammed Aggregate Pier construction drawings. Protection of completed Rammed Aggregate Pier elements is the responsibility of the Contractor. In the event that utility

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 RAMMED AGGREGATE PIERS

excavations are required in close proximity to the installed Rammed Aggregate Pier elements, the Contractor shall contact the Rammed Aggregate Pier Designer immediately to develop construction solutions to minimize impacts on the installed Aggregate Pier elements.

- 7.06 Footing Bottoms
  - A. Excavation and surface compaction of all footings shall be the responsibility of the Contractor.
  - B. Foundation excavations to expose the tops of Rammed Aggregate Pier elements shall be made in a workman-like manner, and shall be protected until concrete placement, with procedures and equipment best suited to (1) avoid exposure to water, (2) prevent softening of the matrix soil between and around the Rammed Aggregate Pier elements before pouring structural concrete, and (3) achieve direct and firm contact between the dense, undisturbed Rammed Aggregate Pier elements and the concrete footing.
  - C. All excavations for footing bottoms supported by Rammed Aggregate Pier foundations shall be prepared in the following manner by the Contractor. Recommended procedures for achieving these goals are to:
    - 1. Limit over-excavation below the bottom of the footing to 3-inches (including disturbance from the teeth of the excavation equipment).
    - 2. Compaction of surface soil and top of Rammed Aggregate Pier elements shall be prepared using a motorized impact compactor ("Wacker Packer," "Jumping Jack," or similar). Sled-type tamping devices shall only be used in granular soils and when approved by the designer. Loose or soft surficial soil over the entire footing bottom shall be recompacted or removed, respectively. The surface of the aggregate pier shall be recompacted prior to completing footing bottom preparation.
    - 3. Place footing concrete immediately after footing excavation is made and approved, preferably the same day as the excavation. Footing concrete must be placed on the same day if the footing is bearing on moisture-sensitive soils. If same day placement of footing concrete is not possible, open excavations shall be protected from surface water accumulation. A lean concrete mud-mat may be used to accomplish this. Other methods must be pre-approved by the Designer.
  - D. The following criteria shall apply, and a written inspection report sealed by the Owner's Testing Agency and shall be furnished to the Installer to confirm:
    - 1. That water (which may soften the unconfined matrix soil between and around the Rammed Aggregate Pier elements, and may have detrimental effects on the supporting capability of the Rammed Aggregate Pier reinforced subgrade) has not been allowed to pond in the footing excavation at any time.

- 2. That all Rammed Aggregate Pier elements designed for each footing have been exposed in the footing excavation.
- 3. That immediately before footing construction, the tops of Rammed Aggregate Pier elements exposed in each footing excavation have been inspected and recompacted as necessary with mechanical compaction equipment.
- 4. That no excavations or drilled shafts (elevator, etc) have been made after installation of Aggregate Pier elements within the excavation limits described in the Rammed Aggregate Pier construction drawings, without the written approval of the Installer or Designer.
- E. Failure to provide the above inspection and certification by the Testing Agency, which is beyond the responsibility of the Rammed Aggregate Pier Installer, may void any written or implied warranty on the performance of the Rammed Aggregate Pier system.

-END-

SECTION NO. 02351 - 10

# SECTION 02503 - PRESTRESSED CONCRETE CYLINDER PIPE AND FITTINGS

PART 1 - GENERAL

- 1.01 Summary
  - A. Section Includes: Requirements for design and providing prestressed concrete cylinder pipe and fittings, including all necessary jointing facilities and materials, specials, adapters and other appurtenances.
  - B. Related Sections:
    - 1. Section 02220 Trenching, Backfilling and Compaction for Utilities
    - 2. Section 02720 Storm Sewer Systems

### 1.02 References

- A. American Society for Testing and Materials (ASTM), latest editions
  - 1. ASTM A 36 Specification for Carbon Structural Steel
  - 2. ASTM A193 Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Application
  - 3. ASTM A194 Carbon and Alloy Steel Nuts for Bolts for High Pressure or Temperature Service or Both
  - 4. ASTM A648 Specification for Steel Wire, Hard-Drawn for Prestressed Concrete Pipe
  - 5. ASTM C150 Specification for Portland Cement
- B. American Water Works Association (AWWA), latest editions
  - 1. AWWA C301 Prestressed Concrete Pressure Pipe, Steel Cylinder Type, or Water and Other Liquids
  - 2. AWWA C304 Design of Prestressed Concrete Cylinder Pipe
  - 3. AWWA M9 Concrete Pressure Pipe
- C. The Society for Protective Coatings (SSPC), latest editions
  - 1. SSPC Manual Steel Structures Painting Council Manual
  - 2. SSPC SP 6 Commercial Blast Cleaning Standard

- 1.03 System Description
  - A. Manufacturing and Design Standards: Provide either lined cylinder or embedded cylinder prestressed concrete cylinder pipe and fittings designed in accordance with AWWA C304 and manufactured in accordance with AWWA C301. Provide fittings designed in accordance with AWWA C301 and the AWWA Manual M9.
    - 1. Design for external loads and internal pressures as follows:
      - a. External load shall be designed for dead load shown on the profile drawings measured from the pipe centerline with 60-degree Olander bedding angle (Type R3 bedding), using the Marston unlimited trench width condition and the following soil characteristics:
        - 1) Soil Weigh: 120 pounds per cubic foot
        - 2) Kµ': 0.19
        - 3) r<sub>sd</sub>p: 0.50
      - b. Internal working pressure = 15 psi
    - 2. Design the pipe in accordance with AWWA C304.

### 1.04 Submittals

- A. The Contractor is solely responsible for the accuracy of all data submitted. The submission of engineering data does not relieve the Contractor of his responsibility to furnish pipe complying in every respect with the requirements of these specifications.
- B. Submit the following shop drawings and design information.
  - 1. Catalog data for pipe, fittings, joints, and gaskets.
  - 2. Fully dimensioned drawings of piping layouts, including fittings, couplings, sleeves, valves, outlets, supports and anchors. Label pipe size, materials, type and class on drawings. Include the limits of each reach of restrained joints. Provide cross sections showing elevations of pipe, fittings, bevels, and all specials. Where special designs or fittings are required, show the Work in large detail and completely describe and dimension all items.
  - 3. A list and technical information on all materials and equipment required to install the pipe and fittings, including the grout bands.
  - 4. Design calculations signed and sealed by a Professional Engineer licensed to practice in the State of Indiana.
  - 5. Pipe installation schedule indicating the sequence for laying the pipe, fittings, bevels, and specials, with centerline elevations and stationing at transition points.
  - 6. Written and illustrated pipe installation and repair instructions.
- 1.05 Quality Control
  - A. Provide and pay for the services of an Independent Testing Consultant to witness and certify all Shop Tests on production pipe as specified. Submit the name of the Independent Testing Consultant and identify key personnel to be
involved in witnessing tests and inspecting pipe including their qualifications and experience to provide these services.

- 1. Submit welder qualification certificates prior to fabrication of pipe.
- 2. Submit results of Shop Tests on production pipe.
- 3. A notarized affidavit of compliance stating that the pipe and fittings being furnished for this Contract were manufactured, inspected, and tested in accordance with the standards specified herein, and that the material and manufacturing test results on the pipe and fittings being furnished for this Contract were in every case acceptable.
- 1.06 Quality Assurance
  - A. Provide Owner notice of commencement of pipe manufacture. The Owner has the right to inspect and to witness any tests being performed by the manufacturer or other material suppliers relative to the pipe being produced.

### PART 2 - PRODUCTS

#### 2.01 Manufacturers

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
  - 1. Prestressed Concrete Cylinder Pipe and Fittings
    - a. Thompson Pipe Group

## 2.02 Materials

- A. Pipe and Fittings: Manufacture pipe and fittings conforming to AWWA C301.
  - 1. Do not supply pipe from inventory.
  - 2. Connecting Pieces and Special Fittings:
    - a. Provide a prestressed concrete cylinder pipe fitting for connecting to the structures and other piping systems shown on the drawings.
    - b. Provide special fittings, where required, that have the same diameters and thicknesses as standard fittings, but their laying lengths and other functional dimensions are determined by their positions in the pipeline and by the particular piping materials to which they connect.
  - 3. Use ASTM C150, Type II Cement for the core, slurry, mortar coating and authorized repairs. Do not use cement replacement materials or admixtures.
  - 4. Steel Reinforcement: Use not less than No. 6 gauge wire reinforcing conforming to the requirements of ASTM A648, Class II or III. Do not use wire with corrosion pitting visible under a 10X microscope.
  - 5. Steel Cylinders: Use steel cylinders hot rolled out of not less than No. 16 gauge steel.
  - 6. Marking: Mark each length of straight pipe and each special on the interior pipe surface within 6 inches of the bell end to identify the design pressure, manufacture date, production control number and cross reference to the

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 PRESTRESSED CONCRETE CYLINDER PIPE AND FITTINGS laying schedule. Stamp the manufacturer's control number or serial number unique to each section of pipe into the metal on the end of the spigot ring when production has begun. For beveled pipe, mark the degrees of bevel and the top of pipe. Mark bends to show the angle turned.

- 7. Joint Rings: Bell and spigot joint rings shall be steel, deep joint, selfcentering type, as specified in AWWA C301. Surfaces of the joint rings that will be exposed after fabrication is complete shall receive a zinc-metalized coating of 4 mils thickness (0.004").
- 8. Fittings: Manufacture fittings to standard dimensions unless shown or specified otherwise. Furnish fittings in conformance with AWWA C301, except as noted otherwise herein.
  - a. Provide welds that are at least the thickness of the thinner section to be joined.
  - b. Before rolling or forming longitudinal edges, lap break all plates by a continuous rolling operation or form in a press having dies machined to proper radius. Exert sufficient pressure during the lap breaking operation to secure a uniform curve at the edges of the plate. Roll or press-form the plates to the specified diameter.
  - c. Remove all scale and other foreign matter accumulating on the plate during rolling and forming operation by air blast so as not to be rolled or pressed into the surface of the plate. Complete all rolling and forming prior to making butt welds.
  - d. Do not form angles by heating or hammer. Prior to welding using fillet welds, closely fit the plates to be welded; and hold firmly together during welding.
  - e. Tack weld or clamp in place in proper alignment the edges of the butt joints and so hold throughout the welding process. Do not use dogs, clips, lugs or equivalent devices welded to the steel plate for the purpose of forcing it into position.
  - f. Prior to welding, clean the surfaces of all plates and members to be welded of all scale and rust for a distance of not less than 1 inch and of all oil or grease for a distance of not less than 3 inches from the welding edge on both sides of the plates in the case of butt joints.
  - g. Remove grease or oil by approved means. Do not use kerosene or any heavier petroleum solvent for removal of grease or oil. When it is necessary to deposit metal over a previously welded surface, remove scale, slag or welding flux with a roughing tool, chisel, air chipping hammer, or other means.
  - h. Where butt-welded joints are used, align edges to be jointed to ensure complete penetration and fusion at the bottom of the joint. Do not exceed 1/16 inch offset in abutting edges at circumferential seams and 1/32 inch at longitudinal seams.
  - i. Grind all butt welds for both hand and automatic welding out to sound metal before welding reverse side.
  - j. Weld longitudinal seams before girth seams. Provide full strength, ductile welds made with a technique which will ensure uniform distribution of load throughout the welded section.
  - k. Produce complete fusion of the plates, free from unsound metal, pinholes, and cracks at all welded joints.

- I. Provide welded joints with finish that is uniform, smooth, and free from grooves, depressions, burrs and other irregularities. No valley or undercut in the center or edges of any weld is allowed.
- m. Provide a mounting diameter for welding-type outlets the same as that of the surface upon which they are to be mounted, except that where the mounting surface is curved to a diameter of 36 inches or more, the outlet bottom may be flat.
- n. Provide steel plate fittings fabricated out of ASTM A36 steel.
- 9. Grout Diaper Bands: Provide joint diapers consisting of a Typar synthetic fabric layer (grey in color) and a layer of closed cell foam. Provide a pair of 5/8" wide steel bands at each edge to secure the diaper to the pipe exterior.
- 10. Restrained Joints: Provide restrained joints as follows:
  - a. Bell and spigot joint rings shall be steel, self-centering, deep joint type rings as specified in AWWA C301. Surfaces of the joint rings that will be exposed after fabrication is complete shall receive a zinc metalized coating of 4 mils thickness (0.004"). In areas of the alignment where the pipe will be subject to unbalanced hydrostatic thrust forces (bends and tees), the pipe joints shall be mechanically restrained (harnessed).
  - b. Perform all restrained distance and steel cylinder calculations in accordance with the AWWA M9 Manual Chapter 9 (Third Edition) using the internal working and surge pressures herein.
  - c. Harnessed or restrained joints are to be the harness clamp or Snap Ring® types of flexible restrained joint. Restrained joints utilizing set screws are not allowed.
  - d. The Snap Ring® type of flexible restrained joint consists of a split steel ring which is recessed in the special steel bell section of the pipe until the joint is made. Once the joint is made, the split steel ring is drawn down into position to form a lock between the bell and spigot by tightening a single steel bolt.
  - e. Both joint types shall be capable of transmitting the longitudinal thrust forces due to working pressure and test pressure and must be encased in grout after the joint has been completed and before the line is pressurized using special grout bands supplied by the pipe manufacturer.
  - f. Field welding of the joints for restraint during installation will not be allowed.
- 11. Flanges and Appurtenances: All flanges shall be carbon steel. Provide flat faced flanges. Provide gasket seat surfaces which have a V-serrated finish of approximately 32 serrations per inch, approximately 1/64 inch deep. Provide either concentric or spiral serrations. Bolts shall be stainless steel (AISI Type 304) hex bolts; ASTM A193 Grade B8 Class 2; threaded in accordance with ANSI B1.1 for screw threads Class 2A fit. Nuts shall be stainless steel (AISI Type 316) hex nuts; ASTM A194 Grade 8M, plain finish, threaded in accordance with ANSI B1.1 for screw threads Class 2B fit. Bolts and nuts shall be lubricated with an anti-locking material prior to installation.
- 12. Shop Primed and Painted Items: Furnish all carbon steel flanges and appurtenances shop-primed and painted. Shop priming shall utilize Tnemec Series 140-Pota-Pox Plus (69% solids) with a dry film thickness of 4.0 to 6.0 mils or equivalent. Shop paint all carbon steel flanges and appurtenances with two (2) coats of Tnemec Series 69 Hi-Build Epoxoline

II (69% solids) with a dry film thickness of 4.0 to 5.0 mils per coat or equivalent.

- 13. Testable Joints: Provide internally testable joints. During the installation of each pipe segment testable joints provide a means of verifying that the gaskets are seated properly before proceeding with the installation of the next pipe segment. Testable joints shall consist of a spigot ring containing two grooves (to hold a test gasket), a laying gasket and a 1/8" NPT threaded plug test hole.
- 14. Manhole System
  - a. Provide manhole system that is watertight under full surcharge conditions.
  - b. Provide manhole system rated for vehicular traffic
  - c. Provide manhole system manufactured by pipe manufacturer, per manufacturer's standard details, and as follows:
    - 1) Bases: Provide deflection manhole tee fitting with eccentric 48" diameter riser (branch tee).
  - d. Riser: Provide 48" LCP riser with AWWA C301 joint with steel bell and spigot O-ring gasket.
  - e. Flat Plate: Provide 48" LCP flat plate plug with 24" eccentric opening for frame and cover.
  - f. Castings
    - 1) Provide cast iron frames and covers in accordance with ASTM A48 Class 35B and INDOT Standard Specification Section 910.
    - 2) Supply all frames and covers from one manufacturer.
    - 3) Furnish frames and covers which are rated for traffic, of non-rocking design, and have machined horizontal and vertical bearing surfaces.
    - 4) Provide manhole frame and cover as shown on Drawings or approved equal. Storm manhole covers shall have the words "STORM SEWER" cast in recessed letters 2 inches in height.
- 2.03 Shop Tests on Production Pipe
  - A. General: Select one length of pipe at random from each lot of not over 100 pieces of pipe in any one size and design class for hydrostatic testing. If there are less than 100 pieces of pipe for the project, two pieces of production pipe must be selected at random and tested.
  - B. Hydrostatic Testing: Raise internal pressure to internal test pressure and maintain for 20 minutes. Fail pipe if cracks, leaks or seeps occur.
  - C. Failure of Shop Test: If a selected production pipe fails the hydrostatic shop test, select and test two other lengths of pipe from the same lot of pipe from which the faulty pipe was selected. If either of the two additional lengths of pipe fails to pass the test, fail the remainder of that lot unless each pipe successfully passes the test.
  - D. Witnessing of Shop Tests: Require Independent Testing Consultant to witness all shop tests on production pipe. Submit certified test results. Do not ship any lot of pipe until shop tests are approved by the Engineer.

# 2.04 Quality Control and Inspection

# A. Final Inspection

- 1. Inspect the completed pipe after placement and curing of the mortar coating.
- 2. Conduct a complete inspection and place an appropriate stamp on the lining indicating the pipe to be complete and ready for shipment in accordance with the specifications prior to final inspection by the Independent Testing Consultant. The final inspection includes but is not limited to:
  - a. Joint ring dimensions and roundness (Pipe Material Supplier shall provide templates and tapes as required).
  - b. Mortar coating defects such as cracks, delamination, spalls, coating thickness, soft areas and foreign matter.
  - c. Marking and identification.
- 3. After shipment to the job site and prior to installation, the pipe may be reinspected by the Engineer for cracks, delamination, spalls or other defects. In addition, the coating may be "sounded," using a ball peen hammer or other implement, over its entire exterior surface at the spacing of approximately one foot both circumferentially and longitudinally to locate any hollow or dummy areas which would indicate a delamination or void.

# PART 3 - EXECUTION

- 3.01 Fabrication
  - A. General Requirements
    - 1. Fabricate the prestressed concrete cylinder pipe and fittings in accordance with AWWA C301.
    - 2. Provide a minimum thickness of the mortar coating to maintain a minimum clear cover of four times the nominal wire diameter over the exterior portion of the wire but not be less than 3/4-inch nor exceed 1-inch maximum.
  - B. Concrete for Pipe Core
    - 1. Maintain the temperature of the mix for vertically cast concrete at less than 90°F at the time of placement unless the recommendations contained in Hot Weather Concreting, as reported by the ACI Committee 305 are applied to control the effect of temperature on the quality of the concrete.
    - 2. Do not allow the measured slump of the concrete used in embedded-cylinder pipe to vary more than 1 inch from the approved mix design, as measured at the mixer discharge. Reject pipe made with a concrete slump exceeding this limit.
    - 3. Cure cores by the accelerated curing method only.
  - C. Placing of Wire Reinforcement
    - 1. Do not core when their temperature is below 40°F. Wrap only cores in a surface dry condition. Fill and patch air pockets, honey combing, holes or

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 PRESTRESSED CONCRETE CYLINDER PIPE AND FITTINGS voids 3/8-inch depth and/or diameter or greater and offsets as defined in Section 3.2 of this specification at the time the form is removed. Adequately cure patches prior to prestressing and finish in such a manner as to prevent bridging or gaps under the pre-stressing wire.

- 2. Do not prestress cores prior to the second calendar day after core placement or until the required concrete strength is attained.
- D. Pipe Mortar Coating
  - 1. Apply the mortar coating within 16 hours after prestressing. If a wrapped core has not been mortar coated within 16 hours of prestressing, the wire must be inspected for corrosion prior to mortar coating. If pitting corrosion is found on the wire, the wire wrapping must be removed and the core rewrapped.
  - 2. Coat only pipe 40°F or higher.
  - 3. Provide cement mortar coating that does not contain any rebound.
  - 4. Cure cement mortar coating by the accelerated method.
- E. Concrete pipe and structures possessing defects including, but not limited to the following, will be rejected:
  - 1. Fractures or cracks passing through the wall
  - 2. Honeycombed or open texture which would adversely affect the function of the sections

### 3.02 Repairs

- A. Employ the following procedures where applicable. Submit exceptions to the procedures for approval by the Engineer.
- B. Cylinders: To remove bumps or dents, use only a rubber or fiber mallet. Hydrostatically retest the cylinder before being reused when the concrete is knocked out of the cores.
- C. Embedded Cylinder Pipe Cores
  - 1. Do not prestress cores with indentations which cause bridging of the wire or create offsets in the outer concrete surface exceeding 1/8 inch. Determine the depth of depression and offset with an outside template placed on the core surface.
  - 2. Repair cores having air pockets in the outer surface. Remove surface skin.
  - 3. Remove and patch sand streaks, honeycombs, casing leaks, or soft and rotten concrete in the inner and outer envelopes.
  - 4. So that patches may cure with the pipe, make all core repairs in the bays immediately after the casings are removed and the core temperature is below 90°F. Maintain the patching mix at the same temperature as the core.
- D. Core Cracks Prior to Prestressing
  - 1. Patch pipe as soon as possible prior to prestressing.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 PRESTRESSED CONCRETE CYLINDER PIPE AND FITTINGS

- 2. Lining circumferential or helical slump cracks of less than 0.015" in width need not be patched. Circumferential cracks in excess of 0.015" in width but less than 0.030" may be repaired. Do not repair circumferential core cracks which exceed 0.030" in width and 12 inches in length; discard the core.
- 3. Embedded cylinder cores with external longitudinal cracks of any width are not acceptable.
- E. Mortar Coating
  - 1. Remove and repair defects appearing in mortar coating, such as blisters, hollow spots, falloffs, or slippage cracks during or immediately after application, before the pipe is placed in the bay for curing.
  - 2. Repair defective areas greater than 50 square inches or extending more than 90° circumferentially by coating machine application only, not by hand.
  - 3. Defective areas smaller than 50 square inches may be hand patched. When pipe is coated horizontally, pipe to be hand repaired should be positioned so that area to be patched is on top when in curing bins.
  - 4. Immediately after removing gauge, press closed holes caused by the depth gauge used to measure the coating thickness.
  - 5. While in the curing bin, fill and repair stone holes in the mortar, preferably prior to curing, otherwise prior to final inspection.
  - 6. Repair drip holes prior to final inspection.
- F. Interior of Finished Pipe
  - 1. Do not slurry, paint over or otherwise dress core cracks except as allowed by these specifications.
  - 2. Repair holes larger than 3/8" diameter x 1/4" deep.
  - 3. Slurry and hand-rub prestressed pipe with shrinkage cracks, either circumferential or helical in excess of 0.005" but less than 0.010" wide prior to shipping. Inject epoxy in circumferential or helical cracks in excess of 0.010" wide prior to shipping. Circumferential cracks at the ends of prestress sections (prestress cracks) 0.015" or less in width can be shipped. Slurry and hand-rub prestress cracks between 0.016" and 0.030" wide. Inject epoxy in prestress cracks wider than 0.030".
  - 4. Inner lining longitudinal cracks exceeding 0.002" width after prestress or with an offset are cause for rejection except for cracks less than 0.01" maximum width in the unprestressed area between the spigot face and joint ring weld or in the unprestressed area of an outlet.
  - 5. Repair materials in contact with potable water shall have NSF approval for contact with potable water.
- G. Exterior of Finished Pipe: For prestressed pipe, cracks in coating of pipe are cause for rejection. This does not apply to surface craze cracks whose width cannot be measured or where cracks occur over saddles which may be repaired.
- H. Ends of Finished Pipe-Over Joint Ring: Repair all visible coating cracks.

## 3.03 Installation

- A. Install all prestressed concrete cylinder pipe and fittings in accordance with the manufacturer's recommendations, reviewed shop drawings, and as specified in Section 02220.
- B. The exterior joint recess of non-restrained joints in which the exposed portions of the steel joint rings have received a 4 mil zinc metalized coating do not need to be diapered and grouted after installation. The exterior joint recess of all restrained joints shall be diapered and grouted after installation.
- C. The interior joint recess shall be pointed with a stiff cement mortar.
- D. In making O-ring rubber gasketed joints, lubricate the gasket and the pipe socket with a lubricant supplied by the pipe manufacturer, and stretch the gasket over the spigot and place gasket accurately in position.
  - 1. Carefully center the spigot end in the socket of the preceding pipe to avoid displacement of the gasket and draw the pipe home while fully compressing the gasket.
  - 2. Make adjustments to line and grade in such a manner that the compressed rubber gasket will not be disturbed.
- E. Require the pipe manufacturer to provide a competent representative experienced in the laying of pipe and making of field joints for the pipe. Such representative shall be available to the Engineer and Contractor for the purpose of advising them in the proper method of laying the pipe and making watertight joints. The representative shall spend adequate time at the work site as required to accomplish the desired result of satisfactory installation practice. The presence of the representative shall not relieve the manufacturer or the Contractor of their responsibility under these specifications.
- F. Do not place defective pipe or fittings. Any piece discovered to be defective after having been placed shall be removed and replaced by a sound and satisfactory piece. The completed repair must meet the approval of the Engineer. Repair, removal, and replacement of defective pipe or fittings shall be at the Contractor's expense.
- G. Install a bulkhead on the end of the last pipe laid and keep in place until the next pipe is laid to prevent sand, mud, and other foreign material from entering the pipe.
- H. All pipe shall be placed at the locations, elevations, and grades shown on the Contract Drawings.
- I. Fittings and pipe sections may be joined together into one section, not to exceed 70 feet in length. This section shall be moved into position by means of suitable rigid supporting truss or strongback from which the pipe

shall be suspended by slings designed and spaced so as to distribute the load equally and not to cause injury to the pipe or joins.

- 3.04 Field Testing
  - A. Air Test
    - 1. Perform air tests on pipe joints in accordance with the pipe manufacturer's written instructions using the test assembly supplied by the pipe manufacturer.
    - 2. Each joint shall be tested as soon as possible, but no later than 8-hours, after assembly.
    - 3. Install test assembly into the spigot ring test hole. Apply a 15 psi air pressure to the test assembly and hold for 5 minutes. Loss in pressure shall not exceed 5 psi for a successful test.
    - 4. After the test, release air pressure, remove the test assembly, install test plug and point test hole with still cement mortar.
    - 5. If a joint fails the pressure test, adjust the installation and retest until it passes the test.
  - B. Perform television inspection per Section 02720.

-END-

## SECTION 02535 - PAVEMENT REPAIR AND RESURFACING

PART 1 - GENERAL

### 1.01 Summary

- A. Section Includes
  - 1. Providing all labor, tools, equipment and materials necessary to restore all streets, roads and sidewalks to as good or better condition than existed prior to construction.
  - 2. Preparation for and resurfacing of existing paved areas including streets, drives, parking lots, etc.
  - 3. Cleaning areas to be paved or surfaced. Removing temporary pavement materials such as cold mix asphalt which are not a part of the permanent pavement, and all deleterious and unsuitable materials.
- B. Related Sections
  - 1. Section 02220 Trenching, Backfilling and Compaction for Utilities
  - 2. Section 02583 Pavement Markings
  - 3. Section 03310 Site Work Concrete
- 1.02 References
  - A. American Society for Testing and Materials (ASTM), latest editions
    - 1. ASTM C94 Standard Specification for Ready-Mixed Concrete
  - B. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition
    - 1. Section 203 Excavation and Embankment
    - 2. Section 207 Subgrade
    - 3. Section 402 Hot Mix Asphalt, HMA, Pavement
    - 4. Section 406 Tack Coat
    - 5. Section 409 Equipment
    - 6. Section 902 Asphalt Materials

#### 1.03 Project Conditions

- A. Do not place asphalt pavement when the air temperature is less than 40 degrees Fahrenheit, nor when the surface on which pavement is to be placed is wet, nor when other conditions are deemed unsuitable.
- B. Do not apply Tack Coat to a wet surface, during wet weather, nor after sunset.

PAVEMENT REPAIR AND RESURFACING

### PART 2 - PRODUCTS

## 2.01 General

- A. Perform work and provide materials in accordance with INDOT Standard Specifications Sections 402, 406, and 409.
- B. The Mixing Plant shall be a plant approved by the Engineer and Owner.
- C. Obtain materials from the same source throughout.
- 2.02 Asphaltic Concrete Paving
  - A. Materials
    - 1. Tack Coat: Asphalt Emulsion, Tack AE-T, in accordance with INDOT Standard Specifications Section 902.
    - 2. Asphalt Cement: PG asphalt binder, Grade 64-22, in accordance with INDOT Specifications Section 902 and 402 for the hot mix asphalt type specified.
    - 3. Aggregate Base Compacted No. 53 aggregate or recycled concrete, in accordance with INDOT Standard Specification Section 904.
    - 4. Hot Mix Asphalt (HMA) Mixture: As shown on the Drawings
  - B. Asphalt Paving Mix
    - 1. Binder content and aggregate mix shall meet the requirements of INDOT Standard Specification Section 402.
- 2.03 Portland Cement Concrete
  - A. Provide ready-mixed concrete meeting the requirements of ASTM C-94 and Section 03310.

# PART 3 - EXECUTION

### 3.01 General

- A. Clean areas to be paved or surfaced. Remove temporary pavement materials such as cold mix which are not part of the permanent pavement, and all deleterious and unsuitable materials.
- B. Replace in kind all pavement encountered with respect to base courses, surface courses and thicknesses or as shown on the Drawings, using whichever pavement section is greater. Finish elevations, lines and grades of replacement pavement shall match original elevations, lines and grades.

PAVEMENT REPAIR AND RESURFACING

- C. Limit open pavement cuts to the minimum width needed to install the pipe and utility. These cuts shall have neat parallel cut lines. No uneven, jagged cuts will be allowed. Repair all roadway surfaces damage by construction equipment outside of this limit.
- D. Any existing pavement surfaces or walks which are not broken or cut along straight lines shall be saw cut along straight lines prior to pavement or walk replacement.

## 3.02 Asphalt Pavement Replacement

- A. Inspection
  - 1. The subgrade or aggregate base shall be dry. Compact all Compacted Aggregate Base, No. 53 to 100 percent Standard Proctor Dry Density. Proof-roll in accordance with INDOT Standard Specifications Section 203 prior to application of asphalt materials.
  - 2. Verify the gradients and elevations of base or subgrade prior to placing asphalt pavement.
- B. Preparation
  - 1. Prepare the aggregate base for the application of asphalt pavement in accordance with INDOT Standard Specifications Section 207.
  - 2. Place Tack Coat on existing paved surfaces and between lifts in accordance with INDOT Standard Specifications Section 406 with a specified application rate of 0.05 gallons per square yard.
  - 3. Materials shall be dry to eliminate foaming. Thoroughly mix the materials.
- C. Placement
  - 1. Place HMA course on previously placed course after pavement has cooled sufficiently to prevent distortions and withstand compaction.
  - 2. Spread and compact pavement in accordance with INDOT Standard Specifications Sections 402 and 409.
  - 3. Place each course to the compacted thickness as shown on the Drawings. The application rate of 110 pounds per square yard is equivalent to 1 inch of asphalt pavement, in place.
  - 4. Restore pavement markings to emulate existing pavement markings, as specified in Section 02583 Pavement Markings.
- D. Tolerances: The maximum tolerance shall be as defined in INDOT Standard Specifications Section 409.

- 3.03 Restoration of Concrete Sidewalk, Curb, and Driveways Disturbed by Construction
  - A. Replace in kind all removed and damaged sidewalks, curbs, and driveways with respect to material type and dimension. Construct sidewalks, curbs and driveways to the section as shown on the Drawings. Finish elevations, lines, and grades of replacement work shall match original elevations, lines, and grades. Sidewalks shall have a light broom finish with edges and joints tooled with 1/4-inch radius. Install sidewalk, curb, and driveway joints to match the existing type and spacing.
  - B. Pavement, sidewalks and curbs shall be removed and replaced to a minimum of 12 inches beyond the sides of the trench in each direction or to the nearest construction or expansion joint (whichever is greater).
  - C. Replace all curbs damaged under this contract.
- 3.04 Construction of New Sidewalk, Curb, and Driveways
  - A. General
    - 1. Construct new sidewalks, curbs, gutters and driveways to the section as shown on the Drawings.
    - 2. Where shown, construct concrete sidewalk ramps including detectable warning elements.
    - 3. Replace all adjacent curbs, sidewalks and drives not shown or needed to be replaced that are damaged during construction for no additional payment.
  - B. Subgrade
    - Shape and compact the subgrade to a firm, even surface. The upper 6 inches of subgrade shall be compacted immediately prior to placing the material thereon. Remove all soft, yielding, or other unsuitable material which cannot be compacted satisfactorily. Remove or break off all rock encountered to at least 6 inches below the subgrade surface. Fill any holes or depressions resulting from the removal of unsuitable material with satisfactory material and compact to conform with the surrounding subgrade surface.
    - 2. Thoroughly moisten the subgrade immediately prior to placing concrete. Spade concrete to avoid a honeycomb appearance and float the surface with a wood float to prevent surface irregularities.
  - C. Forms: Concrete forms shall be straight, free from warp, and shall extend for the full depth of concrete. Clean forms of foreign matter and oil forms before placing concrete.

- D. Joints
  - 1. Expansion Joints: Place preformed 1/2-inch joint filler around all appurtenances, such as manholes and utility poles which extend into and through the sidewalk, and between the sidewalk and any fixed structure such as a building and drives. Extend the joint filler the full depth of the concrete. Allow an adequate area for joint sealant. Form expansion joints transverse across sidewalk and curb and gutters at a maximum spacing as shown on the Drawings for tangent sections and 20 feet for radial sections.
  - 2. Contraction Joints: Provide transverse contraction joints at a maximum spacing as shown on the Drawings, formed by a jointing tool, trowel or similar means. Joint shall extend approximately 1/4 of the concrete depth and be approximately 1/8 inches wide.
  - 3. Install joints to match the existing type and spacing.
  - 4. Expansion joints between the curb and the drive shall be doweled by 1/2-inch bars at 3 feet on center.
  - 5. Expansion joints in the sidewalks, drives, ramps, and curbs require sealant.
- E. Sidewalk Adjacent to Curb
  - 1. Fill the space behind the curb with granular material to the required elevation and compact in layers not to exceed 4 inches.
- F. Concrete Pavement Adjacent to Curb
  - 1. Where concrete pavement is constructed adjacent to the curb, place expansion and contraction joints at the same locations in the curb as the pavement slab.
  - 2. Dowel curb and gutter to the concrete pavement by 1/2-inch bars at 3 feet on center.
- G. Other Curb Installations
  - 1. Where sidewalk is not constructed adjacent to the curb, fill the space behind the curb with suitable material to the required elevation and compact in layers not to exceed 4 inches.
  - 2. If no concrete pavement is being placed at the time of curb construction, place expansion joints at the ends of all returns and at intervals not to exceed 100 feet. Install contraction joints at maximum 20-foot spacing.
- H. Finish: Sidewalks shall have a light broom finish with edges and joints tooled with 1/4-inch radius.

PAVEMENT REPAIR AND RESURFACING

### 3.05 Protection

- A. General: Remove and replace any and all pavement, curb, and sidewalk damaged by rain or low temperatures for no additional payment.
- B. Asphalt Pavement
  - 1. Protect asphalt courses in accordance with INDOT Standard Specifications Section 402.
  - 2. Protect new asphalt pavement from traffic until the mixture has cooled sufficiently to prevent distortion.
- C. Concrete Sidewalk and Curb Ramps: Protect new concrete from traffic for curing for a minimum of 5 calendar days or until the minimum design compressive strength is attained, whichever is lesser.
- D. Concrete Curb and Gutter: Protect new concrete from traffic for curing for a minimum of 14 calendar days or until the minimum design compressive strength is attained, whichever is lesser.
- E. Concrete Pavement: Protect new concrete pavement from traffic for curing for a minimum of 7 calendar days.

-END-

# SECTION 02583 - PAVEMENT MARKING

# PART 1 - GENERAL

- 1.01 Summary
  - A. The work consists of forming and installing or removing pavement traffic markings.
  - B. Related Sections
    - 1. Section 02535 Pavement Repair and Resurfacing

## 1.02 References

A. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

## PART 2 - PRODUCTS

### 2.01 Pavement Markings

- A. Traffic Paint traffic paint shall be in accordance with INDOT Standard Specification Section 909.05.
- B. Glass Beads glass beads shall be in accordance with INDOT Standard Specification Section 921.02.
- C. Raised Pavement Markers markers shall be accordance with INDOT Standard Specification Section 921.02.

### PART 3 - EXECUTION

### 3.01 Pavement Markings

- A. Pavement markings shall be placed at the locations shown on the Plans. Unless otherwise specified, pavement marking lines shall be 4" wide, pavement stop bars 24" wide.
- B. The pavement shall be cleaned of all dirt, oil, grease, excess sealing material, excess pavement marking material and all other foreign material prior to applying new pavement traffic markings. New paint pavement markings may be placed over sound existing markings of the same color. The pavement surface shall be dry prior to applying pavement traffic markings. Traffic paint shall be applied only when the pavement temperature is 40°F or above. The wet film thickness of the traffic paint shall be a minimum of 15 mils. Painted lines and markings shall be immediately reflectorized by applying glass beads at a uniform minimum rate of 6 lb/gal. of traffic paint.

- C. Control points required as a guide for pavement traffic markings shall be spotted with paint for the full length of the road to be marked. Control points along tangent sections shall be spaced at a maximum interval of 100 ft. Control points along curve sections shall be spaced so as to ensure the accurate location of the pavement traffic markings. The location of control points shall be approved prior to the pavement traffic marking application.
- D. All pavement markings on State and Federal Highways will be subject to the final approval of the Indiana Department of Transportation.
- E. All pavement markings on City Streets will be subject to the final approval of the City of Indianapolis.
- F. All double line markings, such as a no-passing zone or the center line of an undivided multi-lane roadway, shall be applied in one pass.
- G. Traffic paint shall be applied with a spray type machine capable of applying the traffic paint under pressure through a nozzle directly onto the pavement. The machine shall be equipped with the following: an air blast device for cleaning the pavement ahead of the painting operation; a guide pointer to keep the machine on an accurate line; at least two spray guns which can be operated individually or simultaneously; paint agitator(s); a control device to maintain uniform flow and application; an automatic device that will provide a broken line of the required length; and an automatic glass bead dispenser which is synchronized with the marking application. When fast-drying traffic paint is used, the machine shall also be capable of heating the paint to a maximum of 160°F.
- H. Raised pavement markers shall be replaced if disturbed during construction and in accordance with manufacturer's requirements.

-END-

# SECTION 02671 - MONITORING WELLS

### PART 1 - GENERAL

- 1.01 Summary
  - A. Section includes the installation of monitoring wells and the abandonment of monitoring wells including all necessary drilling, testing, and developing of the wells.
  - B. A Geotechnical Engineering Investigation was conducted at the Site (report prepared by CTL Engineering located in Appendix D).

### 1.02 References

- A. 312 IAC 12 Water Well Drilling and Ground Water
- B. 312 IAC 13 Water Well Drillers and Water Well Pump Installers
- C. 312 IAC 13-8-3 Monitoring Wells
- D. 312 IAC 13-10-2 Permanent Abandonment of Wells
- E. IC 25-39 Water Well Drilling Contractors

### 1.03 Project Conditions

- A. Inspect the site and become familiar with the location of the wells and the conditions affecting the Work.
- B. Request and obtain the location of all public and private underground utilities in the area prior to mobilization to the site.
- C. Equip the drilling rig with appropriate equipment and lighting as required by Indianapolis International Airport and the Federal Aviation Administration.
- D. At all times during the progress of the work, protect the wells in such a manner as to effectively prevent both tampering with the wells and the entrance of foreign matter into the wells.

### 1.04 Quality Control

A. The installation and closure of monitoring wells shall be performed by an Indiana licensed water well driller and shall be executed in the best practices of the well industry, National Water Well Association, American Water Works Association, and in accordance with all applicable Federal, State and local codes and regulations.

- B. It shall be the responsibility of the Contractor to obtain all permits necessary for the performance of this Work.
- C. If the screen or casing in any of the newly installed wells is damaged or the wells are not constructed in accordance with the specifications to the satisfaction of the Engineer, the Engineer may require changes be made by the Contractor or, in the event that proper changes cannot be made, the Engineer may require the Contractor to abandon the well, without additional cost, and to drill a new well.

### 1.05 Submittals

- A. Product Data
- B. Qualification Statement
- C. Drillers log of the geologic materials encountered during the construction of the well.
- D. Construction logs of each monitoring well showing depth and exact construction of the well, including all dimensions of lengths and diameters of casing and screen, size of slot openings, and other pertinent details and dimensions. Final ground elevations shall be shown on the Record Drawings.
- E. Submit the necessary well log information to the IDNR within 30 days of completion of the well.
- F. Submit the necessary documentation to the IDNR of the abandoned monitoring wells within 30 days of completion.

### PART 2 - PRODUCTS

- 2.01 Well Casing
  - A. The well casing shall be 2-inch inner diameter (I.D.) Schedule 40 polyvinyl chloride (PVC) pipe
  - B. Terminate casing approximately 0.5 feet below grade as shown on the Drawings.

#### 2.02 Well Screen

- A. The well screen will be 15 feet in length and extend from 10 to 25 feet below grade.
- B. Each screen will consist of 1-10 feet and 1-5 feet length threaded screens that include a self-sealing rubber or neoprene seal. The bottom of the screen shall be sealed by a PVC end cap threaded to the screen
- C. The well screen will be constructed of 2-inch I.D., 0.010-inch factory slot Schedule 40 PVC.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04101 MONITORING WELLS

D. The screen shall be threaded to the casing and include a self-sealing rubber or neoprene seal. The bottom of the screen shall be sealed by a PVC end cap threaded to the screen.

## PART 3 - EXECUTION

- 3.01 Identification of Wells
  - A. Contractor shall physically locate all wells identified on drawings to be abandoned and clearly mark as "To be Closed in Place."
  - B. Wells that are marked "To be Closed in Place" shall be permanently abandoned (in place) in accordance with 312 IAC 13-10-2.

## 3.02 Well Construction

- A. Construct the wells such that the screen interval of each well extends from the approximate depth of the shallowest water table anticipated at the Site while intersecting the deeper (more permeable) outwash sediments. To achieve this, the wells will need to be screened from 10 to 25 feet below grade.
- B. Monitoring wells shall be installed using a rotary-drilling rig equipped with 4 <sup>1</sup>/<sub>4</sub>- inch diameter (I.D.) hollow-stem augers.
- C. Equip the drilling rig with appropriate equipment and lighting as required by Indianapolis International Airport and the Federal Aviation Administration.
- D. Collect continuous split-spoon samples to total depth with core descriptions recorded on boring logs.
- E. A sand pack, sized appropriately for the screen slot size, shall be installed to a depth of 1.5 feet above the top of each well screen, followed by 2 feet of bentonite. The remaining annulus shall be concrete grouted and capped at the surface with a concrete seal.
- F. The wells shall be completed approximately 0.5 feet below grade with locking compression well caps. Flush grade, protective, bolt-down well covers (pro covers) will be installed around each well. The pro covers will be installed within a 2 by 2-foot concrete pad. The concrete pad will extend to the top of the bentonite seal.

### 3.03 Permanent Monitoring Well Abandonment

- A. A cased or uncased monitoring well shall be plugged in accordance with 312 IAC 13-10-2 (e)(6) from the bottom of the well or borehole to the ground surface with:
  - 1. Bentonite slurry; or
  - 2. Pelletized or coarse grade crushed bentonite

- 3.04 Miscellaneous
  - A. Soil cuttings: to be managed as construction debris.
  - B. Decontamination: to minimize the potential for the entrainment of fine-grained sediments in the sand pack, all augers will be pressure washed (decontaminated) between borings.
  - C. Wells shall be developed following well installation. Wells to be developed using surge block, air lift with a "J-tube" assembly, or submersible pump method; development water to be disposed of at the Site.
  - D. Decontaminate sampling equipment and tooling prior to arrival at the Site.
  - E. The Work area will be left free of all debris before leaving.
  - F. The top of casing and ground elevations at each monitoring well will be surveyed to the nearest 0.01 foot and referenced to a datum of mean sea level.

-END-

# SECTION 02720 - STORM SEWER SYSTEMS

PART 1 - GENERAL

- 1.01 Summary
  - A. Section Includes: Furnishing and installing storm sewers, inlets, catch basins, and manholes.
  - B. Related Sections
    - 1. Section 02220 Trenching, Backfilling and Compaction for Utilities
    - 2. Section 02732 Sewer Cleaning and Televising

### 1.02 References

- A. American Association of State Highway and Transportation Officials (AASHTO), latest editions
  - 1. AASHTO M170 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
  - 2. AASHTO M199 Standard Specification for Precast Reinforced Concrete Manhole Sections
- B. American Society for Testing and Materials (ASTM), latest editions
  - 1. ASTM A48 Standard Specification for Gray Iron Castings
  - 2. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
  - 3. ASTM C76 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
  - 4. ASTM C443 Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
  - 5. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
  - 6. ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
  - 7. ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs
  - 8. ASTM C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- C. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition
  - 1. Section 901 PCC Materials
  - 2. Section 904 Aggregates
  - 3. Section 907 Concrete, Clay, and Plastic Drainage Components
  - 4. Section 908 Metal Pipe

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04101

- 5. Section 910 Metal Materials
- 1.03 Submittals
  - A. Product Data
    - 1. Pipe
    - 2. End Sections
    - 3. Structures
    - 4. Castings
    - 5. Manhole Steps
- 1.04 Delivery, Storage, and Handling
  - A. Pipe possessing defects including, but not limited to the following, will be rejected for installation:
    - 1. Variations from straight centerline
    - 2. Elliptical shape in round pipe
    - 3. Lack of rigidity
    - 4. Illegible markings as required herein
    - 5. Bruised, broken, or otherwise damaged metallic or bituminous coating or liner, as applicable
    - 6. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
    - 7. Fractures, punctures, or cracks passing through the pipe wall
    - 8. Damaged or cracked ends where such damage would prevent making a satisfactory joint
  - B. Concrete pipe and structures possessing defects including, but not limited to the following, will be rejected for installation:
    - 1. Fractures or cracks passing through the wall
    - 2. Honeycombed or open texture which would adversely affect the function of the sections
    - 3. Ends of sections are not normal to the walls and centerline of the section

# PART 2 - PRODUCTS

- 2.01 Reinforced Concrete Pipe (RCP)
  - A. Pipe Material
    - 1. Provide Class III, Wall B type RCP which conforms to ASTM C76, AASHTO M170, and INDOT Standard Specification Section 907.
  - B. Joints
    - 1. Provide RCP with tongue and groove joints with compression type rubber gasket which conforms to ASTM C443.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04101

- C. Fittings: Provide fabricated wye and tee branches.
- 2.02 Pipe Accessories
  - A. Concrete End Sections
    - 1. Provide concrete end sections in accordance with INDOT Standard Specification Section 907.
- 2.03 Precast Concrete Manholes, Inlets, Catch Basins and Accessories
  - A. General
    - 1. Provide precast concrete sections with no more than 3 holes cast or drilled in the section for handling.
    - 2. Provide rapid setting patch material in accordance with ASTM C928 and INDOT Standard Specification Section 901 or precast concrete plugs for filling all holes used for handling.
  - B. Precast Concrete Manholes
    - 1. Provide precast concrete manholes as follows:
      - a. Cone section: eccentric cone section which conforms to ASTM C478
      - b. Flat top: where necessary, provide flat top section which conforms to ASTM C478
    - 2. Risers/barrels shall conform to ASTM C478, AASHTO M199, and INDOT Standard Specification Section 907.
    - 3. Bases shall conform to ASTM C478, AASHTO M199, and INDOT Standard Specification Section 907.
    - 4. Provide precast concrete floor or form with Class A concrete. Floor shall be sloped to the sewer invert.
    - 5. Gaskets shall be 1/2-inch diameter flexible butyl rubber conforming to ASTM C990 for all manhole section joints. Provide Kent seal or approved equal.
  - C. Precast Concrete Inlets and Catch Basins
    - 1. Provide precast concrete catch basins and inlets to the dimensions as shown on the Drawings.
  - D. Castings
    - 1. Provide cast iron frames and covers in accordance with ASTM A48 Class 35B and INDOT Standard Specification Section 910.
    - 2. Supply all frames and covers from one manufacturer.
    - 3. Furnish frames and covers which are rated for traffic, of non-rocking design, and have machined horizontal and vertical bearing surfaces.
    - 4. Provide manhole frame and cover as shown on Drawings or approved equal. Storm manhole covers shall have the words "STORM SEWER" cast in recessed letters 2 inches in height.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04101

- 5. Provide inlet frames and covers as on the Drawings or approved equal. Casting shall have the words "NO DUMPING, DRAINS TO STREAM" cast in raised or recessed letters 1 inch in height and shall have a symbol of a fish cast with the message.
- E. Steps
  - 1. Provide steps in all structures 4 feet deep or greater in accordance with AASHTO M199 and INDOT Standard Specification Section 907.
  - 2. Provide steps with a minimum 10 inches of clear step width.
  - 3. Provide copolymer polypropylene coated steel steps meeting the requirements of ASTM D4101 and composed of deformed 1/2-inch minimum diameter reinforcing steel in accordance with ASTM A615, Grade 60.
  - 4. Non-coated cast iron steps will not be accepted.
  - 5. Provide steps as manufactured by M.A. Industries, Inc., American Step Company, Inc., or approved equal.
- F. Pipe to Structure Connections
  - 1. Pipe penetration holes shall be either pre-formed by manufacturer or core drilled in the field.
  - 2. For concrete pipe and RCP, provide non-shrink grout mixture of 2 parts No. 23 fine aggregate in accordance with INDOT Standard Specification Section 904 and 1-part Portland cement.

# PART 3 - EXECUTION

# 3.01 Examination

- A. Verification of Conditions
  - 1. Before installing piping, verify location, depth, type of joint needed, and size of pipe to which connection is proposed.
  - 2. Assure that lines can be run as proposed. Notify Engineer immediately for approval of any necessary deviation before lines are run.
  - 3. Work all lengths of pipe into place without forcing.

# 3.02 Installation

- A. Storm Sewer Pipe and Accessories
  - 1. Lay storm sewer pipe uniformly to line and grade so that finished storm sewer will present a uniform conduit.
  - 2. Set line and grade by means of laser beam and target for alignment and grade.
  - 3. Lay storm sewer pipe progressively up grade in a manner to form close, concentric joints with smooth bottom inverts.
  - 4. Maintain 18 inches of vertical separation and 10 feet of horizontal separation between new storm sewer and new or existing water mains unless otherwise

directed. Notify Engineer immediately of all instances where separation cannot be maintained.

- 5. After joint is made, place sufficient bedding material along each side of the pipe to prevent conditions that might tend to move the pipe off line or grade.
- 6. Temporarily plug installed piping systems at end of each day's work or other interruption of progress on a given line. Plug shall be adequate to prevent entry of animals and entrance or insertion of deleterious materials and shall be installed in a manner satisfactory to the Engineer and Owner.
- 7. Securely attach fabricated branches for wyes and tees to wall of pipe in such a manner as to not restrict or otherwise interfere with flow characteristics of the pipe.
- 8. Complete all field-cutting of pipe in a neat, trim manner using a hand or power saw.
- 9. If any existing drainage tile systems are encountered during construction, reconstruct the tile to its original conditions or connect tile to the new storm drainage system as approved by the Engineer.
- B. Precast Concrete Manholes, Inlets, Catch Basins, and Accessories
  - 1. Unless otherwise indicated, provide 0.1-foot sewer invert drop through manholes.
  - 2. Keep structure excavations free from water during construction.
  - 3. Fill all areas excavated below the depth required for the manhole base with compacted granular backfill or No. 8 crushed stone at Contractor's expense.
  - 4. Install precast concrete risers and adjusting rings in such combination that the manhole frame will be at the proper elevation. Supply a minimum of 1 adjusting ring for each manhole. Adjusting rings shall be a minimum of 4 inches and maximum of 12 inches in height. Supply precast concrete riser sections for adjustment greater than 12 inches in height.
  - 5. Install manhole frame to grade and centered.
  - 6. Install steps beginning at 8 inches below the top of the cone or flat top section. Install steps at 10 inches on center minimum to 16 inches on center maximum, continuous and spaced uniformly.
  - 7. Install steps with minimum 3-inch wall embedment and minimum 4-inch clear distance projection from the wall as measured from the point of embedment.
  - 8. Install precast concrete base, risers, cone, and flat top sections so that the axis of the manhole is vertical.
  - 9. Install precast concrete inlets and catch basins so that the axis of the structure is vertical.
  - 10. Install gaskets for joints in accordance with the manufacturer's recommendations. Wrap riser joints with external joint seals in accordance with manufacturer's recommendations.
  - 11. Prior to backfilling, fill all holes used for handling with rapid setting patch material or with precast concrete plugs secured with Portland cement mortar.
  - 12. Unless otherwise indicated, set castings for all structures at finish grade level. Adjust castings to the satisfaction of the Engineer and Owner, at Contractor's expense.
  - 13. Remove all debris and excess soil from structures after installation and prior to flushing the storm sewer pipes, to the satisfaction of the Engineer.

- C. Connection to Existing Structures
  - 1. Core drill new pipe penetration at the proper location where the pipe enters the structure.
  - 2. For concrete pipe and RCP, fill the annular space between the pipe and structure wall with grout as noted in Article 2.03F.2 of this Section.

# 3.03 Field Quality Control

- A. Inspection
  - 1. Television Inspection
    - a. Televise all mainline storm sewers (manhole to manhole).
    - b. Televise all lateral storm sewers (manhole to inlet, inlet to inlet, etc.) in excess of 40 feet in length.
    - c. Perform all television inspection in presence of Engineer.
    - d. Clean all new storm sewers prior to television inspection. The image shall be clear so the interior condition of the pipe is easily evaluated.
    - e. Correct all unacceptable conditions found during the television inspection and re-televise until no unacceptable conditions are found.
    - f. Unacceptable conditions are conditions that adversely affect the ability of the system to function as designed or to be properly maintained and may include, but are not limited to, the following:
      - 1) Protruding taps
      - 2) Cracked or faulty pipe
      - 3) Misaligned or deformed pipe
      - 4) Debris in line
      - 5) Infiltration/exfiltration
      - 6) Excessive gaps at joints
      - 7) Bellies or sags with a depth greater than or equal to 10 percent of the pipe diameter (maximum of 3 inches) or a length greater than 25 feet
    - g. Submit copy of the televising recording (DVD format) within 14 calendar days of the inspection.

# 3.04 Cleaning

A. Clean all new storm sewers after installation and before testing to the satisfaction of the Engineer.

-END-

## SECTION 02725 – CENTRIFUGALLY CAST FIBERGLASS REINFORCED POLYMER MORTAR PIPE (CCFRPM)

### PART 1 - GENERAL

#### 1.01 Summary

- A. Section includes: Requirements for design and for providing centrifugally cast fiberglass reinforced polymer mortar pipe and fittings, including all necessary materials, manhole systems, specials adapters, and other appurtenances.
- B. Related Sections:
  - 1. Section 02220 Trenching, Backfilling and Compaction for Utilities
  - 2. Section 02720 Storm Sewer Systems

#### 1.02 References

- A. American Society for Testing and Materials (ASTM), latest editions
  - 1. ASTM D3754 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.
  - 2. ASTM D4161 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
  - 3. ASTM D2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel- Plate Loading.
  - 4. ASTM D3681 Standard Test Method for Chemical Resistance of "Fiber glass" Pipe in a Deflected Condition.
  - 5. ASTM D638 Test Method for Tensile Properties of Plastics.
- B. American Water Works Association (AWWA), latest editions
  - 1. AWWA C950 AWWA Standard for Fiberglass Pressure Pipe

### 1.03 Submittals

- A. The Contractor is solely responsible for the accuracy of all data submitted. The submission of engineering data does not relieve the Contractor of his responsibility to provide pipe complying in every respect with the requirements of these specifications.
- B. Submit the following shop drawings and design information:
  - 1. Catalog data for pipe, fittings, joints, and gaskets.
  - 2. Fully dimensioned drawings of piping layouts, including fittings, couplings, sleeves, valves, outlets, manhole systems, supports and anchors. Label pipe size, materials, type and class on drawings. Include the limits of each reach of restrained joints. Provide cross sections showing elevations of pipe, fittings,

bevels, and all specials. Where special designs or fittings are required, show the Work in large detail and completely describe and dimension all items.

- 3. A list and technical information on all materials and equipment required to install the pipe and fittings.
- 4. Design calculations signed and sealed by a Professional Engineer licensed to practice in the State of Indiana.
- 5. Pipe installation schedule indicating the sequence for laying the pipe, fittings, bevels, and specials, with centerline elevations and stationing at transition points.
- 6. Written and illustrated pipe installation and repair instructions.
- C. Quality Control
  - 1. Provide and pay for the services of an Independent Testing Consultant to witness and certify all Shop Tests on production pipe. Submit the name of the Independent Testing Consultant and identify key personnel to be involved in witnessing tests and inspecting pipe including their qualifications and experience to provide these services.
  - 2. Submit results of Shop Tests on production pipe.
  - 3. A notarized affidavit of compliance stating that the pipe and fittings being furnished for this Contract were manufactured, inspected, and tested in accordance with the standards specified herein, and that the material and manufacturing test results on the pipe and fittings being furnished for this Contract were in every case acceptable.

#### 1.04 Quality Assurance

- A. The Engineer shall be entitled to inspect pipes or witness the pipe manufacturing.
- B. Should the Owner request to see specific pipes during any phase of the manufacturing process, the manufacturer must provide the Owner with adequate notice of when and where the production of those pipes will take place.

### PART 2 - PRODUCTS

### 2.01 Manufacturers

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
  - CCFRPM pipe, fittings, accessories and appurtenances

     a. HOBAS Pipe USA
- 2.02 Materials
  - A. Resin Systems: The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.

STORMWATER & DEICING CAPACITY PRODOCUTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CENTRIFUGALLY CAST FIBERGLASS REINFORCED POLYMER MORTAR PIPE

- B. Glass Reinforcements: The reinforcing glass fibers used to manufacture the components shall be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.
- C. Silica Sand: Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.
- D. Additives: Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally affect the performance of the product.
- E. Elastomeric Gaskets: Gaskets shall meet ASTM F477 and be supplied by qualified gasket manufacturers and be suitable for the service intended.
- 2.03 Manufacture and Construction
  - A. Pipe, fittings, and manhole systems shall be Stiffness Class (SN) 46 and Pressure Class (PN) 25.
  - B. Pipes: Manufacture pipe by the centrifugal casting process to result in a dense, nonporous, corrosion-resistant, consistent composite structure. Pipes shall be Type 1, Liner 2, Grade 3 per ASTM D3754.
  - C. Joints: Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize elastomeric sealing gaskets as the sole means to maintain joints watertight. The joints must meet the performance requirements of ASTM D4161. Tie-ins, when needed, may utilize gasket-sealed mechanical closure couplings.
  - D. Fittings: Provide flanges, elbows, reducers, tees, wyes, laterals and other fittings that can withstand all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass fiber-reinforced overlays. Properly protected standard ductile iron, fusion-bonded epoxy-coated steel and stainless steel fittings may also be used. Unbalanced thrust forces shall be restrained with thrust blocks or other suitable methods. Fiberglass tees, wyes, laterals, or other similar fittings shall be fully encased in reinforced concrete designed to withstand the pressure forces.
  - E. Manhole System
    - 1. Provide manhole system that is watertight under full surcharge conditions.
    - 2. Provide manhole system rated for vehicular traffic.
    - 3. Provide manhole system manufactured by pipe manufacturer and as follows:
      - a. Bases: Provide pipe manufacturer's tee base
        - 1) Run ends of tee shall have FWC coupling joints
        - 2) Branch end of tee (riser invert) shall have FWC coupling joints.
        - 3) Tee base shall be encased in concrete.
      - b. Riser and Cone: Provide 48" diameter fiberglass riser sections and 48" diameter fiberglass concentric cones.

STORMWATER & DEICING CAPACITY PRODOCUTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CENTRIFUGALLY CAST FIBERGLASS REINFORCED POLYMER MORTAR PIPE

- 4. Castings
  - a. Provide cast iron frames and covers in accordance with ASTM A48 Class 35B and INDOT Standard Specification Section 910.
  - b. Supply all frames and covers from one manufacturer.
  - c. Provide frames and covers which are rated for traffic, of non-rocking design, and have machined horizontal and vertical bearing surfaces.
  - d. Provide manhole frames and covers as shown on Drawings or approved equal. Storm manhole covers shall have the words "STORM SEWER" cast in recessed letters 2 inches in height.
  - e. Casting shall have the words "NO DUMPING, DRAINS TO STREAM" cast in raised or recessed letters 1 inch in height and shall have a symbol of a fish cast with the message.
- 2.04 Dimensions
  - A. Diameters: The actual outside diameter (18" to 48") of the pipes shall be in accordance with AWWA C950. For other diameters, OD's shall be per manufacturer's literature.
  - B. Lengths: Pipe shall be supplied in nominal lengths of 20 feet. When required by radius curves, pit size, or other limitations restrict the pipe to shorter lengths, nominal sections of 10 feet or other even divisions of 20 feet shall be used. Actual laying length shall be nominal +1, -4 inches. At least 90% of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.
  - C. Wall Thickness: The minimum wall thickness shall be per the specified stiffness and pressure class of the pipe.
  - D. End Squareness: Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/8".
- 2.05 Shop Testing
  - A. Pipes shall be manufactured in accordance with AWWA C950.
  - B. Coupling joints shall meet the requirements of ASTM D4161.
  - C. Minimum pipe stiffness when tested in accordance with ASTM D2412 shall normally be 36 psi.
  - D. Pipe hoop tensile strength for pressure pipe shall be verified as specified in applicable standard (ASTM D3754 or AWWA C950) or by random burst testing at the same sampling frequency. All pipes shall be capable of withstanding a test pressure of two (2) times the maximum sustained operating pressure of the line without leaking or cracking. This performance shall be verified as agreed between the buyer and seller.

- 2.06 Packaging, Handling, and Shipping
  - A. Packaging, handling, and shipping shall be done in accordance with the manufacturer's instructions.

## PART 3 - EXECUTION

- 3.01 Installation
  - A. Installation: Install all pipe and fittings in accordance with the manufacturer's recommendations, reviewed shop drawings, and as specified in Section 02220.
  - B. Pipe Grouting: Annular space grouting shall not damage the liner and shall conform to the manufacturer's requirements
  - C. Pipe Handling: Use textile slings, other suitable materials, or a forklift. Use of chains or cables is not recommended.
  - D. Jointing:
    - 1. Clean ends of pipe and coupling components.
    - 2. Apply joint lubricant to pipe ends and the elastomeric seals of coupling. Use only lubricants approved by the pipe manufacturer.
    - 3. Use suitable equipment and end protection to push or pull the pipes together.
    - 4. Do not exceed forces recommended by the manufacturer for coupling pipe.
    - 5. Join pipes in straight alignment then deflect to required angle. Do not allow the deflection angle to exceed the deflection permitted by the manufacturer.

### 3.02 Field Testing

- A. Air Test
  - 1. Perform air tests on pipe joints in accordance with the pipe manufacturer's written instructions using the test assembly supplied by the pipe manufacturer.
  - 2. Each joint shall be tested as soon as possible, but no later than 8-hours, after assembly.
  - 3. Isolate each joint using manufacturer's recommended equipment, apply 15 psi air pressure to the joint testing assembly and let hold for 5 minutes. Loss in pressure shall not exceed 5 psi for a successful test.
  - 4. If a joint fails the pressure test, adjust the installation and retest until it passes the test.
- B. Perform Television Inspection per Section 02720.

-END-

STORMWATER & DEICING CAPACITY PRODOCUTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CENTRIFUGALLY CAST FIBERGLASS REINFORCED POLYMER MORTAR PIPE

# SECTION 02729 – GRAVITY SANITARY SEWER SYSTEMS

## PART 1 - GENERAL

### 1.01 Summary

A. Section Includes: Furnishing and installing gravity sanitary sewers, services, manholes and appurtenances.

## B. Related Sections

- 1. Section 02220 Trenching, Backfilling and Compacting for Utilities
- 2. Section 02730 Force Main Sewer Systems
- 3. Section 02732 Sewer Cleaning and Televising
- 4. Section 02733 Testing Sanitary Sewers and Force Mains

### 1.02 References

- A. American Association of State Highway and Transportation Officials (AASHTO), latest editions
  - 1. AASHTO M198 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
  - 2. AASHTO M199 Standard Specification for Precast Reinforced Concrete Manhole Sections
- B. American National Standards Institute (ANSI), latest editions
  - 1. ANSI A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
  - 2. ANSI A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- C. American Society for Testing and Materials (ASTM), latest editions
  - 1. ASTM A48 Standard Specification for Gray Iron Castings
  - 2. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
  - 3. ASTM C443 Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
  - 4. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
  - 5. ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
  - 6. ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs
  - 7. ASTM D3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
  - 8. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 GRAVITY SANITARY SEWER SYSTEMS

- 9. ASTM D4101 Standard Specification for Polypropylene Injection and Extrusion Materials
- 10. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- 11. ASTM F679 Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
- 12. ASTM F949 Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
- 13. ASTM F1803 Standard Specification for Poly(Vinyl Chloride) (PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter
- D. American Water Works Association (AWWA) Standards, latest editions
  - 1. AWWA C104 Cement Mortar Lining for Ductile Iron Pipe and Fittings
  - 2. AWWA C110 Ductile Iron and Gray Pipe Fittings
- E. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition
  - 1. Section 901 PCC Materials
  - 2. Section 907 Concrete, Clay, and Plastic Drainage Components
  - 3. Section 910 Metal Materials

### 1.03 Submittals

- A. Shop Drawings, as applicable
  - 1. Pipe
  - 2. Fittings
  - 3. Structures
  - 4. Castings
  - 5. Manhole Steps
- 1.04 Delivery, Storage, and Handling
  - A. Acceptance at Site
    - 1. Pipe possessing defects including, but not limited to the following, will be rejected for installation:
      - a. Variations from straight centerline
      - b. Elliptical shape in round pipe
      - c. Lack of rigidity
      - d. Illegible markings as required herein
      - e. Bruised, broken, or otherwise damaged metallic or bituminous coating or liner, as applicable
      - f. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
      - g. Fractures, punctures, or cracks passing through the pipe wall
      - h. Damaged or cracked ends where such damage would prevent making a satisfactory joint

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 GRAVITY SANITARY SEWER SYSTEMS
- 2. Concrete structures possessing defects including, but not limited to the following, will be rejected for installation:
  - a. Fractures or cracks passing through the wall
  - b. Ends of sections are not normal to the walls and centerline of the section
- B. Storage and Protection
  - 1. Protect plastic pipes from extreme temperatures and ultraviolet radiation.

#### PART 2 - PRODUCTS

- 2.01 Polyvinyl Chloride (PVC) Pipe
  - A. Pipe Material
    - 1. Provide solid wall PVC pipe for gravity sanitary sewers 8 to 48 inches in diameter. PVC SDR type shall be as listed on the Drawings and shall be per ASTM D3034.
      - a. For pipe sizes 15-inch and less which are within 10 feet or a water main or 50 feet of a water well, regardless of depth, provide SDR-21 PVC conforming to ASTM D3034.
      - b. For pipe sizes 18-inch to 48-inch, regardless of depth, provide PVC conforming to ASTM F679.
  - B. Joints: Bell and spigot type with elastomeric seals per ASTM D3212, with gaskets conforming to ASTM F477.
  - C. Fittings
    - 1. Provide wyes, tees, bends and other fittings equal to or greater than the class of the adjacent main line pipe to which they are jointed.
    - 2. Provide fittings that conform to corresponding class and internal diameter of specified pipe.
    - 3. Provide joints of the same type as used on the adjoining pipe.
    - 4. Securely attach fabricated branches for wyes and tees to the wall of the pipe in a watertight manner and flush with the inside surface of the pipe.
  - D. Service Laterals
    - 1. Building service laterals: minimum 6-inch diameter PVC of the same class as the adjacent sanitary sewer main, conforming to ASTM D3034.
  - E. Pipe Markings
    - 1. Each length of PVC pipe shall be clearly marked with the following information at a minimum:
      - a. Name of manufacturer or identification symbol
      - b. Trade name or trademark
      - c. Nominal pipe size

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- d. Production/extrusion code
- e. Material and cell class designation
- f. ASTM designation
- 2.02 Manhole and Accessories
  - A. General
    - 1. Provide precast concrete sections with no more than 3 holes cast or drilled in the section for handling.
    - 2. Provide rapid setting patch material in accordance with ASTM C928 and INDOT Standard Specification Section 901 or precast concrete plugs for filling all holes used for handling.
  - B. Precast Concrete Manholes
    - 1. Adjusting rings:
      - a. Supply a minimum of 1 adjusting ring for each manhole.
      - b. Minimum of 4 inches and maximum of 8 inches in height for new manholes.
      - c. Supply precast concrete riser sections for adjustment greater than 12 inches in height.
    - 2. Provide precast concrete eccentric cone section which conforms to ASTM C478. Flat top sections require preapproved by Engineer. Provide a 24-inch opening.
    - 3. Provide precast concrete manhole risers/barrels which conform to ASTM C478, AASHTO M199, INDOT Standard Specification Section 907.
    - 4. Manhole bases:
      - a. Provide precast concrete manhole bases which conforms to ASTM C478, AASHTO M199, and INDOT Standard Specification Section 907.
    - 5. For doghouse manhole base, provide precast concrete base with "doghouse" openings.
    - Manhole benchwalls: precast or constructed using a concrete mixture with a low cure time and the ability to be troweled to a smooth finish.
      a. 28-day compressive strength of no less than 4,000 psi.
    - Provide 1/2-inch diameter flexible butyl rubber joint gaskets conforming to ASTM C443 and AASHTO M198 for all manhole section joints as shown on the Drawings. Provide Kent seal or approved equal.
    - 8. Sumps are not permitted in manhole structures.
  - C. Castings
    - 1. Provide cast iron frames and covers in accordance with ASTM A48 Class 35B and INDOT Standard Specification Section 910.
    - 2. Supply all frames and covers from one manufacturer.
    - 3. Furnish frames and covers which are rated for traffic, of non-rocking design, and have machined horizontal and vertical bearing surfaces. Frames and lids shall be watertight and have a grooved rubber gasket with concealed pick holes.

- 4. Provide bolt-down frames and lids as manufactured by East Jordan Model No. 1022Z1PT, or approved equal.
- 5. Provide manhole frame and cover as shown in casting schedule below, or approved equal. Sanitary manhole lids shall have the words "SANITARY SEWER" cast in raised letters.
- 6. Sanitary Manhole Casting Schedule:

Туре	Neenah Model	EJIW Model		
Frame	R-1772-C	1022Z1		
Cover	R-1772-C	1020AGS		

# D. Steps

- 1. Provide steps in all structures 4 feet deep or greater in accordance with AASHTO M199 and INDOT Standard Specification Section 907.
- 2. Provide steps with a minimum 10 inches of clear step width.
- 3. Furnish copolymer polypropylene coated steel steps or approved non-corrosive fiberglass steps.
- 4. Copolymer polypropylene shall meet the requirements of ASTM D4101 reinforced with deformed 1/2-inch minimum diameter reinforcing steel in accordance with ASTM A615, Grade 60.
- 5. Non-coated cast iron steps will not be accepted.
- 6. Provide steps as manufactured by M.A. Industries, Inc., American Step Company, Inc., or approved equal.
- E. Pipe to Structure Connections
  - 1. Pipe penetration holes shall be either pre-formed by manufacturer or core drilled in the field.
  - 2. Provide flexible neoprene molded boot or resilient seal which conforms to ASTM C923.
    - a. Provide Kor-N-Seal boot as manufactured by National Pollution Control Systems, Inc. or approved equal.
    - b. Provide resilient seal as manufactured by A-Lok or approved equal.

# 2.03 Tracer Wire

- A. Furnish tracer wire for service laterals, from sewer main to building.
- B. For pipe installed by open excavation or within a casing, provide one strand of solid 12 AWG copper wire for the entire length of pipe.
- C. For pipe installed by horizontal directional drilling, provide 2 strands of 12 AWG solid, steel core hard drawn extra high strength copper tracer wire for the entire length of pipe. Supply Copperhead Direct Burial tracer wire, or approved equal.

D. Provide splice kits suitable for underground installation for splices and branch connections. Seal connection with epoxy contained in splice kit and wrap with waterproof tape.

## PART 3 - EXECUTION

## 3.01 General

- A. Do not install pipe when, in the opinion of the Engineer, trench conditions are unsuitable.
- B. Follow manufacturer's installation procedures when installing pipe, fittings, structures, and appurtenances.

#### 3.02 Examination

- A. Verification of Conditions
  - 1. Before installing piping, verify location, depth, type of joint needed, and size of pipe to which connection is proposed.
  - 2. Verify lines can be run as proposed. Refer any necessary deviation to the Engineer for final approval before lines are run.

#### 3.03 Installation

- A. Gravity Sanitary Sewer Pipe, Service Lateral, and Accessories
  - 1. Accurately dimension all lengths of pipe to measurements established at the site, and work into place without forcing.
  - 2. Cut sections of pipe using proper equipment such as a chop saw to provide a beveled end.
  - 3. Alternate sewer pipe materials consisting of ductile iron, concrete encased pipe, or SDR-21 PVC pipe must be used when one or more of the following conditions apply:
    - a. Where sewers or laterals must cross under existing water mains and cannot achieve or maintain 18 inches of clearance, use alternate pipe materials for at least one full pipe length centered under the crossing.
    - b. Where sewers or laterals must be routed horizontally with less than 10 feet of clearance from existing water mains, use alternative pipe materials for entire length.
  - 4. Lay sewer pipe uniformly to line and grade so that the finished sewer will present a uniform conduit.
  - 5. Minimum allowable cover shall be 36 inches over the top of sanitary sewer pipes and services in all locations. Shallower depth of cover may be considered by the OWNER or designated representative under conditions where engineering design will alleviate concern for surface loadings and frost heave.
  - 6. Set line and grade by means of laser beam and target for alignment and grade.

- 7. Lay sewer pipe progressively up grade with bell upstream in a manner to form close, concentric joints with smooth bottom inverts.
- 8. After joint is made, place sufficient bedding material along each side of the pipe to prevent conditions that might tend to move the pipe off line or grade.
- 9. Temporarily plug installed piping systems at end of each day's work, or other interruption of progress on a given line. Install plugging in a manner satisfactory to the Engineer, and adequate to prevent entry of animals into the pipe or the entrance or insertion of deleterious materials.
- 10. Securely attach fabricated branches for wyes and tees to wall of pipe in such a manner as to not restrict or otherwise interfere with flow characteristics of the pipe.
- 11. Where applicable, install laterals at a normal slope of 1/4-inch per foot. Minimum slope shall be 1/8-inch per foot.
- 12. Install a mechanical plug at the end of each lateral and at the end of all sewer stubs. Install the lateral at a depth of approximately 5 feet to allow each customer to connect to the end of the lateral.
- 13. Install a metal T-fencepost at the end of each sewer lateral for marking. Protect markers and verify that all laterals have been properly marked.
- 14. Tracer Wire
  - a. Install tracer wire on service lines, taped to pipe in 15 to 20-foot intervals. Do not wrap wire around pipe.
  - b. Install tracer wire from sanitary sewer main to cleanout and from cleanout to building.
- B. Standard Manholes
  - 1. Keep structure excavations free from water during construction.
  - 2. Fill areas excavated below the depth required for the structure's base with No. 8 crushed stone at Contractor's expense.
  - 3. Set top of casting at elevation to prevent surface water infiltration in areas of flooding or ponding.
    - a. Install precast concrete risers and adjusting rings in such combination that the manhole frame will be at the proper elevation.
    - b. Structures shall be completely constructed to proper finished grade before curbs, asphalt, or other pavement may be installed.
    - c. Patching and filling under frames will not be permitted.
  - 4. Install manhole frame to grade and centered.
  - 5. Install steps with minimum 3-inch wall embedment and minimum 4-inch clear distance projection from the wall as measured from the point of embedment.
  - 6. Install precast concrete base, risers, cone, and flat top sections so that the axis of the manhole is vertical.
  - 7. Install gaskets for joints in accordance with the manufacturer's recommendations.
  - 8. Wrap riser joints with external joint seals in accordance with manufacturer's recommendations.
  - 9. Apply a trowelable grade butyl rubber base exterior backplaster material 1/4-inch minimum thickness (when dry) on the exterior of the manhole at each joint, extending 6 inches above and 6 inches below the joint. Wrap joints with 80-gauge stretch wrap.

- 10. Prior to backfilling, fill all holes used for handling with rapid setting patch material or with precast concrete plugs secured with Portland cement mortar.
- 11. Unless otherwise indicated, set castings for all structures at finish grade level. Adjust castings to the satisfaction of the Owner or designated representative.
- 12. Benchwalls: minimum 1/2-inch per foot slope starting at the manhole wall/benchwall interface and then slope towards the top of the trough.
- 13. Trough; minimum depth equal to the diameter of the incoming and exiting sewers.
- 14. Wrap manhole frames located in pavement in minimum 3/8" preformed joint filler extending from the top to the bottom of the frame.
- C. Doghouse Manholes
  - 1. The following requirements are in addition to Article 3.03B:
    - a. Excavate sufficiently below existing pipe where doghouse manhole is to be placed, in order to allow for placement of crushed stone bedding and minimum base section thickness.
    - b. Use forms for pouring concrete base; do not use earth trench in lieu of forms.
    - c. Install steel reinforcement and pour concrete base
    - d. Pour concrete around existing pipe.
    - e. Saw cut cleanly and remove the top half of existing pipe after manhole is constructed.
- D. Pipe to Structure Connections
  - 1. Core drill new pipe penetration into existing structure at the proper location where the pipe enters the structure.
  - 2. Install flexible neoprene molded boot or resilient seal to secure the pipe in the structure wall as noted in Article 2.02E.2of this Section.
- 3.04 Field Quality Control
  - A. Tests
    - 1. Test all sanitary sewer systems installed in accordance with Section 02733.
- 3.05 Cleaning
  - A. Provide all necessary equipment required for proper completion of the flushing of manholes and piping systems.
  - B. Remove all debris and excess soil from manhole after construction and prior to flushing the sewer pipes.
  - C. Remove all debris and excess soil from all pipe installed by flushing with clean water. If flushing is not adequate to clean the pipes, clean the pipes by jetting and to the satisfaction of the Engineer.

-END-

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

# SECTION 02730 - FORCE MAIN SEWER SYSTEMS

## PART 1 - GENERAL

#### 1.01 Summary

- A. Section includes furnishing and installing force mains, air release valves and appurtenances.
- B. Before installing piping, verify location, depth, type of joint needed, and size of pipe to which connection is proposed. Verify that the lines can be run as contemplated. Any necessary deviation shall be referred to the Engineer for final approval before lines are run.
- C. All lengths of pipe shall be dimensioned accurately to measurements established at the site, and shall be worked into place without forcing. Cut sections of pipe shall be cut using pipe cutters to provide a square end.
- D. Related Sections
  - 1. Section 02224 Trenchless Excavation Horizontal Boring
  - 2. Section 02226 Trenchless Excavation Directional Drilling
  - 3. Section 02733 Testing Sanitary Sewers and Force Mains
  - 4. SP-40 Trenchless Construction Under Interstate 70

#### 1.02 Submittals

- A. Product Data
- B. Pipe material certification
- C. HDPE butt fusion data log
- 1.03 Delivery, Storage and Handling
  - A. Load and unload all pipe, fittings, manhole sections and appurtenances in a manner to avoid shock and damage. Do not drop materials.
  - B. Lifting shall be by hoists or skids when hand lifting is not feasible. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground.
  - C. Damaged or defective pipe and appurtenances shall be replaced.
  - D. Store materials in an area safe from damage and deterioration. Keep the interior of pipe, fittings, manhole sections and appurtenances free from dirt and foreign matter. Store gaskets in a cool location out of direct sunlight and free from contact with petroleum products.

## PART 2 - PRODUCTS

## 2.01 General

- A. Each length of pipe and fitting shall be plainly stamped, marked or color coded to an acceptable standard as to weight, class, and type, and the manufacturer's trademark or name.
- 2.02 High Density Polyethylene (HDPE) Pipe
  - A. Pipe
    - Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high density PE 3408 polyethylene resin. Polyethylene pipe shall meet the requirements of ASTM D3035/F714. Cell classification shall be 345444C per ASTM D3350. Design and manufacture pipe for working pressures of 100 psi and surge pressures of 150 psi. Depth of cover shall be as indicated on the Drawings and specified in this section.
    - 2. Polyethylene pipe shall have a minimum DR (Dimension Ratio) 21 for open cut installation or DR-11 for directional drill installation, and a nominal DIPS (Ductile Iron Pipe Size) outside diameter.
  - B. Fittings
    - 1. Fittings shall be manufactured in accordance with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe listed in this specification.
    - 2. Fittings shall be manufactured by the same manufacturer as the pipe to which fusion bonding is intended, using identical materials.
    - 3. Fittings shall be manufactured to meet the same pressure rating as the pipe with an included 2:1 safety factor. The pipe DR (Dimension Ratio) shall be used to determine the fitting pressure rating requirements.
    - 4. Fitting shall be manufactured in facilities designed for that purpose. Field-fabricated fitting shall not be allowed.
    - 5. Branch Saddle Reducing Tees shall be used to connect Air Release Valves to the force mains. Saddles shall be main line size by 4" with 4" flange adapter and back-up ring, and 4" x 2" NPT companion flange.
  - C. Flange Backup Rings and Gaskets
    - 1. Flange backup rings shall be of the type and pressure rating shown on the piping spool drawings.
    - 2. Ductile iron backup rings shall be of the convoluted type, fabricated from ductile iron per ASTM A536, grade range 60/40/18 to 65/45/12. Ductile iron flange backup ring bolting dimension shall conform to ANSI B16.5 Class 150.

- 3. Backup rings shall be finished as cast with flash removed from all edges and bolt holes to the specified dimensions. Additional finish requirements, if any, shall be as noted on the piping spool drawings and in accordance with the following:
  - a. Epoxy coated, with Bitumastic 300M High Build Coal Tar Epoxy per manufacturer's recommendations.
  - b. Gaskets shall be of the type and thickness shown on the piping spool drawings. Gasket materials shall be compatible with the service of the piping system. Asbestos gaskets will not be allowed.
- D. Fusion Bonding Procedure
  - 1. Piping joints other than those shown as flanged or otherwise mechanically connected shall be butt fusion bonded in accordance with a written bonding procedure specification (BPS) as required by ANSI/ASME B31.3, Chapter VII, paragraph A-328. BPS shall include cutting and facing requirements and shall utilize a data logger.
  - 2. Materials to be fusion bonded shall be from the same manufacturer.
  - 3. Bonders and bonding operators shall be qualified in the use of the BPS as required by ANSI/ASME B31.3, Chapter VII, paragraph A-328. Qualification records certifying that borders and bonding operators employed to complete fusion bonding are qualified in the BPS shall be submitted prior to commencement of fusion bonding work.
  - 4. Bonding equipment specified in the BPS shall be in proper operating condition. Equipment heater performance shall be tested and certified prior to use for fusion bonding. Bonders and bonding operators shall be qualified for the specific bonding equipment utilized in the fusion bonding work.
  - 5. The joining method shall be performed in strict accordance with the pipe manufacturer's requirements. The butt fusion equipment used in the jointing procedure shall be capable of meeting all conditions required by the pipe manufacturer, including temperature, alignment and fusion pressure. Heat fusion joining shall be 100% efficient offering a joint weld strength at least equal to the tensile strength of the pipe. Each butt fusion joint shall be logged electronically by the butt fusion unit, for quality control, by such equipment as The Data Logger manufactured by McElroy Manufacturing, Inc. Logged fusion joints shall be stored in the Data Logger unit, such that it can be downloaded and printed weekly for submittal to the Engineer.
- E. Quality Control
  - The pipe and fittings manufacturer shall have an established quality control program responsible for inspecting incoming materials and outgoing pipe and fittings and components. Incoming polyethylene materials shall be inspected for density per ASTM D-1505 and melt flow rate per ASTM D-1238, and contamination. All incoming materials shall be certified by the supplier. Certifications shall be verified by the pipe manufacturer and submitted to the Engineer.

- 2.03 Ductile Iron Pipe (DIP) Force Main
  - A. Pipe shall be centrifugally cast in metal or sandlined molds and shall conform to ANSI A21.51/AWWA C 151. Minimum thickness class shall be Class 50 for all sizes. Each length of pipe shall be marked to show manufacturer's name or trademark, pipe class, and year of manufacture. Pipe joints shall be push-on type and conform to ANSI A21.11/AWWA C 111.
  - B. Fittings shall be ductile iron mechanical joint conforming to ANSI A 21.10/AWWA C 110 and ANSI A21.11/AWWA C 111. Restrained joints may be used instead of mechanical joints and reaction thrust blocking and shall be Lok-Tyte, Loc-Fast, or approved equal.
  - C. Coatings All ductile iron pipe and fittings shall have a standard thickness cement mortar lining as specified in ANSI A 21.4/AWWA C 104 and an outside coating as specified in ANSI A 21.51/AWWA C 151.
  - D. Gaskets Mechanical joints and push-on joints shall conform to ANSI A 21.11/AWWA C 111.
- 2.04 Sewage Air and Vacuum Valves
  - A. Sewage Air Release and Air Vacuum Valve shall have cast iron body and cover with a stainless steel float and float guide. Valves shall be manufactured by APCO, Val-Matic Valve and Manufacturing Co., or approved equal.
- 2.05 Steel Casing
  - A. Steel Casings shall be as specified in Section 02224.
- 2.06 Tracer Wire
  - A. Tracer Wire shall be 12-gauge AWG copper wire. Splices and branch connecting shall be made with 12 AWG splice kits suitable for underground installation. Seal connection with epoxy contained in splice kit and wrap with waterproof tape.
- 2.07 Location Material
  - A. Location material shall be metallic type tape such as Terra Tape Detectable as manufactured by Reef Industries, Inc. or approved equal. Location material shall be marked with "Caution Sewer Line Buried Below".
- PART 3 EXECUTION
- 3.01 General
  - A. Provide all tools, labor and equipment necessary for the safe and expeditious installation of all force mains, and appurtenances.

FORCE MAIN SEWER SYSTEMS

- B. Inspect sewer pipe, and appurtenances prior to installation and promptly remove damaged or unsuitable materials with new and unused materials.
- C. Force main shall be laid uniformly to line and grade so that the finished sewer will present a uniform bore. The Contractor, at his own expense, shall set force main alignment and grade for all sewers for the minimum depth of cover as shown on the Drawings.
- D. Contractor shall take precautions to avoid constructing "high points" in the force main other than those already shown on the Drawings. The Contractor shall be responsible for installing at his own costs any additional Air Release Valves necessary in these areas to vent accumulated air and gases trapped at these "high points".
- E. Tracer Wire shall be installed on HDPE pipe taped to pipe in 15 to 20-foot intervals.
  - 1. A minimum of two tracer wires shall be provided for all pipe except as noted herein.
  - 2. If pipe is installed by drilling or boring, a minimum of two strands of Copperhead Reinforced Tracer Wire as manufactured by Copperhead Industries or approved equal is required. Do not wrap wire around pipe.
  - 3. Install tracer wire boxes at intervals not to exceed 5,000 feet. Coil tracer wire inside meter box with enough wire to extend two feet above the box.
  - 4. Install tracer wire on outside of all valve boxes between collar and box. Seal splices and branch connections with epoxy and wrap with tape.
  - 5. Provide a continuity test on all tracer wire installed.
- F. Installed piping systems must be temporarily plugged at the end of each day's work, or other interruption of progress on a given line. Plugging shall be installed in a manner satisfactory to the Engineer, and it shall be adequate to prevent entry of animals into the pipe or the entrance or insertion of deleterious materials.
- G. Remove all debris and excess soil from all pipe installed by flushing with clean water. It shall be the Contractor's responsibility to obtain necessary water and equipment to flush the pipes to the satisfaction of the Engineer.

## 3.02 Installation of Sewer Pipe – HDPE

- A. HDPE Pipe installed by open cut shall be butt fusion bonded at grade level and lowered into the trench using nylon slings to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting sections of pipe.
- B. Contractor shall have the option of installing HDPE Force main per 02226-Horizontal Directional Drilling in lieu of open excavation. Contractor shall receive no extra compensation for installing HDPE force main via horizontal directional drilling.
- C. Horizontal directional drilling of HDPE pipe where required per the Drawings shall be as specified in Section 02226.

FORCE MAIN SEWER SYSTEMS

- 3.03 Installation of Casing
  - A. Install steel casing pipe by boring and/or jacking under taxiways and roadways at the required locations and elevations shown on the Drawings and as specified in Section 02224.

-END-

FORCE MAIN SEWER SYSTEMS

# SECTION 02731 - CURED-IN-PLACE PIPE (CIPP) FOR MAINLINE RENEWAL

# PART 1 - GENERAL

- 1.01 Summary
  - A. It is the intent of this specification to provide for the reconstruction of pipelines and conduits by the installation of a resin-impregnated flexible tube that is either inverted or pulled into the original pipeline/conduit and expanded to fit tightly against said pipeline by the use of water or air pressure. The resin system shall then be cured by elevating the temperature of the fluid (water/air) used for the inflation to a sufficient enough level for the initiators in the resin to effect a reaction. The finished pipe shall be such that when the thermosetting resin cures, the total wall thickness shall be a homogeneous and monolithic felt and resin composite matrix that will be chemically resistant to withstand internal exposure to domestic sewage or stormwater.
  - B. CCTV Inspection Review

Contractor shall provide pre-CCTV Inspection videos for the Engineer's review. Videos shall display the sewer segment(s) in a condition ready to have the CIPP Liner installed. Contractor shall also provide the Post-CCTV Inspection videos for the Engineer's review. Videos shall display the installed CIPP Liner after all finish work (e.g. lateral brushing) has been completed.

- 1.02 Related Sections
  - A. Section 02732 Sanitary Sewer Cleaning and Televising
  - B. Section 02734 Bypass Pumping/Flow Control
- 1.03 Qualifications
  - A. Product
    - 1. The system proposed (materials, methods, workmanship) must be proven through previous successful installations to an extent and nature satisfactory to the Owner or designated representative and the Engineer that is consistent with the size of the project being proposed. Only products deemed to have a 50-year design life will be accepted.
    - 2. CIPP liner material shall be as manufactured by Inliner Technologies, LLC, Insituform, Inc., Mississippi Textiles Corporation, C.I.P.P. Corporation, Pipenology, LLC, or Applied Felts, Inc.
    - 3. All CIPP lining products shall comply with the latest versions of ASTM F 1216 or ASTM F 1743, including appendices.
    - 4. The product shall have been successfully in service in an application similar to this for a minimum of 10 years.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CURED-IN-PLACE PIPE FOR MAINLINE RENEWAL B. Pre-Qualification of Alternate CIPP Suppliers

In the event the Bidder wishes to submit an alternate system for consideration by the Engineer, the Bidder shall submit to the Engineer a complete technical proposal for the alternate system to Conform with PART 2 - PRODUCTS as described under this Section. This shall be submitted no later than 7 days prior to the bid opening. The Bidder shall also submit the following for the alternate system:

- Guarantee and Warranty
- List of Names of Applications, Names of Owner Personnel, Telephone Numbers and Addresses. The List shall include installations within the last 12 months as well as installations completed greater than 5 years prior.
- List of Existing Installations

If in the judgment of the Engineer, the submittal is acceptable, the Engineer shall issue an Addendum to the Specifications no later than three (3) days prior to the date of bid opening. If any of the above materials specified for the pre-qualifications proposal is not included in this submittal, the proposal may be considered non-responsive and incomplete and may be rejected by the Engineer.

- C. Installation Contractor
  - 1. The Contractor shall be an approved installer of the CIPP material as determined by the material Manufacturer.
  - 2. The installation Contractor shall have installed within the United States a minimum of 100,000 lineal feet of the same product being represented by the bidder.
  - 3. The actual installation superintendent shall have installed a minimum of 50,000 lineal feet and shall have 3 years of installation experience of the same product being represented by the bidder.

Failure to meet these minimum requirements shall render the bidder non-responsive for purposes of award.

# PART 2 - PRODUCTS

# 2.01 Structural Requirements

A. Each CIPP shall be designed for a minimum 50-year service life under continuous internal and/or external loads as dictated by the site and pipe conditions. Design thickness of the liner shall be based on the condition of the existing pipe which shall be classified as fully deteriorated as defined in ASTM F1216 Appendix XI. The long-term modulus shall not exceed 50 percent of the short-term value for the resin system and shall be verifiable through testing. The thickness calculations,

signed and sealed by a registered professional engineer, shall be submitted to the Engineer prior to CIPP installation.

- B. The layers of the finished CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or such that the knife blade moves freely between the layers. If separation of the layers occurs during testing of the field samples, new samples will be cut from the work. Any reoccurrence may be cause for rejection of the work.
- C. The cured liner shall meet the following minimum strength requirements:

		Cured
	ASTM	Composite
Property	Test Method	Per ASTM
		F1216
Flexural Strength	D790	4,500 psi
Flexural Modulus (initial)	D790	250,000 psi
Tensile Strength <sup>(1)</sup>	D638	3,000 psi

## MINIMUM PHYSICAL PROPERTIES

<sup>(1)</sup>For pressure piping applications only

The thickness for the installed CIPP shall be calculated based on the following minimum design assumptions:

- 1. The design safety factor is 2.0 for pipes smaller than 36 inches in diameter and 1.5 for pipes with a diameter 36 inches and larger.
- 2. The existing sewer is considered fully deteriorated.
- 3. The existing sewer is considered to have an ovality of 2 percent in circumference.
- 4. The CIPP is subjected to a full soil load of 120 pounds per cubic foot.
- 5. The CIPP is subjected to traffic live loads as calculated by AASHTO Standard Specifications for Highway Bridges, HS-20-44 Highway Loading. Railroad or airport loadings shall be used, as applicable.
- 6. The modulus of soil reaction for pipe zone backfill material is 700 psi or less depending soil conditions.
- 7. The CIPP is subject to a groundwater elevation of 5 feet below the ground surface.

#### 2.02 Materials

- A. Liner Tube
  - 1. The tube shall consist of one or more layers of a flexible needled felt or an equivalent nonwoven or woven material, or a combination of nonwoven and woven materials, capable of carrying resin, withstanding installation pressures and curing temperatures. The tube should be compatible with the resin system to be used on this project. The material should be able to stretch to fit irregular

pipe sections and negotiate bends. Projected changes in groundwater level, temperature and other loading factors shall cause no significant changes in the service characteristics or service life of the CIPP.

- 2. The liner shall be fabricated from materials which when cured, will be chemically resistant to reagents as defined in ASTM F1216, ASTM P1743, and ASTM D543.
- 3. The tube should be fabricated under controlled conditions to a size that, when installed, will tightly fit the internal circumference and the length of the original conduit. Allowances should be made for the longitudinal and circumferential stretching that occurs during placement of the tube. Maximum stretching allowances shall be as defined in ASTM F1216 or ASTM F 1743. The Contractor shall verify the lengths in the field before cutting the liner to length. Individual liners can be made over one or more manhole to manhole sections.
- 4. The tube shall be uniform in thickness and when subjected to the installation pressures shall meet or exceed the designed wall thickness.
- 5. Any plastic film applied to the tube on what will become the interior wall of the finished CIPP shall be compatible with the resin system used, translucent enough that the resin is clearly visible, and shall be firmly bonded to the felt material.
- 6. At time of manufacture, each lot of liner shall be inspected and certified to be free of defects. The tube shall be marked for distance at regular intervals along its entire length, not to exceed five feet. Such markings shall also include the Manufacturer's name or identifying symbol.
- 7. The reinforcing material of the liner shall be of a needle interlocked terylene felt formed into sheets of required thickness or other material approved by the Manufacturer.
- 8. Liners may be made of single or multiple layer construction where any layer must not be less than 1.5 mm thick. A suitable mechanical strengthener membrane or strip may be placed in between layers where required to control longitudinal stretching.
- B. Resin Components
  - 1. The resin system shall be a corrosion resistant polyester system that when properly cured within the tube composite meets the minimum requirements given herein or those that are to be utilized in the design of the CIPP for this project.
  - 2. The resin used shall not contain non-strength enhancing fillers.
  - 3. The Contractor shall submit the resin characteristics, including filler identification, to the OWNER or designated representative for approval prior to lining activities.
  - 4. <u>The resin system utilized to CIPP line the 12</u>" sanitary sewer shown on the <u>drawings shall be non-styrenated.</u>

## PART 3 - EXECUTION

#### 3.01 General

- A. The Contractor shall deliver the liner to the site and provide all equipment required to insert and cure the liner within the host pipe. The Contractor shall designate a location where the tube will be vacuum impregnated prior to installation. If requested by the Engineer, the Contractor shall notify the Engineer at least 48 hours prior to wet out to allow the Engineer to observe the materials and wet out procedure. All procedures to prepare the liner for installation shall be in strict accordance with the Manufacturer's recommendations.
- B. The liner shall be impregnated with resin not more than 120 hours before the time of installation and stored out of direct sunlight at a temperature of less than 70° F.
- C. Water required for CIPP installation and subsequent cleaning shall be obtained per Section 02732.

## 3.02 Preparation

- A. The Contractor shall perform cleaning, videotaping, and inspection prior to installation of the CIPP. Engineer shall review and approve Pre-TV inspection video prior to CIPP installation. The Contractor shall remove all debris from within the pipe that will interfere with the installation of the CIPP. Contractor shall be responsible for the disposal of all debris, silt, and accumulated solids removed from the sewer as outlined in Section 02732. Video inspections conducted prior to CIPP installation shall be clearly labeled on the disc and the filename "PRE-TV MH\_\_\_\_\_\_TO \_\_\_\_\_" or "PRE-TV Segment \_\_\_". If multiple discs are required, Contractor shall label discs in chronological order as follows: "Pre TV Disc #\_\_\_".
- B. It is the responsibility of the Contractor to notify the Engineer of line obstructions, offset joints or collapsed pipe that will prevent the insertion of the tube or significantly reduce the capacity of the sewer. The Engineer, with input from the Contractor, shall determine the method of pipe repair required and shall address these concerns on a case-by-case basis.
- C. The Contractor shall confirm the status (active/live or inactive/dead) of service laterals connecting to the mainline sewer. Confirmation shall be made by speaking with sanitary sewer customers or utility personnel, inspecting cleanouts, dye testing, etc. Refer to Paragraph 3.07B, this section.
- D. Protruding laterals or services shall be trimmed flush with the inside of the main sewer wall prior to lining. Trimming shall not cause damage to the lateral or service beyond the inside face of the main sewer. Payment for protruding lateral removal shall be made only where identified on the Schedule of Sewer Rehab and where the lateral protrudes more than 1". Lateral trimming costs shall otherwise be included in the unit price of CIPP liner.
- E. Contractor shall assume all responsibility for notification to and coordination with all collection system customers whose building sewer laterals will be out of service

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CURED-IN-PLACE PIPE FOR MAINLINE RENEWAL during the segmental cured-in-place pipe installation, curing and restoration processes. Notifications shall be in writing via door hanger, door flier or U.S. mail and shall be delivered between 24 to 48 hours in advance of CIPP installation. Notification shall clearly state the purpose of the work, shall advise all affected customer(s) against water usage until the sewer line is placed back in service, and shall clearly state the potential consequences of use of residential wastewater generating facilities during the time when the building sewer service will be out of service (i.e. sewer back-up). The notice shall include a local 24-hour contact telephone number for residents to call Contractor if they have questions regarding the work.

F. No sanitary sewer customer shall be asked to limit water usage for more than 24 consecutive hours. A sample of the written notification shall be submitted to and approved by the Engineer prior to use.

## 3.03 Installation

- A. The CIPP shall be installed in accordance with the practices given in ASTM F 1216 (for direct inversion installations) or ASTM F 1743 (for pulled-in-place installations). The quantity of resin used for the tube's impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances being made for polymerization shrinkage and the loss of any resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used in conjunction with a roller system to achieve a uniform distribution of the resin throughout the tube.
- B. A scaffold or elevated platform shall be erected at the access point. The resinimpregnated tube shall be installed into the host pipe by methods approved by the Manufacturer and proven through previous successful installations. The insertion method shall not cause abrasion or scuffing of the tube. Hydrostatic or air pressure shall be used to inflate the tube and mold it against the walls of the host pipe. There will be no use of sewage in place of clean water for insertion of the tube, or for the curing of the liner.
- C. The tube shall be installed in a controlled manner at a rate sufficient to prevent damage to the tube. The installation rate shall not exceed 32 feet per minute. The installation head shall be such that, allowing for minor impact, at no time shall the hoop tension in the felt exceed 500 psi or the hoop stress in the polyurethane membrane exceed 8,000 psi.

# 3.04 Curing

A. After tube installation is completed the Contractor shall supply a suitable heat source and recirculation equipment. The equipment shall be capable of delivering hot water or steam throughout the section to uniformly raise the temperature above the temperature required to effect a cure of the resin. This temperature shall be determined by the resin/catalyst system employed.

- B. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing heat supply. Thermocouples shall be placed between the tube and the host pipe in downstream manholes at or near the bottom to determine the liner temperature during cure. Water or air temperature in the pipe during the cure period shall be as recommended by the resin Manufacturer.
- C. Initial cure shall be deemed to be completed when inspection of the exposed portions of cured pipe appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize an exotherm. The cure period shall be of a duration recommended by the resin Manufacturer, as modified for the installation process, during which time the recirculation of the heat and cycling of the heat exchanger to maintain the temperature continues. The heat source shall be shut down during the post cure.
- D. Contractor shall provide Engineer with the cure and post-cure period and temperatures as recommended by the manufacturer(s) prior to the cured-in-place liner installation. Contractor shall submit curing logs prepared during CIPP installation to Engineer.

# 3.05 Cool Down

A. Cool down may be accomplished by the introduction of cool water or air into the installation standpipe to replace water or pressurized air being relieved from the manhole. The Contractor shall cool the hardened pipe to a temperature below 100° F before relieving the static head. A minimum period of post cure shall be maintained under a static head to provide a minimum hoop tension on the tube felt. Care shall be taken in the release of the static head so that a vacuum will not be developed.

# 3.06 Finish

- A. The finished lining shall be continuous over the entire length as indicated within the Contract Documents and be as free as commercially practical from visual defects such as foreign inclusions, dry spots, pinholes, and delamination. The lining shall be homogeneous, impervious, and free of any leakage from the surrounding ground to the inside of the lined pipe.
- B. Where the liner is installed through a manhole uninterrupted, the invert shall be maintained smooth through the manhole, with approximately the bottom half of the liner continuous through the manhole. The invert of the manhole shall be shaped and grouted as necessary to support the liner. The cost of this work shall be included in the CIPP unit price.
- C. During the 3-year Maintenance Bond period, any defects which will affect the integrity or strength of the liner, collect solids, or reduce hydraulic flow capabilities of the product shall be repaired at the Contractor's expense in a manner mutually agreed upon by the OWNER or designated representative and the Contractor.

- D. If CIPP does not make a tight seal with the host pipe at the manhole penetration, Contractor shall seal the CIPP/host pipe interface with quick-set, non-shrink grout or epoxy.
- 3.07 Reinstate Laterals and Services
  - A. Accurate location of the lateral and service connections shall be the Contractor's responsibility.
  - B. After the liner has been installed, all existing <u>active</u> lateral sewers and services shall be reinstated unless otherwise indicated by the Owner or designated representative or on the plans. The reinstatement of laterals and services shall be done without excavation unless otherwise specified by the Engineer. Reinstatement of laterals and services will be accomplished from the interior of the pipeline by means of a television camera directed cutting device or by direct man entry when feasible. Each cut lateral and service connection shall be brushed with trenchless equipment to achieve a smooth finish, free from burrs, frayed edges, or any other restriction preventing free flow of wastewater.
  - C. Laterals shall be reinstated to a minimum of 90% of their original diameter and no more than 100% of their diameter. The CIPP liner shall be tightly sealed at the cut openings with no gaps. All coupons cut from the liner as a result of reopening the lateral connections shall be retrieved from the sewer and accounted for by the Contractor.
  - D. All active laterals shall be reinstated immediately following installation of the liner. Under no circumstances shall reinstatement be completed the following day(s) unless otherwise authorized by the Engineer.
  - E. Capped or otherwise inactive laterals shall not be reinstated unless otherwise specified by the OWNER or designated representative or Engineer.

# 3.08 Quality Control Procedures

- A. For every two thousand five hundred (2,500) lineal feet of liner installed, two (2) flat plate samples shall be processed and tested. A minimum of two (2) flat plate samples shall be required per size of CIPP installed. The flat plate samples shall be taken directly from the wet out tube, clamped between flat plates, and cured in the downtube. As an alternative, restrained end samples may be used for pipes eight to 18 inches in diameter.
- B. Testing shall be completed by an accredited, independent laboratory at the Contractor's expense. The Contractor shall submit the chosen laboratory with appropriate accreditation documentation for approval by the Engineer prior to testing. Testing results shall be provided to the Engineer within seven (7) days of receipt. Retainage shall not be released until receipt of acceptable CIPP test results from Contractor.
- C. Samples shall be conditioned and prepared in accordance with ASTM D618 and ASTM D 5813 to ensure consistency in laboratory results.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CURED-IN-PLACE PIPE FOR MAINLINE RENEWAL

- D. Thickness shall be measured in accordance with ASTM D5813, latest version, with only the structural portion of the CIPP being measured.
- E. Flexural testing shall be in accordance with ASTM D790, latest version, with only the structural portion of the CIPP being tested.
- F. For pressure application, tensile testing shall be in accordance with ASTM D638, latest version, with only the structural portion of the CIPP being tested.
- G. The Contractor shall perform cleaning, videotaping, and inspection <u>following</u> <u>installation of the CIPP liner and lateral reinstatement</u>. Contractor shall prepare and deliver Post TV discs and logs to the Engineer weekly for review. Video inspections conducted after CIPP installation shall be clearly labeled "POST-TV MH\_\_\_\_\_TO \_\_\_\_\_" or "POST-TV Segment \_\_\_". If multiple discs are required, Contractor shall label discs in chronological order as follows: "POST TV Disc #\_\_\_". Submittal of all POST TV discs shall be submitted for review prior to substantial completion.

-END-

# SECTION 02732 - SEWER CLEANING AND TELEVISING

# PART 1 - GENERAL

## 1.01 Summary

- A. Provide all labor, materials and equipment required to clean and televise the sewer system. The Work shall include, but not be limited to, mobilization, demobilization, bypass pumping/flow control, traffic control, televising, root removal, debris removal and disposal, site restoration, sewer line cleaning, video recording and field logs, and all incidentals necessary to complete the Work as described in these Specifications and as shown on the Drawings. Water and debris disposal location will not be provided by the Owner or designated representative.
- B. <u>The Indianapolis Airport Authority and Engineer can provide no information on the extent/quantity of solids in the sewers to be cleaned.</u>

## PART 2 - PRODUCTS

- 2.01 Equipment for Sewer Segment Cleaning
  - A. Use High-Velocity Jet Equipment. All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps and powered hose reel.
  - B. Accuracy of equipment and operating method for cleaning shall be judged by the results obtained. There are no restrictions on types and use of machines involved.
  - C. When high-velocity cleaning equipment is used, a suitable sand trap, weir, dam, or other measures shall be employed in the downstream manhole in such a manner that all solids and debris are trapped and removed, thereby preventing such material from passing into the next sewer reach.
  - D. Make all necessary arrangements with Citizens Energy Group for using water from their public water system. Record all water usage using a meter provided by the Owner or designated representative. An approved backflow prevention device must be used.
  - E. When Contractor encounters an obstruction that normally cannot be cleaned with equipment indicated above, Contractor shall indicate the location in his field log. Acceptability shall be based on Engineer's review of the video recording. It is the intent of these Specifications that pipe walls be clean enough for the camera to

discern structural defects, misalignment and points of infiltration. Remove a minimum of ninety-five percent (95%) of the debris.

## PART 3 - EXECUTION

#### 3.01 Buried Manhole

- A. If a manhole is found to be inaccessible (i.e., manhole located under an existing building), record such information on the Drawings and inform Engineer.
- 3.02 Sewer Cleaning
  - A. Selection of cleaning equipment and the method for cleaning shall be determined by the Contractor and shall be based on the condition and/or pipe material of the sewer segment at the time work commences.
  - B. Take precautions to protect the sewer segments and appurtenances from damage by the improper use of cleaning equipment. Any damage inflicted upon a sewer segment or other public or private property which is caused by the improper use of the cleaning equipment, regardless of the cleaning method used, shall be repaired by Contractor at no additional cost to Owner.
- 3.03 Pipe Damage Prevention During Cleaning Operation
  - A. Contractor shall recognize that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where damage would result if cleaning were attempted or continued. Should such conditions be encountered, immediately notify Engineer. If, in the course of cleaning operations, damage does result from preexisting and unforeseen conditions such as broken pipe, Contractor will not be held responsible unless he fails to promptly notify Engineer. Engineer shall be notified by the Contractor of any conditions which warrant termination of cleaning activities.
- 3.04 Debris Removal and Disposal
  - A. Remove all sludge, dirt, sand, rocks, grease and other solid or semisolid material resulting from the cleaning operation from the sewer segment being cleaned. Cleaning equipment shall be capable of adequately cleaning sewers 6 inches in diameter and larger. Passing material from sewer segment to sewer segment shall not be permitted.
  - B. In the event that sludge, dirt, sand, rocks, grease and other solid or semisolid material resulting from the cleaning operation are observed or detected by Engineer as passing to downstream sewer segment(s), Contractor shall clean such sewer segment(s) at no additional cost to Owner upon written notice from the Engineer.
  - C. Contractor shall be responsible for the disposal of all debris, silt, and accumulated solids removed from the sewer. All debris, silt and solids removed shall be

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 SEWER CLEANING AND TELEVISING disposed of in accordance with all appropriate codes, rules and regulations for the handling and disposal of such materials and shall be removed from the sewer prior to beginning the televising inspection. Under no circumstances shall the removed sewage or solids be dumped onto streets or into ditches, catch basins, storm drains, sanitary sewers, combined sewer manholes or otherwise improperly disposed.

- D. Laterals protruding into the sewer shall be removed when they protrude into the sewer more than one (1) inch. These "protruding taps" will be paid as a separate pay item per protruding tap removed. Special attention shall be used during the removal of protruding taps to cause no damage to the sewer.
- E. With the exception of protruding lateral removal, no direct payment shall be made for debris removal and disposal.
- 3.05 Protection During Inspection/Cleaning Operations
  - A. Do not enter any sewer segment where hazardous conditions may exist until such times as the source of those conditions is identified and eliminated by Contractor. Perform all work in accordance with the latest OSHA confined space entry regulations. Coordinate Work with local fire/police rescue units.
  - B. Protect the sewer segments and sewer manholes from damage by the improper use of cleaning equipment. Whenever hydraulically propelled cleaning tools, which depend upon water pressure to provide their cleaning force, or any tools which retard the flow of water in the sewer segment are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or flooding to public or private property being served by the sewer segment involved. The Contractor is fully responsible for any and all damage incurred to public and private property as a result of Contractor's operations and must make full restitution with any and all affected property owners.
- 3.06 Root Removal
  - A. Remove and dispose of roots within sewers when they protrude into the sewer more than 25% of the pipe diameter. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners.
- 3.07 Sewer Segment Television Inspection
  - A. Internally inspect, via closed circuit television inspection, the sewer segments as set forth by Engineer. Record these inspections on color digital video disk (DVD). The electronic video file format shall be capable of playing on standard software, such as Windows Media Player and indexed to permit fast forwarding of the videos. If the electronic file format requires special software for viewing, this software

package shall be provided to the Owner or designated representative and to the Engineer at no cost. The DVD shall include a narrative noting:

- 1. Date, time of day and depth of flow
- 2. Sewer segment number "from manhole to manhole"
- 3. Depth of upstream and downstream manholes
- 4. Sewer material and diameter
- 5. Closest street address and street name on which sewer is located
- 6. Direction of camera movement (upstream or downstream)
- 7. Surface above sewer (i.e. paved road, gravel alley, grass field, etc.)
- 8. Locations of service connections into sewer
- 9. Locations of obstructions, structural defects, joint deterioration, leakage or evidence thereof, and other abnormalities with respect to the sewer condition and distance in feet from the upstream manhole centerline.
- B. The DVD shall visually display the date, pipe section number (manhole number) and distance from the center of upstream manhole to center of downstream manhole, to accuracy of 2 feet±. Where a manhole is encountered that does not have a number, the contact Engineer for assignment of a new manhole number. Where an obstruction is encountered and a reverse set up is required, the distance shall be written and verbally noted on the video as to from which manhole measurements are being made. No additional cost will be paid for reverse set ups. DVD case shall display the same information as indicated above as well as date and crew ID number. DVDs of all segments shall be provided to Engineer along with the respective television inspection field logs at the completion of the job. TV field logs shall legibly show the location of each point of significance in relation to an identified manhole.
- C. Points of significance include, but are not limited to the following: service connections, visible infiltration, unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion, mineral deposits, hardened sewer debris, structural failures and other discernible features.
- D. Present on DVD a continuous image of not less than ninety percent (90%) of the internal pipe surface at all times for sewers 8" through 18" in diameter. Maximum acceptable speed of camera through sewer shall be thirty (30) feet per minute. Lighting system shall be adequate for quality pictures. A reflection in front of the camera may be required to enhance lighting.
- E. Televise the internal surface of each sewer segment in its entirety. Engineer shall reserve the right to deduct that total footage deemed to be non-acceptable from the total footage televised that has been submitted to Engineer for payment.
- F. If any obstruction in the sewer segment such as a protruding building lateral prohibits the passage of the television camera, inspect the remainder of the sewer segments by making a reverse set up at the next down stream manhole.

- G. All obstructions in the sewer segment that prohibit passage of the television camera shall be immediately reported to the Engineer by Contractor referencing location and nature of the obstruction.
- H. Perform a closed circuit television (CCTV) inspection of sewer segments that are 6 inches or greater in diameter. The camera shall be equipped with remote control devices to adjust the light intensity, and a minimum one thousand (1,000) feet of continuous cable shall be provided. The camera shall be able to transmit a continuous image to the television monitor as it is being pulled through the sewer segments. The camera shall be of the motorized variety; "push" type cameras are <u>not</u> permitted.
- I. Contractor shall be responsible for all damage to public or private property resulting from his/her televising activities and shall repair or otherwise make whole such damage at no cost to Owner.
- J. Submit the DVDs, along with corresponding written televising log sheets to Engineer for review at the conclusion of the project.
- 3.08 Sewage Flow Control
  - A. Contractor shall be responsible for controlling and/or maintaining all sanitary and storm flows within the sewer system during the work in accordance with the Specifications. Submit a plan for flow control to Engineer for approval prior to beginning the work. Contractor may consider bypass pumping to a sewer system separate from the project. Contractor is responsible for verifying the capacity of sewers existing within the proposed sewer system prior to commencement of bypass pumping.
  - B. Provide adequate pumping equipment, pneumatic plugs, couplings, suction pipe, discharge pipe, etc., and other facilities to dewater the sewer segment during the Work.
  - C. If bypass pumping is utilized to control flows to achieve television inspection performance requirements, Contractor shall be responsible for monitoring the bypass pumping operation at all times until work is complete. The location of pump(s), force main, discharge point, etc. shall first be approved by Engineer.
  - D. Provide all necessary labor and supervision to set up and operate the dewatering system. Precautions shall be taken to ensure that flow control and dewatering operations will not cause flooding or damage to public or private properties. In the event flooding or damage occurs, make provisions to correct such damage at no additional cost to Owner.
- 3.09 Traffic Control
  - A. Maintain vehicular and/or pedestrian traffic during the Work at all times.

#### 3.10 Site Restoration

- A. Replace all lawn and grass areas disturbed or damaged during the Work to original or better condition.
- B. Deposit and spread topsoil to a minimum finished depth of six (6) inches; finely raked, ready for seeding.
- C. Repair all damage to paved surfaces caused by cleaning and televising activities in accordance with applicable state and local requirements, including damage to privately owned paved surfaces.

# 3.11 Post-TV Requirements

- A. Post-TV inspections shall show the full length of rehabilitated or replaced sewer. The camera shall stop at each service connection, storm and sanitary structure, reinstatement, repaired joint, or defect within the sewer. Pan and tilt the lens around the circumference of the entire lateral, joint, or defect to provide a clear and complete image.
- B. Submit two (2) binders to the Engineer upon completion of all work. Each binder shall include, at a minimum, the following:
  - 1. Cover page, listing the Project Name, Contractor, Engineer, Owner, and Starting/Ending Dates of Work
  - 2. Pre-Televising Videos on DVD. DVD(s) shall be clearly labeled as "Pre-Televising DVD: Disc \_ of \_", and shall include a list of each televised segment on the DVD as well as the Owner's name and date.
  - 3. Pre-Televising field logs, in numerical order based upon upstream manhole. PDF copies shall be included on the Pre-Televising DVD(s)
  - 4. Post-Televising Videos on DVD. DVD(s) shall be clearly labeled as "Post-Televising DVD: Disc \_ of \_", and shall include a list of each televised segment on the DVD as well as the Owner's name and date.
  - 5. Post-Televising field logs, in numerical order based upon upstream manhole. PDF copies shall be included on the Post-Televising DVD(s)

-END-

# SECTION 02733 - SANITARY SEWER AND FORCE MAIN TESTING

#### PART 1 - GENERAL

- 1.01 Summary
  - A. Section Includes: Provide all equipment and instrumentation required for proper flushing and testing of manholes, gravity sanitary sewers, and force mains installed. Source and quality of water, test procedures, and disposal of water shall be approved by the Owner or designated representative.

#### 1.02 Related Sections

- A. Section 02729 Gravity Sanitary Sewer Systems
- B. Section 02730 Force Main Sewer Systems

#### 1.03 References

A. ASTM F1417 - standard test method for installation acceptance of plastic gravity sewer lines using low pressure air, latest revision.

#### PART 2 - PRODUCTS

Not Used.

#### PART 3 - EXECUTION

- 3.01 Sanitary Sewer Testing
  - A. Flush all piping systems with water to remove debris prior to testing.
  - B. Conduct all tests in the presence of the Owner or designated representative. Preliminary tests made by the Contractor without being observed by the Owner or designated representative will not be accepted. Notify the Owner or designated representative at least 36 hours before any work is to be inspected or tested.
  - C. All defects in piping systems shall be repaired or replaced and retested until acceptable to the Owner or designated representative. Repairs shall be made to the standard of quality specified for the entire system.
  - D. Sections of the system may be tested separately, but any defect which may develop in a section previously tested and accepted shall be promptly corrected and retested at no additional cost to the Owner.

- E. All manholes and piping systems shall be tested in accordance with these test methods in addition to any test required by Indiana Department of Environmental Management, State or Local plumbing codes, and building authorities.
- F. Gravity Sewers
  - 1. Tests: Unless otherwise directed by the Owner or designated representative, all underground sewer system piping for gravity flow shall be subjected to post-CCTV inspection and an air test in lieu of a mandrel test or infiltration or exfiltration tests.
    - a. Air Test: The sewer line to be tested shall be tested in increments between manholes. Seal the line at each end. The seal at one end shall have an orifice through which to pass air into the pipe. Connect an air supply to the orifice at one end of the line. The air supply line shall contain an on-off gas valve and a pressure gauge having a range of 0 to 5 psi. The gauge shall have minimum divisions of 0.10 psi and shall have an accuracy of  $\pm$  0.04 psi.
    - b. Pressurize the pipe line under test to 4 psig. Allow the line to stabilize between 4 psig and 3.5 psig for at least 5 minutes. If necessary, add air to the line to maintain the pressure above 3.5 psig. After the stabilization period, close the gas valve. When the line pressure stabilizes above 3.5 psig, commence timing with a stop watch. Run the stop watch until the line pressure drops 1.0 psig or the allowable time in Table 1 is exceeded.

Pipe Dia.,	Minimum Time,	Length for Minimum	Time for Longer	Specification Time for Length(L) Shown, min:s							
In.	min:s	Time, ft.	Length, s								
			_	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.864 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	189	3.418 L	11:20	11:20	11:20	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	66:22	79:45	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106.50	124:38	142:26	60:15
33	31:10	72	26.852 L	43:06	64:38	86:10	107:48	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

# Table 1Minimum Specified Time Required for a 1.0 psig Pressure DropFor Size and Length of Pipe Indicated, Q=0.0015

- c. If the test time is greater than the allowable time for 1.0 psig pressure drop, the test section will have passed the pressure test.
- d. If the test time for 1.0 psig drop is less than that specified, the line has not passed the test and the Contractor shall be required to make all repairs and retests. If the pipe line to be tested is beneath the groundwater level, the

test pressure shall be increased .433 psi for each foot the groundwater level is above the crown of the pipe.

- e. Provide all equipment and personnel required to make all tests including pipe stoppers, air compressor, air storage tank, pressure regulating valves, pressure gauges, stopwatch, etc. Contractor shall take precautions necessary, including blocking of stoppers or plugs, to protect the safety of property and personnel.
- G. Force Mains
  - 1. All sewage force mains shall pass a hydrostatic pressure test as specified. All buried piping with slip-type or mechanical joints shall pass a leakage test. No leakage is allowed in exposed piping or buried piping with flanged, threaded, welded or mechanical joints.
  - 2. Tests for exposed piping shall be made before covering and insulation is placed and prior to concealment within the building construction.
  - 3. The pressure and leakage tests for buried piping shall be made after all jointing operations and backfilling are completed, and concrete reaction blocks and restraints have cured at least 14 days. Piping tested before backfill is in place shall be retested after compacted backfill is placed.
  - 4. Sections of piping between valves, and other short sections of line may be isolated for testing. If shorter sections are tested, provide test plugs or bulkheads at the ends of the test section, and anchors, braces, and other devices required to withstand the hydrostatic pressure without imposing any thrust on the pipe line. The Contractor shall be solely responsible for any damage which may result from the failure of test plugs or supports.
  - 5. Hydrostatic Tests: Slowly fill the piping system with water and expel all air from the pipe. Take care that all air valves are installed and open in the section being filled and that the rate of filling does not exceed the venting capacity of the air valves. After the section of line to be tested has been filled with water, the specified test pressure shall be applied and maintained for a minimum period of 2 hours and for such additional period necessary for the Owner or designated representative to complete the inspection of the line under test. If defects are noted, repairs shall be made and the test repeated until all parts of the line withstand the test pressure. Hydrostatic test pressures shall be 150% of design pressure, but not less than 150 psi. Test duration shall be two hours.
  - 6. Leakage Test: After the specified hydrostatic test has been completed, the line shall be subjected to leakage test under a hydrostatic pressure the same as the pressure specified for the hydrostatic test. The pressure shall be maintained within a maximum variation of 5 percent during the entire leakage test. Leakage measurements shall not be started until a constant test pressure has been established. Measure the line leakage by means of a water meter installed on the supply side of the pressure pump, or method as approved by the Owner or designated representative.

a. The tested section will not be accepted if it has a leakage rate in excess of that rate determined by the formula:

L = 0.000135 ND(P)1/2 in which;

- L = Maximum permissible leakage rate, in gallons per hour, throughout the entire length of line being tested.
- N = Number of gasketed joints (two for each flexible coupling joint) in the line under test.
- D = Nominal internal diameter (in inches) of the pipe.
- P = The actual pressure in psig on all joints in the tested portion of the line. This actual pressure shall be determined by finding the difference between the average elevation of all tested pipe joints and the elevation of the pressure gauge and adding the difference in elevation head to the required pressure.
- b. Where the leakage rate exceeds the permissible maximum, locate and repair leaking joints to the extent required to reduce the total leakage to the acceptable amount.
- c. All leaks discovered within one year from the date of final acceptance of the work by the Owner or designated representative shall be located, repaired and retested by the Contractor, regardless of the total line leakage rate.
- 3.02 Manhole Vacuum Testing
  - A. Conduct a vacuum test on all sanitary manholes to ensure watertightness and manhole integrity.
  - B. The equipment required to conduct a vacuum test on manholes includes inflatable pipe plugs, test head, vacuum pump, flexible air hose and a vacuum gage. The test equipment shall be capable of drawing a vacuum of 10-inch Hg. The equipment shall be designed specifically for the purpose of testing manholes and shall be as manufactured by P.A. Glazier, Inc., Worchester, Massachusetts, 10002 or as approved by the Owner or designated representative.
  - C. The procedure for manhole vacuum testing shall be in accordance with ASTM C1244-93, Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test.

-END-

# SECTION 02734 - BYPASS PUMPING

## PART 1 - GENERAL

#### 1.01 Summary

- A. Section Includes:
  - 1. Control and maintain all flows within the sewer system during the Work.
  - 2. Minimum requirements for bypass pumping necessary to facilitate sewer line inspection, sewer line rehabilitation/replacement, and other construction activities.
- 1.02 Protection of Private and Public Property
  - A. Take precautions to ensure flow control and dewatering operations do not cause flooding or damage to public or private properties. In the event flooding or damage occurs, correct the damage at no additional cost to Owner.
  - B. Contractor is responsible for all damages to public or private property, for overflows from the sewer system, and for violations resulting in fines as a result of the dewatering/bypass operations.

## PART 2 - PRODUCTS

Not Used.

#### PART 3 - EXECUTION

- 3.01 Bypass Pumping
  - A. Provide all labor, equipment, supervision, and materials necessary to reduce, control, or transfer flows through or around the section or sections of pipe designated for inspection, rehabilitation or replacement. Use flow control mechanisms or eliminate flows via bypass pumping.
  - B. Contractor may drain flows by pipes, chases, fluming, bypass pumping, or other appropriate methods approved by Owner or designated representative. Plugging of any sewer line shall not be permitted without bypassing.
  - C. It is the Contractor's responsibility to verify the capacity of sewers existing within the sewer system prior to commencement of bypass pumping.
  - D. If bypass pumping is utilized to control flows, Contractor is responsible for monitoring the bypass pumping operation at all times until the Work is complete.

- E. The location of pump(s), bypass piping, discharge point, pumping rates, etc., shall be the responsibility of the Contractor.
- F. The bypass shall be made by diversion of the flow from an existing upstream location, around the section(s) to be taken from service, to an existing downstream location.
- G. The bypass system shall be of adequate capacity to handle all flows including wet weather-related flows. Ensure all flow is bypassed and do not create an overflow or back-up.

-END-

# SECTION 02776 - REINFORCED POLYPROPYLENE (RPP) LINER

## PART 1 - GENERAL

- 1.01 Summary
  - A. Section Includes: Furnishing and installing a Reinforced Flexible Polypropylene Liner for the Hanna Avenue Basins as shown on the Drawings. All work shall be done in strict accordance with the Drawings and Specifications.

#### 1.02 References

- A. American Society for Testing and Materials (ASTM) Standards, latest edition
  - 1. ASTM D751 Standard Test Method for Coated Fabrics
  - 2. ASTM D1204 Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperatures
  - 3. ASTM D2136 Standard Test Method for Coated Fabrics—Low-Temperature Bend Test
  - ASTM D4437 Standard Practice for Non-destructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes

## 1.03 Definitions

- A. Installer: Party responsible for field handling, transporting, storing and deploying the geomembrane
- B. Lot: A quantity of resin (usually the capacity of one rail car) used to manufacture polyethylene geocomposite rolls; the finished rolls will be identified by a roll number traceable to the resin lot
- C. Manufacturer: Party responsible for manufacturing the geomembrane rolls
- D. Reinforced Polypropylene (RPP) Liner: A manufactured hydraulic barrier consisting of a scrim reinforcing fabric encapsulated by extruded high performance polypropylene
- 1.04 Submittals
  - A. Product data for each manufactured product proposal for use on this project.
  - B. Shop Drawings: RPP liner panel layout plans indicating position of the panel and field seams
  - C. Samples for each product proposed for use on this project.

- D. Manufacturer's Quality Control
  - 1. Quality Control certificates shall be issued by the RPP liner manufacturer to the Engineer stating the material meets or exceeds the requirements of 2.02 Table 2-1. The certifications shall be signed by the quality control manager of the RPP liner manufacturer or other responsible party and shall include the following information, for each lot of material:
    - a. Shipment Packing List: A list indicating rolls shipped on the particular truckload
    - b. Bill of Lading: Shipping documents for the truck used for the shipment
    - c. Letter of Certification: A letter indicating the material is in conformance with the physical properties specified
    - d. Physical Properties Sheet: The material specification for the RPP liner supplied in accordance with this specification
  - 2. Certifications of Subgrade acceptance for each area covered by RPP liner, signed by the earthwork Contractor for approval of the Engineer
  - 3. Reference list supplied by RPP liner Manufacturer indicating the appropriate experience level as required by the Specification
  - 4. Reference list supplied by the RPP liner Installer indicating the appropriate experience level as required by the specification
  - 5. RPP liner materials may be tested and pre-approved at the manufacturing location.
  - 6. Manufacturer shall have manufactured a minimum of 10,000,000 square feet of polypropylene geomembrane material during the last year.
- 1.05 Installer's Quality Control
  - 1. Certify the Installer has installed a minimum of 1,000,000 square feet of polypropylene geomembrane in the last year, and
  - 2. Installer has worked in a similar capacity on at least 5 projects similar in complexity to the project described in the Contract Documents, and
  - 3. The installation Supervisor has worked in a similar capacity on projects similar in size and complexity to the project described in the Contract Documents.
- 1.06 Delivery, Storage and Handling
  - A. RPP Liner Product Packing, Shipping, Handling and Unloading
    - 1. The following procedures are as specific as possible while recognizing that the specific requirements of the project may necessitate minor modifications. Significant deviations from these procedures shall be pre-approved by the Engineer.
    - 2. Packaging: All product rolls produced shall be bagged in moisture resistant plastic sleeves. Cardboard cores used shall be sufficiently strong to resist collapse during transit, but are not required to support the weight of the entire roll.
    - 3. Roll Identification and Labeling: Prior to shipment, the manufacturer shall wrap and label each roll, both on the product roll and on the surface of the plastic protective sleeve. Labels shall be resistant to fading and moisture degradation
to ensure legibility at the time of the installation. At a minimum, the roll labels shall identify the following:

- a. Manufacturer's name
- b. Product identification
- c. Lot or batch number
- d. Roll number, roll dimensions, roll weight
- e. Any special handling requirements (e.g. "this side up") shall be marked on the product itself.
- 4. Shipment and Handling
  - a. The Contractor shall contact the product manufacturer prior to shipment to determine the correct unloading methods and equipment.
  - b. Products must be supported during handling to ensure worker safety and prevent damage to the liner. Under no circumstances should the rolls be dragged, lifted from one end, lifted with only the forks of a lift truck or pushed to the ground from the delivery vehicle.
  - c. The manufacturer's representative and Contractor shall verify that proper handling equipment exists which does not pose any danger to installation personnel or risk damage or deformation to the liner material itself.
  - d. Suitable handling equipment is described below.
    - Spreader Bar Assembly: A spreader bar assembly shall include both a core pipe or bar and a spreader bar beam. The core pipe shall be used to uniformly support the roll when inserted through the Product core, while the spreader bar beam will prevent chains or straps from chafing the roll edges.
    - 2) Stinger: A stinger is a ridged pipe or rod with one end directly connected to a forklift or other handling equipment. If a stinger is used, it should be fully inserted to its full length into the roll to prevent excessive bending of the roll when lifted.
    - 3) Roller Cradles: Roller cradles consist of two large diameter rollers spaced approximately three inches apart, which both support the Product roll and allow it to be freely unrolled. The use of roller cradles shall be permitted if the rollers support the entire width of the Product roll.
    - 4) Straps: Straps may be used to support the ends of spreader bars but shall not be used as the primary support mechanism. As straps may damage the Product where wrapped around the roll and generally do not provide sufficient uniform support in preventing roll bending or deformation, great care must be exercised when using straps for roll support.
- B. Geotextile Packing, Shipping, Handling and Unloading
  - 1. The following procedures are as specific as possible while recognizing that the specific requirements of the project may necessitate minor modifications. Significant deviations from these procedures shall be pre-approved by the Engineer.
  - 2. Geotextile shall be supplied in rolls wrapped in relatively impermeable and opaque protective covers.

- 3. Geotextile rolls shall be marked or tagged with the following information:
  - a. Manufacturer's name
  - b. Product identification
  - c. Lot or batch number
  - d. Roll number
  - e. Roll dimensions
- 4. If any special handling is required, it shall be so marked on the geotextile itself; e.g., "This Side Up" or "This Side Against Soil to be Retained".
- 5. Transportation of the geotextiles is the responsibility of the Installer. The Installer shall be liable for all damages to the materials incurred prior to and during transportation to the site.
- 6. Handling, storage and care of the geotextiles prior to and following installation at the site are the responsibility of the Installer. The Installer shall be liable for all damages to the materials incurred prior to final acceptance of the installation by the Owner and Engineer.
- 7. The Installer shall be responsible for storage of the geotextile material at the site.
- 8. The geotextiles shall be protected from sunlight, moisture, excessive heat or cold, puncture or other damaging or deleterious conditions. The geotextile shall not be exposed to sunlight for more than 15 days. The geotextile shall be protected from mud, dirt and dust. Any additional storage procedures required by the manufacturer shall be the Installer's responsibility
- C. Product Acceptance at Site
  - 1. All materials shall be delivered to the job site in their original containers as labeled by the Manufacturer.
  - 2. Each roll shall be visually inspected when unloaded to determine if any packaging and/or material has been significantly damaged during transit. Repairs to damaged Product shall be performed in accordance with Article 3.04.
  - 3. Rolls exhibiting damage shall be marked and set aside for closer examination during deployment.
  - 4. Minor rips or tears in the plastic packaging shall be repaired with moisture resistant tape prior to being placed in storage to prevent moisture damage.
  - 5. Product rolls delivered to the project site shall be only those indicated on Product manufacturing quality control certificates.
- D. Product Storage and Protection
  - 1. Follow the Manufacturer's directions for protection of materials prior to and during installation. Do not use materials which have been damaged.
  - 2. The Product shall be protected from moisture, excessive heat or cold, puncture, or other damaging or deleterious conditions. The Product shall be stored off the ground, out of direct sunlight and protected from precipitation.
  - 3. Storage of the Product rolls shall be the responsibility of the Installer or other designated party. All Product rolls shall be stockpiled and maintained dry in a flat dedicated area away from high-traffic areas, but sufficiently close to the active work area to minimize handling.

- 4. Product shall be stored no higher than 3 to 4 rolls high or as may be safely handled by installation personnel. Stacks or tiers or rolls should be situated in a manner that prevents sliding or rolling by "chocking" the bottom layer of rolls.
- 5. Rolls shall not be stacked on pallets or other non-uniform, flat surfaces, as this may cause deformation of the rolls and damage to the Product, or cause difficulty inserting the core pipe.
- 6. An additional tarpaulin or plastic sheet shall be used to provide extra shelter for Product material stored in excess of 30 days.
- 7. All waste materials, packaging, roll cores and unsalvageable Product pieces shall be disposed of off-site by the Contractor.

### 1.07 Warranty

- A. Material: A 5-year material and workmanship warranty shall be provided by the manufacturer of the RPP liner, stating that the RPP liner product supplied to the project was manufactured in accordance with industry practices and meets the manufacturer's certified properties. The material shall be warranted against defects for a period of 5 years from the date of the geomembrane installation.
- B. Installation: The Installer of the RPP liner shall provide a 1-year installation workmanship warranty. The product shall be warranted against defects in workmanship for a period of 1 year from the date of the geomembrane installation. The Installer shall repair or replace any material not installed in full compliance with the requirements of the specification.
- C. RPP liner material and installation warranties provided by the Manufacturer and Installer shall be incorporated into the final submittal documents.

# PART 2 - PRODUCTS

#### 2.01 Manufacturers

- A. Subject to compliance with requirements of this Section, provide geomembrane material manufactured by Firestone Specialty Products, Cooley Group, or approved equal.
- B. All elements of the geomembrane system shall be products of the same manufacturer.

### 2.02 Materials

- A. Reinforced Polypropylene (RPP) Liner
  - 1. The RPP liner shall retain its integrity during handling, placement and longterm service and be capable of withstanding outdoor exposure prior to deployment for a minimum of 30 days with no measurable deterioration.
  - 2. The RPP liner shall be manufactured from a composition of new, high quality ingredients suitable for use in hydraulic structures. Reprocessing or reground materials shall not be used.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 3. The polypropylene membrane shall consist of a thoroughly mixed polypropylene compound. It shall be manufactured by the calendaring process and shall be uniform in color, thickness, size and surface texture.
- 4. The RPP liner material shall be in accordance with the test methods, test frequencies and material physical properties listed in Table 2-1. Unreinforced RPP liner shall not be allowed.

Property	Test Method	Values	
Gauge, Nominal (Mils)	ASTM D751	45 ± 10%	
Piles Reinforcing		1	
Breaking Strength	ASTM D751, Method A	275 x 225 lbs.	
Toor Strongth (lbg, min)	ASTM D2136,	70 lbs.	
Teal Strength (Ibs. Inin.)	1/8" Mandrel – 4 hours		
Low Temperature (°F)		-40°F	
Dimensional Stability	ASTM D1204	1%	
(% Change Max.)	(180°F/1 hour)		

Table 2-1: 45 Mil Reinforced Polypropylene Liner Physical Properties

#### 2.03 Anchorage

- A. Bolts shall be 3/8" x 3-1/2" long stainless steel wedge type anchor bolt with stainless steel nut and stainless steel washer.
- B. Flat bar shall be 1-1/2" x  $\frac{1}{4}$ " thick stainless steel bar.
- C. Gaskets shall be 2" x  $\frac{1}{4}$ " thick Neoprene double gasket continuous.

# PART 3 - EXECUTION

#### 3.01 Examination

- A. Subgrade Inspection: The earthen or geosynthetic subgrade shall be continuously inspected, approved and certified by the Construction Quality Control (CQC) inspector and the Engineer prior to RPP liner replacement.
- B. Prior to implementing any of the work in the Section to be lined, carefully inspect the installed work of all other Sections and verify that all work is complete to the point where the installation of the geomembrane material may properly commence without adverse impact.
- C. Upon approval by the CQC inspector, it shall be the Installer's responsibility to indicate to the Engineer any change in the condition of the subgrade that could cause it to be out of compliance with any of the requirements of this section, or the project specific specification.

### 3.02 Preparation

- A. The surfaces upon which the RPP liner will be installed shall be suitable for the placement of RPP liner material in accordance with the applicable sections of the specifications.
- B. Earthen Subgrade: The surface upon which the RPP liner material will be installed shall be inspected by the manufacturer's CQC Inspector and Engineer and certified by the Contractor and CQC Inspector to be in accordance with the requirements of the subgrade preparation specifications.
  - 1. The subgrade soil shall be well graded, containing less than 10 percent gravel (1/2-inch or larger) and no sharp stones within the thickness of the subgrade/foundation layer.
  - 2. Excavate unsuitable areas and backfill with layers or a suitable material to the desired grade.
  - 3. The top 6 inches of the subgrade soil should possess a particle size distribution where at least 80 percent of the soil is finer than 0.2 mm (#60 sieve).
  - 4. Compact the soil supporting the RPP liner to a minimum 90 percent of the material's Modified Proctor maximum dry density, either by construction equipment or by mechanical vibrating roller compacting. At a minimum, the level of compaction should be such that no rutting is caused by installation equipment or other construction vehicles which traffic the area of deployment.
  - 5. The surfaces to be lined shall be smooth drum rolled and free of any debris, vegetation, roots, sticks, sharp rocks, or other deleterious materials larger than 1/2-inch, as well as free of any voids, large cracks or standing water.
  - 6. Immediately prior to deployment of the RPP liner, the subgrade shall be finalgraded to fill remaining voids or desiccation cracks and proof-rolled to eliminate sharp irregularities or abrupt elevation changes. The surface to be lined shall be maintained in this smooth condition, free of standing water. Final grading shall not be considered complete until no wheel ruts, footprints, or other irregularities exist in the subgrade. Furthermore, all protrusions extending more than 1/2 inch from the surface shall be removed, crushed, or pushed into the surface with a smooth-drum compactor.

# 3.03 Liner Installation

- A. General: RPP Liner material shall be placed in general accordance with the procedures specified below, or modified to account for site specific conditions.
- B. RPP Liner Panel Position: Where possible, all slope panels should be installed parallel to the maximum slope while panels installed in flat areas require no particular orientation.
- C. Installation shall follow the following procedure:
  - 1. Deployment shall proceed from the lowest elevation to the highest elevation to minimize tensile stress on the RPP liner during cover soil installation.

- 2. The RPP liner may be deployed on slopes by pulling the material from a suspended roll or securing a roll end into an anchor trench and unrolling each panel as the handling equipment slowly moves backwards.
- 3. To avoid movement and wind uplift during RPP liner installation, install temporary ballasts such as sand bags. Temporary ballasts shall be removed prior to final payment.
- 4. Deployment on flat areas shall be conducted in the same manner as that for the slopes, however, care should be taken to minimize dragging the RPP liner. Slip-sheets may be used to facilitate positioning of the liner while ensuring the RPP liner is not damaged from underlying sources.
- 5. To facilitate welding of seams, all RPP liner panels shall be overlapped. Along the length of the mat, the overlap shall be a minimum of 4 inches. Along the width of the mat, the overlap shall be a minimum of 8 inches. The edges of RPP liner panels shall be adjusted to smooth out any wrinkles, creases, or "fishmouths" in order to maximize contact with the underlying panel. The overlaps shall not be nailed or stapled to the underlying mat.
- 6. Liner shall be cut using only an RPP liner cutter approved by the RPP liner Manufacturer and the CQC Inspector. Special care shall be taken to protect other geosynthetic materials (if any) from damage.
- 7. During placement of the RPP liner, care shall be taken not to entrap stones, excessive dust, or moisture that could damage the RPP liner, generate clogging of the drains or filters, or hamper subsequent seaming. Care shall be taken not to walk on or drag equipment across the exposed RPP liner. Equipment which could damage the RPP liner shall not be allowed to travel directly on it. If the installation equipment causes rutting of the subgrade, the subgrade must be restored to its originally accepted condition before placement continues.
- 8. The RPP liner shall not be installed on a saturated subgrade or on standing water. The RPP liner shall be installed in such a way that prevents leakage under the mat prior to completion of construction of the liner system.
- 9. The RPP liner shall not be installed during precipitation, high winds, or other conditions that may cause damage to the RPP liner or the layers and piping under the RPP liner.
- 10. Avoid any direct contact between the RPP liner and an abrasive surface.
- 11. Immediately after installation of an RPP liner panel, examine the entire surface to ensure that no potentially harmful foreign objects are present. Any foreign objects encountered shall be removed or the RPP liner shall be replaced.
- D. Anchoring
  - 1. All RPP Liner material shall be anchored to prevent potential panel movement.
  - 2. The anchor trench shall be constructed free of sharp edges or corners and maintained in a dry condition. No loose soil shall be permitted beneath the RPP Liner within the trench.
  - 3. The anchor trench shall be inspected and approved by the CQC Inspector and the Engineer prior to RPP Liner placement, backfilling, and compaction of the anchor trench material.
  - 4. The RPP Liner shall be placed into and across, but not up the back wall, of the anchor trench.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 REINFORCED POLYPROPYLENE (RPP) LINER

- 5. Install ballasts as shown on the Drawings.
- 6. Inspect concrete surface where liner anchorage is to be installed. Surfaces at attachment locations is to be trowel finished or ground smooth prior to installation.
- 7. Install 3/8" stainless steel wedge type anchor bolts at 6" o-c per manufacturer's instructions.
- 8. Install 2" x ¼" thick neoprene double gasket continuous and 1-1/2" x ¼" thick stainless steel flat bar continuous as shown on the Drawings and per manufacturer's instructions.
- E. Seaming
  - Field seams shall be made by thermal fusion bonding. The welding machine shall be set to the pre-determined temperature and speed. A trial seam shall be made and tested to verify these settings. The machine settings shall be adjusted accordingly. Throughout the seaming operation, occasional adjustments of temperature or speed as the result of changing ambient conditions may be necessary to maintain a consistent seam. A 1-1/2-inch nominal seam width is required for single-track welds. Dual welds will not be permitted.
  - 2. Install seams on side slopes parallel with the slope (i.e., up and down the slope). Field seams perpendicular to the slope will not be permitted.
  - 3. Do not position a large number of panels that cannot be seamed together in one day.
- F. Detailing
  - 1. Detail work shall include sealing of the liner to pipe penetrations, foundation walls, drainage structures, spillways, and other appurtenances.
  - 2. Detail work shall be performed as shown on the Drawings and as recommended by the RPP liner manufacturer and Engineer.
- G. Bridging of Geomembrane: Bridging or trampolining of the geomembrane at any temperature shall be considered unacceptable. Compensating material shall be installed at these locations. The geomembrane must be fully supported by the subgrade at the time of covering with water.

# 3.04 Repair

- A. Prior to covering the deployed geomembrane, inspect each roll for damage resulting from construction.
- B. Any cuts, rips, tears, test areas, failed seams, or damaged areas in the RPP liner shall be removed and patched with like material. Secure the patch to the original material with a minimum 4-inch overlap of the affected area. The patch must be round, oval, or contain rounded corners. All patches must be heat bonded. The patch edge must be extrusion welded around the perimeter of the entire patch. All seams shall be in accordance with Article 3.03E above. All repairs shall be noted on the Record Drawings.

# 3.05 Field Quality Control

# A. Seam Testing

- 1. Non-Destructive Test: Perform non-destructive testing through visual inspection and air lance test (ASTM D4437). All test shall be conducted and certified by the Installer and performed in the presence of the CQC Inspector. Any failing seams shall be replaced using the patching method in accordance with Article 3.04 above.
- 2. Destructive Mechanical Test: Destructive seam testing shall be performed at the start-up of each day or during any shift change. The sample shall be made from the same sheet of material and using the same seaming method as will be used to fabricate field seams. The sample shall be a minimum of 10 feet in length and tested peel adhesion in accordance with ASTM D4437. Test results shall be compared to the minimum seam requirements of Table 2-1.
- 3. One destructive sampler per 500 feet of field seam, or one sample per seaming crew per 4-hour time period, shall be tested for bonded seam strength and peel adhesion. The sample can either be made from excess material or cut from the installed lining. If the sample is cut out, the resulting hole shall be repaired using the patching method. All results should meet or exceed the minimum field seam requirements of Table 2-1. Any failing seams shall be replaced using the patching method.
- 4. All testing shall be considered integral to the liner installation. All testing shall be performed in the presence of the CQC Inspector and certified by the Installer to the Engineer within 2 days of weld completion.
- 3.06 Protection
  - A. Protect all components of the RPP liner from discharges or contact with chemicals that will have an adverse effect on the geomembrane.

-END-

# SECTION 02777 – GEOPOLYMER LINING SYSTEM

### PART 1 - GENERAL

#### 1.01 Summary

- A. This specification covers work, materials and equipment required for the preparation and installation of a Geopolymer Lining System providing a minimum 50-year design life for internal protection and structural rehabilitation of sewer and storm infrastructure. This includes but is not limited to pipe, tunnels, manholes, culverts, boxes, structures and other similar infrastructure. This is accomplished by using an approved structural, monolithic spray-application of a high-build, geopolymer liner system with enhanced corrosion protection. The protective lining works shall include all activities associated with the protective lining system, not limited to the following:
  - 1. Design of approved continuous protection liners to the internal surface of the host infrastructure (pipe, tunnels, manholes, culverts, boxes, structures, etc.),
  - 2. Pre-construction inspection and surface preparation of host infrastructure prior to application of protective lining system,
  - 3. Installation of approved continuous protection liners to the internal surface of the host infrastructure, for pipe; manhole to manhole, manhole to structure, or structure to structure and including lateral protection and reinstatement. Partial liner installations, unless directed by the Owner, are not allowed,
  - 4. Quality Control Measures,
  - 5. and Post-construction inspection, repairs and testing.
- 1.02 References
  - A. Latest revisions of ASTM and ACI Standards, unless revised herein, are made a part of this Specification.
    - 1. American Society for Testing and Materials (ASTM):
      - a. ASTM C 31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
      - b. ASTM C 39 / C 109 Compressive Strength Hydraulic Cement Mortars
      - c. ASTM C 78 / C 293 / C 348 Flexural Strength of Concrete
      - d. ASTM C 138 / C 642 Standard Test Method for Density
      - e. ASTM C 267 Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings and Polymer Concretes
      - f. ASTM C 469 Static Modulus of Elasticity & Poisson's Ratio of Concrete Compression
      - g. ASTM C 496 Splitting Tensile Strength of Cylindrical Concrete Specimens
      - h. ASTM C 666 Freeze Thaw Durability

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- i. ASTM C 321 / C 882 Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear
- j. ASTM C 1090 Shrinkage Test
- k. ASTM C 1138 Standard Test Method for Abrasion Resistance of Concrete (Underwater Method)
- I. ASTM C 1140-03A Preparing and Testing Specimens from Shotcrete Test Panels
- m. ASTM C 1202 Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- n. ASTM F 2414 Practice for Sealing Sewer Manhole Using Chemical Grouting
- 2. American Concrete Institute (ACI): ACI Certified Concrete Field Testing Technician, Level 1

#### 1.03 Submittals

- A. Before any field work by the Contractor, the Contractor shall submit to the Owner for his review the following:
  - 1. Manufacturer-certified copies of all test reports on each product used, including:
    - a. ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications. Test reports shall be performed at the Contractor's expense and shall be carried out by an approved laboratory or by a reputable independent testing body. As a minimum, the test reports should include all those listed in Table 2 of this Section.
    - b. XRF test results indicating the product confirms to the requirements as found in Table 1 of this Section. Testing to be performed as detailed in Paragraph 1.08.
    - c. XRD test results indicating the product confirms to the requirements as found in Table 1 of this Section. Testing to be performed as detailed in Paragraph 1.08.
  - 2. Detailed Minimum Liner Thickness Calculations as required and as discussed further in Paragraph 2.05 of this Section, along with proposed plan for ensuring that the installed Geopolymer liner meets the minimum thickness requirements.
  - 3. Applicator Qualifications
    - a. Manufacturer certification that Applicator (as defined in Paragraph 1.04 B) has been trained and approved in the handling, mixing and application of the products to be used. At least one manufacturer certified Superintendent (as defined in Paragraph 1.04 C) must be on-site at all times during related construction activities. A fully trained field technician shall apply the liner material.
    - b. Certification that the equipment to be used for applying the products has been manufactured or approved by the Manufacturer and Applicator personnel have been trained and certified for proper use of the equipment.
      1) Proof of any required permits or licenses necessary for the project.

- 4. After cleaning and TV inspection by the Contractor of all proposed infrastructure to be rehabilitated and before beginning lining of any infrastructure, the Contractor shall submit to the Owner/Engineer for his review the following:
  - a. DVD (1 copy), or electronic transmittal, of the Contractor's TV inspection of the infrastructure prior to product application.
- 5. After rehabilitation of the infrastructure, the Contractor shall submit to the Owner/Engineer for his records the following:
  - a. A DVD (1 copy), or electronic transmittal, of the Contractor's TV inspection of the completed Work.
  - b. Test results of samples of Geopolymer material as specified in the Contract Documents.
- 1.04 Quality Control
  - A. Product Manufacturer: Company specializing in manufacturing quality Geopolymer liner products with minimum 5-years' experience.
  - B. Applicator: Company pre-approved by the manufacturer and who meets the following conditions:
    - 1. Horizontal Infrastructure:
      - a. At least 5-years' experience specializing in the application of spray on lining systems including the installation of at least 5,000 LF in horizontal infrastructure using the specific material(s) being proposed for the subject project, OR
      - b. Provide supplemental installation expertise in the form of a product expert, provided by the manufacturer, who meets the Superintendent requirements found in Paragraph 1.04 C. Such product expert must be additionally insured with a minimum liability umbrella of \$4 million dollars.
    - 2. Vertical Infrastructure:
      - a. At least 3-years' experience specializing in the application of spray on lining systems including the installation of at least 10,000 VF in vertical infrastructure using geopolymer, cementitious or mortar products in horizontal infrastructure applications similar to those being proposed for the subject project, OR
      - b. Provide supplemental installation expertise in the form of a product expert, provided by the manufacturer, who meets the Superintendent requirements found in Paragraph 1.04 C. Such product expert must be additionally insured with a minimum liability umbrella of \$4 million dollars.
    - 3. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM and ACI standards and Manufacturer's recommendations.
  - C. Superintendent: Individual specialized in the application of Geopolymer Liner products, pre-approved by, or associated with the Geopolymer Liner

manufacturer for the application of spray on lining systems, who, meets the following minimum requirements:

- 1. 5-years' experience in the industry actively involved in field services related to the lining of pipes, manholes or other wastewater and/or stormwater infrastructure,
- 2. Installation of 5,000 LF for horizontal infrastructure or 10,000 VF for vertical infrastructure using the specific Geopolymer Liner product proposed AND for Horizontal Infrastructure:
  - a. Installation of 15,000 LF of geopolymer, cementitious or mortar products in horizontal infrastructure applications similar to those being proposed for the subject project.
- D. Single Source Responsibility: Geopolymer Liner and all products used with the lining system, to include but not limited to Infiltration Control, Invert Repair and Patching and optional Antimicrobial Liquid shall be approved by and supplied through the Geopolymer Liner manufacturer. Use only products approved by Geopolymer Liner manufacturer and use only within recommended limits.
- 1.05 Delivery, Storage, and Handling
  - A. Delivery: Deliver materials in original containers with seals unbroken and labels intact and free of moisture. Do not use materials that have been exposed to moisture or if there is visible damage to the packaging.
  - B. Receipt Process: All materials must be inspected upon receipt and properly documented as to the amount of material and the identification of the material by batch numbers. Dates and times along with the shipping company delivering the material should be recorded for possible future reference. See Daily Activity Log, Paragraph 1.08 C.
  - C. Storage: Contractor shall designate a specific space at the project site for storing and mixing materials. Protect this space and repair all damage resulting from use. Do not store kerosene or gasoline in this space. Remove oily rags at the end of each day's work. Products are to be kept dry, protected from weather and stored under cover within the temperature ranges recommended by the manufacturer. Products are to be stored and handled according to their MSDSs or appropriate classification. Damaged or unsuitable products shall be promptly removed from the job site and shall be replaced with suitable materials.

### 1.06 Project Conditions

A. Environmental Requirements: Applicator shall conform with all local, state and federal regulations including those set forth by OSHA and the EPA and any other applicable authorities. Confined space entry requirements shall be followed.

- B. Maintain the temperature inside the host infrastructure at not less than 34° F and no more than 100° F, or as otherwise directed by manufacturer, during application and finishing.
- C. Provide continuous ventilation and if necessary cooling and heating facilities to maintain surface and ambient temperatures before, during, and following application of finishes, within temperature range and for duration as directed by manufacturer.
- D. Protection: Provide sufficient shielding to fully protect adjacent finished work.
- 1.07 Quality Control
  - A. Confirmation of a Geopolymer
    - 1. Material shall be confirmed as a Geopolymer as determined by XRF and XRD testing. Testing shall be completed on the proposed Geopolymer material and results submitted at the following stages:
      - a. As a part of the Submittal documentation outlined in Paragraph 1.04.
      - b. During application, XRF and XRD testing shall be carried out as follows:1) Sieve the geopolymer material with 200 mesh.
        - 2) XRF and XRD testing to be run on the powder.
        - 3) Based upon the size of the project, as determined by the material that is to be used, testing shall be carried out based upon the following:
          - a) For projects utilizing equal to or less than 100,000 lbs. of product, first and last batch of material.
          - b) For projects utilizing more than 100,000 lbs. of product, first, last and one randomly sampled batch throughout the project life.
  - B. Sampling and Testing
    - 1. During application, Applicator shall regularly perform and record Geopolymer lining thickness readings with a method approved by manufacturer. Applicator shall submit all documentation on thickness readings to Inspector on a daily basis when lining application occurs.
    - 2. Sample and make five test cylinders per ASTM C 31 and analyze with ASTM C 39, or as specified by contract document, for testing compressive strength from each day's work (for Vertical Infrastructure) or every 32,000 lbs. of material (for Horizontal Infrastructure). Label the cylinders with the date, location, project, and product batch numbers. The product batch numbers are located on each geopolymer material bag. Send the cylinders to a third-party laboratory or the manufacturer for verification. Test in accordance with ASTM C 39, or as specified in contract documents. Test the geopolymer material for compressive strength at 7 days (1 cylinder) and 28 days (3 cylinders) and leave 1 cylinder for retainage.
      - a. Performance and Material Testing Vertical Infrastructure (Manholes, Boxes, Structures, etc.)
        - 1) Performance testing as directed in ASTM F 2551.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 2) Submit the following information to the engineer: Product data, including manufacturer and brand name along with laboratory test results to verify 28-day compressive strength in accordance with ASTM C 39 or ASTM C 109. The samples must be undisturbed for a period of at least 24 hours before they can be transported. The project superintendent will require that samples of applied material be taken representative of each day's work of material used. Samples shall be obtained from the pump, hose or nozzle, identified, and sent to an independent test laboratory to verify 28-day compression strength testing as described in ASTM C 39 or ASTM C 109 and shall have a minimum average of the strength set forth in Section 2.04, Table 2.
- b. Performance and Material Testing Horizontal Infrastructure (Pipes, Culverts, Tunnels, etc.)
  - 1) Submit the following information to the engineer: Product data, including manufacturer and brand name along with laboratory test results to verify 28-day compressive strength in accordance with ASTM C 31 or ASTM C 39. The project superintendent will require that samples of the applied material will be taken first and last day of application and every 32,000 lbs. of material. The samples may be taken from the pump immediately before discharge into the hose or at the spin caster, if feasible. A minimum of five samples will be obtained as required by ASTM C 31 and analyzed by ASTM C 39 or C 109. The samples must be undisturbed for a period of at least 24 hours before they can be transported. The material thickness may be determined by using depth gauges during the spraying process. Permanent depth gauges may either be attached to the host infrastructure prior to Geopolymer liner application or a handheld depth gauge may be used by the installer during installation. The depth measurements should be made in at least three locations within the infrastructure being lined as well as near both ends and the middle of the infrastructure. These measurements must be written down in a log book which will be submitted to the client at the end of the project, along with digital photos of the completed lining.
- C. Daily Activity Logs
  - 1. Horizontal Infrastructure
    - a. A Daily Activity Log will be filled out completely anytime a work crew is on site. This log includes listing the personnel present at the site, when they arrived and when they left the site. All materials must be inspected upon receipt and properly documented as to the amount of material and the identification of the material by batch numbers. Dates and times along with the shipping company delivering the material should be recorded for possible future reference
    - b. Important spray data includes the times material was applied and under which atmospheric conditions. The ambient air temperature, the dry powder temperature, the mixing water temperature, and the

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

temperature inside the infrastructure are all recorded on the daily activity report.

- c. The operating conditions are also recorded. These measurements include the water addition rate taken at the meter tube, the retrieval speed of the retraction system and the pump motor speed recorded at the pump.
- d. Any special conditions are to be noted in the daily log.
- 2. Vertical Infrastructure
  - a. A Daily Activity Log will be filled out completely anytime a work crew is on site. This log includes listing the personnel present at the site, when they arrived and when they left the site.
  - b. Surface preparations made.
  - c. Repair materials used.
  - d. Any special conditions are to be noted in the daily log.
- D. Equipment Calibration Reports
  - 1. Equipment calibration reports are to be maintained at all times for inspection by the Owner/Engineer.
- E. Final Inspection
  - 1. See Paragraph 3.14
- 1.08 Warranty
  - A. Manufacturer shall warrant all work against defects in materials and applicator shall warrant all work against defects in workmanship for a period of one (1) year, unless otherwise noted, from the date of final acceptance of the project. Manufacturer / Applicator shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship, as applicable, which may develop during said one (1) year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the Owner.
  - B. Geopolymer shall adhere to the following warrantied Material Properties:
    - 1. Compressive Strength, which exceeds the values used in the design calculations, as sampled by ASTM C 31 and as tested by ASTM C 39, results as follow:
      - a. 28 Day Minimum Compressive Strength 7,000 psi

# PART 2 - PRODUCTS

- 2.01 Existing Products
  - A. Existing infrastructure may consist of RCP, brick, stone, corrugated metal, HDPE and others as allowed by manufacturer.

- 2.02 Acceptable Materials
  - A. When more than one product is used in composite with other(s), all materials shall be supplied by the same manufacturer.
  - B. Approved materials include:
    - 1. Geopolymer Liner
    - 2. Infiltration Control (Mild to Moderate)
    - 3. Infiltration Control (Heavy) Chemical Grout as approved by Geopolymer Manufacturer
    - 4. Invert Repair and Patching (Fast Return to Service)
    - 5. Invert Repair and Patching (Bypassed or No Flow)
    - 6. Treatment of Exposed Rebar Ospho or Corroseal Rust Converter
    - 7. Secondary Corrosion Protection ConSeal ConBlock

#### 2.03 Geopolymer – Characterization Techniques

- A. A process to determine that a product is actually a geopolymer shall include oxide composition and phase composition testing, using X-Ray Fluorescence (XRF) and X-Ray Diffraction (XRD), respectively.
- B. A geopolymer precursor, the powder passing a #200 mesh, must contain significant amounts of amorphous SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> in particular ratios as determined by X-Ray Fluorescence (XRF). See: Table 1
- C. Phase composition utilizing X-Ray Diffraction (XRD) shall be used to quantify amorphous phases in the geopolymer precursor powder. A significant amount of amorphous SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> is required for the geopolymerization process.

Using (XRF) and (XRD) together provides optimum information for both oxide composition and phase composition. See Table 1.

l'able l			
Oxid	e Content of Geopolymer Powder	Acceptable Values	
Oxides		(% wt)	
	SiO <sub>2</sub>	40 - 55 %	
	Amorphous SiO <sub>2</sub> (Geopolymer precursor*)	25 - 40 %	
	Al <sub>2</sub> O <sub>3</sub>	13 – 30 %	
	Amorphous Al <sub>2</sub> O <sub>3</sub> (Geopolymer precursor*)	10 - 20 %	
	Total Amorphous content (XRD Testing)	>50 %	
	Total of cementitious crystalline phases wt.% (% Portland, calcium aluminate or calcium sulfoaluminate cement, i.e.: $C_3S$ , $C_2S$ , $C_3A$ , $C_4AF$ , $C_{12}A_7$ , $C_4A_3\hat{S}$ , etc.)	<20 %	
	Total CaO	<25 %	
	Total Na <sub>2</sub> O	0.35 - 15.0 %	
Oxide Ratios		(ratio)	
	Amorphous SiO <sub>2</sub> / Amorphous Al <sub>2</sub> O <sub>3</sub> (Ratio)	1-3	
	Total Na <sub>2</sub> O / Amorphous Al <sub>2</sub> O <sub>3</sub> (Ratio)	0.05 - 1.2	

Table 1

\*GEOPOLYMER PRECURSORS AND TOTAL AMORPHOUS CONTENT SHALL EXCLUDE ALL CRYSTALLINE FORMS SUCH AS BUT NOT LIMITED TO THOSE FOUND IN CEMENTITIOUS MATERIALS (C<sub>3</sub>S, C<sub>2</sub>S, C<sub>3</sub>A, C<sub>4</sub>AF, C<sub>12</sub>A<sub>7</sub>, C<sub>4</sub>A<sub>3</sub>Ŝ, ETC.) OR IN MINERALS (QUARTZ, MULLITE, ETC.).

#### 2.04 Geopolymer – Physical Properties

- A. The Geopolymer lining material may be Centrifugally Cast, Manually Sprayed or Hand Troweled.
- B. The Geopolymer lining material shall be a micro-fiber reinforced ultra-dense Geopolymer. This material shall provide a high strength fiber reinforced mortar specifically designed for ease of mechanical pumping, spraying and spin casting.
- C. The Geopolymer liner shall not clog spinner heads or spray equipment. The Geopolymer liner can also be used to repair, resurface, or rebuild pits, sumps, trenches, tunnels, bridged, piers or any infrastructure that has experienced deterioration.
- D. The Geopolymer liner shall be designed to produce a liner with improved compressive and flexural strength, high adhesion to damp surfaces, lower permeability and increased resistance to aggressive chemical attack as compared to Portland Cement based systems.
- E. The fiber reinforced formula shall be engineered to improve hydraulic abrasion resistance, provide dimensional stability and protect against penetration by substances such as fats, oils, greases and chloride ions as compared to Portland Cement based systems.

- F. The finished infrastructure must be such that once the Geopolymer liner sets, the total wall thickness will be homogeneous and monolithic.
- G. The Geopolymer liner material shall conform to the minimum requirements demonstrated in standard laboratory conditions following ASTM Standards as presented in Table 2.

Table 2				
Physical Properties	ASTM Reference	Requirements		
Compressive Strength	ASTM C 39 / C 109	Min. 8,000 psi @ 28 days		
Flexural Strength	ASTM C 78 / C 293 / C 348	Min. 800 psi @ 28 days		
Density	ASTM C 138 / C 642	Dry 75 – 90 lb/ft <sup>3</sup> Wet 100 – 115 lb/ft <sup>3</sup>		
Chemical Resistance, Sulfuric Acid PH 1.0	ASTM C 267	Max 2% mass loss @ 8 weeks		
Modulus of Elasticity	ASTM C 469	Min. 5,400,000 psi @ 28 days		
Split Tensile Strength	ASTM C 496	Min. 900 psi @ 28 days		
Freeze Thaw Durability	ASTM C 666	Max 0.1% Loss @ 300 cycles		
Bond Strength to Concrete	ASTM C 882	Min. 3,000 psi @ 28 days		
Shrinkage Test	ASTM C 1090	Max 0.02% @ 28 days		
Abrasion Resistance	ASTM C 1138	Max 1.5% Weight Loss @ 6 cycles on 28 day sample		
Rapid Chloride Ion Permeability	ASTM C 1202	Very Low @ 28 days		

- 2.05 Geopolymer Liner Thickness Design
  - A. General Liner Thickness Guidelines The design thickness of the centrifugally cast, manually sprayed or hand troweled liner is largely a function of the condition of the existing infrastructure, earth loading, traffic loading, hydraulic loading, earthquake loading, ground conditions, variations in the ground water through seasons, variations in conditions in the longitudinal direction and other factors that the registered professional engineer retained by either the manufacturer or the owner may consider as important, given the local site conditions.
  - B. Signed and sealed designs shall be prepared and submitted by a Licensed Professional Engineer licensed in the state in either the state of liner application or in which the product is manufactured in the following conditions:
    - 1. Pipe/culverts When non-round (Elliptical, box, etc.) or 60-inch and greater in diameter or when measured pipe ovality is greater than two percent or when bury depth as measured from top of pipe to top of ground at pipe is less than two times the pipe diameter.

- C. The thickness calculations are site specific and involve a careful consideration of loading conditions that are applicable to those for the construction phase and long term service of the infrastructure in question. Therefore, such design steps or simpler equations cannot be presented in cases where a Licensed Professional Engineer is required. In these cases, a Licensed Professional Engineer, experienced in infrastructure liner design, should provide a signed and sealed design thickness report, showing the assumptions made, input data used, design principles employed and the results of the calculations that would meet the standard of care, expected of professionals practicing in the same region and time period.
- D. As determined in Paragraph 2.05/B in this Section, the Contractor shall submit manufacturer's minimum recommended thicknesses or liner thickness calculations to the Owner/Consulting Engineer for review. Thickness or calculations shall substantiate sufficient liner thickness to achieve desired 50-year design life.
- E. The Contractor shall submit his proposal based upon the appropriate length, size, design life and host infrastructure parameters designated in the Project Plans and Specifications.

Table 3				
<b>Design Parameter</b>	Below to be filled in by Owner/Consultant			
Shape / Size	Circular 128" diameter			
Pipe Material	Corrugated Metal Pipe			
Length	120 LF			
Bury Depth	10 feet			
Level of Deterioration	Little to no deterioration			
Ovality	0%			
Live Loading Conditions	HS-20-44 Highway Loading			
Soil Density	120 pounds per cubic foot			
Ground Water Elevation	5 feet below the ground surface			
Access Information	Access via embankment at S High School Rd and S Perimeter Rd			
Restrictions on Construction	Subject to Indianapolis Airport Authority restrictions			

F. The Design Parameters shall be as presented in Table 3:

# 2.06 Infiltration Control

- A. Heavy Infiltration
  - 1. Injection grouting material shall be used to address heavy infiltration following manufacturer's instructions. Apply injection grouting material as approved by the Geopolymer manufacture.

- 2. Heavy infiltration means infiltration that meets the definition of a "runner" or "gusher", as defined by NASSCO's Pipeline Assessment Certification Program.
  - a. Runner water running into the sewer through a faulty joint or pipe wall. A continuous flow will be visible.
  - b. Gusher water entering the pipe "under pressure" through a defect or faulty joint.
- B. Mild to Moderate Infiltration
  - All fast setting materials furnished shall be designed to be applied in dry powder form, with no prior mixing of water, directly to active leaks under hydrostatic pressure in pipes, manholes or related structures. Materials shall consist of rapid setting cements, siliceous aggregates, and various accelerating agents. Material shall not contain chlorides, gypsum, or metallic particles.
  - 2. Physical Properties of approved material shall exhibit the following minimum physical properties:
    - a. Set Time: 30 seconds
- 2.07 Invert Repair and Patching
  - A. All material furnished shall be designed to fill large voids in pipe, manholes and structure walls and to repair or reconstruct inverts where no hydrostatic pressure exists.
  - B. For infrastructure with heavily deteriorated inverts and which is rehabilitated under no flow or bypass conditions, where flow will not be returned until at least 12 hours after Geopolymer liner application, Quad-Flow flowable fill with a minimum of 5,000 psi may be used.
  - C. For infrastructure which must be returned to service quickly, material shall consist of rapid setting cements, NSG aggregates, and various accelerating agents. Material shall not contain chlorides, gypsum, or metallic particles.
    - 1. Physical Properties of approved quick-setting material shall exhibit the following minimum physical properties:
      - a. Compressive Strength (ASTM C109)
        - 1) 30 mins: >1,200 psi
        - 2) 1 hour: >2,500 psi
        - 3) 1 day: >3,500 psi
      - b. Bond Strength (ASTM C882)
        1) 28 Day: >3.000 psi
      - c. Shrinkage (ASTM C1090)
        - 1) < 0.1%

### 2.08 Treatment of Exposed Rebar

- A. When encountered, exposed rebar shall be cleaned and then coated with a rust inhibiting coating to chemically modify the existing rust and introduce an inhibitor to reduce future rust formation. Approved rust inhibitor shall be Ospho as manufactured by Skybryte or Corroseal Rust Converter as manufactured by Rodda Paint.
- 2.09 Secondary Corrosion Protection (Antimicrobial Liquid)
  - A. Application of Antimicrobial Liquid, (when directed by Owner/Engineer), is to provide additional Microbiologically Induced Corrosion (MIC) resistance to the Geopolymer liner. The work consists of rolling, spraying or centrifugally applying Antimicrobial Liquid, or approved substitute, to the surface of the newly lined infrastructure. Equipment required for application can include centrifugal spray mechanisms, pneumatic spray pumps, hand pumps or paint style roller. Approved secondary corrosion protection (Antimicrobial Liquid) shall be ConBlock as manufactured by ConSeal.
  - B. The Antimicrobial Liquid shall be used as specified by the manufacturer and shall not be diluted in excess of the Manufacturer's recommendation for a full-strength coating.
  - C. The Antimicrobial Liquid, shall be applied to the finished surface of the Geopolymer material during the application of the Geopolymer liner or anytime thereafter, as recommended by the Manufacturer.
  - D. The Antimicrobial Liquid shall be applied adequately to achieve surface saturation.
  - E. The Antimicrobial Liquid must be allowed to cure for a minimum of 30 minutes, or meet manufacturer recommended cure time, prior to releasing bypass or opening to any traffic.

# 2.10 Geopolymer Liner Application Equipment

- A. Horizontal Infrastructure
  - 1. Manufacturer approved equipment shall be used in the application of the specified Geopolymer lining. The following outlines the equipment that is to be used on application to Horizontal Infrastructure. Such equipment may also be used on Vertical Infrastructure at the installer's discretion.
  - 2. Major equipment components consist of a generator, an air compressor, a high pressure washer, a high shear mixer, a high output pump, a gyroscopic high speed spin cast delivery assembly, an electronic retraction system capable of +/- 5% repeatability, and high pressure hoses and couplings.
  - 3. Application equipment shall include a high shear mixer and high output swing tube pump. In addition, the application equipment will have safety sensors that monitors specific operation parameters.

- 4. Application equipment shall have visible display for the rate of water addition. This will ensure water/material ratios are known and controlled. Water/material ratio must be maintained per manufacturers' recommendations.
- 5. Application equipment shall measure the back pressure on the discharge side of the pump. The change in pressure will alert the operator to any potential changes in flow rates. Backpressures must not exceed the system providers' recommendations at all times.
- 6. Spinner head shall be attached to a gyroscopic mechanism to layer the materials. The gyroscopic mechanism can adjust the spinner head pattern and frequency. The multiple layering process allows more uniform application of the product and achieves higher thickness levels, in a single pass.
- 7. Retraction system shall be capable of pulling the sled assembly with no more than +/-5% tolerance. The tolerance shall be verified on a daily basis, prior to product application, and recorded in the daily log.
- 8. Retraction system shall have a visible display that monitors the controlled rate of retraction. The rate of retraction and the volume of material discharged is necessary to calculate the thickness of the applied materials.
- 9. The rate of retraction, material application volume, dry material usage and length of application covered should be monitored and recorded on a daily basis. This is a critical to accurately verify the thickness of material applied.
- 2.11 Equipment Maintenance
  - A. All equipment shall be in clean and good working conditions.
  - B. Maintenance and service shall be performed on the equipment to manufacturers' standards.
  - C. Inspect the dry material hopper in the mixer to ensure that there is no blockage or debris in the dry material feed point. Remove any debris prior to feeding dry powder.
  - D. Inspect the pre-mix chamber to ensure it that there is no blockage or debris. Remove any debris prior to mixing.
  - E. Inspect the mixing chamber to ensure there is no blockage or debris. Remove any debris or dry materials prior to application.
  - F. Inspect the pump to ensure there is no debris or blockage in the pump. Remove any debris prior to application.
  - G. Spare parts or extra equipment should be kept on site to ensure rapid redeployment in the event of equipment failure.

### PART 3 - EXECUTION

- 3.01 Acceptable Applicators
  - A. Geopolymer liner must be applied by a Certified Applicator of the Geopolymer lining manufacturer, as discussed in Paragraph 1.04 and according to manufacturer specifications.
  - B. Format and Preparation of Data Log and Startup Checklist:
    - Data Log and Startup Checklist for all works shall be on-site prior to commencement of the works. These sheets shall be used to ensure that the works are carried out and audited at multi-level according to standard steps and procedures. These sheets will be maintained on-site and available for viewing but will not be submitted. Information found on these logs will be used in the preparation of Daily Logs discussed in Paragraph 1.07 C.
    - 2. A Data Log shall be prepared for each shift/application at each location. Data Log shall contain the following information at minimum:
      - a. Job Name and Location;
      - b. Upstream, downstream and all intermediate manhole/access chambers reference numbers;
      - c. Material(s) used in the application (by batch number) and the precise location of applied lining applications within the infrastructure system;
      - d. Record of time/date of delivery of materials to application point (to include batch number and shipping company delivering the material);
      - e. Time of commencement and completion of application;
      - f. Application Method (hand trowel, hand sprayed or spin cast);
      - g. Hose Length, Product Temperature Wet/Dry, Water Temperature, Water Addition Rate, Pressure, Condition of Surface to be Rehabbed, Manhole/Structure/Pipeline Temp. and Prevailing Atmospheric Conditions;
      - h. Motor Speed and Retrieval Speed.
- 3.02 Examination
  - A. Applicator shall verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.
  - B. Applicator shall examine surfaces scheduled to be finished prior to commencement of work. Report to Owner any condition that may potentially affect proper application.
  - C. Appropriate actions shall be taken to comply with regulatory and other applicable agencies with regard to environment, health and safety.
  - D. Any active flows shall be dammed, plugged or bypassed as required to ensure that the conveyed flow is maintained away from the surfaces to be lined. Flows should be totally plugged and/or diverted when lining the invert and

during required dry/cure periods. All extraneous flows into the host infrastructure at or above the area lined shall be plugged and/or diverted until the Geopolymer liner has cured per manufacturer recommendations.

- E. Installation of the Geopolymer liner shall not commence until the host infrastructure has been properly cleaned and repaired in accordance with these specifications and Geopolymer liner manufacturer recommendations.
- F. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the infrastructure being lined.

### 3.03 Bypass Pumping

- A. Maintain sewer service during the installation process, as required for acceptable completion of the work.
- B. Install and operate bypass pumping equipment to maintain sewage flow around the host infrastructure being rehabilitated, and to prevent backup or overflow in compliance with Owner requirements.
- C. Coordinate with Owner regarding potential upstream diversion strategies which could potentially reduce influent flow from upstream system.
- D. Install all bypass and isolation material and equipment so as to not affect flow in upstream or downstream structures. The pump and bypass lines shall be of adequate capacity and size to handle the anticipated flow.

#### 3.04 Surface Preparation and Light Cleaning

- A. Excessive debris, sediment, root intrusion or other foreign materials which may impact the effectiveness of the surface preparation process shall be removed prior to the commencement thereof.
- B. Offset structural components, lids, covers, frames, etc. shall be reported to the Owner / Consulting Engineer so that direction related to further possible action may be discussed prior to the commencement of surface preparation.
- C. External soil/fill voids shall be remediated and/or stabilized by replacement or injection of stabilizing grout, flowable fill, or Quad-Flow as determined appropriate by the engineer.
- D. Oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants which may affect the performance and adhesion of the lining to the substrate shall be addressed per manufacturers' recommendations.
- E. Choice of surface preparation method(s) should be based upon the condition of the structure and concrete or masonry surface, potential contaminants present, access to perform work, and the required cleanliness and profile of the prepared surface to receive the repair and/or lining product.

- F. Surface preparation method, or combination of methods, that may be used include high-pressure water cleaning (minimum 3,500 psi), water jetting, abrasive blasting, abrasive blasting, grinding or scarifying. When grease or oil are present within the host infrastructure, steam, heated water (up to 200°F) or an approved detergent may be added to the water may be used integrally with the high-pressure water cleaning and other methods as referenced in industry accepted standards such as:
  - 1. ASTM-F-2551 Standard Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes.
- G. Loose debris materials resulting from the cleaning of the structure shall be removed prior to application of the Geopolymer lining material.
- H. Loose or defective brick, concrete, grout, ledges, and steps shall be removed to provide an even surface prior to application of Geopolymer lining material.
- Exposed rebar shall be pressure washed to remove any extraneous materials, such as dirt, oil, grease, debris and loose rust scale. Rebar is then coated with rust inhibiting coating and allowed to dry overnight. Geopolymer lining using the selected application method can then begin, lining to the required application thickness.

### 3.05 Pre-Construction Inspections

A. Prior to lining, the Contractor's experienced personnel trained in the inspection of large diameter pipes and/or related manholes and structures will clean the infrastructure to be rehabilitated and provide pre-construction videos utilizing color video inspection equipment. As an alternative, photos are acceptable for manholes and structures. The interior of the effected host infrastructure shall be carefully inspected to determine the location of and conditions which may prevent the proper installation of the Geopolymer liner, and it shall be noted so that these conditions can be corrected. A DVD or electronic transmittal shall be submitted to the Owner prior to the commencement of work.

# 3.06 Sealing Active Leaks

- A. The work consists of hand applying a dry quick-setting cementitious mix or, for heavy leaks, chemical grout designed to instantly stop running water or seepage in all types of concrete, metal and masonry pipes, manholes and structures. The applicator shall apply an approved quick-setting mortar or chemical grout in accordance with manufacturer's recommendations and the following requirements.
  - 1. The area to be repaired must be clean and free of debris to the extent the repair material will bond to the surface of the affected area.
  - 2. For quick-setting mortar, with gloved hand, place a generous amount of the dry quick-setting cementitious material to the active leak, with a smooth fast motion, maintaining external pressure for 30 seconds, repeat until leak is stopped.

- 3. Proper application should not require any special mixing of product or special curing requirements after application.
- B. Materials, additives, mixture ratios, and procedures utilized for the grouting process shall be in accordance with manufacturer's recommendations and shall be appropriate for the application.

### 3.07 Invert Repair and Patching

- A. The work consists of mixing and applying flowable fill or a rapid setting, high early strength, non-shrink patching material to fill all large voids and repair inverts prior to spray lining of the structure in accordance with Part 2.07. For pipe or manhole invert repairs, flow must be temporarily restricted prior to cleaning.
  - 1. The area to be repaired must be capable of receiving the appropriate repair material.
  - 2. Mix water shall be clean potable water and require no additives or admixtures for use with cementitious patching materials.
  - 3. Flowable fill shall be mixed on-site or delivered to the site ready for use. Patching material shall be mixed in a mortar tub or 5-gallon pail with water per manufacturer's specifications. Material should be mixed in small quantities, to avoid setting prior to placement in voids or inverts.
  - 4. Once mixed to proper consistency, the materials shall be applied to the invert or void areas by pump, hand or trowel. In invert applications, care should be taken to not apply excessive material in the channel, which could restrict flow. Once applied, materials should be smoothed either by hand or trowel in order to facilitate flow.
  - 5. Flows in inverts patched with patching material can be reestablished within 30 minutes of material placement. Flows with inverts patched with flowable fill or Quad-Flow are typically not reestablished until rehabilitation of the host infrastructure with Geopolymer liner has been completed.
- 3.08 Mixing of the Geopolymer Lining Material
  - A. Contractor shall add the Geopolymer material to the batch water following precisely the manufacturer's water/material ratio. Precision metering of water in mixer is required to maintain the strict water to material ratio. The ability to closely adjust and monitor the addition of water through the use of a water meter is required.
  - B. Mixing water temperatures must be determined before blending operations begin. The mixing water temperature must be recorded in the data log at multiple times throughout the day during the installation process. Water temperatures should be maintained at all times to within the limits required by the system supplier or manufacturer. The ability to provide mixing water at a consistent temperature is a critical aspect of the mixing and installation process.
  - C. The lining material shall be mixed in a high shear mixer, or similar, to ensure thorough and uniform mix of water with the material prior to pumping.

- D. The mixing operations must be performed so that the minimum of dust is released into the surrounding environment.
- E. The batch style mixing, precise metering of water and pump rate eliminates wet/dry and thick/thin variations resulting in a uniform structure liner regardless of the pumping distance.
- F. Multiple application nozzles should be onsite at all times to address any application issues or failure of the nozzle. Multiple nozzles may be required to produce the required depth or finish of the liner surface.

### 3.09 Application of Geopolymer Lining Material

- A. The work consists of spray applying and/or centrifugally spin-casting the specified geopolymer liner material to the inside of an existing structure. The necessary equipment and application methods to apply the liner materials shall be only as approved by the material manufacturer. Material shall be mixed in accordance with manufacturer's specifications to proper consistency, then the materials shall be pumped through a high-pressure material hose for delivery to the selected application device.
- B. In brick, block, rock, concrete and corrugated metal pipelines, tunnels and manholes with deteriorated surfaces, mortar material shall be applied to specified thickness, but no less than one (1) inch. Application on all pre-cast/poured-in-place manholes shall occur after preparing surfaces. Material shall be applied to the bench and invert area in such a manner as to provide for proper drainage without ponding and to compensate for abrasion. Material must be applied only when surfaces are damp but with no visible water dripping or running.
- C. Hand Troweled Application
  - 1. In locations where equipment access is limited or work scope is such that mobilization of equipment is not justifiable, material may be hand troweled into place.
  - 2. Proper mixing should be achieved with a portable mixing unit of sufficient strength to thoroughly mix product to manufacturers recommended consistency.
  - 3. Application of material by troweling shall be performed by starting at the bottom of the structure and progressing up the wall.
  - 4. Material shall be applied to a specified uniform minimum thickness no less than 1 inch, unless otherwise instructed by manufacturer. Material shall be applied to the bench area in such a manner as to provide for proper drainage without ponding and accounting for anticipated abrasion.
  - 5. Troweling of materials shall begin immediately following the mixing of the product. Initial troweling shall be in a motion, to compress the material into any voids within the structure walls. Precautions should be taken not to over trowel.
  - 6. Once troweling has been completed the applied liner shall be brushed to remove trowel marks and to break up the latent surface brought about by

troweling. Brushing should be in the horizontal plane and as with troweling do not over work the lining material.

- D. Hand Spray Application
  - 1. Material hose shall be coupled to a low-velocity spray application nozzle. Pumping of the material shall commence and the mortar shall be atomized by the introduction of air at the nozzle, creating a low-velocity spray pattern for material application.
  - 2. Spraying typically is performed by starting at the bottom of the structure and progressing up the wall.
  - 3. Material shall be applied to a specified uniform minimum thickness no less than 1 inch. Material shall be applied to the bench area in such a manner as to provide for proper drainage without ponding and accounting for anticipated abrasion.
  - 4. Troweling of materials shall begin immediately following the spray application. Initial troweling shall be in a motion, to compress the material into any voids within the structure walls. Precautions should be taken not to over trowel.
  - 5. Once troweling has been completed the applied liner shall be brushed to remove trowel marks and to break up the latent surface brought about by troweling. Brushing should be in the horizontal plane and as with troweling do not over work the lining material.
- E. Centrifugal Application
  - 1. Spin-cast unit shall be approved by the material manufacturer. Mechanical insertion/extraction equipment and speeds shall be calibrated to the structure diameter to ensure uniform application to specified thickness. Material hose shall be coupled to the spin-cast unit. The spin-cast unit shall then be properly positioned within the horizontal or vertical structure.
    - a. Vertical Structures/Manholes
      - 1) Initially locate the spinner at either the top of the manhole chimney or the lowest point corresponding to the junction of the manhole bench and walls.
      - 2) The spin-cast unit shall then be initialized, and pumping of the material shall commence.
      - 3) As the mortar begins to be centrifugally cast evenly around the interior of the structure, the rotating applicator head may be cycled up and down, when installing in rough, non-uniform vertical structures, at a controlled retrieval speed conducive to providing a uniform material thickness on the structure walls.
    - b. Horizontal Structures/Pipes
      - 1) The Geopolymer lining material delivery hose shall be coupled to a medium-velocity spray application nozzle.
      - 2) Pumping of the material shall commence and the material shall be spin cast onto the pipe surface.
      - 3) A gyroscopic head that has a speed adjustment for making multiple position changes per minute is required. The gyroscopic head allows the spin cast mechanism and the associated selected nozzle

to make multiple passes on the pipe wall in a single pass of the sled assembly.

- 4) Spraying of a pipe is typically performed by starting at the pipe endproject location (Lower level) and progressing towards the entrance of the pipe (Higher level).
- 5) At the beginning of each application segment the mechanical retraction system should be calibrated.
- 6) The measured rate observed and recorded must be within 5% of the expected speed and can be verified by this process.
- 7) Geopolymer liner shall be applied to a specified uniform minimum thickness as instructed by the professional engineer.
- 8) The Geopolymer delivery hose shall be coupled to a gyroscopic applicator device. The gyroscopic applicator shall then be positioned within the center, or positioned higher inside the pipe, as required by the diameter and shape of the pipe.
- 9) As the material begins to be gyroscopically cast evenly around the interior of the cavity, the rotating applicator head shall produce a uniform material thickness to the repair surface.
- 10)Controlled multiple passes shall then be made, if necessary, until the specified minimum finished thickness is attained. If the procedure is interrupted for any reason, the operator shall arrest the longitudinal transition of the applicator head until flows are recommenced.
- 11)Material thickness may be verified at any point with an approved depth gauge. If additional material is required at any level, the gyroscopic applicator head shall be placed at the location and application shall recommence until that area meets the required thickness.
- 12)The lining material shall be applied to a damp surface, with no free water.
- 13) The medium-velocity spray nozzle and the gyroscopic spin casting head may be used in conjunction to facilitate uniform application of the material to irregularities in the contour of the pipe walls.
- 14) If desired, the liner may be troweled following the spray application. Initial troweling shall be in an upward motion, to compress the material and solidify the pipe wall.
- 15) Proper steps shall be taken to ensure the material is cured in a moist and moderate climate as directed by the manufacturer. General underground conditions are usually adequate to meet this curing requirement. However, when situations of dry and/or hot conditions are present, the use of a wind barrier and fogging spray may be required.
- 3.10 Curing of the Geopolymer Lining Material
  - A. The Manufacturer's recommended cure schedule must be followed at all times unless advised otherwise by Manufacturer in writing. The Contractor must provide evidence of such adherence via the Data Log.

- B. SPECIAL NOTE: The use of curing compounds is not recommended for Geopolymer liners.
- 3.11 Reinstatement of Laterals and Connecting Pipes
  - A. Using the records from the pre-construction inspections, the Contractor shall insure that all laterals and other connecting pipes are properly reinstated and put back in service. Any excessive Geopolymer liner material at the connection shall be removed.
  - B. The Contractor shall insure that no infiltration is originating at the point of connection. If it is, the Contractor shall seal the leak with chemical grout.
  - C. The laterals and pipe connections shall then be completed by hand, applying the liner to the outer surface of the connection to the pipe and smoothly tapering it into the lateral or connecting pipe. No rough edges or abrupt transitions that could catch debris or hinder the flow shall remain.
- 3.12 Termination and Sealing at Manholes, Junctions, Bends, Inlets, Outlets, Shafts, and Other Structures
  - A. Termination of the Geopolymer liner at the end of a pipe or manhole shall be completed by hand applying the liner to the outer surface of the pipe or into the interior of the manhole.
  - B. Unless specifically directed otherwise in the project plans/specification, all starter/intermediate/terminal manholes/junctions/bends/other structures which are directly impacted by pipe rehabilitation activities will also be Geopolymer lined. If no direction is provided, or should information conflict, these manholes are to be lined with a minimum thickness of one (1) inch. The junctions, bends, shafts, and other structures are to be lined with a minimum thickness of one (1) inch. The junctions, bends, shafts, and other structures are to be lined with a minimum thickness of one (1) inch. Refer to Part 2.05 for design requirements.
- 3.13 End of Shift Equipment Clean Up Procedures
  - A. All equipment used during the days/shifts operations shall be properly cleaned and stored.
  - B. All hoses, fittings, pumps, mixers, spray head equipment, retraction equipment will be cleaned both inside and out.
  - C. All mixed Geopolymer materials shall be captured and disposed of properly.
- 3.14 Final Inspection
  - A. Any deficiencies in the finished lining shall be marked and repaired by Applicator according to the procedures set forth herein.
  - B. At the completion of a lining stage of the infrastructure, and once all repairs have been made and accepted, a video inspection DVD (1 copy) of the completed line

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

segments shall be submitted to the Owner/Engineer by the Contractor. This inspection shall be performed by a color video inspection system. The finished Geopolymer shall be continuous over the entire length of all runs and be free of dry spots. No infiltration of groundwater shall be observed. All service entrances shall be accounted for and shall be unobstructed.

-END-

GEOPOLYMER LINING SYSTEM

02777-23

# SECTION 03100 - CONCRETE FORMWORK

### PART 1 - GENERAL

### 1.01 Summary

- A. Section Includes: Furnishing all labor, equipment and services (including the design and detailing) required for forms for all cast-in-place concrete shown on the Drawings and subsequent removal of all such forms described in this Section.
- B. Related Sections:
  - 1. Section 03200 Concrete Reinforcement
  - 2. Section 03300 Cast-In-Place Concrete
  - 3. Section 03310 Site Work Concrete
  - 4. Section 03810 Unbonded Post-Tensioned Concrete

#### 1.02 References

- 1. ACI 301 Specifications for Structural Concrete for Buildings.
- 2. ACI 117 Standard Specification for Tolerances for Concrete Construction and Materials
- 3. "Recommended Practice for Concrete Formwork", publication ACI 347 of the American Concrete Institute

### 1.03 Submittals

- A. Provide all submittals specified in Division 1 prior to starting fieldwork including the following:
  - 1. Dimensioned formwork layout drawings for all supported levels, showing formed openings.
  - 2. Provide dimensioned sections indicating concrete outlines with reference elevations noted.
- B. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
  - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- C. Product Information:
  - 1. Submit product information for steel forms under the provisions of Division 1.

### 1.04 Quality Assurance

- A. Formwork Design
  - 1. Formwork shall be designed by a Professional Engineer, retained by the Contractor, registered in the State of the project with not less than five (5) years of experience in such construction. The Formwork Engineer shall prepare detailed documents for all formwork, including falsework and reshoring and shall sign and seal all documents complying with the regulations of the State.
- B. Qualifications of workmen
  - 1. Provide at least one experienced person present at all times during execution of Work qualified and responsible as follows:
    - a. Thoroughly familiar with the type of materials being installed, the referenced standards, best methods for installation, and the requirements of this Work.
    - b. Direct all work performed under this Section.

# PART 2 - PRODUCTS

- 2.01 Manufacturers
  - A. Form Release Agent:
    - 1. Magic Kote by Symons Manufacturing Company
    - 2. Formshield Chemical Release Agent by Grace Construction Products
- 2.02 Form Materials & Accessories
  - A. Form Lumber:
    - 1. In contact with exposed concrete: New or of sufficient quality to insure an unblemished texture.
    - 2. Forms for all concrete unless otherwise indicated
      - a. Face Forms: B-B Plyform Class I or II, exterior, bearing APA grade stamp on each piece. Minimum thickness: 3/4"
    - 3. Forms for concrete where indicated on the drawings
      - a. Face Forms: High Density Overlaid Plyform Class I or II, exterior, bearing APA grade stamp on each piece. Minimum thickness: 3/4"
  - B. Form Ties:
    - 1. Factory fabricated, adjustable length with waterstop collars.
    - 2. Design to prevent form deflection and to prevent spalling of concrete upon removal
    - 3. The metal after breaking should be at least 1" from the face of the wall
  - C. Form Release Agent:

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CONCRETE FORMWORK

- 1. Non-staining, neutral, barrier type that will not cause softening or impede curing
- D. Footing Forms: Wood
- 2.03 Other Materials
  - A. Contractor to select, subject to the approval of the Engineer, all other material not specifically described but required for proper completion of concrete formwork.

### PART 3 - EXECUTION

- 3.01 Inspection
  - A. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is completed to the point where this installation may properly commence.
  - B. Verify that forms are constructed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.
  - C. Discrepancies:
    - 1. In the event of discrepancy, immediately notify the Engineer.
    - 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved and reviewed by the Engineer.

#### 3.02 Construction of Forms

- A. Construct forms to be sufficiently tight to prevent leakage of concrete, and able to prevent excessive deflection when filled with wet concrete.
- B. Layout:
  - 1. Form all required cast-in-place concrete to the shapes, sizes, lines and dimensions indicated on the Drawings. Provide 3/4" chamfers on all exposed corners of concrete except those abutting or aligning with masonry.
  - 2. Exercise particular care in the layout of formwork to avoid the necessity for cutting of concrete after it is in place.
  - 3. Make proper provision for all openings, offsets, recesses, anchorage, blocking, and other features of the Work as shown or required.
  - 4. Perform all forming required for Work of other trades and do all cutting and repairing of forms required to permit such installation.
  - 5. Carefully examine the Drawings and Specifications and consult with other trades as required relative to provision for openings, reglets, chases and other items in the forms.

- C. Set steel frames, angles, trench drains, bolts, inserts, conduits, and other such items required to be anchored or embedded in the concrete before the concrete is placed.
- D. Bracing:
  - 1. Properly brace and tie the formwork together so as to maintain position and shape and to ensure safety to workers.
- E. Construct all formwork straight, true, plumb, level and square within a tolerance as specified in ACI 301 and within tolerances set forth in ACI 117. Use a reference point on the ground to check plumbness and elevations. Do not use a previous floor as the reference.
- F. Keep formwork sufficiently wetted to prevent joints opening up before concrete is placed.
- G. Provide holes at bottom of formwork for cleaning and inspection. Close prior to placing concrete.
- 3.03 Form Removal
  - A. Remove formwork in an approved manner under competent supervision to avoid damage to the concrete and to prevent spalling.
  - B. Repair concrete damaged by too early removal of supports to the satisfaction of the Engineer or replaced at no additional cost to the Owner.
  - C. Do not remove shores and other supports until concrete has attained sufficient strength to support without objectionable deflections its own weight plus all anticipated construction loads.
  - D. Do not remove falsework until concrete has attained, as indicated by the fieldcured cylinders, at least 70 percent of its specified 28-day strength.
  - E. Reshore all floor decks as required to support construction loads from floors and roof above.
  - F. Do not remove formwork for vertical elements (walls and columns) until the day after casting of the concrete or as otherwise required for proper curing of the concrete. Do not damage concrete surfaces during form removal.
- 3.04 Maintenance
  - A. Clean and recondition formwork before each use.
  - B. Completely repair any damage to formwork during placing, removal, or storage.
  - C. Do not use formwork with repairs or patches that would result in adverse effects to the concrete finish.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CONCRETE FORMWORK
STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

CONCRETE FORMWORK

SECTION NO. 03100 - 5

-END-

# SECTION 03200 - CONCRETE REINFORCEMENT

## PART 1 - GENERAL

- 1.01 Summary
  - A. Section Includes: Furnishing all labor, equipment, materials and services required for the installation of all concrete reinforcement and associated items required and/or indicated on the Drawings or specified herein.
  - B. Related Sections:
    - 1. Section 03100 Concrete Formwork
    - 2. Section 03300 Cast-in-Place Concrete

### 1.02 References

A. Codes and standards referred to in this Section are:

- 1. "Manual of Standard Practice for Detailing Reinforced Concrete Structures" ACI 315.
- 2. "Code Requirements for Environmental Engineering Concrete Structures" ACI 350.
- 3. "Building Code Requirements for Reinforced Concrete" ACI 318.
- 4. CRSI Manual of Standard Practice.

### 1.03 Submittals

- A. Shop Drawings
  - 1. Provide shop drawings giving details of fabrication and placing.
  - 2. Shop Drawings will be checked by the Engineer for correct interpretation of the Drawings but does not relieve the Contractor of his primary responsibility to provide the correct number of properly detailed bars in all members.
  - 3. Resubmitted shop drawings:
    - a. Do not change correct information from the original submittal on resubmitted shop drawings.
    - b. Cloud submittal information changed due to a Change Order on resubmitted shop drawings.
  - 4. See the General Notes and Typical Details for extra reinforcing around openings, over beams and other general information for the Detailer.
  - 5. Prepare in accordance with the following:
    - a. Beams and Walls: Provide 1/4 inch scale elevations of all walls and beams with all the reinforcing shown on the elevations, <u>not</u> scheduled.
    - b. Slabs and Mats: Show reinforcing for all concrete slabs on a floor plan drawn exclusively for this use. Do not use a schedule for this reinforcing.
    - c. Slabs and Mats: Provide a support system plan for all slabs. Show supports for slab top and bottom bars in number and location. Maximum

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CONCRETE REINFORCEMENT

spacing of support bars is 4'-0. Maximum overhang beyond a support bar or a slab bolster is 1'-0.

- d. Provide bar bending diagrams for all bent bars (within a submittal) in that same submittal.
- e. Provide sections of walls, beams, joists and slabs clearly showing bar positions and clearances to forms.
- f. Indicate spacers used to maintain clearances for vertical wall steel on wall sections.
- g. Indicated size and spacing of beam bolsters and joist chairs on the sections and elevations.
- h. Include all details, sections, and installation instructions indicated on the structural drawings required to place the reinforcement without using the structural drawings.
- i. Indicate grades of reinforcement on each shop drawing.
- 6. Submit the following regarding the mechanical tension butt splices, the endbearing splices and the dowel bar replacement system to be used:
  - a. Shop drawings indicating fabrication and placement details per this section
  - b. Manufacturer's literature, product samples, and certified test reports substantiating compliance with the Specification.

### 1.04 Quality Control

- A. Qualifications of workmen
  - 1. Provide at least one experienced person present at all times during execution of Work qualified to direct all work performed under this section and responsible as follows:
    - a. Thoroughly familiar with the type of materials being installed, the referenced standards, best methods for installation, and the requirements of this Work
- B. Attend a preconstruction meeting with ironworker foreman to discuss the review of reinforcement steel installation
- 1.05 Delivery, Storage, and Handling
  - A. Protection:
    - 1. Use all means necessary to protect concrete reinforcement before, during and after installation and to protect the installed work and materials of all other trades.
    - 2. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bondbreaking coatings.
    - 3. Use all necessary precautions to maintain identification after the bundles are broken.
  - B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

### PART 2 - PRODUCTS

### 2.01 Manufacturers

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
  - 1. Mechanical Tension Butt Splices
    - a. Lenton Rebar Splicing by Erico.
    - b. Grip Twist System by Dayton Barsplice, Inc.
    - c. Cadweld, C-Series by Erico
  - 2. End-Bearing Splices (Compression Butt Splices)
    - a. G-LOC by Gateway Erectors, Inc.
    - b. Speed sleeve by Erico Products, Inc.
  - 3. Dowel Bar Replacement System
    - a. DB-SAE Dowel Bar Splicer by Richmond Screw Anchor Co.
    - b. Dowel Bar Replacement System by Dayton Superior
    - c. Lenton Form Saver by Erico
    - d. Stabox by Couplerbox Inc.
    - e. Systems Intersect by Dayton Superior
- 2.02 Concrete Reinforcement
  - A. Provide concrete reinforcement materials complying with the following:
    - 1. New, free from rust
    - 2. Main Reinforcing Bars: ASTM A-615 Grade 60
    - 3. Stirrups and Column tie Bars: ASTM A-615 Grade 60
    - 4. Wire Reinforcement: ASTM A- 82
    - 5. Welded Wire Fabric: ASTM A-185
- 2.03 Mechanical Tension Butt Splices
  - A. Mechanical tension butt splices: Conform to ACI 350-01.
  - B. Provide Cadweld butt splices or position threaded couplers for hooked bars that must be butt spliced.
- 2.04 End-Bearing Splices (Compression Butt Splices)
  - A. Conform to ACI 350-01, section 12.16.4.
- 2.05 Dowel Bar Replacement System
  - A. Conform to ACI 350-01.
- 2.06 Accessories
  - A. Provide bar supports, ties, blocking and accessories in accordance with CRSI "Manual of Standard Practice".

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CONCRETE REINFORCEMENT

- B. Bar supports: Stainless steel or protected with plastic in contact area.
  - a. Bar supports located underneath painted and exposed floor: Stainless steel
- C. Provide plastic Aztec "space wheels" to maintain clearances for vertical wall reinforcement.

# PART 3 - EXECUTION

# 3.01 Fabrication

- A. Fabrication: Comply with the requirements of ACI 318, ACI 315, ACI 350, and CRSI "Manual of Standard Practice".
- 3.02 Surface Conditions
  - A. Inspection:
    - 1. Carefully inspect the installed work of all other trades prior to installation and verify that all such work is complete.
    - 2. Verify that concrete reinforcement is installed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the original design.
  - B. Discrepancies:
    - 1. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved and reviewed by the Engineer.

# 3.03 Installation

- A. Complete the installation in accordance with approved shop drawings.
- B. Hold reinforcement securely in design position by wiring to supports in accordance with CRSI standards.
- C. Provide other supports as needed to secure every bar against displacement
- D. Support overhanging tails positively.
- E. Avoid walking on top slab bars.
- F. Straighten and reposition bars bent and/or displaced during concrete placement before they are encased in concrete.

G. Tolerances on reinforcing placement:

MEMBER	TOP STEEL	BOTTOM STEEL	SIDE STEEL
Slabs	3/8"	1/4"	1/4"
Joists, Beams	1/2"	1/4"	1/2"

- H. Do not splice main reinforcement unless indicated on the Structural Drawings or approved by the Engineer.
- I. Concrete Protection: Comply with the requirements of ACI 318 and ACI 350 except as modified on the Structural Drawings.
- J. Obstructions
  - 1. In the event conduits, piping, inserts, sleeves or any other items interfere with placing reinforcement as indicated on the Drawings or as otherwise required, immediately consult the Engineer and obtain approval of new procedure before placing concrete.

# 3.04 Notification

- A. Notify the Engineer when reinforcement for a pour is nearing completion so that reinforcing steel in place may be reviewed.
  - 1. Floor pours, roof pours, and mats: Complete installation of reinforcement by noon of the day prior to casting the concrete.
  - 2. Allow sufficient time for setters to make adjustments or corrections so that reinforcing steel correct in size, shape and position will be in place when concreting is started.

-END-

# SECTION 03300 - CAST-IN-PLACE CONCRETE

# PART 1 - GENERAL

- 1.01 Summary
  - A. Section Includes: Furnishing all labor, equipment, tools, and materials required for placing, finishing, and curing cast-in-place concrete and the installation of specified items to be embedded in cast-in-place concrete.
  - B. Products Installed But Not Furnished Under this Section
    - 1. Section 05500 Metal Fabrications: Miscellaneous metals work and Division II equipment:
    - 2. Section 05532 Aluminum hatches to be embedded in cast-in-place concrete.
  - C. Related Sections
    - 1. Section 03100 Concrete Formwork
    - 2. Section 03310 Concrete Reinforcement

### 1.02 References

- A. American Concrete Institute
  - 1. ACI 117 Specification for Tolerances for Concrete Construction and Materials and Commentary
  - 2. ACI 301 Specifications for Structural Concrete.
  - 3. ACI 305 Hot Weather Concreting
  - 4. ACI 306 Cold Weather Concreting
  - 5. ACI 318 Building Code Requirements for Reinforced Concrete
- B. American Society for Testing and Materials (ASTM)
  - 1. ASTM C31 Making and Curing Concrete Test Specimens in the Field
  - 2. ASTM C33 Concrete Aggregates
  - 3. ASTM C39 Test for Compressive Strength of Cylindrical Concrete Specimens
  - 4. ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
  - 5. ASTM C94 Ready-Mixed Concrete
  - 6. ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
  - 7. ASTM C143 Test for Slump of Hydraulic Cement Concrete
  - 8. ASTM C150 Portland Cement
  - 9. ASTM C171 Sheet Materials for Curing Concrete
  - 10. ASTM C172 Sampling Freshly Mixed Concrete
  - 11. ASTM C173 Test for Air Content of Freshly Mixed Concrete by the Volumetric Method

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 12. ASTM C231 Test for Air Content of Freshly Mixed Concrete by the Pressure Method
- 13. ASTM C260 Air-Entraining Admixtures for Concrete
- 14. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete
- 15. ASTM C494 Chemical Admixtures for Concrete
- 16. ASTM C567 Unit Weight of Structural Lightweight Concrete
- 17. ASTM C618 Fly Ash and Raw or Calcined Natural Pozzolans for Use in Portland Cement Concrete
- 18. ASTM C827 Standard of Fast Method for Change in Height at Early Ages of Cylindrical Specimen of Cementitious Mixtures
- 19. ASTM D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
- 20. ASTM E1155 Standard Test Method for Determining Floor Flatness and Levelness Using the F-Numbers System

# 1.03 Submittals

- A. Provide all submittals specified in Division 1, and in accordance with ACI 301, including the following:
- B. Concrete Mix Designs
  - 1. Submit a mix design for each class of concrete required for the project under the provisions of Division 1 and including:
    - a. Standard deviation analysis, required average strength and documentation of average strength verifying compliance with ACI 318.
    - b. Mix proportions by weight, water-cement ratio, slump and air content
    - c. Sieve analyses of fine and coarse aggregates
    - d. Complete list of materials specified in Article 2.01 with product information demonstrating compliance with all specified requirements.
  - 2. Submit with sufficient time allowed for review before concrete is required for the project.
- C. Layout Drawings
  - 1. Submit complete shop drawings indicating:
    - a. Locations of construction joints in supported levels
    - b. Locations of control joints in slabs on grade
    - c. Sizes and locations of sleeves
    - d. Locations of waterstops
- D. Product Data: Submit product data for materials demonstrating compliance with specified requirements.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field Quality Control Test Reports: Submit reports within 3 days after completion of the 7-day and 28-day tests.

- G. Concrete Placement Records: Submit records after completion of the concrete placement.
- H. Submit concrete delivery tickets in accordance with ASTM C94 for each batch of ready mixed concrete delivered, including total water content, batch time and batch weight on each ticket.

### 1.04 Quality Control

- A. Perform Work in accordance with ACI 301.
- B. Conduct field sampling and testing of concrete, including the making of test specimens, with personnel holding current certificates issued by the Concrete Technician Certification Committee of ICACI. Include proof of certifications with the shop drawings. Contractor will not conduct field sampling or testing.
- C. Attend a preconstruction meeting to discuss submittals, concrete placement, and concrete testing. Provide a responsible representative of the concrete placing/finishing contractor, the concrete supplier, and the testing laboratory.

### 1.05 Delivery, Storage, and Handling

- A. Deliver concrete in accordance with ASTM C94. Do not use non-agitating transporting equipment.
- B. Store materials and equipment in designated areas and in accordance with manufacturer's instructions.
- C. Store materials and equipment off the ground, totally protected from ground splash, mud, weather separation, intrusion of foreign materials, and other damage.

### 1.06 Environmental Requirements

- A. Inclement Weather: Do not place concrete during rain, sleet or snow unless adequate protection is provided.
- B. Protection of footing against freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against freezing.

# PART 2 - PRODUCTS

- 2.01 Manufacturers
  - A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
    - 1. Air- Entraining Admixture a. Micro-Air by BASF

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- b. MB-VR by BASF
- c. Darex II by W. R. Grace & Co.
- d. Daravair 1000 by W. R. Grace & Co.
- e. Air Mix by The Euclid Chemical Co.
- 2. Water-Reducing Admixture
  - a. Pozzolith 122-N or LL-960 by BASF
  - b. Pozzolith 322-N or 220-N by BASF
  - c. WRDA with Hycol by W. R. Grace & Co.
  - d. Daracem 55 by W. R. Grace & Co.
  - e. Eucon WR-75 by The Euclid Chemical Co.
- 3. Retarding Admixture
  - a. Pozzolith 122-R by BASF
  - b. Daratard-17 by W. R. Grace & Co.
- 4. Accelerating Admixture
  - a. Pozzutec 20-Accelerator by BASF
  - b. Polarset by W. R. Grace & Co.
  - c. Accelguard 80 by The Euclid Chemical Co.
- 5. Water-Reducing & Retarding Admixture
  - a. Pozzolith 122-R by BASF
  - b. Daratard-17 by W. R. Grace & Co.
  - c. Eucon Retarder-75 by The Euclid Chemical Co.
- 6. High Range Water-Reducing Admixture
  - a. Pozzolith 440-N by BASF
  - b. Rheobuild 1000 by BASF
  - c. Daracem 100 by W. R. Grace & Co.
  - d. WR-19 by W. R. Grace & Co.
  - e. Eucon 37 by The Euclid Chemical Co.
  - f. Eucon 537 by The Euclid Chemical Co.
- 7. Synthetic Fibers
  - a. Nycon by Nycon, Inc.
  - b. Fibermesh by Fibermesh Company
  - c. Grace Microfiber by Grace Construction Products
  - d. FORTA CFP by Forta Corp.
  - e. FORTA Nylon by Forta Corp.
- 8. Concrete Curing and Sealing Compound for Interior
  - a. Sonneborn "Kure-N-Seal"
  - b. Toch Bros. "Sealkure"
  - c. Grace "Horn Clear Seal"
- 9. Concrete Curing and Sealing Compound for Exterior
  - a. Grace "Horncue 40W"
  - b. Toch Bros. "Torkure"
  - c. Sonneborn "Hydrocide Curing Compound"
- 10. Evaporation Retardant
  - a. Confilm by Master Builders.
  - b. EUCO-BAR by the Euclid Chemical Co.
- 11. Epoxy Bonding Adhesive
  - a. Sikadur 32, Hi-Mod by Sika Corporation
- 12. Two-Component Epoxy

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- a. Hilti HIT Dowelling Anchor System with HY 150 cartridge by Hilti Fastening Systems.
- b. Sikadur 32, Hi-Mod by Sika Corporation; (vertical holes)
- c. Sikadur Injection Gel by Sika Corporation; (horizontal holes)
- d. Sikadur 31, Hi-Mod Gel by Sika Corporation; (overhead application)
- e. Approved equal; submit literature including depth of embedment to develop reinforcing bars/anchor bolts and spacing requirements.
- 13. Patching Material
  - a. SikaTop 122 PLUS (horizontal and vertical surfaces), by the Sika Corporation
  - b. SikaTop 123 PLUS (overhead surfaces), by the Sika Corporation
  - c. Sto Trowel Grade Mortar (horizontal surfaces), by the Sto Corporation
  - d. Sto High Strength Overhead Mortar (vertical and overhead surfaces), by the Sto Corporation
- 14. Joint Filler- ASTM D994
  - a. Sealtight asphalt expansion joint filler, as manufactured by W. R. Meadows, Inc.
- 15. Joint Filler- ASTM D1752, Type III
  - a. Self Expanding Cork by W. R. Meadows, Inc.
- 16. Waterstops
  - a. Waterstop-RX by Colloid Environmental Technologies Company (Volclay)
- 17. Calcium Nitrite Corrosion Inhibitor Admixture
  - a. DCI Corrosion Inhibitor by Grace Construction Products

## 2.02 Concrete Materials

- A. Portland Cement: ASTM C150, Type I or Type III
  - 1. Use one brand of cement throughout the project unless specifically approved by the Engineer.
- B. Flyash: ASTM C618, Class C
  - 1. Maximum loss on ignition: 3.0 percent.
  - 2. Maximum amount retained when wet-sieved on No. 325 sieve: 30 percent.
- C. Fine Aggregate: ASTM C33
  - 1. Natural sand of clean, hard, durable particles
  - 2. Indiana Department of Highways, Standard Specifications, Size #23
- D. Coarse Aggregate: ASTM C33.
  - 1. Crushed stone or gravel of clean, sound, tough, durable particles
    - a. For air-entrained concrete mixes: ASTM C33, Class 4S
    - b. For non air-entrained concrete mixes: ASTM C33, Class 2S
  - 2. Indiana Department of Highways, Standard Specifications, Class A, Size 8, 3/4 inch maximum size

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- E. Water: Clean and free from injurious amounts of oil, acids, alkalis, salts, organic materials and other deleterious substances.
- F. Air-Entraining Admixture: ASTM C260
- G. Water-Reducing Admixture: ASTM C494, Type A
- H. Retarding Admixture: ASTM C494, Type B
- I. Accelerating Admixture: ASTM C494, Type C
  - 1. Non-chloride, non-corrosive
  - 2. Calcium chloride or admixtures containing more than 0.05% chloride ions are not permitted.
  - Thiocyanate-based accelerators per dosage rate: Contribute thiocyanate ions less than 0.30 percent by weight of cement.
    a. Certified by the manufacturer
- J. Water-Reducing & Retarding Admixture: ASTM C494, Type D
- K. High Range Water-Reducing Admixture: ASTM C494, Type F
- L. Synthetic Fibers
  - 1. Virgin (non-recycled), nylon or polypropylene fibers ASTM C 1116
  - 2. <sup>3</sup>/<sub>4</sub>-inch length (unless specified otherwise)
  - 3. Use in strict accordance with manufacturer's instructions.
  - 4. Introduce fibers into concrete at the batch plant.

### 2.03 Form-Facing Materials

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints
  - 1. Plywood, metal, or other approved panel materials.
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

- 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
- 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
- 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

## 2.04 Related Materials

- A. Curing Compound: ASTM C309
  - 1. Clear curing, non-yellowing under ultra violet light.
  - 2. Sodium silicate products are not permitted.
  - 3. Compatible with applied sealers and finishes specified for the concrete surfaces to be cured.
  - 4. Apply curing compound at the coverage rate to comply with ASTM C309.
  - 5. VOC of Curing Compound: less than 350g/L
- B. Approved Concrete Curing and Sealing Compound for Interior: ASTM C309
  - 1. VOC of Curing and Sealing Compounds for both interior and exterior: less than 400g/L
  - 2. Impervious, non-bituminous, liquid, compatible with floor finish
- C. Approved Concrete Curing and Sealing Compound for Exterior: ASTM C309
  - 1. White pigmented, wax resin base membrane type
- D. Moisture Retention Cover: ASTM C171
  - 1. Waterproof paper or polyethylene film
- E. Evaporation Retardant
  - 1. Apply in accordance with manufacturer's instructions
- F. Epoxy Bonding Adhesive
  - 1. Two-part structural epoxy adhesive
  - 2. Use to bond fresh, plastic concrete or patching mortar to hardened concrete.

# G. Two-Component Epoxy

- 1. Drilled hole size and installation: Conform to manufacturer's instructions.
- 2. Use carbide bit drill to prevent damage to reinforcement.
- 3. Moisture insensitive epoxy
- 4. Use to anchor reinforcing steel or anchor bolts into hardened concrete.
- H. Patching Material:

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 1. Use to repair honeycombed and other defective concrete
- I. Joint Filler: ASTM D994
  - 1. Asphalt filler for unsealed expansion or isolation joints.
  - 2. Use at sidewalks, driveways, floor slab-on-grade, and elsewhere as indicated on the drawings.
- J. Joint Filler: ASTM D1752, Type III.
  - 1. Granulated cork particles, specially treated, dehydrated, and compressed to enable expansion in presence of moisture.
  - 2. Use at slab on grade isolation joints
- K. Waterstops
  - 1. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) BoMetals, Inc.
      - 2) Greenstreak.
      - 3) Vinylex Corp.
  - 2. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular, trapezoidal, or half-circle strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete.
    - a. Products:
      - 1) Colloid Environmental Technologies Company (CETCO); Volclay Waterstop-RX.
        - a) Appropriate RX material shall be used for layers of steel through the construction joint and concrete cover.
        - b) RX101: Use with concrete with two rows of reinforcement and with 3 inches minimum concrete cover
        - c) RX102: Use with one row of reinforcement and with 2 inches minimum concrete cover
    - b. Install in strict accordance with manufacturer's requirements.
    - c. Keep dry at all times
- L. Non-Shrink Grout
  - 1. 5,000 psi (28 day) high early strength, no-metallic, shrinkage resistant (when tested in accordance with the latest edition of ASTM C827 or CRD-C621), premixed, non-corrosive, non-staining product containing Portland Cement,

silica sands, shrinkage compensating agents and fluidity improving compounds.

- 2. Perform grout compressive strength tests in accordance with the latest edition of ASTM C109, with a restraining plate placed over the molds.
- 3. Install grout in accordance with the manufacturer's instructions.
- 4. Place grout in a non-sag flowable state and have forms built around it for confinement. Cure grout according to the manufacturer's recommendations.
- M. Crystalline Waterproofing Dry Pac: Xypex Concentrate or an approved equivalent.
- N. Sheet Vapor Retarder. Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.
- O. Sheet Vapor Retarder. (Administration Building). Co-extruded Polyolefin Membrane Underslab Vapor Retarders: Sheet manufactured in multilayer extrusion process using virgin (non-recycled) polyolefin resins, with maximum permeance rating as tested by ASTM E96, Procedure B of 0.02 perms.
  - 1. Subject to compliance with requirements, provide one of the following:
    - a. Fortifiber Building System Group; Moistop Ultra 15.
    - b. Insulation Solutions, Inc.; Viper Vaporcheck II, 15 Mil.
    - c. Raven Industries, Inc.; Vapor Block 15.
    - d. Reef Industries, Inc.; Griffolyn 15 mil.
    - e. W. R. Meadows, Inc.; Perminator 15.

### 2.05 Proportioning Concrete Mixes

- A. Provide homogeneous, durable mixes with the required average strength based on the appropriate amount of overdesign as required by Section 5.3 of ACI 318.
- B. Provide workability and consistency to permit concrete to be worked readily into the corners and angles of the forms and around reinforcement by the methods of placement and consolidation to be employed, without segregation or excessive bleeding.
- C. Include a water-reducing or high range water-reducing admixture, used in strict accordance with manufacturer's instructions, in all mix designs. Specified minimum cement contents are based on the use of such admixtures.
- D. Include an air-entraining admixture in mix designs for all concrete exposed to freezing and thawing during service and for all concrete exposed to cold weather, as defined in Article 3.11, during construction, before attaining its specified compressive strength.
- E. Base mix design on saturated surface dry aggregates. Adjust the amount of mixing water added at the batch plant for the moisture condition of the aggregates.
  - 1. Calculate the water-cement ratio for each class of concrete using the cement plus flyash.
    - a. Class C flyash, use 100 percent of flyash

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 2. Flyash may be used as a cement substitute.
  - a. Maximum 20 percent substitution rate on a pound for pound basis for Class C flyash
- 3. Do not use flyash in the concrete mix for interior slabs on grade.
- F. Water Soluble Chloride Ion Content
  - 1. Maximum percent in concrete by weight of cement
    - a. Reinforced concrete for water retention structures: 0.10
    - b. Reinforced concrete exposed to earth or weather: 0.15
    - c. Other reinforced concrete construction: 0.30
- G. Slump
  - 1. Ramps and slabs not more than 3 inches
  - 2. Reinforced foundation systems 1 to 3 inches
  - 3. Mixes containing high range water-reducing admixture: 5 to 8 inches
  - 4. Mixes containing water-reducing admixture: 5 inches maximum
- H. Use synthetic fibers as noted on Drawings per the dosage rate indicated in the manufacturer's literature.
- I. Adjustments to the approved mix designs may be requested by the Contractor when job conditions, weather, test results, or other circumstances warrant. Submit revised concrete mix designs to the Engineer for review prior to their use.
- J. Concrete Mix Classes
  - 1. Seerly West Class A Concrete (Foundation base slabs, walls, columns, beams & supported slabs)
    - a. Compressive strength at 28 days: 5,000 psi
    - b. Minimum cement content: 658 lb/cu yd
    - c. Fly Ash: Type C
    - d. Maximum water-cement ratio: 0.45
    - e. Coarse aggregate: 3/4" nominal maximum
    - f. Air content:  $6\% \pm 1\%$
    - g. Corrosion-Inhibiting admixture: 3 gal/cu yd
    - h. Crystalline waterproofing admixture: 3% by weight of the Portland cement content
  - 2. Hanna Class 5000 Concrete (Foundation base slabs, walls, columns, beams & supported slabs)
    - a. Compressive strength at 28 days: 5,000 psi
    - b. Minimum cement content: 658 lb/cu yd
    - c. Fly Ash: Type C
    - d. Maximum water-cement ratio: 0.45
    - e. Coarse aggregate: 3/4" nominal maximum.
    - f. Air content:  $6\% \pm 1\%$ . Do not allow air content of trowel-finished floors to exceed 3 percent.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- g. Corrosion-Inhibiting admixture: 3 gal/cu yd
- h. Crystalline waterproofing admixture: 3% by weight of the Portland cement content.
- 3. Hanna Class 3000 Concrete (Concrete fill for structures and corner fillets)
  - a. Compressive strength at 28 days: 3,000 psi
  - b. Minimum cement content: 517 lb/cu yd
  - c. Fly Ash: Type C
  - d. Maximum water-cement ratio: 0.50
  - e. Coarse aggregate: 3/4" nominal maximum.
  - f. Air content: Zero to 3% maximum.
  - g. Corrosion-Inhibiting admixture: 3 gal/cu yd
  - h. Crystalline waterproofing admixture: 3% by weight of the Portland cement content
- 2.06 Batching and Mixing
  - A. Batch and mix concrete in accordance with ASTM C94.
  - B. Mix concrete until there is a uniform distribution of materials.
  - C. Truck mixer: Minimum of 70 revolutions to produce a uniform mixture per ASTM C94.

# PART 3 - EXECUTION

### 3.01 Preparation

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
  - 1. Reference Section 03100 Concrete Formwork for class of surface finish required.
- C. Chamfer exterior corners and edges of permanently exposed concrete
- D. Install items to be embedded in concrete. Position accurately and secure against displacement.
  - 1. Do not embed aluminum items in concrete.
- E. Remove wood scraps, ice, snow, frost, standing water and debris from areas in which concrete will be placed.

- F. Before fresh concrete is placed against hardened concrete, retighten forms and suitably clean and moisten the surface of the hardened concrete for bond to the fresh concrete.
- G. Thoroughly moisten subgrade on which concrete is to be placed. Do not place concrete on frozen subgrade.
- H. Thoroughly clean conveying and handling equipment.

### 3.02 Surface Conditions

- A. Before concrete is placed, inspect the installed Work of this and other Sections and verify that all such Work is complete.
- B. Verify that concrete can be placed to the required lines and elevations with required cover for reinforcement.
- C. Prevent groupings of conduits, pipes, and sleeves in concrete that would significantly impair the strength of the concrete.
- D. Notify the Engineer when concrete placement is planned. Allow sufficient time for review of formwork, reinforcement and embedded items, and for any required corrective Work.

### 3.03 Placing

- A. Protect adjacent finish materials against spatter during concrete placement. Remove any spatter immediately using appropriate cleaning methods.
- B. Addition of water to the concrete during transport or at the site is strictly prohibited.
- C. Convey concrete by methods and equipment capable of supplying concrete from mixer to place of final deposit without segregation and such that detectable setting of concrete does not occur before adjacent concrete is placed.
- D. Use pumping equipment with sufficient design and pumping capacity to ensure a practically continuous flow of concrete at the point of discharge without segregation.
  - 1. Do not add water or alter the mix design in any way to facilitate pumping.
  - 2. Pumping concrete through aluminum pipe is prohibited.
- E. Limit vertical drop of concrete to 3 feet unless appropriate equipment is used to prevent segregation.
- F. Do not bear concrete conveying equipment on fresh concrete or reinforcement.
- G. After concrete placing has started, provide continuous operation until placement of the section is complete. Do not place a greater section at one time than can be properly finished.

- H. Deposit concrete as nearly as practicable to its final position to avoid segregation due to rehandling or flowing.
- I. Place concrete at a rate such that the concrete is at all times plastic and flows readily between reinforcement and into corners of forms without segregation.
- J. Place concrete in all slabs, mats, and beams for the full depth of the member at one time in such a way as to prevent a horizontal cold joint from occurring.
- K. Discharge all concrete into the structure within 90 minutes after batching per ASTM C94.
- L. Do not place concrete that has partially hardened, been retempered or contaminated by foreign materials.

### 3.04 Consolidation

- A. Thoroughly consolidate concrete with high frequency vibrators, working the concrete thoroughly around reinforcement and embedded items and into corners of forms.
- B. Use a sufficient number of vibrators, of appropriate size and type, to provide complete vibration throughout the concrete at the same rate it is placed. Provide at least one spare vibrator at the site for use in case of breakdown.
- C. Provide properly spaced vibration of duration sufficient to produce complete consolidation, but not long enough to cause segregation. Continue vibration until mortar just begins to puddle at the surface. Remove any excess free water that collects on the surface.
- D. Do not use vibrators to transport concrete within forms.
- E. Supplement internal vibration with manual consolidation methods and external form vibration as required to produce concrete free of voids, honeycomb and rough surfaces. Vibrate forms in such a way as to avoid form displacement.

### 3.05 Waterstops

- A. Place waterstops in all walls and floor slabs where earth or air is on one side and fluid on the other side.
- B. Place waterstops in all walls and floor slabs where it is possible to isolate one tank or structure from each other.
- C. Waterstops will not be placed in divider walls where fluid is on either side, except in the case where tank or structure can be isolated.

## 3.06 Equipment Mounting Pads

A. Install all floor mounted equipment on a minimum 6-inch concrete pad as shown on standard detail drawings.

### 3.07 Grout Fill

- A. Use grout fill for leveling courses, filling in base plates, and other similar applications as shown on the Drawings.
- B. Proportion the materials to produce a grout that is suitable for the intended applications.
- C. Use a bonding agent to bond the grout to the surface receiving the grout. Follow manufacturer's requirements.
  - 1. Clean surface receiving grout with the finish specified in this Section. Remove oil, grease, and similar substances. Remove unsound concrete, loose material, and foreign matter by scarifying or other mechanical means.
  - 2. Mix and place bonding agent according to bonding agent manufacturer's instructions.

## 3.08 Finishing

- A. Tolerances
  - 1. Finish concrete tolerances
    - a. Variation from plumb:  $\pm$  1/4 inch per 10 feet but not more than 1 inch.
    - b. Variation from level or indicated grade: <u>+</u> 1/4 inch per 10 feet but not more than 1/2 inch.
    - c. Variation from horizontal: <u>+</u> 1/4 inch per 10 feet but not more than 1/2 inch.
    - d. Variation in size and location of openings or sleeve: <u>+</u> 1/4inch.
    - e. Variation in steps
      - 1) Flight of stairs
        - a) Riser: <u>+</u> 1/8 inch
        - b) Treads: <u>+</u> 1/4 inch
      - 2) Consecutive steps
        - a) Riser: <u>+</u> 1/16 inch
        - b) Treads: <u>+</u> 1/8 inch
  - 2. Remediate work in areas of non-compliance at the Owner's request. Use a self-leveling underlayment concrete, or self-leveling polymer modified industrial topping, or as directed by the Engineer.
- B. Screeding
  - 1. Immediately after placing, strike off excess concrete with a straightedge to bring the top surface to proper grade, aligning it to the contours of screeds.
  - 2. Screed off edge forms, intermediate screed strips or pipe set accurately and firmly to the required elevations and contours for the finished surface.

- 3. Move straight-edge across the concrete surface with a sawing motion, advancing forward a short distance with each movement.
- 4. Maintain a surplus of concrete against the front face of the straight-edge to fill in low areas as the straightedge passes over the surface.
- 5. Complete screeding before any excess moisture or bleeding water is present on the surface.

# C. Bull Floating

- 1. Immediately after screeding, bull float the concrete surface, eliminating high and low spots, smoothing the surface and embedding the coarse aggregate.
- 2. Avoid overworking the concrete. Do not close up or seal the surface of the concrete.
- 3. Complete bull floating before any excess moisture or bleeding water is present on the surface.

# D. Floating

- 1. Begin floating operations when bleeding water has disappeared or been removed from the surface and when the surface has stiffened sufficiently to support the operation.
  - a. Do not use dry cement and sand to take up bleeding water.
- 2. Hand or power float the concrete surface, removing slight imperfections and producing a relatively even and true surface with a uniform, sandy texture prepared for final finishing.
- 3. Avoid overworking the concrete. Do not close up or seal the surface of the concrete.

# E. Final Finishing

- 1. Hard Trowel Finish
  - a. Immediately after floating, use power trowel for first trowelling to produce a smooth surface relatively free of defects.
  - b. For first trowelling, use hand trowelling in areas inaccessible to power trowelling.
  - c. Use hand trowel and heavy pressure for final trowelling after concrete has become hard enough to produce a ringing sound as the trowel is moved over the surface. Produce a smooth, hard, dense surface, uniform in texture and appearance and free of defects.
- 2. Broom Finish
  - a. Immediately after floating, draw a broom across the concrete surface transversely.
- F. Rough Form Finish
  - 1. After being cleaned and thoroughly dampened, fill tie holes solid with patching mortar matching the color of the surrounding concrete.
  - 2. Patch defective areas in accordance with Article 3.09.

- 3. Completely remove all fins and projections. Fill all voids on exposed vertical walls and ceilings which are 1/8 inch or greater in size.
- G. Smooth Form Finish (sack-rubbed finish)
  - 1. After being cleaned and thoroughly dampened, fill tie holes solid with patching mortar matching the color of the surrounding concrete.
  - 2. Patch defective areas in accordance with Article 3.09.
  - 3. Completely remove all fins and projections. Fill all voids on exposed vertical walls and ceilings which are 1/8 inch or greater in size.
  - 4. Apply grout clean-down treatment to surface areas.
    - a. Saturate surface thoroughly with water.
    - b. Uniformly apply grout consisting of 1 part cement, 1<sup>1</sup>/<sub>2</sub> to 2 parts of fine sand, and water to completely fill all voids.
    - c. Vigorously float the surface immediately after applying grout in a general swirl pattern. Remove remaining excess grout.
    - d. Remaining grout will lose some plasticity but not damp appearance.
    - e. Rub surface with clean, dry burlap to remove all excess grout.
    - f. Dry surface appearance will have a swirl pattern and uniform color and texture.
  - 5. Remove all slobbers and fins at corners and edges left from rubbing to provide clean, sharp edges.
- H. Smooth Rubbed Finish
  - 1. Following smooth form finish described above, wet the concrete surface and rub with carborundum brick or other abrasive until uniform color and texture are produced.
  - 2. Do not use cement grout other than the cement paste drawn from the concrete by the rubbing process.
  - 3. Provide sample of smooth rubbed area on first exposed concrete wall pour. Minimum sample area is 25 square feet. Provide sample finish acceptable to the Engineer to serve as the level of quality for all remaining areas requiring a smooth rubbed finish for the remainder of the project.

I. Finish concrete in accordance with the following schedule:

Surface	<u>Finish</u>
All exposed vertical surfaces to a point 12 inches below grade or minimum water level (including vertical faces of elevated walkways and slabs)	Smooth form finish (Formed Finish Class C)
Floor slabs of tanks and channel floors which will not receive sloped grout	Smooth floated finish
Floor slab of tanks and channel floors which will receive sloped grout	Broom finish
Interior floor slabs	Hard trowel finish
Sloped grout fill over tank floor slabs and channel floors	Screeded with hard trowel finish
Exterior horizontal traveled surfaces (sidewalks, aprons, ramps, stoops, stairs, platforms, and elevated walkways)	Broom finish
Concrete ceilings and underside of elevated walks and slabs	Rough form finish (Formed Finish Class C)

# 3.09 Repair of Defective Areas

- A. Remove honeycombed and other defective concrete, exposing sound concrete. Cut and chip edges straight and perpendicular to the surface or slightly undercut to a depth of1/2 inch. Feather edges are not permitted.
- B. Dampen areas to be patched and surrounding areas. Patch with patching material according to manufacturer's recommendations. Submit data on patching material to engineer for review prior to starting repair.
- C. Apply patching material to the surface after surface water has evaporated from the area to be patched.
- D. Apply curing to the patched surface as soon as possible and maintain for a minimum of 2 days.

# 3.10 Curing

A. Maintain concrete in a moist condition for at least 5 days at temperatures above 70°F and at least 7 days at temperatures between 50°F and 70°F.

- B. Curing Slabs: Curing compounds or moisture retention covers.
  - 1. Apply curing compounds to the concrete surface, immediately after final finishing of the concrete, in accordance with manufacturer's instructions to comply with ASTM C308.
    - a. Curing compound must be removed by mechanical abrasion if not compatible with the floor finish.
  - 2. Place moisture retention covers on the concrete surface immediately after final finishing of the concrete. Lap edges 6 inches and seal, creating a moisture barrier that must remain intact for the duration of the curing period.
- C. Curing Formed Surfaces:
  - 1. Formed surfaces may be cured by leaving forms in place. Keep forms moist by sprinkling during hot, dry weather.
  - 2. Apply curing compound to walls and columns when forms are removed before the end of the curing period.

## 3.11 Joints

- A. Construction Joints
  - 1. Locate construction joints so as not to impair the strength of the structure.
  - 2. With the exception of slabs on grade, continue reinforcement across construction joints.
  - 3. Thoroughly clean the concrete surface at construction joints and remove laitance before placing adjoining concrete.
  - 4. Beams, girders or slabs supported by columns or walls shall not be cast until the concrete in vertical support members is no longer plastic.
  - 5. In slabs on grade with control joints, locate construction joints at control joint locations.
- B. Slab on Grade Contraction Joints
  - 1. Hand-Tooled Control Joints: Tool joints with hand groovers in straight lines to avoid unsightly joints. Locate joints as shown on the structural drawings or locate as necessary for the specific location to appropriately control cracking.

### 3.12 Hot Weather Concreting

- A. Follow these specifications and ACI 305 when the rate of evaporation of surface moisture from the concrete exceeds 0.18 lb/sq ft/hr (Figure 2.1.5, ACI 305).
- B. Control concrete setting time with the use of retarding admixtures or waterreducing & retarding admixtures as required to facilitate placing and finishing operations.
- C. Before placing concrete, spray the subgrade, forms and reinforcement with water to keep them cool and to prevent absorption of water from the concrete.

- D. Transport, place and finish concrete as quickly as practicable. Plan concrete delivery, placing techniques and consolidation methods to avoid cold joints.
- E. Maximum temperature of concrete during placing: 90°F.
- F. Apply evaporation retardant to the surface of the fresh concrete after screeding and as needed during finishing.
- G. Take additional precautions as necessary to prevent plastic shrinkage cracking.
- H. Start curing the concrete immediately after finishing operations have been completed.
- 3.13 Cold Weather Concreting
  - A. Follow these specifications and ACI 306 when the average daily temperature (average of the highest and lowest temperature during the period from midnight to midnight) is less than 40°F.
  - B. Control concrete setting time with the use of accelerating admixtures and waterreducing accelerating admixtures as required to facilitate placing and finishing operations.
  - C. Do not use calcium chloride as an accelerating admixture.
  - D. Temperature of concrete during placing: 55°F to 75°F.
  - E. Maintain the temperature at the concrete surface between 55°F and 75°F until the concrete reaches 70 percent of its specified compressive strength by providing heated enclosures or insulated blankets.
    - 1. Construct weathertight enclosures, allowing the heated air to circulate around the outer edges of the concrete.
    - 2. Provide a sufficient number of heaters to assure an even temperature within the enclosure.
    - 3. Use indirect-fired heaters vented to the exterior where heat is supplied to the top of fresh concrete to prevent dusting due to carbonation.
    - 4. Add moisture to the heated air as required to maintain a minimum relative humidity of 40 percent within the enclosure. Do not allow any concrete surface to become dry during the protection period.
    - 5. Maintain enclosures for 24 hours after heating has been discontinued to allow the concrete to cool gradually.
    - 6. Lap insulating materials and cover the edges and corners of the concrete to provide complete and adequate protection.
    - 7. Wrap columns and walls with insulated blankets.
    - 8. Monitor the temperature of the concrete surface regularly with suitable thermometers throughout the protection period.

- F. Provide insulation or temporary backfill to protect all earth supported concrete from damage due to frost heaving.
- 3.14 Protection
  - A. Protect finished concrete surfaces from damage by construction equipment, materials or methods and by rain or running water.
  - B. Do not load any concrete member in such a way as to overstress the concrete.
- 3.15 Field Quality Control
  - A. Strength Tests
    - 1. Take samples of concrete for strength tests in accordance with ASTM C172 during the progress of the work.
    - 2. Take samples from the discharge of the concrete pump piping when pumping is used for concrete placement.
    - 3. Make and cure a minimum of 4 cylinders in accordance with ASTM C31 for each of the following:
      - a. Each 50 cubic yards of concrete.
      - b. Each 3000 square feet of surface area for slabs and walls.
      - c. Each class of concrete placed in a day's work.
    - 4. Test each group of 4 cylinders in accordance with ASTM C39 as follows:
      - a. Two field cured cylinders to be tested at 7 days or just before anticipated time of form removal.
      - b. Two laboratory cured cylinders to be tested at 28 days.
    - 5. A strength test is the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days.
    - 6. The strength level of an individual class of concrete will be considered satisfactory if each strength test equals or exceeds the specified compressive strength.
    - Conduct core testing in accordance with ASTM C42, impactometer testing or load testing on the area of concrete in question as required by the Engineer if the strength level of an individual class of concrete is found to be unsatisfactory (per Paragraph 3.15 B5)
    - 8. Corrective measures will be required to ensure structural adequacy if such additional testing does not produce acceptable results. Make appropriate adjustments to the concrete mix designs as required.
  - B. Slump Tests
    - 1. Make one slump test in accordance with ASTM C143 with each group of 4 cylinders.
    - 2. Make the slump test at the point of discharge when concrete is pumped.
    - 3. Keep a slump cone available at the site for additional testing as required.

- C. Air Content Tests: Make one air content test in accordance with ASTM C173 or ASTM C231 with each group of 4 cylinders for air-entrained concrete mixes at point of discharge.
- D. Concrete temperature: Test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above and each time a set of compression test specimens is made.
- E. Air-Dry Density Tests: For structural lightweight concrete, make one air-dry density test in accordance with ASTM C567 for each group of 4 cylinders.
- F. Yield Tests: Make one yield test in accordance with ASTM C-138 for each group of 4 cylinders.
- G. Rejection of Concrete
  - 1. If measured slump or air content falls outside limits specified, make test check immediately on another portion of the sample. In the event of second failure, concrete is considered to have failed to meet requirements of Specifications and will be rejected.
- H. Field Quality Control Test Reports
  - 1. Include the following information in test reports:
    - a. Project identification and portion of structure represented
    - b. Concrete mix class and specified compressive strength requirements
    - c. Weather conditions and air temperature
    - d. Concrete temperature, slump and air content test results
    - e. Dates of placing and testing
    - f. Method of curing (field or laboratory)
    - g. Strength test results
    - h. Technician's name, certification number with expiration date

-END-

# SECTION 03310 - SITE WORK CONCRETE

# PART 1 - GENERAL

1.01 Summary

Provide all labor, tools and equipment necessary to construct site work concrete.

- 1.02 Related Sections:
  - A. Section 03100 Concrete Formwork

## 1.03 References

- A. American Society for Testing and Materials Standards (ASTM).
- B. American Concrete Institute "Building Code Requirements for Reinforced Concrete" (ACI 318 Latest Edition).

### 1.04 Quality Control

- A. Allowable Tolerances
  - 1. ±1/4 inch in 10 ft. for flat surfaces.
  - 2.  $\pm 1/4$  inch maximum deviation from required elevations.
- B. Tests and Products
  - 1. Compression Tests: by an approved testing laboratory, paid for by Contractor, approved by Engineer.
  - 2. Cement: only one brand by an American manufacturer.

### 1.05 Submittals

- A. Submit concrete compression test results to Engineer.
- B. Submit concrete delivery tickets in accordance with ASTM C94 for each batch of ready mixed concrete delivered, indicating total water content on each ticket.
- 1.06 Product Delivery, Storage and Handling
  - A. Store and handle material to prevent deterioration or intrusion of foreign matter.
  - B. Immediately and completely remove deteriorated or damaged material from the work and replace with new material.
  - C. Deliver ready mix concrete in accordance with ASTM C-94.

SITE WORK CONCRETE

## 1.07 Alternatives

A. Construction joints may be substituted for control or contraction joints at indicated joint locations in slabs on grade and other locations approved by the Engineer.

# PART 2 - PRODUCTS

- 2.01 Materials
  - A. Portland Cement: ASTM C-150.
  - B. Air-entrained Portland Cement: ASTM C-175.
  - C. Air-entrained Agent: ASTM C-260.
  - D. Fine Aggregate
    - 1. ASTM C-33.
    - 2. Natural sand composed of clean, sound, hard, durable particles.
  - E. Coarse Aggregate
    - 1. ASTM C-33.
    - 2. Clean, hard, durable, screened, crushed stone or gravel.
    - 3. #5, graded from a maximum of 1 1/2 inches for footing.
    - 4. *#*7, graded from a maximum of 1 inch for slabs.
  - F. Mixing Water: free from oil, acid, vegetable matter, alkalis and other impurities and clean, suitable for drinking.
  - G. Admixture other than air-entraining agent: Not to be used unless written approval is obtained from Engineer.
  - H. Joint Filler
    - 1. Premolded, resilient, compressible, pre-expanded, non-extruding and non-staining.
    - 2. 3/8 inch thick unless otherwise indicated.
    - 3. Polyethylene foam, polyurethane foam, neoprene sponge or polyvinyl chloride sponge.
    - 4. Closed-cell type with 25% compressibility when subject to 10 to 15 psi distributed pressure.

- 2.02 Approved Concrete Curing and Sealing Compound for Exterior.
  - A. ASTM C-309.
  - B. White pigmented, wax resin base membrane type.
  - C. Manufactured by: Grace "Horncue 40W", Toch Bros. "Torkure", Sonneborn "Hydrocide Curing Compound" or approved equal.
- 2.03 Concrete Design Criteria
  - A. Minimum ultimate compressive strength: 4,000 psi at 28 days, unless otherwise noted.
  - B. Maximum slump shall be 3 inches.
- 2.04 Concrete Mix
  - A. ACI 318-83 and ASTM C-94.
  - B. Proportioned by water-cement ratio method based on requirements for a plastic and workable mix with not less than 6 bags of cement per cu. yd. and not more than 6 gallons of water per 94 lb. bag of cement.
  - C. Ready mixed or job mixed at Contractor's option.
  - D. Air entrained with 5% to 7% by volume for concrete exposed to weather with not more than 5 gallons of water per bag of cement.

### PART 3 - EXECUTION

- 3.01 Inspection
  - A. Inspect piping, conduits, drains and similar items for proper placement and condition prior to placing concrete.
  - B. Do not place concrete until bearing surfaces have been inspected, approved and authorization to proceed is received from Engineer.
- 3.02 Concrete Placement: ACI 301-66 and ASTM C-94.
  - A. Place in final position as soon as possible after mixing in an approved manner to prevent segregation. Handle rapidly from mixer to forms. Spade, work by hand, and vibrate to assure close contact with forms and reinforcement.
  - B. Place on clean, damp surfaces, free of water. Place in final position within 90 minutes after mixing water with dry material. No water shall be added to the concrete after initial mixing. Do not use concrete which has been retempered, has partially hardened or been contaminated by foreign material.

- C. Remove unsuitable materials from the project site immediately. Do not deposit concrete when temperature of materials is below 50°F or above 85°F. Form concrete slabs to thicknesses shown on Drawings but not less than 4 inches and strike off at proper levels to receive finish.
- D. Winter Concreting
  - 1. Shall meet the requirements of ACI 306.
  - 2. Provide for maintaining concrete at a temperature not lower than 70°F. for 3 days or 50°F. for 5 days after placing.
  - 3. Approved by the Engineer for methods of heating materials and protecting concrete. The use of salts, chemicals or other foreign materials shall not be mixed with concrete for the purpose of preventing freezing.
- E. Hot Weather Concreting
  - 1. Shall meet the requirements of ACI 305.
  - 2. Do not exceed 90°F maximum concrete temperature.
  - 3. Protect concrete from rapid moisture evaporation by covering with polyethylene sheeting or spraying.
  - 4. Provide wind breaks as necessary.
- F. Install perimeter insulation before placing concrete for slab.
- G. Form concrete slabs to thicknesses shown on Drawings but not less than 4 inches and strike off at proper levels to receive finish. Screed and tamp to eliminate voids in surfaces.
- H. Form floor slabs to pitch evenly to drains. Form exterior slabs to drain away from building.
- I. Inserts and Fastening Devices of Other Work
  - 1. Provide for installation of inserts, anchors, dowels, bolts, thimbles and other fastening devices required for attachment of other work.
  - 2. Properly locate and secure in position before placing concrete.
- J. Joints
  - 1. Construct all joints indicated on Drawings.
  - 2. Control Joints
    - a. Depth: 1/4 thickness of slab.
    - b. Width: 3/16 inch maximum.
    - c. Walks and ramps: 5 ft. on center.
    - d. After placing concrete make interior concrete joints by inserting plastic control joint former or sawing.
    - e. Sawing of joints shall start not less than 8 hours after and be completed not more than 30 hours after placing concrete.
    - f. Flush joints with water immediately after sawing to remove residue.
    - g. Fill joints with sealant.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 SITE WORK CONCRETE

- 3. Expansion Joints
  - a. Install premolded joint filler where concrete slabs on grade abut structure and elsewhere indicated.
  - b. Install premolded joint filler full depth of slab except for joints permanently exposed, allow 3/8 inch at top and fill with joint sealant.
- 4. Construction Joints
  - a. Provide keyed joints between cast sections of slabs on grade.

### 3.03 Curing and Protection

- A. Do not use dry sand or cement to take up excess free surface water.
- B. Cure concrete immediately after placing, finishing, and free water has disappeared.
- C. Protect concrete from moisture loss by water curing or application of membrane curing compound.
  - 1. Water Curing: By sprinkling or ponding to keep concrete continuously wet or by moisture retention covers.
  - 2. Compound Curing: By pressure spraying membrane curing as recommended by manufacturer in sufficient thickness to form an effective water seal.
- D. Cure concrete minimum of 7 days after placement.
- E. Protect fresh concrete from heavy rain, mechanical injury and injurious action of sun.
- F. Provide protection and cover concrete until project is completed to prevent construction work damage.
- 3.04 Field Quality Control Tests
  - A. Compression Tests
    - 1. Provide for test purposes one set of three cylinders taken for each day's concrete placement.
    - 2. Make test cylinders and cure in accordance with ASTM C-31 and C-39.
    - Test one cylinder 7 days, and one cylinder 28 days after concrete is placed. If the cylinders fail to meet the compression strength specified, the third cylinder shall be tested. Should all cylinders tested fail to meet the compression strength specified, all concrete in place as represented by the test cylinders shall be removed.
    - 4. Contractor shall be responsible for payment of tests.

- B. Slump Tests
  - 1. Furnish slump cone and rod for use by the Inspector when concrete is being placed. Make tests at the place of deposit and in accordance with ASTM C-143.
  - 2. Make tests periodically where cylinders are made and as often in the opinion of the Engineer when a change in consistency of the concrete mix is noted.
- C. Air Content Tests: Make one air content test in accordance with ASTM C-173 or ASTM C-231 with each group of 4 cylinders for air-entrained concrete mixes at point of discharge.
- D. Concrete temperature: Test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above and each time a set of compression test specimens is made.
- E. Rejection of Concrete: Any concrete that does not meet the specified requirements for air-entrainment, concrete temperature, or slump shall not be placed until corrective measures have been taken, and the concrete has been re-tested to indicate compliance.
- 3.05 Concrete Finishes
  - A. Exterior concrete slabs: ACI 301 with a light broom finish to texture approved by Engineer, edges and joints tooled, and slabs scored.

-END-
# SECTION 03381 - UNBONDED POST-TENSIONED CONCRETE

PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Post-tensioning tendons and accessories, including pocket formers, bar chairs, slab bolsters, and nonprestressed reinforcement required for installing post-tensioning tendons, including the following:
    - a. Support bars.
    - b. Backup bars and hairpins at anchorages.
    - c. Hairpins at locations of horizontal curvature.
    - d. Supplemental reinforcement at blockouts.
  - 2. Post-tensioning operations, including stressing, recording tendon elongations and gage pressures, and finishing tendons.
- B. Related Requirements:
  - 1. Section 03100 "Concrete Formwork.
  - 2. Section 03200 "Concrete Reinforcement
  - 3. Section 03300 "Cast-in-Place Concrete" for concrete.

#### 1.3 DEFINITIONS

- A. Strand Tail: Excess strand length extending past the anchorage device.
- B. Stressing Pocket: Void formed by pocket former at stressing-end anchorage that provides required cover over wedges and strand tail.
- C. Wedge Cavity: Cone-shaped hole in anchorage device designed to hold the wedges that anchor the strand.

### 1.4 COORDINATION

- A. Attachments and Penetrations:
  - 1. Drilled anchors, power-driven fasteners, and core drilling for sleeves or other penetrations are not allowed unless authorized in writing by Engineer.
  - 2. Form penetrations within 18 inches of an anchorage with ASTM A 53, Schedule 40 steel pipe.

# 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review procedures related to installation and stressing of post-tensioning tendons, including, but not limited to, the following:
    - a. Construction schedule and availability of materials, personnel, and equipment needed to make progress and avoid delays.
    - b. Storage of post-tensioning materials on-site.
    - c. Structural load limitations.
    - d. Coordination of post-tensioning installation drawings and nonprestressed reinforcing steel placing drawings.
    - e. Horizontal and vertical tolerances on tendons and nonprestressed reinforcement placement.
    - f. Marking and measuring of elongations.
    - g. Submittal of stressing records and requirements for tendon finishing.
    - h. Removal of formwork.

# 1.6 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Post-tensioning coating.
  - 2. Tendon sheathing.
  - 3. Anchorage devices.
  - 4. Tendon couplers.
  - 5. Bar and tendon supports.
  - 6. Pocket formers.
  - 7. Sheathing repair tape.
  - 8. Stressing-pocket patching material.
  - 9. Encapsulation system.
- B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing tendon layout, installation procedures, and the following:
  - 1. Installation drawings, including plans, elevations, sections, and details.
  - 2. Numbers, arrangement, and designation of post-tensioning tendons.

- 3. Tendon profiles and method of tendon support, including chair heights and locations. Show tendon profiles at sufficient scale to clearly indicate all support points with their associated heights.
- 4. Details for horizontal curvature around openings and at anchorages.
- 5. Locations of anchorages and blockouts required for stressing.
- 6. Anchorage details, including bundled tendon flaring.
- 7. Tendon clearances around slab openings and penetrations.
- 8. Construction joint locations and pour sequence.
- 9. Details for corners and other locations where tendon layouts may conflict with one another or with nonprestressed reinforcing steel.
- 10. Locations of nonprestressed reinforcement required for installing post-tensioning tendons, including, but not limited to, the following:
  - a. Support bars.
  - b. Backup bars and hairpins at anchorages.
  - c. Hairpins at locations of horizontal curvature.
  - d. Supplemental reinforcement at blockouts.
- 11. Stressing procedures and jacking force to result in final effective forces used in determining number of tendons required.
- 12. Calculated elongations for each tendon.
- C. Samples: For the following products:
  - 1. Anchorages with 24 inches of coated, sheathed strand.
  - 2. Couplers with 24 inches of coated, sheathed strand.
  - 3. Components of the encapsulation system, unassembled and clearly identified.

# 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include resume of individual supervising installation and stressing of post-tensioning tendons.
- B. Evaluation Reports: For each type of anchorage device and coupler, from ICC-ES:
- C. Product Certificates: For each type of encapsulation system.
- D. Mill Test Reports: Certified mill test reports for prestressing strand used on Project, indicating that strand is low relaxation and including the following:
  - 1. Coil numbers or identification.
  - 2. Breaking load.
  - 3. Load at 1 percent extension.
  - 4. Elongation at failure.
  - 5. Modulus of elasticity.
  - 6. Diameter and net area of strand.
- E. Field quality-control reports.

- F. Procedures Statement: Procedures for cutting excess strand tail and patching stressing pocket.
- G. Stressing Jack Calibration: Calibration certificates for jacks and gages to be used on Project. Calibrate each jack-and-gage set as a pair.
- H. Stressing Records: Submit the same day as stressing operations.

### 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Fabricating plant certified by PTI according to procedures set forth in PTI's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."
- B. Installer Qualifications: A qualified installer whose full-time Project superintendent has successfully completed PTI's Level 1 Field Fundamentals course or has equivalent verifiable experience and knowledge acceptable to Engineer.
  - 1. Superintendent shall be trained by post-tensioning supplier in the operation of stressing equipment to be used on Project.
- C. Owner's Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
  - 1. Owner's Testing Agency Inspector: Personnel performing field inspections and measuring elongations shall have successfully completed PTI's Level 1 Field Fundamentals course or shall have equivalent verifiable experience and knowledge acceptable to Engineer.
- 1.9 DELIVERY, STORAGE, AND HANDLING
  - A. Deliver, store, and handle post-tensioning materials according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

# PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain post-tensioning materials and equipment from single source.
  - 1. Stressing jacks not provided by post-tensioning supplier must be calibrated and approved for use on Project by post-tensioning supplier.

# 2.2 PRESTRESSING TENDONS

- A. ACI Publications: Comply with ACI 423.7 unless otherwise indicated.
- B. Prestressing Strand: ASTM A 416/A 416M, Grade 270, uncoated, seven-wire, low-relaxation, 0.5-inch- diameter strand.
- C. Post-Tensioning Coating: Compound with friction-reducing, moisture-displacing, and corrosion-inhibiting properties; chemically stable and nonreactive with prestressing strand, nonprestressed reinforcement, sheathing material, and concrete.
  - 1. Minimum Coating Weight: 2.5 lb for 0.5-inch- diameter strand per 100 feet of strand.
  - 2. Completely fill annular space between strand and sheathing over entire tendon length with post-tensioning coating.
- D. Tendon Sheathing:
  - 1. Material: Polyethylene or polypropylene with a minimum density of 0.034 lb/cu. in..
  - 2. Minimum Thickness: 0.050 inch.
  - 3. Continuous over length of tendon to provide watertight encapsulation of prestressing strand.
- E. Anchorage and Coupler Assemblies: Assemblies of prestressing strand, wedges, and anchor or coupler complying with static and fatigue testing requirements and capable of developing 95 percent of actual breaking strength of strand.

#### 2.3 PATCHING MATERIAL

A. One-component, polymer-modified, premixed patching material containing selected silica aggregates and portland cement, suitable for vertical and overhead applications. Do not use material containing chlorides or other chemicals known to be deleterious to prestressing steel or material that is reactive with prestressing steel, anchorage device material, or concrete.

# PART 3 - EXECUTION

#### 3.1 FORMWORK

- A. Design formwork to support load redistribution that may occur during stressing operation. Ensure that formwork does not restrain elastic shortening, camber, or deflection resulting from application of prestressing force.
- B. Do not remove forms supporting post-tensioned elements until tendons have been fully stressed and elongations have been approved by Engineer.

C. Do not place concrete in supported floors until tendons on supporting floors have been stressed and elongations have been approved by Engineer.

## 3.2 NONPRESTRESSED STEEL REINFORCEMENT PLACEMENT

A. Placement of nonprestressed steel reinforcement is specified in Section 033000 "Castin-Place Concrete." Coordinate placement of nonprestressed steel reinforcement with installation of post-tensioning tendons.

### 3.3 TENDON INSTALLATION

- A. Install tendons according to installation drawings and procedures stated in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
  - 1. Tolerances: Comply with tolerances in ACI 423.7 for beams and slabs.
- B. Tendon Supports: Provide continuous slab bolsters or bars supported on individual high chairs spaced at a maximum of 42 inches o.c. to ensure tendons remain in their designated positions during construction operations and concrete placement.
  - 1. Support tendons as required to provide profiles shown on installation drawings. Position supports at high and low points and at intervals not exceeding 48 inches. Ensure that tendon profiles between high and low points are smooth parabolic curves.
  - 2. Attach tendons to supporting chairs and reinforcement without damaging tendon sheathing.
  - 3. Support slab tendons independent of beam reinforcement.
- C. Maintain tendon profile within maximum allowable deviations from design profile as follows:
  - 1. 1/4 inch for member depth less than or equal to 8 inches.
  - 2. 3/8 inch for member depth greater than 8 inches and less than or equal to 24 inches.
  - 3. 1/2 inch for member depth greater than 24 inches.
- D. Maintain minimum radius of curvature of 480-strand diameters for lateral deviations to avoid openings, ducts, and embedded items. Maintain a minimum of 2 inches of separation between tendons at locations of curvature.
- E. Limit tendon bundles to five tendons. Do not twist or entwine tendons within a bundle. Maintain a minimum distance of 12 inches between center of adjacent bundles.
- F. If tendon locations conflict with nonprestressed reinforcement or embedded items, tendon placement governs. Obtain Engineer's approval before relocating tendons or tendon anchorages that interfere with one another.

- G. Deviations in horizontal spacing and location of slab tendons are permitted when required to avoid openings and inserts.
- H. Installation of Anchorages:
  - 1. Place anchorages at locations shown on approved installation drawings.
  - 2. Do not switch fixed- and stressing-end anchorage locations.
  - 3. Attach pocket formers, intermediate anchorages, and stressing-end anchorages securely to bulkhead forms. Install stressing-end and intermediate anchorages perpendicular to tendon axis.
  - 4. Install tendons straight, without vertical or horizontal curvature, for a minimum of 12 inches behind stressing-end and intermediate anchorages.
  - 5. Embed intermediate anchorage devices at construction joints in first concrete placed at joint.
  - 6. Minimum splice length in reinforcing bars at anchorages is 24 inches. Stagger splices a minimum of 60 inches.
  - 7. Place fixed-end anchorages in formwork at locations shown on installation drawings. Support anchorages firmly to avoid movement during concrete placement.
  - 8. Remove loose encapsulation caps on fixed-end anchorages, refill with posttensioning coating, and re-attach encapsulation caps to achieve a watertight enclosure.
- I. Maintain minimum concrete cover as follows:
  - 1. From Exterior Edge of Concrete to Wedge Cavity: 2 inches.
  - 2. From Exterior Edge of Concrete to Wedge-Cavity Cap: 1 inch.
  - 3. Top, Bottom, and Edge Cover for Anchorages: 1-1/2 inches.
- J. Maintain minimum clearance of 6 inches between tendons and openings.
- K. Prior to concrete placement, mark tendon locations on formwork with spray paint.
- L. Do not install sleeves within 36 inches of anchorages after tendon layout has been inspected.
- M. Do not install conduit, pipe, or embeds requiring movement of tendons after tendon layout has been inspected.
- N. Do not use couplers unless location has been approved by Engineer.

# 3.4 SHEATHING INSPECTION AND REPAIR

- A. Inspect sheathing for damage after installing tendons. Repair damaged areas by restoring post-tensioning coating and repairing or replacing tendon sheathing.
  - 1. Ensure that sheathing is watertight and there are no air voids.
  - 2. Follow tape repair procedures in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

STORMWATER & DEICING CAPACITY PROJECTS UNBONDED POST-TENSIONED CONCRETE I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 SECTION NO. 03381 - 7 B. Immediately remove and replace tendons that have damaged strand.

## 3.5 CONCRETE PLACEMENT

- A. Do not place concrete until placement of tendons and nonprestressed-steel reinforcement has been inspected by special inspector.
- B. Provide Engineer and special inspector a minimum of 48 hours' notice before concrete placement.
- C. Ensure compaction of concrete around anchorages.
- D. Ensure that position of tendons and nonprestressed-steel reinforcement do not change during concrete placement. Reposition tendons and nonprestressed-steel reinforcement moved during concrete placement to original location.
- E. Ensure that method of concrete placement does not damage tendon sheathing. Do not support pump lines, chutes, or other concrete-placing equipment on tendons.

### 3.6 TENDON STRESSING

- A. Calibrate stressing jacks and gages at start of project and at least every six months thereafter. Keep copies of calibration certificates for each jack-and-gage pair on Project site that are available for inspection. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.
- B. Stress tendons only under supervision of a qualified post-tensioning superintendent.
- C. Do not begin stressing operations until concrete compressive strength has reached 3000 psi as indicated by tests of field-cured cylinders.
- D. Complete stressing within 96 hours of concrete placement.
- E. If concrete has not reached required compressive strength, obtain Engineer's approval to partially stress tendons and delay final stressing until concrete has reached required strength.
- F. If detensioning and restressing of tendon is required, discard wedges used in original stressing and provide new wedges.
- G. Mark and measure elongations according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons." Measure elongations to closest 1/8 inch.
- H. Submit stressing records within one day of completion of stressing. If discrepancies between measured and calculated elongations exceed plus or minus 7 percent, resolve these discrepancies to satisfaction of Engineer.

- I. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and calculated and measured elongations agree within 7 percent.
- J. If measured elongations deviate from calculated elongations by more than 7 percent, perform additional testing, restressing, strengthening, or replacing of affected elements unless otherwise approved by Engineer.
- K. Stressing Records: Owner's Testing Agency shall record the following information during stressing operations:
  - 1. Name of Project.
  - 2. Date of approved installation drawings used for installation and stressing.
  - 3. Floor number and concrete placement area.
  - 4. Date of stressing operation.
  - 5. Weather conditions, including temperature and rainfall.
  - 6. Name and signature of inspector.
  - 7. Name of individual in charge of stressing operation.
  - 8. Serial or identification numbers of jack and gage.
  - 9. Date of jack-and-gage calibration certificates.
  - 10. Gage pressure to achieve required stressing force according to supplied calibration chart.
  - 11. Tendon identification mark.
  - 12. Calculated tendon elongation.
  - 13. Actual tendon elongation.
  - 14. Actual gage pressure.

# 3.7 TENDON FINISHING

- A. Do not cut strand tails or cover anchorages until stressing records have been reviewed and approved by Engineer.
- B. Cut strand tails as soon as possible after approval of elongations.
- C. Cut strand tail between 1/2 and 3/4 inch from wedges. Do not damage tendon or concrete during removal of strand tail. Acceptable methods of cutting strand tail include the following:
  - 1. Oxyacetylene flame.
  - 2. Abrasive wheel.
  - 3. Hydraulic shears.
  - 4. Plasma cutting.
- D. Install encapsulation caps and sleeves on intermediate anchorages within one day of stressing.
- E. Cut strand tails and install encapsulation caps on stressing-end anchorages within one day of Engineer's acceptance of elongations.

F. Patch stressing pockets within one day of cutting strand tail. Clean inside surface of stressing pocket to remove laitance or post-tensioning coating before installing patching material. Finish patching material flush with adjacent concrete.

# 3.8 FIELD QUALITY CONTROL

- A. Engage a qualified testing agency/special inspector to perform tests and inspections.
  - 1. Before concrete placement, special inspector or testing agency will inspect the following for compliance with post-tensioning installation drawings and the Contract Documents:
    - a. Location and number of tendons.
    - b. Tendon profiles and cover.
    - c. Installation of backup bars, hairpins, and other nonprestressed reinforcement shown on post-tensioning installation drawings.
    - d. Installation of pocket formers and anchorage devices.
    - e. Repair of damaged sheathing.
    - f. Connections between sheathing and anchorage devices.
  - 2. Special inspector will record tendon elongations during stressing.
  - 3. Special inspector will immediately report deviations from the Contract Documents to Engineer.
- B. Prepare test and inspection reports.

#### 3.9 PROTECTION

- A. Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade components.
- B. Protect exposed components within one workday of their exposure during installation.
- C. Prevent water from entering tendons during installation and stressing.
- D. Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

#### 3.10 REPAIRS

- A. Submit repair procedure to Engineer for evaluation and approval.
- B. Do not proceed with repairs requiring removal of concrete unless authorized in writing by Engineer.

-END-

STORMWATER & DEICING CAPACITY PROJECTS UN I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

# SECTION 03410 - PRECAST STRUCTURAL CONCRETE

### PART 1 - GENERAL

#### 1.01 Summary

- A. Section Includes:
  - 1. Precast structural concrete.
  - 2. Precast structural concrete with commercial architectural finish.
- B. Related Sections:
  - 1. Section 03300 "Cast-in-Place Concrete" for concrete topping and placing connection anchors in concrete.
  - 2. Section 05120 "Structural Steel" for furnishing and installing connections attached to structural-steel framing.
  - 3. Section 05500 "Metal Fabrications" for kickers and other miscellaneous steel shapes.
- 1.02 Definition
  - A. Design Reference Sample: Sample of approved precast structural concrete color, finish, and texture, preapproved by Architect.
- 1.03 Performance Requirements
  - A. Delegated Design: Design precast structural concrete, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
  - B. Structural Performance: Precast structural concrete units and connections shall withstand design loads as required by code IBC 2012 ASCE 7.
  - C. Structural Performance: Provide precast structural concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
    - 1. Dead Loads.
    - 2. Concrete Topping Load.
    - 3. Live Loads.
    - 4. Roof Loads.
    - 5. Snow Loads.
    - 6. Seismic Loads.
    - 7. Wind Loads.
    - 8. Design precast structural concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of ACI 318 (ACI 318M).

- a. Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes.
- 9. Fire-Resistance Rating: Select material and minimum thicknesses to provide indicated fire rating.

#### 1.04 Action Submittals

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.
- C. Shop Drawings: Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement. Detail fabrication and installation of precast structural concrete units.
  - 1. Indicate joints, reveals, and extent and location of each surface finish.
  - 2. Indicate separate face and backup mixture locations and thicknesses.
  - 3. Indicate welded connections by AWS standard symbols. Show size, length, and type of each weld.
  - 4. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
  - 5. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
  - 6. Include and locate openings larger than by 10 inches (250 mm).
  - 7. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
  - 8. Indicate relationship of precast structural concrete units to adjacent materials.
  - 9. Indicate locations and details of brick units, including corner units and special shapes, and joint treatment.
  - 10. Indicate locations and details of stone facings, anchors, and joint widths.
  - 11. Indicate estimated camber for precast floor slabs with concrete toppings.
  - 12. Indicate shim sizes and grouting sequence.
  - 13. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
- D. Samples:
  - 1. For each type of finish indicated on exposed surfaces of precast structural concrete units with architectural finish, in sets of 3, illustrating full range of

finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (300 by 300 by 50 mm).

- a. Where other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
- 2. Samples for each thin- or half-brick unit required, showing full range of color and texture expected. Include Samples showing color and texture of joint treatment.
  - a. Grout Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.
  - b. Grout Samples for Verification: Showing color and texture of joint treatment.
- E. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- 1.05 Informational Submittals
  - A. Qualification Data: For Installer, fabricator, and testing agency.
  - B. Welding certificates.
  - C. Material Certificates: For the following, from manufacturer:
    - 1. Cementitious materials.
    - 2. Reinforcing materials and prestressing tendons.
    - 3. Admixtures.
    - 4. Bearing pads.
    - 5. Structural-steel shapes and hollow structural sections.
  - D. Material Test Reports: For aggregates.
  - E. Source quality-control reports.
  - F. Field quality-control and special inspection reports.
- 1.06 Quality Assurance
  - A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
    - Participates in PCI's Plant Certification program at time of bidding and is designated a PCI-certified plant as follows: a. Group C, Category C4 - Prestressed Deflected Strand Structural Members.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

b. Group CA, Category C3A - Prestressed Straight-Strand Structural Members.

- B. Installer Qualifications: A precast concrete erector qualified at time of bidding, as evidenced by PCI's Certificate of Compliance, to erect Category S2 - Complex Structural Systems.
- C. Installer Qualifications: An experienced precast concrete erector who, before erection of precast concrete, has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project installed by erector in Category S2 - Complex Structural Systems and who produces an Erectors' Post Audit Declaration, according to PCI MNL 127, "PCI Erector's Manual - Standards and Guidelines for the Erection of Precast Concrete Products."
- D. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- E. Design Standards: Comply with ACI 318 (ACI 318M) and design recommendations in PCI MNL 120, "PCI Design Handbook Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.
- F. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."
- G. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D.1.1M, "Structural Welding Code Steel."
  - 2. AWS D1.4, "Structural Welding Code Reinforcing Steel."
- H. Fire-Resistance Calculations: Where indicated, provide precast structural concrete units whose fire resistance meets the prescriptive requirements of authorities having jurisdiction or has been calculated according to ACI 216.1/TMS 0216.1, "Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies," and is acceptable to authorities having jurisdiction.
- I. Sample Panels: After sample approval and before fabricating precast structural concrete units with architectural finish, produce a minimum of 2 sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.
  - 1. Locate panels where indicated or, if not indicated, as directed by Architect.

- 2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
- 3. After approval of repair technique, maintain one sample panel at fabricator's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
- 4. Demolish and remove sample panels when directed.
- J. Mockups: After sample panel approval but before production of precast structural concrete units with architectural finish, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockup as indicated on Drawings including sealants and precast structural concrete units with an architectural finish complete with anchors, connections, flashings, and joint fillers.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- K. Preinstallation Conference: Conduct conference at Project site.
- 1.07 Delivery, Storage, and Handling
  - A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.
  - B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
    - 1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
    - 2. Place adequate dunnage of even thickness between each unit.
    - 3. Place stored units so identification marks are clearly visible, and units can be inspected.
  - C. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses that would cause cracking or damage.
  - D. Lift and support units only at designated points shown on Shop Drawings.
- 1.08 Coordination
  - A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations,

setting diagrams, templates, instructions, and directions, as required, for installation.

#### PART 2 - PRODUCTS

- 2.01 Manufacturers
  - A. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work.
- 2.02 Mold Materials
  - A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.
    - 1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.
  - B. Form Liners: Units of face design, texture, arrangement, and configuration to match those used for precast concrete design reference sample. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.
  - C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.
- 2.03 Reinforcing Materials
  - A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
  - B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
  - C. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars, ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized, and chromate wash treated after fabrication and bending.
  - D. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars, assembled with clips.
  - E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
  - F. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

- G. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.
- 2.04 Prestressing Tendons
  - A. Unbonded Post-Tensioning Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation strand.
    - 1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.6 and sheath with polypropylene tendon sheathing complying with ACI 423.6. Include anchorage devices and coupler assemblies.
  - B. Post-Tensioning Bars: ASTM A 722, uncoated high-strength steel bar.

### 2.05 Concrete Materials

- A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.
  - 1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.
- B. Supplementary Cementitious Materials:
  - 1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
  - 2. Metakaolin Admixture: ASTM C 618, Class N.
  - 3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
  - 4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 5S and Class 5M. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
  - 1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
    - a. Gradation: Uniformly graded.
  - 2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate unless otherwise approved by Architect.
- D. Lightweight Aggregates: Except as modified by PCI MNL 116, ASTM C 330, with absorption less than 11 percent.
- E. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- G. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- H. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
  - 1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
  - 5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M.
- I. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
- 2.06 Steel Connection Materials
  - A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
  - B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.
  - C. Carbon-Steel Plate: ASTM A 283/A 283M.
  - D. Malleable-Iron Castings: ASTM A 47/A 47M.
  - E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).
  - F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
  - G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
  - H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).
  - I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.
  - J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.

- K. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M) or ASTM A 490 (ASTM A 490M,), Type 1, heavy hex steel structural bolts; heavy hex carbonsteel nuts, ASTM A 563 (ASTM A 563M); and hardened carbon-steel washers, ASTM F 436 (ASTM F 436M).
  - 1. Do not zinc coat ASTM A 490 (ASTM A 490M) bolts.
- L. Shop-Primed Finish: Prepare surfaces of nongalvanized-steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3, and shop apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 or SSPC-Paint 25 according to SSPC-PA 1.
- M. Welding Electrodes: Comply with AWS standards.
- N. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.
- 2.07 Stainless-Steel Connection Materials
  - A. Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.
  - B. Stainless-Steel Bolts and Studs: ASTM F 593, Alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly.
  - C. Stainless-Steel-Headed Studs: ASTM A 276, with minimum mechanical properties of PCI MNL 116.
- 2.08 Bearing Pads
  - A. Provide one of the following bearing pads for precast structural concrete units as recommended by precast fabricator for application:
    - 1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore, Type A durometer hardness, ASTM D 2240; minimum tensile strength 2250 psi (15.5 MPa), ASTM D 412.
    - Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. 70 to 90 Shore, Type A durometer hardness, ASTM D 2240; capable of supporting a compressive stress of 3000 psi (20.7 MPa) with no cracking, splitting, or delaminating in the internal portions of pad. Test 1 specimen for every 200 pads used in Project.
    - Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; 80 to 100 Shore, Type A durometer hardness, ASTM D 2240; complying with AASHTO's "AASHTO Load and Resistance Factor Design (LRFD) Bridge Specifications," Division II, Section 18.10.2; or with MIL-C-882E.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 4. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to stainless- or mild-steel plate, of type required for in-service stress.
- 5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

# 2.09 Grout Materials

- A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.
- C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

# 2.10 Concrete Mixtures

- A. Prepare design mixtures for each type of precast concrete required.
  - 1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
  - 2. Limit use of fly ash to 25 percent replacement of portland cement by weight and granulated blast-furnace slag to 40 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 116 when tested according to ASTM C 1218/C 1218M.
- D. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 116.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- F. Lightweight Concrete Backup Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).
  - 2. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft. (1842 kg/cu. m), plus or minus 3 lb/cu. ft. (48 kg/cu. m), according to ASTM C 567.
- G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.
- H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
- I. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

### 2.11 Mold Fabrication

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
  - 1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.
- B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
  - 1. Form joints are not permitted on faces exposed to view in the finished work.
  - 2. Edge and Corner Treatment: Uniformly chamfered.

#### 2.12 Fabrication

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
  - Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.
- D. Cast-in openings larger than 10 inches (250 mm) in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
  - 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
  - 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
  - 3. Place reinforcement to maintain at least 3/4-inch (19-mm) minimum coverage. Increase cover requirements according to ACI 318 (ACI 318M) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
  - 4. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch (19-mm) minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches (38 mm) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
  - 5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
  - F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses.
- G. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.
  - 1. Delay detensioning or post-tensioning of precast, prestressed structural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete.

- 2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
- 3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
- 4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
- 5. Protect strand ends and anchorages with a minimum of 1-inch- (25-mm-) thick, nonmetallic, nonshrink, grout mortar and sack rub surface. Coat or spray the inside surfaces of pocket with bonding agent before installing grout.
- H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch (25 mm) or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.
- J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.
  - 1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- K. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 116.
  - 1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."
- L. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- M. Comply with PCI MNL 116 procedures for hot-weather concrete placement.
- N. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that will not show in finished structure.
- O. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

- P. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.
- 2.13 Fabrication Tolerances
  - A. Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product dimension tolerances.
  - B. Brick-Faced Precast Structural Concrete Units: Restrict the following misalignments to 2 percent of number of bricks in a unit:
    - Alignment of Mortar Joints:
      a. Jog in Alignment: 1/8 inch (3 mm).
      b. Alignment with Panel Centerline: Plus or minus 1/8 inch (3 mm).
    - 2. Variation in Width of Exposed Mortar Joints: Plus or minus 1/8 inch (3 mm).
    - 3. Tipping of Individual Bricks from the Panel Plane of Exposed Brick Surface: Plus 1/16 inch (1.6 mm); minus 1/4 inch (6 mm) less than or equal to depth of form-liner joint.
    - 4. Exposed Brick Surface Parallel to Primary Control Surface of Panel: Plus 1/4 inch (6 mm); minus 1/8 inch (3 mm).
    - 5. Individual Brick Step in Face from Panel Plane of Exposed Brick Surface: Plus 1/16 inch (1.6 mm); minus 1/4 inch (6 mm) less than or equal to depth of form-liner joint.
  - C. Stone Veneer-Faced Precast Structural Concrete Units:
    - 1. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated: Plus or minus 1/4 inch (6 mm).
    - 2. Variation in Joint Width: 1/8 inch in 36 inches (3 mm in 900 mm) or a quarter of nominal joint width, whichever is less.
    - 3. Variation in Plane between Adjacent Stone Units (Lipping): 1/16-inch (1.6mm) difference between planes of adjacent units.
- 2.14 Commercial Finishes
  - A. Commercial Grade: Remove fins and large protrusions and fill large holes. Rub or grind ragged edges. Faces must have true, well-defined surfaces. Air holes, water marks, and color variations are permitted. Limit form joint offsets to 3/16 inch (5 mm).
  - B. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch (13 mm) caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than 1/4 inch (6 mm) in width that occur more than once per 2 sq. in (1300 sq. mm). Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch (3 mm).

- C. Grade B Finish: Fill air pockets and holes larger than 1/4 inch (6 mm) in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than 1/8 inch (3 mm) in width that occur more than once per 2 sq. in. (1300 sq. mm). Grind smooth form offsets or fins larger than 1/8 inch (3 mm). Repair surface blemishes due to holes or dents in molds. Discoloration at form joints is permitted.
- D. Grade A Finish: Fill surface blemishes with the exception of air holes 1/16 inch (1.6 mm) in width or smaller, and form marks where the surface deviation is less than 1/16 inch (1.6 mm). Float apply a neat cement-paste coating to exposed surfaces. Rub dried paste coat with burlap to remove loose particles. Discoloration at form joints is permitted. Grind smooth all form joints.
- E. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.
- F. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.
- G. Apply roughened surface finish according to ACI 318 (ACI 318M) to precast concrete units that will receive concrete topping after installation.
- 2.15 Source Quality Control
  - A. Testing Agency: Engage a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.
    - 1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.
  - B. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements.
    - 1. Test and inspect self-consolidating concrete according to PCI TR-6.
  - C. Strength of precast structural concrete units will be considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.
  - D. If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 (ACI 318M) requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.
    - 1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 2. Cores will be tested in an air-dry condition or, if units will be wet under service conditions, test cores after immersion in water in a wet condition.
- 3. Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
- 4. Test results will be made in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:
  - a. Project identification name and number.
  - b. Date when tests were performed.
  - c. Name of precast concrete fabricator.
  - d. Name of concrete testing agency.
  - e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- E. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- F. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups.

# PART 3 - EXECUTION

- 3.01 Examination
  - A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.
  - B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - C. Do not install precast concrete units until supporting, cast-in-place, building structural framing has attained minimum allowable design compressive strength or until supporting steel or other structure is complete.

#### 3.02 Installation

- A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.
- B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, supports, and bracing as required to maintain position, stability, and alignment of units until permanent connection.
  - 1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
  - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
  - 3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
  - 4. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.
- C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
  - 1. Do not permit connections to disrupt continuity of roof flashing.
- D. Field cutting of precast units is not permitted without approval of the Architect.
- E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.
- F. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
  - 1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
  - 2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
  - 3. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
  - 4. Remove, reweld, or repair incomplete and defective welds.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
  - 1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.
- H. Grouting: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled.
  - 1. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces.
  - 2. Fill joints completely without seepage to other surfaces.
  - 3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
  - 4. Place grout end cap or dam in voids at ends of hollow-core slabs.
  - 5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
  - 6. Keep grouted joints damp for not less than 24 hours after initial set.
- 3.03 Erection Tolerances
  - A. Erect precast structural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.
  - B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

### 3.04 Field Quality Control

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
  - 1. Erection of precast structural concrete members.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Field welds will be visually inspected and nondestructive tested according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- G. Prepare test and inspection reports.

#### 3.05 Repairs

- A. Repair precast structural concrete units if permitted by Architect.
  - 1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units has not been impaired.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.
- 3.06 Cleaning
  - A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
  - B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
    - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
    - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

-END-

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

# SECTION 05120 - STRUCTURAL STEEL

### PART 1 - GENERAL

- 1.01 Summary
  - A. Section includes structural steel and grout.

#### 1.02 Definitions

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- 1.03 Performance Requirements
  - A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
    - 1. Select and complete connections using schematic details indicated and AISC 360.
    - 2. Use LRFD; data are given at factored-load level.
  - B. Moment Connections: Type FR, fully restrained.

#### 1.04 Submittals

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
- C. Qualification Data: For qualified fabricator.
- D. Welding certificates.

#### 1.05 Quality Assurance

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- C. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC 303.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 STRUCTURAL STEEL

- 2. AISC 360.
- 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

### PART 2 - PRODUCTS

- 2.01 Structural-Steel Materials
  - A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
  - B. W-Shapes: ASTM A 992/A 992M.
  - C. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.
  - D. Plate and Bar: ASTM A 36/A 36M.
  - E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
  - F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
  - G. Welding Electrodes: Comply with AWS requirements.
- 2.02 Bolts, Connectors, and Anchors
  - A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
    - 1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.
  - B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers with plain finish.
    - 1. Direct-Tension Indicators: ASTM F 959, Type 490 (ASTM F 959M, Type 10.9), compressible-washer type with plain finish.
  - C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers.
    - 1. Finish: Hot-dip zinc coating

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating, baked epoxy-coated finish.
- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- E. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
  - 1. Configuration: Straight.
  - 2. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- F. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
  - 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- G. Threaded Rods: ASTM A 36/A 36M.
  - 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

### 2.03 Primer

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rustinhibiting primer complying with MPI#79 and compatible with topcoat.

#### 2.04 Grout

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- 2.05 Fabrication
  - A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
  - B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- 2.06 Shop Connections
  - A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
    - 1. Joint Type: Snug tightened.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
- 2.07 Shop Priming
  - A. Shop prime steel surfaces except the following:
    - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
    - 2. Surfaces to be field welded.
    - 3. Surfaces to be high-strength bolted with slip-critical connections.
    - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
    - 5. Galvanized surfaces.
  - B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
    - 1. SSPC-SP 2, "Hand Tool Cleaning."
    - 2. SSPC-SP 3, "Power Tool Cleaning."
  - C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
- 2.08 Source Quality Control
  - A. Testing Agency: Engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
    - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
  - B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
  - C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  - D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    - 1. Liquid Penetrant Inspection: ASTM E 165.
    - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

STRUCTURAL STEEL

- 3. Ultrasonic Inspection: ASTM E 164.
- 4. Radiographic Inspection: ASTM E 94.

# PART 3 - EXECUTION

### 3.01 Examination

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 Erection

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

# 3.03 Field Connections

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

### 3.04 Field Quality Control

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
  - 1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

-END-
## SECTION 05500 - METAL FABRICATIONS

### PART 1 - GENERAL

### 1.01 Summary

- A. Section Includes:
  - 1. Miscellaneous steel framing and supports.
  - 2. Shelf angles.
  - 3. Metal ladders.
  - 4. Ladder safety cages.
  - 5. Metal floor plate and supports.
  - 6. Metal bollards.
  - 7. Abrasive metal nosings treads and thresholds.
  - 8. Loose bearing and leveling plates.
- B. Products furnished, but not installed, under this Section:
  - 1. Loose steel lintels.
  - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
  - 3. Steel weld plates and angles for casting into concrete.

#### 1.02 Performance Requirements

- A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

#### 1.03 Submittals

- A. Product Data: For the following:
  - 1. Prefabricated building columns.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 METAL FABRICATIONS

- 2. Metal nosings and treads.
- 3. Paint products.
- 4. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
  - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### PART 2 - PRODUCTS

- 2.01 Metals, General
  - A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.
- 2.02 Ferrous Metals
  - A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
  - B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  - C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.
  - D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
  - E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
  - F. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.
    - 1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:
      - a. IKG Industries, a division of Harsco Corporation; Mebac.
      - b. SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.
      - c. Approved manufacturer's name; product name or designation.
  - G. Steel Tubing: ASTM A 500, cold-formed steel tubing.

- H. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm) or as indicated
  - 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.108-inch (2.8-mm) nominal thickness.

### 2.03 Nonferrous Metals

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

### 2.04 Fasteners

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Post-Installed Anchors: Chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
  - Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).
- D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

- 2.05 Miscellaneous Materials
  - A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
  - C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
  - D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- 2.06 Fabrication, General
  - A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
  - B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
  - C. Weld corners and seams continuously to comply with the following:
    - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    - 2. Obtain fusion without undercut or overlap.
    - 3. Remove welding flux immediately.
    - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
  - D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
  - E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
  - F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches (600 mm) o.c.
- 2.07 Miscellaneous Framing and Supports
  - A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
  - B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

#### 2.08 Shelf Angles

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

## 2.09 Metal Ladders

- A. General:
  - 1. Comply with ANSI A14.3 unless otherwise indicated.
  - 2. For elevator pit ladders, comply with ASME A17.1.
- B. Aluminum Ladders:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ACL Industries, Inc.
    - b. Alco-Lite Industrial Products.
    - c. Halliday Products.
    - d. O'Keeffe's Inc.
    - e. Precision Ladders, LLC.
    - f. Royalite Manufacturing, Inc.
    - g. Thompson Fabricating, LLC.
    - h. Approved manufacturer.
  - 2. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
  - 3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches (64 mm) deep, 3/4 inch (19 mm) wide, and 1/8 inch (3.2 mm) thick.
  - 4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch (19 mm) deep and not less than 1/8 inch (3.2 mm) thick, with ribbed tread surfaces.

## 2.10 Ladder Safety Cages

A. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.

- B. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet (6 m) o.c. Provide secondary intermediate hoops spaced not more than 48 inches (1200 mm) o.c. between primary hoops.
- 2.11 Metal Floor Plate
  - A. Fabricate from rolled-stainless-steel floor plate.
    - 1. Thickness: 1/4 inch (6.4 mm) or as indicated.
  - B. Provide stainless-steel angle supports as indicated.
  - C. Provide flush stainless-steel bar drop handles for lifting removable sections, one at each end of each section.
- 2.12 Metal Bollards
  - A. Fabricate metal bollards from Schedule 40 steel pipe [1/4-inch (6.4-mm) or steel shapes, as indicated.
    - 1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate.
  - B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch (19-mm) anchor bolts.
  - C. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch-(6.4-mm-) thick steel plate welded to bottom of sleeve.
  - D. Prime bollards with zinc-rich primer.
- 2.13 Abrasive Metal Nosings Tread and Thresholds
  - A. Extruded Units: Aluminum, with abrasive filler in an epoxy-resin binder.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - a. ACL Industries, Inc.
      - b. American Safety Tread Co., Inc.
      - c. Amstep Products.
      - d. Armstrong Products, Inc.
      - e. Balco Inc.
      - f. Granite State Casting Co.
      - g. Wooster Products Inc.
      - h. Approved manufacturer.
    - 2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
    - 3. Provide solid-abrasive-type units without ribs.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c.
- D. Apply bituminous paint to concealed surfaces of cast-metal units.
- E. Apply clear lacquer to concealed surfaces of extruded units.
- 2.14 Loose Bearings and Leveling Plates
  - A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- 2.15 Loose Steel Lintels
  - A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
  - B. Galvanize loose steel lintels located in exterior walls.
  - C. Prime loose steel lintels located in exterior walls with zinc-rich primer.
- 2.16 Steel Weld Plates and Angles
  - A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.
- 2.17 Finishes, General
  - A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - B. Finish metal fabrications after assembly.
- 2.18 Steel and Iron Finishes
  - A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
    - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 METAL FABRICATIONS

- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." Or SSPC-SP 3, "Power Tool Cleaning." requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

## PART 3 - EXECUTION

- 3.01 Installation, General
  - A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
  - B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
  - C. Field Welding: Comply with the following requirements:
    - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    - 2. Obtain fusion without undercut or overlap.
    - 3. Remove welding flux immediately.
    - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
  - D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
  - E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- 3.02 Installing Metal Bollards
  - A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

- B. Anchor bollards to existing construction with expansion anchors Provide four 3/4inch (19-mm) bolts at each bollard unless otherwise indicated.
- C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete in formed or core-drilled holes. Fill annular space around bollard solidly with nonshrink, nonmetallic grout.
- D. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- E. Fill bollards solidly with concrete, mounding top surface to shed water.

### 3.03 Installing Bearing and Leveling Plates

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
- C. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.04 Adjusting and Cleaning

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

-END-

## SECTION 05511 - METAL STAIRS

## PART 1 - GENERAL

### 1.01 Summary

- A. Section Includes:
  - 1. Industrial-type stairs with steel grating treads.
  - 2. Steel tube railings attached to metal stairs.
  - 3. Steel tube handrails attached to walls adjacent to metal stairs.
- 1.02 Performance Requirements
  - A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
  - B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
    - 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
    - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
    - 3. Uniform and concentrated loads need not be assumed to act concurrently.
    - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
    - 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.
  - C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
    - 1. Handrails and Top Rails of Guards:
      - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
      - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      - c. Uniform and concentrated loads need not be assumed to act concurrently.
    - 2. Infill of Guards:
      - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      - b. Infill load and other loads need not be assumed to act concurrently.

- D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. Component Importance Factor is 1.5.

### 1.03 Submittals

- A. Product Data: For metal stairs.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.04 Quality Assurance

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
  - 1. Industrial-Type Stairs: Industrial class.

### PART 2 - PRODUCTS

- 2.01 Metals
  - A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
  - B. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
  - C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  - D. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.
  - E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
  - F. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
  - G. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).

- H. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.
- I. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- 2.02 Miscellaneous Materials
  - A. Extruded Units: Aluminum units with abrasive filler in an epoxy-resin binder.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - a. ACL Industries, Inc.
      - b. American Safety Tread Co., Inc.
      - c. Amstep Products.
      - d. Armstrong Products, Inc.
      - e. Balco Inc.
      - f. Granite State Casting Co.
      - g. Wooster Products Inc.
      - h. Approved manufacturer.
    - 2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
    - 3. Provide solid-abrasive-type units without ribs.
  - B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
  - C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.
  - D. Apply clear lacquer to concealed surfaces of extruded units set into concrete.
  - E. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
  - F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
  - H. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa) unless otherwise indicated.
  - I. Welded Wire Fabric: ASTM A 185/A 185M, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated.

### 2.03 Fabrication, General

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
  - 3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without impairing work.
- E. Weld connections to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Weld exposed corners and seams continuously unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

#### 2.04 Steel-Framed Stairs

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alfab, Inc.
  - 2. American Stair, Inc.
  - 3. Sharon Companies Ltd. (The).
  - 4. Approved manufacturer.
- B. Stair Framing:
  - 1. Fabricate stringers of steel plates or channels.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
- 3. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
- 4. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below.
- 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch (1.7 mm).
  - 1. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
  - 2. Provide epoxy-resin-filled treads, reinforced with glass fibers, with slipresistant, abrasive surface.
- D. Metal Floor Plate Stairs: Form treads and platforms to configurations shown from rolled-steel floor plate of thickness needed to comply with performance requirements, but not less than 1/4 inch (6.4 mm). Form treads with integral nosing and back edge stiffener. Weld steel supporting brackets to stringers and weld treads to brackets.
- E. Metal Bar-Grating Stairs: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."
  - 1. Fabricate treads and platforms from steel grating with 1-1/4-by-3/16-inch (32by-5-mm) bearing bars at 15/16 inch (24 mm) o.c. and crossbars at 4 inches (100 mm) o.c.
  - 2. Fabricate grating treads with rolled-steel floor plate or cast abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

## 2.05 Stair Railings

- A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
  - 1. Rails and Posts: 1-1/2-inch- (38-mm-) square top and bottom rails and 1-1/2-inch- (38-mm-) square posts.
  - 2. Picket Infill: 1/2-inch- (13-mm-) square pickets spaced less than 4 inches (100 mm) clear.

- B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.
- C. Form changes in direction of railings by bending or by inserting prefabricated elbow fittings.
- D. Form curves by bending members in jigs to produce uniform curvature without buckling.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
  - 1. Connect posts to stair framing by direct welding.
- H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, to transfer wall bracket loads through wall finishes. Size fillers to suit wall finish thicknesses.
- 2.06 Finishes
  - A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - B. Finish metal stairs after assembly.
  - C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning or SSPC-SP 3, "Power Tool Cleaning."
  - E. Apply shop primer to uncoated surfaces of metal stair components. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

## PART 3 - EXECUTION

### 3.01 Installation

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
- D. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- E. Place and finish concrete fill for treads and platforms to comply with Division 3 Section "Cast-in-Place Concrete."
  - 1. Install abrasive nosings with anchors fully embedded in concrete.
- F. Install precast concrete treads with adhesive supplied by manufacturer.
- G. Attach handrails to wall with wall brackets. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

## 3.02 Adjusting and Cleaning

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

-END-

# SECTION 05531 – BAR GRATINGS

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes metal bar gratings.
- B. Related Requirements:
  - 1. Section 05120 "Structural Steel" for structural-steel framing system components.
  - 2. Section 05511 "Metal Stairs" for grating treads and landings of steel-framed stairs.

#### 1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Clips and anchorage devices for gratings.
  - 2. Paint products.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For gratings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless steel certifying that products furnished comply with requirements.
- B. Welding certificates.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- 1.5 QUALITY CONTROL
  - A. Welding Qualifications: Qualify procedures and personnel according to the following:
    - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."
    - 2. AWS D1.3/D1.3M, "Structural Welding Code Sheet Steel."

### 1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design gratings.
- B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Floors: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 3,000 lbf (13.40 kN), whichever produces the greater stress.
  - 2. Walkways and Elevated Platforms: Uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m).
  - 3. Sidewalks and Vehicular Driveways, Subject to Trucking: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 16,000 lbf (71.17 kN), whichever produces the greater stress.
  - 4. Limit deflection to L/360 or 1/4 inch (6.4 mm), whichever is less.
- C. Seismic Performance: Gratings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. Component Importance Factor: 1.5.

#### 2.2 METAL BAR GRATINGS

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual" and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."
- B. Welded Steel Grating Seerly West Tank:
  - 1. Bearing Bar Spacing: 1-3/8 inches (35 mm) o.c.
  - 2. Bearing Bar Depth: 6 inches (152 mm).

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 3. Bearing Bar Thickness: 1/2 inch (13 mm).
- 4. Crossbar Spacing: 4 inches (102 mm) o.c.
- 5. Grating Mark 22-W-4 (6 x 1/2) STEEL
- 6. Traffic Surface: Serrated.
- 7. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. (550 g/sq. m) of coated surface.
- C. Pressure-Locked, Aluminum I-Bar Grating [MBG-531]: Fabricated by swaging crossbars between bearing bars.
  - 1. Bearing Bar Spacing: 1-3/16 inches (30 mm) o.c.
  - 2. Bearing Bar Depth: As required to comply with structural performance requirements.
  - 3. Bearing Bar Flange Width: 1/4 inch (6.4 mm).
  - 4. Crossbar Spacing: 4 inches (102 mm) o.c.
  - 5. Grating Mark P-19-4 (1-1/2 I-Bar) ALUMINUM: 1-1/2-inch (38-mm) I-bar bearing bars at 1-3/16 inches (30 mm) o.c., and crossbars at 4 inches (102 mm) o.c.
  - 6. Grating Mark: As indicated.
  - 7. Traffic Surface: Serrated.
- D. Aluminum Finish: .Mill finish.

#### 2.3 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- C. Wire Rod for Bar Grating Crossbars: ASTM A 510 (ASTM A 510M).
- D. Uncoated Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30 (Grade 205).
- E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating.

#### 2.4 ALUMINUM

- A. General: Provide alloy and temper recommended by aluminum producer for type of use indicated, with not less than the strength and durability properties of alloy, and temper designated below for each aluminum form required.
- B. Extruded Bars and Shapes: ASTM B 221 (ASTM B 221M), alloys as follows:
  - 1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
  - 2. 6061-T1, for grating crossbars.
- C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 5052-H32.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

## 2.5 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M,) and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M,) and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Post-Installed Anchors: Torque-controlled expansion or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

## 2.6 MISCELLANEOUS MATERIALS

- A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

## 2.7 FABRICATION

- A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Welding: Comply with AWS recommendations and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
  - 1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
  - 2. Fabricate toeplates for attaching in the field.
  - 3. Toeplate Height: 4 inches (100 mm) unless otherwise indicated.
- G. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
  - 1. Provide no fewer than four saddle clips for each grating section containing rectangular bearing bars 1/2 inch (13 mm) or less in thickness and spaced 1-3/8 inch (35 mm) or more o.c., with each clip designed and fabricated to fit over two bearing bars.
  - 2. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.
- H. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
  - 1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

I. Do not notch bearing bars at supports to maintain elevation.

# 2.8 GRATING FRAMES AND SUPPORTS

- A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
  - 1. Unless otherwise indicated, fabricate from same basic metal as gratings.
  - Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.
- B. Galvanize steel frames and supports in the following locations:
  - 1. Exterior.

## 2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I.
- 2.10 STEEL FINISHES
  - A. Finish gratings, frames, and supports after assembly.
  - B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
    - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
  - C. Shop prime gratings, frames, and supports not indicated to be galvanized unless otherwise indicated.
    - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
  - D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- D. Fit exposed connections accurately together to form hairline joints.
  - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Attach toeplates to gratings by welding at locations indicated.
- F. Field Welding: Comply with AWS recommendations and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
- G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

#### 3.2 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

## 3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

-END-

# SECTION 05532 - ALUMINUM HATCHES

## PART 1 - GENERAL

1.01 Summary

Furnish and install aluminum hatches, accessories, and appurtenances.

- 1.02 Submittals
  - A. Submit shop drawings with physical characteristics of aluminum hatches.

### 1.03 Product Delivery, Storage, and Handling

A. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

### PART 2 - PRODUCTS

### 2.01 General

- A. Provide hatches and accessories as indicated in the schedule in Section 3.03.
- B. All hatches and accessories shall be provided from a single manufacturer.

#### 2.02 Flush-Mounted Hatches

- A. General
  - 1. Provide access hatches able to withstand the design load with a maximum deflection of 1/150<sup>th</sup> of the hatch span.
  - 2. Operation of the covers shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
  - 3. Operation of the covers shall not be affected by temperature.
  - 4. Door leaves shall be 1/4-inch aluminum diamond pattern plate.
  - 5. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.
  - 6. Insulation: Provide metal enclosed fiberglass insulated hatch covers where indicated.
  - 7. Provide all hatches with a manufacturer installed deadbolt cylinder lock.
    - a. Lock cylinder shall be recessed and covered from the exterior by means of a gasketed, threaded deck plate.
- B. Channel Frame Hatches
  - 1. Provide Bilco Type J-AL or JD-AL, or equal.
  - 2. Provide cover reinforcement rated to support a minimum live load of 300 psf

ALUMINUM HATCHES

- 3. Traffic Rated:
  - a. Provide Bilco Type J-AL H20 or JD-AL H20, or equal.
  - b. Provide cover reinforcement rated to support AASHTO H-20 loading.
  - c. Manufacturer to provide structural calculations stamped by a registered professional engineer upon request.
- 4. Channel frame shall be extruded aluminum with bend down anchor tabs around the perimeter.
- 5. Hinges shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.
- 6. Provide a 1-1/2-inch drain coupling located in the right front corner of the channel frame
- 7. Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4-inch gusset support plate.
- 8. A removable exterior turn/lift handle with a spring-loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.
- 9. Hardware:
  - a. Heavy forged Type 316 stainless steel hinges, each having a minimum ¼inch diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.
  - b. Covers shall be equipped with a hold open arm which automatically lock each cover in the open position.
  - c. Covers shall be fitted with the required number and size of compression spring operators. Springs and spring tubs shall be Type 316 stainless steel.
  - d. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the covers.
  - e. Hardware shall be Type 316 stainless steel throughout.
- 10. Entire door, including all hardware components, shall be highly corrosion resistant.
- C. Angle Frame Hatches
  - 1. Provide Bilco Type K-AL or KD-AL, or equal.
  - 2. Frame shall be extruded aluminum with strap anchors bolted to the exterior.
  - 3. Hinges shall be specifically designed for horizontal installation and shall be bolted to the underside of cover.
  - 4. Cam-action hinges shall pivot on torsion bars to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing.
  - 5. A removable exterior turn/lift handle with a spring-loaded ball detent shall be provided to open the cover.

- 6. Hardware:
  - a. Hinges: Cast steel cam-action hinges which pivot on torsion bars shall be provided.
  - b. Covers shall be equipped with steel hold open arms that automatically lock each cover in the open position.
  - c. Covers shall be fitted with the required number and size of torsion bars.
  - d. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the covers.
  - e. Hardware shall be Type 316 stainless steel.
- D. Ladder Safety Post
  - 1. Provide Bilco Type LU-4 aluminum LadderUp®, or equal.
  - 2. The ladder safety post shall be pre-assembled from the manufacturer.
  - 3. Tubular post shall lock automatically when fully extended.
  - 4. Safety post shall have controlled upward and downward movement.
  - 5. Release lever shall disengage the post to allow it to be returned to its lowered position.
  - 6. Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14" on center and clamp brackets to accommodate ladder rungs up to 1-3/4" in diameter.
  - 7. Post shall be manufactured of high strength square tubing. A pull up loop shall be provided at the upper end of the post to facilitate raising the post.
  - 8. All mounting hardware shall be Type 316 stainless steel.
  - 9. Factory finish shall be mill finish aluminum.
- E. Fall Protection
  - 1. Provide Bilco, Type FPG Fall Protection Grating System, or equal.
  - 2. Hatch manufacturer shall install the grating system when the hatch is fabricated.
  - 3. Provide grating panels that are:
    - a. high visibility safety yellow in color
    - b. lock automatically in the full open position
    - c. have a provision for locking to prevent unauthorized opening
    - d. Panels shall be aluminum with a powder coat paint finish and designed to meet OSHA 29 CFR 1910.23 requirements for fall protection.
  - 4. Hold open feature: A Type 316 stainless hold open device shall be provided to lock the cover in the fully open 90 degree position.
  - 5. All hardware shall be Type 316 stainless steel.

#### PART 3 - EXECUTION

- 3.01 Installation
  - A. Install hatches in accordance with manufacturer's recommendations and as specified in this Section.
  - B. Cast flush mounted hatches into concrete slabs.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 ALUMINUM HATCHES

- C. Hatches shall be uniformly supported. Lids shall operate smoothly without binding.
- D. Flush mounted hatch and door covers, when closed, shall not protrude above the operating surface in which they are installed, unless otherwise indicated.
- E. Channel Frame Hatches Drainage
  - 1. Provide one of the following methods:
    - a. Install one-inch diameter PVC piping from the lip drain to the nearest floor drain, sump, wet well, or other structure as approved by the Engineer.
    - b. Install one-inch diameter PVC piping from the lip drain into an area drain outside of the structure consisting of one cubic yard of #2 crushed stone.
  - 2. Install all drainage pipe outside of structures at least three feet below the finished grade.
- 3.02 Cleaning and Adjusting

All equipment installed under this Section shall be cleaned and adjusted for proper operation to the satisfaction of the Engineer.

## 3.03 Hatch Schedule

Hatches are tabulated giving location, type, size, and number of leaves.

NO.	LOCATION	TYPE	SIZE	LEAVES	TRAFFIC RATED	FALL PROTECTION GRATING	LADDER SAFETY POST	INSULATED
1	Seerley Creek West Storage Tank, Junction Chamber	Channel Frame	60" x 60"	2	Х	Х	Х	
2	Seerley Creek West Storage Tank, Hanna Overflow Chamber	Channel Frame	60" x 60"	2	Х	Х	Х	
3	Seerley Creek West Storage Tank, Evac Pump Station	Channel Frame	60" x 78"	2		Х		
4	Seerley Creek West Storage Tank, Evac Pump Station	Channel Frame	60" x 78"	2		Х		
5	Seerley Creek Discharge Channel	Channel Frame	60" x 60"	2	Х	Х	Х	
6	Seerley Creek West Storage Tank	Channel Frame	48" x 48"	1	Х	Х	Х	
7	Seerley Creek West Storage Tank	Channel Frame	48" x 48"	1	Х	Х	Х	
8	Seerley Creek West Storage Tank	Channel Frame	48" x 48"	1	Х	Х	Х	
9	Hanna North Discharge Pump Station	Channel Frame	60" x 72"	2		Х		
10	Hanna North Discharge Pump Station	Channel Frame	60" x 72"	2		Х		
11	Hanna North Discharge Pump Station, Valve Vault	Channel Frame	36" x 72"	2				
12	Hanna North Discharge Pump Station, Valve Vault	Channel Frame	36" x 72"	2				
13	Hanna North Discharge Pump Station, Valve Vault	Channel Frame	36" x 36"	1		Х	Х	
14	Hanna North Discharge Pump Station, Electrical Control Room	Channel Frame	72" x 72"	2		х		Х
15	Hanna North Discharge Pump Station, Meter Vault	Channel Frame	48" x 48"	1	х			
16	Hanna North Midfield Force Main Valve Manhole	Channel Frame	36" x 36"	1		Х		
17	Hanna South Discharge Pump Station	Channel Frame	48" x 96"	2		Х		
18	Hanna South Discharge Pump Station	Channel Frame	48" x 96"	2		Х		
19	Hanna Underdrain Pump Station, Control Building	Channel Frame	48" x 48"	1		Х	Х	

#### STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

## ALUMINUM HATCHES

05532-5

NO.	LOCATION	TYPE	SIZE	LEAVES	TRAFFIC RATED	FALL PROTECTION GRATING	LADDER SAFETY POST	INSULATED
20	Hanna Underdrain Pump Station, Control Building	Channel Frame	48" x 48"	1		Х	Х	
21	Hanna Underdrain Pump Station	Channel Frame	48" x 48"	1		х		
22	Hanna Underdrain Pump Station	Channel Frame	48" x 48"	1		х		
23	Hanna Underdrain Pump Station	Channel Frame	48" x 48"	1		Х		

-END-

# SECTION 07161 - CRYSTALLINE WATERPROOFING

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes crystalline waterproofing.
- B. Related Sections include the following:
  - 1. 03100 Concrete Formwork
  - 2. 03200 Concrete Reinforcement
  - 3. 03300 Cast-In-Place Concrete

#### 1.2 SUBMITTALS

- A. Product Data: Include material descriptions and installation instructions for crystalline waterproofing.
- B. Product Certificates: For crystalline waterproofing, signed by product manufacturer.
- C. Qualification Data: For Installer and manufacturer.
- D. Material Test Reports: For crystalline waterproofing, from independent testing laboratory, demonstrating that the waterproofing system complies with requirements of this Section. Reports should include dosage rates for admixtures.
- E. Manufacturer's inspection reports of completed installation.
- F. Warranty: Special warranty specified in this Section.

### 1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
  - 1. ISO 9001 certified.
  - 2. Having at least 15 years' experience in the manufacture of cementitious crystalline waterproofing materials.
- B. The Contractor shall provide the Engineer with a list of at least five projects similar in concept which he has completed in the last ten years as a certified applicator. Such lists shall include:

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CRYSTALLINE WATERPROOFING

- 1. Project name, description, and location.
- 2. Owner's name, address, and telephone number.
- 3. Project consultant.

## 1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of crystalline waterproofing that fails in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to maintain watertight conditions within specified warranty period.
  - 2. Warranty Period: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide the specified product made by Xypex Chemical Corporation, or a comparable product by one of the other manufacturers listed:
  - 1. Crystalline Waterproofing: Basis-of-Design Product Xypex Admixture C-500 or C-500 NF:
    - a. Xypex Chemical Corporation; Xypex Admixture.
    - b. Kryton International, Inc.; Krystol Internal Membrane (KIM)
    - c. The Euclid Chemical Company; Eucon Vandex Super.
    - d. BASF Corporation; MasterLife 300D

## 2.2 MATERIALS

- A. Crystalline Waterproofing: A prepackaged, gray-colored proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates by capillary action into concrete and reacts chemically with free lime in the presence of water to develop crystalline growth within concrete capillaries to produce an impervious, dense, waterproof concrete with properties meeting or exceeding the following criteria:
  - 1. Permeability: Treated specimen does not exhibit any water leakage when tested at 200 psi (1.4 MPa) head pressure for 14 days according to COE CRD-C 48.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 CRYSTALLINE WATERPROOFING

- 2. Compressive Strength: As indicated at 28 days when tested according to ASTM C 109/C 109M.
- 3. Chemical Resistance: ASTM C267.
- 4. Drying Shrinkage: Minimum 20% reduced drying shrinkage for treated concrete when tested to ASTM C157.
- 5. Self-Sealing: Autogenous crack sealing of treated concrete for cracks with width of 0.16 inches or smaller; verified by independent testing.
- B. Water: Potable.

# PART 3 - EXECUTION

- 3.1 APPLICATION
  - A. General: Comply with waterproofing manufacturer's written instructions for application.

-END-
### SECTION 07900 - JOINT SEALERS

### PART 1 - GENERAL

### 1.01 Summary

- A. Extent of each form and type of joint sealer is indicated on drawings and schedules.
- B. Section Includes: joint sealers for the following locations:
  - 1. Exterior joints in vertical surfaces and non-traffic horizontal surface.
  - 2. Exterior joints in horizontal traffic surfaces.
  - 3. Interior joints in vertical surfaces and horizontal non-traffic surfaces.
  - 4. Interior joints in horizontal traffic surfaces
  - 5. Joints in water immersion
  - 6. Joints in pavement

### 1.02 System Performances

Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals

### 1.03 Submittals

- A. Product Data from manufacturers for each joint sealer product required, including instructions for joint preparation and joint sealer application
- B. Samples for Initial Selection Purposes. Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- C. Samples for verification purposes of each type and color of joint sealer required. Install joint sealer samples in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealers.
- D. Certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for the use indicated.

#### 1.04 Quality Control

- A. Installer Qualifications: Engage an Installer who has successfully completed within the last 3 years at least 3 joint sealer applications similar in type and size to that of this Project.
- B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.

- C. Field-Constructed Mock-Ups: Prior to installation of joint sealers, apply elastomeric sealants to the following selected building joints as indicated below for further verification of colors selected from sample submittals and to represent completed work for qualities of appearance, materials, and application.
  - 1. Joints in field-constructed mock-ups of assemblies specified in other sections which are indicated to receive elastomeric joint sealants specified in this section.
  - 2. Retain mock-ups during construction as standard for judging completed construction.
- 1.05 Delivery, Storage, and Handling
  - A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
  - B. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- 1.06 Project Conditions
  - A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
    - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
    - 2. When joint substrates are wet due to rain, frost, condensation, or other causes.
  - B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.
  - C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

## PART 2 - PRODUCTS

#### 2.01 Materials

- A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Provide color of exposed joint sealers as selected by Engineer from manufacturer's standard colors.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 2.02 Elastomeric Joint Sealants
  - A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses.
  - B. Type 1 Two-Part Non-Sag Polysulfide Sealant: Type M; Grade NS; Class 12-1/2; Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
    - 1. Products:
      - a. "CM-60"; W.R. Meadows, Inc.
      - b. "Synthacalk GC2+"; Pecora Corp.
      - c. "Sonolastic Two-Part"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
  - C. Type 2 Two-Part Pourable Polysulfide Sealant: Type M; Grade P; Class 12-1/2; Uses T, M, G, A, and, as applicable to joint substrates indicated, O.
  - D. Type 3 Two-Part Water Immersion Polysulfide Sealant: Type M; Grade NS; Class 12-1/2; Uses T, M, G, A, and, as applicable to joint substrates indicated, O; with a history of successful test results, per ASTM C 719, and field experience in the sealing of joints immersed intermittently or continuously in water of the same composition as that to which sealant will be exposed after installation.
    - 1. Products:
      - a. "Synthacalk GC2+"; Pecora Corp.
      - b. "Sonolastic Two-Part"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
  - E. Type 4 Multi-Part Non-Acid-Curing Silicone Sealant: Type M; Grade NS; Class 25; Uses T, NT, M, G, A, and, as applicable to joint substrates indicated, O; and complying with the following requirements for additional joint movement capability:
    - 1. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:
      - a. 50 percent movement in both extension and compression for a total of 100 percent movement.
    - 2. Products: "Dow Corning 695"; Dow Corning Corp.
  - F. Type 5 One-Part Non-Acid-Curing Silicone Sealant: Type S, Grade NS, Class 25, and complying with the following requirements for Uses and additional joint movement capability:
    - 1. Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
    - 2. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage

changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:

- a. 40 percent movement in both extension and compression for a total of 80 percent movement.
- 3. Products:
  - a. "Dow Coming 790"; Dow Corning Corp.
  - b. "Silpruf SCS 2000"; Momentive Performance Materials, Inc.
  - c. "864 NST"; Pecora Corp.
  - d. "Dow Coming 795"; Dow Coming Corp.
  - e. "Omniseal"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
  - f. "Sikasil WS-290"; Sika Corp.
- G. Type 6 One-Part High-Modulus Non-Acid-Curing Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
  - 1. Products
    - a. "Dow Corning 784"; Dow Coming Corp.
    - b. "Dow Coming 799"; Dow Coming Corp.
    - c. "Ultraglaze SSG 4000"; General Electric Co.
- H. Type 7 One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to non-porous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with non-porous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.
  - 1. Products
    - a. "Dow Coming 786"; Dow Coming Corp.
    - b. "SCS 1702 Sanitary"; General Electric Co.
    - c. "898 NST"; Pecora Corp.
    - d. "OmniPlus"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
    - e. "Sikasil-N Plus"; Sika Corp.
    - f. "Sikasil-GP"; Sika Corp.
- I. Type 8 Multi-Part Non-Sag Urethane Sealant: Type M, Grade NS, Class 25, and complying with the following requirements for Uses:
  - 1. Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
  - 2. Products:
    - a. "Bostik 505"; Bostik, Inc.
    - b. "Dualthane"; W.R. Meadows
    - c. "Dynatrol II"; Pecora Corp.
    - d. "Permapol RC-2"; Products Research & Chemical Corp.
    - e. "Sikaflex-2c NS EZ Mix"; Sika Corp.
    - f. "Sonolastic NP 2"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 JOINT SEALERS

- J. Type 9 Multi-Part Pourable Urethane Sealant: Type M, Grade P, Class 25, and complying with the following requirements for Uses:
  - 1. Uses T, M, and, as applicable to joint substrates indicated, O.
  - 2. Products:
    - a. "Bostik 555-SL"; Bostik, Inc.
    - b. "Pourthane"; W.R. Meadows, Inc.
    - c. "Urexpan NR-200"; Pecora Corp.
    - d. "PRC 280"; Products Research & Chemical Corp.
    - e. "Sikaflex 2c SL"; Sika Corp.
    - f. "Sonolastic Paving Joint Sealant"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
    - g. "THC 900"; Tremco Sealant/Weatherproofing Division of RPM International, Inc.
    - h. "THC 901"; Tremco Sealant/Weatherproofing Division of RPM International, Inc. (for up to 10% slope)
- K. Type 10 One-Part Non-Sag Urethane Sealant: Type S; Grade NS; Class 25; Uses NT, M, A and, as applicable to joint substrates indicated, O.
  - 1. Products:
    - a. "Bostik 900"; Bostik, Inc.
    - b. "Bostik 915"; Bostik, Inc.
    - c. "Bostik 916"; Bostik, Inc. (textured)
    - d. "Dynatrol I-XL"; Pecora Corp.
    - e. "Permapol RC-1"; Products Research & Chemical Corp.
    - f. "Sikaflex-la"; Sika Corp.
    - g. "Sikaflex-15LM"; Sika Corp.
    - h. "Sonolastic NP 1"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
    - i. "Dymonic"; Tremco Sealant/Weatherproofing Division of RPM International, Inc.
    - j. ""Vulkem 116"; Tremco Sealant/Weatherproofing Division of RPM International, Inc.
- L. Type 11 One-Part Pourable Urethane Sealant: Type S, Grade P, Class 25, and complying with the following requirements for Uses:
  - 1. Uses T, M and, as applicable to joint substrates indicated, O.
  - 2. Products:
    - a. "Bostik 955-SL"; Bostik, Inc.
    - b. "Urexpan NR-201"; Pecora Corp.
    - c. "Sonolastic SL-1 "; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
    - d. "Sikaflex-1c SL"; Sika Corp.
    - e. ""Vulkem 45SSL"; Tremco Sealant/Weatherproofing Division of RPM International, Inc.

- 2.03 Solvent-Release-Curing Joint Sealants
  - A. Type 12 Acrylic Sealant: Manufacturer's standard one-part, non-sag, solventrelease curing, acrylic terpolymer sealant complying with ASTM C 920 for Type S; Grade NS; Uses NT, M, G, A, and, as applicable to joint substrates indicated, O; except for selected test properties which are revised as follows:
    - 1. Heat-Aged Hardness: 40-50
    - 2. Weight Loss: 5%
    - 3. Max. Cyclic Movement Capability: Plus or Minus 12-1/2%
    - 4. Products:
      - a. "PTI 738"; Protective Treatments Inc.
      - b. "PTI 767"; Protective Treatments Inc.
- 2.04 Latex Joint Sealants
  - A. Type 13 Acrylic-Emulsion Sealant: Manufacturer's standard, one part, non-sag, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior locations involving joint movement of not more than plus or minus 5 percent.
    - 1. Products:
      - a. "Chem-Calk 600"; Bostik Construction Products Div.
      - b. "AC-20 +Silicone"; Pecora Corp.
      - c. "Sonolac"; Sonneborn Building Products Div.; Rexnord Chemical Products, Inc.
  - B. Type 14 Silicone Emulsion Sealant: Manufacturer's standard one-part, non-sag, mildew-resistant, silicone-emulsion sealant complying with ASTM C 834 and ASTM C 920, formulated to be paintable and recommended for exposed applications on interior and on protected exterior locations involving joint movement of not more than plus or minus 12-1/2 percent.
    - 1. Products
      - a. "Performance Plus Silicone Sealant"; Dow Corning Corp.
- 2.05 Joint Sealants for Paving
  - A. Type 15 Two-Part Jet-Fuel-Resistant Cold-Applied Sealant: Manufacturer's standard, pourable, chemically curing, elastomeric sealant complying with FS SS-S-200 and of the following formulation for base polymer.
    - 1. Urethane formulation complying with FS TT-S-00227, with maximum movement capability of plus or minus 12-1/2 percent.
    - 2. Polymer formulation complying with ASTM C 920 for Type M, Grade P, Class 25, Uses T and O as applicable to joint substrates indicated.
    - 3. Coal-tar modified polymer formulation complying with ASTM C 920 for Type M, Grade P, Class 25, Uses T and O as applicable to joint substrates indicated.
    - 4. Bitumen-modified urethane formulation.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 JOINT SEALERS

- 5. Products:
  - a. "Gardox"; W.R. Meadows, Inc.
  - b. "Urexpan NR-300"; Pecora Corp.
  - c. "Sonomeric CT 2"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
  - d. "Sikaflex-2c SL"; Sika Corp.
- B. Type 16 One-Part Jet-Fuel-Resistant Cold-Applied Urethane Sealant: Manufacturer's standard, pourable, coal-tar modified urethane formulation complying with performance requirements of FS SS-S-200, Type H.
  - 1. Products:
    - a. "Sonomeric CT 1"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
    - b. "Sikaflex-1c SL"; Sika Corp.
- C. Type 17 One-Part Jet-Fuel-Resistant Silicone Sealant: Manufacturer's standard, pumpable, low-modulus non-acid-curing silicone sealant complying with ASTM C 920 for Type S; Grade NS; Class 25; Uses T, M and, as applicable to joint substrates of concrete highways and concrete runways of airports subject to jet fuel exposure, O; and complying with the following requirements:
  - 1. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:
    - a. 50 percent movement in extension of 50 percent movement in compression for a total of 100 percent movement.
  - 2. Accepted for use in concrete highway and airport runway joints per FAA Engineering Brief No. 36, May 21, 1986.
  - 3. Products:
    - a. "Dow Corning 888"; Dow Corning Corp.
    - b. "Sikasil-728 NS"; Sika Corp.
    - c. "301 NS"; Pecora Corp.

### 2.06 Butyl Joint Sealants

- A. Type 18 Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
  - 1. Applications: Use for:
    - a. Concealed sealant bead in sheet metal work.
    - b. Concealed sealant bead in siding overlaps.
  - 2. Products:
    - a. "SikaLastomer-511"; Sika Corp.
    - b. ""Butyl Sealant"; Tremco Sealant/Weatherproofing Division of RPM International, Inc.
    - c. "BA-98"; Pecora Corp.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

#### 2.07 Joint Sealant Backing

- A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing per ASTM C 1330.
- B. Plastic Foam Joint Fillers: Performed, compressible, resilient, non-waxing, nonextruding strips of flexible, non-gassing plastic foam of material indicated below; non-absorbent to water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
  - 1. Either open-cell polyurethane foam or closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filter materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

#### 2.08 Miscellaneous Materials

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate tests and field tests.
- B. Cleaners for Non-Porous Surfaces: Provide non-staining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent non-porous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
- C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surfaces adjacent to joints.
- 2.09 Joint Fillers for Concrete Paving

Provide joint fillers of thickness and widths indicated which are compatible with sealant system used.

### PART 3 - EXECUTION

#### 3.01 Examination

Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

### 3.02 Preparation

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements.
  - 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
  - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
  - 3. Remove laitance and form release agents from concrete.
  - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- B. Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on pre-construction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
  - 1. Prime all concrete, masonry, stone, and similar porous surfaces.
- C. Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.03 Installation of Joint Sealers

- A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C 804 for use of solvent-release-curing sealants.

- D. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.
- E. Install sealant backings to comply with the following requirements:
  - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
    - a. Do not leave gaps between ends of joint fillers.
    - b. Do not stretch, twist, puncture, or tear joint filters.
    - c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
  - 2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.
- F. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- G. Tooling of Non-Sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
  - 1. Provide concave joint configuration per Figure 6A in ASTM C 962, unless otherwise indicated.
  - 2. Provide flush joint configuration per Figure 6B in ASTM C 962 at horizontal joints.

### 3.04 Cleaning

Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.05 Protection

Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

## JOINT SEALER SCHEDULE

#### A. Exterior Joints

- 1. Vertical and Non-Traffic Horizontal Surfaces
- a. Sealants: Type 4 (Silicone) or Type 8 (Polyurethane)
- b. Applications:
  - i. Control & expansion joints in cast-in-place concrete
  - ii. Control & expansion joints in unit masonry
  - iii. Control & expansion joints in ceiling and overhead surfaces
  - iv. Joints between different surfaces listed above
- 2. Horizontal Traffic Surfaces
- a. Sealants: Type 9 (Polyurethane)
- b. Applications:
  - i. Control, expansion, and isolation joints in cast-in-place concrete slabs
- 3. Submerged Surfaces
  - a. Sealants: Type 8 (Polyurethane)
  - b. Applications:
    - i. Control & expansion joints in new and existing cast-in-place concrete
- 4. Other Exterior Surfaces
  - a. Sealants: Type 12 (Acrylic)
  - b. Applications:
    - ii. Perimeter Joints Around Door, Window, and Louver Frames
    - iii. Perimeter joints of exterior openings and other locations where indicated on the drawings not listed above
- 5. Sheet Metal and Siding
  - a. Sealants: Type 18 (Butyl)
  - b. Applications:
    - i. Concealed sealant bead in sheet metal work.
    - ii. Concealed sealant bead in siding overlaps.
- B. Interior Joints
  - 1. Vertical and Non-Traffic Horizontal Surfaces
    - a. Sealants: Type 5 or 6 (Silicone), Type 10 (Polyurethane), or Type 13 (Acrylicemulsion)
    - b. Applications:
      - i. Control and expansion joints on exposed interior surfaces of exterior walls
      - ii. Joints between tops of non-load bearing unit masonry walls and underside of cast-in-place concrete slabs and beams
      - iii. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions
      - iv. Joints on underside of precast concrete beams and panels

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 JOINT SEALERS

- v. Perimeter joints around interior side of window, door, and louver frames
- vi. Perimeter joints of exterior openings and other locations where indicated on the drawings not listed above
- vii. Joints where drywall meets other substrates and finish carpentry
- 2. Horizontal Traffic Surfaces
  - a. Sealants: Type 11 (Polyurethane)
  - b. Applications:
    - i. Control and expansion joints in cast-in-place concrete
- 3. Perimeter Joints of Restroom Fixtures
  - a. Sealant: Type 7 (Silicone)
- C. Water Immersion
  - 1. Sealants: Type 3 (Polysulfide)
  - 2. Applications:
    - a. Control and construction joints, interior side of tanks walls and slabs
    - b. Joints and gaps in weirs, baffles, and other submerged items
- D. Paving, Petroleum, and Solvents
  - 1. Sealants: Type 15 or 16 (Urethane) or Type 17 (Silicone)
  - 2. Applications:
    - a. Joints in concrete pavements
    - b. Joints between concrete and bituminous pavements
    - c. Joints between new and existing bituminous pavement
    - d. Joints susceptible to contact with petroleum, fuels, and solvents.
- E. Chlorine Environments
  - 1. Sealant: Type 1 (polysulfide)
  - 2. Applications:
    - a. Interior or exterior joints, vertical and horizontal, exposed to chlorine environments, airborne or submerged.

-END-

## **DIVISION 11 – EQUIPMENT**

### SECTION 11285 – SLIDE GATES

#### PART 1 - GENERAL

#### 1.01 Summary

- A. Section Includes: Furnish and install slide gates and appurtenances in accordance with the latest version of AWWA C561.
  - 1. Each unit shall be complete with gate, frame, rising stem, wall thimble and mounting hardware, electric motor actuator, and appurtenances. All components shall be furnished by one manufacturer.
- B. Codes, specifications, and standards referred to by number or title shall form a part of this specification to the extent required by the references thereto. Latest revisions apply.
- 1.02 Quality Control

Upon installation, manufacturer shall inspect the slide gate for mechanical and structural correctness and actuators for electrical correctness.

- 1.03 Performance
  - A. Leakage shall not exceed 0.05 U.S. gallons per minute per foot of seal periphery under the design seating and unseating heads.
- 1.04 Submittals
  - A. Submit the following for the Engineer's review and approval:
    - Shop drawings with performance data, descriptive literature, weights and dimensions, and other physical characteristics verifying compliance with this Section. When numerous options and sizes are shown, mark the shop drawings to clearly indicate the sizes and types specific to this Section and project;
    - 2. Complete calculations for each gate indicating the force required to operate the gate, the size of the operating stem and stem guide required for the gate when operated with an electric operator.
    - 3. Manufacturer's installation instructions and recommended testing procedures;
    - 4. Manufacturer's operation and maintenance (O&M) manuals and materials. When numerous types and sizes are shown, mark the manuals to clearly indicate the sizes and types specific to this project. Provide four (4) bound hard copy sets and two (2) CD's with complete electronic copy in pdf format.

### 1.05 Product Delivery, Storage, and Handling

A. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

### PART 2 - PRODUCTS

#### 2.01 Slide Gates

- A. Gate and Frame: Wrought 316L stainless-steel, vertically-mounted, rising stem, with the size, seating head, and unseating head as specified on the slide gate schedule in this Section. Slide gates frame configuration shall be of the flush-bottom type. Design gate, frame, and sealing for seating and unseating head conditions measured from the center of the gate, as noted in the schedule.
- B. Seals: Side seals shall be made of UHMWPE (ultra-high molecular weight polyethylene) of the self-adjusting type. A continuous compression cord shall ensure contact between the UHMWPE guide and the gate in all positions. The sealing system shall maintain efficient sealing in any position of the slide and let the water flow only in the open part of the gate. The bottom seal shall be made of resilient EPDM or virgin neoprene set into the bottom member of the frame and shall form a flush-bottom.
- C. Guides: The guides shall be of 316L stainless steel incorporating a one-piece frame with gussets to transfer the load from unseating head conditions. Sandwich type and two-piece, bolted guides are not acceptable. Equip the guides with a selfadjusting UHMWPE seal system. Provide upward opening gates with an EPDM flush bottom invert seal. Top seals shall be self-adjusting UHMWPE. The seal system shall be self-adjusting by means of a compression cord. Adjustable wedges and pressure pads are not acceptable. Rubber J-seals, P-seals or similar are not acceptable. Bolt all seals, including the invert seal, with stainless steel fasteners which can be field replaced without the need to remove the frame from the wall or remove concrete or grout. The guide slot shall accept the plate of the disc and the outermost portion of the vertical reinforcing ribs of the disc. The guides shall be designed for maximum rigidity, shall have a weight of not less than 13 pounds per foot for wall mounted gates and 6.5 pounds per foot for embedded and in-channel mounted gates, and shall be provided with holes for anchor bolts a minimum of every 18 inches. The portion of the frame, where the anchors penetrate, shall have a minimum thickness of 1/2 inch. Where the guides extend above the mounting surface, they shall be sufficiently strong so that no further reinforcing will be required. Guide extensions shall have a weight of not less than 6.5 pounds per foot and shall be constructed of C shaped or Z shaped plate for rigidity. Angles are not acceptable guide extensions.
  - The yoke to support the operating bench stand shall be formed by two C channels welded at the top of the guides to provide a one-piece rigid frame. Angles are not acceptable yoke members. The arrangement of the yoke shall be such that the disc and stem can be removed without disconnecting the yoke.

- 2. The disc or sliding member shall be 316L stainless steel and consist of a flat plate reinforced with formed plates or structural members to limit deflection to 1/720 of the gate's span under the design head.
- 3. The portion of the disc that engages the frame shall have a minimum thickness of 1/2 inch.
- 4. All parts of the gate shall have a minimum thickness of 1/4 inch.
- 5. All necessary attaching bolts and anchor bolts shall be 316 stainless steel and shall be furnished by the slide gate manufacturer. Anchor bolts shall have a minimum diameter of 1-1/2 inches.
- D. Operating Stem
  - 1. The operating stem shall be Type 316 stainless steel designed to have an L/r of less than 200, and be designed to transmit in compression at least two times the rated output of the operating manual mechanism with a 40 lbs. effort on the crank or hand wheel. Where a motor operator is used, the stem design force shall not be less than 1.25 times the output thrust of the motor in the stalled condition.
  - 2. The stem shall have a minimum diameter of 1-1/2 inches. The threaded portion shall have machine rolled, full depth Acme threads with a 16 microinch finish or better.
  - 3. Stem guides shall be constructed of 316L stainless steel and shall be outfitted with adjustable UHMWPE bushings.
  - 4. Provide bronze stop collars on gates with manual actuators. Stop collars shall be internally threaded and mounted on the stem, secured by a stainless steel set screw.
  - 5. Provide a clear butyrate or lexan weather-proof stem cover with position indication. Provide vent holes to prevent condensation.
  - 6. Provide lubrication fittings for all bearings.
  - 7. Provide gates having a width of 48 inches or greater and equal to or greater than two times the gate height with two lifting mechanisms connected by a tandem shaft. The tandem shaft shall be 316 stainless steel. Aluminum shafts are not acceptable.
  - 8. Stems in more than one piece and a diameter equal to or greater than 1 <sup>3</sup>/<sub>4</sub> inches are to be joined together by solid bronze or stainless steel couplings. Pin stems with a diameter smaller than 1<sup>3</sup>/<sub>4</sub> inches to an extension tube.
- E. Wall Thimbles: Provide wall thimbles made of wrought stainless steel by the gate manufacturer. The wall thimble shall provide a rigid mounting designed to prevent warping of the gate frame. The front or mounting flange shall be machined and be drilled and tapped to the same template used for its gate frame. A waterstop ring shall be cast on the periphem of the wall thimble.
- F. All assembly bolts, studs, nuts, and anchor bolts shall be of such size and spacing as required to provide for the design forces with a safety factor of 5.
- G. Stems and Stem Couplings: Design the operating stems for electric motor driven lifts. The stem design force shall not be less than 1.25 times the output thrust of

the unit in the stalled motor condition. For modulating service, provide a hoist having a cast nylon operative nut and a polished stainless steel stem.

- 1. Machine cut or roll the threads of the stem, which shall be square or Acme type. The number of threads per inch shall be such as to work most effectively with the lift mechanism used.
- 2. Where stems are furnished in more than one piece, join the different sections together by solid couplings. The couplings shall be threaded and keyed or threaded and bolted, and shall be of greater strength than the stem.
- 3. Bracket and floor mounted stem guides (including both the guide housing and the bracket) shall be so constructed that when properly spaced they will hold the stem in alignment and yet allow it enough play to permit easy operation. The inside diameter of the guide shall not be greater than 1/8 inch larger than the outside diameter of the stem. The guides shall be spaced in accordance with the manufacturer's recommendations for each stem size. The L/r ratio shall not be greater than 200. The guides shall be adjustable with respect to the bracket to provide proper concentric alignment with the stem, and shall be so designed that alignment will be maintained after adjustment. The guides shall be lined and provisions shall be made to hold the lining in place. Brackets shall be attached to the wall by sufficient anchor bolts to prevent twisting or sagging under load.
- H. Stem Covers
  - 1. Provide rising stem gates with clear plastic stem covers to provide indication of gate position, permit inspection of the stem threads, and to protect the stem from contamination. The stem cover shall be constructed of clear rigid plastic. Vent holes drilled into the stem cover for condensation prevention shall be of adequate size and at proper angle to prevent rainwater from entering the tube.
- I. Modulating Gates
  - 1. In addition to the requirements above, slide gates indicated in the gate schedule as modulating shall also meet the requirements below:
    - a. The recess in the back of the disc shall be filled to minimize the clearance between the seat facing and the steel. Provide replaceable tongue covers and guide liners to reduce the clearance. For gates with an excess of 20foot seating head, the bottom rib shall be of the bull-nose type. Polish stem threads to the method ME standard or better.
- J. Slide gate manufacturers:
  - 1. Rodney Hunt Company,
  - 2. Waterman Industries,
  - 3. R.W. Gate
  - 4. Or Engineer-approved equal.

### PART 3 - EXECUTION

### 3.01 Installation

- A. Install gates in accordance with manufacturer's recommendations and as specified herein.
- B. Cover or protect gate surfaces during construction from concrete spillage, paint, oil, and debris. Correct any damage that occurs to the gate in storage or handling prior to installation of the gate or operation and testing of the gate.
- C. Permanently glued together stem cover that consists of more than one section. After installation, properly seal the stem cover to prevent rainwater from entering the electrical actuator.
- D. Gates shall operate smoothly, not binding while operating in either direction. Leakage on gates shall meet the requirements of AWWA C-561 after installation. Adjust, remove, reinstall, or replace gates until leakage is within allowable limits.

### 3.02 Warranty

Guarantee the equipment to be free from defective material and workmanship for a period of two years from the date of acceptance of the equipment by the Owner. Replace any defective materials, components, or workmanship during this time, including but not limited to all materials, labor, shipping, and transportation, at no additional cost to the Owner. Any repair work performed during this two-year period shall also be guaranteed to be free from defective material or workmanship for a period of one year from the date the work is complete and shall be addressed in the same manner at no additional cost to the Owner.

### 3.03 Cleaning

Clean excess grease, oil, or any other debris from exterior surfaces of the gates.

### 3.04 Acceptance of Equipment

A. Refer to Section 01650 for acceptance of equipment by the Owner.

## SLIDE GATE SCHEDULE

DESIGNATION	LOCATION	DESCRIPTION	OPERATING CONDITIONS	SPECIFICATIONS	OPERATION
SLG-SCJC-1	Seerley Creek Junction Chamber/Lower Plan	From SCJC to SCWST	Seating Head: 10.1 Unseating Head: 10.1	Size: 6' x 6' Type: Non Self-Contained Wall Mounted	Automated
SLG-SCJC-2	Seerley Creek Junction Chamber/Lower Plan	From SCJC to Hanna	Seating Head: 10.1 Unseating Head: 10.1	Size: 6.5' x 6.5' Type: Non Self-Contained Wall Mounted	Automated
SLG-SCJC-3	Seerley Creek Junction Chamber/Lower Plan	Discharge to Seerley Creek	Seating Head: 9.1 Unseating Head: N/A	Size: 8' x 8' Type: Self-Contained Wall Mounted	Automated (Modulating)
SLG-SCEPS-1	Seerley Creek Junction Chamber/Lower Plan	From SCWST to SCEPS	Seating Head: 20.1 Unseating Head: 20.1	Size: 2' x 2' Type: Non Self-Contained Thimble: Circular 24" Dia MJ	Automated
SLG-SCEPS-2	Seerley Creek Junction Chamber/Lower Plan	From SCEPS to Hanna	Seating Head: 23.1 Unseating Head: 18.1	Size: 1.5' x 1.5' Type: Non Self-Contained Thimble: Circular 18" Dia MJ	Automated
SLG-SCJST-1	Seerley Creek Junction Chamber/Lower Plan	SCWST to Hanna	Seating Head: 18.0 Unseating Head: 16.0	Size: 3' x 3' Type: Non Self-Contained Thimble: Circular 36" Dia MJ	Automated
SLG-HNFCC-1	Hanna North Structure/Lower Plan	From MFSPS to HHCST Chamber	Seating Head: 26.1 Unseating Head: 24.1	Size: 3' x 3' Type: Non Self-Contained Thimble: F	Automated
SLG-HNFCC-2	Hanna North Structure/Lower Plan	From WSPS to HHCST Chamber	Seating Head: 26.1 Unseating Head: 24.1	Size: 3' x 3' Type: Non Self-Contained Thimble: F	Automated

11285-6

SLG-HNFCC - 3	Hanna North Structure/Lower Plan	To Future HHCST	Seating Head: 27.0 Unseating Head: N/A	Size: 2' x 2' Type: Non Self-Contained Thimble: Circular 24" Dia MJ	Automated
SLG-HNFCC-4	Hanna North Structure/Lower Plan	From HHCST Chamber to HSPS Wet Well	Seating Head: 27.1 Unseating Head: 25.1	Size: 3' x 3' Type: Non Self-Contained Thimble: F	Automated
SLG-HNIC-1	Hanna North Structure/Lower Plan	From SCJC	Seating Head: 30.1 Unseating Head: N/A	Size: 6.5' x 6.5' Type: Non Self-Contained Thimble: E, Special	Automated
SLG-HNIC-2	Hanna North Structure/Lower Plan	From HSPS to HWSB	Seating Head: 30.0 Unseating Head: 30.0	Size: 7' x 7' Type: Non Self-Contained Thimble: F	Automated
SLG-HNIC-3	Hanna North Structure/Lower Plan	From HSPS to HESPS	Seating Head: 30.0 Unseating Head: 30.0	Size: 7' x 7' Type: Non Self-Contained Thimble: F	Automated
SLG-HNIC-4	Hanna North Structure/Lower Plan	From HSPS to HNSB	Seating Head: 31.1 Unseating Head: 31.1	Size: 5' x 5' Type: Non Self-Contained Thimble: F	Automated
SLG-HNDPS-1	Hanna North Structure/Lower Plan	From HWSB to HNDPS	Seating Head: 37.1 Unseating Head: 37.1	Size: 2' x 2' Type: Non Self-Contained Thimble: Circular 24" Dia MJ	Automated
SLG-HNDPS-2	Hanna North Structure/Lower Plan	From HESB to HNDPS	Seating Head: 37.1 Unseating Head: 37.1	Size: 2' x 2' Type: Non Self-Contained Thimble: Circular 24" Dia MJ	Automated
SLG-HNFCC-5	Hanna North Structure/Middle Plan	Influent Trough to HWSB	Seating Head: 12.1 Unseating Head: 6.1	Size: 3' x 3' Type: Non Self-Contained Thimble: Circular 36" Dia MJ	Automated
SLG-HNFCC-6	Hanna North Structure/Middle Plan	Influent Trough to HSPS	Seating Head: 12.1 Unseating Head: 6.1	Size: 3' x 3' Type: Non Self-Contained Wall Mounted	Automated
SLG-HNDC-1	Hanna North Structure/Middle Plan	HNDC to HWSB	Seating Head: 17.1 Unseating Head: 11.1	Size: 5' x 5' Type: Non Self-Contained Thimble: F	Automated
SLG-HNDC-2	Hanna North Structure/Middle Plan	HNDC to HESB	Seating Head: 17.1 Unseating Head: 11.1	Size: 5' x 5' Type: Non Self-Contained Thimble: F	Automated

SLIDE GATES

SLG-HNDC-3	Hanna North Structure/Middle Plan	HNDC to HNSB	Seating Head: 21.1 Unseating Head: 15.1	Size: 4' x 4' Type: Non Self Contained Thimble: Circular 48" Dia MJ	Automated
SLG-HSDPS-1	Hanna South Structure/Lower Plan	From HWSB to HSDPS	Seating Head: 34.1 Unseating Head: 34.1	Size: 3' x 3' Type: Non Self-Contained Thimble: F	Automated
SLG-HSDPS-2	Hanna South Structure/Lower Plan	From HESB to HSDPS	Seating Head: 34.1 Unseating Head: 34.1	Size: 3' x 3' Type: Non Self-Contained Thimble: F	Automated

-END-

## SECTION 11303 – STORMWATER TREATMENT DEVICE

### PART 1 - GENERAL

### 1.01 Summary

- A. Section Includes: Provide all labor, equipment, and materials necessary to install the stormwater treatment device and appurtenances complete and operable.
- **B.** Related Sections
  - 1. Section 02140 Dewatering
- 1.02 System Description
  - A. Design and Performance Requirements
    - The stormwater treatment device (SWTD) shall meet the requirements of this Section and the City of Indianapolis Stormwater Design and Construction Specifications. Units must be identified in Table 1 of the City of Indianapolis Stormwater Quality Unit Selection Guide or approved according to the City of Indianapolis Manufactured Stormwater Quality Treatment System Evaluation Criteria.
    - 2. The SWTD shall be capable of achieving an 80% average annual reduction of TSS or an 80% reduction of TSS based on a treatment flow rate of 60.6 cfs.
    - 3. Manufacturer shall furnish documentation which supports product performance claims and features, storage capacities, and maintenance requirements.
    - 4. The SWTD shall be completely housed within one structure.
- 1.03 The manufacturer of the SWTD shall be regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production. The SWTD(s) shall be:
  - A. Vortechs® device manufactured by:

Contech Engineered Solutions LLC 9025 Centre Pointe Drive West Chester, OH, 45069 Tel: 1 800 338 1122

- B. Or approved equal
- 1.04 All components shall be subject to inspection by the Engineer at the place of manufacture or installation. All components are subject to being rejected or identified

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

for repair if the quality of materials and manufacturing do not comply with the requirements of this specification.

- 1.05 Submittals
  - A. Furnish site-specific structural design drawings certified by a Professional Engineer registered in the State of Indiana.
  - B. Furnish shop drawings showing assembly details and installation instructions as provided by the Manufacturer. Shop drawings shall be annotated to indicate all materials to be used and all applicable standards for materials, required tests of materials and design assumptions for structural analysis. Shop drawings shall be prepared at a scale of not less than 3/16-inches per foot (1:75).
  - C. Submit to the Engineer of Record a "Manufacturer's Performance Certification" certifying that each SWTD is capable of achieving the specified removal efficiencies listed in these specifications. The certification shall be supported by independent third-party research.
- 1.06 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer. Submissions for substitutions require review and approval by the Engineer, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the City of Indianapolis.
- 1.07 Warranty
  - A. Manufacturer shall guarantee the SWTD components against all manufacturer defects in materials or workmanship for a period of twelve (12) months from the date the SWTD is put into operation. The manufacturer shall upon its determination repair, correct, or replace any manufacturer defects within the referenced warranty period.

### PART 2 - PRODUCTS

- 2.01 Each SWTD shall include a circular aluminum "swirl chamber" (or "grit chamber") with a tangential inlet to induce a swirling flow pattern that will accumulate and store settleable solids in a manner and a location that will prevent re-suspension of previously captured particulates.
- 2.02 Housing unit of SWTD shall be constructed of pre-cast or cast-in-place concrete. Concrete for precast SWTD shall conform to ASTM C 857 and C 858 and meet the following additional requirements:
  - A. The wall thickness shall not be less than 6 inches (152 mm) or as shown on the Drawings. In all cases the wall thickness shall be no less than the minimum thickness necessary to sustain HS20-44 (MS18) loading requirements as determined by a Licensed Professional Engineer.

- B. Sections shall have tongue and groove or ship-lap joints with a butyl mastic sealant conforming to ASTM C 990.
- C. Cement shall be Type II Portland cement conforming to ASTM C 150.
- D. All sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi (28 MPa) or until 5 days after fabrication and/or repair, whichever is the longer.
- E. Pipe openings shall be sized to accept pipes of the specified size(s) and material(s), and shall be sealed by the Contractor with a hydraulic cement conforming to ASTM C 595M.
- F. Brick or masonry used to build the manhole frame to grade shall conform to ASTM C 32 or ASTM C 139 and shall be installed in conformance with all local requirements.
- G. Casting for manhole frames and covers shall be in accordance with ASTM A48, CL.35B and AASHTO M105.

### 2.03 Internal Components:

- A. Internal aluminum plate components shall be aluminum alloy 5052-H32 in accordance with ASTM B 209.
- B. Sealant to be utilized at the base of the swirl chamber shall be 60 durometer extruded nitrile butadiene rubber (buna n) and shall be provided to the concrete precaster for installation.

## PART 3 - EXECUTION

- 3.01 Place the base unit on six inches of compacted Class I aggregate. Check the granular subbase for level prior to setting the base section. The trap shall be checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5%, remove the base section and re-level the aggregate subbase material.
- 3.02 Prior to setting subsequent sections place bitumen sealant in conformance with ASTM C 990-91 along the construction joint in the section already in place.
- 3.03 After setting the base and wall or riser sections, prepare to install the swirl chamber (if not installed prior to delivery).
  - A. Place the butyl mastic sealant vertically on the outside of the swirl chamber starting one inch above the bottom of the swirl chamber and continuing to a height equal to the elevation of the bottom of the upper aperture of the swirl chamber. The butyl mastic sealant should abut the downstream side of the pre-drilled mounting holes that attach the swirl chamber to the long walls of the concrete vault.

- B. Next, install the extruded Buna N seal on the bottom edge of the 180-degree downstream section of the swirl chamber by first applying a bead of Sikaflex-1a polyurethane elastomeric sealant into the extruded slot then slide the seal onto the swirl chamber. The extruded seal should extend 3 inches upstream of the mounting holes, toward the inlet end of the vault.
- C. Set the swirl chamber into position and keep the seal approximately ½-inch above the floor of the concrete vault. Apply a continuous bead of Sikaflex-1a sealant under the cupped bottom of the seal.
- D. Set the circular swirl chamber on the floor of the vault and anchor it by bolting the swirl chamber to the side walls of the concrete vault at the three (3) tangent points and at the inlet tab using HILTI brand stainless steel drop-in wedge anchors or equivalent 3/8-inch diameter by 2-3/4 inch minimum length at heights of approximately three (3) inches off the floor and at fifteen (15) inch intervals to approximately the same height of the butyl mastic sealant (at locations of pre-drilled holes in aluminum components). Apply a continuous bead of Sikaflex-1a sealant to the intersection of the inside bottom edge of the extruded seal and the vault floor.
- 3.04 If the oil baffle wall (Baffle A) and flow control wall (Baffle B) are not integrally cast-in to riser/wall sections, then the Baffle wall panels shall be placed in the formed keyways or between bolted-in-place angle flanges as provided by the manufacturer. Apply non-shrink grout or Sikaflex-1a sealant to each end of Baffle A and Baffle B at the upstream intersection with the side walls of the concrete vault.
- 3.05 Prior to setting the precast roof section, place bitumen sealant equal to ASTM C 990 along the top of the oil baffle wall (Baffle A), using more than one layer of mastic if necessary, to a thickness at least 1-inch greater than the nominal gap between the top of the baffle and the roof section. The nominal gap shall be determined either by field measurement or the shop drawings. Do not seal the top of Baffle B unless specified on the shop drawings to do so. After placement of the roof section has compressed the butyl mastic sealant in the gap over Baffle A, finish sealing the gap with an approved non-shrink grout on both sides of the gap using the butyl mastic as a backing material to which to apply the grout. If roof section is "clamshell" or "bathtub" halves, then finish sealing the ends of the Baffle Walls by applying non-shrink grout or Sikaflex-1a sealant to each end of Baffle A at the upstream intersection with the side walls of the concrete vault and to each end of Baffle B at the downstream intersection with the side walls of the concrete vault.
- 3.06 After setting the precast roof section of the stormwater treatment system, set precast concrete manhole riser sections, to the height required to bring the cast iron manhole covers to grade, so that the sections are vertical and in true alignment with a ¼-inch maximum tolerance allowed. Backfill in a careful manner, bringing the fill up in 6-inch lifts on all sides. If leaks appear, clean the inside joints and caulk with lead wool to the satisfaction of the Engineer. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of SWTDs shall conform to ASTM specification C 891 "Standard Practice for Installation of Underground Precast Utility Structures".

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

Holes made in the concrete sections for handling or other purposes shall be plugged with a nonshrink grout or by using grout in combination with concrete plugs. Where holes must be cut in the precast sections to accommodate pipes, do all cutting before setting the sections in place to prevent any subsequent jarring which may loosen the mortar joints. The Contractor shall make all pipe connections.

-END-

### **DIVISION 15 - MECHANICAL**

### SECTION 15010 - GENERAL PROVISIONS

#### PART 1 - GENERAL

- 1.01 Codes and Standards
  - A. All mechanical work installed under this contract shall conform to current codes and standards and all applicable requirements of Federal, State, and Local Authorities having jurisdiction, including OSHA standards.
  - B. Obtain all licenses, permits, etc., as required and bear complete cost of same. All materials shall be manufactured and tested in accordance with latest editions of U.L., ANSI and respective Association Standards. U.L. labeling shall be provided where specified for specific items.
  - C. Owner's Requirements, or Regulations, pertaining to safety, fire, conduct, parking, sanitary conditions, smoking, etc., shall be strictly adhered to by all Contractors and their employees and Subcontractors on the job.
- 1.02 Mechanical Reference Symbols and Details
  - A. Standard Details are typical and as such are subject to minor variations to suit specific job conditions.
- 1.03 Delivering and Storing
  - A. Deliver mechanical system accessories, small unmarked parts, adhesives, mechanical items to site in manufacturer's original unopened, labeled containers.
  - B. Store materials and equipment to prevent damage and injury. Store ferrous materials to prevent rusting. Store equipment to prevent staining and discoloring.

#### PART 2 - PRODUCTS

- 2.01 All materials shall be new unless use of an existing item is indicated on Drawings or approved in writing by Engineer.
- 2.02 Materials shall be best grade of each representative type, and of domestic manufacture.
- 2.03 All pipe, fittings, and valves shall be, as a minimum, of service class suitable for working and test pressure for which they will be used, rated for respective media handled and shall comply with applicable code requirements.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO.199017.04.101 GENERAL PROVISIONS

### PART 3 - EXECUTION

### 3.01 Notifications

- A. Notify of installation requirements and schedule of trades that may have work to be connected to mechanical system and trades that may do preparatory work for mechanical system.
- B. Inform Engineer of installing schedule to allow sufficient time for inspecting without delaying work.
- C. Coordinate work to avoid cutting work in place and to avoid interference with other work.
- D. Provide personnel doing mechanical work that are knowledgeable in the requirements of applicable specifications and codes.

#### 3.02 Protection

- A. Handle Mechanical Systems items to avoid injury to persons and to avoid damage to materials or to work in place. Satisfactorily repair or remove and replace work that has been damaged.
- B. Plug or cap pipes and fittings, when not in use, to prevent entrance of extraneous material. Cover or encase equipment and finished materials to prevent soiling, staining or damage.
- C. Cover trenches and holes when not in use.

#### 3.03 Design Drawings

- A. Design Drawings are diagrammatic and indicate relation of piping, connections and equipment. Do not deviate from basic requirements of Drawing without prior approval from Engineer.
- B. Make accurate measurements to prevent misfitting of work.

#### 3.04 Installation

- A. All installation of mechanical systems shall be accomplished by mechanics thoroughly skilled in trades involved.
- B. The use of equipment requiring different connections or being of a shape or size other than that shown on the Drawings or specified herein shall not constitute sufficient grounds for additional claims. It shall be the sole responsibility of the Contractor to familiarize himself with the additional and/or varying requirements of the equipment he proposes to use and to include all additional costs in his bid.

# 3.05 Cleaning Up

A. The Contractor shall at all times keep the premises free from accumulations of waste materials, or rubbish caused by his operations. At the completion of his work, he shall leave the job site in a clean condition.

-END-

GENERAL PROVISIONS

## SECTION 15060 - PROCESS AND YARD PIPING

PART 1 - GENERAL

#### 1.01 Summary

- A. Section Includes
  - 1. Ductile iron pipe, fittings and appurtenances required in pump stations, junction chambers and associated yard piping.
  - 2. All pipe, fittings and references to pipe diameter on the Drawings or in the Specifications are intended to be nominal size or diameter and shall be interpreted as such.
  - 3. Ductile iron pipe option for force mains are NOT part of this Section. Refer to Section 02730 for force main specifications.
- B. Related Sections
  - 1. Section 02220 Trenching Backfilling & Compaction for Utilities
  - 2. Section 15080 Valves

### 1.02 References

- A. Reference standards for this Section include the following.
  - 1. ANSI B1.20.1 Pipe Threads, General Purpose
  - 2. ASTM A536 Ductile Iron Castings
  - 3. ASTM A746 Ductile Iron Gravity Sewer Pipe
  - 4. ASTM B16.1 Cast Iron Pipe Flanges and Flanged Fittings
  - 5. ASTM B16.3 Malleable Iron Threaded Fittings
  - 6. AWWA C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
  - 7. AWWA C110 Ductile-Iron and Gray-Iron Fittings
  - 8. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
  - 9. AWWA C115 Flanged Ductile-Iron Pipe with Ductile-Iron or Grey-Iron Threaded Flanges
  - 10. AWWA C150 Thickness Design of Ductile Iron Pipe
  - 11. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast
  - 12. AWWA C153– Ductile Iron Compact Fittings for Water Service
  - 13. AWWA C600 Installation of Ductile-Iron Mains and Their Appurtenances

### 1.03 Submittals

A. Provide the following:

- 1. Manufacturer's Certificate of Compliance with the applicable specifications and standards.
- 2. Certified copies of test reports of factory tests required by the applicable standards.
- 3. Dimensioned layouts of piping and valves

STORMWATER & DEICING CAPACITY PROJECT I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 4. Shop drawings with performance data and physical characteristics for:
  - a. Pipe
  - b. Fittings
  - c. Gaskets
  - d. Joint restraints
  - e. Adaptors
  - f. Other related items and appurtenances
- B. Test Results
  - 1. Hydrostatic test
  - 2. Continuity test (for Tracer Wire)
- 1.04 Quality Control
  - A. Provide pipe and fittings marked in accordance with the applicable standard.
  - B. Perform factory and field tests in accordance with the applicable specification or standard.
- 1.05 Delivery, Storage and Handling
  - A. Load and unload all pipe, fittings and appurtenances by hoists or skidding, and do not drop, skid or roll products. Pad slings, hooks and pipe tongs, and use in such a manner to prevent damage to the products
  - B. Keep stored products safe from damage or deterioration Keep the interior of pipe, fittings and appurtenances free from dirt or foreign matter. Store gaskets, plastic pipe and fittings, and other products, which deteriorate by sunlight, in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products
  - C. Do not stack ductile iron pipe higher than the manufacturer's recommendations. Do not stack fittings.
  - D. Promptly remove damaged products from the job site and replace with undamaged products at no cost to the owner.
- 1.06 Warranty
  - A. Locate and repair leaks on all pipe installed that occur within the 1-year warranty period at no cost to the Owner.
- PART 2 PRODUCTS
- 2.01 Exposed Ductile Iron Pipe and Fittings
  - A. All pipe, fittings and appurtenances shall be new and unused unless otherwise indicated.

- B. Manufacturers
  - 1. Ductile Iron Pipe and Fittings
    - a. American Pipe
    - b. U.S. Pipe
  - 2. Flange Gaskets
    - a. American
    - b. U.S. Pipe Flange-Tyte
  - 3. Sleeve-type Couplings
    - a. 12 inches and smaller
      - 1) Dresser Industries, Style 153
      - 2) Smith-Blair, Type 441 Omni Coupling System
    - b. Larger than 12 inches
      - 1) Dresser Industries, Style 38
      - 2) Smith-Blair, Type 411
  - 4. Flexible Couplings
    - a. The Metraflex Company, Metrasphere Style R
  - 5. Pipe Support Stands
    - a. Model B3088ST, Cooper B-Line
    - b. Fig 316T, Tolco
  - 6. Pipe Support Saddles
    - a. Model B3093, Cooper B-Line
    - b. Fig 317A, Tolco
  - 7. Pipe Support Saddles with Yokes
    - a. Model B3092, Cooper B-Line
    - b. Fig 318A, Tolco
  - 8. Pipe Flange Supports
    - a. Fig 314, Tolco
- C. Ductile Iron Pipe and Fittings
  - 1. Pipe
    - a. Provide pipe centrifugally cast in metal or sand-lined molds conforming to AWWA C151.
    - b. Mark each length of pipe with the manufacturer's name or trade mark, pipe class, year of manufacture, and the AWWA Standard that it conforms to.
    - c. Minimum rated working pressure
      - 1) 350 psi for 12-inch diameter and smaller pipe
      - 2) 250 psi for 14-inch diameter and larger pipe
  - 2. Ductile Iron Fittings
    - a. Provide fittings with flange joints meeting the requirements of AWWA C110.
    - b. Design and manufacture flange joints for a minimum pressure rating of 150 psi.
  - 3. Pipe Joints
    - a. Provide screwed on DI flanged joints conforming to AWWA C115.
    - b. Use Thickness Class 53 ductile iron pipe when threaded flanges are required. Field made flanges are not allowed unless approved in writing by Engineer.

STORMWATER & DEICING CAPACITY PROJECT I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 4. Flanged Joint Adapters
  - a. The use of flange adapters and union flanges, such as Mega-Flange and Uni-Flange, shall not be allowed unless absolutely necessary to make a connection in the opinion of the Engineer. The use of adapters will be strictly limited and will be reviewed by the Engineer on a case-by-case basis.
  - b. If allowed, provide flanged joint adapters with restrained joints designed for a pressure rating of 150 psi.
- 5. Gaskets
  - a. Provide gaskets conforming to AWWA C111.
  - b. Full face bulb-type black SBR rubber
  - c. Thickness: not less than 1/8-inch.
- 6. Sleeve Couplings
  - a. 8-inch diameter and smaller pipes: Provide sleeve couplings with lengths of at least 5 inches fabricated out of 1/4-inch thick steel.
  - b. 10-inch diameter and larger pipes: Provide sleeve couplings with lengths of at least 7 inches fabricated out of 3/8-inch thick steel.
  - c. Provide harnessed or restrained sleeve coupling.
- 7. Flexible Couplings
  - a. Provide molded flexible couplings of the spherical type constructed out of Neoprene with internal steel wire, molded within the raised face ends that are rated for 225 psi at 240°F, with a minimum safety factor of 4 to 1.
  - b. Supply the couplings with one-piece, free-floating, class 150 galvanized plate steel type flanges with drilled holes.
- 8. Nuts and Bolts
  - a. Use low-carbon steel hex-head bolts and hexagon nuts conforming to ASTM A307, Grade B, chemical and mechanical requirements.
- 9. Interior Coatings
  - a. Coat the interior surfaces of exposed ductile iron pipe, fittings, and adaptors with a cement mortar lining and bituminous seal coat. conforming to AWWA C104.
- 10. Exterior Coatings
  - a. Coat the exterior surfaces of exposed ductile iron pipe, fittings and adaptors as follows. Apply finish coats after installation.
  - b. Surface preparation
    - 1) Non-Submerged Service Commercial blast cleaning per SSPC-SP 6
    - 2) Submerged Service Commercial blast cleaning per SSPC-SP 10
  - c. Prime Coat (Shop Coated or Field Coated): Organic Zinc-Rich Primer, 1 coat, 3.0-4.0 mils DFT
    - 1) Carboline: Carbozinc 859
    - 2) Sherwin Williams: Corothane I GalvePac, B65 Series
  - d. Finish Coats: Epoxy, 2 coats, 4.0-6.0 mils DFT per coat
    - 1) Carboline: Carboguard 60
    - 2) Sherwin Williams: Macropoxy 646, B58 Series
    - 3) Minimum of 3 coats and a minimum total finished DMT of 11.0

- D. Wall Pipe and Wall Sleeves Wall pipe refers to wall castings which convey fluid or air as part of the piping system, as opposed to wall sleeves which serve as a casing pipe in which another pipe is inserted.
  - 1. Provide DI wall pipe meeting AWWA standards and this Section for DI process piping in submerged applications. The type of joint varies depending upon the joint of the connecting pipe. Provide waterstops for wall pipe installed in a submerged application.
  - 2. Provide waterstops for wall sleeves in a submerged application of plain-end DI pipe. Seal the pipe inserted through the wall sleeve watertight with Link-Seal and non-shrink grout or other method approved by the Engineer.
  - 3. Provide ductile iron or carbon steel wall sleeves for non-ductile iron piping for interior wall penetrations in new concrete structures. Coat carbon steel sleeves prior to installation. Provide a watertight seal of the inserted pipe unless otherwise indicated by the Engineer.

## E. Couplings

- 1. Provide expansion couplings composed of two steel follower flanges, one steel middle ring, two molded rubber gaskets and sufficient rolled thread, track headed bolts to properly compress the gaskets.
- 2. Exposed rubber expansion joints for spool-type applications shall be single-arch type with standard 125 lb. drilled flanges integral to the body and drilled to conform to the bolt holes of the connecting piping.
  - a. Tube and cover: constructed from synthetic rubber, with the tube being seamless from the outside edges of flange to flange.
  - b. Carcass: constructed of reinforced fabric of high-strength synthetic fibers.
  - c. Capable of operating temperatures up to 250 degrees Fahrenheit and pressures of 130 psi.
- 2.02 Buried Yard Piping and Fittings
  - A. All pipe, fittings and appurtenances shall be new and unused unless otherwise indicated.
  - B. Manufacturers
    - 1. Ductile Iron Pipe and Fittings
      - a. U.S. Pipe Tyton Joint pipe
      - b. American Pipe Fastite Joint pipe
    - 2. Gaskets
      - a. American
      - b. U.S. Pipe
    - 3. Fitting Restraints
      - a. Series 1100 Megalug by EBAA Iron for DI pipe (3- to 48-inch diameter)
      - b. JCM 610 Sur-Grip Restrainer by JCM for DI (4- to 12-inch diameter)
      - c. Ford Meter Box Uni-Flange Series 1400 Restrainer for DI pipe (3- to 36-inch diameter)

STORMWATER & DEICING CAPACITY PROJECT I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 4. Pipe Joint Restraints
  - a. Series 1700 Megalug Restraint Harness by EBAA Iron for DI pipe (4- to 48-inch diameter)
  - b. Field Lok 350 Gaskets by U.S. Pipe & Foundry Company for DI pipe (4- to 24-inch diameter)
  - c. Flex-Ring Joint System by American Ductile Iron Pipe for D.I. pipe (14- to 48-inch diameter)
  - d. Grip Ring Series 600 Pipe Restraining System manufactured by ROMAC Industries, Inc. for DI pipe (4- to 12-inch diameter)
  - e. Ford Meter Box Uni-Flange Series 1390 Joint Restrainer for DI pipe (black body) (4- to 16-inch diameter)
- C. Ductile Iron Pipe and Fittings
  - 1. Provide DI pipe and fittings in conformance with the requirements of AWWA C151 and ASTM A746.
  - 2. Mark each length of pipe with the manufacturer's name or trade mark, pipe class, year of manufacture, and the AWWA Standard that it conforms to.
  - 3. Minimum rated working pressure
    - a. 350 psi for 12-inch diameter and smaller pipe
    - b. 250 psi for 18-inch diameter pipe
    - c. 350 psi for 24-inch and 48-inch diameter pipe to be provided due to the depth of bury. See the Drawing details for bedding and backfill requirements.
  - 4. Exterior Coating Provide pipe and fittings with bituminous-coated exterior complying with AWWA C151 and AWWA C110.
  - 5. Interior Linings
    - a. For pipes and fittings 24-inch in diameter and smaller, provide with interior cement mortar lining and a bituminous seal coat meeting the requirements of AWWA C104.
    - b. For pipes and fittings 48-inch in diameter provide with a flexible lining in accordance with ASTM A746.
  - 6. Pipe Joints
    - a. Provide push-on type joints with gaskets conforming to AWWA C111.
    - b. Use restrained joints (RJ) instead of thrust blocking where shown on Drawings.
  - 7. Fittings
    - a. Provide mechanical joint ductile iron fittings conforming to AWWA C153 and AWWA C110.
    - b. Design and manufacture fittings for a minimum pressure rating of 150 psi.
  - 8. Nuts and Bolts Furnish high strength, heat treated cast iron nuts and bolts which conform to AWWA C111. Nuts shall be hexagon and bolts shall be tee head.
# PART 3 - EXECUTION

#### 3.01 Examination

- A. The quality of materials and finished products are subject to inspection and approval by the Engineer. Inspection may be made at the place of manufacture, after delivery to the site, or both. The products are subject to rejection for failure to meet the specifications' requirements, even though sample products may have been previously accepted as satisfactory at the place of manufacture.
- B. Prior to being installed, inspect each pipe and fitting carefully. Remove materials not meeting the specifications immediately from the work site.
- C. In any pipe showing a distinct crack and which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved by the Engineer, may be cut off. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.
  - 1. All cutting shall be done in strict accordance with the manufacturer's recommendations with a machine having steel cutters or knives adapted to the purpose.
  - 2. Cut ends shall be examined for possible cracks caused by cutting.
  - 3. Cut ends shall be conditioned by beveling with a portable grinder at an angle of about 30 degrees to remove any sharp, rough edges that may damage the gasket.
  - 4. For pipe 14 inches in diameter and larger that is to be cut in the field, the material shall be order as "gauged full length" and specifically marked to avoid confusion with regular pipe. Field cutting and gauging shall be per the manufacturer's directions and tolerances.
- 3.02 Installation of Exposed Piping (4-Inch and Larger)
  - A. Install piping to accurate lines and grades with fittings, valves and appurtenances at the required locations.
  - B. Clear piping of debris, dirt, etc., before installation and keep it clean until the Work is accepted.
  - C. Install piping in such a manner to prevent damage to piping materials, protective coatings and liners.
  - D. Wherever possible, install piping parallel to walls and floors. Provide pipe and tubing racks and supports for a neat installation.
  - E. Connecting Piping to Equipment
    - 1. Conduct field measurements prior to ordering pipe, fittings, and equipment to prevent misfitting of Work.
    - 2. Incorporate into the Work any valve or other fitting shown on the Drawings, or schematics by a consistent symbol, but not described or scheduled into the

STORMWATER & DEICING CAPACITY PROJECT I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 PROCESS AND YARD PIPING

Work, but first determine from the Engineer the requirements for such valves or fittings.

- 3. Install piping such that there is no undue strain placed upon piping joints, equipment, or structures.
  - a. Support suction and discharge piping connecting to pumps, blowers, and other equipment in a manner that the piping does not transmit any load to the pump or equipment.
  - b. Accurately cast piping in concrete or masonry set with bolt holes carefully aligned so that connecting piping can be installed without undue strain and at the lines and grades required.
- F. Flange Joints: Install pipe and fittings with flanged joints in accordance with the manufacturer's recommendations and AWWA C600.
  - 1. Make flanged joints with bolts or bolt studs with a nut on each end.
  - 2. Shop screw threaded flanges to pipe.
  - 3. Flange to Pipe Assembly: Assemble pipe to be fitted with threaded flanges as follows:
    - a. Accurately thread pipe and flanges to the appropriate gauge, screw flanges on by heavy machinery until the end of the pipe projects beyond the face of the flange and a tight metal-to-metal joint is produced without evidence of heat in the threaded portion.
    - b. Cut the projecting end of the pipe off flush with the face of the flange.
    - c. Make a light refacing cut across both the end of the pipe and the face of the flange at right angles to the center line of the pipe and then ream the pipe.
  - 4. Flanged to Flange Assembly: Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by bolt manufacturer. Do not over torque nuts and bolts.
- G. Threaded Joints
  - 1. Thread steel pipe after bending, forging, heat treating, or welding operations.
  - 2. Threads shall be concentric with the outside of the pipe and conform to ANSI 82.1.
  - 3. Do not seal weld threaded joints; instead make leak-tight using Teflon tape on all but the first two threads of the pipe.
  - 4. When threading chemically cleaned pipe, use inhibited trichloroethane (methyl chloroform) as the cutting fluid.
  - 5. Avoid overtightening of threaded joints.
  - 6. Backing off of made-up threaded joints to facilitate fit-up or alignment will not be permitted.
- H. Supports and Hangers
  - 1. Provide all necessary supports to keep the pipe and appurtenances stable at the lines and grades shown on Drawings without placing strain on the piping, fittings, valves, and connected equipment.

- Support piping from the floor by suitable saddle stands or concrete piers. Support piping along walls using suitable wall brackets with attached roller or saddles, or by wall brackets with hanger rods. Use rod anchors for piping supported from the ceiling.
- 3. Provide stainless steel or fiberglass supports in tanks (supported from floor, wall or cantilevered walkway, submerged, or non-submerged), including any all-thread rods used with hanging supports.
- 4. Provide fiberglass or non-metallic supports in chemical and corrosive rooms. Fiberglass and non-metallic supports w/ hangers shall be as manufactured by Aickinstrut, Inc., or as approved by the Engineer.
- 5. Locate supports wherever necessary and not exceeding 8 feet on centers, unless otherwise required by the manufacturer or code.
- 6. Install the hangers and pipe guides in accordance with the manufacturer's recommendations and at intervals that are less than or equal to the intervals in the Cooper B-Line's reference tables using a temperature of 100 degrees Fahrenheit. In addition, provide a hangar at every change of direction for all pipes.
- 7. Install supports bases mounted on the floor with grout pads that are at least 2 inches thick.
- 8. Anchor supports with stainless steel hardware.
- 9. Install compressed air tubing in wire cable trays.
- 10. Do not obstruct access to equipment or other items, or the service area for any equipment, with floor mounted supports. Provide hangers.
- I. Wall Penetrations, Wall Pipes, and Wall Sleeves
  - 1. Details for the installation of wall penetrations, wall pipes, and wall sleeves are shown on the Drawings.
  - 2. Provide water stops for wall pipes and sleeves installed for a submerged application in which one or both sides of the wall, floor, or ceiling will be submerged. Replace submerged or exterior wall penetrations, wall pipes, and wall sleeves that leak at no extra cost to the Owner.
  - 3. Exterior walls refer to walls which are on the exterior of a building or structure, either buried or exposed. Interior walls refer to a wall between two interior rooms in a building or structure.
  - 4. Use wall pipe on new concrete structures where process piping is in a submerged application to allow connection of process piping directly to the wall pipe joints. Lay lengths and sizes of wall pipes vary depending on the wall width and connecting pipe size shown on the Drawings for each specific application.
  - 5. Wall sleeves may be used for all non-process piping. In new wall submerged applications or on new exterior walls, floors, or ceilings, the seal the inserted pipe watertight with Link-Seal.
  - 6. Wall sleeves may be used for process and non-process piping on interior walls, floors, or ceilings. Fill the annular space between the inserted pipe and sleeve as shown on the Drawings.
  - 7. Core-drill penetrations of existing interior, exterior, or submerged walls, floors, or ceilings and seal the inserted pipe watertight with Link-Seal.

- 8. New interior, exterior, and submerged walls may be core-drilled and follow the same requirements as existing walls only if prior approval is granted by the Engineer and only on a case-by-case basis for each application.
- 3.03 Installation of Buried Piping and Fittings
  - A. General
    - 1. Follow manufacturer's installation procedures for installing pipe and fittings.
    - 2. Cut pipe in a neat and workmanlike manner without damage the cement lining of DI pipe. Use a cutting machine to leave smooth ends at right angles to the axis of the pipe. Flame cutting with an oxyacetylene torch is not allowed on DI pipe. For bell and spigot joint installation, bevel the edges of all field cut pipe after cutting. For mechanical joint installation do not bevel the pipe end. Remove all burs that form as a result of field cutting the pipe, whether the pipe end is beveled or not.
    - 3. Install buried pipe and fittings as shown on the Drawings and as specified in this Section. Do not install pipe when, in the opinion of the Engineer, trench conditions are unsuitable.
    - 4. Sewer pipe installed parallel to existing water mains shall have a minimum horizontal separation of 10 feet measured from edge of pipe to edge of pipe.
    - 5. Sewer pipe crossing water mains shall have a minimum vertical separation of 18 inches measured edge to edge. This separation applies whether the water main is above or below the sewer.
    - 6. Install temporarily plugs in installed piping systems at the end of each day's work or other interruption of progress on a given line. Install plugs in a manner satisfactory to the Engineer, and ensure plugs are adequate to prevent the entry of animals into the pipe or the entrance or insertion of deleterious materials.
  - B. Laying Pipe
    - 1. Excavation shall be in accordance with federal, state and local OSHA requirements. Provide and use proper tools and facilities for safe working conditions.
    - 2. Excavate trenches to widths which provide adequate working space for proper pipe installation, jointing and embedment. Shape the bottom of trench to give uniform circumferential support to the lower quarter of each pipe. Lay pipe with bell ends facing in the direction of laying.
    - 3. Clean pipe and fittings of debris, dirt and other foreign material before being laid, and keep clean until accepted in the completed work.
    - 4. Pipe laying shall proceed upgrade, beginning at the lower end of the pipe line. Lay and maintain pipe and fittings to the lines and grade shown on the Drawings.
    - 5. Lower pipe and fittings into trench by hand, by means of hoists or ropes, or by other suitable tools or equipment which will not damage materials, coatings or linings. Do not drop or dump pipe and fittings into trench.
    - 6. As each length of pipe is installed, joint the pipe to the previously installed pipe. Bring the pipe to the correct line and grade and secure in place with bedding tamped under and around each side of the pipe. Deposit and compact backfill

PROCESS AND YARD PIPING

material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

- 7. Use laser beam equipment, surveying instruments or other proven techniques to maintain accurate alignment and grade.
- 8. Wherever it is necessary to deflect pipe from a straight line in either a vertical or horizontal plane, do not exceed the amount of deflection allowed by the pipe manufacturer's specifications. If the alignment requires joint deflections in excess of the allowable, furnish and install fittings or a sufficient number of shorter lengths of pipe.
- 9. Provide mechanical restraints on all fittings and on pipe joints designated to be restrained on the Drawings.
  - a. For fittings with mechanical joints that require harnessing, provide DI mechanical joint retainer glands.
  - b. For push-on joints that require harnessing provide push-on gripper gaskets. Use a stencil and paint the word "HARNESSED" in 2-inch safety orange letters on the top of the bell on each push-on joint assembled with a gripper gasket. Do not use gripper gaskets when installing plugs.
- 10. Protect open excavations at all times. At the end of each day's work, protect the open ends of all pipes against the entrance of animals, children, earth or debris by bulkheads or stoppers.
- C. Pipe Bedding, Haunching and Backfill
  - 1. Refer to the Drawing details for bedding and initial backfill requirements and Section 02220 for trenching, backfill and compaction requirements.

#### 3.04 Cleaning

- A. Flush piping with a flushing velocity of 2.5 feet per second until the water discharged is clear. The following flows are required to provide a flushing velocity of 2.5 feet per second:
- B. For larger pipes in which an adequate flushing velocity cannot be attained, use other means to clean the pipes.

# 3.05 Inspection

- A. Television Inspection
  - 1. Televise all storm sewers in excess of 40 feet in length.
  - 2. Perform all television inspection in presence of Engineer and Owner.
  - 3. Clean all new storm sewers prior to television inspection. The image shall be clear so the interior condition of the pipe is easily evaluated.
  - 4. Correct all unacceptable conditions found during the television inspection and re-televise until no unacceptable conditions are found.
  - 5. Unacceptable conditions are conditions that adversely affect the ability of the system to function as designed or to be properly maintained and may include, but are not limited to, the following:
    - a. Cracked or faulty pipe

STORMWATER & DEICING CAPACITY PROJECT I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 PROCESS AND YARD PIPING

- b. Misaligned or deformed pipe
- c. Debris in line
- d. Infiltration/exfiltration
- e. Bellies or sags with a depth greater than or equal to 10 percent of the pipe diameter (maximum of 3 inches) or a length greater than 25 feet
- 6. Repair defect pipes or joints in the piping system.
- 7. Submit copy of the televising recording (DVD format) within 14 calendar days of the inspection.

#### 3.06 Air Test

- A. Perform air testing on gravity sewer lines 24 inches or less in diameter.
- B. Procedure for Conducting a Low-Pressure Air Test
  - 1. Unless otherwise directed by the Engineer, all underground sewer system piping for gravity flow shall be subjected to an air test rather than an infiltration or exfiltration tests, however, infiltration and exfiltration test methods have been included if requested by the Engineer during construction. No extra compensation will be allowed if such tests are required.
  - 2. When leakage occurs in excess of the specified limits, defective pipe or joints shall be located and repaired. Remove and reconstruct, along with retesting, as much of the original work as necessary to obtain a sewer test within the allowable leakage limits.
  - 3. Air Test
    - a. The sewer line to be tested shall be tested in increments between manholes. The line shall be sealed at each end. The seal at one end shall have an orifice through which to pass air into the pipe. An air supply shall be connected to the orifice at one end of the line. The air supply line shall contain an on-off gas valve and a pressure gauge having a range of 0 to 5 psi. The gauge shall have minimum divisions of 0.10 psi and shall have an accuracy of  $\pm$  0.04 psi.
    - b. The pipe line under test shall be pressurized to 4 psig. The line shall be allowed to stabilize between 4 psig and 3.5 psig for a period of no less than 5 minutes. If necessary, air shall be added to the line to maintain the pressure above 3.5 psig. After the stabilization period, the gas valve shall be closed. When the line pressure stabilizes above 3.5 psig, commence timing with a stop watch. The stop watch shall be allowed to run until such time as the line pressure drops 1.0 psig or the allowable time in Table 1 is exceeded. If the test time is greater than the allowable time for 1.0 psig pressure drop, the test section will have passed the pressure test.
    - c. Allowable time shall be as shown in Table 1.

Table 1Minimum Specified Time Required for a 1.0 psig Pressure DropFor Size and Length of Pipe Indicated, Q=0.0015

Pipe Dia.,	Minimum Time,	Length for Minimum	Time for Longer	Specification Time for Length(L) Shown, min:s							
In.	Min, s	Time, ft.	Length, s								
			_	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.864 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	189	3.418 L	11:20	11:20	11:20	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	66:22	79:45	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106.50	124:38	142:26	60:15
33	31:10	72	26.852 L	43:06	64:38	86:10	107:48	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

- d. If the time lapse is greater than that specified, the section undergoing tests shall have passed. If the time for 1.0 psig drop is less than that specified, the line has not passed the test and the Contractor shall be required to make all repairs and retests. If the pipe line to be tested is beneath the ground water level, the test pressure shall be increased .433 psi for each foot the ground water level is above the crown of the pipe.
- e. The Contractor shall furnish all equipment and personnel required to make all tests including pipe stoppers, air compressor, air storage tank, pressure regulating valves, pressure gauges, stopwatch, etc. Contractor shall take precautions necessary, including blocking of stoppers or plugs, to protect the safety of property and personnel.
- 4. Infiltration Tests (If required): When the groundwater level is four feet above the top of the sewer, the infiltration test will consist of sealing off a length of sewer and measuring the depth of flow over a measuring weir, or by pumping the infiltrated water into containers for measurement. Tests shall be conducted for a minimum of four hours. Infiltration leakage shall not exceed 200 gallons per 24 hours per inch diameter, per mile of sewer.
- 5. Exfiltration Tests (If required): When the groundwater level is below four feet above the top of the pipe, the exfiltration test shall consist of isolating the particular section and filling the water to 4 feet above the groundwater level in the upper manhole and allowing it to stand not less than four hours. The section shall then be refilled with water up to the original point and after two hours the drop in water surface shall be measured. The computed leakage shall not exceed 200 gallons per inch diameter, per 24 hours, per mile of sewer.

-END-

STORMWATER & DEICING CAPACITY PROJECT I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101 PROCESS AND YARD PIPING

- PART 1 GENERAL
- 1.01 Summary
  - A. Section Includes
    - 1. Requirements for providing process valves and actuators and yard valves.
    - 2. HVAC, plumbing, and other mechanical non-process valves when required are specified in other Sections.
  - B. Related Sections
    - 1. Section 02730 Force Main Sewer Systems
    - 2. Section 15060 Process and Yard Piping

#### 1.02 References

- A. Standards referred to in this Section are:
  - 1. ASME B1.20.1 Pipe Threads, General Purpose
  - 2. ASTM A27 Standard Specification for Steel Castings, Carbon, for General Application
  - 3. ASTM A29 Standard Specification for Steel Bars, Carbon and Alloy, Hot Wrought and Cold-Finished, General Requirements
  - 4. ASTM A48 Standard Specification for Gray Cast Iron Castings
  - 5. ASTM A126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
  - 6. ASTM A197 Standard Specification for Cupola Malleable Iron
  - 7. ASTM A240 Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip and Pressure Vessels
  - 8. ASTM A351 Standard Specification for Castings, Austentic, for Pressure-Containing Parts
  - 9. ASTM A536 Specifications for Ductile Iron Castings
  - ASTM A743 Standard Specification for Castings, Iron-Chromium, Iron-Chromium - Nickel, and Nickel-Base Corrosion-Resistant for General Application
  - 11. ASTM B16 Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
  - 12. ASTM B62- Standard Specification for Composition Bronze or Ounce Metal Castings
  - 13. ASTM B138 Standard Specification for Manganese Bronze Rod, Bar, and Shapes
  - 14. ASTM B148 Standard Specification for Aluminum-Bronze Castings
  - 15. ASTM B584 Specification for Copper Alloy Sand Castings for General Applications
  - 16. ASTM B763 Standard Specification for Copper Alloy Sand Castings for Valve Applications.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 17. ASTM D429 Standard Test Method for Rubber Property Adhesion to Rigid Substrates
- 18. ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
- 19. AWWA C111 Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- 20. AWWA C504 Standard for Rubber-Seated Butterfly Valves
- 21. AWWA C508 Standard for Swing Check Valves for Waterworks Service, 2 inch through 24 inch NPS
- 22. AWWA C517 Standard for Resilient-Seated Cast-Iron Eccentric Plug Valves
- 23. AWWA C550 Standard for Protective Interior Coatings for Valves and Hydrants
- 24. MSS SP-25 Standard Marking System for Valves, Fittings, Flanges and Unions
- 25. MSS SP-67 Butterfly Valves
- 26. MSS SP-71 Cast Iron Swing Check Valves, Flanged and Threaded Ends
- 27. SAE J356 Welded Flash-Controlled Low Carbon Steel Tubing Normalized for Bending, Double Flaring, and Beading
- 28. SAE J524 Seamless Low-Carbon Steel Tubing Annealed for Bending and Flaring
- 29. SAE J525 Welded and Cold-Drawn Low-Carbon Steel Tubing Annealed for Bending and Flaring
- 30. SSPC Society of Protective Coatings
- 1.03 System Description
  - A. Performance Requirements
    - 1. Valve sizes on the Drawings and in the Specifications are intended to be nominal size.
    - 2. Supply valve bodies and internals, including seating surfaces, suitable for the system pressures.
- 1.04 Submittals
  - A. Product Data/Shop Drawings
    - 1. Catalog cuts for valves, operators, and actuators
    - 2. Complete detailed drawings of valves, operators and actuators
    - 3. Weight of valves, operators and actuators
    - 4. Working drawings, including arrangement and erection drawings of the operators, actuators and control equipment; schematic control diagrams, electrical connection diagrams, and complete description of the control system; and operating characteristics
    - 5. If requested, complete calculations for each size of motor operator indicating the force required to operate the valve, the operator force provided, full load and locked rotor current, and horsepower

- B. Quality Control
  - 1. Manufacturer's Certificate of Compliance with the referenced specification and applicable standards
  - 2. Certified copies of factory tests and reports specified in this Section or required by the referenced standards
  - 3. Manufacturer's installation instructions and recommended testing procedures
  - 4. If requested, manufacturer's certified performance and material records
  - 5. Where valve actuators are installed in NEC Class I, Group D, Division 1 or 2 hazardous locations, provide operator-related electrical equipment and appurtenances that are UL, Inc. approved for use in such areas.
- C. Contract Closeout
  - 1. Manufacturer's Operation and Maintenance (O&M) manuals
  - 2. Copy of the manufacturer's standard warranty for each type of valve and actuator supplied
- 1.05 Delivery, Storage and Handling
  - A. Packing, Shipping and Storage
    - 1. Pack, transport and store valves in protective enclosures such that they are not subjected to forces or elements that may damage the valves.
    - 2. Store gaskets and other products which will deteriorate when exposed to sunlight in a cool location out of direct sunlight. Store and handle gaskets to prevent contact with petroleum products.
    - 3. Do not stack valves, valve boxes or valve stands.
    - 4. Promptly remove damaged products from the job site and replace with undamaged products.

# 1.06 Maintenance

- A. Spare Parts
  - 1. Lever Actuators: Furnish one lever type actuator for each size valve in each room or space in which valves that require lever operation are located.
  - 2. Tee Wrenches: Furnish one 4-foot long tee wrench for use on extended valve operating stems. Furnish one standard length tee wrench for use on actuating valves without handwheels, levers, or actuators.

# PART 2 - PRODUCTS

- 2.01 Manufacturers
  - A. Provide all valves of the same type from the same manufacturer. Provide parts that are interchangeable for all valves of the same type and size.

- B. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
  - 1. AWWA Butterfly Valves
    - a. Dezuirk
    - b. Henry Pratt Company
    - c. Mueller Company
  - 2. Eccentric Plug Valves
    - a. DeZurik
    - b. Henry Pratt Company
    - c. Milliken Valve Company
    - d. Val-Matic
  - 3. Rubber Flapper Check Valve
    - a. APCO Valve and Primer Company
    - b. Crispin Multiplex Manufacturing Company
    - c. Val-Matic
  - 4. Flap Gates
    - a. Rodney Hunt
    - b. Hydro-Gate

# 2.02 Equipment

- A. General
  - 1. For each valve, provide the type of operator or actuator specified in the Valve Schedule on the Drawings.
  - 2. Fabricate valves and operators of materials resistant to corrosion for the required service.
  - 3. Cast each valve with the manufacturer's name, nominal size, pressure rating and year manufactured on the body.
- B. Valve Joints
  - 1. Provide valves that will be exposed and are 4 inches in diameter and larger with flanged type joints, unless otherwise specified. Provide flanges that are faced accurately at right angles to the axis of the casting. Face and drill flanges and shop coat with a rust preventive compound before shipping.
  - Fabricated flanges to dimensions and drillings meet the requirements of ANSI with ANSI grade 304 Stainless Steel nuts, washers and bolts. For valves installed in pipelines with test pressures in excess of 125 psi, provide flanges with pressure ratings equal to or exceeding the specified test pressure of the pipeline.
  - 3. Supply valves that will be buried and are 4 inches in diameter and larger with mechanical joints conforming the requirements contained in AWWA C111.

- C. Valve Operators and Actuators
  - 1. Design the valve operators and valve actuators to unseat, open and close, and seat the valves under the most adverse operating conditions to which the valves will be subjected.
  - 2. Mount the operators and the actuators as shown or as directed by the manufacturer and/or Engineer.
- D. Coatings
  - 1. Shop: Sandblast the surfaces to be coated to a near white metal surface per SSPC SP10.
  - 2. Shop: Valves interior and exterior ferrous surfaces shall have a factory applied fusion-bonded epoxy coating system in accordance with AWWA C550 with a minimum dry film thickness of 10 mils.

# 2.03 Butterfly Valves

- A. Provide tight-closing, rubber-seated butterfly valves and all accessories, including the operators, conforming to AWWA C504. Valves shall be bubble-tight at the rated pressure in either direction and suitable for throttling service. Provide valve bodies of the short-body flange type or mechanical joint-end type, as specified. Wafer body type valves are not acceptable.
- B. Materials
  - 1. Body and Handwheels: a. Cast Iron ASTM A126, Class B b. Ductile Iron ASTM A536, Grade 65-45-12 2. Shafts: ASTM A276, Grade 304 3. Discs: a. Stainless Steel ASTM A351 Grade CF8N (316 SS) ASTM A48, Class 40 b. Cast Iron ASTM A126, Grade B c. Ductile Iron ASTM A536, Grade 65-45-12 4. Disc Seating Surfaces: a. Stainless Steel ASTM A276, Grade 304 or 316 5. Valve Seats: Buna-N (Wastewater) Natural Rubber or Buna-N (Water) 6. Operator Gears: a. Steel ASTM A29 Grade Designation 8620 b. Bronze ASTM B148, Alloy C95400 or C95500 ASTM B584, Alloy C86300 7. Stud Bolts and Nuts: a. Below Ground ASTM F593/4 304 SST b. Above Ground ASTM A307 Grade B, Zinc Plated

- C. Pressure Rating: Provide butterfly valves with a pressure class not less than Class 150B, or with a pressure class rating that exceed the pipeline test pressure in which the valve is installed when the test pressure is greater than 150 psi.
- D. Operators: Provide 8-inch and larger butterfly valves with geared operators. Provide exposed valves with an external valve position arrow that indicates the valve position. Provide traveling nut, self locking type operators that are adequate to drive the valve using a standard valve tee wrench under a differential pressure of 150 psi and maximum flow, and that are designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering on valves that are buried. Provide geared operators that are sealed gasketed and lubricated for underground service with components that are capable of withstanding an overload input torque of 450 foot-pounds at the full-open and full-closed positions without damage to the valve or operator. Equip operators with mechanical stop-limiting devices to prevent over-travel of the disc in the open and closed positions.
- E. Discs: Provide lens-shaped, concentric designed discs.

# 2.04 Eccentric Plug Valves

A. Provide quarter turn plug valves having full round port or a minimum of 80 percent of the pipe area and with plugs that have an eccentric action that causes the plug to rise off of the seat contact during the opening movement rather than sliding from its seat. Design and manufacture valves 12 inches and smaller to shut off bubble tight at 175 psig, and valves 14 inches and larger to shut off bubble tight at 150 psig.

#### B. Materials

1.	Body:	
	a. Čast Iron	ASTM A126, Class B
2.	Plug:	
	a. Cast Iron	ASTM A126, Class B
	b. Ductile Iron	ASTM A536, Grade 65-45-12
3.	Bearings:	ASTM A743, Grade CF8M
4.	Bonnet Bolt, Studs and Nuts:	ASTM A307 Grade B, Zinc Plated

- C. Plugs: Provide one-piece solid plugs that are Neoprene or Buna-N faced and that are assembled with grit seals on both the upper and lower plug shafts to reduce torque and to prevent dirt and grit from entering into the bearing and seal areas.
- D. Bearings: Provide plug valves with sleeve type metal bearings of the sintered, oil impregnated permanently lubricated type.
- E. Seats: Provide seats with a minimum 1/8-inch thick weld-in overlay of not less than 90 percent pure nickel content on all surfaces contacting the plug face.
- F. Seat Adjustment: Make the water-tightness or gas-tightness of the valve seating adjustable. Provide a seating adjustment device that is external to the valve and

can be used without the need to remove the valve from the piping with the valve under pressure.

- G. Lubrication: Provide plug valves with oil impregnated, permanently lubricated, bronze of Type 316 stainless steel bearings in the upper and lower journals.
- H. Packing: Provide plug valves with multiple V-Ring type packing with adjustable follower or self compensating U-Cup design packing. Make the packing adjustable and replaceable without removing the valve from the piping and without the need to disassemble the valve and operator.
- I. Geared Operators: Provide plug valves 8 inches and larger with worm gear operators. Worm gear operators shall be heavy duty construction, capable of withstanding a minimum of 300 ft-lbs of torque at the stops, with ductile iron quadrants supported on the top and bottom by oil impregnated bronze bearings. Manufacture the worm gears and shafts of hardened steel and run on high efficiency roller bearings. Size the actuators for bi-directional shutoff at the valve at full design pressure rating. Fabricate the valves with built-in adjustable opening and closing stops and a valve position indicator. Provide totally enclosed valves and operators for underground or submerged services.
- J. Position Indicators: Equip exposed plug valves with external visible indicators of the plug position.
- K. Nameplates: Supply plug valves with a corrosion resistant nameplate that shows the serial number, manufacturer, size, cold working pressure, and the direct and reverse actuator pressure rating.

#### 2.05 Check Valves

- A. Rubber Flapper Swing Check Valve
  - 1. Design
    - a. Provide rubber flapper check valve bodies designed to provide full flow equal to the nominal pipe diameter at any point through the valve.
    - b. Provide rubber flapper check valves meeting the requirements of AWWA C508.
    - c. Provide the valves with one moving part, the valve disc, and fabricate the valves with the disc seating surface on a 45-degree angle from the centerline of the valve to minimize disc travel.
    - d. Provide rubber flappers internally reinforced with steel with an O-ring seating edge.
    - e. Provide valves with domed access covers that when removed allows the removal of the disc without removing the valve body from the pipeline.
    - f. Provide bodies of long pattern design (not wafer) with integrally cast-on end flanges.
  - 2. Materials
    - a. Body and Cover
      - 1) Ductile Iron ASTM A536 Grade 65-45-12

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 2) Cast Iron ASTM A126 Grade B
- b. Disc: Buna-N ASTM D2000-BG w/ steel reinforcement
- 3. Pressure Rating
  - a. Working Pressure: 250 psig
  - b. Differential Pressure: 175 psig.

# 2.06 Flap Gates

- A. Design
  - 1. All gates shall be round and supplied in the nominal diameter for the pipe it is to be mounted to.
  - 2. All gates shall be equipped with flat-back seats designed for wall-thimble mount.
  - 3. Flaps shall be affixed via a pivot lug. Each pivot lug shall be cast in one piece. Lugs shall have double bosses to place the top hinge pins in double shear when they are assembled through the link.
  - 4. Lugs shall be adjustable in the horizontal plane without removal of the cover from the gate links.
- B. Materials
  - 1. Body shall be constructed entirely of cast or ductile iron
  - 2. Frames shall be of one single piece casting.
  - 3. Flaps shall be of one single piece casting.
  - 4. Faces of frames shall be machined at an angle off vertical to ensure the gate seats completely by gravity
  - 5. All contact surfaces shall be provided with a resilient seat
- C. Pressure rating
  - 1. Flap Gates shall be designed to unseat with a maximum of 0.4" of head.
- D. Nameplates: Supply flap gates with a corrosion resistant nameplate that shows the serial number, manufacturer, size, and unseating head.

# 2.07 Manual Operators

- A. Unless otherwise shown or specified, provide manual operators as follows:
  - 1. Equip valves with manual operators or actuators as indicated on the valve schedule on the Drawings.
  - 2. Design and fabricate valves with wrench operated nuts, levers, handwheel and chainwheel operators such that the maximum force required to operate the valve (including breakaway torque requirements) does not exceed 80 pounds. Use the test pressure for the piping in which the valve is to be installed to size the valve operator. Limit the overall length of each wrench or single arm lever to 18 inches. Limit the overall length of dual-armed levers to 36 inches. Provide handwheels not less than 12 inches or more 24 inches in diameter.

- 3. Provide floor stands where shown. Supply cast iron floor stands with flanged bases for mounting on a slab or stand support brackets.
- B. Attach manual operators rigidly to the valve body.
- C. Provide manual operators that open when turned counterclockwise and have the open direction clearly and permanently marked.
- D. Fit nut operated valves with 2-inch square AWWA standard operating nuts with the word "Open" and an arrow indicating the direction to open.
- E. Provide exposed valves with lever, handwheel, hand-cranks, and chainwheel operators with an arrow that indicates the direction to open.
- F. Geared manual operators shall be of the worm gear, traveling nut or scotch yolk type except manual operators for butterfly valves 18 inches in diameter or larger, which shall be worm gear, unless otherwise indicated. Gear operators shall be of the worm gear or bevel gear type. Gear box designs incorporating end of travel stops in the housing shall be equipped with AWWA input stops. Each gearbox shall require a minimum of 10 turns for 90-degree rotation or full valve stem travel and shall be equipped with a mechanical valve position indicator.
- 2.08 Accessories
  - A. Provide all appurtenances necessary for the valve to perform its intended function. Such appurtenances include, but are not limited to, anchor bolts and other mounting hardware, gearboxes, extension stems, operating nuts, floor boxes, valve boxes, floor stands, levers, handwheels, chainwheels, and other such items.
- 2.09 Source Quality Control
  - A. Tests
    - 1. Butterfly Valves: Prior to shipment from the factory, perform hydrostatic and seat leakage tests on each butterfly valve in accordance with AWWA C504.
    - 2. Plug Valves: Prior to shipment from the factory, test each plug valve and certify they are bubble tight at the full rated pressure in both directions.
    - 3. Swing Check Valves: Prior to shipment from the factory, perform hydrostatic and seat leakage tests on each swing check valve in accordance with AWWA C508.

# PART 3 - EXECUTION

- 3.01 Installation
  - A. Install valves in accordance with the manufacturer's instructions and the reviewed shop drawings.

- B. Clean and inspect the valve interiors before installation. Actuate the valves to confirm proper operation prior to installation.
- C. Position valves to permit access to and easy removal of the fixtures and equipment served.
- D. Unless otherwise shown, provide valves that are the same size as the lines the valves are mounted in.
- E. Do not mount valves, with the stem and bonnet pointed below a horizontal position.
- F. Install all valves in the open position. Close only when assured that the sealing parts are free from foreign materials. Foreign materials found embedded in sealing surfaces, will require the installation of new trim or complete valve.
- G. Support exposed valves from the floor with saddles or concrete piers, or when shown, from the wall or ceiling with wall brackets and pipe hangers as needed to prevent strain being transferred to adjacent piping and equipment.
- H. Lower valves into the trench or excavation by hand, or with equipment using ropes or slings which will not damage the valves, coatings or linings. Do not drop or dump the valves into the trench or excavation.
- 3.02 Field Quality Control
  - A. Tests
    - 1. Valve Testing
      - a. Performance Tests: After installation of the valves, control equipment, and all appurtenances, test the valves under actual operating conditions. Operate each valve through one complete open-closed cycle under the maximum pressure differential that can be applied by the operating conditions.
      - b. Pressure Tests: Test valves for leakage at the same time that the connecting pipelines are tested. Protect or isolate any parts of valves, operators, or control and instrumentation systems whose pressure rating is less than the pressure test.
      - c. Valves shall show zero leakage through the valve joints. Repair or replace valves showing leaks and retest.
    - 2. Test Certification: Certification of tests and copies of test or certificate of conformity reports shall be provided on request if the request is made prior to the time of testing.
  - B. Manufacturer's Field Service
    - 1. Furnish the services of a qualified representative of the valve manufacturer to provide instructions on the proper installation of the equipment, inspect the completed installation, make necessary adjustments, participate in the field testing of the equipment, and place the equipment in trouble-free operation.

# 3.03 Demonstration

A. Furnish the services of a qualified representative of the valve manufacturer to demonstrate proper operation and instruct personnel in the equipment's operation and maintenance.

-END-

# **TABLE OF CONTENTS**

<u>Section</u>	Description				
SP-1	OVERALL PROJECT SCOPE OF WORK				
SP-2	CONTRACT TIME				
SP-3	PROJECT FUNDING AND WAGE RATES				
SP-4	TEXTING WHILE DRIVING				
SP-5	SMOKING ON AIRPORT PROPERTY				
SP-6	OPERATIONAL SAFETY ON AIRPORT DURING CONSTRU	CTION			
SP-7	EXISTING CONDITIONS				
SP-8	COORDINATION OF CONTRACT, PLANS, AND SPECIFICA	TIONS			
SP-9	GENERAL CONSTRUCTION NOTES				
SP-10	AIRPORT SECURITY WITHIN AIRPORT OPERATIONS ARI	EA			
SP-11	PROJECT SECURITY	PROJECT SECURITY			
SP-12	FAA FACILITIES AND CABLE RUNS				
SP-13	PAVEMENT CLEANING OPERATIONS				
SP-14	CONTRACTOR'S STAGING AND PARKING AREAS				
SP-15	COOPERATION WITH PUBLIC AND PRIVATE UTILITIES				
SP-16	DISPOSAL OF FACILITIES				
SP-17	SANITARY FACILITITES				
SP-18	COORDINATION AND SCHEDULING OF WORK WITH OWNER				
SP-19	TEMPORARY INSTRUMENTATION AND CONTROL DURING				
SP-20	WORK HOURS				
SP-21	PERMITS				
SP-22	PUMPING MANHOLES				
SP-23	M-102 MAINTENANCE OF TRAFFIC				
SP-24	M-103 CONSTRUCTION ENGINEERING				
SP-25	P-151 CLEARING AND GRUBBING				
SP-26	P-156 TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION AND SILTATION CONTROL				
SP-27	ADDITIONAL SOIL EROSION AND SILTATION CONTROL MEASURES				
SP-28	SP-209 CRUSHED AGGREGATE BASE COURSE				
STORMWATER	& DEICING CAPACITY PROJECTS	SPECIAL F	ROVISION		

I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

ONS

# Section Description

SP-29	D-705 PIPE UNDERDRAINS FOR AIRPORTS
SP-30	D-753 RIPRAP
SP-31	F-162 CHAIN-LINK FENCE
SP-32	T-901 SEEDING
SP-33	T-905 TOPSOILING
SP-34	T-908 MULCH
SP-35	L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS
SP-36	L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES
SP-37	INDOT STANDARD SPECIFICATIONS
SP-38	WELL CLOSURE/MONITORING WELL CLOSURE
SP-39	COMPACTED CLAY LINER
SP-40	TRENCHLESS CONSTRUCTION UNDER INTERSTATE 70

SP-41 EQUIPMENT MANUALS

-END-

#### SP-1 OVERALL PROJECT SCOPE OF WORK

This work includes Stormwater and Deicing Control and Capacity improvements at and south of Indianapolis International Airport, located in Indianapolis, Indiana.

The overall scope of work of this project includes, but is not limited to:

- Demolition of existing Seerley Creek Basin
- Grading of existing Seerley Creek Basin (Base Bid)
- Fill of existing Seerley Creek Basin (Add Alternate Bid No. 2)
- Construction of new storm sewers up to 96-inch in size including trenchless installation of 78-inch storm sewer under Interstate 70
- Drainage improvements along Interstate 70
- Rerouting existing Mars Ditch Force Main
- Construction of new Seerley Creek West Storage Tank
- Construction of a new water quality treatment unit
- Construction of new force mains, including trenchless installation under Interstate 70
- Installation of cured-in-place pipe in existing storm and sanitary sewers
- Relocation of an existing sanitary sewer
- Geopolymer lining of an existing 128-inch culvert
- Construction of a new fiber optic ductbank from Seerley Creek to Hanna Avenue Facility
- Construction of two (2) stormwater basins (Base Bid) with Add Alternate Bid No. 1 for a future third stormwater basin; Stormwater basins include underdrain and interliner systems, lining systems, and concrete basin bottoms.
- Construction of new access drives at Hanna Avenue Facility
- Reroute of Dollar Hide Creek
- Construction of new Hanna North Structure and Hanna South Structure
- Construction of new Hanna Cascade Aerator

#### SP-2 CONTRACT TIME

The scope of work for each individual bid package shall be defined in more detail elsewhere in the bidding documents.

The Completion Time for all Contract Work shall be per the following:

- Milestone 1 Substantially Complete all work as shown on G-013 Control of Water Plan on or before October 1, 2018
- Milestone 2 Substantially Complete all work excluding Punch List work on or before October 15, 2019
- Milestone 3 Substantially Complete all work for Add Alternate Bid No. 1 on or before September 1, 2020

All Punch List work shall be complete within 60 calendar days from issuance of Final Punch List.

# SP-3 PROJECT FUNDING AND WAGE RATES

This project is eligible for Federal Aviation Administration (FAA) Airport Improvement Program (AIP) grant funding, therefore all AIP-related specifications and federal provisions apply.

The construction of the project is expected to be funded in part by a State Revolving Fund (SRF) as administered by the Indiana Finance Authority. The Contractor shall comply with all requirements of said agency.

In accordance with the Davis-Bacon requirements, all contractor and subcontractors are required to pay not less than the Federal prevailing wage rates published by the U.S. Department of Labor for each classification of work performed on this project.

# <u>SP-4</u> <u>TEXTING WHILE DRIVING</u>

Pursuant to and in accordance with Executive Order 13513, Federal Leadership on Reducing Text Messaging While Driving, October 1, 2009, and DOT Order 3902.10, Text Messaging While Driving, December 30, 2009; text messaging while driving on or around the project site is strictly prohibited.

# <u>SP-5</u> <u>SMOKING ON AIRPORT PROPERTY</u>

Smoking is prohibited on the project site and all properties owned and operated by the Indianapolis Airport Authority. Smoking is strictly prohibited in any airport building, structure, facility, or vehicles per General Ordinance 6-2007.

#### SP-6 OPERATIONAL SAFETY ON AIRPORT DURING CONSTRUCTION

All Contractors' operations shall be conducted in accordance with the project safety plan and the provisions set forth within the current version of Advisory Circular (AC) 150/5370-2. The safety plan included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a plan that details how it proposes to comply with the requirements presented within the safety plan known as a Safety and Phasing Compliance Document (SPCD) prior to the start of construction. A sample SPCD is provided in the above referenced AC. The Engineer, on behalf of the IAA, has developed and provided to the FAA, a Construction Safety and Phasing Plan (CSPP) in accordance with the safety and site logistics plans provided in the construction plan set. A copy of the project CSPP is available upon request of the IAA.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks of the safety plan measures to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the safety plan and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved safety plan unless approved in writing by the Owner or Engineer. The safety plan shall be included as part of the submittal for an IAA work permit.

# SP-7 EXISTING CONDITIONS

Not all the details, characteristics, and nuances of the project are shown on the Plans; therefore, the Contractor shall visit the site and familiarize itself with the project before submitting a proposal.

It is the responsibility of the Contractor to verify the elevations at all points where the new construction is to match existing pavement. The Contractor shall take all necessary precautionary measures, and perform the work in such a manner as to adequately protect and safeguard the existing pavement or pavement surface to remain in place from any damage due to such operations. The Contractor's attention is also called to the fact that the operation of crawler type construction equipment on those portions of the surface to remain in place will not be permitted, and the operation of overweight or oversize equipment in those areas shall be governed by State Laws and Regulations. Any damaged portion of surface or pavement and surface removed in excess of that required for the construction as set out in plans, shall be satisfactorily replaced or repaired by the Contractor at his own expense.

# SP-8 COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS

The following sentence is added to the end of the first paragraph of GP 50-03:

Geotechnical reports are included for information only but are not part of the Contract Documents.

#### SP-9 GENERAL CONSTRUCTION NOTES

All utilities shown on the Drawings are approximate locations. The Contractor will be required to contact all utility companies and field locate any underground lines in the construction limits. Any inadvertent utility cuts shall be immediately corrected by the Contractor without any cost to the Owner. All necessary precautions to protect existing utilities shall be provided as required by the utility companies. Temporary support system design for trenches and cuts will be the responsibility of the Contractor. When required, the Contractor shall coordinate utility relocations with the respective Utility Company. Relocation of utility shall be performed by the respective Utility Company, unless the Utility authorizes the Contractor to relocate the utility.

Any stockpiling and/or rehandling of excavated material shall be included in the overall construction cost. The Contractor shall maintain positive drainage throughout the entire project. The stripping of topsoil from areas as necessary to assure adequate topsoil supply, the stockpiling of topsoil and the placement of topsoil is incidental to the contract.

Seeding shall be placed as early as possible for proper erosion control. Placement of seeding shall be in stages as the Contractor acquires finish grade in various locations of the project. Temporary seeding and temporary mulching may be required as directed by the Engineer for erosion control.

# SP-10 AIRPORT SECURITY WITHIN AIRPORT OPERATIONS AREA

Per the requirements outlined in General Provision 70-23, the Contractor will be allowed to badge up to 10 of the Contractor's employees to serve as Crew and/or Area Guards. Airport Identification requirements are included in the Attachments section of the specifications. Below is a summary of Owner-approved security firms which can provide necessary staff for Crew and/or Area Guards, etc. at Indianapolis International Airport:

Protection Plus	White Security	Securitas USA	G2 Secure Staff
2345 S. Lynhurst Drive	8146 McFarland Road	1712 N. Meridian Street, Suite 200	7800 Col Weir Cook Drive
Indianapolis, IN 46241	Indianapolis, IN 46227	Indianapolis, IN 46202	Indianapolis, IN 46241
317-244-7569	317-201-4976	317-568-1790	317-339-6617

#### Owner Approved Security Firms

Refer to General Provision 70-23 for specific requirements of Airport Security. All costs associated with badging shall be considered incidental to the item M-104, Project Security. No further measurement for payment will be made.

# SP-11 PROJECT SECURITY

Work located inside the AOA is subject to GP 70-23 and M-104 with the following revisions:

No guard house shall be required

Delete 104-2.1 Method of Measurement and 104-3.1 Basis of Payment.

# SP-12 FAA FACILITIES AND CABLE RUNS

The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the prosecution of the project work, shall comply with the following:

- 1. The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.
- 2. The Contractor shall notify the named FAA Point-of-Contact included provided with the utility information seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.
- 3. If execution of the project work requires a facility outage, the Contractor shall contact the above named FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.
- 4. Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road or FAA facility to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

5. If the project work requires the cutting or splicing of FAA owned cables, the above named FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the above named FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA Airway Facilities, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

# **<u>SP-13</u> PAVEMENT CLEANING OPERATIONS**

The Contractor shall maintain a pavement cleaning operation in all airfield operations areas affected by the construction whenever work is active. All debris deposited on the pavement due to construction activities shall be removed immediately. Methods for removal of large debris such as gravel, dirt clods, concrete pieces, material containers, etc. shall be subject to the approval of the Engineer. Dust control for debris such as sand, concrete sawing residue, cement, mud, etc. shall be performed with hand tools and self-propelled truck-type vacuum cleaners as approved by the Engineer.

# SP-14 CONTRACTOR'S STAGING AND PARKING AREAS

A primary staging and field office area has been designated in the design documents. These areas are outside the secure area of the airport; materials and equipment not in use shall be moved to these locations. In conjunction with the primary staging and field office area, the Contractor will also be assigned a designated employee parking area. The Contractor shall contact the Indianapolis Airport Authority and/or the respective utility companies to determine exact locations for utility connections and what charges would be incurred for the use of these utilities. Employee's vehicles may be parked in these areas during working hours only. The Contractor shall keep the drives and streets clean to the satisfaction of the Indianapolis Airport Authority. After completion of the project, the staging area and parking area shall be cleaned and the sites restored to their original (or better) conditions.

# SP-15 COOPERATION WITH PUBLIC AND PRIVATE UTILITIES

The Plans show all known private (Owner and FAA-owned) and public utilities located within the limits of this project according to information obtained from various utility companies and airport record drawings. The accuracy of the plans in this respect is not guaranteed. The Contractor will be required to cooperate and coordinate its work with all utility companies and the Owner within the limits of this project as directed by the Engineer.

# SP-16 DISPOSAL OF FACILITIES

All waste, broken concrete pavement, aggregate, wood, rubber, old pavement markings, etc. shall be legally disposed of off the airport property. Recycling of waste materials such as broken concrete, aggregate, and soil is preferred. The Contractor shall notify the Owner of the dump site location. A release from the property owner will be required if the dump site location is not a public landfill. The Contractor shall also provide receipts, weigh tickets, or other acceptable forms of documentation of amount (tonnage or volume) of material disposed at the facility(ies) receiving waste material or recyclable items from this project.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

# SP-17 SANITARY FACILITIES

The Contractor shall provide sanitary facilities for employees at the Contractor's Staging Area. No airport facilities shall be used.

# SP-18 COORDINATION AND SCHEDULING OF WORK WITH OWNER

The Contractor shall coordinate implementation of all Maintenance of Traffic plans (MOTs) and lane closures with the Owner two weeks prior to work in each area.

#### SP-19 TEMPORARY INSTRUMENTATION AND CONTROL DURING CONSTRUCTION

Prior to the initiation of demolition work at the existing Seerley Creek Facility, the following work shall be completed.

- 1. Decommissioning
  - a. The following components of the existing Seerley SCADA system are to be decommissioned and used as part of the temporary monitoring system
    - 1) Seerley Lift Station 1 PLC Panel
    - 2) Utilinet radio, cables, connectors, surge arrestor and antenna
    - 3) Black Box Ethernet extender radio, surge arrestor and power injector.
  - b. The following components of the existing Seerley SCADA system are to be decommissioned and retained by the contractor for re-use in the new system.
    1) Utilinet radio, cables, connectors and surge arrestor.
  - c. The following components of the SCADA system are to be decommissioned and turned over to IAA.
    - 1) Seerley Lift Station 1 PLC enclosure and internal components
    - 2) Seerley Lift Station 1 Radio enclosure and internal components
    - 3) Seerley Lift Station 2 PLC enclosure and internal components
    - 4) Seerley Black Box Ethernet extender radio
    - 5) Seerley Influent PLC enclosure and internal components
    - 6) Combustible gas monitor
    - 7) Seerley Lift Station 1 touchscreen workstation and iFix license key
- 2. Interim Facility Monitoring
  - a. Process monitoring is required during the demo and construction phases of this project.
    - 1) The Contractor shall relocate existing control equipment at the Seerley site from Lift Station 1 to the location of the temporary bypass pumps. Existing control equipment includes but is not limited to: PLC subpanel, telephone pole, radio and coax cable
    - 2) One new NEMA 4X enclosure shall be provided and installed next to the bypass pumps. The existing PLC subpanel shall be installed inside this enclosure. Additionally, the existing Utilinet radio shall be installed inside this enclosure.
    - 3) A temporary utility pole and IPL transformer for RTU power shall be provided and installed to power the temporary monitoring equipment.
    - 4) Temporary 120VAC power feed from utility transformer to the bypass pump location shall be provided and installed to power the temporary monitoring equipment.
    - 5) One temporary level transmitter shall be provided and installed to monitor the west basin level.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 6) One temporary level transmitter shall be provided and installed to monitor the supplemental basin level.
- 7) Temporary utility pole with extended mast shall be provided for the temporary RTU panel next to the bypass pumps. The existing Black Box Ethernet extender radio, Utilinet antenna and the data mirror antenna shall be relocated to this pole. The height of the extended mast shall be at an elevation that provides a direct line of site to the MTU radio at building 146.
- 8) Contractor shall install temporary conduits between the temporary RTU panel and the bypass pump control panel.
- 9) Contractor shall install temporary conduit between the temporary RTU panel and the west basin level transmitter.
- 10) The Contractor shall supply all additional required parts to make the interim monitoring system functional and able to report information back to the Airport's existing glycol monitoring system.
- 11) The following points are to be monitored by the interim facility monitoring system:
  - a. West Basin Level
  - b. Supplemental Basin Level
  - c. Bypass Pump 1 Running
  - d. Bypass Pump 2 Running
  - e. Bypass Pump Flow Rate
  - f. SPCC Monitoring

# SP-20 WORK HOURS

It is expected the Contractor will limit work to daylight hours for most activities. However, work during dusk to dawn hours can be scheduled with 48-hour prior notice to the Owner.

The following Construction Moratorium Dates apply for 2018:

- Indy 500 (2018) 5/23/18 (23:59 hrs. local time) through 5/29/18 (6:00 am local time)
- Brickyard 400 (2018) 9/5/18 (23:59 hrs. local time) through 9/11/18 (6:00 am local time)
- Thanksgiving 2018 11/17/18 through 11/26/18
- Christmas 2018 12/15/18 through 1/2/19

The FAA has identified two additional periods in 2018 wherein no major local systems should be interrupted:

<ul> <li>Grand Prix</li> </ul>	May 10-12, 2018
--------------------------------	-----------------

• Vintage Race Invitational June 13-17, 2018

Construction Moratoriums require contractors to cease any excavation or construction-related work that might impact any FAA facilities and communications including any IAA utilities or lines servicing said facilities. These utilities include:

- Power
- Sanitary
- Storm Drainage
- Water
  - Potable
  - Fire
- Fuel
  - Natural Gas
  - Petroleum
  - Propane
- Communications
  - Fiber or Copper
    - -Telephone
    - -Data
    - -Video
    - -Radio

For years 2019 and 2020, calendar dates may change however for all the listed events, the requirements and durations shall be the same.

Construction activities that are anticipated to occur during moratorium periods are to be identified and reviewed with the Engineer, Airport Operations and FAA representatives at least one week in advance of the moratorium dates to establish any work activities that are permitted to occur during the moratorium period.

# SP-21 PERMITS

The following paragraph shall be inserted after the first paragraph of General Provision Section 70-02 Permits and Licenses and shall read as follows:

- 1. Seerley Creek Improvements (Includes Conveyances under I-70 to Hanna Facility)
  - a. Owner shall be responsible for applying for and obtaining the following permits:
    - 1) Jurisdictional Determination Request (USACE)
    - 2) Section 404 Regional General Permit Application (USACE)
    - 3) Section 401 Water Quality Certification Regional General Permit Notification (IDEM)
    - 4) Infrastructural Plan Review (City of Indianapolis)
    - 5) Drainage Permit (City of Indianapolis)
    - 6) NPDES Rule 5 Stormwater Construction Permit (IDEM)
    - 7) Building Plan Review and Construction Design Release (Fire Marshall)
    - 8) Building Permit (City of Indianapolis)
    - 9) Sanitary Sewer Main Application (Citizens)
    - 10) NPDES Discharge Permit for Dewatering (IDEM)

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- 11) Significant Water Withdrawal Facility registration (IDNR)
- 12) Temporary Construction Dewatering Report (IDNR)
- 13) Notice of Proposed Construction or Alteration 7460 Permit (FAA)

Copies of all permits shall be obtained and reviewed by Contractor prior to commencing any work on site.

- b. Contractor shall be responsible for obtaining all other construction-related permits and documents which may be required to complete the work. Permits and documents the Contractor is responsible to obtain shall include, but are not limited to:
  - 1) Airport Work Permit (Indianapolis Airport Authority)
  - 2) Well Log Submittal (IDNR)
  - 3) Coordination with Citizens (Gas/Water/Sewer)
  - 4) Special Sanitary Discharge Permit (Citizens) for Discharge of Cured-in-Place Pipe Cure Water
  - 5) Coordination with IPL (Electric)
  - 6) Construction Permit Electrical (City of Indianapolis)
  - 7) Construction Permit Plumbing (City of Indianapolis)
  - 8) Construction Permit Structural (City of Indianapolis)
  - 9) Construction Permit HVAC (City of Indianapolis)
  - 10) Construction Permit Wrecking (City of Indianapolis)
  - 11) Coordination and locate IAA Lines
  - 12) Coordination and locate FAA Lines
  - 13) Right-of-Way Permit (INDOT) Permit Process has been initiated by Engineer

Copies of all permits shall be forwarded to the Owner and Engineer prior to Contractor commencing any work on site.

- 2. Hanna Avenue Facility Improvements (Includes Force Mains Hanna to Existing IAA Force Main, and West to Hanna)
  - a. Owner shall be responsible for applying for and obtaining the following permits:
    - 1) Section 404 Regional General Permit Application (USACE)
    - 2) Section 401 Water Quality Certification Regional General Permit Notification (IDEM)
    - 3) Infrastructural Plan Review (City of Indianapolis)
    - 4) Drainage Permit (City of Indianapolis)
    - 5) NPDES Rule 5 Stormwater Construction Permit (IDEM)
    - 6) Right of Way Permit (City of Indianapolis)
    - 7) Driveway Permit (City of Indianapolis)
    - 8) Building Plan Review and Construction Design Release (Fire Marshall)
    - 9) Building Permit (City of Indianapolis)
    - 10) Sanitary Sewer Main Application (Citizens)
    - 11) NPDES Discharge Permit for Dewatering (IDEM)
    - 12) Significant Water Withdrawal Facility registration (IDNR)
    - 13) Temporary Construction Dewatering Report (IDNR)
    - 14) Notice of Proposed Construction or Alteration 7460 Permit (FAA)

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

Copies of all permits shall be obtained and reviewed by Contractor prior to commencing any work on site.

- b. Contractor shall be responsible for obtaining all other construction-related permits and documents which may be required to complete the work. Permits and documents the Contractor is responsible to obtain shall include, but are not limited to:
  - 1) Airport Work Permit (Indianapolis Airport Authority)
  - 2) Well Log Submittal (IDNR)
  - 3) Coordination with Citizens (Gas/Water/Sewer)
  - 4) Coordination with IPL (Electric)
  - 5) Construction Permit Electrical (City of Indianapolis)
  - 6) Construction Permit Plumbing (City of Indianapolis)
  - 7) Construction Permit Structural (City of Indianapolis)
  - 8) Construction Permit HVAC (City of Indianapolis)
  - 9) Coordination and locate IAA Lines
  - 10) Coordination and locate FAA Lines
  - 11) TEPPCO (Enterprise) Line Approval
  - 12) Right-of-Way Permit (INDOT) Permit Process has been initiated by Engineer

Copies of all permits shall be forwarded to the Owner and Engineer prior to Contractor commencing any work on site.

# SP-22 PUMPING MANHOLES

The Contractor is advised that the existing ducts, manholes, handholes, and other existing structures may have water in them. The Contractor shall provide pumping as necessary to perform the work.

# SP-23 M-102 MAINTENANCE OF TRAFFIC

The Contractor shall erect and maintain all traffic control devices – signs, barricades, closure crosses, etc., as indicated on the Plans. Unless specified otherwise, the following standards for traffic control will be applicable:

- 1. Outside Airport Operations Area (AOA) Manual of Uniform Traffic Control Devices for Streets and Highways, latest edition.
- 2. Inside AOA FAA AC 150/5370-2, latest edition. This AC is available at www.faa.gov.

These devices shall be maintained continuously by the Contractor to ensure conformance to the plans and to protect the public.

Sign posts shall be located and constructed to hold signs in a proper position to resist swaying, turning or displacement, and at the same time constitute the least possible hazard to motorists.

The Contractor shall maintain access to all existing facilities, including FedEx and the Plumber's and Steamfitters Local 440 at all times. The Contractor acknowledges heavy traffic due to FedEx operations along High School Road between 9:00 pm and 3:30 am.

The Contractor shall prepare and submit for Owner review and comment a Maintenance of Traffic Plan

detailing how traffic and access to all existing facilities shall be maintained.

Delete 102-2 Method of Measurement and 102-3 Basis of Payment.

#### SP-24 M-103 CONSTRUCTION ENGINEERING

Replace 103-2.6 Record Drawings, Second Paragraph with the following:

In addition to the red-lined record drawings, the Contractor shall furnish and submit a record drawing survey in accordance with IAA CAD and GIS Standards. Similar to the red-lined record drawings, data shall be obtained by Contractor for all new pavement, terrain, grading, equipment, pipe, conduit, cable, signs, lights, utilities, etc. installed as a part of this work. In addition, any found existing utilities (active or abandoned) not shown or otherwise noted on the plan set shall be obtained and submitted by the Contractor during construction. Record drawing survey coordinates and elevations shall be consistent with the survey control information provided in the construction plan set.

Delete 103-3.1 Method of Measurement and 103-4.1 Basis of Payment.

# <u>SP-25</u> <u>P-151 CLEARING AND GRUBBING</u>

Delete 151-3.1 Method of Measurement and 151-4.1 Basis of Payment.

# <u>SP-26</u> <u>P-156 TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND</u> <u>SILTATION CONTROL</u>

Delete 156-4.1 Method of Measurement and 156-5.1 Basis of Payment.

#### SP-27 ADDITIONAL SOIL EROSION AND SILTATION CONTROL MEASURES

1. Inlet Protection

Install inlet protection at all stormwater inlets within the construction area, or in areas that receive runoff from disturbed areas, to prevent sediments, construction debris, and other potential stormwater pollutants from entering storm sewer inlets and catch basins. For inlets within a road or driving lane, equip the inlet protection practice with an overflow or bypass so ponding water does not cause unsafe driving conditions. Remove accumulated sediment and debris collected by inlet protection practices and dispose of properly after every rain event. When cleaning or removing inlet protection, do not place sediment and debris in a ditch, stream, wetland, waterway or stormwater conveyance. Inlet protection bags shall meet the below requirements:

Test	Method	Requirements	
Grab Strength	ASTM D4632	80 lb minimum	
Puncture Strength	ASTM D4833	120 lb minimum	
Water Flow Rate	ASTM D4491	250 gal/mm/ft <sup>2</sup> or less	
Apparent Opening Size	ASTM D4751	Sieve No. 30 or less	
Permittivity	ASTM D4491	3.5 per second or less	

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

#### 2. Filter Socks or Tubes

Fabric shall meet the requirement of the latest edition of the INDOT Standard Specifications 914.09. Install in accordance with manufacturer's instructions. Use fiber filtration tubes for the slowing and filtering of stormwater. Use the appropriate tube size for the slope and the distance between tubes as specified by the manufacturer. The tubes shall allow water to flow freely and provide filtration of suspended particles.

- 3. Temporary Construction Entrance
  - a. Install a temporary construction entrance as specified in the Drawings. Construct temporary construction entrances where needed and in locations shown on the Drawings to prevent tracking of soil or mud onto publicly or privately owned paved surfaces. Place temporary construction entrances at locations where construction vehicles will repeatedly access a disturbed or unpaved area from a paved roadway.
  - b. Not all locations of construction entrances may be shown on the Drawings. The Contractor is responsible for locating and placing construction entrances to prevent tracking. Should tracking of soil occur, clear accumulated sediment from public and private driveways daily at a minimum and more frequently as sediment is tracked onto roadways. Redistribute or properly dispose of collected sediments in a manner that is in accordance with all applicable statutes and regulations. Do not rinse tracked material with water unless water is collected and disposed of properly.
- 4. Pumping Bags

Install pumping bags according to the Drawings. Provide pumping bags to filter sediment from dewatering operations. Properly dispose of used pumping bags. Appropriately size the bags for the amount of flow. Use pumping bags on an erosion resistant surface. Do not discharge sediment-laden water from dewatering operations into or near stormwater conveyances, wetlands, rivers, streams, and impoundments or into natural or manmade channels leading thereto. Refer also to Special Technical Provision 02102 for the disposal of sediment-laden water.

- 5. Concrete Washout Area
  - a. Provide concrete washout facilities of adequate capacity in accordance with project requirements. The concrete washout shall be located as far from surface waters as practical (50 feet minimum), and shall be able to contain all liquid and solid material from concrete truck or mixer washing operations without contacting or contaminating the ground. The Contractor is responsible for locating and placing.
  - b. The containment system shall be inspected for leaks, spills, and tears, and shall be repaired or replaced as necessary. The Contractor shall ensure that each containment system maintains adequate capacity. Refer to Special Technical Provision 02102 for Concrete Washout requirements.

#### 6. Erosion Control for Soil Stockpiles

Manage soil stockpiles for wind erosion, stormwater erosion and sediment control. Temporarily or permanently stabilize stockpiled soil that is scheduled or likely to be left inactive for 15 days or more with measures appropriate for the season to minimize erosion potential. Position stockpiles away from any ditch, stream, wetland, or stormwater conveyance. Properly dispose of soil that will not be used for the project.
- 7. Management of Soil from Trench Excavation Pile material from trench excavations in an area away from any ditch, stream, wetland or stormwater conveyance and install silt fence around the material for sediment control. Install inlet protection within the project area when excavated material is placed on a paved surface. Following pipe installation, backfill trenches and temporarily or permanently stabilized all bare areas to prevent soil erosion.
- 8. Directional Drilling or Horizontal Boring Erosion and Sediment Control Install erosion and sediment control measures in accordance with the Drawings. Install silt fence around all work areas at bore and receiving pits to control sediments. Pile materials from ditch excavation away from ditches, streams, wetlands or stormwater conveyances. Properly dispose of material that is not used to backfill pits. Filter pit dewatering discharge in accordance with Special Technical Provision 02102 for the Disposal of Sediment-Laden Water. Seed and mulch disturbed soil surfaces.
- 9. Working Near Water Wells

Identify water wells on the plans. Implement erosion and sediment control practices to reduce sedimentation introduction into groundwater. Position construction materials and equipment so that the area slopes away from wells. Provide secondary containment for all chemicals, fuels or other liquids to capture spills or leaks. Clean up spills with absorbents or dry methods. Do not allow spills to soak into the ground and do not wash off with water or detergents. Properly dispose of waste materials.

#### SP-28 P-209 CRUSHED AGGREGATE BASE COURSE

Delete 209-4.1 Method of Measurement and 209-5.1 Basis of Payment.

#### SP-29 D-705 PIPE UNDERDRAINS FOR AIRPORTS

Replace references to P-152 with Special Technical Provision 02220.

PVC Underdrains shall be installed in accordance with D-705 with the following modifications:

705-2.2 PIPE – replace this section with the following:

Underdrain pipe shall be Schedule 40 Poly (Vinyl Chloride) (PVC) per ASTM D 1784 and ASTM D 2467

705-2.7 FILTER FABRIC:

Delete "N/A"

Insert:

All underdrains shall be installed with filter fabric and shall be backfilled with #8 double-washed stone as shown on the Drawings. Fabric for encasing the pipe and aggregate backfill shall be a permeable, geotextile fabric meeting the following

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

#### minimum values:

Grab Tensile	90 lbs.
Grab Elongation	50%
Mullen Burst	210 psi
Puncture	65 lbs.
Equivalent Opening Size	
(U.S. Sieve Number)	70
Permittivity	50 gal/min/sq ft
Mass per Unit Area	4.0 oz/sq yd

Delete 705-4.1 Method of Measurement and 209-5.1 Basis of Payment.

#### <u>SP-30</u> <u>D-753 RIPRAP</u>

Delete 753-4.1thru 4.3 Method of Measurement and 753-5.1thru 5.3 Basis of Payment.

#### SP-31 F-162 CHAIN-LINK FENCE

Delete 162-4.1 Method of Measurement and 162-5.1 Basis of Payment.

#### <u>SP-32</u> <u>T-901 SEEDING</u>

Seeding shall be completed in accordance with T-901 with the following modifications:

Delete T-901-2.2 SEED. Insert T-901-2.2 SEED as follows:

Seed shall be Type "R", except where otherwise specified, per Indiana Department of Transportation Specifications. Seed shall be purchased from sources of supply that have been sampled, tested, and reported by the Indiana State Seed Commissioner and found to be satisfactory. Seed which has been tested by the State Seed Commissioner may be used without further testing provided each bag of seed bears a tag showing the seed meets the requirements of the INDOT specifications.

Delete 901-4.1 Method of Measurement and 901-5.1 Basis of Payment.

#### SP-33 T-905 TOPSOILING

Delete 905-4.1 Method of Measurement and 905-5.1 Basis of Payment.

#### <u>SP-34</u> <u>T-908 MULCH</u>

Delete 908-4.1 Method of Measurement and 908-5.1 Basis of Payment.

#### <u>SP-35</u> <u>L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS</u>

110-2.6 Concrete – replace reference "Item P-610, Structural Portland Cement Concrete" with the following:

Special Technical Provisions 03100 – Concrete Formwork; 03200 – Concrete Reinforcement; and 03300 – Cast-In-Place Concrete

110-2.7 Flowable Backfill – replace reference "Item P-153 'Controlled Low Strength Material'" with the following:

Special Technical Provision 02220 – Trenching, Backfilling, and Compaction for Utilities

110-3.1 General - remove last sentence of the eighth paragraph "All such rock removal shall be performed and paid for under Item P-152."

General – replace all references to "Item P-152" with the following:

Special Technical Provision 02220

Delete 110-4.1 Method of Measurement and 110-5.1 Basis of Payment.

#### SP-36 L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

115-2.5 Concrete – replace reference "Item P-610, Structural Portland Cement Concrete" with the following:

Special Technical Provisions 03100 – Concrete Formwork; 03200 – Concrete Reinforcement; and 03300 – Cast-In-Place Concrete

115-3.2 Concrete Structures – replace reference "Item P-610" with the following:

Special Technical Provisions 03100; 03200; and 03300

115-2.10 Flowable Backfill – replace reference "Item P-153 'Controlled Low Strength Material'" with the following:

Special Technical Provision 02220 - Trenching, Backfilling, and Compaction for Utilities

115-3.7 Backfilling – replace reference to "Item P-152" with the following:

Special Technical Provision 02220

Delete 115-4.1 Method of Measurement and 115-5.1-5.2 Basis of Payment.

#### SP-37 INDOT STANDARD SPECIFICATIONS

It is the intent that hot mix asphalt (HMA) construction and materials conform to the State of Indiana Department of Transportation Standard Specifications. Therefore, unless stated otherwise, the most recent State of Indiana Department of Transportation Standard Specifications shall apply to the specified INDOT Item 303 and 402.

If there is a conflict between the Indiana Department of Transportation Standard Specifications

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

and the contents of the General Provisions and Special Provisions of these specifications, these specifications shall govern.

Deviations from the requirements of INDOT 303 and 402 are as follows:

- 1. Definition of Terms:
  - a. Department shall mean the Engineer or Owner's representative
  - b. Commissioner shall mean Engineer
  - c. Engineer shall mean the designated representative of the Owner
  - d. Laboratory shall mean the Engineer or the Owner's designated testing firm
  - e. Owner shall mean Indianapolis Airport Authority
  - f. Division of Materials and Tests shall mean the Engineer
  - g. State shall mean the Owner

#### SP-38 WELL CLOSURE/MONITORING WELL CLOSURE

Abandonment and well closure procedure:

- 1. Contractor shall physically locate all wells identified on drawings to be closed. Well which are to be closed need to be clearly marked "To be Closed in Place".
- Specifications for installation and closure are defined in "the Indiana Administrative Code, 312 IAC 13 - Article 13 Rule 10. Water Well Drillers and Water Well Pump Installers" rule. All Well installation and closure must be completed by an Indiana Licensed well driller or pumper.
- 3. Wells that are marked to be closed in place shall be permanently abandoned (in place) in accordance with Special Technical Provision 02671 and 312 IAC 13-10-2 "Permanent Abandonment of Wells"
- 4. The Licensed well driller or pumper will be responsible to notify IDNR of the well abandonment and provide the owner with copies of the well record for closure.

#### **SP-39** COMPACTED CLAY LINER

Quality Assurance (QA) refers to the function of the owner or owner's representative, usually an independent testing firm, to monitor construction activity and review construction data and reports from contractors, manufacturers and suppliers. Contractors, manufacturers and supply Quality Control (QC) information for their products and equipment. The information becomes part of the project quality assurance/documentation report.

A specific sequence of procedures is necessary for the construction of the clay liner. Documentation of each procedure becomes necessary to demonstrate that design or performance specifications have been achieved. Visual inspection, field and laboratory testing will be undertaken as appropriate. Recommendations for geotechnical testing frequencies and geotechnical product specifications are provided below.

1. Scope

The work shall consist of the construction of the clay liner as shown on the plans. A geocomposite drainage layer will be placed between the native soils and the clay liner.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

Contractor shall harvest and stockpile soils generated from excavation operations that are suitable for clay liner construction in sufficient quantities to construct the clay liner.

2. Materials

Soils used in the clay liner construction shall have a minimum plasticity index of 10 as tested by Atterberg Limit tests (ASTM D 4318), a minimum of 60% passing the number 200 sieve (ASTM D 422), and a recompacted permeability of 10<sup>-6</sup> cm/sec or less as tested by Hydraulic Conductivity (ASTM D 5084). Clay materials shall contain no sod, brush, roots, frozen soil, or other perishable materials. Rock particles larger than 1/2 inches shall be removed prior to compaction of the clay.

#### 3. Foundation Preparation

A grid pattern should be established at the base and sides of the excavation, generally 100foot spacing. Foundation surfaces shall be graded to remove surface irregularities. The foundation shall be compacted as specified for subsequent layers of clay liner.

4. Placement

The clay liner material shall be placed and compacted over the geocomposite drainage layer using proper equipment following the manufacturer recommendations. Special precautions will be necessary to prevent damage to the geocomposite drainage layer.

The clay liner shall be placed in lifts. The thickness of each lift before compaction shall not exceed 8 inches. The clay liner shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the clay liner. Special precautions to prevent freezing and/or drying of the compacted clay liner will be necessary. These methods may include soil cover and/or insulation.

The distribution of materials throughout the clay liner shall be essentially uniform, and the clay liner shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified to a depth of not less than 2 inches before the next layer is placed.

5. Control of Moisture Content

During placement and compaction of the clay liner, the moisture content of the clay being placed shall be maintained and compacted at 2 to 4 percent above the moisture content at maximum proctor density as determined by the Modified Proctor Test (ASTM D-1557).

The application of water to the clay shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the clay after placement and before compaction of the liner, if necessary. Uniform moisture distribution shall be obtained by disking.

6. Compaction

The clay liner shall be compacted to a minimum of 95% of modified proctor dry density (ASTM D-1557) at 2 to 4 percent above optimum moisture. The clay liner shall be

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

compacted with a footed compactor or equivalent operated continuously, in uncompacted lift thicknesses not to exceed 8 inches. The compaction equipment shall be of sufficient size to achieve the compaction requirements and to avoid damage to the geocomposite drainage layer.

7. Protection of Clay Liner

Contractor shall protect the clay liner prior to placement of the Reinforced Polypropylene (RPP) liner from conditions which may alter the moisture content beyond that listed under Section 5 of this special provision. These conditions may include, but are not limited to, exposure to precipitation or prolonged periods of exposure. If it is determined the moisture content of the clay liner does not meet the moisture content requirements, the clay liner shall be reworked per the requirements of this special provision.

8. Reworking or Removal and Replacement of Defective Liner

Clay liner material placed at densities lower than the specified minimum density or at moisture contents outside the specified moisture content range or otherwise not conforming to the requirements of the specifications shall be reworked to meet the specifications or removed and replaced by acceptable material. The replacement clay and the foundation and fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, permeability and compaction.

9. Testing and Documentation Requirements

Liner construction shall be tested and documented as specified below. Copies of the documentation report, including test locations and test results shall be provided to the owner or owner representative. Prior to the Laboratory Testing program listed in Section 8.1, the contractor shall clearly identify the stockpiles that will be used for the clay liner.

Field and laboratory soil tests shall be completed on the clay liner, by an engineering firm retained by the contractor (QC) and an engineering firm retained by the owner or owner representative (QA) to document compliance with this specification. Laboratory testing shall be performed on each stockpiled material, borrow area or on any changes in the soil type. Each set of laboratory testing shall include Modified Proctor, Atterberg Limits, Grain Size Distribution and Hydraulic Conductivity (Permeability) performed at +2 percent of optimum moisture content.

a. Laboratory Testing shall be completed on the clay liner, by an engineering firm retained by the contractor (QC) and an engineering firm retained by the owner or owner representative (QA) to document compliance with this specification. Laboratory testing shall be performed on each stockpiled material, borrow area or on any changes in the soil type. Each set of laboratory testing shall include Modified Proctor, Atterberg Limits, Grain Size Distribution and Hydraulic Conductivity (Permeability) performed at +2 percent of optimum moisture content.

Modified Proctor (ASTM D 1557)

One per 2,000 cubic yards of clay liner or any changes in the major soil type.

Atterberg Limits (ASTM D 4318)	One per 1,000 cubic yards of clay liner or any changes in the major soil type.
Grain Size Distribution (ASTM D 422)	One per 1,000 cubic yards of clay liner or any changes in the major soil type.
Permeability (ASTM D 5084)	One per 2,000 cubic yards of clay liner with a minimum of one per borrow area or any changes in the major soil type.

b. <u>Field Testing</u> shall be performed as the liner is being placed and on the in-place clay liner material. The following tests shall be completed, as a minimum, at the specified frequency.

Modified Proctor Test (ASTM D 1557)	One per 2,000 cubic yards of clay liner or any changes in the major soil type.
Field Density Test (ASTM D 2922, or D 2937, or D 2167, or D 1556)	One test per 100-foot grid per 6 inch thickness of clay liner, not less than 3 tests per day
Atterberg Limit tests (ASTM D 4318)	One test on undisturbed sample obtained from each layer of the constructed clay liner.
Grain Size Distribution (ASTM D 422)	One test on undisturbed sample obtained from each layer of the constructed clay liner.
Permeability (ASTM D 5084)	One test on undisturbed sample obtained from each layer of the constructed clay liner.

All test holes shall be backfilled using powdered bentonite mixed with clay soil used in liner construction and compacted by hand tamping. The clay shall be broken down into clods less than 1/2 inch in diameter. A minimum of 50% of the backfilled test hole volume shall be occupied by powdered bentonite after backfilling.

The contractor shall be aware that results from the Atterberg Limits, Grain Size Distribution and Permeability testing program specified above will be available within 3 to 5 working days after the clay liner has been placed. Clay liner not meeting the specified requirements shall be treated as specified above in Item 8. Therefore, it is critical that material used for the clay liner material be tested by the contractor prior to placement as part of the QC program.

#### SP-40 TRENCHLESS CONSTRUCTION UNDER INTERSTATE 70

1. <u>Scope</u>

Work shall include the installation of 78-inch sewer, and 102-inch casing (if required by the approved construction method), under Interstate 70 as shown on the plans. This Special

Provision shall also govern trenchless pipe installation methods not covered by Special Technical Provision 02224 Trenchless Excavation – Horizontal Borings and 02226 – Trenchless Excavation – Directional Drilling.

Indiana Department of Transportation (INDOT) requirements detailed in this special provision shall also apply to other trenchless crossings under Interstate 70 (Midfield to Hanna Force Main and West to Hanna Force Main).

#### 2. Existing Conditions and Available Information

Available geotechnical information in the vicinity of this work is limited. Available information has been included in the appendix. Contractor shall be responsible for performing additional site investigations, including geotechnical evaluations, with the approval of Owner (and INDOT, within Interstate 70 right-of-way) to obtain the existing condition information necessary for determination of the means and methods necessary to complete the work.

#### 3. <u>General Requirements</u>

All work shall be in compliance with the INDOT permit initiated by Engineer and obtained by Contractor, and INDOT's Utility Accommodation Policy (Appendix C). For each trenchless crossing of Interstate 70, Contractor shall complete a Permit Bond Form (Appendix C) and provide INDOT a bond in an amount equal to the cost of the work plus 25 percent. Contractor shall also prepare a Settlement Monitoring Plan and surveys per INDOT requirements.

#### 4. Installation Plan

Contractor shall submit for Owner review and approval an installation plan that details the construction method for installation of the 78-inch storm sewer.

The installation plan shall consist of narratives, design calculations, design drawings, specifications, details, and submittals for the trenchless system design, materials, construction means and methods including, but not limited to:

- a. Installation method
- b. Equipment
- c. Dewatering
- d. Spoils handling/disposal
- e. Soil stabilization
- f. Filling of voids
- g. Temporary face support
- h. Pipe, casing, tunnel shoring systems
- i. Anticipated pressures required to stabilize tunnel and control groundwater inflow and methods and equipment for monitoring these pressures
- j. Access pits
- k. Reaction blocks for jacking
- 1. Methods for controlling line and grade
- m. Methods for addressing boulder interference
- n. Provisions for standby and backup equipment
- o. Schedule and sequencing
- p. Spacers

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

- q. Grouting
- r. Ventilation
- s. Lighting
- t. INDOT Highway Settlement Monitoring Plan (Appendix C)
- u. Contractor Quality Control Plan (per INDOT Office of Materials Management, ITM No. 803-11P) (Appendix C)

Engineering designs and calculations required for the trenchless system shall be prepared and stamped by a Professional Engineer licensed in the State of Indiana, with a minimum of 10 years' experience in the design of the proposed trenchless system.

Construction methods may include, but are not limited to, tunnel bore method, bore hole, and jacked liner. The construction method shall be compatible with the selected storm sewer pipe material and meet the pipe manufacturer's recommendations.

- 5. <u>Contractor Experience</u>
  - a. Contractor shall demonstrate experience and expertise in the proposed trenchless construction method by providing a list of six references for whom similar work has been performed. These references shall include names and telephone numbers for the contact persons so Owner may verify experience and expertise.
  - b. Contractor shall also provide documentation showing successful completion of at least an aggregate total of 10,000 linear feet of similar trenchless construction method experience of 54-inch diameter pipe and larger.
  - c. All supervisory personnel shall be adequately trained and shall have at least ten years of experience in the proposed trenchless construction method. Contractor shall also submit the names and resumes of all supervisory field personnel for review by the Engineer prior to commencing any work.
- 6. Materials

Storm sewer pipe may be prestressed concrete cylinder pipe per Special Technical Provision 02503, or fiberglass reinforced polymer mortar pipe per Special Technical Provision 02725. Casing pipe shall be per Special Technical Provision 02224. Cellular concrete grout used to fill the annulus of the tunnel shall be per ASTM C 796 and INDOT Specification 725.07.and shall possess a minimum compressive strength of 150 psi.

- 7. Execution
  - a. Perform the initial INDOT settlement monitoring survey.
  - b. All work shall be per the Owner-approved installation plan.
  - c. All work shall stop immediately if any movement or settlement occurs.
  - d. Contractor shall monitor all existing pavement and utility crossings for settlement.
  - e. If the 78-inch sewer is placed inside a casing pipe, the gravity-flow carrier pipe shall be shimmed to proper line, elevation, and grade and then the void between the two pipes shall be grouted with cellular grout.
  - f. All voids and annular spaces shall be filled under pressure with cellular concrete grout.
  - g. A closed-circuit television inspection of the 78-inch sewer shall be completed per Special Technical Provision 02732 at least 30 days after complete installation of the 78-inch sewer under Interstate 70.

STORMWATER & DEICING CAPACITY PROJECTS I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT WESSLER PROJECT NO. 199017.04.101

#### SP-41 EQUIPMENT MANUALS

Add the following to GP 90-04 j.:

Submit Manufacturer Operation and Maintenance (O&M) Manuals to the Engineer for review a minimum of four (4) weeks prior to system start up for each respective system or equipment. System or equipment start up and substantial completion may be delayed at the discretion of the Engineer if Operation and Maintenance Manuals are not received by the Engineer in the time frame specified herein.

Furnish four (4) printed sets and two (2) thumb drives with electronic copies in pdf/bookmarked format of the equipment manufacturer's operation and maintenance (O&M) materials and manuals to the Engineer. The O&M Manual shall include local sources of service and parts for the equipment.

All O&M Manuals submitted shall be specific for the items and models furnished under this contract and reflect as-approved and as-installed information. Standard manuals from equipment suppliers which reflect all sizes and options of equipment available from the supplier shall be clearly marked to indicate the applicable sizes and options specific to this project.

Manual organization shall be as follows:

- 1. Organize operation and maintenance manuals into suitable sets of manageable size.
- 2. Bind data into individual binders for each manual, properly identified on front and spine. For large manuals, provide an index sheet and thumb tabs for separation of information categories.
- 3. Provide heavy-duty, three-ring, vinyl-covered binders, 1/2 to 3-inch thick as required to contain information, sized for 8-1/2x11 or 11x17 paper with inside pockets or pocket folders for folded sheets.

Each O&M Manual shall include information specified in individual Technical Provisions, Special Technical Provisions, and Special Provisions and the following:

- 1. Project title, equipment manufacturer, local equipment supplier, subcontractor, and prime contractor, including contact information (address, phone number, and e-mail) for each.
- 2. Copy of manufacturer warranties specific to this project.
- 3. Copies of factory tests or certified tests and reports, if required by the Technical Provisions, Special Technical Provisions, or Special Provisions or by referenced standards.
- 4. Equipment installation instructions.
- 5. Troubleshooting guide and emergency instructions.
- 6. List of spare parts provided or recommended.
- 7. Recommended maintenance materials, instructions, and procedures, including schedules, drawings, and diagrams.
- 8. Precautions against improper maintenance and exposure.
- 9. Inspection and system test procedures.

- 10. Copies of revised Shop Drawings and Product Data showing as-installed information, including:
  - a. Detailed drawings and descriptions of equipment showing all dimensions, elevations, parts, constructed details, materials of construction, performance data, descriptive literature, weights, and other physical characteristics, including performance curves, motor starting and full-load amps, motor horsepower, and motor data.
  - b. Project name, equipment name, tag numbers, location, and/or other identifying description included on the drawings and cut sheets.
  - c. All sizes, special features, options, modifications, etc., that are provided specific to this project.
  - d. All options or features not provided specific to this project are deleted, crossed out, or otherwise removed.
- 11. Electrical & Controls Information:
  - a. Detailed drawings and descriptions of electrical and controls equipment, including main and auxiliary control panels, showing all dimensions, parts, constructed details, and materials of construction.
  - b. Complete electrical system drawings and description including, but not limited to, the following:
    - 1) Complete system interconnection diagrams between power supply, control panels, drive motors, secondary drive motors, and all ancillary equipment connected to control system, including terminal number connection points.
    - 2) Control panel overall dimensions dimensions and layout of external and internal mounted components.
    - 3) Complete electrical schematics with power wiring and control wiring in accordance with current standards. Schematics shall include all component ratings.
  - c. Complete motor rating including all nameplate data, guaranteed minimum rated efficiency, and speed torque curves.
  - d. Description of control system in written form including functions monitored, controlled, and alarmed. Include sequence of operation and interface requirements.

-END-

# **APPENDIX A**

# IAA ATTACHMENTS

# APPENDIX A – IAA ATTACHMENTS

- INDIANAPOLIS AIRPORT SAFETY PROGRAM
- IAA WORK PERMIT POLICY
- IAA WORK PERMIT APPLICATION

#### TABLE OF CONTENTS

Α.	ADMINISTRATIVE	1
1.0	INTRODUCTION	.1
2.0	DEFINITIONS	.1
3.0	OVERVIEW	.2
4.0	OBJECTIVES	.2
5.0	COMMUNICATIONS	.3
6.0	SAFETY RESPONSIBILITIES	.3
6.1	CONTRACTOR SAFETY REPRESENTATIVE (CSR)	.3
7.0	COMPETENT PERSONS	.5
7.1	CONTRACTOR SUPERVISION	.5
7.2	EMPLOYEES	.5
8.0	PROJECT SAFETY ORIENTATION	.5
9.0	SAFETY TRAINING	.7
9.1	WEEKLY TOOL BOX SAFETY MEETINGS	.7
9.2	BULLETIN BOARDS	.7
9.3	EMERGENCY PROCEDURES OVERVIEW	.7
9.4	FIRST AID AND MEDICAL TREATMENT	.7
9.6	EVACUATION PROCEDURES	. 8
9.7	ROLL CALL	.8
9.8	NEWS MEDIA	. 8
10.0	INCIDENT PREVENTION	.9
10.1	INCIDENT/ACCIDENT PROCEDURES	.9
10.2	INCIDENT NOTIFICATION AND INVESTIGATION	10
10.3	INCIDENT REVIEW PROCESS	10
11.0	DISCIPLINARY ACTION	11
12.0	SAFE WORK PLAN OVERVIEW	13
13.0	SECURITY REQUIREMENTS-	13
140		4.4
14.0	SUBSTANCE ABUSE PRUGRAM	14
B.	SAFE WORK REQUIREMENTS	14 14
14.0 B. 1.0	SAFE WORK REQUIREMENTS	14 14 14
14.0 B. 1.0 2.0	SOBSTANCE ABOSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS	14 <b>14</b> 14 15
14.0 B. 1.0 2.0 3.0	SOBSTANCE ABOSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS	14 14 14 15 15
14.0 B. 1.0 2.0 3.0 4.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES	14 14 15 15 15
14.0 B. 1.0 2.0 3.0 4.0 5.0	SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES	14 14 15 15 15 15
B. 1.0 2.0 3.0 4.0 5.0 6.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES	14 14 15 15 15 16
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION	14 14 15 15 15 16 16
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION	14 14 15 15 15 16 16 17 18
H4.0 B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION	<b>14</b> 14 15 15 15 16 16 17 18
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES	<b>14</b> 14 15 15 15 16 16 17 18 19 20
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS	<b>14</b> 14 15 15 15 16 16 17 18 19 20 20
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT	<b>14</b> 14 15 15 16 16 17 18 20 20 20
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING	<b>14</b> 14 15 15 15 16 16 17 18 19 20 20 21
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING LADDERS	<b>14</b> 14 15 15 16 16 17 18 20 20 20 21 22
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING LADDERS LIFTING SAFETY	<b>14</b> 14 15 15 16 16 17 18 20 20 21 22 22 22
<ul> <li>14.0</li> <li>B.</li> <li>1.0</li> <li>2.0</li> <li>3.0</li> <li>4.0</li> <li>5.0</li> <li>6.0</li> <li>7.0</li> <li>8.0</li> <li>9.0</li> <li>10.0</li> <li>11.0</li> <li>12.0</li> <li>13.0</li> <li>14.0</li> <li>15.0</li> <li>16.0</li> </ul>	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES. FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT. HOUSEKEEPING LADDERS LIFTING SAFETY LIGHTING	14 14 15 15 15 16 17 18 20 20 21 22 22 22 22 22
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING LADDERS LIFTING SAFETY LIGHTING LIQUEFIED PETROLEUM GAS (LPG)	<b>14</b> 14 15 15 16 16 17 18 20 21 22 22 22 22 22 22 22 22 22 22 22 22
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING LADDERS LIFTING SAFETY LIGHTING LIQUEFIED PETROLEUM GAS (LPG) LOCKOUT/TAG-OUT	14 14 15 15 16 16 17 18 20 21 22 22 22 22 23 23
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING LADDERS LIFTING SAFETY LIGHTING LIQUEFIED PETROLEUM GAS (LPG) LOCKOUT/TAG-OUT MAN LIFTS/SCISSORS LIFTS	<b>14</b> 14 15 15 16 16 17 18 20 21 22 22 22 23 23 23
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING LADDERS LIFTING SAFETY LIGHTING LIQUEFIED PETROLEUM GAS (LPG) LOCKOUT/TAG-OUT MAN LIFTS/SCISSORS LIFTS MATERIALS STORAGE AND HANDLING	<b>14</b> 14 15 15 16 17 18 20 21 22 22 23 23 23 23 23
<ul> <li>14.0</li> <li>B.</li> <li>1.0</li> <li>2.0</li> <li>3.0</li> <li>4.0</li> <li>5.0</li> <li>6.0</li> <li>7.0</li> <li>8.0</li> <li>9.0</li> <li>10.0</li> <li>11.0</li> <li>12.0</li> <li>13.0</li> <li>14.0</li> <li>15.0</li> <li>16.0</li> <li>17.0</li> <li>18.0</li> <li>19.0</li> <li>20.0</li> <li>21.0</li> </ul>	SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT. HOUSEKEEPING LADDERS LIFTING SAFETY LIGHTING LIQUEFIED PETROLEUM GAS (LPG) LOCKOUT/TAG-OUT MAN LIFTS/SCISSORS LIFTS MATERIALS STORAGE AND HANDLING PERMITS AND TAGS	<b>14</b> <b>14</b> <b>15</b> <b>16</b> <b>17</b> <b>16</b> <b>17</b> <b>18</b> <b>10</b> <b>20</b> <b>21</b> <b>22</b> <b>23</b> <b>23</b> <b>23</b> <b>23</b> <b>24</b>
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0	SUBSTANCE ABOSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING LADDERS LIFTING SAFETY LIGHTING LIQUEFIED PETROLEUM GAS (LPG) LOCKOUT/TAG-OUT MAN LIFTS/SCISSORS LIFTS MATERIALS STORAGE AND HANDLING PERMITS AND TAGS. PERSONAL PROTECTIVE EQUIPMENT (PPE)	<b>14</b> <b>14</b> <b>15</b> <b>15</b> <b>16</b> <b>17</b> <b>19</b> <b>20</b> <b>21</b> <b>22</b> <b>23</b> <b>23</b> <b>23</b> <b>24</b> <b>25</b>
B. 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0	SUBSTANCE ABUSE PROGRAM SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING LADDERS LIFTING SAFETY LIGHTING LIQUEFIED PETROLEUM GAS (LPG) LOCKOUT/TAG-OUT MAN LIFTS/SCISSORS LIFTS MATERIALS STORAGE AND HANDLING PERMITS AND TAGS PERSONAL PROTECTIVE EQUIPMENT (PPE) POWDER-ACTUATED TOOLS	<b>14</b> 14 15 15 16 17 18 20 21 22 22 23 23 24 22 22 23 23 24 22 22 23 23 24 22 22 23 23 24 22 22 23 23 23 24 25 27
<ul> <li>14.0</li> <li>B.</li> <li>1.0</li> <li>2.0</li> <li>3.0</li> <li>4.0</li> <li>5.0</li> <li>6.0</li> <li>7.0</li> <li>8.0</li> <li>9.0</li> <li>10.0</li> <li>11.0</li> <li>12.0</li> <li>13.0</li> <li>14.0</li> <li>15.0</li> <li>16.0</li> <li>17.0</li> <li>18.0</li> <li>19.0</li> <li>20.0</li> <li>21.0</li> <li>22.0</li> <li>23.0</li> <li>24.0</li> </ul>	SAFE WORK REQUIREMENTS GENERAL CONSTRUCTION SAFETY REQUIREMENTS BLOOD-BORNE PATHOGENS COMPRESSED GAS CYLINDERS CRANES ELECTRICAL SAFETY EXCAVATIONS/UNDERGROUND UTILITIES FALL PROTECTION FIRE PREVENTION/PROTECTION HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION GUARDRAILS/BARRICADES HAND TOOLS AND POWER TOOLS HEAVY EQUIPMENT HOUSEKEEPING LADDERS LIFTING SAFETY LIGHTING LIQUEFIED PETROLEUM GAS (LPG) LOCKOUT/TAG-OUT MAN LIFTS/SCISSORS LIFTS MATERIALS STORAGE AND HANDLING PERSONAL PROTECTIVE EQUIPMENT (PPE) POWDER-ACTUATED TOOLS RADIOS AND OTHER ELECTRONIC COMMUNICATION DEVICES	<b>14</b> 14 15 15 16 17 18 20 20 22 22 23 23 24 27 27

26.0 SPILL CONTROL/ENVIRONMENTAL PROTECTION	28
27.0 TEMPORARY BUILDING	28
28.0 TOOLBOX TALKS/SAFETY TRAINING	28
29.0 VEHICLE USAGE (EXCLUDING AIRPORT OPERATIONS AREAS)	28
30.0 WASTE DISPOSAL	29
FORMS	29
ΕΧΗΙΒΙΤ ΔΔ	1
EXHIBIT AB	2
EXHIBIT AC	4
	5
	6
EXHIBIT AE-1	8
EXHIBIT AF	9
EXHIBIT AF-1	10
EXHIBIT AG	11
EXHIBIT AG-1	12
EXHIBIT AG-2	13
EXHIBIT AG-3	14
EXHIBIT AG-4	15
EXHIBIT AH	16
	17
EXHIBIT AJ	18
EXHIBIT AK	19

# INDIANAPOLIS AIRPORT SAFETY PROGRAM CONTRACTOR SAFETY INSTRUCTIONS

#### A. ADMINISTRATIVE

#### 1.0 INTRODUCTION

- A. This project safety plan is not an attempt to reiterate the numerous applicable regulations, standards, and laws that contractor are bound to comply with in achieving a safe and healthful workplace. IOSHA standards are minimum requirements. This program is intended to be a supplement to enumerate requirements that raise the level of safety and clarify and highlight certain requirements with the intent of achieving the safest possible workplace. Contract firms and their employees must understand what is required of them because they are accountable for maintaining a safe project. Nothing contained in this project safety plan is intended to relieve any contractor or supplier of the obligations assumed by them under their contract with the IAA or as required by law.
- B. In addition to site safety, this project mandates that construction activities do not impact airport operations or the public.
- C. Each contract firm and their employees have the explicit responsibility to provide a safe workplace and follow safe work practices at all times.

#### 2.0 DEFINITIONS

- A. Air Operations Area (AOA) Areas of the airport used on intended for landing, taking off, surface maneuvering, loading, unloading, or servicing of aircraft, operational vehicular traffic and cargo operations. This is a high security area requiring special badging and compliance with unique laws and security regulations.
- B. Airport Operations Officer A representative from the airport's Operations Department with the authority to intervene if the contractor's actions on the airport are detrimental to the airport's operational safety or security.
- C. Competent Person Person designated by contractor who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorizations to take prompt corrective measures to eliminate these conditions.
- D. Contractor An individual, firm, partnership, corporation, or subcontractor undertaking a project with the IAA to perform work on the project.
- E. Contractor Safety Representative A full time on-site safety professional with a minimum 30 Hour OSHA Construction Standards Class in the last twelve months and minimum of five years experience or equivalent safety related college degree hired by a contractor to manage only safety efforts. This person must be familiar with the type of work to be performed under the contract and have no other duties. The requirements contained herein are in addition to other requirements contained in the contract documents.
- F. Live Load Any load of material (i.e. steel, building materials) attached to a crane or by means of a cable or sling shall be referred to as a "live load" until the materials have been disconnected.
- G. Obstacle Free Zone (OFZ) An area clear of vehicles and fixed objects that is in proximity to a runway or taxiway.

#### 3.0 OVERVIEW

- A. The Project Safety Program addresses two major safety areas: 1) safe work environment and safe work practices for contractor employees, visitors, vendors, etc., 2) impact to airport operations.
- B. Construction activities in proximity to or affecting AOA must be coordinated by contractors with the Construction Manager and Airport Operations. Contractors shall make all employees aware of and follow all airport and security policies and procedures.
- C. Contractors must ensure that all construction activities are outlined and identified on project plans and shared with Construction Manager and Airport Operations. Contractors must maintain a close relationship with Airport Operations throughout the construction of the project to ensure no interruptions to airport operations.
- D. Any construction activity occurring outside the perimeter of the project or within the project perimeter that may effect airport operations must be communicated to Construction Manager and Airport Operations. Specific regulations govern these activities and contractors will be required to ensure they follow these requirements.
   Any instructions issued to contractors by the control tower shall be immediately obeyed.

# 4.0 OBJECTIVES

- A. The specific goals are established to foster a safety conscious environment, encouraging contractors to actively manage safety and thus limit losses from personal injuries and property damage. The ultimate objectives are to minimize injuries/accidents, achieve greater efficiency, and reduce the direct and indirect costs associated with injuries or claims.
- B. The effectiveness of the Project Safety Program depends upon the active participation and cooperation of the Contractor's Project Managers, Supervisors, and Employees to carry out the following basic procedures:
  - 1 **Detection** Maintain a system of prompt detection and correction of unsafe practices and conditions.
  - 2 **Education** Establish and conduct an educational program to stimulate and maintain the interest and cooperation of all employees. Education will be conducted through orientation sessions, safety meetings, bulletin boards, and training programs.
  - 3 **Investigation** All incidents, accidents, near misses, and claims will be investigated to determine their root cause and implement reasonable corrective actions in a timely manner.
  - 4 **Planning** Plan all work to minimize the potential for personal injury, property damage, and loss of productivity.
  - 5 **Regulations** Comply with Federal, state, and local, and Authority laws, ordinances, regulations, industry standards. (see Appendix for a list of applicable agencies)
  - 6 **Verification** Verification of effective safety process through audits and metrics.

# 5.0 COMMUNICATIONS

A. At a minimum each project Superintendent and Safety Representative will be required to have adequate communications (i.e. radio, cellular phone, etc.) while on the project.

# 6.0 SAFETY RESPONSIBILITIES

- A. Every person involved with the project is responsible for their own safety and that of their fellow workers. Each person must thoroughly understand the scope of work and the safety precautions that apply.
- B. Project safety professionals serve as a resource to monitor, interpret, review and facilitate the Project Safety Program elements. The following information details the roles and responsibilities for Indianapolis Airport Management and Safety Personnel regarding project safety

# 6.1 CONTRACTOR SAFETY REPRESENTATIVE (CSR)

- A. All Contractors, regardless of size of its on-site work force, shall have a full time onsite CSR.
- B. Each self-performing subcontractor to the Contractor with an on-site workforce greater than thirty (30) craftspersons, shall also provide a full time on-site safety professional responsible for overseeing the subcontractor's safety. Subcontractor's CSR must be on-site at all times when construction activities are occurring.
  - 1 If the on-site work force of a Contractor's Subcontractor is between 1 to 29, the Subcontractor is to designate a Superintendent or other management person with OSHA 30-hour Construction Standards to oversee safety program compliance.
- C. Additional CSR requirements for the Contractor's subcontractors are addressed in the following chart:

Work Force	Additional Requirement for Onsite Contractor Safety Representative
See D below	One (1) Full-time non-working qualified Safety Representative is required for each subcontractor with an Experience Modification Rate greater than 1.00.
50-150	Two (2) Full-time non-working qualified Safety Representatives with OSHA 30- hour Construction Standards and a minimum of five (5) years safety related experience or equivalent safety related college degree.
151+	Three (3) Full-time non-working qualified Safety Representatives with OSHA 30- hour Construction Standards and a minimum of five (5) years safety related experience or equivalent safety related college degree.

- D. Any subcontract firm with an EMR greater than 1.00 is required to provide a full-time on-site safety professional to ensure compliance with the Safety Program.
- E. If any subcontractor with a work force less than 30 demonstrates difficulty, or fails to fulfill safety responsibilities on the project, that subcontractor will provide a full time on-site safety CSR to bring their performance into compliance.
- F. A CSR is a full time position with no other duties assigned other than ensuring safety on the project.

1 Minimum qualifications for a CSR are OSHA 30 hour training and a minimum of 5 years safety related or equivalent (safety related college degree). Other relevant credentials, additional years of related experience, and performance track record, will be evaluated for possible substitutes of listed criteria. Persons assigned as on-site Safety Professionals will be on probationary basis for 90 days.

#### G. The CSR is required to perform the following duties:

- 1 **Jobsite Inspections.** Maintain a high level of presence in the field making jobsite observations and ensuring that all unsafe acts and conditions are rectified and submit daily written inspections.
- 2 Accident/Incident Investigations. Investigate all accidents, incidents, and near miss incidents. Provide preliminary investigation findings for all incidents and accidents within 8 hours of the occurrence and facilitate the accident/incident review meeting.
- 3 **Recordkeeping.** Maintaining and posting their company's OSHA 300 log.
- 4 **Contractor Toolbox Safety Meetings.** Conduct weekly Tool Box Safety Meetings and submit documentation of the meeting.
- 5 **Cooperation.** Safety responsibilities include cooperation with Construction Manager, Operations, Security and others related to the project. Implementation of corrective actions for unsafe acts and conditions must be completed and documented immediately following implementation.
- 6 **Equipment Inspections.** All machinery, tools, equipment and safety devices must be regularly inspected for deficiencies. Any deficiencies noted will result in the item being tagged "out of service", correction of the deficiency, or disposal of the item.
- 7 First Aid/Medical Treatment/Bloodborne Pathogens. The CSR shall ensure that persons requiring first aid/medical treatment are brought to the immediate attention of their company and that emergency services are notified. This must occur in every case regardless of severity or other first aid. The CSR is to ensure that Bloodborne Pathogens concerns are addressed by properly trained and equipped personnel.
- 8 **Incident/Injury Reporting.** The CSR is responsible for immediately notifying their company in the event of an incident/injury on-site. This notification includes near miss incidents and minor first aid cases. Preliminary investigations are required to be submitted 8 hours of the occurrence.
- 9 **Man-hour Reports.** A man-hour report for all hours worked is required to be submitted the 5<sup>th</sup> day of each month.
- 10 **Permits.** The CSR is responsible for initiating permits for hot work, confined space, excavations, and critical lifts, and submitting the permit for approval.
- 11 **Safety Training.** The CSR is required to verify and provide training documentation for all state, local and federal safety requirements. Examples of this training may include Hazard Communication, Fall Protection, Heavy Equipment Operator, Forklift, PPE, scaffolds, excavation, and Confined Space.
- 12 **Disciplinary Action.** The CSR is required to initiate disciplinary procedures when safety policies and procedures are violated. Documentation of disciplinary actions shall be provided to the contractor and violator.

13 **Corrective Actions.** Any unsafe acts or conditions that are observed or reported must be immediately corrected. Written documentation of corrective actions is required.

# 7.0 COMPETENT PERSONS

A. Each contractor is required to designate the competent person(s) for various tasks in the scope of their work. Designated competent persons are required for fall protection, excavation, ladders, scaffolds, rigging, electrical, steel erection, vehicles, and PPE. IOSHA may require competent persons for other items within a contractor's scope of work.

# B. A competent person:

- 1 Has training and experience in the subject.
- 2 Is capable of identifying existing or predictable hazards in the job being performed.
- 3 Is capable of identifying working conditions that are unsanitary, hazardous, or dangerous to the safety and health of the employees.
- 4 Has authority to take prompt corrective measures to eliminate the above conditions.
- C. The designated competent person must have an immediate knowledge of the subject, either by years of experience in the subject field, formal education or specialized training. The competent person must understand the activity being performed, applicable safety and health standards, current conditions, potential hazards, technology and controls.

# 7.1 CONTRACTOR SUPERVISION

A. The above requirements for safety professionals are intended to provide dedicated persons to serve as a technical resource to contractor supervision and perform constant inspections on the project site. All levels of the contractor's supervision, including superintendents, general foremen, and foremen are responsible for setting up and maintaining safe work areas for their employees and ensuring safe work practices by their employees.

# 7.2 EMPLOYEES

A. Each employee on this project is accountable for their own safety and that of their coworkers. Employees will be given the project safety requirements through orientation, training, bulletins, project signage, and Safe Work Plan information. Each employee is required to remain aware of their surroundings at all times, follow the safety rules and regulations applicable to their work, participate in the Safe Work Plan process, and promptly report hazards and incidents.

#### 8.0 **PROJECT SAFETY ORIENTATION**

A. The Contractor is to prepare its safety orientation program consisting of an orientation lecture and handout materials to convey highlights of project safety requirements and relevant security information. By administering the orientation in this manner, all personnel entering the construction area will be given consistent information. The following is an outline of the topics that should be covered by the Contractor:

- 1 Substance Abuse Policy
- 2 Emergency Action Plan
- 3 Access, and Security Requirements
- 4 Parking
- 5 Lunch Areas
- 6 Tobacco Use
- 7 Incident/Accident Reporting
- 8 Safety Responsibilities
- 9 Personal Protective Equipment
- 10 Housekeeping
- 11 Hazard Communication
- 12 Fire Prevention/Protection
- 13 Personal Tools
- 14 Hand/Power Tools
- 15 Electrical
- 16 Hazardous Energy Control (Lockout/Tag-out)
- 17 Ladders/Scaffolds
- 18 Fall Protection
- 19 Openings in Walking/Working Surfaces
- 20 Hoisting and Lifting Operations
- 21 Excavations
- 22 Confined Space Operations
- 23 Equipment and Vehicle Safety
- 24 Foreign Object Debris/Damage (FOD)
- 25 AOA Activities and Restrictions
- 26 Job Site Meetings
- 27 Safe Work Plan
- 28 Disciplinary Procedures
- B. Contractor is to provide a safety handbook summarizing the safety orientation information to all employees.
- C. Each person attending the orientation will complete an orientation comprehension acknowledgement form. Additional time will be given to any person(s) who indicate that they do not understand all of the requirements. A photo ID badge may be issued to each person completing the orientation program to be displayed at all times while on the job site.
- D. Revisions to the orientation information will be communicated to employees utilizing project bulletin boards, safety committee and supplements to toolbox safety talks.

#### 9.0 SAFETY TRAINING

A. Each contractor is responsible for providing their employees with training appropriate for the tasks to which they will be assigned. This training may be required by IOSHA, the contracts specifications, or other regulatory agencies.

# 9.1 WEEKLY TOOL BOX SAFETY MEETINGS

- A. Contractors and subcontractors are to conduct a detailed Tool Box Safety Meeting prior to beginning work on Monday or the first work day in weeks with holidays. The training topics covered shall be relevant to the work being performed. The time committed to training each week may vary with topics, but actual training time shall be a minimum of 15 minutes.
- B. All employees are required to sign in for this meeting on the Safety Training Sign In form (See Forms in Appendix). A copy of the meeting documentation and sign in sheet is to be delivered to the Construction Manager.
- C. Additional documentation of employee training and employer certifications must be made available upon request.

# 9.2 BULLETIN BOARDS

A. Contractor is to construct and conspicuously locate plywood bulletin boards of a size to be determined that is used to communicate certain project safety information to employees. OSHA required postings, project safety statistics, project contact numbers; emergency response information, recipients of safety achievement awards, meetings and tool recall information are examples of what shall be put on the bulletin boards.

#### 9.3 EMERGENCY PROCEDURES OVERVIEW

- A. Every emergency is considered an incident; however, not all incidents are emergencies. Several types of emergency situations may arise during the course of the project: accidents, with or without injuries or property damage, work-related illness, or personal medical situation, fire, severe weather, earthquake, chemical spill/release, security emergency, utility outage, equipment or structural failure, terrorist-related event, or aircraft-related emergency.
- B. Contractor is to develop a project Emergency Action Plan. Key personnel from the may be required to fulfill temporary assignments in emergencies, drills, exercises, etc.
- C. Various elements of the plan (i.e. response procedures, signal methods, shelters, rally points, evacuation routes, etc.), may change as the project evolves, and updates will be required in a timely manner to maintain emergency preparedness.
- D. Essential details of the Emergency Action Plan, such as signal methods, reporting protocol, emergency numbers, shelters, and evacuation routes, will be prominently posted throughout the project. This information will also be covered in the project employee safety orientation.

#### 9.4 FIRST AID AND MEDICAL TREATMENT

A. **Employee Responsibilities:** Report any injury or illness, including suspected injury or illness, immediately to their supervisor. If their supervisor is not readily available, and the situation dictates, they can summon emergency assistance by:

- 1 Calling 911
- 2 Having a nearby person call 911 for them
- 3 Using 2-way radio to request assistance
- 4 Sounding emergency signal air horn
- B. If an employee discovers someone else who appears to be injured or ill, they should summon emergency assistance immediately using one of the above methods reporting their location and any additional information, which may be useful. Do not attempt to move an injured person unless they are in imminent danger of further danger such as fire, falling debris, etc. If you are not currently certified in first aid, CPR, and bloodborne pathogens do not attempt to treat an injured or ill person. Always be certain that emergency response has been started and then stay with the person, if there is no threat to your safety. Keep them as calm as possible. If possible while awaiting arrival of emergency response; find out the injured's name, company, and what happened.
- C. When you are being attended to by emergency response personnel, be sure to tell them the details of what happened as well as relevant medical information such as medical conditions, medications, etc
- D. **Supervisor Responsibilities.** Notify the Construction Manager and your company's on-site safety representative of the incident.
- E. Try to determine what happened. If there were witnesses, direct them to write down their statements. If the situation is serious, direct that the scene be preserved for the investigation.

#### 9.5 EMERGENCY PHONE NUMBERS AND CONTACT LIST

A. A contact list for all contractors will be developed for notification of emergencies. Contractor shall maintain records that contain emergency contact persons and phone numbers for each employee working on the project. Phone/pager numbers are also needed in the event employees need to be contacted when they are not currently working, in order to communicate work schedule changes and related information that may result from an emergency.

#### 9.6 EVACUATION PROCEDURES

A. Procedures for evacuations will be established for the project. Project personnel must be aware of these procedures at all times. Rally points and shelters will be established for each sector of the project. Essential information, such as evacuation routes, rally points, shelters, and signals will be posted throughout the project.

#### 9.7 ROLL CALL

- A. In the event of a significant emergency event or evacuation, a roll call will be required to account for all project personnel. This roll call is to be performed at the rally point by each supervisor and account for each employee. Any persons not accounted for and their last known location is to be reported immediately.
- B. In order to perform an accurate headcount, each contractor must maintain an up-todate employee list for those currently working on the project. Each contractor is also responsible for his or her visitors, vendors, and delivery personnel, etc.

#### 9.8 NEWS MEDIA

A. All media requests will be coordinated through IAA.

B. Defer requests for information from media, public, and agency representatives to. Exceptions to this would include responding to lawful requests from an emergency incident commander, security, police, IOSHA or IDEM compliance officer, Indianapolis Airport Authority, etc.

# 10.0 INCIDENT PREVENTION

- A. All contractors have the responsibility to correct hazardous conditions and practices. When more than one contractor is working within a given area, any contractor Foreman shall have the authority to take action to prevent physical harm or significant property damage. If it is determined there is imminent danger, the contractor shall:
  - 1 Take immediate action to remove worker from the hazard and stabilize or stop work until corrective actions can be implemented to eliminate the hazard.
  - 2 Immediately notify the Contractor Safety Representative and Construction Manager of the condition.
  - 3 Identify and implement corrective action to eliminate the hazard. When the contractor cannot correct the unsafe condition, the Contractor Foreman shall make the contractor's Project Manager and/or Contractor Safety Representative aware of the situation in order to correct.
  - 4 Contractor employees shall immediately report any condition suspected to be unsafe or unhealthy to their job Foreman, or Safety Representative.
- B. Before commencing work, contractors shall follow these rules:
  - 1 Contractors of all tiers must have submitted their safety program, and incident statistics. Contractors are responsible for ensuring that their subcontractors have submitted this information.
  - 2 All contractors shall ensure all employees shall have personal protective equipment and other safety items required by the project safety program and all laws, standards, regulations, and orders. The contractor shall not receive additional payment or reimbursement for these items.
  - 3 Contractor shall meet with Construction Manager to discuss and review the contractor's site-specific safety plan. This plan must be site-specific and address the hazards based on the contractor's scope of work.
  - 4 Contractor must have submitted a resume indicating the qualifications and work experience of their proposed Safety Representative and received a review from the Construction Manager. On-site work cannot be performed until the **Contractor's Safety Representative, (CSR) is assigned full-time on-site.**

#### 10.1 INCIDENT/ACCIDENT PROCEDURES

- A. Contractors are responsible for immediate verbal reporting all incidents. Every emergency is an incident; however, not all incidents will constitute an emergency. The requirements described in this procedure are in addition to following the appropriate Emergency Response Plan as necessary.
- **B.** The definition of an incident is any unplanned event, which results in personal injury or damage to property, equipment, or environment, or has the potential to result in such consequences. Any incident that impacts airport operations or has the potential

for same requires an incident report. An incident report is required for all injuries, regardless of severity and any incident resulting in property damage over \$500.00.

# **10.2 INCIDENT NOTIFICATION AND INVESTIGATION**

- **A.** In the event of an incident/accident on the project, the following actions are to be initiated after the appropriate Emergency Response plan is activated.
  - 1 Verbally notify Construction Manager of the occurrence. Take reasonable measures to control additional loss. Cordon off serious incident scenes to preserve evidence for investigation. Identify s involved and possible witnesses and have them complete their statements as soon as possible.
  - 2 Contractor Safety Representative will submit written Incident Notification (see Forms in appendix) with attached Employee and Witness Statements to the CM within 8 hours of the incident.
  - 3 If the incident resulted in injury, the contractor will submit to CM a copy of the First Report of Injury and the Supervisor's Report of Accident with the Incident Report.
  - 4 A thorough investigation of the incident is to begin as soon as possible by the Contractor and Contractor Safety Representative. The Incident Investigation Report (see Forms in appendix) is to be submitted within 24 hours of the incident.
  - 5 A formal Incident Review meeting will always be required for OSHA recordable incidents.
    - a NOTE: The investigation is to be a joint effort between the Contractor, Contractor's Safety Representative and CM and is to involve individuals who are familiar with aspects of the incident or practices involved, contractor supervision, witnesses, and victim(s). The goal of the investigation is to determine all causal factors and implement corrective actions to prevent a recurrence. This investigation and report do not preclude similar investigations and reports required by governmental regulations, but may be handled concurrently with them.

#### **10.3 INCIDENT REVIEW PROCESS**

- **A.** An incident review is conducted when a serious incident (OSHA Recordable Incident, other incidents or near miss events has occurred. The incident review meeting should be scheduled within 7 days of the incident date to allow for fresh recollection of event details. Persons who are to attend the incident review meeting are:
  - 1 Injured/ill employee(s) or employee(s) directly involved in near miss (if applicable)
  - 2 Witnesses to the incident
  - 3 Supervisor of the employees involved in the incident
  - 4 Superintendent and Contractor Safety Representative
  - 5 Construction Manager
  - 6 Others if appropriate
- **B.** The review meeting agenda is as follows:
  - 1 Introductions
  - 2 Define the Purpose for the Meeting

- 3 Review of the Incident, causal factors, root cause
- 4 Verification of corrective action implementation
- 5 Determine which portion of Safety Process failed and remedy
- 6 Proper Incident Reporting and Emergency Response procedures followed
- 7 Action Items including follow-up verification of effectiveness of corrective action
- 8 Summarize the Meeting
- **C.** Within one business day after the review meeting, the Contractor Safety Representative will submit a Final Incident Report which will include information from the review meeting.
- **D.** One of the most important parts of the Incident Review process is to verify completion of corrective actions. Most of the corrective actions will be the responsibility of the contractor and will include safety meetings with employees, training, safety program review/update, disciplinary action, etc.

#### 11.0 DISCIPLINARY ACTION

A. Violations of the Project Safety Program or federal, state and local laws will result in disciplinary action to the employee and/or Contractor in violation. Disciplinary action for minor violations will follow progressive steps: documented verbal warning, written warning, suspension from project for up to one week, and removal from the project. Disciplinary action for flagrant violations will vary according to circumstances and severity of the violation.

#### B. INDIVIDUALS (CONTRACTOR EMPLOYEES)

- 1 Two types of violations will require initiation of the disciplinary program: Flagrant or Minor
  - a **Flagrant Violations** "Flagrant" violations may have potentially severe consequences, or place individual(s) in imminent danger. Examples of violations, which are considered "flagrant", include:
    - Smoking in areas not designated as acceptable.
    - Possession, use, or under influence of alcohol, illegal drugs
    - Possession of firearms, or contraband
    - Harassment (sexual, ethnic, racial, gender, religion, disability)
    - Assault and battery, serious intimidation
    - Tampering with emergency equipment.
    - Airport Security Violations
  - b Examples of additional safety violations, which <u>could</u> be considered flagrant and <u>may</u> lead to removal from the project include but are not limited to:
    - Working without appropriate, valid permits (i.e. hot work, confined space, etc.)
    - Violating conditions of permit-controlled work

- Working without proper fall protection, placing a person in imminent danger
- Entering excavations or trenches without appropriate sloping, shoring, or other protective measures, placing a person in imminent danger
- Entering areas designated and marked as "Do Not Enter", placing a person in imminent danger, or creating a potentially adverse impact to aviation safety.
- Operating equipment (e.g., cranes, motor vehicles, mechanical mobile lifts, etc.) without valid licensing or training certification.
- Not reporting work-related injuries and/or damage to equipment or property.
- Not reporting near-miss incidents.
- Failure to correct recognized safety hazards.
- Repeated or multiple minor safety violations.
- Lack of proper personal protective equipment
- Other acts which indicate a contractor employee's disregard toward his/her safety, the safety of others, or neglect of proper care of company equipment
- c **Minor Violations** "Minor" violations are infractions of safety practices but with a lesser degree of intent and resulting danger. Minor violations include infractions that are not classified as "flagrant", as defined above.
- 2 Situations where craftspersons are injured and circumstances surrounding the injury indicate an associated safety violation will automatically result in a written sanction.
- 3 The above stated safety violation criteria will serve as the basis for disciplinary actions. Stricter provisions may be invoked as applicable to the circumstances.

# C. CONTRACT FIRM

- 1 Three safety violations involving one contractor ("flagrant" and/or" minor") will result in written communication (Project Safety Notification). The Contractor is required to respond in writing stating the countermeasures that will be taken to correct the violations. If the safety violations reported to the contract firm's site management are not corrected, the contract firm's home office will be notified in writing (Company Warning Notification). The contract firm's home office and site management will be required to meet on-site with Construction Management to discuss the contractor's corrective actions. Corrective actions may include removal of the individual(s) and/or company management/supervision, in violation of the safety policies and procedures, company probation, suspension, or barring.
- **D.** If the Construction Manager or Contractor is aware of any noncompliance with safety requirements, or is advised of such noncompliance, the following may occur:
  - 1 The Contractor will remove any employee or piece of equipment deemed to be unsafe form the project.

2 Any employee removed from the project cannot be hired to work for any other contractor on the project for minimum of one year from the date of removal.

# 12.0 SAFE WORK PLAN OVERVIEW

- A. A Safe Work Plan (see Safety Work Plan Form in Appendix) will be completed by contractor field supervision for each crew and scope of work combination. The Safe Work Plan will list tasks assigned to the crew, associated hazards, hazard controls and safe work procedures that are to be followed. The Safe Work Plan is to be communicated to and signed off by the crewmembers prior to the start of the work. A copy of the Safe Work Plan must be displayed in the work area and a copy is to be forwarded to the CM. The same Safe Work Plan may be used for a maximum of one week, as long as there are no changes in the crewmembers, tasks, hazards, or controls.
- **B.** The Safe Work Plan is the one of the most important tools in achieving job site safety. Field supervision plans the tasks necessary for a scope of work, the related hazards of these tasks, and lists the control measures and resources needed to complete the work safely. This information is communicated to the crewmembers assigned to the tasks and craftspersons sign the form acknowledging they understand what is to be done and how to accomplish the job safely.

#### 13.0 SECURITY REQUIREMENTS-

- **A.** The Indianapolis International Airport requires strict compliance with all Federal Aviation Administration (FAA) regulations including Part 107 that prohibits unauthorized entry into the AOA. All construction activities will be limited to the areas identified and authorized in the construction plans. Any deviation from this regulation will result in immediate sanctions to the contractor by the FAA or Indianapolis International Airport.
  - 1 **Security Badges/ Identification:** A badging procedure for construction craftspersons may be implemented to identify authorization of employees to be on-site as well as to control access to the project. Personnel are required to wear the badges in a visible location at all times while on the project.
  - 2 **Project Access:** There may be vehicular and personnel gates at the project site. Badges or gate passes must be shown to security personnel prior to being allowed entry to the site.
  - 3 **Visitors:** Visitors are required to sign in and must be escorted by authorized project personnel. All required personal protective equipment must be donned prior to entering the construction-site.
  - 4 **Project Deliveries:** All project deliveries must report to the vehicular security checkpoint and sign in. A representative of the contractor responsible for the delivery must escort the delivery to the relevant storage or staging area for material.
  - 5 **Vehicle Requirements:** Site security will have a list of all companies who are authorized to drive company vehicles into the site construction area. The name of the company and vehicle pass must be conspicuously posted on the vehicle at all times. Keys must be left in the ignition to facilitate moving the vehicle in an emergency. Vehicles producing excessive oil smoke may not be permitted to enter if it may create a visibility issue. Vehicles permitted to access the project

must have safety-related functions in good working order (i.e. brakes, steering, horn, lights, window glass, wipers, defroster, tires, seat belts, etc.)

6 **Gates and Fences:** Fences may be installed in all work areas to limit access by unauthorized personnel. The fence must be highly visible and adequately restrict access to areas of the project when necessary.

# 14.0 SUBSTANCE ABUSE PROGRAM

- A. Consistent with the owner's desire to provide a safe and healthful workplace, the intent of the substance abuse policy is to maintain a drug and alcohol free project. The Indianapolis Airport recognizes valid cards from IUCRC, MICCS, IBEW, or ISPTA to achieve this goal. Additional programs may be recognized in the future.
- **B.** The following are a summary of the requirements for the Indianapolis Airport substance abuse program:
  - 1 Unauthorized use, possession, sale, dispensing, or distribution of illegal drugs or alcohol beverages is strictly prohibited on Indianapolis International Airport property.
  - 2 The legal use of over-the-counter and prescribed drugs is permitted on the Indianapolis Airport, provided its use does not impair an employee's ability to perform work in a safe manner. Employees must notify their supervisor whenever they are using prescription medication on the job site.
  - 3 Prior to beginning work, all employees must have a valid card capable of being verified via SafeSite.org or proof of a test taken within the previous 24 hours.
  - 4 Employees in violation of the policy will be removed from the project immediately. These personnel will not be readmitted to the project until the requirements of the substance abuse policy have been successfully met.
  - 5 Except where noted, the associated cost of the following required substance abuse testing is the responsibility of the contractor:
    - a Pre-employment testing
    - b Annual substance abuse testing
    - c Random substance abuse testing of 10% of project
    - d Probable Cause/Reasonable Suspicion
    - Post-Incident/Accident Test (this test is required in three instances):
       Off-site medical treatment
      - 2 When a life threatening safety violation is observed
      - 3 When an incident results in property damage
    - f Return-to-duty testing and follow-up testing

# B. SAFE WORK REQUIREMENTS

#### 1.0 GENERAL CONSTRUCTION SAFETY REQUIREMENTS

**A.** Note: The following information is not an attempt to reiterate IOSHA Standards; it is intended to highlight common items and clarify project requirements that exceed IOSHA Standards.

# 2.0 BLOOD-BORNE PATHOGENS

**A.** Only persons who are properly trained and equipped to deal with bloodborne pathogens are permitted to clean and disinfect areas that may contain body fluids. These situations may be anticipated if someone becomes ill or is injured.

#### 3.0 COMPRESSED GAS CYLINDERS

- A. In addition to compliance with applicable IOSHA standards and Compressed Gas Association (CGA) guidelines, the following project specific requirements apply to compressed gas cylinders:
  - 1 Cylinders (including "B" tanks of acetylene) must be stored in an upright manner and secured with suitable wire, chain, bar or in designed carts, racks, or holders.
  - 2 Valve protection caps shall be installed when cylinders are stored or moved and at the end of each shift.
  - 3 Torch carts and cylinder racks may be lifted by crane only if they are so designed.
  - 4 Do not allow oxidizers such as oxygen to come in contact with hydrocarbon in any form.
  - 5 Contractors shall not take compressed gas cylinders into confined spaces except for fire extinguishers and breathing apparatus. Care must be used in taking aerosol products into confined spaces as these containers usually contain flammable propellants and may also present toxicity hazards. Disposable cigarette lighters containing butane or similar gas are prohibited in all construction zones.

#### 4.0 CRANES

- **A.** All cranes shall be equipped with a functioning anti-two block device, Load Moment Indicator (LMI), and wind speed indicators.
- **B.** Annual crane inspection documentation shall be provided when arriving on-site. Cranes assembled on-site must have a documented inspection performed prior to use by a qualified inspector. At the Owner's discretion, contractor-owned cranes may need to be certified by a qualified third party.
- **C.** Documents to be maintained in the crane cab include a daily pre-shift inspection, visible load chart, operating manual and most recent annual inspection.
- **D.** Some critical lifts may require certification from a PE. Qualifying lifts include dual crane lifts, lifts exceeding 75% of manufacturer's capacity, and lifts of suspended work platforms.
- **E.** Crane operators shall be trained and experienced on the crane(s) they will operate. Documentation shall be available indicating relevant Operating Engineers training, certification from CCO or reputable school.
- **F.** To control suspended loads and avoid being under them, tag line(s) shall be used on every suspended load (except for shakeout).
- **G.** Crane operators and crew must know the weight of the loads to be lifted and the center of gravity.
- **H.** Lift rated rigging and proper rigging methods are to be used at all times.

- I. Crane operators shall frequently compare computer-generated information to the load chart to ensure correct and accurate setup.
- J. Crane operators and/or ground crew must signal when loads may pass near employees.
- **K.** Crane operators are to avoid being distracted (i.e. cell phone) so they can focus on the lift and signals for safe operations.
- L. Due to dangers of using aerial equipment such as cranes on an airport, the following safety provisions must be made:
  - 1 Use of aerial equipment, including cranes, shall also be in accordance with FAA and Airport requirements.
  - 2 *Notifications.* Airport operations must be notified prior to crane operations and FAA Form 7460 must be completed and submitted. All operations must be in accordance with FAR Part 77.
  - 3 *Reporting.* Operating times and boom heights shall be communicated to Airport Operations.
  - 4 At night and during periods of low visibility, a red obstruction light must mark the highest point of boom
  - 5 Lighting, flagging, raising and lowering of booms shall be performed in accordance with FAA regulations and airport policies and procedures.

#### 5.0 ELECTRICAL SAFETY

- **A.** Where flexible power cords and extension cords are used with 115/120 Volt 15/20 Amp single phase power circuits, the cord shall be plugged into a Ground Fault Circuit Interrupter (GFCI) device, unless the circuit is provided with GFCI protection. GFCI devices must be tested regularly.
- **B.** Only extension cords that meet NEC and IOSHA standards may be used for temporary power. Flat cords may not be used as extension cords on this project.
- **C.** All extension cords and power tools must be inspected prior to use. Any defect in the power cords of tools or to an extension cord may be repaired only by a qualified electrician or discarded.
- **D.** Taped repairs to flexible power cords and extension cords are not permitted.
- **E.** Outdoor transformers and temporary distribution panels shall be adequately protected from vehicular damage by location and/or barricades
- **F.** Electrical equipment rooms and panels must be closed and locked when not being worked on by authorized personnel.
- **G.** Live electrical equipment rooms and panels that are being worked on must be guarded by a dedicated person or barricaded and sign posted warning of hazard.
- **H.** Only authorized personnel are permitted to move, enter, or work on energized electrical equipment and these authorized personnel must follow appropriate safe work practices.

#### 6.0 EXCAVATIONS/UNDERGROUND UTILITIES

**A.** Before drilling, driving posts or rods, and before opening any excavation, private and public utilities locates must be performed.

- **B.** For excavations 4 feet or greater in depth, an Excavation Permit (see Forms in Appendix) must be completed by the Competent Person to document compliance with 29 CFR 1926 Subpart P. The permit shall be conspicuously posted in the immediate area of the excavation. Expired permits are to be retained by the Contractor.
- **C.** Contractors, who create, close, enter, or work in excavations shall have a Competent Person on-site at all times during their scope of work.
- **D.** Any excavation that is 5 feet or greater in depth must have acceptable cave-in protection. Some examples of this protection include sloping, or the use of a professionally engineered trench box or shoring system. Applicable IOSHA standards must be followed when creating and working in excavations.
- **E.** Atmospheric testing must be performed for all excavation 4 feet or greater in depth and the results of these tests must be documented on the excavation permit.
- **F.** For all excavations 4 feet or greater in depth there must be a stairway, straight or extension ladder, or ramp access within 25 feet of lateral travel distance of each employee working in the excavation.
- **G.** Employees entering excavations must be trained in excavation safety prior to entering any excavation.
- **H.** Water accumulations must be addressed promptly.
- I. If red tape or concrete is encountered (electrical circuits) while creating an excavation, STOP immediately and notify the Construction Manager.
- **J.** Excavations must be adequately guarded to prevent persons, equipment, or vehicles from inadvertent entry.
- **K.** There are significant differences in definitions and requirements for excavations in the Airport Operations Area (AOA). Explicit approval must be received from the Airport Operator and Construction Manager before any excavation is performed in AOA.

#### 7.0 FALL PROTECTION

- A. 100% fall protection is required for all persons with 6 feet or greater fall potential. This requirement includes steel erection, roofing activities, working from ladders, working on scaffolds, climbing shoring tower/scaffold frames, climbing rebar mats, wall or column forms. Positioning devices do not satisfy the project fall protection requirement and must be used in conjunction with fall arrest system when exposed to a fall potential of 6 feet or more.
- **B.** ANY fall involving Fall Protection equipment qualifies as a reportable incident. All equipment and anchorage involved must be tagged out of service immediately
- **C.** Fall arrest lanyards may not be tied back to the lanyard unless specifically designed by the manufacturer
- **D.** When not actively tied off, tripping/snagging hazard of excess lanyard length can be controlled by tucking excess into harness.
- **E.** Fall protection is required at all times when using articulating/telescoping boom lifts.
- **F.** Fall arrest equipment and devices must be specifically designed for fall arrest by manufacturer or be certified for fall arrest by registered Professional Engineer.

These devices include any component of the harness, lanyard, static lines, stanchions, connectors, anchorage, and vertical or horizontal lifelines.

- **G.** Plastic-coated wire rope may not be used in any fall protection system, which utilizes wire rope clips for attachment.
- **H.** Failure to properly utilize fall protection when working above 6 feet will result in immediate implementation of disciplinary action for the employee and responsible supervisor.

#### 8.0 FIRE PREVENTION/PROTECTION

- **A.** Unintended fires must be prevented for employee safety and to avoid creating conditions affecting airport operations.
- **B.** The use of common kitchen matches, liquefied petroleum gas lighters (disposable butane lighter), or lighters not equipped with cover to avoid accidental lighting, is prohibited in areas designated as construction zone(s).
- **C.** Smoking is permitted in designated areas only. Receptacles for butts shall be provided and used.
- **D.** Portable heaters and weed burners shall be equipped with an approved automatic device to shut off the flow of gas in the event of flame failure. Weed burners shall not be used in lieu of approved temporary heaters.
- **E.** Hot Work Permit (see Forms in Appendix) is required to control ignition sources. Areas not requiring a permit will be designated. A trained fire watch is required during hot work operations and for 30 minutes following the operation. Water spray cans or hoses may be used if appropriate; however, the Multipurpose Dry Chemical extinguisher must be present.
- **F.** Fire extinguishers (minimum 10# ABC dry chemical) shall be conspicuously located, accessible, inspected, and maintained. 20# ABC dry chemical is required for some situations such as fuel storage area, or certain hot work operations.
- **G.** The area surrounding and below a hot work operation must be kept free from combustible material such as paper, wood, cardboard, flammable liquids, etc. Cylinders, including aerosol cans, shall be located so that sparks, hot slag, or flame will not reach them. If this cannot be accomplished, fire resistant shields shall be provided.
- **H.** Welding cables and connectors shall be properly insulated, flexible, and rated for the type of current that is to be used.
- I. No welding cables with splices or repaired areas within 10 feet of the electrode holder shall be used
- J. Electrodes shall be removed from holders when left unattended
- **K.** Employees shall be protected with the proper personal protective equipment in accordance with OSHA standards and hazard assessment when performing hot work operations.
- L. Whenever feasible, all arc welding and cutting operations shall be shielded by noncombustible or flameproof screens which will protect employees and other persons working in the vicinity of the direct rays of the arc.
- **M.** Some areas of the Indianapolis Airport premises and construction areas may be classified as Hazardous Area due to the presence of fuels, gases, or solvents in paints, adhesives, etc. These areas will be clearly marked and the definition of hot work in these Hazardous Areas would be expanded to include any spark or heat-producing tool, device, or activity, such as internal combustion engines, electric motors and other electric devices, impact tools. Control of static electricity is also required in these areas and may require static dissipative shoes or straps, grounding/bonding equipment, and other appropriate control measures.
- **N.** Fire blankets/shields, and weld screens shall be used as required to protect persons and property.
- **O.** In the event of a fire, trained craftspersons may attempt to extinguish incipient fire only after reporting it first.
- **P.** Contractors shall provide, and inspect fire extinguishers for their hot work.
- **Q.** Immediately replace any extinguisher that is used or found defective.
- **R.** Load strips for powder-actuated tools must be promptly removed from work area and disposed of properly.

# 9.0 HAZARDOUS CHEMICALS/FUEL STORAGE/SPILL PREVENTION

- **A.** Flammable materials must be stored in approved containers and away from heat/ignition sources (i.e. fabrication shops, hot work operations, etc.).
- **B.** Not more than 25 gallons of flammable liquids can be stored in an area without use of an NFPA approved storage cabinet. No more than 60 gallons of flammable liquids may be stored in one cabinet.
- **C.** Secondary containment is required for totes, and tanks of chemicals. Containment must be 120% of the largest container within.
- **D.** Canopies may be used to prevent rainwater accumulation providing adequate ventilation is maintained.
- **E.** Contractors utilizing storage tanks are responsible for having rainwater pumped from containment areas by an approved waste hauler.
- **F.** Fuel storage tanks shall meet current NFPA 30, IDEM, and Airport Authority requirements for design, location, grounding, venting, filling and transfer.
- **G.** Fuel storage tanks may not be supported on legs higher than 12 inches
- **H.** Outdoor storage tanks must be adequately protected from vehicular damage.
- I. Fire extinguishers must be available 25-75 feet from a flammable material storage cabinet or tank.
- J. Required signage/labels shall be placed on all flammable materials storage cabinets, tanks, and containers/tanks of chemicals per IOSHA. HMIS (Hazardous Material Identification System) labels are the recommended format for Hazard Communication.
- **K.** Containers/tanks of water shall be marked as potable or non-potable water (any format OK).
- L. Flammable materials and gases shall not be stored near exits or stairways.

- **M.** Fuel delivery operations are to be attended at all times while fuels are being transferred.
- **N.** Grounding and bonding must be utilized when transferring flammable liquids.
- **O.** Each contractor using hazardous materials shall follow spill prevention methods, and provide and maintain appropriate spill containment equipment.

# 10.0 GUARDRAILS/BARRICADES

- A. Guardrails and toe boards or other appropriate barricades/hole covers shall be placed around holes and openings in walking surfaces or walls. If a contractor should need to temporarily remove guardrail Contractor shall replace guardrails immediately after need for opening has ended. Fall protection must be utilized at any time employee is exposed to fall hazard of 6 feet or greater.
- **B.** The use of typical plastic "Caution" and "Danger" barricade tape is prohibited on the Indianapolis Airport as part of managing Foreign Object Debris/Damage (FOD). High strength braided barricade tape and rope may be permitted.
- **C.** When temporary barricades are erected, securely attached tag or signage must indicate date erected, hazard description, and contact firm/person for permission/coordination if there is a need to enter.
- **D.** Areas where materials or tools may be dropped from overhead work must be barricaded or have dedicated traffic control to prevent persons from entering hazard area.
- **E.** All site barricades and fences may only be constructed with the approval of the Construction Manager.

# 11.0 HAND TOOLS AND POWER TOOLS

- **A.** Hand and power tools must be inspected prior to use. If any deficiencies are observed, equipment should be repaired, tagged "Out of Service" or disposed of accordingly.
- **B.** Only qualified persons are authorized to make repairs to hand and power tools.
- **C.** Taped repairs to flexible power cords are not allowed.
- **D.** Tools shall be used and maintained as intended and designed by manufacturer.
- E. All guards must be in place when using grinders.
- **F.** Grinding wheels must be replaced per manufacturer's instructions including material and RPM rating.
- **G.** ANSI approved safety glasses and a face shield is required when grinding.

# 12.0 HEAVY EQUIPMENT

- **A.** Equipment such as backhoes, excavators, front-end loaders, forklifts, dump trucks and cranes shall only be operated by trained and qualified personnel.
- **B.** Heavy equipment must be provided with functional mirrors, horns, back-up alarms, fire extinguishers, service brake system, emergency brake, parking brake, and manufacturer's operation/safety manual. Appropriate spill kit must be available in area.

- **C.** When moving equipment (rubber-tired and crawler cranes, forklifts, cement trucks, etc.), with limited or obstructed view, or near electrical equipment, excavations, or other equipment, then spotters are necessary to ensure safe operations.
- **D.** Cranes shall boom down as far as possible at the end of the shift.
- E. When wind speeds exceed 30 MPH or the manufacturer's specs (whichever is lower), cranes shall not perform lifts and are to boom down until wind subsides
- **F.** Equipment shall be inspected prior to use and recent daily inspection documentation shall be maintained in cab or weatherproof box.
- **G.** Contractors are responsible to ensure Rollover Protection System and seat belts are provided and used, when required by IOSHA.
- **H.** Equipment may not be altered or used except as designed by the manufacturer.
- I. All loads being moved while suspended from mobile equipment shall have load secured to prevent swinging.
- J. Cranes and other aerial equipment shall be lowered to stowed height when not in use or as otherwise directed. The highest point of each piece of equipment shall be visibly marked. At night and during periods of low visibility, a red obstruction light must mark the highest point of the crane. Crews must be prepared to remove equipment promptly if so directed.
- **K.** Lighting, flagging, raising and lowering of crane booms and other aerial equipment shall be done in accordance with FAA rules and airport policy/procedures.

# 13.0 HOUSEKEEPING

- A. Housekeeping will be a priority for all phases of the Indianapolis Airport. Construction materials and debris cannot be allowed to blow around the site and potentially enter the AOA. These materials can have very destructive consequences for aircraft and can be unsafe for workers on the construction-site as well. Contractors must be aware of the dangers caused by Foreign Object Debris (FOD) and aggressively manage their housekeeping programs to eliminate the possibilities of any construction materials or debris from incurring the AOA.
  - 1 Special attention is required to eliminate the potential for Foreign Object Debris/Damage (FOD), or contributing to visibility issues that impact airport operations.
  - 2 All contractors must continuously address conditions that may attract wildlife to the project site and surrounding area because this can affect the safety of airport operations. Food waste and ponding of water are two attractants that will need to be controlled.
  - 3 Walking and working surfaces shall be kept free of excess debris at all times.
  - 4 Any item that could create a slip or trip hazard must be removed immediately.
  - 5 Materials that are stacked shall be secured to prevent them from falling, rolling, and creating trip hazards or becoming airborne in high winds.
  - 6 Extension cords, leads, hoses, etc shall be routed out of walkways and traffic ways; alternatively, protect the equipment and traffic by means of ramp, trough, tree, etc.

# 14.0 LADDERS

- **A.** All ladders must be designed for heavy-duty industrial use (minimum 1A) and be in good working condition.
- **B.** Metal frame ladders are prohibited.
- **C.** Job made ladders must be constructed per ANSI standard.
- **D.** Each ladder shall be permanently marked with owner identification.
- **E.** Each ladder shall be visually inspected prior to each use; defective ladders must be immediately tagged out of service and removed.
- **F.** When ascending or descending a ladder, the user shall face the ladder and use both hands, maintaining 3 points of contact at all times. A rope or bucket shall be used for hoisting when attempting to carry tools and materials would interfere with maintaining the required 3 points of contact.
- **G.** Stepladders and extension ladders shall only be used by one person at a time.
- **H.** A stepladder shall never be used as a straight ladder. Stepladders must be fully extended open and the top step and the top shall not be used. Platform ladders may be used as designed.
- I. All straight and extension ladders shall extend 3 feet over the supporting object (when used for access to an upper level), be secured from movement at the top, be equipped with non-skid feet, and be placed at an angle so the base is one-fourth the length of the working height. Some situations may dictate that the ladder also be secured from movement at the bottom. Having additional employee to steady ladder may be used for temporary situations or until ladder can be properly secured.
- **J.** Employees working from a ladder with 6 feet or more of fall exposure must use personal fall protection.

# 15.0 LIFTING SAFETY

- **A.** To prevent painful, disabling back injuries, follow these rules whenever manually lifting significant weight.
  - 1 Plan for the lifting task. If at all possible, start lift height between knees and elbows.
  - 2 Keep load close to body.
  - 3 Bend knees and keep back straight, lifting with leg muscles.
  - 4 Lift smoothly; don't jerk ("jerking" effectively multiplies the weight by adding kinetic energy).
  - 5 If you must turn while lifting, turn with your feet don't twist your torso.
  - 6 Ask for help or use material handling equipment whenever possible.

# 16.0 LIGHTING

- **A.** Temporary lighting, visible outside of enclosures, must meet IAA/FAA and Construction Manager approval prior to use due to potential of impacting airport operations.
- **B.** Temporary lighting shall be suspended and used per manufacturer instructions.

# 17.0 LIQUEFIED PETROLEUM GAS (LPG)

- **A.** LPG may not be stored inside any building. Only those cylinders in use shall be allowed in a building
- **B.** LPG cylinders/tanks may be left on LPG powered equipment overnight and on weekends provided the valves are closed.
- **C.** Portable heaters and weed burners shall be equipped with an approved automatic device to shut off the flow of gas in the event of flame failure.
- **D.** Weed burners shall not be used in lieu of temporary heaters.
- **E.** Containers shall be placed upright/vertical on firm foundations, or otherwise firmly secured.
- **F.** Use and location of bulk LPG containers must have written authorization from Construction Manager.

# 18.0 LOCKOUT/TAG-OUT

- **A.** Before beginning work on a system or piece of equipment, all primary and residual energy sources (electrical, mechanical, thermal, pneumatic, chemical, hydraulic, gravity, etc.) must be purged, dissipated, and locked out.
- **B.** Contractors that need to perform control of hazardous energy in the scope of their work must work through the CM to ensure coordination where the work could involve or affect multiple contractors and/or airport operations.
- **C.** Companies must train their employees on all OSHA lockout/tag-out requirements and have written documentation to verify this training.

# 19.0 MAN LIFTS/SCISSORS LIFTS

- **A.** Aerial lifts are to be operated only by personnel who have been trained and qualified on the model that they will be operating.
- **B.** Personal fall protection shall be worn at all times and connected to the approved attachment point while working in an articulating or telescoping boom lift.
- **C.** Hi-jacks and manlifts shall not be used without the safety closure in place across the entrance. Hi-jacks shall not be used without the outriggers fully extended
- **D.** IOSHA required operating and safety manual, and inspection documentation must be located in the weatherproof box on the equipment.
- **E.** Equipment shall be inspected prior to use.
- **F.** Hi-jacks, articulating and telescoping boom lifts, scissors lifts, mast climbers, spyders, and similar equipment shall not be operated when wind speeds exceed the manufacturer's operating instructions
- **G.** Aerial man lifts shall not be used to lift suspended materials.

# 20.0 MATERIALS STORAGE AND HANDLING

- **A.** Tools or materials may not be dropped or thrown from one level to another. A rope, other hoisting device, or enclosed chute, must be used to transport these materials.
- **B.** Employees must be trained per OSHA requirement in the operations of forklifts and powered pallet trucks.

- **C.** All construction materials must be stored in designated areas.
- **D.** Materials must be stored in a manner that prevents sliding, falling, rolling, or collapse of the material.
- E. Materials must not be stored or staged in manner which blocks path of egress.
- **F.** All materials must be adequately secured to eliminate the possibility of being blown away by the wind or air turbulence generated by aircraft.
- **G.** Material storage, even within the job site perimeter, must not be configured in a manner, which will interfere with airport operations such as blocking line-of-sight from control tower to runways, taxiways, etc.
- **H.** Tag lines should be of different size, color, or material in order to distinguish from vertical lifelines. Knots, loops, etc. shall be removed from tag lines to avoid snagging.
- I. Tag lines are required to control all suspended loads (except shakeout) and must be long enough so that personnel can avoid being under suspended loads

# 21.0 PERMITS AND TAGS

- **A.** The following permits and tags (see Forms in Appendix) are required for the Indianapolis Airport:
  - 1 Confined Space Entry Permit. A permit-required confined space is defined as an area that has a limited or restricted means of entry or exit, is large enough for a person to enter, is not intended for continuous human occupancy, and has a potentially hazardous atmosphere or other serious hazard. The permit documents the persons involved including the competent person, hazard identification, control measures, rescue plan, air monitoring, etc.
  - 2 **Excavation Permit.** All excavations 4 feet or greater in depth will require a permit to be filled out by the contractor's competent person and approved by the CM. The permit will document the persons involved, including the competent person, air monitoring (when required) and means of cave-in and other protection, and access/egress.
  - 3 **Critical Lift Permit.** Permit for critical lifts (i.e. over 75% of manufacturer's capacity, dual cranes, suspended work platforms)
  - 4 **Hot Work Permit.** Hot Work permit must be issued by the CSR before conducting any spark producing or open flame activity. Areas not requiring a Hot Work permit will be designated. Contractors shall provide fire extinguisher for all fire hazard activities.
  - 5 **Scaffold Tag.** Scaffolds that have working surfaces 6 feet or greater, shall be tagged to indicate their state of readiness for use. Scaffold tags must be of durable construction and be securely attached to eliminate detachment and FOD potential.
    - a Red –Do Not Use
    - b Yellow Use with specific instructions (i.e. 100% tie off)
    - c Green –Ready for Use

# 22.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

- A. Companies shall furnish customary PPE and ensure their employees use PPE per OSHA requirements and hazard assessments. All PPE shall meet applicable ANSI/NIOSH standards
- **B.** Companies shall train their employees on PPE use
- **C.** Delivery truck drivers, concrete truck drivers, etc. must wear appropriate PPE if they need to get out of their truck.
  - 1 NOTE: Offensive language or graphics are strictly prohibited on all PPE, clothing, tool boxes, etc.

# D. Clothing

- 1 Full length pants to the ankle with no low rise or excessive bagging, sagging, or holes are required; pants should not be of excessive length or have flared bottoms. Pant cuffs and sweat pants are not permitted for craftspersons
- 2 Shirts shall be worn at all times, have a minimum of a 4" sleeve, extend to the belt. Net shirts, tank tops, halter-tops are not permitted.
- 3 Where entanglement hazards exist, loose clothing, dangling necklaces, bracelets, earrings, long hair, etc. must be addressed. ID lanyards may be worn around the neck if provided with safety breakaway feature.

# E. Eye/Face Protection

- 1 All persons working in construction zones of this project must wear eye protection meeting current ANSI standard.
- 2 Employees who wear prescription glasses must wear glasses meeting ANSI Z87.1 standard along with hard polycarbonate side shields, or wear compatible oversized safety glasses or goggles over their "street" glasses.
- 3 Break areas, offices, or vehicles with enclosed cabs are exempt from this requirement.
- 4 Eye protection shall be worn when welding hoods are raised up.
- 5 At no time will these eye protection requirements replace safety goggles, face shields or other more stringent eye protection required by IOSHA regulations. Workers must wear a face shield over safety glasses or safety goggles conforming to current ANSI Z87.1 specifications when performing overhead activities or any activity with an exposure to flying debris or chemicals (i.e. remove/install ceiling panels, drilling above shoulder height, grinding, impact chisels, powder-actuated tools, friction cut-off saws, line breaking, masonry saws).
- 6 Tinted lenses (with the exception of welding and cutting operations) shall not be worn inside of buildings or in periods of limited visibility or darkness.
- 7 Welding hoods used on the project must be designed to be worn with a required hard hat.
- 8 Face shields shall be attached to headgear designed to be worn using a hard hat.

# F. Foot Protection

- 1 Contractors shall wear sturdy work boots or shoes, made of leather or leather-like materials that are suitable for the type of work being performed. Athletic style footwear, such as tennis/running shoes, open-toe or high-heeled shoes are not permitted.
- 2 All footwear shall be in reasonably good condition, including tread on soles, in order to serve the intended functions of slip-resistance, and foot protection.
- 3 Steel or composite safety toe work boots meeting requirements of ANSI Z41.1 are recommended for all contractors working on the Indianapolis Airport.

# G. Hand/Arm Protection

- 1 Operations that present a hazard to employee's hands shall require the use of gloves.
- 2 The use of barrier creams designed for specific chemical hazard protection for exposed skin is allowed. Example: SBS-44 for exposure to alkaline solutions such as concrete mixtures.
- 3 Only gloves, which protect the employee from the specific hazard identified, shall be used. Some tasks may also require the use of protective sleeves, such as hot work in warm weather, or cut-resistant gloves and sleeves where lacerations are a hazard.
- 4 Specific operations that will require the use of gloves include, but are not limited to the following:
  - a Demolition
  - b Installation or removal of insulation
  - c Material handling
  - d Sheet metal work
  - e Hot Work activities
  - f Working in or around chemicals

## H. Head Protection

- 1 Hard hats meeting ANSI Z89.1 standards shall always be worn when in any construction zone. Exception: Operating a vehicle or equipment from within an enclosed cab with adequate impact protection.
- 2 Some construction areas may have designated non-hard hat areas, i.e. while eating in lunch area.
- 3 Hard hats meeting ANSI Z89.2 shall be worn when employees are exposed to high voltage electrical shock and burns.
- 4 Hard hats shall be used according to manufacturer's instructions.
- 5 Welding hoods and face shield headgear must be designed to wear with a hard hat.
- 6 Ball caps may not be worn under hard hats in work areas.
- 7 Metal and western style hard hats are not permitted on the project site.

# I. Hearing Protection

- 1 Employees' hearing will be protected in accordance with 29 CFR 1926.52
- 2 When hearing protection is required, attenuating type equipment may be necessary so that the user maintains the ability to communicate and has awareness of surroundings, back up alarms, signals, etc.

# J. Respiratory Protection

- 1 Respiratory protection shall be worn as the hazard dictates and as required by OSHA standards.
- 2 Material Safety Data Sheets (MSDS) will often identify the correct respiratory protection for the chemical exposure hazards.
- 3 Contractors who will be using respiratory protection shall be properly trained, medically qualified, be fitted for the respiratory equipment that will be used, per their company's IOSHA-compliant respiratory protection program.
- 4 Facial hair is not permitted in the sealing area of respiratory protection devices.
- 5 Their company's written respiratory protection program and training, medical approval, and fit test documentation readily available for review.

# 23.0 POWDER-ACTUATED TOOLS

- **A.** Must be used in compliance with IOSHA and manufacturer requirements by trained and qualified personnel only. Documentation of training is required. (Suppliers usually provide training at no charge.)
- **B.** Requires issuance of a Hot Work permit.
- **C.** Used load strips (which frequently contain unfired shot) must be promptly removed from work area and properly disposed of.

# 24.0 RADIOS AND OTHER ELECTRONIC COMMUNICATION DEVICES

- **A.** Electrical equipment including two-way radios, pagers, mobile phones, etc. is allowed on-site if approval is received from Airport Operator.
- **B.** Electrical equipment shall be intrinsically safe if used in classified hazardous areas
- **C.** The use of personal entertainment audio equipment (radios, CD players, etc.) is prohibited in construction zones.

# 25.0 SCAFFOLDING

- **A.** Scaffolding shall be erected, moved, altered, dismantled, maintained, and inspected only under the supervision and direction of a competent person qualified in these activities and in compliance with IOSHA and project specific requirements.
- **B.** 100% fall protection is required when erecting and dismantling scaffold over six (6) feet in height.
- **C.** Engineering design criteria for any fabricated scaffold components shall be submitted for review and approval by CM, prior to use.
- **D.** All planking shall be scaffold grade and must not be cracked, painted, or chipped in any way. Laminated planking shall not be used or stored in manner which permits being soaked and thus weakened.

- **E.** Employees may not ride or "scoot" manually propelled scaffolds.
- **F.** Only ladders or other approved means shall be used to access scaffolds. Cross braces do not satisfy guardrail requirements for work levels.
- **G.** Scaffolds, which have working surfaces 6 feet or greater, shall have tags designating their use and status of erection. These tags must be securely attached so as not to become airborne objects.

# 26.0 SPILL CONTROL/ENVIRONMENTAL PROTECTION

- **A.** No chemicals of any kind shall intentionally or unintentionally be permitted to enter any waterway (ditch, sewer, stream, trench, etc.) or spill onto the ground.
- **B.** Each contract firm is responsible to maintain appropriate spill prevention and mitigation equipment.
- **C.** Chemicals are to be stored in areas away from drains and sewers.
- **D.** To prevent spills from totes, and tanks, adequately sized secondary containment shall be used (120% of largest container).
- **E.** Rainwater shall not be allowed to accumulate in secondary containment and thus negate the intended purpose of the containment.
- **F.** Rainwater must be removed and disposed of by a licensed waste service.

# 27.0 TEMPORARY BUILDING

- A. Temporary buildings shall be kept clean and neat.
- **B.** Proper entry and exit stairs must be provided for temporary buildings
- **C.** Fire extinguishers shall be present in all temporary buildings.
- **D.** All temporary buildings, such as office trailers, shall be suitably anchored to the ground.

# 28.0 TOOLBOX TALKS/SAFETY TRAINING

- **A.** Contract firms are responsible for training employees in accordance with IOSHA standards.
- **B.** The training shall be documented and available upon request by IOSHA. All training documentation must include the date, location, topic, trainer name and signature, attendee name and signature, training content including handouts, or audio/visuals titles, if used.
- **C.** At a minimum, each contractor must have an individual on-site that has completed the OSHA 10 hour training course in construction standards within the last 12 months, prior to beginning work on the Indianapolis Airport.
- D. Contractors are responsible for conducting weekly toolbox safety sessions with all site personnel. These talks shall be documented and available for review by Safety Management Group. Site or project specific requirements may apply regarding conducting toolbox talks on Monday before work begins.

# 29.0 VEHICLE USAGE (EXCLUDING AIRPORT OPERATIONS AREAS)

**A.** Vehicles shall only be operated by qualified persons. When license is required by regulation, valid operator license shall be on their person, appropriate for the vehicle

type. Vehicles are to be operated with due regard to safety, pedestrians, and following posted signage. Seat belts are to be used in equipped vehicles.

- **B.** All persons, in any vehicle, shall ride in the manufacturer provided seats only. No persons may ride in the back of pickups, or in the back of carts, etc. where no seat is provided. This provision would not apply to vehicles designed for operation in a standing position, such as certain types of forklifts, or pallet jacks.
- **C.** Vehicle windows must be adequately cleared of snow, ice, fog, dirt to ensure safe operation. Broken windows must be replaced promptly. Operational legends must be legible.
- **D.** Do not block access to emergency equipment, i.e. extinguishers, fire hydrants, eyewash station, and exits.
- **E.** Keys of vehicles in construction zone must be left in the ignition for moving in emergencies.
- **F.** If operating a vehicle when an emergency is signaled, immediately pull to the side of the roadway clear of intersections, turn ignition off, leave key in ignition, and get out of the vehicle and walk.

# 30.0 WASTE DISPOSAL

- **A.** General refuse such as empty containers, trash, packaging, paper, cardboard, and construction debris shall be disposed of in dedicated dumpsters and roll-off boxes.
- **B.** Any hazardous chemicals or wastes shall not be placed in the general refuse dumpsters. Hazardous waste must be disposed of according to local, state, and federal laws.

# FORMS FOLLOW

#### INDIANAPOLIS AIRPORT CONFINED SPACE ENTRY PERMIT

#### **SECTION 1 -- ENTRY REQUEST**

IF ALL SECTIONS OF THIS PERMIT ARE SATISFACTORILY COMPLETED. IDENTIFIED CONFINED SPACE MAY BE ENTERED ON DATE/TIMES INDICATED BY THE NAMED AUTHORIZED PERSONS FOR STATED PURPOSES.

CONFINED SPAC PURPOSE FOR E	E (Name/ID/Loca NTRY:	tion):			
DATE:	FROM:	TO:	(one shift max)	ENTRY COMPLETED AT:	
AUTHORIZED EN	TRANTS:		·		

#### SECTION 2 - PREPARATION OF CONFINED SPACE

HAZARDS OF SPACE TO BE ENTERED: Yes No

- HAS CONFINED SPACE BEEN ADEQUATELY VENTED? Circle Ventilation Method Mechanical / Natural CONFINED SPACE TEMPERATURE APPEARS TO BE 40-100 DEG F?
- \_\_\_\_ ALL APPROPRIATE PRIMARY AND SECONDARY ENERGY SOURCES ARE LOCKED OUT PROPERLY?
- ATMOSPHERE HAS BEEN TESTED FOR OXYGEN CONTENT AND IS BETWEEN 19.5-23.5%?
- \_ ATMOSPHERE HAS BEEN TESTED FOR FLAMMABLES AND IS <10% LEL? ATMOSPHERE HAS BEEN TESTED FOR APPLICABLE TOXICS AND IS BELOW PEL?
- HOT WORK IS NOT INVOLVED OR VALID HOT WORK PERMIT IS ATTACHED? (Circle one)

#### AIR MONITORING RESULTS

Time Recorded			
% Oxygen			
% LEL			
CO ppm			
H2S ppm			
Other			

AIR MONITORING INSTRUMENT USED & SERIAL NUMBER:

SIGNATURE OF EMPLOYEE WITNESSING INITIAL AIR TEST:

#### COPY OF THIS PERMIT MUST BE POSTED AT ENTRY POINT UNTIL ENTRY COMPLETED

#### SECTION 3 -- TOOLS, EQUIPMENT, LIGHTING

CONSIDERATION MUST BE GIVEN TO HAZARDS ASSOCIATED WITH ENTRY

YES	s no ir	NSP	
			ELECTRICAL EQUIPMENT, TOOLS, LIGHTING (GFCI/INTRINSICALLY SAFE?)
			HOT WORK EQUIPMENT?
			CHEMICALS, CLEANING AGENTS?
			OTHER?
SEC YES	CTION 4	I PEF	RSONAL PROTECTIVE EQUIPMENT
			HARNESS OR WRISTLETS
			RETRIEVAL DEVICE:
			FALL PROTECTION
			CHEMICAL PROTECTIVE CLOTHING
			PERSONAL AIR MONITORING
			RESPIRATORY PROTECTION TYPE:
			PERSONAL ALERT DEVICE (PASS)
			FLASHLIGHTS (INTRINSICALLY SAFE?)
			LADDER DESIGNED FOR ENTRY
			MECHANICAL VENTILATION EQUIPMENT
			APPROVED HAND TOOLS
			HARD HAT
			EYE PROTECTION
			APPROPRIATE HAND PROTECTION
			APPROPRIATE FOOTWEAR
			APPROPRIATE FIRE EXTINGUISHER
			BARRIERS/SIGNS TO PROTECT PEDESTRIANS/VEHICULAR TRAFFIC
			OTHER
SEC	CTION 5	- COM	
C		NICATIC	IN METHOD BETWEEN ENTRANT & ATTENDANT:
			IN METHOD BETWEEN ATTENDANT & RESCUE TEAM:
SEC			
SEC			
D			
F	NTRY S	SUPERV	ISOR (signature):
Ā	TTEND	ANT (S)	(signature):
		· · ·	· · · · · · · · · · · · · · · · · · ·

ATTENDANT MUST NEVER LEAVE CONFINED SPACE DURING ENTRY; ATTENDANT AUTHORIZED TO STOP WORK AND ORDER ENTRANTS OUT AT FIRST SIGN OF POSSIBLE PROBLEM; ATTENDANT MUST NEVER EVER ENTER CONFINED SPACE

#### EXHIBIT AB

INDIANAPOLIS AIRPORT CRITICAL LIFT PLAN NOTE: A LIFT PLAN SHOULD BE COMPLETED PRIOR TO MOBILIZATION OF EQUIPMENT AND RIGGING

Lood Descriptions	<u> </u>		
Load Description:			
Date of Lift:			
A. WEIGHT			E. Sizing of Slings
1. Equipment Conditions:	New [] Used []		1. Sling Selection
2. Weight Empty:		_LBS.	a. Type of Arrangement
3. Weight of Headache Ball:		_LBS.	b. Number of Slings @ Hookup
4. Weight of Lifting Bar			c. Sling Size
6. Weight of Slings and Shackles:			e Rated Canacity of Sling
7 Weight of Jib		LBC.	2 Shackle Selection
[] Erect [] Stored		LBS.	a. Pin Diameter (inches)
8. Weight of Headache Ball on Jib:		LBS.	b. Capacity (tons)
9. Load of Cable:		LBS.	c. Shackle Attached To Load By
10. Allowance for Unaccounted		LBS.	Lifting Lugs
Material or Equipment		LBS.	d. Number of Shackles
11. Other:		LBS.	
			F. CRANE
lotal weight:		LBS.	1. Type of Crane
Source of Load Waight:			2. Crane Capacity TON
Weights Verified By:			a Max Distance. Center of Load
regno vernoù by.		_	to Center Pin of Crane FT
3. JIB			b. Length of Boom
Erected [ ] Stored [ ]			c. Angle of Boom At Pick-up DEG.
1. Is Jib to be used:	Yes [] No []		d. Angle of Boom At SetDEG.
2. Length of Jib:		FT.	e. Rated Capacity of Crane Under Severest
3. Angle of Jib:		DEG.	Lifting Conditions (From Chart)
4. Rated Capacity of Jib:		_	1. Over Rear LBS.
(From Chart)			2. Over FrontLBS.
Crone Blacement			3. Uver Side LBS.
C. Crane Placement			4. From ChartRated Capacity of Crane
<b>C. Crane Placement</b> 1. Any Deviation From Smooth Solid Foundation in the Area?			3. Over SideLBS.     4. From ChartRated Capacity of CraneLBS.     For This LiftLBS.     5. Max Load On CraneLBS
<b>C. Crane Placement</b> 1. Any Deviation From Smooth Solid Foundation in the Area?			3. Over SideLBS.     4. From ChartRated Capacity of CraneLBS.     For This LiftLBS.     5. Max. Load On CraneLBS.
<b>C. Crane Placement</b> 1. Any Deviation From Smooth Solid Foundation in the Area?		_	3. Over SideLBS.     4. From ChartRated Capacity of CraneLBS.     For This LiftLBS.     5. Max. Load On CraneLBS.     6. Lift is%
C. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area?		_	S. Over SideLBS.     4. From ChartRated Capacity of CraneLBS.     For This LiftLBS.     5. Max. Load On CraneLBS.     6. Lift is%     of Crane's Capacity
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?		_	4. From ChartRated Capacity of Crane For This Lift LBS.     5. Max. Load On Crane LBS.     6. Lift is %     of Crane's Capacity
C. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area?		_	A. From ChartRated Capacity of Crane For This Lift LBS.     Max. Load On Crane LBS.     A. Lift is     of Crane's Capacity
C. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area?		_	3. Over SideLBS.     4. From ChartRated Capacity of CraneLBS.     5. Max. Load On CraneLBS.     6. Lift is%     of Crane's Capacity  G. PRE-LIFT CHECK LIST YES / NO     1 Matting Accentable?[ ]
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swime	q?	_	G. PRE-LIFT CHECK LIST     G. Matting Acceptable?     C. Outriggers Fully Extended?     []     []     []
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swing	g?		3. Over Side LBS.     4. From ChartRated Capacity of Crane     For This Lift LBS.     5. Max. Load On Crane     6. Lift is     of Crane's Capacity  G. PRE-LIFT CHECK LIST YES / NO     1. Matting Acceptable?     [] []     2. Outriggers Fully Extended?     [] []     3. Crane in Good Condition?     [] []
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swing	g?		3. Over Side      LBS.         4. From ChartRated Capacity of Crane      LBS.         For This Lift      LBS.         5. Max. Load On Crane      LBS.         6. Lift is      %         of Crane's Capacity       %         G. PRE-LIFT CHECK LIST         YES / NO       1. Matting Acceptable?         1. Matting Acceptable?       []         2. Outriggers Fully Extended?       []         3. Crane in Good Condition?       []         4. Swing Room?       []
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swing	g?		3. Over Side      LBS.         4. From ChartRated Capacity of Crane      LBS.         For This Lift      LBS.         5. Max. Load On Crane      LBS.         6. Lift is      %         of Crane's Capacity       %         G. PRE-LIFT CHECK LIST         YES / NO       1. Matting Acceptable?         1. Matting Acceptable?       []         2. Outriggers Fully Extended?       []         3. Crane in Good Condition?       []         4. Swing Room?       []         5. Head Room Checked?       []
2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swing 4. Swing Direction and Degree (Boom Swing)	g? )		3. Over Side       LBS.         4. From ChartRated Capacity of Crane       For This Lift         For This Lift       LBS.         5. Max. Load On Crane       LBS.         6. Lift is of Crane's Capacity       %         6. Lift is of Crane's Capacity       %         7. Matting Acceptable?       []         1. Matting Acceptable?       []         2. Outriggers Fully Extended?       []         3. Crane in Good Condition?       []         4. Swing Room?       []         5. Head Room Checked?       []         6. Max Counterweights Used?       []
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swing  4. Swing Direction and Degree (Boom Swing)	g? )		3. Over Side
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swing  4. Swing Direction and Degree (Boom Swing)	g? )		3. Over Side
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swing  4. Swing Direction and Degree (Boom Swing)  Cable Cable	g? )		3. Over Side
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swing 4. Swing Direction and Degree (Boom Swing)  2. Cable 1. Number of Parts Cable:	g? )		3. Over Side
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swing  4. Swing Direction and Degree (Boom Swing)  D. Cable  1. Number of Parts Cable:	g? )		3. Over Side
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swing  4. Swing Direction and Degree (Boom Swing)  D. Cable  1. Number of Parts Cable:  2. Size of Cable:	g?		3. Over Side
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swin 4. Swing Direction and Degree (Boom Swing) 4. Swing Direction and Degree (Boom Swing) 2. Cable 1. Number of Parts Cable: 2. Size of Cable:	g?		3. Over Side
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swin 4. Swing Direction and Degree (Boom Swing)  4. Swing Direction and Degree (Boom Swing)  5. Cable 1. Number of Parts Cable: 2. Size of Cable:	g?		3. Over Side
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swin 4. Swing Direction and Degree (Boom Swing)  4. Swing Direction and Degree (Boom Swing)  5. Cable 1. Number of Parts Cable: 2. Size of Cable:	g? )		3. Over Side       LBS.         4. From ChartRated Capacity of Crane       For This Lift         For This Lift       LBS.         5. Max. Load On Crane       LBS.         6. Lift is       %         of Crane's Capacity       %         6. Lift is       %         of Crane's Capacity       %         6. Lift is       %         7. Tage Crane's Capacity       []         1. Matting Acceptable?       []         2. Outriggers Fully Extended?       []         3. Crane in Good Condition?       []         4. Swing Room?       []         5. Head Room Checked?       []         6. Max Counterweights Used?       []         7. Tag Line Used?       []         8. Experienced Operator?       []         9. Experienced Rigger?       []         10. Experienced Rigger?       []         11. Load Chart in Crane?       []         12. Wind Conditions:       []         13. Crane Inspected
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swin 4. Swing Direction and Degree (Boom Swing) 4. Swing Direction and Degree (Boom Swing) 2. Cable 1. Number of Parts Cable: 2. Size of Cable:	g? )		3. Over Side       LBS.         4. From ChartRated Capacity of Crane       For This Lift         For This Lift       LBS.         5. Max. Load On Crane       LBS.         6. Lift is       %         of Crane's Capacity       %         6. Lift is       %         of Crane's Capacity       %         6. Lift is       %         7. Matting Acceptable?       []         1. Matting Acceptable?       []         2. Outriggers Fully Extended?       []         3. Crane in Good Condition?       []         4. Swing Room?       []         5. Head Room Checked?       []         6. Max Counterweights Used?       []         7. Tag Line Used?       []         8. Experienced Operator?       []         9. Experienced Flagman       []         10. Experienced Rigger?       []         11. Load Chart in Crane?       []         12. Wind Conditions:       []         13. Crane Inspected By:         14. Functional Test of Crane By:
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swing 4. Swing Direction and Degree (Boom Swing) 4. Swing Direction and Degree (Boom Swing) 2. Cable 1. Number of Parts Cable: 2. Size of Cable: 3. Special Instructions or Restrictions for Crane	g? )		3. Over Side       LBS.         4. From ChartRated Capacity of Crane       For This Lift         For This Lift       LBS.         5. Max. Load On Crane       LBS.         6. Lift is       %         of Crane's Capacity       %         6. Lift is       %         of Crane's Capacity       %         6. Lift is       %         7. Matting Acceptable?       []         1. Matting Acceptable?       []         2. Outriggers Fully Extended?       []         3. Crane in Good Condition?       []         4. Swing Room?       []         5. Head Room Checked?       []         6. Max Counterweights Used?       []         7. Tag Line Used?       []         8. Experienced Operator?       []         9. Experienced Flagman       []         10. Experienced Rigger?       []         11. Load Chart in Crane?       []         12. Wind Conditions:       []         13. Crane Inspected By:         14. Functional Test of Crane By:
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swing 4. Swing Direction and Degree (Boom Swing) 4. Swing Direction and Degree (Boom Swing) 2. Cable 1. Number of Parts Cable: 2. Size of Cable: Special Instructions or Restrictions for Crane Diagram Crane and Load Placement	g? )		3. Over Side       LBS.         4. From ChartRated Capacity of Crane       For This Lift         For This Lift       LBS.         5. Max. Load On Crane       LBS.         6. Lift is       %         of Crane's Capacity       %         6. Lift is       %         7. Matting Acceptable?       []         1       []         3. Crane in Good Condition?       []         4. Swing Room?       []         5. Head Room Checked?       []         6. Max Counterweights Used?       []         7. Tag Line Used?       []         8. Experienced Plagman       []         9. Experienced Rigger?       []         10. Experienced Rigger?       []         11. Load Chart in Crane?       []         12. Wind Conditions:       []<
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swin 4. Swing Direction and Degree (Boom Swing) 4. Swing Direction and Degree (Boom Swing) 2. Cable 1. Number of Parts Cable: 2. Size of Cable: Special Instructions or Restrictions for Crane Diagram Crane and Load Placement	g? )		3. Over Side       LBS.         4. From ChartRated Capacity of Crane       For This Lift         For This Lift       LBS.         5. Max. Load On Crane       LBS.         6. Lift is       %         of Crane's Capacity       %         6. Lift is       %         7. Matting Acceptable?       []         1. Matting Acceptable?       []         2. Outriggers Fully Extended?       []         3. Crane in Good Condition?       []         4. Swing Room?       []         5. Head Room Checked?       []         6. Max Counterweights Used?       []         7. Tag Line Used?       []         8. Experienced Flagman       []         10. Experienced Rigger?       []         11. Load Chart in Crane?       []         12. Wind Conditions:       []         13. Crane Inspected By:         14. Functiona
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swin 4. Swing Direction and Degree (Boom Swing 4. Swing Direction and Degree (Boom Swing 5. Cable 1. Number of Parts Cable: 2. Size of Cable: Special Instructions or Restrictions for Crane Diagram Crane and Load Placement * Multiple Crane Lifts Require a Separate Lift	g? ) , Rigging, Lift, etc		3. Over Side
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swin  4. Swing Direction and Degree (Boom Swing  4. Swing Direction and Degree (Boom Swing  5. Cable  1. Number of Parts Cable:  2. Size of Cable:  Special Instructions or Restrictions for Crane Diagram Crane and Load Placement  * Multiple Crane Lifts Require a Separate Lift * Any Changes In The Configuration Of	g? ) , Rigging, Lift, etc Plan For Each Crane. Crane, Placement, Rigging.		3. Over Side
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swin 4. Swing Direction and Degree (Boom Swing 4. Swing Direction and Degree (Boom Swing 5. Cable 1. Number of Parts Cable: 2. Size of Cable: Special Instructions or Restrictions for Crane Diagram Crane and Load Placement * Multiple Crane Lifts Require a Separate Lift * Any Changes In The Configuration Of The Oscheme.	g? ) , Rigging, Lift, etc Plan For Each Crane. Crane, Placement, Rigging,		3. Over Side       LBS.         4. From ChartRated Capacity of Crane       LBS.         For This Lift       LBS.         5. Max. Load On Crane       LBS.         6. Lift is       %         of Crane's Capacity       %         6. Lift is       %         7. Tage Capacity       %         6. Max Counterweights Used?       1         7. Tag Line Used?       1       1         8. Experienced Operator?       1       1         9. Experienced Rigger?       1       1         10. Experienced Rigger?       1       1         11. Load Chart in Crane?       1       1         12. Wind Conditions:       1       1         13. Crane Inspected By:       1       1         14. Functional Test of Crane By:       1
2. Crane Placement 1. Any Deviation From Smooth Solid Foundation in the Area? 2. Electrical Hazards in the Area? 3. Obstacles or Obstructions to Lift and Swin 4. Swing Direction and Degree (Boom Swing 4. Swing Direction and Degree (Boom Swing 5. Cable 1. Number of Parts Cable: 2. Size of Cable: Special Instructions or Restrictions for Crane Diagram Crane and Load Placement * Multiple Crane Lifts Require a Separate Lift * Any Changes In The Configuration Of The Oscheme. Etc., Or Changes in Any Calculations Require	g? ) , Rigging, Lift, etc Plan For Each Crane. Crane, Placement, Rigging, ire That A New Lift Plan Be		3. Over Side       LBS.         4. From ChartRated Capacity of Crane       LBS.         For This Lift       LBS.         5. Max. Load On Crane       LBS.         6. Lift is       %         of Crane's Capacity       %         9. Crane in Good Condition?       []         11. Swing Room?       []       []         12. Head Room Checked?       []       []         13. Experienced Operator?       []       []         14. Experienced Rigger?       []       []         13. Crane Inspected By:
C. Crane Placement  1. Any Deviation From Smooth Solid Foundation in the Area?  2. Electrical Hazards in the Area?  3. Obstacles or Obstructions to Lift and Swin  4. Swing Direction and Degree (Boom Swing  4. Swing Direction and Degree (Boom Swing  5. Cable  1. Number of Parts Cable:  2. Size of Cable:  Special Instructions or Restrictions for Crane Diagram Crane and Load Placement  * Multiple Crane Lifts Require a Separate Lift * Any Changes In The Configuration Of The O Scheme. Etc., Or Changes in Any Calculations Require version	g? ) , Rigging, Lift, etc Plan For Each Crane. Crane, Placement, Rigging, ire That A New Lift Plan Be	Lifting	3. Over Side       LBS.         4. From ChartRated Capacity       of Crane         For This Lift       LBS.         5. Max. Load On Crane       LBS.         6. Lift is

EXHIBIT AC					
Indianapolis Airport					
Daily Safety Observation Report					
Date:	Report Completed by:				
	Report Completed by:				
Construction Manager:	Weather:				

#### Safety Observations:

Contractor	Observation	Туре	Corrective Action	Corrected Y/N	Person Notified/ Time

Fall Protection- FP Housekeeping-HK Personal Protective Equipment-PPE Permitting-PM Fall Prevention-FPR Barricading-BA Fire Hazard-FH Miscellaneous-MI

#### **EXHIBIT AD**

#### INDIANA WORKER'S COMPENSATION EMPLOYER FIRST REPORT OF INJURY FORM INSTRUCTIONS General Instructions:

- 1. Please enter information into all of the areas of the First Report form, except the boxes at the top right corner of the form which is for office use only.
- 1. Enter all dates in MM/DD/YY format.
- 2. Please return completed form electronically by an approved EDI process.
- 4. For answers to questions, please call (317) 232-3808.

#### Definitions:

**AGENT NAME AND CODE NUMBER:** Enter the name of your insurance agent and his / her code number if known. This information can be found on your insurance policy.

#### ALL EQUIPMENT, MATERIALS OR CHEMICALS EMPLOYEE WAS USING WHEN ACCIDENT OR EXPOSURE OCCURRED: List

anything the employee was using, applying, handling or operating when the injury or exposure occurred. If the injury involves a fall, indicate any surfaces and / or objects the claimant fell on and where they fell from. Enter "NA" if no equipment, materials or chemicals were being used (*e.g. Acetylene cutting torch, metal plate, etc.*).

**AVG WG/WK:** Claimant's average weekly wage, calculated by totaling the latest 52 weeks of wages (*including overtime, tips, etc.*) and dividing by 52.

**CLAIMS ADMINISTRATOR:** Enter the name of the carrier, third-party administrator, state fund, or self-insured responsible for administering the claim.

**CONTACT NAME / TELEPHONE NUMBER:** Enter the name of the individual at the employer's premises to be contacted for additional information (*i.e. Supervisor, HR Person, Nurse, etc.*)

**DATE DISABILITY BEGAN:** The first day on which the claimant originally lost time from work due to the occupational injury or disease or as otherwised deigned by statute.

**DEPARTMENT OR LOCATION WHERE ACCIDENT OR EXPOSURE OCCURRED:** If the accident or exposure did not occur on the employer's premises, enter address or location. Be specific (e.g. Maintenance, Client's Office, Cafeteria, etc.).

**EMPLOYEE STATUS:** Indicate the employee's work status from the following choices: Full-time, Part-time, Apprentice Full-time, Apprentice Part-time, Volunteer, Seasonal Worker, Piece Worker, On-Strike, Disabled, Retired, Not Employed or Unknown (you may also abbreviate the above as: *(FT, PT, AFT, APT, VO, SW, PW, OS, DI, RE, NE, or UK)*.

**HOW INJURY / ILLNESS OCCURRED:** Describe the sequence of events leading to the injury or exposure (e.g. Worker stepped back to inspect work and slipped on some scrap metal. As worker fell, he brushed against the hot metal; Worker stepped to the edge of the scaffolding, lost balance and fell six feet to the concrete floor. The worker's right wrist was broken in the fall).

NCCI CLASS CODE: A four-digit code classifying the occupation of the claimant.

OCCUPATION / JOB TITLE: Enter the primary occupation of the claimant at the time of the accident or exposure.

PART OF BODY AFFECTED: Indicate the part of body affected by the injury / illness (e.g. Right forearm, Low Back, etc.)

**REPORT PURPOSE CODE:** 00 = Original First Report of Injury; 02 = Updated or Amended First Report.

**RTW DATE (Return to Work Date):** Enter the date following the most recent disability period on which the employee returned to work.

**SIC CODE:** This is the code which represents the nature of the employer's business which is contained in the Standard Industrial Classification Manual published by the Federal Office of Management and Budget.

SPECIFIC ACTIVITY EMPLOYEE ENGAGED IN DURING ACCIDENT / EXPOSURE: Describe the specific activity the employee was

engaged in during the accident or exposure (e.g. Cutting metal plate for flooring, sanding ceiling woodwork in preparation for painting).

TYPE OF INJURY / ILLNESS: Briefly describe the nature of the injury or illness (e.g. Contusion, Laceration, Fracture, etc.)

**WORK PROCESS THE EMPLOYEE WAS ENGAGED IN DURING ACCIDENT / EXPOSURE:** Enter "NA" if employee was not engaged in a work process, such as if walking down the hallway (*e.g. Building maintenance*).



#### INDIANA WORKER'S COMPENSATION FIRST REPORT OF EMPLOYEE INJURY, ILLNESS State Form 34401 (R10 / 1-02)

FOR WORKER'S COMPENSATION BOARD USE ONLY

Jurisdiction	Jurisdiction claim number	Process date
--------------	------------------------------	--------------

Please return completed form electronically by an approved EDI process. PLEASE TYPE or PRINT IN INK

# NOTE: Your Social Security number is being requested by this state agency in order to pursue its statutory responsibilities. Disclosure is voluntary and you will not be penalized for refusal.

EMPLOYEE INFORMATION												
Social Security number	Date of birth	Sex	ex ] Male 🗌 Female 🗌 Unknown			Occ	Occupation / Job title			NCCI class code		
Name (last, first, middle)	•		Marital status			Date	e hired	:	State of h	ire	Employ	ee status
Address (number and street, city, state, ZIP code)			☐ Unm ☐ Mari ☐ Sen	Inmarried Aarried		/ Day / Wk	s /	Avg Wg	g/Wk	☐ Paid ☐ Sala	Day of Injury ry Continued	
					nown	Waថ \$⊡	ge ∣Hour □ D	Per ay 🗌 '	Neek 🗌	Month	☐ Year [	Other
Telephone number (includ	e area			Numbe depend	r of ents							
EMPLOYER INFORMATION	ON											
Name of employer				Employ	er ID#			SIC	code		Insured	report number
Address of employer (num	ber and street, ci	ty, state,	ZIP	Locatio	n number			Em	ployer's lo	ocation	address	(if different)
code)				Telepho	one number							
				Carrier	/ Administra	tor cla	aim number	OS	HA log nu	ımber	Report	purpose code
Actual location of accident	/ exposure (if no	t on empl	loyer's p	remises	5)			1				
CARRIER / CLAIMS ADM	INISTRATOR INF	ORMAT	TION		,							
Name of claims administra	ator				Carrier fed	eral II	D number	Che	eck if app	ropriate	e 🗌 Self I	nsurance
Address of claims adminis <i>ZIP cod</i> e)	trator <i>(number an</i>	nd street,	city, sta	tate, Insurance Carrier		Pol	Policy / Self-insured number					
Telephone number						Pol	Policy period From To					
Name of agent				Code number								
OCCURRENCE / TREAT		ΓΙΟΝ										
Date of Inj./ Exp.	Time of occurre AM	nce etermined	d	Date employer Type of injur notified		ıry / ex	y / exposure			Type code		
Last work date	Time workday b	egan D	Date disa	bility be	egan		Part of body				Part code	
RTW date	Date of death	lr e C	njury / E: employer ] No	xposure 's prem	e occurred or iises?	n es	Name of contact			elephone	number	
Department or location wh	ere accident / exp	oosure oo	ccurred				All equipment, materials, or chemicals involved in accident					
Specific activity engaged in during accident / exposure					Work process employee engaged in during accident / exposure				accident /			
How injury / exposure occu	urred. Describe th	e sequer	nce of e	/ents ar	nd include ar	ny rele	evant objec	ts or s	ubstances	3.		
Norma of physician / boolth											cause of I	njury code
Name of physician / nealtr	at (name and add	(race)								INITI		
	it (name and add	1835)									Medical inor: By E	Treatment mployer
Name of witness		Т	Felephon	e numb	ber		Date admir notified	istrato	r		nergency pspitalized	Care 24 Hours
Date prepared	Name of prepare	er		Title			Telephone number			r Medical / cipated		

An employer's failure to report an occupational injury or illness may result in a \$50 fine (IC 22-3-4-13). EXHIBIT AE

INDIANAPOLIS AIRPORT EXCAVATION PERMIT						
Location:	Contractor:					
Date:	Time:	Expiration Date:	(3 working days Maximum)			
Job Description and Location:	•	÷				
Review Prior to Entering Excavation	n (* Permit must be completed	for all excavations deer	per than 5')			
Soil Classification- Type A B C	Stable Rock					
Soil Classification determined by:_ using following method: Soil Classification performed on:		Inspection/Atmosphe	eric Testing Documentation:			
(mm/dd/yy)		Time:				
Inderground I Itilities have been I ocat	ed 🔲 Yes-Document	02:				
locate info. begin excavating	No- Do not					
Locate Date:						
Excavation location to Buildings, F of Vibration verified on prints?	ootings or Pilings or sources					
Specify Means of Engulfment Prot	ection	Date:				
□ Sloping □Shoring: □ Certifie	ed Trench Box	O2:				
Heve weather conditions altered the	along of the execution?	CO:				
If shoring, has system been approved Yes- proceed with work No-Appr entering	by a Professional Engineer? oval must be granted before	Inspected/Tested By (	signature):			
☐ Means of Entry/ Egress within 25 f ☐ Ladders ☐Walk Out Ramp ☐ 0	eet (specify) Other (Specify)	Date:				
$\Box$ is Excavation over 20' in Denth2		Time:				
Yes- Professional Engineer has a	pproved excavation	CO:				
	U EXCAVATION IS CONECT	LEL				
PPE Required Hard Hats Safety Glasses F Suits	ace Shield 🔲 Tyvek®	Inspected/Tested By (	signature):			
Rubber Boots Hepatitis Vaccin	ation D Other (Specify)					
Excavation Characteristics	_					
Length:						
Width:						
Surface Water Diversion is Require Water Accumulations Addressed	ed	If Sloping, Sketch Exc	avation:			
Comments:	an ITAIIIC AUUIESSEU					
Competent Person: (Print Name)	Signature	Company	Date:			
	9	company	Time:			
Operator:			Date: Time:			
Entrants: (Use back if Necessary)			Date:			
			Time:			
			Time:			
CM:			Date:			
		1	I ime:			

\*\* All Items must be reviewed prior to entering the excavation. Contact Contractor Safety Representative if you have questions. Approved permit to be posted at excavation during work. Expired permit to be retained on file

#### EXHIBIT AE-1 Excavation Permit Entrant Sign In Sheet

Print Name	Sign Name	Contractor	Date Time
			Date: Time:

#### FIRE PREVENTION AND PROTECTION INSTRUCTIONS

Obtain a HOT WORK permit for any activity using equipment capable of creating or being an ignition source. This includes operations which use flame or spark-producing equipment such as welding, burning, grinding, brazing, soldering that are capable of igniting flammable vapors or gases. In classified Hazardous Locations, this includes any electronic device such as pager, computers, and telephones, motors, impact tools, and static electricity.

#### Prevention

- Whenever possible, move the work to a safe location, or a designated welding area.
- . If it is not feasible to move the work, then move all fire hazards to a safe place.
- If the fire hazards cannot be moved, then they must be covered with fire-resistant materials.
- In areas provided with automatic fire suppression systems, these should be operational.

• Floor and wall openings, sewers, sumps, and drain openings shall be covered to contain sparks and slag. NOTE: if the above requirements cannot be met, the hot work shall not be performed. Contact your supervisor and the CM for more information.

#### **Fire Watch Instructions**

• Fire watch shall be provided in any situation requiring a HOT WORK permit.

• Fire watch is to be supplied with a fire extinguisher (minimum 10# ABC multipurpose dry chemical) which has current inspection and is in proper working order). Containers of water, sand, charged hoses may also be used, but ABC dry chemical must be available also.

- Fire watch may also be necessary for adjoining areas, and/or above and below the work area.
- Fire watch is trained in the use of the extinguishers and when/how to sound the alarm.

• Fire watch shall be maintained continuously during the hot work and for 30 minutes following the completion of the work (including breaks).

#### **Protection Instructions**

- Floors are swept clean of all combustible materials within a 35' radius.
- Combustible floors shall be kept damp or they shall be covered with wet sand or protected by fire-resistant materials.
- Ducts and/or conveyors must be shielded or shut down.
- Special precautions and Entry Permit are necessary for hot work in confined spaces.

• Hot work equipment must be in good condition. Flame arrestors are required at regulator; hoses/torch must be in good condition; welding leads may not be have any repaired areas within 10 feet of either end; electrode must be removed from holder; regulator faces must be enclosed; regulators and hoses must be removed and valve protection caps installed at end of each shift. Valve protection caps must be installed before cylinders are transported.

#### Welding/Cutting on containers

• All used drums, barrels, or tanks must be cleaned thoroughly to eliminate flammable materials or materials or materials that could produce flammable or toxic vapors.

- Any pipelines or connections to a drum, barrel or tank shall be disconnected or blanked.
- Equipment or containers shall be flushed and/or purged with an inert gas.

#### IN THE EVENT OF ANY FIRE

- Only fight incipient fires, only by trained person, only after reporting the fire, and while maintaining exit from area
- Uncontrollable fires- sound the emergency alarm and evacuate the area
- Notify Project Security
- Notify the onsite safety representative for your company and Construction Management

#### EXHIBIT AF-1 INDIANAPOLIS AIRPORT HOT WORK PERMIT

Display in a prominent location at the work area.

Emergency Phone Number\_\_\_\_\_

Upon completion of the job (or at end of shift), return this permit to the designated location.

_			
Date	Shift		
Building/Area	Floor		
Describe location_			
Location of neares	t alarm		
Location of neares	t phone		
Time started			
Time completed			
Object(s) on which	hot work is to be perfor	rmed:	
LEL% (must be <1	0%)	or does not apply	d I have checked for compliance with the F
LEL% (must be <1 The location where Prevention and Pro	0%) the above work is to b otection Instructions list	or does not apply e done has been personally examine ed on the reverse side of this permit	d. I have checked for compliance with the F and have authorized the work to be performe
LEL% (must be <1 The location where Prevention and Pro Onsite Safety Repr	0%) the above work is to b otection Instructions list	or does not apply e done has been personally examine ed on the reverse side of this permit	d. I have checked for compliance with the F and have authorized the work to be performe
LEL% (must be <1 The location where Prevention and Pro Onsite Safety Repr	0%) the above work is to be stection Instructions list resentative	or does not apply e done has been personally examine ed on the reverse side of this permit Sign and Print	d. I have checked for compliance with the F and have authorized the work to be performe
LEL% (must be <1 The location where Prevention and Pro Onsite Safety Repr Hot Work Supervis	0%) the above work is to be stection Instructions list resentative or	or does not apply e done has been personally examine ed on the reverse side of this permit <i>Sign and Print</i>	d. I have checked for compliance with the F and have authorized the work to be performe
LEL% (must be <1 The location where Prevention and Pro Onsite Safety Repr Hot Work Supervis	0%) the above work is to be stection Instructions list resentative or	or does not apply e done has been personally examine ed on the reverse side of this permit Sign and Print Sign and Print	ed. I have checked for compliance with the F and have authorized the work to be performe
LEL% (must be <1 The location where Prevention and Pro Onsite Safety Repr Hot Work Supervis Hot Work Craftspe	0%) the above work is to be stection Instructions list resentative or rson	or does not apply e done has been personally examine ed on the reverse side of this permit Sign and Print Sign and Print	rd. I have checked for compliance with the F and have authorized the work to be performe
LEL% (must be <1 The location where Prevention and Pro Onsite Safety Repr Hot Work Supervis Hot Work Craftspe	0%) the above work is to be otection Instructions list resentative or rson	or does not apply e done has been personally examine ed on the reverse side of this permit Sign and Print Sign and Print Sign and Print	ed. I have checked for compliance with the F and have authorized the work to be performe
LEL% (must be <1 The location where Prevention and Pro Onsite Safety Repr Hot Work Supervis Hot Work Craftspe Fire Watch	0%) the above work is to be stection Instructions list resentative for rson	or does not apply e done has been personally examine ed on the reverse side of this permit Sign and Print Sign and Print Sign and Print	ed. I have checked for compliance with the F and have authorized the work to be performe — —

INFORMATION ABOUT PERSO	ON INVOLVED			
FULL NAME:	POSITIO	N:	COMPANY:	
DATE OF BIRTH:	GENDER: M F	SOCIAL SE	CURITY #:	
HOME ADDRESS:				
	<u> </u>			
PHONE NUMBERS: home:	work:	Cell:	pager:	
DATE OF HIRE:		ARIEDONIE	IIS PROJECT:	
		a 2nd hour):		
DESCRIBE PHASE OF EMPLO	OYEE'S WORKDAY (i.e	. performing v	work, during meal p	period, working overtime, entering or leaving
site):				
SUPERVISOR'S NAME:		ATTACH EI	MPLOYEE STATEM	ENT
INCIDENT TYPE: (Circle all the	at apply) Near Miss	Injury N	Aedical Fatality	
Property Damage Fire E	nvironmental Secu	ritv Other		
		.,		
DATE/TIME OF INCIDENT:				
DATE/TIME OF INCIDENT.				
SPECIFIC LOCATION OF INCI	DENT:			
	everything that is know	own at this tin	ne about what, why	, now and attach photos/sketch)
WHO REPORTED INCIDENT:	то	WHOM:	WHEN	
WERE THERE ANY WITNESS	ES: Yes No If Yes	, attach witnes	ss statements	
DESCRIBE ANY INJURY:				
type of injury /i e cut bruise	strain): body part(s) ir	volved (i e lo	wer left lea right in	ndex finger, lower right back):
, 1980 of mjary (no. out, bruise,	strain, sour parties in		in a long log, nght h	as mgo, one ngh saoky.

DESCRIBE IMMEDIATE RESPONSE:
FIRST AID BY:
MEDICAL TREATMENT BY:
DESCRIBE ANY PROPERTY DAMAGE:
DESCRIBE EQUIPMENT, TOOLS, OR CHEMICALS INVOLVED:
DESCRIBE CAUSAL FACTORS: (weather, environment, conditions, employee, procedures, failures, etc. that contributed to the
incluent. Indicate which factor has been determined to be the root cause.)
LIST COPPECTIVE ACTIONS TO PREVENT RECURRENCE (include date completed or scheduled date of completion):
LIST OF ATTACHMENTS (photos/sketch, employee and witness statements):
LIST PERSONS WHO PARTICIPATED IN INVESTIGATION:
THIS REPORT PREPARED BY: (print)
(cignoture)
(signature)
DATE REPORT COMPLETED:
INCIDENT REVIEW REQUIRED Yes No
DISTRIBUTION:

EMPLOYEE STATEMENT		
Name:	Telephone:	-
Home Address:		-
Company:Pos	ition/Title	-
Statement:		
Signature	Date:	-
WITNESS STATEMENT:		
Name:	Telephone:	
Home Address:		-
Company:Pos	ition/Title	-
The following statement is true to the best of my reco	llection:	
Signature	Date:	-

#### EXHIBIT AG-3 INDIANAPOLIS AIRPORT INCIDENT REVIEW MEETING AGENDA

Incident Date

Incident Name:

Involved Employee:

#### Meeting Attendees:

IAA PM	Involved Employee
IAA PE	Employee's Foreman
Construction Manager PM	Employee's PM
Construction Manager Supt.	Employee's Safety Dir.
Contractor PM	Contractor Foreman
	Safety Director

#### A. Introductions

#### B. Define Meeting Purpose

C. Review of Incident (by Contractor)

#### 1. INCIDENT INFORMATION (facts only)

#### 2. CONTRIBUTING FACTORS

- a. reason for action
- b. at risk behaviors, unsafe acts, safety rules violated
- c. unsafe conditions
- d. personal contributing factors
- e. other
- 3. CORRECTIVE ACTIONS
- D. Proper Incident Procedures Followed?

#### E. Summarize Meeting

- 1. Lessons Learned
- 2. Assignments, Follow-up, Timetable

EXHIBIT AG-4 INDIANAPOLIS AIRPORT INCIDENT REVIEW

Date of Incident

Location of Incident

Employee/Employee Information:

#### A. INCIDENT DESCRIPTION

#### **B. REVIEW OF THE INCIDENT**

#### C. ROOT CAUSE

#### D. IDENTIFY CORRECTIVE ACTIONS & ASSIGNMENTS

#### CHECKLIST OF ACCIDENT FACTORS/TERMS

#### Nature of Injury

Abrasions Foreign Body Dermatitis	Chemical Strain/Spi	Exposure rain Burns, Electrical Shock	Chemica Other	Fracture Il Bruises-Contusions	Puncture Cut	Hernia Dislocatio	Amputatic Injection m	on Burns, T Inflamma	Crushing hermal ation
Body Part									
Head & Neck Scalp Ear Eye Face Neck Skull Mouth		Upper Extremitie Shoulder Arms (upper) Elbow Forearm Wrist Hand Finger & Thumb	95	Body Back Chest Abdomen Groin Other			Lower Ex Hips Thigh Leg Knee Ankle Feet Toe	tremities	5
Overexertion (result Slip (not a fall), Trip Struck against (roug Struck by sliding, fal Contact with electric	ing in strai gh or sharp lling or oth c current	in, hernia, etc o object or surface er moving objects	)	Fall on sa Caught in, on, or be Struck by Contact w Inhalation	ime level o itween flying obje vith tempe a, absorptio	or fall to dif ect rature extri on, ingestio	fferent leve emes, burr on, poisoni	el ns, chemi ing	icals
Unsafe Acts/Unsafe	•			Conditions/Contribu	ting Facto	rs			
Unsafe lifting/carryir Failure to use perso Failure to warn or se Machinery in motion Horseplay Operating at unsafe vehicles Unguarded machine Inadequate training Unsafe design or co Hazardous arranger No Policy/Procedure	ng nal protec ecure - adjustir speed ery for hazard onstruction ment e establish	tive equipment ng, clearing jams, l	cleaning	Unsafe loading, plar Failure to use equip Making safety devic Poor housekeeping Operating without a Using defective equination Improperly guarded Defective tools, equinate Inadequate warning Improper illumination Improper ventilation	cing, or mi ment prov e or guarc uthority ipment, m machiner ipment, or system n lmproper	xing ided (exce l inoperativ aterials, to y substance dress	ept PPE) ve pols, or es		
Rushing/Poor house Lack of knowledge of Failure to follow inst Overhead Hazards No contributing facto	ekeeping or skill tructions ors			Congested area W Act of other than inj Disabilities No unsafe acts	et or slipp ured	ery			

EXHIBIT AH INDIANAPOLIS AIRPORT MONTHLY HOURS REPORT

CONTRACTOR\_\_\_\_\_

PERIOD: From \_\_\_\_\_ To\_\_\_\_\_

Names of Contractor and Subcontractors	Man Hours through previous period	Man Hours	Total Man Hours To Date	Projected Total Man Hours for Job

Note: Please include all of your Subcontractor's Man Hours and complete all columns. .

REPORT COMPLETED BY: (printed)

(signature)

DATE OF THIS REPORT:

EXHIBIT AI INDIANAPOLIS AIRPORT PROJECT SAFE WORK PLA	N					
PROJECT SAFE WORK PLAN       Specific Location:     Contract		Contractor/ Sub-Co Date/ Time of Issi	e/ Time of Issuance: * Any of documents * Any of a new of		ns: Supervision shall evaluate work areas and twill be required for the assigned activities. All on will then be communicated to the son prior to starting work activities. rsons are required to sign off that they have ormed of the hazards listed below and have an nding of all assigned activities and safety ons to be taken. ange in work operations will require ntation of the changes on this plan or issuance plan	
Safety Hazards	Permi	its	Safety Precaution	IS	PPE Required	
Electrical Hazards     Fall Hazards     Hot Work/ Fire Hazard     Noise     Overhead Utilities     Trenches/ Excavations     Underground Utilities     Vehicular Traffic     Chemicals: Specify:     Other: (Specify)	Confined Permit Hot Wor Critical I Excavat Other: (\$	d Space Entry rk Permit Lift Plan ion Permit Specify)	MSDS Reviewe Utility Line Loca Fall Protection Barricades/ Sig Atmospheric Te Fire Extinguishe Other: (Specify	ed ates Ins esting er /)	Specify provisions taken for each:   Fall Protection   Eye/ Face   Respirator   Foot Protection   Hand Protection   Hearing Protection   Other (Specify):	
Work Activities		н	azards		Protective Measures	
List tasks for this crew's sc assignment	ope of work	Describe Haza Potentially Cre	ords of Operation or eated by Other Craft	Hazards ts:	Means to Protect Craftspersons (i.e. engineering Controls, PPE, etc.).	

Supervisor: \_

٠

Date: \_\_\_\_\_\_ Date: \_\_\_\_\_\_ The signature of the Supervisor confirms completion of the Safe Work Plan and communication regarding the above items to all craftspersons/ Sub-Contractors on Crew.

CRAFTSPERSONS SIGNATURES	

#### EXHIBIT AJ

#### INDIANAPOLIS AIRPORT SAFETY TRAINING SIGN IN SHEET

TOPIC\_\_\_

DATE/TIME\_\_\_\_\_COMPANY\_\_\_\_\_

LOCATION\_\_\_\_\_BY (printed name and signature)\_\_\_\_\_

DESCRIPTION OF CONTENT, HANDOUTS, VIDEOS, EXERCISES, ETC. USED IN TRAINING

PRINTED NAME	SIGNATURE	COMPANY
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		
29.		
30.		

#### INDIANAPOLIS AIRPORT SUSPENDED WORK PLATFORM LIFT PLAN & CHECKLIST

THIS IS A UNIQUE SITUATION AND NO OTHER PRACTICAL MEANS OF PLACING EMPLOYEES AT THIS WORK LOCATION IS AVAILABLE. STATE REASON FOR REQUEST TO USE SUSPENDED WORK PLATFORM:

Supervisor's employer:

Supervisor's signature: \_\_\_\_\_\_Superintendent's signature: \_\_\_\_\_

Crane Description & Location:

#### CRANE REQUIREMENTS

1. Controlled load lowering on hoist drum (free fall prohibited)

2. Power load lowering on boom

3. Positive acting anti-two-blocking device

4. Boom angle indicator

5. Boom length indicator on telescoping boom

6. Load hook throat opening closed and locked

#### PLATFORM REQUIREMENTS

1. Designed with 5 to 1 safety factor

2. Designed to minimize tipping

3. 42" high top rail, intermediate rail, 4" toe board, toe board to intermediate rail solid or expanded metal (openings not greater than ½")

4. Grab rail inside entire perimeter

5. Access gate swings in (if provided)

6. Access gate restraining device (if provided)

7. Adequate headroom for employees 8. Hard hats required

9. Overhead protection if employees exposed to falling objects

10. Rough edges smoothed

11. Capacity and weight of platform on data plate

Equal distribution of load on slings (if fitted)
 Dedicated wire rope slings with thimbles (if fitted)

12. Dedicated rigging has 5 to 1 safety factor (if fitted) (10 to 1 for rotation resistant ropes)

### OPERATIONAL REQUIREMENTS

1. Total weight of loaded platform and related rigging does not exceed 50% of rated capacity for the radius and configuration of the crane

2. Trial lift at 125% of platform capacity

3. Crane is uniformly level (within 1% of level grade) and on firm footing

4. Crane inspected and checked out OK

5. Platform inspected after trial lift and checked out OK

6. Employees tied off to platform or above hook

7. Communications with crane operator

8. No crane travel

9. Crane operator stays in cab

10. Documented pre-lift meeting held to review requirements/procedures of 1926.550g

# INDIANAPOLIS AIRPORT AUTHORITY WORK PERMIT POLICY

# A. <u>Introduction</u>.

Under IAA General Ordinance No. 3-2014, all construction, remodeling, additions, alterations, utility work, safety, environmental, or security work (hereinafter sometimes referred to individually and/or collectively as "Work"), of any kind or nature whatsoever, on property owned or leased by the Indianapolis Airport Authority ("IAA"), shall require a "work permit" issued by the IAA (the "Permit"). A Permit will be issued only to the entity, or an authorized representative of the entity, initiating the Work (the "Authorized Representative").

# B. <u>Time and Place of Filing</u>.

The Authorized Representative must submit the Application (along with detailed plans) to IAA at least two (2) weeks prior to the desired start date. The IAA's Work Permit Committee (the "Committee") meets every Wednesday (as needed), and Applications must be submitted by noon on Monday in order to get on the agenda for review. However, with respect to emergency repairs (*e.g.*, major equipment replacements or repairs requiring immediate attention), the Work Permit Application (the "Application") shall be submitted to the IAA by no later than 5:00 p.m. of the next business day (Monday-Friday). All Applications must be filed with the IAA at 7800 Col. H. Weir Cook Memorial Drive, Indianapolis IN 46241, Attention: Work Permits or electronically at workpermit@ind.com.

# C. <u>Required Information</u>.

The Application must contain the following mandatory information, or else it may be rejected as incomplete and/or not considered by the IAA's Work Permit Committee:

- 1. Specific location and limits of proposed activity, with a brief detailed description of the Work;
- 2. Anticipated start and completion dates (or as outlined in a detailed schedule);
- 3. If pertinent (or required by IAA) detailed plans and specifications stamped by an Engineer/Architect licensed to practice in Indiana, and other documents that may be deemed appropriate by the IAA;
- 4. Name(s), address(es) and telephone number(s) for the contact person(s) for the entity doing the Work;
- 5. Estimated cost of the Work;
- 6. If ANY portion of the project requires access into a "secured area", a detailed project security plan (the "Security Plan") must be submitted and approved by the IAA Work Permit Committee. At a minimum, the Security Plan must include the

name of the security company providing the escort, the number of workers, the number of security personnel that will be used, and the point of entry into the "secured area". All workers must be aware of, and abide by, the six (6) to one (1) ratio, 500 feet, in line-of-sight rule, where one security guard can escort up to six (6) workers so long as the workers are in line-of-sight of said guard and within a 500-foot radius of him/her. Larger projects that require posting of guards can be referenced per project specification requirements; the following entities are approved to provide security escorts at:

317-244-7569	Terminal and Airfield.
317-568-1790	Airfield Only.
317.517-1020	Terminal and Airfield.
317.225.7801	Terminal and Airfield.
	317-244-7569 317-568-1790 317.517-1020 317.225.7801

- 7. All information and/or questions on the Work Permit Checklist must be provided and/or answered, respectively, as it pertains to the proposed project; for assistance regarding all utility disconnects/shut off valves that are not directly located in a tenant space; the contractor shall contact IAA Maintenance at 317-487-5158 in advance for location and access, i.e. electrical panels.
- 8. Excavations, trenching, and borings will require utility locates from the Federal Aviation Administration ("FAA") and the IAA, in addition to what is required by Indiana law. Site plans must be sent, electronically, to the persons and/or entities designated, from time to time, by the IAA:

IAA	Chris Miller	<u>cmiller@ind.com</u>
IAA	Scott Lawson	<u>slawson@ind.com</u>
FAA	Dustin Hudacin	dustin.a.hudacin@faa.gov

Written confirmation of completion of utility locates from both FAA and IAA is mandatory prior to issuing a Permit.

9. The licensed general contractor must provide proof of insurance in the form of a "Certificate of Insurance" designating the "Indianapolis Airport Authority" as an "additional insured" thereunder. The following (general liability and auto liability if company vehicles will be used during the project, each occurrence) insurance amounts are required for the different work areas:

Airside:	\$10,000,000
Landside:	\$ 5,000,000
Relievers:	\$ 5,000,000

General and auto liability limits may be made up of a primary policy or a combination of primary and excess/umbrella coverage.

The licensed general contractor must also provide proof of worker's compensation insurance as required by statute.

# D. <u>Committee Review; Issuance of Permit.</u>

After the Application (and all the required information) has been received by the IAA, the IAA Work Permit Committee will review and approve, or disapprove, said Application; and no application may be approved absent a quorum of the IAA Work Permit Committee. If, after review by the IAA Work Permit Committee, the Application (and proposed Work) meets all IAA rules and regulations, does not violate the integrity, function or capacity of existing IAA systems or property, and is not contrary to the best interests of the IAA, its airport(s) or the public, then a Permit will be issued by IAA.

# E. <u>Display of Permit; Penalties</u>.

After issuance, the Permit must be displayed in a prominent and highly visible location at the worksite. Failure to properly display a Permit may result in a penalty of One Hundred Dollars (\$100.00) per day and a suspension of work. Work shall not resume until fee is received by the IAA at 7800 Col. H. Weir Cook Memorial Drive, Indianapolis IN 46241, pending method of payment.

# F. Failure to Obtain Permit; Penalties.

Failure to obtain a Permit will result in suspension of work in progress by issuance of a "stop work" order enforceable by IAA, and may also result in a penalty of Five Hundred Dollars (\$500.00) per day, for each day that any Work was performed without a Permit. Work shall not resume until an IAA Work Permit is issued, and the fee is received by the IAA at 7800 Col. H. Weir Cook Memorial Drive, Indianapolis IN 46241, pending method of payment.

# G. <u>Inspections</u>.

IAA's Building Inspector will make periodic and scheduled inspections of the Work being performed under the Permit.

If the Building Inspector should observe any environmental issues or violations, unsafe practices/conditions, or violations of IAA's rules and regulations, then the IAA shall have the right to order an immediate suspension of said Work; and the Work shall not resume until and unless the cause of the suspension has been resolved to IAA's satisfaction.

During final inspection, if it is found that the Work, or any part thereof, was completed contrary to, or inconsistent with, the information set forth or supplied in the Application, or if the Work has damaged and/or compromised any property or systems owned or operated by IAA, then, in such event, the Authorized Representative shall be directly responsible and liable for promptly rectifying and correcting the situation to the satisfaction of, and at no cost to, the IAA.

# H. <u>Extension of Time</u>.

The Work Permit Certificate will allow the construction to commence. If the construction time extends past the expiration date printed on the certificate, an extension may be

obtained from the Building Inspector upon review of the circumstances, upon approval the existing work permit will be updated as applicable.

# I. <u>General Provisions</u>.

A Permit issued by IAA: (i) shall be in addition to any and all other permits, licenses, certificates, approvals, etc., that may be required by local, state, and federal governmental authorities or agencies, or by a lease or other contract with the IAA; (ii) will not supersede or preempt any requirement of another government authority or agency, nor shall it relieve the Authorized Representative from complying with, and fulfilling, all the applicable requirements thereof; and (iii) shall not be deemed, construed or considered as approval of a project for fitness for a particular use, structural integrity, suitability of purpose, or otherwise.

# J. <u>Post Construction</u>.

# 1. Final Construction Costs

Within thirty (30) days, or as specifically defined within Tenants' lease documents, of completion of any construction or alterations, Tenant or contractor, shall present to IAA for examination and approval a sworn statement of the Final Construction and/or Alteration Costs.

# 2. AS-BUILT DRAWINGS

Within thirty (30) days, or as specifically defined within Tenant's lease documents, following completion of any construction, additions, alterations or improvements, Tenant or contractor shall present to IAA a complete set of Portable Document Format (PDF) "record" drawings, including all amendments and changes issued during construction, and including, but not limited to, specifications, submittals and shop drawings. In addition, all "as-built" drawings must be submitted in a current supported AutoCAD release.


## WORK PERMIT APPLICATION

Approved / Disapproved (Circle C	One) Initial & Date
Approved / Disapproved (Circle C	ne) milai & Dale

Engineering	A D	Maintenance	A D	
Fire Inspector	A D	Health & Safety	A D	
Environmental	A D	IT	A D	
ADM	A D	Security	A D	
Sponsor:				
Approved	Denied	Resubmit as Directed	Permit #	
SignedWo	ork Permit Inspector	Phone: 487-5159	Date:	
Special Notes from	n WP Committee:			
		DO NOT WRITE ABOVE THIS LINE	:	
Tenant/ Owner Inf	ormation			
Tenant/ Owner:				_
Address:				_
Str	eet			
City		State	Zip Code	
Submitted By:		Phone: ()	E-mail:	
Location of Propo Building #, Room #	<b>sed Work</b> #, Concourse, address,	etc.:		
Scope of Work:				
	Indianapolis	Airport Authority, 7800 Col. H. Weir Coo Indianapolis, IN 46241 FAX 317-487-52	k Memorial Drive 201	

workpermit@ind.com

### <u>CHECKLIST</u>

**Requirements to Perform Work** (Circle Yes or No to <u>all</u> that apply)

#### Y or N Impairing Fire Protection Systems -

All work that will involve impairing the Fire Protection System requires a special "Red Tag Permit". This tag is issued by calling the Building Maintenance Request line at 317-487-5158. **This permit shall be obtained 24 hours prior to work being performed**. This work may require a shut-down of alarm systems, approved ventilation to the outside, possession of an appropriate fire extinguisher, a stand-by person on fire watch and work on "premium" time. In addition, the "fire watch person" will be expected to have the Airport emergency telephone number (911) in their possession and be able, in an emergency, to explain exactly their location. **System shutdown will only occur once weekly. Advance scheduling is suggested.** 

- Y or N <u>Hot Works (i.e. Welding and Cutting)</u> 675 IAC 22-2.4-27 Chapter 26 WELDING AND OTHER HOT WORK All hot work requires a special "Yellow Hot Work Permit" issued by the IAA Planning and Development Department and can be obtained by calling 317-487-5159. **This should be obtained 24 hours prior to start of work**. This work may require a shut-down of alarm systems, approved ventilation to the outside, possession of an appropriate fire extinguisher, a stand-by person on fire watch and work on "premium" time. In addition, the "fire watch person" will be expected to have the Airport emergency telephone number (**911**) in their possession and be able, in an emergency situation, to explain exactly their location.
- Y or N *Electrical* 29 CFR Part 1926, Subpart K
- Y or N Lockout/Tag out 29 CFR Part 1926, Subpart K Please identify electrical panels \_\_\_\_\_\_ and substations (if applicable) \_\_\_\_\_\_ to this permit. You must notify IAA through the Building Maintenance Service Request line by calling 317-487-5158, (for terminal substation work). A minimum of 48 hours' notice is required prior to utility disruption.
- Y or N Scaffolding 29 CFR Part 1926, Subpart L
- Y or N Fall Prevention 29 CFR Part 1926, Subpart M
- Y or N Cranes & Hoists 29 CFR Part 1926, Subpart N
- Y or N Excavations & Trenching CFR 29 Part 1926, Subpart P
- Y or N <u>Confined Spaces</u> CFR 29 Part 1910, Subpart J Attach your Confined Space Plan to this application. Contractor is required to notify the Airport Control Center at (317) 487-5089 prior to and upon completion of confined space activities.
- Y or N Handling Hazardous Materials 29 CFR Part 1910, Subpart H
- Y or N <u>Work Including Toxic and/or Hazardous Substances</u> 29 CFR Part 1910, Subpart Z Contractor is required to notify Airport Control Center at 317-487-5089 prior to handling of all Hazardous/Toxic materials.
- Y or N **Project Security Plan** A detailed security plan will need to be submitted if the proposed work is in a secured area. Details must include the name of the individual and/ or the company providing escort services, where the contractor will enter into the secured area, and the number of employees entering the secured area. One badged individual can escort up to six (6) workers as long as each worker remains within 500 feet and in line of sight of the escort (6 to 1 ratio, 500 foot in line of sight rule). The project security plan should reflect that all contractors are aware of and will abide by the 6 to 1 ratio, 500 foot in line of sight rule.
- Y or N Handling of Refrigerants. Section 608. Clean Air Act 40 CFR Part 82, Subpart F.

Indianapolis Airport Authority, 7800 Col. H. Weir Cook Memorial Drive Indianapolis, IN 46241 FAX 317-487-5201 workpermit@ind.com Y or N **Data Cabling** – All Data cabling must meet EIA/TIA cabling standards.

	eled in order to process the a	application.	
General Contractor Name:			
Emergency Contact (24/7) Nar	ne:	Phone: ()	E-mail:
Estimated Cost: <u>\$</u>	Est. Start Date:	Est. Compl	etion Date:
List <u>all</u> sub-contractors working	g on job:		
Charlist of itoms to be subn	aittad with the work normit s	application if applicable:	
			_
Insurance Certificate	City Permits	State Plan Review	Safety Plan
Security Plan	Airspace Approval	🗌 Red Tag Permit	Environmental
☐ Hot Works permit (yellow	v)		
By signature, applicant or ager OSHA Safety and Health Stan and Indiana Fire and Building (	nt certifies they have read, und dards for the Construction Indu Code, IAA work permit policy a	erstand, and agree to comply wi ustry, Occupational Safety and H nd other applicable ordinances.	ith these and all other applicable lealth Standard for General Industry
Signed:		Date:	
Printed:		Phone: ()	Fax: ()

## ALL ADDITIONAL PERMITS AND LICENSES ARE THE CONTRACTOR'S RESPONSIBILITY

# **APPENDIX B**

## **SRF DOCUMENTS**

## APPENDIX B - SRF DOCUMENTS

- FRONT END DOCUMENT CERTIFICATION
- DAVIS BACON WAGE DETERMINATION
- ATTACHMENT A FORM W-347
- ATTACHMENT B REQUIRED CONTRACT PROVISIONS RELATED TO DAVIS-BACON ACT AND RELATED ACTS
- ATTACHMENT C REQUIRED CONTRACT PROVISIONS RELATED TO WAGE-FRINGE BENEFIT CERTIFICATION
- ATTACHMENT D IFA WAGE=FRINGE BENEFIT CERTIFICATION FORM
- ATTACHMENT E REQUIRED CONTRACT PROVISION RELATED TO SUSPENSION AND DEBARMENT
- ATTACHMENT F- REQUIRED BID INSTRUCTION RELATED TO GPR COMPNENTS
- ATTACHMENT G GPR BID BREAKDOWN
- ATTACHMENT H GPR FINAL BID SUMMARY
- ATTACHMENT I REQUIRED CONTRACT PROVISIONS RELATED TO AMERICAN IRON AND STEEL
- ATTACMENT J REQUIRED CERTIFICATION FROM CONTRACT RELATED TO AMERICAN IRON AND STEEL

## FRONT-END DOCUMENT CERTIFICATION

I	, of	certify
(Engineer's Name)	(Engineering Firm	)
that the bidding documents for the	· · · ·	Project(s) for the
	(Project Name)	
	comply with the current Consolidated	Appropriations Act
(SRF Applicant)		

and all the bidding requirements of the State Revolving Fund Loan Programs, the Indiana Finance Authority and the State of Indiana (collectively also called the "State") which include among others the following:

- 1. **OEE-1** (Certification of Non-segregated Facilities)
- 2. **OEE-2** (Notice to Labor Unions or Other Organizations of Workers Nondiscrimination In Employment)
- 3. Bidders List (available on SRF website)
- 4. Davis-Bacon Act and related laws and regulations.
  - a) A copy of the applicable Davis-Bacon wage determination will be included in all contracts and subcontracts for work.
  - b) A copy of the wage determination and the Davis-Bacon poster (WH-1321) will be posted at all times by the contractor and subcontractors at the Project site in a prominent and accessible place where it can be easily seen by workers.
  - c) All contracts and subcontracts for work will include terms and conditions similar to those provided in <u>Attachments A-D</u>.
- 5. Green Project Reserve and Sustainability Incentive. If U.S. EPA Green Project Reserve (GPR) components are included in this project, all Bidders shall provide the portion of their total bid amount allocated to each GPR component. All solicitations or requests for Bids shall include instructions similar to those provided in Attachment F. Bidders shall be required to provide the bid amount allocated to each GPR component with their Bid using the GPR Bid Breakdown (attached as Attachment G) or equivalent form. Consulting Engineer shall return the GPR Final Bid Summary (attached as Attachment H) to SRF with each Project Contract post-bid documentation.
- 6. **Suspension and Debarment** All contracts for work will include terms and conditions similar to those provided in <u>Attachment E</u>.
- 7. American Iron and Steel Clause.
  - a) All procurement contracts must include American Iron and Steel language as set forth in <u>Attachment I</u>. Bid documents must inform the bidders of this requirement.
  - b) Prior to entering into a procurement contract all successful bidders will certify in the form as set forth in <u>Attachment J</u> to such matters. (Bid documents must inform the bidders of such matters).
  - c) The current Consolidated Appropriations Act and section 608 of the Clean Water Act requires that none of the appropriated funds may be used for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States unless (a) a waiver is provided to the recipient by U.S. EPA ("EPA Waiver") or (b) compliance would be inconsistent with United States obligations under international agreements. In order to receive an EPA Waiver, the SRF Applicant must send a written request to EPA and EPA must find that:

*i.* Applying the subsection (a) would be inconsistent with the public interest;

- *ii. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or*
- *iii. Inclusion of iron and steel, products produced in the United States will increase the overall cost of the project by more than 25 percent.*
- 8. **Nonpoint Source.** If NPS components are included in this project, all Bidders shall include the NPS components in their total bid amount.

## 9. Engineer's Useful Life Certificate

## Please check one of the following:

- I certify that no land/easement acquisition was required for this project.
- Land/easement acquisition is not yet complete so we are requesting a mutual agreed upon date of \_\_\_\_\_\_ to have all acquisition finalized.
- All land acquisition is complete and a letter from the SRF applicant and their attorney is attached certifying compliance with 49 CFR Part 24.

## Please check one of the following:

- A construction permit is not required for this project. A summary of the project and drawings are attached.
- A construction permit is required for this project. A permit application has been submitted to IDEM.

## Please check the following as applicable:

Sustainable Infrastructure (SI)/Green Initiative (GI) components have been included in this project:

- All the SI/GI components indicated in the SRF SI/GI Checklist dated and approved in the PER are incorporated in the Contract Documents and have been appropriately specified and shown on the plans and specifications.
- Not all the SI/GI components approved in the PER and the SRF SI/GI Checklist are included in the contract documents.
- \_\_\_\_\_ Other SI/GI components have been incorporated to substitute or add to the original components.
  - Note: Both items below must be checked.
- \_\_\_\_\_ An attachment showing an updated SRF SI/GI Checklist that identifies the component(s) that are being added, substituted or dropped.
- \_\_\_\_\_ An attachment showing the updated plans and specification sections that the proposed substitutions/additions are included in.

(Engineer Signature)

(Date)

(Engineer's Seal)

By signing below, SRF Applicant authorizes the Engineer to act on SRF Applicant's behalf in complying with all applicable federal, state and local laws including, but not limited to, those identified in this certification. By signing below, SRF Applicant further authorizes the Engineer to administer the oversight and enforcement of all applicable federal, state and local laws including, but not limited to, the completion and submission of the Davis-Bacon Compliance Transmittals and Schedules and all accompanying actions and documentation. SRF Applicant understands and acknowledges that this authorization does not alter or relieve any of its responsibilities under this certification or the Financial Assistance Agreement. SRF Applicant further understands and acknowledges that this certification is offered as guidance to assist SRF Applicant with its obligation to comply with all applicable laws and that there are additional requirements.

(SRF Applicant Representative Signature)

(Date)

Updated 07/20/2017

General Decision Number: IN180006 02/09/2018 IN6

Superseded General Decision Number: IN20170006

State: Indiana

**N7** 1

Construction Types: Heavy and Highway

Counties: Adams, Allen, Bartholomew, Benton, Blackford, Boone, Brown, Carroll, Cass, Clark, Clay, Clinton, Crawford, Daviess, Dearborn, Decatur, DeKalb, Delaware, Dubois, Elkhart, Fayette, Floyd, Fountain, Franklin, Fulton, Gibson, Grant, Greene, Hamilton, Hancock, Harrison, Hendricks, Henry, Howard, Huntington, Jackson, Jasper, Jay, Jefferson, Jennings, Johnson, Knox, Kosciusko, Lagrange, Lawrence, Madison, Marion, Marshall, Martin, Miami, Monroe, Montgomery, Morgan, Newton, Noble, Ohio, Orange, Owen, Parke, Perry, Pike, Posey, Pulaski, Putnam, Randolph, Ripley, Rush, Scott, Shelby, Spencer, Starke, Steuben, Sullivan, Switzerland, Tippecanoe, Tipton, Union, Vanderburgh, Vermillion, Vigo, Wabash, Warren, Warrick, Washington, Wayne, Wells, White and Whitley Counties in Indiana.

\* EXCEPT LAKE, LAPORTE, PORTER AND ST. JOSEPH COUNTIES HEAVY AND HIGHWAY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modificati	ion Number	r Publi	ication	i Date			
	0	01/	05/2018	3			
	1	01/3	12/2018	3			
	2	01/3	19/2018	3			
	3	01/2	26/2018	3			
	4	02/	09/2018	3			
100000	004 00 /07						
ASBE0008-	-004 07/0	L/201/					
DEARBORN, COUNTIES	FAYETTE,	FRANKLIN,	OHIO,	RIPLEY	SWITZERLAND	AND	UNION

......

Rates

Fringes

Asbestos Workers/Insulator (Includes application of all insulating materials, protective coverings, coatings & finishings to all types of mechanical systems).....\$ 29.50 16.72 HAZARDOUS MATERIAL HANDLER (Includes preparation, wettings, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....\$ 25.00 13.70 \_\_\_\_\_

ASBE0018-004 06/01/2017

BARTHOLOMEW, BENTON, BOONE, CARROLL, CLINTON, DELAWARE, FOUNTAIN, HAMILTON, HANCOCK, HENDRICKS, HOWARD, JOHNSON, MADISON, MARION, MONROE, MONTGOMERY, MORGAN, SHELBY, TIPPECANOE, TIPTON, AND WARREN COUNTIES:

Rates Fringes ASBESTOS WORKER/HEAT & FROST INSULATOR (includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....\$ 31.24 19.44 HAZARDOUS MATERIAL HANDLER (includes preparation, wettings, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....\$ 23.00 14.40 \_\_\_\_\_

ASBE0037-004 06/01/2017

DAVIESS, DUBOIS, GIBSON, KNOX, MARTIN, PIKE, POSEY, SPENCER, SULLIVAN, VANDERBURGH AND WARRICK COUNTIES

Rates Fringes

ASBESTOS WORKER/HEAT & FROST INSULATOR (includes application of all insulating materials protective coverings, coatings an finishes to all types of mechanical systems. Also the application of firestopping, material openings and penetrations in walls,

floors, ceilings, curtain walls and all lead abatement.)...\$ 30.87 18.01 HAZARDOUS MATERIAL HANDLER (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....\$ 23.00 14.40 \_\_\_\_\_ ASBE0041-002 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KALB, GRANT, HUNTINGTON, JAY, MIAMI, NOBLE, STEUBEN, WABASH, WELLS AND WHITLEY COUNTIES: Rates Fringes ASBESTOS WORKER/HEAT & FROST INSULATOR (includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....\$ 29.82 14.26 HAZARDOUS MATERIAL HANDLER (includes preparation, wettings, stripping, removal, scrapping, vaccuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....\$ 23.00 14.40 \_\_\_\_\_ ASBE0051-003 06/01/2017 CLARK, FLOYD, HARRISON and JENNINGS COUNTIES Rates Fringes ASBESTOS WORKER/HEAT & FROST INSULATOR (Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....\$ 25.36 14.51 HAZARDOUS MATERIAL HANDLER (includes preparation, wettings, stripping, removal, scrapping, vaccuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....\$ 19.80 13.30 \_\_\_\_\_

ASBE0079-002 07/01/2017

RANDOLPH AND WAYNE COUNTIES

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (Includes application of all insulating materials, protective coverings, coatings & finishings to all types of mechanical systems) HAZARDOUS MATERIAL HANDLER (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems))	Rates .\$ 22.25 .\$ 25.00	Fringes 8.89 13.70
BRIN0003-001 06/01/2017		
INDIANAPOLIS BOONE, HANCOCK, HENDRICKS, JOHNS and SHELBY COUNTIES	SON, MARIO	N, MONTGOMERY, MORGAN
	Rates	Fringes
Bricklayer, Stone Mason, Pointer, Caulking TERRAZZO FINISHER TERRAZZO WORKER/SETTER Tile & Marble Finisher Tile, Marble Setter	.\$ 31.15 .\$ 19.36 .\$ 31.11 .\$ 20.76 .\$ 29.91	12.39 8.65 12.29 8.61 12.14
BRIN0004-004 06/01/2017		
FORT WAYNE ADAMS, ALLEN, DEKALB, HUNTINGTON WHITLEY COUNTIES:	I, NOBLE, S	STEUBEN, WELLS AND
	Rates	Fringes
BRICKLAYER (STONE MASON, MARBLE MASONS, POINTER, CLEANER, AND CAULKER) Terrazzo Grinder Finisher Terrazzo Worker Mechanic Tile Setter & Marble Mason Mechanic Tile, Marble & Terrazzo Finisher	.\$ 29.40 .\$ 26.09 .\$ 29.82 .\$ 26.40 .\$ 22.93	13.35 10.40 13.72 11.38 10.10
BRIN0004-009 06/01/2017		
BARTHOLOMEW, BROWN, DEARBORN, I OWENS, RIPLEY and SWITZERLAND	COUNTIES	ENNINGS, MONROE, OHIO,

	Rates	Fringes
Bricklaver. Stonemason	27.63	12.10
TERRAZZO FINISHER Ś	19 36	8 65
	21 11	12 29
TERRAZZO WORRER/BEITER	31.11	0 61
Tile & Marble Finisher	20.70	0.01
111e, Marble Setter	30.48	12.19
BRIN0004-010 06/01/2017		
	Rates	Fringes
BRICKLAYER		
CLARK, FLOYD, & HARRISON		
COUNTIES		
BRICKLAYERS, STONEMASONS		
AND CEMENT MASONS\$	25.96	11.85
POSEY, VANDERBURGH AND		
WARRICK COUNTIES		
BRICKLAYERS, MASONS\$	30.00	14.71
TILE, MARBLE AND TERRAZZO		
WORKERS\$	25.81	12.12
BRIN0004-015 06/01/2017		
TERRE HAUTE		
CLAY, DAVIESS, GIBSON, GREENE, KNO	X, MARTIN, PARK	E, PIKE,
PUTNAM, SULLIVAN, VERMILLION and V	IGO COUNTIES	
	Rates	Fringes
BRICKLAYER		
BDICKLAVEDS STONE MASONS		
and DOINTER (		
	20 25	10 56
CLEANER/CAULKER	30.35	12.50
CEMENT MASON (Greene and	0	11 00
Sullivan Counties)\$	27.78	11.02
CEMENT MASON (REMAINING		
COUNTIES)\$	30.35	12.56
TERRAZO FINISHER\$	19.36	8.65
TERRAZZO WORKER\$	31.11	12.29
TILE LAYER, MARBLE MASON,		
MOSAIC WORKER\$	30.48	12.19
BRIN0004-016 06/01/2017		
MUNCIE		
BLACKFORD, DELAWARE, FAYETTE, FRAN	KITN HAMTITON	HENRY, JAY,
MADISON. RANDOLPH RUSH TIDTON	UNION and WAYNE	COUNTIES
The solution of the solution o	OLITON ANA MAINE	
	Patag	Fringos
	Kales .	rringes
Bricklaver Stonemacon		
Directayer, Sconemason,	20 75	12 50
Poincer, Cauiker & Cleaner\$	49.15	13.50
TERRAZZO FINISHER\$	19.36	8.65
TERRAZZO WORKER/SETTER\$	31.11	12.29
Tile & Marble Finisher\$	20.76	8.61
Tile & Marble Setter; Mosaic		

Worker....\$ 30.48 12.19 \_\_\_\_\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ BRIN0006-001 06/01/2016 JASPER, NEWTON & STARKE COUNTIES Rates Fringes BRICKLAYER (Including Stonemason, and Pointer, Caulker & Cleaner).....\$ 37.05 21.64 Tile, Marble & Terrazzo Worker...\$ 37.05 21.64 \_\_\_\_\_ \_\_\_\_\_ ----BRIN0011-001 06/01/2017 LAFAYETTE BENTON, CARROLL, CLINTON, FOUNTAIN, TIPPECANOE, WARREN and WHITE COUNTIES Fringes Rates Bricklayer, Stonemason, Pointer, Caulker & Cleaner.....\$ 27.80 15.27 TERRAZZO FINISHER.....\$ 19.36 8.65 TERRAZZO WORKER/SETTER.....\$ 31.11 12.29 Tile & Marble Finisher.....\$ 20.76 8.61 Tile & Marble Setter; Mosaic Worker.....\$ 30.48 12.19 \_\_\_\_\_ BRIN0018-002 06/01/2016 CASS, ELKHART, FULTON, GRANT, HOWARD, KOSCUISKO, LAGRANGE, MARSHALL, MIAMI, PULASKI, WABASH Rates Fringes Bricklayer, Caulker, Cleaner, Pointer.....\$ 28.49 13.49 \_\_\_\_\_ -----CARP0002-023 04/01/2017 DEARBORN, JACKSON, JENNINGS, OHIO, RIPLEY AND SWITZERLAND COUNTIES Rates Fringes CARPENTER.....\$ 25.09 20.48 \_\_\_\_\_ CARP0133-001 04/01/2017 BOONE, CLAY, FOUNTAIN, MONROE, MONTGOMERY, MORGAN, OWEN, PARKE, PUTNAM, VERMILLION AND VIGO COUNTIES Rates Fringes CARPENTER.....\$ 26.03 20.20

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

CARP0133-003 04/01/2017		
HAMILTON, HANCOCK, HENDRICKS, JOH Atterbury north of Hospital Road, MARION Counties	NSON (Townships Pleasant, Whit	of Clark, Camp e River), and
	Rates	Fringes
CARPENTER	\$ 27.14	20.20
CARP0175-004 04/01/2017		
CLARK, FLOYD, HARRISON, JEFFERSON	,SCOTT AND WASH	INGTON COUNTIES
	Rates	Fringes
CARPENTER	\$ 24.52	21.05
CARP0215-002 04/01/2017		
BENTON, CARROLL, CLINTON, PULASKI COUNTIES	, TIPPECANOE, W.	ARREN AND WHITE
	Rates	Fringes
CARPENTER	\$ 27.25	18.94
CARP0224-011 04/01/2017		
CRAWFORD, DUBOIS, PERRY, PIKE, PO WARRICK COUNTIES:	SEY, SPENCER, V.	ANDERBURGH AND
	Rates	Fringes
CARPENTER	\$ 24.59	20.98
CARP0224-012 04/01/2017		
DAVIESS, GIBSON, GREENE, KNOX, L SULLIVAN COUNTIES:	AWRENCE, MARTIN	, ORANGE AND
	Rates	Fringes
CARPENTER	\$ 24.94	21.03
CARP0232-003 04/01/2017		
ALLEN, DEKALB, LAGRANGE, NOBLE,	STEUBEN and WHI	TLEY COUNTIES
	Rates	Fringes
CARPENTER	\$ 25.86	19.67
CARP0301-001 04/01/2017		

BARTHOLOMEW, BROWN,(Camp Atterbury south of Hospital Road), DECATUR, FRANKLIN, JOHNSON (Townships of Blue River, Franklin, Hensley, Needham, Nineveh, Union), RUSH AND SHELBY COUNTIES

	Rates	Fringes
CARPENTER	\$ 25.59	20.20
CARP0413-003 04/01/2017		
ADAMS, CASS, ELKHART, FULTON, ( KOSCIUSKO, MARSHALL, MIAMI, TI)	GRANT, HOWARD PTON, WABASH A	, HUNTINGTON, AND WELLS COUNTIES:
	Rates	Fringes
CARPENTER	\$ 26.18	19.50
CARP0999-001 06/01/2017		
JASPER, NEWTON, AND STARKE COU	NTIES	
	Rates	Fringes
CARPENTER	\$ 37.56	26.42
CARP1016-001 04/01/2017		
BLACKFORD, DELAWARE, FAYETTE, 1 UNION AND WAYNE COUNTIES	HENRY, JAY, MA	ADISON, RANDOLPH,
	Rates	Fringes
CARPENTER	\$ 25.89	20.20
ELEC0016-003 04/01/2017		
CRAWFORD, DAVIESS, DUBOIS, GIB PERRY, PIKE, POSEY, SPENCER, V	SON, LAWRENCE	, MARTIN, ORANGE, ARRICK
	Rates	Fringes
ELECTRICIAN	\$ 36.25	15.83
* ELEC0016-006 06/30/2017		
CRAWFORD, DAVIESS, DUBOIS, GIB PERRY, PIKE, POSEY, SPENCER, V	SON, LAWRENCE	, MARTIN, ORANGE, ARRICK
	Rates	Fringes
ELECTRICIAN (Communication Technician Only)	\$ 26.41	14.54
ELEC0071-006 01/02/2017		

DEARBORN, OHIO, and SWTIZERLAND COUNTIES

	:	Rates	Fringes
Line	Construction: Equipment Operator\$ Groundman\$ Lineman & Cable Splicers\$	32.24 23.28 36.64	12.59 10.62 13.57
ELEC	C0153-003 06/05/2017		
ELKHA	ART, KOSCIUSKO and MARSHALL CO	UNTIES	
		Rates	Fringes
Commu ELECT	unication Technician\$ TRICIAN\$	26.00 33.60	16.20 21.88
the transmission and reception of signals of any nature, for any purpose, including but not limited to , sound and voice transmission/transference systems, communication systems that transmit or receive information and /or control systems, television and video systems, micre-processor controlled fire alarm systems, and security systems and the performance of any task directly related to such installation or service. The scope of work shall exclude the installation of electrical power wiring and the installation of conduit raceways exceeding fifteen (15) feet in length.			
DEARI	BORN, OHIO, and SWITZERLAND CO	UNTIES	
	:	Rates	Fringes
ELEC	IRICIAN\$	27.90	17.56
* ELI	EC0305-003 01/01/2018		
ADAMS WELLS	S, ALLEN, DE KALB, HUNTINGTON, S, and WHITLEY COUNTIES	LAGRANGE , NC	BLE, STEUBEN,
		Rates	Fringes
ELEC	IRICIAN\$	32.11 27	.35%+\$7.70
* ELH	EC0305-004 06/01/2017		
ADAMS WELLS	S, ALLEN, DE KALB, HUNTINGTON, S, and WHITLEY COUNTIES	LAGRANGE , NC	BLE, STEUBEN,
		Rates	Fringes
ELEC	IRICIAN (Communication		

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

Technician Only).....\$ 26.75

ELEC0369-005 05/31/2017

CLARK, FLOYD, and HARRISON COUNTIES

1	Rates	Fringes
ELECTRICIAN\$	31.07	16.60
Groundman\$	13.83	6.35
Lineman; Equipment Operator.\$	22.25	6.35
ELEC0481-003 05/29/2017		

14.63

\_\_\_\_\_

\_\_\_\_\_

BARTHOLOMEW, BOONE, DECATUR, HAMILTON, HANCOCK, HENDRICKS, JENNINGS, JOHNSON, MADISON, MARION, MONTGOMERY, MORGAN, PUTNAM, RIPLEY, RUSH AND SHELBY COUNTIES

BARTHOLOMEW, BOONE, DECATUR, HAMILTON, HANCOCK, HENDRICKS, JENNINGS, JOHNSON, MADISON, MARION, MONTGOMERY, MORGAN, PUTNAM, RIPLEY, RUSH AND SHELBY COUNTIES

Rates Fringes ELECTRICIAN (Communication Technician Only).....\$ 27.60 13.50 \_\_\_\_\_ \* ELEC0531-002 05/29/2017 JASPER, PULASKI, and STARKE COUNTIES Rates Fringes ELECTRICIAN.....\$ 39.00 25.15 \_\_\_\_\_ ----\* ELEC0531-003 06/01/2017 JASPER, PULASKI, and STARKE COUNTIES Rates Fringes ELECTRICIAN (Communication Technician Only).....\$ 27.39 12.74 \* ELEC0668-001 06/01/2017 BENTON, CARROLL, CASS, FULTON, TIPPECANOE and WHITE COUNTIES Fringes Rates ELECTRICIAN (Communication

Technician Only).....\$ 27.72 14.13 \_\_\_\_\_ ELEC0668-002 06/01/2017 BENTON, CARROLL, CASS, FULTON, TIPPECANOE and WHITE COUNTIES Rates Fringes ELECTRICIAN.....\$ 32.73 18.09 FOOTNOTE: a. PAID HOLIDAYS: New Years Day, Memorial Day, July 4th, Labor Day, Veterans Day Thanksgiving Day and Christmas Day \_\_\_\_\_ ELEC0702-003 01/01/2018 DUBOIS, GIBSON, PERRY, PIKE, POSEY, SPENCER AND VANDERBURGH COUNTIES Rates Fringes Line Construction: GROUNDMAN, Class A.....\$ 26.85 29% + \$5.75 GROUNDMAN-EQUIPMENT OPERATOR (All other equipment).....\$ 34.10 29% + \$5.75 HEAVY-EQUIPMENT OPERATOR (All crawler type equipment D-4 and larger)...\$ 38.91 29% + \$5.75 LINEMAN.....\$ 47.44 29% + \$5.75 \_\_\_\_\_ \* ELEC0725-007 06/01/2017 BROWN, CLAY, GREENE, KNOX, MONROE, OWEN, PARKE, SULLIVAN AND VIGO COUNTIES Rates Fringes 13.01 Communication Technician.....\$ 27.85 Includes the installation, operation, inspection, maintenance, repair and service of radio, television, recording, voice sound and vision production and reproduction apparatus, equipment and appliances used for domestic, commercial, education, entertainment and private telephone systems. \_\_\_\_\_ \* ELEC0725-014 03/01/2017 BROWN, CLAY, GREENE, KNOX, MONROW, OWEN, PARKE, SULLIVAN AND VIGO COUNTIES Rates Fringes ELECTRICIAN.....\$ 35.70 18.37

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

ELEC0855-001 06/01/2017		
FAYETTE, FRANKLIN, HENRY, RANDO	LPH, UNION A	ND WAYNE COUNTIES
	Rates	Fringes
ELECTRICIAN	\$ 32.22	15.84
* ELEC0873-001 06/30/2017		
CLINTON, GRANT, HOWARD, MIAMI,	TIPTON, AND	WABASH COUNTIES
	Rates	Fringes
ELECTRICIAN (Communication Technician Only)	\$ 27.76	4%+\$12.48
ELEC0873-002 03/01/2017		
CLINTON, GRANT, HOWARD, MIAMI,	TIPTON AND W	ABASH COUNTIES:
	Rates	Fringes
ELECTRICIAN	\$ 33.28	1.35%+15.26
ELEC1393-001 01/01/2017		
REMAINING COUNTIES		
	Rates	Fringes
Line Construction: EQUIPMENT OPERATOR 1: Diggers, 5th wheel type trucks, crawler type, D-4 and smaller, bucket trucks and live boom type line trucks	\$ 29.51	5.65+29%
GROUNDMAN	\$ 36.49 \$ 21.43 \$ 22.19 \$ 38.47	5.65+29% 5.65+29% 5.65+29% 5.65+29%
ELEC1393-002 01/01/2017		
NEWTON COUNTY		
	Rates	Fringes
Line Construction: EQUIPMENT OPERATOR 1: Diggers, 5th wheel type trucks, crawler type, D-4 and smaller, bucket trucks and live boom type line		

trucks......\$ 29.51 5.65+29% EQUIPMENT OPERATOR 3 (Backhoes over 1/2 yard bucket capacity, cranes rated at 15 ton or more capacity) 95% J.L. rate....\$ 36.49 5.65+29% GROUNDMAN TRUCK DRIVER.....\$ 21.43 5.65+29% GROUNDMAN.....\$ 22.19 5.65+29% LINEMAN.....\$ 38.47 5.65+29%

ENGI0103-003 04/01/2017

INCLUDING UNDERGROUND AND UTILITY CONSTRUCTION

ADAMS, ALLEN, BENTON, BLACKFORD, CARROLL, CASS, CLINTON, DEKALB, DELAWARE, FAYETTE, GRANT, HAMILTON, HANCOCK, HENRY, HOWARD, HUNTINGTON, JAY, JOHNSON, MADISON, MARION, MIAMI, RANDOLPH, RUSH, SHELBY, STEUBEN, TIPPECANOE, TIPTON, UNION, WABASH, WAYNE, WELLS, WHITE AND WHITLEY COUNTIES

	Rates	Fringes
Power equipment operators:		
GROUP 1	\$ 34.05	17.50
GROUP 2	\$ 32.33	17.50
GROUP 3	\$ 31.41	17.50

GROUP 4.....\$ 29.91 17.50

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Air compressors in manifold with throttle valve; Asphalt plant engineer; Auto grade or similar type machine; Auto patrol; Backhoe or farm-type tractor, 45 hp and over; Ballast regulator (RR); Bituminous mixer; Bituminous paver; Bituminous plant engineer; Bulldozer; Caisson drilling machine; Cherry picker, 15 ton or over; Chip spreader; Concrete mixer 21 cu. ft. or over; Core drilling machine; Crane or derrick with any attachment (including clamshell, dragline, shovel, backhoe, etc.); Dredge engineer; Dredge operator; Drilling machine on which the drill is an integral part; Earth mover, rubber-tired (paddle wheel, 616, 631, TS-24 or similar type); Earth mover, rubber-tired, tandem (\$0.50 per hour additional for each bowl); Elevating grader; Fork lift, 10 ton or over; P.C.C. formless paver post driver; Highlift shovel, 1 1/2 cu. yd. or over; Hoist, 2 drums and over; Helicopter, crew; Hydraulic boom truck; keystone, skimmer scoop; Loader, self-propelled (belt, chain, wheel); Locomotive operator; Mechanic; Mucking machine; Panel board concrete plant, central mix type; Paver, Hetherington; Pile driver, skid or crawler; Road paving mixer; Rock breaking plant; Rock crushing plant, portable; Roller (asphalt, waterbound macadam, bituminous macadam, brick surface); Roller with dozer blade; Root rake, tractor-mounted; Self-propelled widener; Stump remover, tractor-mounted; Surface heater and planer; Tandem push tractor (\$0.50 per hour additional); Tractor, boom; Winch or hoe head; Tractor, push; Tractor with scoop; Tractor-mounted spreader; Tree mover; Trench machine, over 24"; Tug boat operator; Well drilling machine; Winch truck

with A-frame

GROUP 2: Air compressor with throttle valve or clever brooks-type combination; Backfiller; Backhoe on farm-type tractor, under 45 hp; Bull float; Cherry picker under 15 ton; Chip spreader, self-propelled; Concrete pump; Concrete mesh depressor, independently operated; Concrete spreader, power-driven; End loader under 1 1/2 cu. yd.; Excavating loader, portable; Finishing machine and bull float; Gunite machine; Head greaser; Mesh or steel placer; Multiple tamping machine (RR); P.C.C. concrete belt placer; Pull grader, power control; Refrigerating machine, freezing operation; Ross carrier; Sheepfoot roller (self-propelled); Tamper (multiple vibrating, asphalt, waterbound macadam, bituminous macadam, brick surface); Trench machine, 24" and under; Tube float; Welder

GROUP 3: Assistant plant engineer; Base paver (Jersey or similar type machine); Concrete finishing machine; Concrete mixer, less than 21 cu. ft.; Curb machine; Farm tractor, including farm tractor with all attachments except backhoe and including high lift end loaders of 1 cu. yd. capacity or less; Fire tender on boiler; Hoist, 1 drum; Operator, 5 pieces of minor equipment; Paving breaker; Power broom, self-propelled; Roller, earth and sub-base material; Slurry seal machine; Spike machine (RR); Tamper (multiple vibrating, earth and sub-base material); Throttle valve and fire tender combination on horizontal or upright boiler; Tractaire with drill; Tractor, 50 h.p. or over; Well point system; Widener, APSCO or similar type

GROUP 4: Air compressor; Assistant to engineer, oiler; Automatic dry batch plant; Bituminous distributor; Bituminous patching tamper; Belt spreader; Broom and belt machine; Chair cart, self-propelled; Coleman-type screen; Conveyor, portable; Digger post hole, power-driven; Fork lift, under 10 ton; Form grader; Form tamper, motor-driven; Generator; Hetherington driver; Hydra seeder; Operator, 1 through 4 pieces of minor equipment; Outboard or inboard motor boat; Power curing spraying machine; Power saw, concrete, power-driven; Pug mill; Pull broom, power-type; Seaman tiller; Straw blower or brush mulcher; Striping machine paint, motor-driven; Sub grader; Tractaire, tractor, below 50 h.p.; Truck crane oiler, driver; Spreader; Water pump; Welding machine, 2 of 300 amps or over

ENGI0150-009 04/01/2017

HEAVY, HIGHWAY AND RAILROAD CONSTRUCTION

ELKHART, FULTON, JASPER, KOSCIUSKO, LAGRANGE, MARSHALL, NEWTON, NOBLE, PULASKI, and STARKE COUNTIES

Deter

Eningog

\_\_\_\_\_

1	Rales	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1\$	30.20	25.85
GROUP 2\$	28.60	25.85

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

GROUP	3\$	27.30	25.85
GROUP	4\$	25.90	25.85
GROUP	5\$	22.65	25.85

#### POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Air compressors in manifold with throttle valve; Asphalt plant engineer; Auto grade or similar type machine; Auto patrol; Automatic Sub-Grade; Backhoe or farm type tractor, 45 hp and over; Ballast regulator (RR); Barrier Wall Machine; Batch Plants (Concrete & Asphalt); B ituminous mixer; Bituminous paver; Bituminous plant engineer; Boring Machine; Bulldozer; Caisson drilling machine; Cherry picker, 15 ton or over; Chip spreader; Concrete mixer, 21 cu. ft. or over; Concrete Belt Placer; Concrete Paver; Concrete Pump (Truck Mounted); Concrete Saw (track mounted); Concrete Spreader (power driven); Core drilling machine; Crane or derrick with any attachment (including clamshell, dragline, shovel, backhoe, etc.); Curb Machine; Gutter Machine; Dredge engineer; Dredge operator; Drilling machine on which the drill is an integral part; Earthmover, rubber-tired (paddle wheel, 616, 631, TS-24 or similar type); Earthmover, rubber-tired, tandem (.50 per hr. additional for each bowl); Elevating Grader; Forklift (10 ton or over); P.C.C. Formless Paver; Gradall; Gravel Processing Plant (portable); Operator of Guard Rail Post Driver; Highlift Shovel 1-1/2 cu.yd. or over) Frame; Hoist (2 drum & over); Helicopter crew; Hydraulic boom truck; Hydraulic Excavator; Loaded-Self propelled (belt chain wheel); Laser Screed; Locomotive operator; Mechanic; Mucking machine; P.C.C. Concrete Belt Placer; Panel board concrete plant (central mix type); Paver (Hetherington); Pavement Breaker; Pile driver, skid or crawler; Road paving mixer; Rock breaking plant; Rock crushing plant (portable); Roller (asphalt, waterbound macadam, bituminous macadam, brick surface); Roller with dozer blade; Road Widener; Root rake (tractor-mounted); Roto Mill Grinder; Self-propelled widener; Stump remover; Surface heater and planer; Tandem push tractor (\$0.50 per hour additional); Tractor, boom; Winch or hoe head; Tractor (push); Tractor with scoop; Tractor-mounted spreader; Tree mover; Trench machine, over 24"; Tug boat operator; Well drilling machine; Widener (Apsco or similar type); Winch truck with A-frame

GROUP 2: Air compressor with throttle valve or Clever Brooks type combination; Backfiller; Farm type tractor (under 45 H.P.); Cherry picker under 15 ton; Chip spreader (self-propelled); Concrete pump (trailer type); Concrete mesh depressor, independently operated; End loader under 1 1/2 cu. yd.; Excavating loader (portable); Finishing machine and bull float; Gunite machine; Hydraulic Power unit; Head greaser; Mesh or steel placer; Multiple tamping backhoe on machine (RR); Bull float (bidwell Machine); Refrigerating machine-operation; Ross Carrier; Sheepfoot roller (self-propelled); Tamper-Multiple Vibrating (Asphalt, Waterbound, Macadam, Bituminous Macadam, Brick Surface); Trench machine (24" and under); Tube float; Water Pull/Wagon; Welder GROUP 3: Plant engineer; Base paver (Jersey or similar type machine); Concrete finishing machine; Concrete mixer, less than 21 cu. ft.; Curb machine; Farm tractor, including farm tractor with all attachments except backhoe and including high lift end loaders of 1 cu. yd. capacity or less; Fireman, on boiler; Hoist, 1 drum; Operator, 3-5 pieces of minor equipment; Paving breaker; Power broom, self-propelled; Roller, earth and sub-base material; Power Saw-Concrete (Power Driven); Slurry seal machine; Spike machine (RR); Sub-surface Material Distributor; Tamper (multiple vibrating, earth and sub-base material); Throttle valve; Throttle Valve and fireman combination on horizontal or upright boiler; Tractaire with drill; Well Point

GROUP 4: Air compressor; Assistant to engineer, oiler; Bituminous patching tamper; Belt spreader; Broom and belt machine; Chair cart, self-propelled; Coleman-type screen; Conveyor, portable; Deck-hand Digger post hole, power-driven; Forklift, under 10 ton; Form grader; Form tamper, motor-driven; Generator; Hetherington driver; Hydra seeder; Mechanic heater; Operator, 2 pieces of minor equipment; Outboard or inboard motor boat; Power curing spraying machine; Pug mill; Pull broom, power type; Seaman tiller; Skid steer loader over 3/4 cu. yd.; Straw blower or brush mulcher; Striping machine paint, motor-driven; Sub-grader; Tractaire; Tractor, below 50 h.p.; Truck crane oiler; Spreader; Water pump

GROUP 5: Skid steer loader under 3/4 cu. yds

\_\_\_\_\_

Rates

Fringes

ENGI0150-039 06/01/2017

#### UNDERGROUND & UTILITY CONSTRUCTION:

JASPER, NEWTON, PULASKI AND STARKE COUNTIES:

POWER EQUIPMENT OPERATOR		
GROUP 1\$	40.50	32.88
GROUP 2\$	39.70	32.88
GROUP 3\$	35.40	32.88
GROUP 4\$	33.20	32.88
GROUP 5\$	27.75	32.88

POWER EQUITMENT OPERATOR CLASSIFICATIONS

GROUP 1: Asphalt plants (construction), Asphalt plant (permanent), Auto Patrol (Maintainer), Automatic Dry Batch Plant, Automated Concrete Placer, Automated Sub-Grader, Automated Slip Form Paver, Automated Finish Machine, Combination Backhoe Front, End Loader Machine (1/2 cu. yd.), Backhoe bucket or over or with attachments), Combination backhoe 1 cu yd, Backhoe bucket or over or with attachments, Ballast Regulator (RR), Belt Loader (stationary), Boring Machine (road), Bulldozer, Concrete Mixer(27 cu. ft. or over), Concrete Pump (truck mounted), Concrete Breaker (truck mounted and self-propelled), Core Drilling Machine, Cranes and Backhoes (all attachments), Cranes, Hammerhead, Creter Crane, Crushers (concrete, rock, recycling, etc.), Derricks , Derricks (traveling), Dredge Operator, Formless Curb and Gutter Machine (36 inches and over), Formless Curb and Gutter Machine under 36 inches, Gradall and Machines (of a like nature), Guardrail Post Driver (truck mounted), Lead Greaser, Helicopter, Highlift Shovel (3 yd. and over), Hoist (1 drum), Hoist (2, and 3 drums), Hydraulic Power Units (grouting, piledriving and extracting) Hydro or water blaster (self-propelled), Locomotive Operators, Mechanic, Welder, Mucking Machine, Panelboard Concrete Plant (central mix type), Paver (Hetherington), Pile Driver (Skid or Crawler), Road Paving Mixer, Rock Drill Crawler or Skid Rig, Rock Drill (truck Mounted), Ross Carrier, Roto Mill Grinder (36" and over), Roto mill grinder (less than 36"), Throttle Valve and Compressor or Clever Brooks Type Combination, Throttle Valve and Fireman Combination or Horizontal or Upright Boiler, Tournapull or similar type equipment, Tractor (boom), Tractor Drawn Belt Loader with attached Pusher (requires two engineers), Trench Machine, Tug Boat Operator, Wheel Excavator, Winch Tractor with "a" frame, Scoops, Turnapull or similar types machine used in Tandem (add \$1.00 to class 1 hourly rate for each machine attached there to).

GROUP 2: Combination Backhoe Front End Loader Machine with less than 1/2 cu. yd., Backhoe Bucket or with attachments, Bituminous Mixer, Bituminous Paver, Bridge Deck Finisher, Concrete Mixer (less than 27 cu. ft.), Compressor and throttle valve, Compressor (common receiver 3), Greaser, Highlift Shovels (under 3 cu. yds.), Jersey Spreader or Base Paver, Pavement Bump Grinder (self-propelled), Roller (Asphalt, waterbound, Macadam, Bituminous Macadam, Brick Surface, Sheepfoot Roller (self- propelled with blade), Surface Heater and Planer, Tamper (mutiple vibrating, asphalt waterbound macadam, bituminous macadam, brick surface), Tractor (push), Tractor with scoop, Widener, Apsco or similar type.

GROUP 3: Back Filler, Bituminous Distributor, Broom and Belt Machine, Bull Float, Compressor (common receiver 2), Concrete cutter wheel type (rockwell), Concrete Finishing Machine, Concrete Spreader (power driven), Digger, Post Hole (power driven), Finishing Machine and Bull Float, Forklift, Form Grader, Form Tamper (motor driven), Hydraulic (boom truck) when used for hauling materials, Laser screed, Mutiple Tamping Machine, Paving Breaker, Roller (earth and subbase material), Roller sheepfoot (self-propelled), Sub-grader, Tamper, Mutipile Vibrating (earth and subbase material), Tractaire with Drill, Tractor (with all drawn attachements except backhoe and including Highlift, Endloader of 1 cu. yd. capacity and less.

GROUP 4: Air Compressors, Conveyor (all), Fireman on Boiler, Generator, Grout Machine, Power curing Spraying Machine (self-propelled), Broom (self-propelled), Seaman Tiller, Skid steer loaders, Spike Machine (RR), Stripping Machine (paint, self-propelled), Throttle Valve, Welding Machine, Well Points System. GROUP 5: Deck Hand, Hetherington Driver, Mechanical Heater (1 to 5), Outboard or Inboard Motor Boat, Oiler, Power Saw (Concrete Power Driven), Water Pump, Grasscutter.

ENGI0181-014 04/01/2017

HEAVY AND HIGHWAY CONSTRUCTION:

BARTHOLOMEW, BROWN, CLARK, CRAWFORD, DEARBORN, DECATUR, DUBOIS, FLOYD, FRANKLIN, GIBSON, HARRISON, JACKSON, JEFFERSON, JENNINGS, LAWRENCE, MARTIN, OHIO, ORANGE, PERRY, PIKE, POSEY, RIPLEY, SCOTT, SPENCER, SWITZERLAND, VANDERBURGH, WARRICK, and WASHINGTON COUNTIES

	Rates	Fringes
Power equipment operators: GROUP A\$ GROUP B\$ GROUP C\$	34.85 32.20 30.07	15.15 15.15 15.15

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP A: Air compressor in manifold with throttle valve; Asphalt plant engineer; Auto grade or similar type machine; Bituminous mixer; Bituminous paver; Bituminous plant engineer; Bulldozer; Caisson drilling machine; Cherry picker, all; Ballast regulator (RR); Chip spreader, self-propelled; Cold grinder or similar type equipment; Concrete mixer, 21 cu. ft. or over; Concrete pump, truck-mounted; Core drilling machine; Crane or derrick with any attachment (including clamshell, dragline, shovel, backhoe, etc.); Dredge operator; Drilling machine on which the drill is an integral part; Earth mover, rubber-tired, tandem 0.50 per hour additional; Elevating grader; Endloader, Hi- lift shovel; P.C.C. formless paver; Gradall; Gravel processing plant, portable; Guardrail post driver operator; Head greaser; Hi-lift shovel, endloader; Hoist (2 drums and over); Helicopter crew; Hydraulic boom truck, Keystone, Skimmer Scoop; Loader, self-propelled (belt, chain wheel); Locomotive operator; Mechanic; Mucking machine; Multi-bank drill operator; Panel board concrete plant, central mix type; Paver, Hetherington; Pile driver, skid or crawler; Road paving mixer; Rock breaking plant; Rock crushing plant, portable; Roller (asphalt, waterbound, macadam, bituminous macadam, brick surface); Roller, with dozer blade; Root rake, tractor-mounted; Stump remover, tractor- mounted; Surface heater and planer; Tandem push tractor, \$0.50 per hour additional; Tractor, boom winch or hoe head; Tractor, push; Tractor with scoop; Tractor-mounted spreader; Tree mover; Trench machine, over 24"; Tug boat operator; Welder; Well drilling machine; Self-propelled widener.

GROUP B: Air compressor with throttle valve or clever brooks-type combination; Backfiller, base paver, Jersey or similar type machine; Bull float; Concrete finishing machine; Concrete mesh depressor, independently operated; Concrete spreader, power- driven; Dredge engineer; Excavator loader, portable; Fire tender on boiler; Forklift, regardless of ton; Hoists, 1 drum; Mesh or steel placer; Minor equipment operator, 5 pieces; Multiple tamping machine (RR); P.C.C. concrete placer; Paving breaker; Power broom, self-propelled; Pull grader, power-controlled; Refrigerating machine, freezing operation; Roller, earth and sub- base material; Ross carrier (Straddle buggy); Sheepfoot roller, self-propelled without blade; Tamper, multiple\vibrating (asphalt, waterbound macadam, bituminous macadam, brick surface); Tamper, multiple vibrating (earth and sub-base material); Trench machine, 24" and under; Tube float; Well point system; Widener, Apsco or similar type; Winch truck with A-frame.

GROUP C: Air compressor, oiler; Automatic dry batch plant; Bituminous distributor; Bituminous patching tamper; Belt spreader; Broom and belt machine; Brush burner; Chair cart, self- propelled; Coleman-type screen; Cold grinder oiler; Concrete mixer, less than 21 cu. ft.; Conveyor, portable; Curb machine; Deckhand; Digger (post hole, power-driven); Farm tractor, including farm tractor with all attachments (except backhoe, Hi- lift endloaders); Form grader; Form tamper, motor-driven; Generator; Gunite machine; Hetherington driver; Hydra seeder; Mechanical heater; Minor equipment operator, 1 through 4 pieces; Curing spraying machine; Power saw, concrete (power-driven); Pug mill pull broom, power type; Seaman tiller; Slurry seal machine; Spike machine; Straw blower or brush mulcher; Stripping machine (paint, motor-driven); Sub grader; Throttle valve; Tractaire with drill; Truck crane and multi-drill oiler, driver; Spreader; Water pump.

\_\_\_\_\_

#### ENGI0181-015 04/01/2017

#### SEWER WATERLINE & UTILITY CONSTRUCTION:

BARTHOLOMEW, BROWN, CLARK, CRAWFORD, DEARBORN, DECATUR, DUBOIS, FLOYD, FRANKLIN, GIBSON, HARRISON, JACKSON, JEFFERSON, JENNINGS, LAWRENCE, MARTIN, OHIO, ORANGE, PERRY, PIKE, POSEY, RIPLEY, SCOTT, SPENCER, SWITZERLAND, VANDERBURGH, WARRICK, and WASHINGTON COUNTIES

Rates Fringes

Power equipment operators:		
GROUP A\$	33.93	15.15
GROUP B\$	25.80	15.15

#### SEWER WATERLINE & UTILITY CONSTRUCTION

GROUP A: A-frame winch truck; Air compressor 900 cu. ft. and over; Air tugger; Autograde (CMI); Auto patrol; Backhoe; Ballast regulator (RR); Batch plant (electrical control concrete); Bending machine (pipe); Bituminous plant (engineer); Bituminous plant; Bituminous mixer travel plant; Bituminous paver; Bituminous roller; Buck hoist; Bulldozer; Cableway; Chicago boom; Clamshell; Concrete mixer, 21 cu. ft. or over; Concrete paver, concrete pump, crete; Crane; Craneman; Crusher plant; Derrick; Derrick boat; Dinky; Dope pots (pipeline); Dragline; Dredge operator; Dredge engineer; Drill operator; Elevator grader; Elevator; Ford hoe, or similar type equipment; Forklift; Formless paver; Gantry crane; Gradall; Grademan; Hopto; Hough loader or similar type; Hydro crane; Motor crane; Mucking machine; Multiple tamping machine (RR); Overhead crane; Pile driver; Pulls; Push dozer; Push boats; Roller (sheep foot); Ross Carrier; Scoop; Shovel; Side boom; Swing crane; Trench machine; Welder (heavy duty; Truck-mounted concrete pump; Truck-mounted drill; Well point; Whirleys.

GROUP B: Air compressor, up to 900 cu. ft.; Brakeman; Bull float; Concrete mixer, over 10S and under 21S; Concrete spreader or puddler; Deck engine; Electric vibrator compactor (earth or rock); Finishing machine; Fireman; Greaser, on grease facilities servicing heavy equipment; Material pump; Motor boats; Portable loader; Post hole digger; Power broom; Rock roller; Roller, wobble wheel (earth and rock); Spike machine (RR); Seaman tiller; Spreader rock; Sub grader; Tamping machine; Welding machine; Widener, Apsco or similar type: Bituminous distributor; Cement gun; Concrete saw; Conveyor; Deckhand oiler; Earth roller; Form grader; Generator; Guard rail driver; Heater; JLG lifts; Oiler; Paving joint machine; Power traffic signal; Scissor lift; Steam Jennyu; Truck crane oiler; Vibrator; Water pump.

\_\_\_\_\_

#### ENGI0841-011 04/01/2015

#### HEAVY, HIGHWAY AND UTILITY CONSTRUCTION

BOONE, CLAY, DAVIESS, FOUNTAIN, GREENE, HENDRICKS, KNOX, MONROE, MONTGOMERY, MORGAN OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLIAN, VIGO, and WARREN COUNTIES

Rates Fringes

Power equipment operators:		
GROUP 1	\$ 30.85	18.35+a
GROUP 2	\$ 24.60	18.35+a

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Air Compressor Over 600 CU FT, Air Compressors (2), Compressors hooked in Manifold, Asphalt Plant Engineer, Auto Grade and/or C.M.I. or similar type Machine, Auto Patrol, Motor Patrol, Power Blade, Aspco Paver, Asphalt Planer, Asphalt Rollers, Asphalt Paver Operator, Concrete or Asphalt Milling Machine, Self Propelled Widener, Backhoe and/or Pavement Breaker Attachment, Self Propelled Pavement Breaker, Ballast Regulator (R.R), Bituminous Mixer, Bituminous Paver, Bituminous Plant Engineer, Bulk Cement Plant Engineer, Bulldozer, One Drum Hoist with Tower or Boom, Cableways, Tower Machines, Back Filler, Boom Tractor, Boom or Winch Truck, Winch or Hydraulic Boom Truck, Boring Machine, Bolier Operator, Brush Mulcher, Bull Float, Finishing Machine, Power Cranes, Overhead Cranes, Truck cranes, Piledriver, Skid or Crawler, Guard Rail Post Driver, Tower Cranes, Hydro Crane, Cherry Picker, Draglines, Derricks, Shovels, Clam, Gradalls, Two Drum Machine, Concrete or Asphalt Curb Machine, Self Propelled, Concrete Mixers with Skid, Tournamixer, Concrete Pump (Truck or Skid Mounted), Concrete Plant Engineer, Soil Cement Machine, Formless Paver, Concrete Spreader, Span Saw (and similar types), Chip Spreader, Mesh Placer, Dredging Equipment or Dredge Engineer or Dredge Operator, Tug Boat Operator, Marine Scoops, Ditching Machine with Dual Attachment, Standard or Dinkey Locomotives, Drilling Machine, including Well Testing, Caissons, Shaft or any similar type Drilling Machine (Well Point Systems), 4 Point Life System (Power Lift or similar type), Mud Cat, Mucking Machine, Sull-Air, Mechanics, Welder, Head Equipment Greaser, Tournapull, Tractor Operating Scoops, Push Tractors, Large Rollers on Earth, Loaders (Track or Rubber Mounted), or similar type Machine, Lull, Tournadozer, Scoopmobiles, Elevating Machines, Power Broom (Self Propelled), Power Sub Grader, Hydra Ax, Farm Tractor with Attachments, Soil Stabilizer (Seaman Tiller, Bo mag, Rago Gator and similar types of equipment), Tree Mover, Stump Remover, Root Rake, Hydra Seeder, Straw Blower, Refrigerating Machine, Freezing Operator, Chair Cart-Self Propelled, Helicopter Crew (3), Ross Carrier or Straddle Buggy or similar Machine, Rock Crusher Plant, Gravel Processing Machine, Pipe Cleaning Machine, Pipe Wrapping Machine, Pipe Bending Machine, Pug Mill, Concrete Bump Grinder Machine, Power Curing Spray Machine, Forklift (except when used for landscaping), Snooper Truck Operator.

GROUP 2: Air Compressor 600 cu. ft. and under, Air Tugger, Air Valves, Assistant Concrete Plant Engineer, Assistant Asphalt Plant Engineer, Asphalt Plant Fireman, Bulk Cement Plant Equipment Greaser, Concrete Mixers without Skips, Curbing Machine, Concrete Saw (Self Propelled), Conveyors, Cement Blimps, Ditching Machine under 6", Distributor Operator On trucks, Deck Hands, Elevators when used for hoisting material, Engine Tenders, Fork Lift (when used for landscaping), Farm Tractor, Fireman, Fireman on Paint or Dope Pots, Form Tamper, Form Grader, Flex Plane, Generators (two to four), or Welding Machines or Water Pumps, within 400 feet, Gunite Machine, Machine Mounted Post Hole Digger, Mude Jack, One Drum Machines without Tower or Boom, One Water Pump, One Welding Machine, Outboard or Inboard Motor Boat, Pull Broom (Power Type, Siphons and Pulsometer, Switchman, Striping and or Painting Machine (motor driven), Slurry Seal Machine, Track Jack, Temporary Heat, Throttle Valve, Tube Float, Tractaire, Wagon Drill, Multiple Tamping Machine (R.R.), Spike Machine (R.R.), Mechanical Heaters, Brush Burner, Vacuum Truck (Super Sucker and similar types).

#### FOOTNOTES:

A. Employees operating booms from 149Ft. to 199 Ft. including jib, shall receceive an additional seventy-five Cents (.75) per hour above the rate. Employees operating booms over 199 Ft. including jib, shall receive an additional one dollar and twenty- five cents (\$1.25) per hour above the regular rate.

B. Employees operating scoops, pulls, or tractors hooked in tandem shall receive an additional one dollar (\$1.00) per hour above the regular rate.

C. Employees operating scoops, pulls, or tractors pulling any other hauling unit in tandem shall receive an additional one dollar (\$1.00) per hour above the regular rate.

D. Underground work - Employees working in tunnels, shafts, etc. shall be paid a thirty percent (30%) premium above the wage rate.

IRON0022-001 06/01/2017

BARTHOLOMEW, BENTON, BOONE, BROWN, CARROLL, CASS, CLAY, CLINTON, DAVIESS (REMAINDER OF COUNTY), DECATUR (W 3/4), DELAWARE (REMAINDER OF COUTNTY), FAYETTE (W 1/3), FOUNTAIN,FRANKLIN (NW TIP), FULTON (REMAINDER OF COUNTY), GRANT (REMAINDER OF COUNTY), GREENE, HAMILTON, HANCOCK, HENDRICKS, HENRY, HOWARD, JACKSON, JASPER (SOUTHEASTERN 1/2), JENNINGS (NORTHWEST 2/3), JOHNSON, KNOX (REMAINDER OF COUNTY), LAWRENCE, MADISON, MARTIN (NW 2/3), MIAMI (REMAINDER OF COUNTY), MONROE, MONTGOMERY, MORGAN, NEWTON (SOUTHERN 1/2), OWEN, PARKE, PULASKI (REMAINDER OF COUNTY), PUTNAM, RANDOLPH (SW TIP), RUSH (REMAINDER OF COUNTY), SHELBY, SULLIVAN, TIPPECANOE, TIPTON, VERMILLION, VIGO, WAYNE, WARREN AND WHITE COUNTIES:

	Rates	Fringes
IRONWORKER	\$ 30.64	22.05

The following holidays shall be observed: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and the day after Thanksgiving and Christmas Day. Any holiday which occurs on a Sunday shall be observed the following Monday, unless the legal observance of these holidays is changed by law.

IRON0044-010 06/01/2017

DEARBORN, DECATUR (REMAINDER OF COUNTY), FAYETTE (REMAINDER OF COUNTY), FRANKLIN (REMAINDER OF COUNTY), JEFFERSON (REMAINDER OF COUNTY), JENNINGS (REMAINDER OF COUNTY), OHIO, RIPLEY, RUSH (SOUTHEASTERN TIP), SWITZERLAND, AND UNION (SOUTHERN 1/3)

	Rates	Fringes
Ironworkers:		
FENCE ERECTORS\$	25.62	20.10
ORNAMENTAL\$	26.97	20.10
STRUCTURAL, MACHINERY		

20.10

MOVERS, RIGGERS.....\$ 26.97

IRON0070-002 06/01/2017

CLARK, CRAWFORD, FLOYD, HARRISON, JACKSON (SOUTHERN 3/4); JEFFERSON (EXCLUDING NORTHEASTERN TIP); JENNINGS (SOUTHERN 3/4), LAWRENCE (SOUTHERN 2/3), MARTIN (SOUTHEASTERN 2/3), ORANGE, PERRY (EASTERN 3/4); SCOTT AND WASHINGTON COUNTIES:

\_\_\_\_\_

	Rates	Fringes	
IRONWORKER	\$ 28.30	21.85	
IRON0070-016 06/01/2017			

DEARBORN, DECATUR (REMAINDER OF COUNTY), FAYETTE (SE CORNER), FRANKLIN (S 3/4), OHIO, RIPLEY (REM. OF COUNTY), SWITZERLAND (REMAINDER OF COUNTY) and JENNINGS (NE TIP) COUNTIES

	Rates	Fringes	
IRONWORKER (Reinforcing)	\$ 28.30	21.85	
IRON0103-001 08/01/2017			

DAVIESS (S 1/2), DUBOIS, GIBSON, KNOX (S 1/2), MARTIN (SW 1/3), PERRY (W 1/4), PIKE, POSEY, SPENCER, VANDERBURGH, AND WARRICK

	Rates	Fringes	
IRONWORKER	\$ 28.64	21.385	
IRON0147-004 06/01/2017			

ADAMS, ALLEN, BLACKFORD, DEKALB, DELAWARE (NORTHEAST THIRD OF COUNTY), FULTON (EASTERN PART), GRANT (EXCLUDING SOUTHWEST PORTION), HUNTINGTON, JAY, MIAMI (NORTHEAST HALF), NOBLE (EXCLUDING NORTHEAST TIP), STEUBEN, WABASH, WELLS, and WHITLEY COUNTIES

RatesFringesIRONWORKER......\$ 26.3421.77IRON0290-00406/01/2016FAYETTE (NE 1/4), RANDOLPH (S. PART OF COUNTY EXCLUDING<br/>WINCHESTER BUT INCLUDING UNION CITY) UNION (NORTHERN 2/3) AND

	Rates	Fringes	
Ironworkers:	\$ 27.00	20.98	
IRON0292-005 06/01/2017			

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

WAYNE (REMAINDER OF COUNTY) COUNTIES

ELKHART, FULTON (North 2/3), KOSCIUSKO (Remainder of County), LAGRANGE (West 1/3), MARSHALL, MIAMI (Northwestern Tip), NOBLE (Northwestern Tip), PULASKI (Northeast Half), and STARKE COUNTIES

	Rates	Fringes		
IRONWORKER	\$ 29.30	21.11		
IRON0395-002 06/01/2017				
JASPER (NORTHERN 1/2), NEWTON (NO (NORTHWESTERN TIP) COUNTIES	RTHERN 1/2), PUI	LASKI		
	Rates	Fringes		
IRONWORKER IRONWORKERS SHEETER	\$ 39.55 \$ 39.80	30.32 30.32		
LABO0041-003 04/01/2017				
HEAVY & HIGHWAY CONSTRUCTION				
NEWTON COUNTY				
	Rates	Fringes		
LABORERS Group 1 Group 2 Group 3	\$ 30.24 \$ 30.54 \$ 31.24	15.63 15.63 15.63		
GROUP 1: Construction Laborer, Carpenter Tender, Fence Erector, Grade Checker, Guard Rail Erector, Continuous Steel Rod or Mat Installer, Wire Mesh Layer, Joint Man (Mortar, Mastic, and all other types), Lighting Installer (Permanent or Temporary), Lineman for Automatic Grade Maker on Paving Machines, Mortar Man, Multi-Plant Erector, Rip-rap Installer (all Products and Materials), Road Marking and Delineation Laborer, Setting and Placing of all Precast Concrete Products, Sing Installation including supporting structure, Spraying of all Epoxy, Curing Compound, or Like Material, Flagperson, Air Tool, Power Tool Operator, Asphalt Raker Man, Batch Truck Dumper, Bridge Hand Rail ERector, Handler (bulk or bag cement), Chain Saw Man, Concrete Puddler, Concrete Rubber, Concrete Saw Operator, Core Drill Operator, Eye Level, Hand Blade Operator Hydro Seeder Man, Motor Driven Georgia Buggy Operator, Power Driven Compactor or Taper Operator, Power				

Saw Operator, Pump Crete Assembly Man, Sreed Man or Screw Man on Asphalt Paver, Regar Installer, Sandblaster Man, Sealer Applicator for Asphalt (toxic), Setting and Placing pre-stressed on Pre-cast Concrete Structural Members, Side Rail Setters (for Sidewalk, Side Ditches, Radii, and
Pavement), Spreader Box Tender (manua or power driven), Straw Blower Man, Subsureface Drain and Culvert Pipe Layer, Concrete Conveyor, Horizonal Boring and Jackman and Sheetman, Pipe Greade Man, Winch and Windless Operator Conduit Installer, Sod Layer

GROUP 2: Cutting Torch Burner, Laser Beam Aligner, Manhole Erector, Sewer Pipe Layer, Water Line Installer, Temporary or Permanent Welders (electric or Oxy Acetylene)

GROUP 3: Air Track and Wagon Drillman, Dynamite and Powder Man, Concrete Barrier Rail Form Setter, Concrete Saw Joint Control Cutting

-----

LABO0041-005 04/01/2017

UTILITY CONSTRUCTION

JASPER & NEWTON COUNTIES

Rates	

Fringes

Laborers:			
GROUP	1\$	31.07	15.63
GROUP	2\$	31.37	15.63
GROUP	3\$	32.07	15.63

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole

erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

-----

### LABO0041-006 04/01/2017

HEAVY & HIGHWAY CONSTRUCTION

JASPER & STARKE COUNTIES

			5
LABORERS			
Group	1\$	27.47	15.63
Group	2\$	37.77	15.63
Group	3\$	28.47	15.63

Rates

Fringes

LABORERS CLASSIFICATIONS (HEAVY AND HIGHWAY)

GROUP 1: Construction Laborer, Carpenter Tender, Fence Erector, Grade Checker, Guard Rail Erector, Continuous Steel Rod or Mat Installer, Wire Mesh Layer, Joint Man (Mortar, Mastic, and all other types), Lighting Installer (Permanent or Temporary), Lineman for Automatic Grade Maker on Paving Machines, Mortar Man, Multi-Plant Erector, Rip-rap Installer (all Products and Materials), Road Marking and Delineation Laborer, Setting and Placing of all Precast Concrete Products, Sing Installation including supporting structure, Spraying of all Epoxy, Curing Compound, or Like Material, Flagperson, Air Tool, Power Tool Operator, Asphalt Raker Man, Batch Truck Dumper, Bridge Hand Rail ERector, Handler (bulk or bag cement), Chain Saw Man, Concrete Puddler, Concrete Rubber, Concrete Saw Operator, Core Drill Operator, Eye Level, Hand Blade Operator Hydro Seeder Man, Motor Driven Georgia Buggy Operator, Power Driven Compactor or Taper Operator, Power Saw Operator, Pump Crete Assembly Man, Sreed Man or Screw Man on Asphalt Paver, Regar Installer, Sandblaster Man, Sealer Applicator for Asphalt (toxic), Setting and Placing pre-stressed on Pre-cast Concrete Structural Members, Side Rail Setters (for Sidewalk, Side Ditches, Radii, and Pavement), Spreader Box Tender (manua or power driven), Straw Blower Man, Subsureface Drain and Culvert Pipe Layer, Concrete Conveyor, Horizonal Boring and Jackman and Sheetman, Pipe Greade Man, Winch and Windless Operator Conduit Installer, Sod Layer

GROUP 2: Cutting Torch Burner, Laser Beam Aligner, Manhole Erector, Sewer Pipe Layer, Water Line Installer, Temporary or Permanent Welders (electric or Oxy Acetylene)

GROUP 3: Air Track and Wagon Drillman, Dynamite and Powder Man, Concrete Barrier Rail Form Setter, Concrete Saw Joint

Control Cutting

\_\_\_\_\_

UTILITY CONSTRUCTION

LABO0081-003 04/01/2017

STARKE COUNTY

Rates Fringes

Laborers:			
GROUP	1\$	30.72	15.63
GROUP	2\$	31.02	15.63
GROUP	3\$	31.72	15.63

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

\_\_\_\_\_

LABO0120-003 04/01/2017

## UTILITTY CONSTRUCTION

# MARION & SHELBY COUNTIES

#### Laborers:

GROUP	1\$	23.22	14.30
GROUP	2\$	23.52	14.30
GROUP	3\$	24.22	14.30

Rates

Fringes

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

LABO0204-003 04/01/2017

## UTILITY CONSTRUCTION

CLAY, FOUNTAIN, GREENE, HENDRICKS, OWEN, PARKE, PUTNAM,

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

SULLIVAN, VERMILLION, VIGO, & WARREN COUNTIES

Rates

Fringes

Laborers:			
GROUP	1\$	23.42	14.30
GROUP	2\$	23.72	14.30
GROUP	3\$	24.42	14.30

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

LABO0213-003 04/01/2017

UTILITY CONSTRUCTION

ADAMS, ALLEN, DEKALB, HUNTINGTON, NOBLE, STEUBEN, WABASH, WELLS, & WHITLEY COUNTIES

Rates

Fringes

Laborers:			
GROUP	1\$	23.22	14.30
GROUP	2\$	23.52	14.30
GROUP	3\$	24.22	14.30

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

\_\_\_\_\_

LAB00274-005 04/01/2017

UTILITY CONSTRUCTION

BENTON, BOONE, CARROLL, CASS, CLINTON, FULTON, HOWARD, MIAMI, MONTGOMERY, PULASKI, TIPPECANOE, TIPTON, and WHITE COUNTIES

Rates

Fringes

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

Laborers:

GROUP	1\$	23.22	14.30
GROUP	2\$	23.52	14.30
GROUP	3\$	24.22	14.30

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

\_\_\_\_\_

LABO0561-015 04/01/2017

UTILITY CONSTRUCTION

DAVIESS, DUBOIS, GIBSON, KNOX, PIKE, POSEY, SPENCER, VANDERBURGH, & WARRICK COUNTIES

Rates

Fringes

Laborers:

GROUP	1\$	23.72	14.30
GROUP	2\$	24.02	14.30
GROUP	3\$	24.72	14.30

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

LAB00645-005 04/01/2017

## UTILITTY CONSTRUCTION

ELKHART COUNTY

	R	ates	Fringes
Laborers:			
GROUP	1\$	23.42	14.30
GROUP	2\$	23.72	14.30
GROUP	3\$	24.42	14.30

## LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

\_\_\_\_\_

LAB00645-006 04/01/2017

UTILITY CONSTRUCTION

KOSCIUSKO, LAGRANGE, & MARSHALL COUNTIES

Rates	Fringes
-------	---------

Laborers:			
GROUP	1\$	23.22	14.30
GROUP	2\$	23.52	14.30
GROUP	3\$	24.22	14.30

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

(mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

\_\_\_\_\_

LABO0741-007 04/01/2017

UTILITY CONSTRUCTION

BARTHOLOMEW, BROWN, DEARBORN, DECATUR, FRANKLIN, JACKSON, JENNINGS, JOHNSON, LAWRENCE, MARTIN, MONROE, MORGAN, OHIO, ORANGE & RIPLEY COUNTIES

	Rates	Fringes
Laborers:		
GROUP	1\$ 23.42	14.30
GROUP	2\$ 23.72	14.30
GROUP	3\$ 24.42	14.30

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer

(permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

# LAB00795-004 04/01/2017

UTILITY CONSTRUCTION

CLARK, CRAWFORD, FLOYD, HARRISON, JEFFERSON, PERRY, SCOTT, SWITZERLAND, & WASHINGTON COUNTIES

Rates Fringes

Laborers:			
GROUP	1\$	23.42	14.30
GROUP	2\$	23.72	14.30
GROUP	3\$	24.42	14.30

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

\_\_\_\_\_

LABO0999-001 04/01/2017

HEAVY AND HIGHWAY CONSTRUCTION

ALL COUNTIES EXCEPT: Jasper, Newton, & Starke

Rates Fringes

Laborers:

GROUP	1\$	23.22	14.30
GROUP	2\$	23.52	14.30
GROUP	3\$	24.22	14.30

LABORERS CLASSIFICATIONS

GROUP 1: Building and Construction Laborers; Scaffold Builders (other than for Plasterers); Mechanic Tenders; Window Washers and cleaners; Waterboys and Toolhousemen; Roofers Tenders; Railroad Workers; Masonry Wall Washers (interior and exterior); Cement Finisher Tenders; Carpenter Tenders; All Portable Water pumps with discharge up to (3) inches; Plaster Tenders; Mason Tenders; Flag & Signal Person. GROUP 2: Waterproofing; Handling of Creosot Lumber or like treated material (excluding railroad material); Asphalt Rakers and Lutemen; Kettlemen; Air Tool Operators and all Pneumatic Tool Operators; Air and Electric Vibrators and Chipping Hammer Operators; Earth Compactors Jackmen and Sheetmen working Ditches deeper than (6) ft.in depth; Laborers working in ditches (6) ft.in depth or deeper; Assembly of Unicrete Pump; Tile Layers (sewer or field) and Sewer Pipe Layer (metallic or non-metallic); Motor driven Wheelbarrows and Concrete Buggies; Hyster Operators; Pump Crete Assemblers; Core Drill Operators; Cement, Lime or Silica Clay Handlers (bulk or bag); Handling of Toxic Materials damaging to clothing; Pneumatic Spikers; Deck Engine and Winch Operators; Water Main and Cable Ducking (metallic and non-metallic); Screed Man or Screw Operator on Asphalt Paver; Chain and Demolition Saw Operators; Concrete Conveyor Assemblers.

GROUP 3: Water Blast Machine Operator; Mortar Mixers; Welders (Acetylene or electric); Cutting Torch or Burner; Cement Nozzle. Laborers; Cement Gun Operator; Scaffold Builders when Working for Plasterers. Dynamite Men; Drillers - Air Track or Wagon Drilling for explosives Hazardous and Toxic material handler, asbestos removal or handler.

\_\_\_\_\_

LAB01112-003 04/01/2017

UTILITY CONSTRUCTION

BLACKFORD, DELAWARE, FAYETTE, GRANT, HAMILTON, HANCOCK, HENRY, JAY, MADISON, RANDOLPH, RUSH, UNION & WAYNE COUNTIES

Rates Fringes

Laborers:

1\$	23.22	14.30
2\$	23.52	14.30
3\$	24.22	14.30
	1\$ 2\$ 3\$	1\$ 23.22 2\$ 23.52 3\$ 24.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw

operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

-----

PAIN0012-006 05/01/2017

COMMERCIAL AND INDUSTRIAL

DEARBORN, OHIO, RIPLEY AND SWITZERLAND COUNTIES:

	Rates	Fringes
PAINTER Bridges, Lead Abatement Brush & Roller,	.\$ 25.61	9.54
Paperhanger, Drywall Taping Sandblasting, Waterblasting Spray	.\$ 24.61 .\$ 25.36 .\$ 25.11	9.54 9.54 9.54
PAIN0027-005 06/01/2017		
NEWTON COUNTY, West of Highway #4	11	
	Rates	Fringes
GLAZIER	\$ 42.45	34.18
PAIN0047-005 06/01/2017		
BARTHOLOMEW, BOONE, BROWN, DECATT HENDRICKS, JACKSON, JENNINGS, JOH MARTIN, MONROE, MORGAN, ORANGE, A	JR, HAMILTON, HAJ HNSON, LAWRENCE, AND SHELBY COUNT	NCOCK, MARION, IES
	Rates	Fringes

PAINTER		
BRIDGE WORK		
Concrete/Masonry Bridges\$	26.44	13.30
Steel Bridges\$	30.50	13.30

NON-BRIDGE WORK Brush, Roller.....\$ 25.18 12.35 Spray and Sand-Blasting....\$ 26.18 12.35 \_\_\_\_\_ PAIN0080-001 06/01/2017 BENTON, CARROLL, CASS, CLINTON, FOUNTAIN, MONTGOMERY TIPPECANOE AND WARREN COUNTIES Rates Fringes PAINTER Brush and Roller.....\$ 25.00 15.33 Spray and Sandblasting.....\$ 26.00 15.33 \_\_\_\_\_ PAIN0091-007 06/01/2014 ELKHART, FULTON, KOSCIUSKO AND MARSHALL COUNTIES Rates Fringes PAINTER Brush & Roller, Drywall Taping & Finishing, Vinyl/Paper Hanging.....\$ 26.32 12.75 Spray.....\$ 26.82 12.75 \_\_\_\_\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ PAIN0118-005 06/01/2017 CLARK, CRAWFORD, FLOYD, HARRISON JEFFERSON, SCOTT AND WASHINGTON COUNTIES Rates Fringes Painters: Heavy Construction Brush, Roller & Paperhanger.....\$ 21.25 12.27 Spray, Sandblast & Waterblast.....\$ 22.25 12.27 Highway Construction & Railroad Bridges Brush, Roller & Paperhanger.....\$ 27.68 12.27 Spray, Sandblast & Waterblast.....\$ 28.68 12.27 \_\_\_\_\_ PAIN0156-001 04/01/2017 DAVIESS, DUBOIS, GIBZSON, KNOX, PERRY, PIKE, POSSEY, SPENCER, VANDERBURGH, AND WARRICK COUNTIES Rates Fringes Painters:

BRUSH & ROLLER OF MASTICS, CREOSOTES, KEWINCH KOATE,

& COAL TAR EPOXY.....\$ 28.60 \$14.05+A BRUSH & ROLLER.....\$ 27.60 \$14.05+A DRYWALL FINISHERS.....\$ 27.85 \$14.05+A SPRAY of MASTICS CREOSOTES, KWINCH KOATE, COAL TAR EPOXY.....\$ 29.60 \$14.05+A SPRAY, SANDBLAST, POWER TOOLS, WATERBLAST & STEAM CLEANING.....\$ 28.60 \$14.05+A FOOTNOTE A: All Structures over 40Â' S0.75/ hour above base wage All Structures over 75Â' 51.501 hour above base wage All Structures over 100Å' 52.50/ hour above base wage \_\_\_\_\_ PAIN0197-001 06/01/2017 CLAY, GREENE, OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLION AND VIGO COUNTIES: Fringes Rates Painters: Brush & Roller.....\$ 25.70 12.52+A Sandblasting.....\$ 27.70 12.52+A 12.52+A Spray & Pot Man.....\$ 26.20 FOOTNOTE A: \$1.00 premium for work on structures over 40 ft. above floor/ground level \$2.00 premium for work on structures over 100 ft above floor/ground level \_\_\_\_\_ PAIN0387-004 11/01/2017 DEARBORN, FRANKLIN, OHIO, RIPLEY, and SWITZERLAND COUNTIES Rates Fringes GLAZIER.....\$ 26.00 14.15 \_\_\_\_\_ PAIN0460-004 06/01/2017 JASPER, NEWTON, PULASKI, STARKE AND WHITE COUNTIES Rates Fringes Painters: Brush & Roller.....\$ 33.99 21.28 Building.....\$ 34.00 22.76 Brush and Roller Heavy and Highway.....\$ 36.80 22.76 Drywall Taping & Finishing..\$ 34.80 22.76 \_\_\_\_\_ PAIN0469-002 06/01/2016 ADAMS, ALLEN, DEKALB, GRANT, HUNTINGTON, LAGRANGE, NOBLE,

STEUBEN, WABASH, WELLS, and WHITLEY COUNTIES

	I	Rates	Fringes
Painters:			
101' 8	over\$	23.31	11.57
31' -	60'\$	22.71	11.57
61' -	100'\$	23.11	11.57
Brush	Roller,		
Paperl	nanger, & Drywall		
Finisl	ning\$	21.86	11.57
Lead	AbatementŚ	26.86	11.57
Sprav	& Sandblast Pot		
Tende	rs and Ground		
Perso	nel\$	22.76	11.57
Sprav	Sandblast, Power		22.00
Tools	Waterblast & Steam		
Clean	ng Ś	22 86	11 57
CIEdii.		22.00	11.31

PAIN0669-001 04/01/2015

BLACKFORD, DELAWARE, FAYETTE, FRANKLIN, HENRY, HOWARD, JAY, MADISON, MIAMI, RANDOLPH, RUSH, TIPTON, UNION and WAYNE COUNTIES

	Rates	Fringes
Painters: Brush; Roller;		
Paperhanging; Drywall Finishers Spray/Waterblasting;	.\$ 20.50	11.39
Sandblasting	.\$ 21.50	11.39
PAIN1165-014 07/01/2017		
CLARK, CRAWFORD, DAVIESS, DUBOIS JEFFERSON, KNOX, MARTIN, ORANGE, SPENCER, VANDERBURGH, WARRICK AN	, FLOYD, GIBSON, PERRY, PIKE, PO D WASHINGTON	HARRISION, SEY, SCOTT,
	Rates	Fringes
GLAZIER	.\$ 28.18	14.72
PAIN1165-017 07/01/2017		
ADAMS, ALLEN, BLACKFORD, DE KALB NOBLE, STEUBEN, WABASH, WELLS AN	, GRANT, HUNTING D WHITLEY COUNTI	TON, JAY, ES
	Rates	Fringes
GLAZIER	.\$ 24.77	12.97
PAIN1165-018 07/01/2017		
JASPER and NEWTON (East of High	way #41) COUNTIE	S
	Rates	Fringes

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

Page 42 of 52

GLAZIER.....\$ 34.85 21.62

PAIN1165-019 07/01/2017

ELKHART, FULTON, KOSCIUSKO, LAGRANGE, MARSHALL, PULASKI, and STARKE COUNTY

Rates Fringes 16.38 GLAZIER.....\$ 27.66 \_\_\_\_\_ PAIN1165-022 01/01/2018 BARTHOLOMEW, BENTON, BOONE, BROWN, CARROLL, CASS, CLAY, CLINTON, DECATUR, DELEWARE, FAYETTE, FOUNTAIN, GREENE, HAMILTON, HANCOCK, HENDRICKS, HENRY, HOWARD, JACKSON, JENNINGS, JOHNSON, LAWRENCE, MADISON, MARION, MIAMI, MONROE, MONTGOMERY, MORGAN, OWEN, PARKE, PUTNAM, RANDOLPH, RUSH, SHELBY, SULLIVAN, TIPPECANOE, TIPTON, UNION, VIGO, VERMILLION, WARREN, WAYNE, and WHITE COUNTIES Rates Fringes GLAZIER.....\$ 26.26 16.22 \_\_\_\_\_ PLAS0075-001 06/01/2017 CLAY, OWEN, PARKE, PUTNAM, VERMILLION AND VIGO COUNTIES: Rates Fringes CEMENT MASON/CONCRETE FINISHER...\$ 25.75 13.50 \_\_\_\_\_ PLAS0075-002 06/01/2017

GREENE and SULLIVAN COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	.\$ 28.50	13.50
PLAS0101-001 06/01/2014		
FULTON AND MARSHALL COUNTIES; PU	LASKI COUNTY (SO	UTHERN 1/2):
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	\$ 30.57	11.50
PLAS0101-008 06/01/2014		
ADAMS, ALLEN, DEKALB, HUNTINGTON STEUBEN, WELLS AND WHITLEY COUNT:	, KOSCIUSKO, LAG IES	RANGE, NOBLE,

Rates Fringes

Page 43 of 52

CEMENT MASON/CONCRETE FINISHER...\$ 23.38 11.94 PLASTERER.....\$ 25.69 11.75 \_\_\_\_\_ PLAS0438-003 06/01/2014 PULASKI (NOTHERN 2/3), JASPER (N. EASTERN PORTION OF WEST TO BUT NOT INCLUDING WHEATFIELD), ALL OF STARKE COUNTY Rates Fringes 22.15 CEMENT MASON/CONCRETE FINISHER...\$ 36.01 \_\_\_\_\_ PLAS0692-002 06/01/2016 AREA #46 BARTHOLOMEW, BOONE, BROWN, CLARK, CLAY, CRAWFORD, DAVIESS, DUBOIS, GIBSON, HENDRICKS, JACKSON, JEFFERSON, JENNINGS, JOHNSON, KNOX, LAWRENCE, MARION, MARTIN, MONROE, MORGAN, ORANGE, OWEN, PARKE, PERRY, PIKE, POSEY, PUTNAM, SCOTT, SHELBY, SPENCER, VANDERBURGH, VERMILLION, VIGO and WARRICK COUNTIES Rates Fringes PLASTERER.....\$ 25.04 13.23 \_\_\_\_\_ PLAS0692-008 05/01/2017 BARTHOLOMEW, BROWN, CLARK, DEARBORN, FLOYD, JACKSON, JEFFERSON, JENNINGS, LAWRENCE, OHIO, ORANGE, RIPLEY, SCOTT, SHELBY, SWITZERLAND, and WASHINGTON Counties Rates Fringes CEMENT MASON/CONCRETE FINISHER AREA #821.....\$ 24.18 13.49 PLAS0692-009 04/01/2017 AREA #83 BLACKFORD, DELAWARE, GRANT, HAMILTON (Northern Part), HANCOCK (Northern Part), JAY, MADISON, TIPTON, and WABASH COUNTIES Rates Fringes CEMENT MASON/CONCRETE FINISHER...\$ 25.45 13.84 PLASTERER.....\$ 25.49 11.95 PLAS0692-011 04/01/2017 AREA #83 DECATUR, FAYETTE, FRANKLIN, HENRY, RANDOLPH, RUSH, UNION and WAYNE COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER\$	25.45	13.84
PLASTERER\$	25.49	11.95
PLAS0692-015 06/01/2016		
AREA #121		
BENTON, CARROLL, CASS, CLINTON, FC MONTGOMERY, TIPPECANOE, WARREN, WH Part) COUNTIES	UNTAIN, HOWARD	, MIAMI, LION (Northern
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER\$ PLASTERER\$	26.10 27.71	17.30 16.40
PLAS0692-018 06/01/2017		
AREA #165		
ELKHART and NEWTON COUNTIES		
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER\$	38.88	23.73
PLAS0692-022 06/01/2017		
Southward on Rt. No. 49 to the JAS lines, including the City Limits of Remington, Indiana. To the West,	PER, BENTON and f Wheatfield, H the boundary of	d WHITE County Rensselaer and E NEWTON County
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER AREA #406\$	33.35	19.09
PLAS0692-023 06/01/2017		
AREA #532		
BOONE, HAMILTON (SOUTH HALF OF COU INDIANA #32 INCLUDING NOBLESVILLE) AND WESTERN PART OF HANCOCK COUNTY FORTVILLE); HENDRICKS, JOHNSON, MA	NTY NORTH TO NE ; HANCOCK COUNT , NORTH TO BUT RION and MORGAN	EW ROUTE FY (SOUTHERN NOT INCLUDING N COUNTIES
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER\$ Slip Form Shift Work\$ Swinging/Suspended Scaffold.\$	26.45 27.45 26.70	17.11 17.11 17.11

\_\_\_\_\_

PLAS0692-027 04/01/2017

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

AREA #566

CRAWFORD, DAVIESS, DUBOIS, GIBSON, HARRISON, KNOX, MARTIN, PERRY, PIKE, POSEY, SPENCER, VANDERBURGH and WARRICK COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER.	\$ 25.60	16.66
PLUM0136-003 10/01/2017		
DAVIESS, DUBOIS, GIBSON, JACKSO ORANGE, OWEN, PERRY, PIKE, POSE WARRICK COUNTIES	N, LAWRENCE, Y, SPENCER, N	MARTIN, MONROE, /ANDERBURGH, and
	Rates	Fringes
Plumbers and Pipefitters	\$ 34.72	18.71
PLUM0157-002 01/01/2018		
BENTON, CARROLL, CLINTON, FOUNT. WARREN AND WHITE COUNTIES:	AIN, MONTGOME	ERY, TIPPECANOE,
	Rates	Fringes
Plumbers and Pipefitters	\$ 36.93	16.58
PLUM0166-001 06/01/2017		
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHI	B, GRANT, HUN TLEY COUNTIES	NTINGTON, NOBLE,
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHI	B, GRANT, HUN TLEY COUNTIES Rates	TINGTON, NOBLE, S Fringes
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHI Plumber and Steamfitter	B, GRANT, HUN TLEY COUNTIES Rates \$ 34.36	TINGTON, NOBLE, Fringes 15.66
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHI Plumber and Steamfitter PLUM0166-002 06/01/2017	B, GRANT, HUN TLEY COUNTIES Rates \$ 34.36	TTINGTON, NOBLE, Fringes 15.66
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHI Plumber and Steamfitter PLUM0166-002 06/01/2017 ELKHART, KOSCIUSKO, and LAGRANG	B, GRANT, HUN TLEY COUNTIES Rates \$ 34.36  E COUNTIES	TTINGTON, NOBLE, S Fringes 15.66
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHT Plumber and Steamfitter PLUM0166-002 06/01/2017 ELKHART, KOSCIUSKO, and LAGRANG	B, GRANT, HUN TLEY COUNTIES Rates \$ 34.36  E COUNTIES Rates	TINGTON, NOBLE, Fringes 15.66 Fringes
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHT Plumber and Steamfitter PLUM0166-002 06/01/2017 ELKHART, KOSCIUSKO, and LAGRANG PLUMBER	B, GRANT, HUN TLEY COUNTIES Rates \$ 34.36  E COUNTIES Rates \$ 34.36	TTINGTON, NOBLE, Fringes 15.66 Fringes 15.66
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHT Plumber and Steamfitter PLUM0166-002 06/01/2017 ELKHART, KOSCIUSKO, and LAGRANG PLUMBER PLUM0172-001 05/29/2017	B, GRANT, HUN TLEY COUNTIES Rates \$ 34.36 E COUNTIES Rates \$ 34.36	TTINGTON, NOBLE, Fringes 15.66 Fringes 15.66
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHT Plumber and Steamfitter PLUM0166-002 06/01/2017 ELKHART, KOSCIUSKO, and LAGRANG PLUMBER PLUM0172-001 05/29/2017 JASPER (S of the N. Side of the PULASKI and STARKE COUNTIES	B, GRANT, HUN TLEY COUNTIES Rates \$ 34.36 E COUNTIES Rates \$ 34.36 City of Rens	TTINGTON, NOBLE, Fringes 15.66 Fringes 15.66 sselear), MARSHALL,
PLUM0166-001 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KAL STEUBEN, WABASH, WELLS, and WHT Plumber and Steamfitter PLUM0166-002 06/01/2017 ELKHART, KOSCIUSKO, and LAGRANG PLUMBER PLUM0172-001 05/29/2017 JASPER (S of the N. Side of the PULASKI and STARKE COUNTIES	B, GRANT, HUN TLEY COUNTIES Rates \$ 34.36  E COUNTIES Rates \$ 34.36  City of Rens Rates	TTINGTON, NOBLE, Fringes 15.66 Fringes 15.66 sselear), MARSHALL, Fringes

https://www.wdol.gov/wdol/scafiles/davisbacon/IN6.dvb?v=4

PLUM0210-003 06/01/2017 JASPER (to the City of Rensselaer) and NEWTON COUNTIES Rates Fringes PLUMBER.....\$ 39.32 23.41 -----PLUM0392-006 06/01/2014 DEARBORN, RIPLEY, OHIO AND SWITZERLAND COUNTIES Rates Fringes Plumbers and Pipefitters.....\$ 29.80 17.79 \_\_\_\_\_ PLUM0440-002 06/05/2017 BARTHOLOMEW, BOONE, HAMILTON, HANCOCK, HENDRICKS, HOWARD, JOHNSON AND MARION COUNTIES; MIAMI COUNTY (SOUTH OF A STRAIGHT LINE WHERE ROUTE 218 ENTERS W. BOUNDARY); MORGAN, SHELBY and TIPTON COUNTIES Rates Fringes 16.09 Plumbers and Pipefitters.....\$ 36.72 \_\_\_\_\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ PLUM0440-004 06/05/2017 FAYETTE, FRANKLIN, HENRY, RANDOLPH, RUSH, UNION and WAYNE COUNTIES Rates Fringes Plumber and Steamfitter.....\$ 36.72 16.09 PLUM0502-001 08/01/2016 CLARK, FLOYD AND HARRISON COUNTIES Rates Fringes PLUMBER/PIPEFITTER.....\$ 32.00 20.13 \_\_\_\_\_ PLUM0597-004 06/01/2017 JASPER (Excluding the city limits of Rensselear), AND NEWTON (Entire County) Rates Fringes PIPEFITTER.....\$ 47.50 30.02 \_\_\_\_\_ \_\_\_\_\_ ROOF0023-004 06/01/2017 ELKHART, FULTON, KOSCIUSKO, LAGRANGE, MARSHALL, PULASKI, and STARKE COUNTIES

	Rates	Fringes
ROOFER COMPOSITIONSLATE & TILE	\$ 28.76 \$ 29.76	14.50 14.50
ROOF0023-008 06/01/2017		
ALLEN, DEKALB, NOBLE, STEUBEN, an	d WHITLEY COUNT	IES
	Rates	Fringes
ROOFER COMPOSITION SLATE & TILE	\$ 28.76 \$ 29.76	14.50 14.50
ROOF0106-006 04/01/2017		
CRAWFORD, DAVIESS, DUBOIS, GIBSON PIKE, POSEY, SPENCER, VANDERBURG	KNOX, MARTIN, H AND WARRICK	ORANGE PERRY,
	Rates	Fringes
Roofers: COMPOSITION SLATE & TILE	\$ 29.50 \$ 27.46	15.52 13.01
ROOF0150-002 07/01/2017		
CLAY, GREENE, OWEN, PARKE, SULLIV. COUNTIES	AN, VERMILLION .	AND VIGO
	Rates	Fringes
ROOFER	\$ 27.00	14.43
SHEE0020-003 07/01/2017		
	Rates	Fringes
Sheet metal worker (HVAC Duct Work)	\$ 29.14	23.65
SHEE0020-010 07/01/2017		
BARTHOLOMEW, BOONE, BROWN, DECATU FRANKLIN, HAMILTON, HANCOCK, HEND JENNINGS, JOHNSON, LAWRENCE, MADI ORANGE, RIPLEY, RUSH, SHELBY, TIP COUNTIES	R, DELAWARE, FA RICKS, HENRY, J. SON, MARION, MO TON, UNION AND	YETTE, ACKSON, NROE, MORGAN, WASHINGTON
	Rates	Fringes
Sheet metal worker	\$ 33.39	21.52

\_\_\_\_\_

## SHEE0020-024 07/01/2017

CLAY, GREENE, MARTIN, OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLION, and VIGO COUNTIES

	Rates	Fringes
Sheet metal worker	\$ 33.50	20.45
TEAM0135-003 04/01/2017		
REMAINING COUNTIES		
	Rates	Fringes
TRUCK DRIVER GROUP 1 GROUP 2 GROUP 3 GROUP 4 GROUP 5 GROUP 5 GROUP 6 GROUP 7 GROUP 7 GROUP 9 GROUP 9 GROUP 10 GROUP11	\$ 28.16 \$ 28.21 \$ 28.26 \$ 28.31 \$ 28.36 \$ 28.41 \$ 28.46 \$ 28.51 \$ 28.56 \$ 28.01 \$ 28.56	15.14 15.14 15.14 15.14 15.14 15.14 15.14 15.14 15.14 15.14 15.14 15.14

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Single/batches axle straight trucks; Batch trucks, wet or dry 3 (34E) axle or less; Single axle Grease and maintenance truck

15.14

GROUP 2: Single axle fuel and water trucks

GROUP12....\$ 28.66

GROUP 3: Single axle "dog-legs", and tandem truck or doglegs; Winch trucks or A-frames when used for transportation purposes; Drivers on batch trucks, wet or dry over 3 (34E) batches and tandem axle grease and maintenance truck

GROUP 4: Tandem axle fuel trucks; tandem axle water trucks; butuminous distributors (two-man)

GROUP 5: Tandem trucks over 15 tons payload; Single axle semi trucks; Farm tractors hauling material; Mixer trucks (all types); Trucks pulling tilt-top trailer single axle; Single axle low- boys; Truck-mounted pavement breakers

GROUP 6: Tandem trucks or "dog-legs"; Semi-water Truck; Sprinkler Truck; Heavy equipment-type water wagons, 5,000 gallons and under; butuminous distributors (one-man)

GROUP 7: Tri-axle trucks; Tandem axle semi trucks; Equipment when not self-loaded or pusher loaded, such as Koehring or similar dumpsters, track trucks, Euclid bottom dump and hug bottom dump, tournatrailers, tournarockers, Acey wagons or for similar equipment (12 cu yds or less); Mobile mixer

truck; Tandem Axle trucks pulling tilt-top trailer; Tandem
- Axle lowboy; Tri- Axle batch Truck; Tri-Axle grease and
maintenance truck

GROUP 8: Tandem-tandem semi trucks; Truck mechanics and welders; Heavy equipment-type water wagon over 5,000 gallons; Tri-Axle Trucks pulling tilt-top trailer; Low-boys, tandem-tandem axle

GROUP 9: Low-boys, tandem tri-axle; Acey wagons up to and including 3 buckets; Equipment when not self-loaded or pusher loaded, such as koehring or similar dumpsters, Track Trucks, Euclid bottom dump and hug bottom dump, Tournatrailers, Tournarockers, Acey wagons or for similar equipment (over 12 cu yds.)

GROUP 10: Pick-up trucks

GROUP 11: Helpers; Greasers; Tire men; Batch board tenders; Warehouseman

GROUP 12: Acey wagon (over 3 buckets); Quad Axle Trucks; Articulating Dump

\_\_\_\_\_

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

\_\_\_\_\_

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

\_\_\_\_\_

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

# Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

# Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

# Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of

each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

### \_\_\_\_\_

### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations Wage and Hour Division U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210 4.) All decisions by the Administrative Review Board are final.

\_\_\_\_\_

END OF GENERAL DECISION

General Decision Number: IN180002 02/09/2018 IN2

Superseded General Decision Number: IN20170002

State: Indiana

Construction Type: Building

Counties: Adams, Allen, Bartholomew, Benton, Blackford, Boone, Carroll, Cass, Clinton, DeKalb, Delaware, Fountain, Fulton, Grant, Hamilton, Hancock, Hendricks, Howard, Huntington, Jay, Johnson, Madison, Marion, Miami, Monroe, Montgomery, Morgan, Noble, Shelby, Steuben, Tippecanoe, Tipton, Wabash, Warren, Wells, White and Whitley Counties in Indiana.

BUILDING CONSTRUCTION(does not include single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	r Publication Date
0	01/05/2018
1	01/12/2018
2	01/26/2018
3	02/09/2018

ASBE0018-004 06/01/2017

BARTHOLOMEW, BENTON, BOONE, CARROLL, CLINTON, DELAWARE, FOUNTAIN, HAMILTON, HANCOCK, HENDRICKS, HOWARD, JOHNSON, MADISON, MARION, MONROE, MONTGOMERY, MORGAN, SHELBY, TIPPECANOE, TIPTON, AND WARREN COUNTIES:

Rates

Fringes

ASBESTOS WORKER/HEAT & FROST INSULATOR (includes application of all insulating materials, protective coverings, coatings and

finishings to all types of mechanical systems).....\$ 31.24 19.44 HAZARDOUS MATERIAL HANDLER (includes preparation, wettings, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....\$ 23.00 14.40 \_\_\_\_\_ ASBE0041-002 06/01/2017 ADAMS, ALLEN, BLACKFORD, DE KALB, GRANT, HUNTINGTON, JAY, MIAMI, NOBLE, STEUBEN, WABASH, WELLS AND WHITLEY COUNTIES: Rates Fringes ASBESTOS WORKER/HEAT & FROST INSULATOR (includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....\$ 29.82 14.26 HAZARDOUS MATERIAL HANDLER (includes preparation, wettings, stripping, removal, scrapping, vaccuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from 14.40 mechanical systems).....\$ 23.00 \_\_\_\_\_ ASBE0075-003 06/01/2017 CASS, FULTON and WHITE COUNTIES Rates Fringes ASBESTOS WORKER/HEAT & FROST INSULATOR (includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....\$ 31.50 20.79 HAZARDOUS MATERIAL HANDLER (includes preparation, wetting, stripping, removal, scrapping, vaccuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....\$ 23.00 14.40 \_\_\_\_\_ BOIL0374-002 01/01/2013

Rates Fringes

https://www.wdol.gov/wdol/scafiles/davisbacon/IN2.dvb?v=3

Page 3 of 31

BOILERMAKER.....\$ 33.78 25.19 \_\_\_\_\_ BRIN0003-001 06/01/2017 INDIANAPOLIS BOONE, HANCOCK, HENDRICKS, JOHNSON, MARION, MONTGOMERY, MORGAN and SHELBY COUNTIES Rates Fringes Bricklayer, Stone Mason, Pointer, Caulking.....\$ 31.15 12.39 TERRAZZO FINISHER.....\$ 19.36 8.65 TERRAZZO WORKER/SETTER.....\$ 31.11 12.29 Tile & Marble Finisher.....\$ 20.76 8.61 Tile, Marble Setter.....\$ 29.91 12.14 \_\_\_\_\_ BRIN0004-004 06/01/2017 FORT WAYNE ADAMS, ALLEN, DEKALB, HUNTINGTON, NOBLE, STEUBEN, WELLS AND WHITLEY COUNTIES: Fringes Rates BRICKLAYER (STONE MASON, MARBLE MASONS, POINTER, CLEANER, AND CAULKER).....\$ 29.40 13.35 Terrazzo Grinder Finisher.....\$ 26.09 10.40 Terrazzo Worker Mechanic.....\$ 29.82 13.72 Tile Setter & Marble Mason Mechanic.....\$ 26.40 11.38 Tile, Marble & Terrazzo Finisher.....\$ 22.93 10.10 BRIN0004-021 06/01/2017 BARTHOLOMEW and MONROE COUNTIES Rates Fringes Bricklayer, Stonemason.....\$ 27.63 12.10 TERRAZZO FINISHER.....\$ 19.36 8.65 TERRAZZO WORKER/SETTER.....\$ 31.11 12.29 Tile & Marble Finisher.....\$ 20.76 8.61 Tile & Marble Setter; Mosaic Worker....\$ 30.48 12.19 \_\_\_\_\_ BRIN0011-001 06/01/2017

LAFAYETTE BENTON, CARROLL, CLINTON, FOUNTAIN, TIPPECANOE, WARREN and WHITE COUNTIES

Rates

Fringes

Bricklayer, Stonemason, Pointer, Caulker & Cleaner.....\$ 27.80 15.27 TERRAZZO FINISHER.....\$ 19.36 8.65 TERRAZZO WORKER/SETTER.....\$ 31.11 12.29 Tile & Marble Finisher.....\$ 20.76 8.61 Tile & Marble Setter; Mosaic Worker.....\$ 30.48 12.19 \_\_\_\_\_ BRIN0018-001 06/01/2017 CASS, FULTON, GRANT, HOWARD, MIAMI and WABASH COUNTIES Rates Fringes Bricklayer, Stonemason, Pointer, Caulker & Cleaner.....\$ 28.15 13.21 Terrazzo Worker Finisher.....\$ 29.29 14.57 TERRAZZO WORKER/SETTER.....\$ 31.00 16.91 Tile & Marble Finisher.....\$ 28.29 13.70 Tile, Marble Setter.....\$ 30.00 16.91 BRIN0019-001 06/01/2016 MUNCIE CHAPTER BLACKFORD, DELAWARE, HAMILTON, JAY, MADISON AND TIPTON COUNTIES: Rates Fringes Bricklayer, Stonemason, Pointer, Caulker & Cleaner.....\$ 29.75 13.50 TERRAZZO FINISHER.....\$ 19.07 7.06 TERRAZZO WORKER/SETTER.....\$ 29.57 10.96 Tile & Marble Finisher.....\$ 19.96 7.07 Tile & Marble Setter; Mosaic Worker.....\$ 28.98 10.85 \_\_\_\_\_ CARP0215-001 06/01/2017 BENTON, CARROLL, CLINTON, TIPPECANOE, WARREN AND WHITE COUNTIES: Rates Fringes CARPENTER.....\$ 28.52 19.70 MILLWRIGHT.....\$ 28.73 19.92 \_\_\_\_\_ CARP0232-001 06/01/2017 ALLEN, DEKALB, NOBLE, STEUBEN and WHITLEY COUNTIES Rates Fringes Carpenter & Piledrivermen.....\$ 24.75 18.53 \_\_\_\_\_ CARP0615-001 06/01/2017 ADAMS, CASS, FULTON, GRANT, HOWARD, HUNTINGTON, MIAMI, TIPTON, WABASH and WELLS COUNTIES

	Rates	Fringes
Carpenter & Piledrivermen	\$ 25.30	18.85
CARP0912-001 06/01/2017		
	Rates	Fringes
CARPENTER ZONE 2: BOONE, FOUNTAIN, HENDRICKS, MONROE, MONTGOMERY AND MORGAN COUNTIES		
Carpenters, Drywall Millwright ZONE 4: BLACKFORD, DELAWARE, JAY AND MADISON COUNTIES	\$ 28.31 \$ 27.72	19.35 21.45
Carpenters, Drywall Millwright	\$ 28.02 \$ 27.72	19.35 21.45
CARP0912-002 10/01/2017		
HAMILTON, HANCOCK, JOHNSON (Tow and Clark), MARION	nships of Wl	nite River, Pleasant
	Rates	Fringes
Carpenters: Carpenters, Drywall Installers, Piledrivers Millwright Soft Floor Layers	\$ 29.82 \$ 27.72 \$ 27.29	19.35 21.45 17.44
 CARP0999-008 10/01/2017		
BARTHOLOMEW, JOHNSON (Townships Nineva, Needham and Blue River)	of Union, H , SHELBY COU	Hensley, Franklin, JNTIES
	Rates	Fringes
Carpenters: Carpenters, Drywall Installers, Piledriver Millwright Soft Floor Layers	\$ 26.83 \$ 27.72 \$ 27.29	19.35 21.45 17.44
CARP1029-001 06/01/2017		
ADAMS, ALLEN, CASS, DEKALB, ELK HUNTINGTON, KOSCIUSKO, LAGRANGE JOSEPH, STEUBEN, TIPTON, WABASE	HART, FULTO , MARSHALL, , WELLS and	N, GRANT, HOWARD, MIAMI, NOBLE, ST. WHITLEY COUNTIES

Rates

Fringes

MILLWRIGHT.....\$ 25.91 22.73 \_\_\_\_\_ \_\_\_\_\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \* ELEC0305-002 01/01/2018 ADAMS, ALLEN, DE KALB, HUNTINGTON, NOBLE, STEUBEN, WELLS, and WHITLEY COUNTIES Rates Fringes ELECTRICIAN.....\$ 32.11 27.35%+\$7.70 \_\_\_\_\_ ELEC0481-005 05/29/2017 BARTHOLOMEW, BOONE, HAMILTON, HANCOCK, HENDRICKS, JOHNSON, MADISON, MARION, MONTGOMERY, MORGAN AND SHELBY COUNTIES Rates Fringes ELECTRICIAN.....\$ 34.50 19.82 \_\_\_\_\_ ELEC0538-006 01/01/2018 FOUNTAIN AND WARREN COUNTIES: Rates Fringes ELECTRICIAN.....\$ 33.80 22.01 \_\_\_\_\_ ELEC0668-002 06/01/2017 BENTON, CARROLL, CASS, FULTON, TIPPECANOE and WHITE COUNTIES Rates Fringes ELECTRICIAN.....\$ 32.73 18.09 FOOTNOTE: a. PAID HOLIDAYS: New Years Day, Memorial Day, July 4th, Labor Day, Veterans Day Thanksgiving Day and Christmas Day \_\_\_\_\_ ELEC0725-006 06/01/2017 MONROE COUNTY Rates Fringes Communication Technician.....\$ 27.85 13.01 Includes the installation, operation, inspection, maintenance, repair and service of radio, television, recording, voice sound and vision production and reproduction apparatus, equipment and appliances used for domestic, commercial, education, entertainment and private telephone systems. \_\_\_\_\_ ELEC0725-011 03/01/2017

MONROE COUNTY:

	Rates	Fringes		
ELECTRICIAN	\$ 35.70	18.37		
ELEC0855-003 06/01/2017				
BLACKFORD, DELAWARE, AND JAY CO	UNTIES			
	Rates	Fringes		
ELECTRICIAN	\$ 32.22	15.84		
ELEC0873-002 03/01/2017				
CLINTON, GRANT, HOWARD, MIAMI,	TIPTON AND W	NABASH COUNTIES:		
	Rates	Fringes		
ELECTRICIAN	\$ 33.28	1.35%+15.26		
ELEV0034-001 01/01/2018				
	Rates	Fringes		
ELEVATOR MECHANIC	\$ 46.51	32.645+a+b		
a) PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Vetern's Day, Thanksgiving Day, the Friday after Thanksgiving, and Christmas Day.				
b) Employer contributes 8% of regular hourly rate to vacation pay credit for employee with more than 5 years of service; 6% for less than 5 years' service.				
ELEV0044-002 01/01/2018				
	Rates	Fringes		
ELEVATOR MECHANIC	\$ 48.18	32.645+a+b		
a) PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Vetern's Day, Thanksgiving Day, the Friday after Thanksgiving, and Christmas Day.				
b) Employer contributes 8% of pay credit for employee with 6% for less than 5 years' ser	regular hou more than 5 vice.	arly rate to vacation years of service;		
ENGI0103-001 04/01/2016				
BENTON, CARROLL, CASS, CLINTON, GRANT, HOWARD, MIAMI, TIPPECANOE, TIPTON, WABASH, and WHITE COUNTIES				

Rates Fringes

https://www.wdol.gov/wdol/scafiles/davisbacon/IN2.dvb?v=3

Power equipment operators:

GROUP	1\$	33.06	16.34
GROUP	2\$	30.06	16.34
GROUP	3\$	28.49	16.34
GROUP	4\$	24.79	16.34

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: A-Frame Winch Truck, Air Compressors over 600 cu.ft., Air Tugger, Autograde (CMI), Auto Patrol, Backhoe, Ballast Regulator (RR), Batcher Plant (electricial control concrete), Bending Machine (pipe), Bituminous Plant (engineer), Bituminous Plant, Bituminous Mixer Travel Plant, Bituminous Paver, Bituminous Roller, Buck Hoist, Bull Dozer, Cable Way, Chicago Boom, Clamshell, Concrete Mixer (21 cu. ft. or over), Concrete Paver, Concrete Pump(crete), Crane, Craneman, Crusher Plant, Derrick, Derrick Boat, Dinkey, Dope Pots (pipeline), Dragline, Dredge Operator, Dredge Engineer, Drill Operator,, Elevating Grader, Elevator, Ford Hoe (or similar type equipment), Forklift, Formless Paver, Gantry Crane, Gradall, Grademan, Grout Pump, Helicopter Crew, Heterington Paver, High-Lift, Hoist, Hopto, Hough Loader (or similar type), Hydro Crane, Hydro Hammer, Locomotive Crane, Locomotive, Mechanic, Mobile Mixer, Motor Crane, Mucking Machine, Multiple Tamping Machine (rr), Overhead Crane, Pile Driver, Pulls, Push Dozer, Push Boats, Roller (sheep foot), Ross Carrier, Scoop, Shovel, Side Boom, Swing Crane, Tail Boom, Tar Machine (pipeline), Throttle Valve, Tower Crane, Trench Machine, Welder (heavy duty), Truck Mounted Concrete Pump, Truck-Mounted Drill, Well Point, Whirleys

GROUP 2: Air Compressor (up to 600 cu. ft.), Brakeman, Bull Float, Concrete Mixer (over 10s and under 21s), Concrete Spreader or Puddler, Deck Engine, Drill Helper, Electic Vibrator Kompactor (earth or rock), Finishing Machine, Gireman, Greaser (on grease facilities servicing heavy equipment), Material Pump, Motor Boats, Motor Crane Oiler, Portable Loader, Post Hole Digger, Power Broom, Rock Roller, Roller-Wobble Whell (earth or rock), Spike Machine (RR) Seamen Tiller, Spreader Rock, Sub Grader, Tamping Machine, Truck Mounted Drill Oiler, Welding Machine, Widener (apsco or similar type)

GROUP 3: Air Compressor 210 cu ft & over, Bituminous Distributor, Chair Cart, Concrete Curing Machine, Concrete Saw, Dope Pot Power Agitated, Flex Plane, Form Grader, Hydrohammer, Jacks Hydraulic Power Driven, Paving Joint Machine, Post Hole Digger, Roller Earth, Throttle Valve, Track Jack Power Driven, Tractor Farm Type, Truck Crane Driver

GROUP 4: Air Compressor (under 200 cu. fr. per min), Bituminous Distributor, Cement Gun, Concrete Saw, Conveyor, Deck Hand Oiler, Earth Roller, Form Grader, Generator, Guardrail Driver, Heater, Oiler, Paving Joint Machine, Power Traffic Signals, Steam Jenny, Vibrator, Water Pump, "JLG" Lifts and "Scissor" Lift or similar machine
### ENGI0103-002 04/01/2016

BLACKFORD, DELAWARE, HAMILTON, HANCOCK, JAY, JOHNSON, MADISON, MARION, and SHELBY COUNTIES

Rates

Fringes

Power equipment operators:		
GROUP 1\$	34.80	15.13
GROUP 2\$	33.85	15.13
GROUP 3\$	29.80	15.13
GROUP 4\$	26.10	15.13

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Air Compressor (pressurizing shafts, tunnels & drivers); Air Tugger; Auto Patrol; Back Filler; Back Hoe; Boom Cat; Boring Machine; Bull Dozer; Caisson Drilling Machine; Cherry Picker; Compactor (with dozer blade); Concrete Mixer (dual drum); Concrete plant; Concrete Pump; Crane with all attachments; Crane- Electric overhead; Derrick; Ditching Machine (18' and over); Dredge; Elevators (when hoisting material or tools); Fork Lift (machinery); Formless Paver; Generator (power for welders of compressor); Gradall; Helicopter; Helicopter Winch Operator; High Lift-Front End Loader; Hoist-Material and/or Personnel over 3 Floors; Locomotive; Mechanic on job site; Mucking Machine; Panel Board Concrete Plant; Pile Driver; Push Cat; Scoop & Tractor; Scraper-Rubber Tired; Spreader-Tractor Mounted; Straddle Carrier-Ross Type; Sub Base Finish Machine (C.M.I. or smiliar); Tower Crane; Tractor with Backhoe (over 1/2 yard); Welder (craft)

GROUP 2: A Frame Truck; Batcher Plant (automatic dry batch); Bending Machine-Power Driven; Bituminous Mixer; Bituminous Paver; Bituminous Plant Engineer; Boatman; Bull Float; Compactor or Tamper-Self Propelled; Concrete Mixer (21 cu. ft. or over); Concrete Spreader-Power Driven; Dinkey Engine; Ditching Machine; Ditching Machine (less than 18"); Drilling Machine; Finish Machine & Bull Float; Finishing Machine; Fireman-Pile Driving and Boilers; Fork Lift-Masonry & Material; Gunite Machine; Head Greaser; Hoist-Material and/or personnel 3 floors and under; Mechanic in shop; Mesh Depresser-Mesh Placer; P.C.C. Concrete Belt Placer; Ruller-Asphalt, stone & sub base; Sheepsfoot Roller- Self Propelled; Shop Mule; Spreader or Base Paver-Self Propelled; Sub Grader; Throttle valve with air compressor or boiler; Tractor with Backhoe (1/2 yard & under); Tractor-high lift-farm type; Tractor-Industrial Type; Tractor with Winch; Well Points; Winch Trick

GROUP 3: Air Compressor (210 cu. ft. & over); bituminous Distributor; Chair Cart; Concrete Curing Machine; Concrete Saw; Dope Pot Power Agitated; Flex Plane; Form Grader; Hydrohammer; Jacks-Hydraulic-Power Driven; Minor Equipment opr. 3,4, or 5; Paving Joint Machine; Post Hole Digger; Roller-Earth; Throttle Valve; Track Jack-Power Driven; Tractor-Farm Type; Truck Crane Driver GROUP 4: Air Compressor (less than 210 cu. ft.); Concrete Mixer (under 21cu. ft.); Conveyor; Generator; Mechanical Heater; Oiler; Operator-2 pieces of miner equipment; Power Broom; Pump; Welding Machine

ENGI0103-007 04/01/2016

ADAMS, ALLEN, DEKALB, HUNTINGTON, STEUBEN, WELLS, and WHITLEY COUNTIES

I	Rates	Fringes
Power equipment operators:		
GROUP 1\$	33.13	15.77
GROUP 2\$	32.18	15.77
GROUP 3\$	29.18	15.77
GROUP 4\$	25.68	15.77

### POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Air Tugger; Auto Patrol, Back Filler; Back Hoe; Boom Cat; Boring Machine; Bull Dozer; Caisson Drilling Machine; Cherry Picker; Compactor (with dozer blade); Concrete Mixer (dual drum); Concrete Plant; Concrete Pump; Crane with all attachments; Crane Electric overhead; Derrick; Ditching Machine (18" and over); Dredge; Fork Lift (machinery); Formless Paver; Gradall; Helicopter; Helicopter Winch Operator; High Lift Front End Loader; Hoist Material and/or personnel over 3 floors; Locomotive; Mechanic on Job Site; Mucking Machine; Panel Board Concrete Plant; Pile Driver; Push Cat; Scoop & Tractor; Scraper Tubber Tired; Skid Steer Machine (grading and back hoe); Spreader Tractor Mounted; Straddle Carrier Ross Type; Sub Base Finish Machine (C.M.I.or similar); Tower Crane; Tractor with backhoe (over 1/2 yard); Welder for Craft Work.

GROUP 2: A-Frame Truck; Batcher Plant (automatic dry batch); Bending Machine Power Driven; Bituminous Mixer; Bituminous Paver; Bituminous Plant Engineer; Boatman; Bull Float; Compactor or Tamper Riding Only; Concrete Mixer (21 cu. ft. or over); Concrete Spreader Power Driven; Dinkey Engine; Ditching Machine (less than 18" riding only); Drilling Machine; Elevators (when hoisting material or tools); Finish Machine and bull Float (excluding trowelling machine); Fireman Pile Driving and Boilers; Gunite Machine; Head Greaser; Hoist Material and/or personnel 3 floors and under; Mesh Depressor Mesh Placer; P.C.C. Concrete Belt Placer; Roller Asphalt, Stone & Sub Base; Sheepsfoot Roller Self Propelled; Shop Mule; Spreader or Base Paver Self Propelled; Sub Grader; Throttle Valve with Air Compressor or Boiler; Tractor with Backhoe (1/2 yard & under); Tractor High Lift Farm Type; Tractor Industrial Type; Tractor with Winch; Winch Truck.

GROUP 3: Bituminous Distributor; Chair Cart; Concrete Cuting Machine; Dewatering Sytems; Dope Pot Power Agitated; Flex Plane; Fork Lift (masonry and material); Form Grader; Hydrohammer; Jacks Hydraulic Power Driven; Paving Joint Machine; Post Hole Digger (machine Mounted); Roller Earth; Skid Steer Machine (fork lift and trasporting); Throttle Valve; Track Jack Power Driven; Tractor Farm Type.

GROUP 4: Air Compressor (pressurizing shafts, tunnels and divers); Air Compressor (over 210 cu. ft.); Concrete Saw; Conveyor; Generators; Oiler; Operating minor equipment; Power Broom; Truck Crane Driver; Welding Machines over 300 amps (2 or more).

ENGI0150-017 06/01/2017

FULTON and NOBLE COUNTIES

	Ι	Rates	Fringes
POWER EQUIF	MENT OPERATOR		
GROUP	1\$	29.05	27.15
GROUP	2\$	27.70	27.15
GROUP	3\$	26.90	27.15
GROUP	4\$	26.10	27.15
GROUP	5\$	23.50	27.15

POWER EQUIPMENT OPERATOR CLASSIFICATIONS:

GROUP 1: Mechanic, Asphalt Plant, Asphalt Spreader, Auto Grader; Batch Plant, Benoto (requires 2 Engineers), Boiler and Throttle Valve, Boring Machine (road), Bulldozers (with engines of 140 net horse power or more) Caisson Rigs, Central Redi-mix Plant, Concrete Conveyor Systems, Concrete Power (over 27E cu. ft.), Concrete Paver (27E cu. ft. and under), Concrete Pumps/Grout cncrete placer (Truck Mounted), Concrete Tower, Cranes and backhoes (all), Cranes, Hammerhead Tower, Creter Crane, Derricks (all), Forklift (capble of hoisting and mechanically moving forks horizontally), Grader, Elevating, Highlift Shovels or Front End Loaders (over 3 yd bucket), Hoists (2 or more drums), Locomotives (all), Laser screed, Motor Patrol, Pile Drivers and Skid Rig, Pre-Stress Machines, Pump Cretes & Similar Types, Rock Drill (Self-Propelled), Rock Drill (self propelled Truck Mounted), Scoops (tractor drawn), Slip-Form Paver, Tournapull, Tractor with Boom & Side Boom, Trenching Machine (12 or more inches in width), Combination Backhoe Front End Loader Machine with backhoe 1/2 yd bucket or attachments.

GROUP 2: Air Compressor (600 cu. ft. and over), Bob Cat (over 3/4 cu. yd.), Boilers, Broom (all powered propelled), Bull Dozers with engines of less than 140 net horsepower, combination backhoe front end loader 1/2 yf bskhhoe or under, Compressor and Throttle Valve, Concrete Breaker (truck mounted), Concrete Mixer (of moore than 21 cu. ft. capacity), Forklift (with fixed or tilt mast), Greaser Engineer, Highlift shovel or front endloader 3 yd bucket and under, Hoists (1 drum), Hydrulic Boom Truck, Post Hole Digger (vehicle mounted), Pump Cretes (squeze crete type pumps, Gypsum, bulker , Rollers(all), Steam Generators, Stone Crushers, Stradddle Buggies, Tractors, Winch Trucks (with "a" frame.

GROUP 3: Buck Hoist, Combination (small equipment operator), .Conveyor (portable), Grouting Machine, Hoist Elevators (material and personnel), Hydraulic Power Units, Grouting and Pile Driving, Stud Welder, Trenching Machines less than 12 inches in width, Welding Machines (8 through 15).

GROUP 4: Bobcat (up to and including 3/4 cu. yd.). Compressor (over 210 cu. ft. and less than 600 cu. ft.), Generator (over 50 kw.), Heaters, Mechanical, Hoists (all elevator, permanent installation), Hoist (automatic), Hoist (tugger single drum), Oilers, Pumps, Well Points and electric submersible, Small Rubber Tired End Loaders (1/4 cu. yd. and under), Tractors (farm type) Welding Machines (2 through 8).

GROUP 5: Bobcats and forklifts (commercial or residential).

\_\_\_\_\_

ENGI0181-004 04/01/2015

BARTHOLOMEW COUNTY

	Rates	Fringes
Power equipment operators:		
GROUP A\$	31.88	14.40
GROUP B\$	23.75	14.40

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP A: A-frame winch truck, articulating dump, autograde (CMI), auto patrol, ballast regulator (RR), batcher plant (electrical control concrete), bending machine (pipe), bituminous plant (engineer), bituminous plant, bituminous mixer travel plant, bituminous paver, bituminous roller, boring machine, buck hoist, bull dozer, cable way, Chicago boom, chimney hoist, clamshell, concrete mixer (21 cu.ft. or over), concrete paver, concrete pump (crete), construction elevator (Allmac or similar) creane, creaneman, crawler backhoe, bcreawler high-lift, crusher plant, derrick, derrick boat, dinkey, directional/boring machine, dope pots (pipeline), double drum tugger (electric or air), dragline, dredge operator, dredge engineer, drill operator, elevating grader, extendable boom forklift, formless paver, gantry crane, gator (or similar type tiller), gradeall, grader, grademan, greaser (on grease facility servicing heavy equipment), G.P.S. System (on equipment within the classificaitons), grout pump, head greaser, helicopter crew, Hetherington paver, hoist (motorized, gas or disel), hydraulic crane, ghdro blaster, Industrial type forklift (over 9,000 lbs.), laser concrete screed, laser or remote controlled equipment (within the classifications), locomotive crane, locomotive, mechanic, mobile mixer, botor creane, mucking machine, multiple tamping machine (RR) overhead crane, pile driver, pulls, push dozer, push boats, roller (sheep foot), rough terrain crain, R.T. backhoe, R.T. endloader, Ross carrier, scoop, shovel, side boom, skidsteer loader (bobcat or similar

type), swing crane, tail boom, tar machine (pipeline), tower crane, trench machine, welder (heavy duty), truck mounted concrete pump, truck-mounted drill, vacuum truck, well point, whirleys

GROUP B: Air compressor (1 or more, 600 cfm and over), air compressor with throttle valve, bituminous distributor, brakeman, bullfloat, cement gun, concret mixer, concrete say, soncrete spreader or puddlers, conveyor, deck hand oiler, deck engine, drill helper, earth roller electric vibrator compactor (earth or rock), elevator (in-plant, automatic), finishing machine fireman, form grader, generator, guard-rail driver, heater, oiler, Industrial type forklift (9,000 lbs and under), aterail pump, motor boats, paving joint machine, post hole digger, power broom, power traffic signals, rock roller, rock spreader, Roller (earth or rock), spike machine (RR), steam jenny, sub grader, taping machine, gruck crane oiler, truck mounted drill oiler Tugger (one-drum, air or electric)vibrator, vibro-piling hammer- hydraulic hammer or auger, water pump, widener (apsco or similar type) welding machine, JLG lifts and scissor lifts or similar machine.

ENGI0841-008 04/01/2015

- -- ----

BOONE, FOUNTAIN, HENDRICKS, MONROE, MONGOMERY, MORGAN, and WARREN COUNTIES

Rates Fringes

Power equipment	operators:		
GROUP 1		30.05	18.35
GROUP 2	\$	22.90	18.35

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Power Cranes, Draglines, Derricks, Shovels, Gradalls, Mechanics, Tractor Highlift, Tournadozer. Concret Mixers with Skip Tournamixer, Two-Drum Machine, One-Drum Hoist with Tower or Boom, Cableways, Tower Machines, Motor Patrol, Boo Tractor, Boom or Winch Truck, Winch or Hydraulic Boom Truck, Truck Crane, Tournapull, Tractor Operating Scoops, Bulldozer, Push Tractor, Asphalt Planer, Finishing Machine on Asphalt, Large Rollers on Earth, Rollers on Asphalt Mix, Ross Carrier or Similar Machine, Gravel Processing Machine, Asphalt Plant Engineer, Paver Operator, Farm Tractor with Half Yard Bucket and/or Backhoe Attachments, Dredge Engineer, or Dredge Operator, Central Mix Plant Engineer, CMI or Similar Type Machine, Truck or Skid Mounted Concrete Pump, Tower Crane, Engine or Rock Crusher Plant, Concrete Plant Engineer, Ditching Machine with Dual Attachment, Tractor Mounted Loaders, Cherry Picker, Hydro Crane, Standard or Dinkey Locomotives, Scoopmobiles, Euclid Loader, Soil Cement Machine, Back Filler, Elevating Machine, Power Blade, Drilling Machines including Well Testing, Caissons, Shaft or any similartype Drilling Machines, Motor Driven Paint Machine, Pipe Cleaning Machine, Pipe Wrapping Machine, Pipe Bending

Machine, Apsco Paver, Boring Machine, (Equipment Greased), Barber-Greene Loaders, Formless Paver, (Well Point System), Concrete Spreader, Hydra Ax, Span Saw and Similar Types, Marine Scoops, Brush Mulcher, Brush Burner, Mesh Placer, Tree Mover, Helicopter Crew (3), Piledriver-Skid or Crawler, Stump Remover, Root Rake, Tug Boat Operator, Refrigerating Machine, Freezing Operator, Chair Cart-Self Propelled, Hydra Seeder, Straw Blower Power Sub Grader, Bull Float, Finishing Machine, Self-Propelled Pavement Breaker (Backhoe Attached), Lull (or Similar Type Machine), Two Air Compressors, Compressors Hooked in Manifold, Overhead Crane, Chip Spreader, Mud Cat, Sull-Air Fork Lifts (Except when used for Landscaping Work), Soil Stablilizer (Seaman Tiller, Bo Mag, Rago Gator and Similar types or Equipment), Tube Float, Spray Machine, Curing Machine, Concrete or Asphalt Milling Machine, Snooper Truck Operator.

GROUP 2: Concrete Mixers without Skips, Rock Crusher, Ditching Machine Under 6', Curbing Machine, One Drum Machines without Tower or Boom, Air Tugger, Self-Propelled Concrete Saw, Machin- Mounted Post Hole Digger, Two to Four Generators, Water Pumps, or Welding Machines, with 400 ft., Air Compressor 600 cu. ft. and Under, Rollers on Aggregate and Seal Coat Surfaces, Fork Lifts (When used for Landscaping Work), Concrete and Blacktop Curb Machine, Farm Tractor with less than Half Yard Bucket, One Water Pump, Iolers, Air Valves or Steam Valves, One Welding Machine, Truck Jack, Mud Jack, Gunnite Machine, House Elevators when used for Hoisting Material, Engine Tenders, Wagon Drill, Flex Plane, Conveyor, Siphons nad Pulsometer, Switchman, Fireman on Paint Pots, Fireman on Asphalt Plants, Distributor Operators on Trucks, Tampers, Self-Propelled Power Broom, Striping Machine (motor driven), Form Tamper, Bulk Cement Plan Equipment Greaser, Deck Hands, Truck Crane Oiler Driver, Cement Blimps, Form Grader, Temporary Heat, Throttle Valve, Farm Tractor, Super Sucker (and similar type of equipment). FOOTNOTE: Employees operating booms from 149 ft. to 199 ft. including jib, shall receive an additional seventy five cents (.75)per hour above the rate. Employees operating booms over 199 ft. including jib, shall receive an additional one dollar and twenty-five cents (\$1.25) per hour above the regular rate.

### IRON0022-004 06/01/2017

BARTHOLOMEW; BENTON, BOONE; CARROLL; CASS; CLINTON; DELAWARE (S 2/3); FOUNTAIN; FULTON (SW 1/4 OF COUNTY); GRANT (SW PORTION); HAMILTON; HANCOCK; HENDRICKS; HOWARD; JOHNSON; MADISON; MARION; MIAMI; MONROE; MONTGOMERY; MORGAN; SHELBY; TIPPECANOE; TIPTON; WARREN AND WHITE COUNTIES

\_\_\_\_\_

Rates Fringes

IRONWORKER.....\$ 30.64 22.05

The following holidays shall be observed: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and the day after Thanksgiving and Christmas Day. Any

following Monday, unless the legal observance of these holidays is changed by law. \_\_\_\_\_ IRON0147-004 06/01/2017 ADAMS, ALLEN, BLACKFORD, DEKALB, DELAWARE (NORTHEAST THIRD OF COUNTY), FULTON (EASTERN PART), GRANT (EXCLUDING SOUTHWEST PORTION), HUNTINGTON, JAY, MIAMI (NORTHEAST HALF), NOBLE (EXCLUDING NORTHEAST TIP), STEUBEN, WABASH, WELLS, and WHITLEY COUNTIES Rates Fringes IRONWORKER.....\$ 26.34 21.77 \_\_\_\_\_ IRON0292-006 06/01/2017 FULTON (Remainder of County) and NOBLE (Northeastern Tip) COUNTIES Rates Fringes IRONWORKER.....\$ 29.30 21.11 \_\_\_\_\_ LABO0120-001 06/01/2016 MARION and SHELBY COUNTIES Rates Fringes Laborers: GROUP 1.....\$ 22.84 13.80 GROUP 2....\$ 23.59 13.80 GROUP 3.....\$ 23.84 13.80 LABORER CLASSIFICATIONS GROUP 1: Building and Construction Laborers; Scaffold Builders (other than for Masons and Plasterers); Mechanic Tenders; Window Washers and cleaners; Railroad Workers; Masonry Wall Washers; Portable Water pumps with discharge up to (3) inches; Flag & Signal Person; Waterproofing; Handling of Creosot Lumber or like treated material (excluding railroad material); Asphalt Rakers and Lutemen; Kettlemen; Air Tool Operators; Pneumatic Tool Operators; Air and Electric Vibrators and Chipping Hammer Operators; Earth Compactors Jackmen and Sheetmen working Ditches deeper than (6) ft.in depth; Laborers working in ditches (6) ft.in depth or deeper; Assembly of Unicrete Pump; Chain Saw and Demolition Saw; Tile Layers (sewer or field) and Sewer Pipe Layer (metallic or non-metallic); Motor driven Wheelbarrows and Concrete Buggies; Hyster Operators; Pump Crete Assemblers; Concrete Conveyor Assemblers; Core Drill Operators; Cement, Lime or Silica Clay Handlers (bulk or bag); Handling of Toxic Materials damaging to clothing;

holiday which occurs on a Sunday shall be observed the

Pneumatic Spikers; Deck Engine and Winch Operators; Water

Main and Cable Ducking (metallic and non-metallic); Screed Man or Screw Operator on Asphalt Paver; Asbestos Removal and Hazardous Waste Removal.

GROUP 2: Plaster Tenders; Mason Tenders; Mortar Mixers; Welders (Acetylene or electric); Cutting Torch or Burner; Cement Nozzle Laborers; Cement Gun Operator; Scaffold Builders when working for Plasterers and Masons; Water Blast Machine.

GROUP 3: Dynamite men, Drillers-air track or wagon drilling for explosives.

\_\_\_\_\_

### LABO0204-001 06/01/2016

FOUNTAIN, HENDRICKS, and WARREN COUNTIES

Rates

Fringes

Laborers:

Caisson and Tun	nel Work in
-----------------	-------------

Compressed and Free Air	
GROUP 1\$ 21.63	13.80
GROUP 2\$ 22.58	13.80
GROUP 3\$ 22.93	13.80
GROUP 4\$ 22.63	13.80
LABORERS	
GROUP 1\$ 21.63	13.80
GROUP 2\$ 22.38	13.80
GROUP 3\$ 22.63	13.80

### LABORER CLASSIFICATIONS

GROUP 1: Building and Construction Laborers; Scaffold Builders (other than for Masons and Plasterers); Mechanic Tenders; Window Washers and cleaners; Railroad Workers; Masonry Wall Washers; Portable Water pumps with discharge up to (3) inches; Flag & Signal Person; Waterproofing; Handling of Creosot Lumber or like treated material (excluding railroad material); Asphalt Rakers and Lutemen; Kettlemen; Air Tool Operators; Pneumatic Tool Operators; Air and Electric Vibrators and Chipping Hammer Operators; Earth Compactors Jackmen and Sheetmen working Ditches deeper than (6) ft.in depth; Laborers working in ditches (6) ft.in depth or deeper; Assembly of Unicrete Pump; Chain Saw and Demolition Saw; Tile Layers (sewer or field) and Sewer Pipe Layer (metallic or non-metallic); Motor driven Wheelbarrows and Concrete Buggies; Hyster Operators; Pump Crete Assemblers; Concrete Conveyor Assemblers; Core Drill Operators; Cement, Lime or Silica Clay Handlers (bulk or bag); Handling of Toxic Materials damaging to clothing; Pneumatic Spikers; Deck Engine and Winch Operators; Water Main and Cable Ducking (metallic and non- metallic); Screed Man or Screw Operator on Asphalt Paver, Asbestos Removal, Hazardous Waste Removal.

GROUP 2: Plaster Tenders; Mason Tenders; Mortar Mixers; Welders (Acetylene or electric); Cutting Torch or Burner; Cement Nozzle Laborers; Cement Gun Operator; Scaffold Builders when working for Plasterers and Masons; Water Blast Machine.

GROUP 3: Dynamite men, Drillers-air track or wagon drilling for explosives.

LABORER CLASSIFICATIONS For CAISSON AND TUNNEL WORK IN COMPRESSED and FREE AIR

GROUP 1: Cage Tenders, Dump Men, Flagman, Signalman, Top Laborers, Rod Men.

GROUP 2: Concrete Repairmen, Lock Tenders (pressure side), Motor men, Muckers, Grout Machine, Track Layers, Air Hoist, Key Board, Agitator Car, Car Pushers, Concrete Laborers, Grout Laborers, Lock Tenders (free air side), Steel Setters, Tuggers, Switchmen.

GROUP 3: Mucking Machine, Laser Beam, Liner Plate & Ring Setter, Shield Drivers, Power Knife, Welders Burners, Pipe Jacking Machine, Skinners, Maintenance Technician, Miner, Bricklayer Tenders, Concrete Blowers, DRillers, Erectors, Form Men, Jackhammermen, Mining Machine.

GROUP 4: Dynamite Men, Drillers air track or wagon drilling for explosives.

-----

LABO0213-001 06/01/2016

ADAMS, ALLEN, DEKALB, HUNTINGTON, NOBLE, STEUBEN, WABASH, WELLS AND WHITLEY COUNTIES

Rates

Fringes

Laborers:

GROUP	1\$	19.38	13.15
GROUP	2\$	19.88	13.15
GROUP	3\$	20.38	13.15

### LABORERS CLASSIFICATION

GROUP 1: Building and Construction Laborers; Scaffold Builders (other than for Masons and Plasterers); Mechanic Tenders; Window Washers and cleaners; Railroad Workers; Masonry Wall Washers; Portable Water pumps with discharge up to (3) inches; Flag & Signal Person; Waterproofing; Handling of Creosot Lumber or like treated material (excluding railroad material); Asphalt Rakers and Lutemen; Kettlemen; Air Tool Operators; Pneumatic Tool Operators; Air and Electric Vibrators and Chipping Hammer Operators; Earth Compactors Jackmen and Sheetmen working Ditches deeper than (6) ft.in depth; Laborers working in ditches (6) ft.in depth or deeper; Assembly of Unicrete Pump; Tile Layers (sewer or field) and Sewer Pipe Layer (metallic or non-metallic); Motor driven Wheelbarrows and Concrete Buggies; Hyster Operators; Pump Crete Assemblers; Core Drill Operators; Cement, Lime or Silica Clay Handlers (bulk or bag); Handling of Toxic Materials damaging to clothing;

Pneumatic Spikers; Deck Engine and Winch Operators; Water Main and Cable Ducking; Screed Man or Screw Operator on Asphalt Paver; Chain and Demolition Saw Operators; Concrete Conveyor Assemblers

GROUP 2: Plaster Tenders; Mortar Mixers; Welders (Acetylene or electric); Cutting Torch or Burner; Cement Nozzle Laborers; Cement Gun Operator; Scaffold Builders when working for Plasterers; Water Blast Machine

GROUP 3: Dynamite men-drillers-air track or wagon drilling for explosives

### LABO0274-001 06/01/2016

BENTON, BOONE, CARROLL, CASS, CLINTON, FULTON, HOWARD, MIAMI, MONTGOMERY, TIPPECANOE, TIPTON, and WHITE COUNTIES

	I	Rates	Fringes
Laborers:			
GROUP	1\$	21.68	13.80
GROUP	2\$	22.43	13.80
GROUP	3\$	22.68	13.80

### LABORER CLASSIFICATIONS

GROUP 1: Building and construction laborers; Scaffold builders (other than for masons or plasterers); Railroad Workers; Masonry Wall Washers (interior & exterior); All Portable Water Pumps with Discharge of Up to Three (3) Inches; Handling of Creosote Lumber or Like Treated Material (excluding railroad material); Asphalt Rakers and Lutemen; Earth Compactors; Jackmen and Sheetmen Working Ditches Deeper than Six (6) Feet in Depth; Laborers Working Ditches Six (6) Feet in Depth or Deeper; Assembly of Unicrete Pump; Tile Layers (sewer or field) and Sewer Pipe Layers (metallic or non-metallic); Motor Driven Wheelbarrows and Concrete Buggies; Hyster Operators; Pump Crete Assemblers; Core Drill Operators; Cement, Lime or Silica Clay Handler (bulk or bag); Handling of Toxic Material Damaging to Clothing; Pneumatic Spikers; Deck Engine and Winch Operators; Water Main and Cable Ducking (metallic and non-metallic); Screed Man or Screw Operator on Asphalt Paver; Chain Saw and Demolition Saw Operators; Concrete Saw; Concrete Conveyor Assemblers; Applying of Curing Compound; Sinking of Wellpoints; Dewatering Header Systems

GROUP 2: Plaster Tenders; Mason Tenders; Mortar Mixers; Welders (acetylene or electric); Cutting Torch or Burner; Cement Nozzle Laborers; Cement Gun Operators; Scaffold Builders for Plasterers; Scaffold Builders for Masons; Water Blast Machine Operators, Air and Electric Vibrators and Chipping Hammer Operators; Asbestos Removal; Hazardous Waste Removal; All Boiler Setters Laborers, including Expediters, Bottom Men, Bell Men, and Mason Tenders GROUP 3: Dynamite man, Drillers-air track or wagon for explosives.

\_\_\_\_\_

### LABO0741-003 06/01/2016

BARTHOLOMEW, JOHNSON, MONROE, and MORGAN COUNTIES

	I	Rates	Fringes
Laborers:			
GROUP	1\$	21.58	13.80
GROUP	2\$	22.33	13.80
GROUP	3\$	22.58	13.80

LABORERS CLASSIFICATIONS

GROUP 1: Building and Construction Laborers; Scaffold Builders (other than for masons or plastersrs); Railroad Workers; Masonry Wall Washers (interior & exterior); Portable Water Pumps with Discharge up to three (3) inches; Handling of Creosote Lumber or Like Treated Material (excluding railroad material); Asphalt Rakers and Lutemen; Earth Compactors; Jackmen and Sheetmen Working Ditches Deeper than Six (6) Feet in Depth; Laborers Working Ditches Six (6) Feet in Depth or Deeper; Assembly of Unicrete Pump; Tile Layers (sewer or field) and Sewer Pipe Layers (metallic or non-metallic); Motor Driven Wheelbarrows and Concrete Buggies; Hyster Operators; Pump Crete Assemblers; Core Drill Operators; Cement, Lime or Silica Clay Handler (bulk or bag); Handling of Toxic Material Damaging to Clothing; Pneumatic Spikers; Deck Engine and Winch Operators; Water Main and Cable Ducking (metallic and non-metallic); Screed Man or Screw Operator on Asphalt Paver; Chain Saw and Demolition Saw Operators; Concrete Saw; Concrete Conveyor Assemblers; Applying of Curing Compound; Sinking of Wellpoints; Dewatering Header Systems

GROUP 2: Plaster Tenders; Mason Tenders; Mortar Mixers; Welders (acetylene or electric); Cutting Torch or Burner; Cement Nozzle Laborers; Cement Gun Operators; Scaffold Builders for Plasterers; Scaffold Builders for Masons; Water Blast Machine Operators; Air Tool Operators and all Pneumatic Tool Operators, Air and Electric Vibrators and Chipping Hammer Operators; Asbestos Removal; Hazardous Waste Removal; Biler Setters Laborers, including expediters, bottom men, bell men, and Mason Tenders

GROUP 3: Dynamite men; Drillers-air track or wagon drilling for explosives

\_\_\_\_\_

LAB01112-001 06/01/2016

BLACKFORD, DELAWARE, GRANT, HAMILTON, HANCOCK, HENRY, JAY, & MADISON COUNTIES

Rates

Fringes

Laborers:			
GROUP	1\$	21.26	13.80
GROUP	2\$	22.01	13.80
GROUP	3\$	22.26	13.80

### LABORER CLASSIFICATIONS

GROUP 1: Building and construction laborers, scaffold builders (other than for masons of plasterers), mechanic tenders, window washers and cleaners, railroad workers, masonry wall washers, portable water pumps with discharge up to 3 inches, signal & flag person, Waterproofing, hauling of creosote lumber or like treated material (excluding railroad material), asphlat rakers and lutemen, kettlemen, air tool operator, pneumatic tool operator, air & electric vibrators and chipping hammer operator, earth compactors, jackman & sheetmen in ditches more than 6 feet deep, laborers in ditches 6' deep or deeper, assembly of unicrete pump, tile layers (sewer or field), sewer pipe layers, motor- driven wheelbarrows and concrete buggies, hyster operator, pumpcrete assemblers, core drill operator, cement, lime or silica clay handlers, handling of toxic materials damaging to clothing, pneumatic spikers, deck engine & winch operator, water main & cable ducking, screed man or screw operator on asphalt paver, chain saw & demolition saw operator, concrete conveyor assembler

GROUP 2: Plaster tenders; mortar mixers; welders (acetylene or electric); cutting torch or burner; cement nozzle laborers; cement gun operators; scaffold builders for plasterers; scaffold builders for masons; water blast machine operator; Air tool Operators and all Pnuematic Tool Operators, Air and Electric Vibrators and Chipping Hammer Operators; Asbestos removal; Hazardous waste removal; All Boiler Setters Laborers, including expediters, bottom men, bell men, and Mason Tenders

GROUP 3: Dynamite men-drillers-air track or wagon drilling for explosives

\_\_\_\_\_

PAIN0047-003 06/01/2017

BARTHOLOMEW, BOONE, HAMILTON, HANCOCK, HENDRICKS, JOHNSON, MARION, MONROE, MORGAN AND SHELBY COUNTIES:

 Rates
 Fringes

 PAINTER
 Brush and Roller......\$ 25.18
 12.35

 Spray and Sandblasting.....\$ 26.18
 12.35

 PAIN0080-001 06/01/2017
 PAIN0080-001 06/01/2017

BENTON, CARROLL, CASS, CLINTON, FOUNTAIN, MONTGOMERY TIPPECANOE AND WARREN COUNTIES

Rates

Fringes

PAINTER		
Brush and Roller\$ Spray and Sandblasting\$	25.00 26.00	15.33 15.33
PAIN0091-005 06/01/2014		
FULTON COUNTY		
	Rates	Fringes
PAINTER Brush & Roller, Drywall Taping & Finishing, Vinyl/Paper Hanging\$ Spray\$	26.32 26.82	12.75 12.75
PAIN0460-002 06/01/2017		
WHITE COUNTY		
	Rates	Fringes
Painters: Brush & Roller\$ Drywall Finisher\$	36.80 34.80	22.76 22.76
PAIN0469-001 06/01/2016		
ADAMS, ALLEN, DEKALB, GRANT, HUNTI WABASH, WELLLS, and WHITLEY COUNTI	NGTON, NOBLE, ES	STEUBEN,
	Rates	Fringes
Painters: 101' & over'	23.31 22.71 23.11 21.86 26.86 22.76 22.76	11.57 11.57 11.57 11.57 11.57 11.57 11.57 11.57
PAIN0669-001 04/01/2015		

BLACKFORD, DELAWARE, FAYETTE, FRANKLIN, HENRY, HOWARD, JAY, MADISON, MIAMI, RANDOLPH, RUSH, TIPTON, UNION and WAYNE COUNTIES

Rates Fringes

Painters: Brush; Roller;

Paperhanging; Drywall Finishers.....\$ 20.50 11.39 Spray/Waterblasting; Sandblasting.....\$ 21.50 11.39 \_\_\_\_\_ PAIN1165-010 07/01/2017 Rates Fringes 16.38 GLAZIER.....\$ 27.66 \_\_\_\_\_ PAIN1165-013 07/01/2017 ADAMS, ALLEN, BLACKFORD, DEKALB, GRANT, HUNTINGTON, JAY, NOBLE, STEUBEN, WABASH, WELLS, WHITLEY Rates Fringes GLAZIER.....\$ 24.77 12.97 \_\_\_\_\_ PAIN1165-016 01/01/2018 BARTHOLOMEW, BENTON, BOONE, CARROLL, CASS, CLINTON, DELAWARE, FOUNTAIN, HAMILTON, HANCOCK, HENDRICKS, HOWARD, JOHNSON, MADISON, MARION, MIAMI, MONROE, MONTGOMERY, MORGAN, SHELBY, TIPPECANOE, TIPTON, WARREN, and WHITE COUNTIES Rates Fringes 16.22 GLAZIER.....\$ 26.26 \_\_\_\_\_ PLAS0101-002 06/01/2014 Rates Fringes CEMENT MASON/CONCRETE FINISHER...\$ 26.44 12.20 PLASTERER.....\$ 26.81 12.40 \_\_\_\_\_ -----PLAS0101-003 06/01/2014 ADAMS, ALLEN, DEKALB, HUNTINGTON, NOBLE, STEUBEN, WELLS AND WHITLEY COUNTIES Rates Fringes

CEMENT MASON/CONCRETE FINISHER...\$ 23.38 11.94 PLASTERER.....\$ 25.69 11.75 PLAS0692-006 06/01/2016

AREA #46

FULTON COUNTY

FULTON COUNTY

BARTHOLOMEW, BOONE, HENDRICKS, JOHNSON, MARION, MONROE, MORGAN

and SHELBY COUNTIES

	Rates	Fringes
PLASTERER	.\$ 25.04	13.23
PLAS0692-007 06/01/2017		
area #75		
MONROE COUNTY		
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	.\$ 25.75	13.50
PLAS0692-009 04/01/2017		
area #83		
BLACKFORD, DELAWARE, GRANT, HAMI (Northern Part), JAY, MADISON, T	LTON (Nort IPTON, and	hern Part), HANCOCK WABASH COUNTIES
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER PLASTERER	.\$ 25.45 .\$ 25.49	13.84 11.95
PLAS0692-015 06/01/2016		
AREA #121		
BENTON, CARROLL, CASS, CLINTON, MONTGOMERY, TIPPECANOE, WARREN, Part) COUNTIES	FOUNTAIN, WHITE and	HOWARD, MIAMI, VERMILLION (Northern
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER PLASTERER	.\$ 26.10 .\$ 27.71	17.30 16.40
PLAS0692-023 06/01/2017		
AREA #532		
BOONE, HAMILTON (SOUTH HALF OF C INDIANA #32 INCLUDING NOBLESVILL AND WESTERN PART OF HANCOCK COUN FORTVILLE); HENDRICKS, JOHNSON,	OUNTY NORI E); HANCOC TY, NORTH MARION and	TH TO NEW ROUTE TK COUNTY (SOUTHERN TO BUT NOT INCLUDING MORGAN COUNTIES
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER Slip Form Shift Work Swinging/Suspended Scaffold	.\$ 26.45 .\$ 27.45 .\$ 26.70	17.11 17.11 17.11

https://www.wdol.gov/wdol/scafiles/davisbacon/IN2.dvb?v=3

### PLAS0821-001 05/01/2007

BARTHOLEMEW AND SHELBY COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	.\$ 21.90	8.25
PLUM0136-006 10/01/2017		
MONROE COUNTY		
	Rates	Fringes
Plumbers and Pipefitters	.\$ 34.72	18.71
PLUM0157-002 01/01/2018		
BENTON, CARROLL, CLINTON, FOUNTA WARREN AND WHITE COUNTIES:	IN, MONTGOMERY,	TIPPECANOE,
	Rates	Fringes
Plumbers and Pipefitters	.\$ 36.93	16.58
PLUM0166-001 06/01/2017		
ADAMS, ALLEN, BLACKFORD, DE KALB STEUBEN, WABASH, WELLS, and WHIT	, GRANT, HUNTING LEY COUNTIES	TON, NOBLE,
	Rates	Fringes
Plumber and Steamfitter	.\$ 34.36	15.66
PLUM0172-002 05/29/2017		
CASS and FULTON COUNTIES		
	Rates	Fringes
Plumber, Pipefitter, Steamfitter	.\$ 32.81	19.80
PLUM0440-002 06/05/2017		
BARTHOLOMEW, BOONE, HAMILTON, HA JOHNSON AND MARION COUNTIES; MIA LINE WHERE ROUTE 218 ENTERS W. B TIPTON COUNTIES	NCOCK, HENDRICKS MI COUNTY (SOUTH OUNDARY); MORGAN	5, HOWARD, 1 OF A STRAIGHT 1, SHELBY and
	Rates	Fringes
Plumbers and Pipefitters	.\$ 36.72	16.09
PLUM0440-003 06/05/2017		

DELAWARE, JAY and MADISON COUNTIES

	Rates	Fringes
Plumber and Steamfitter	.\$ 36.72	16.09
ROOF0023-003 06/01/2017		
ALLEN, DEKALB, NOBLE, STEUBEN, a	nd WHITLEY	COUNTIES
	Rates	Fringes
ROOFER COMPOSITION	.\$ 28.76 \$ 29.76	14.50
ROOF0023-007 06/01/2017		
FULTON COUNTY		
	Rates	Fringes
ROOFER		
COMPOSITION SLATE & TILE	.\$ 28.76 .\$ 29.76	14.50 14.50
ROOF0023-010 06/01/2017		
ADAMS, HUNTINGTON, MIAMI, WABASH	I, and WELL	S COUNTIES
	Rates	Fringes
ROOFER COMPOSITION SLATE & TILE	.\$ 28.76 .\$ 29.76	14.50 14.50
ROOF0119-003 09/01/2013		
BARTHOLOMEW, BOONE, HAMILTON, HA MARION, MONROE, MORGAN and SHELB	NCOCK, HEN SY COUNTIES	IDRICKS, JOHNSON,
	Rates	Fringes
Roofers:	.\$ 24.80	10.75
ROOF0119-005 09/01/2013		
	Rates	Fringes
ROOFER	.\$ 24.80	10.75
SFIN0669-002 04/01/2017		
	Rates	Fringes
SPRINKLER FITTER	.\$ 37.96	19.25
SHEE0020-003 07/01/2017		
	Rates	Fringes

Sheet metal worker (HVAC Duct Work).....\$ 29.14 23.65 \_\_\_\_\_ SHEE0020-004 07/01/2017 BARTHOLOMEW, BOONE, DELAWARE, HAMILTON, HANCOCK, HENDRICKS, JOHNSON, MADISON, MARION, MONROE, MORGAN, SHELBY AND TIPTON COUNTIES Rates Fringes Sheet metal worker (Including HVAC Duct Work).....\$ 33.39 21.52 \_\_\_\_\_ SHEE0020-016 07/01/2017 FULTON COUNTY Rates Fringes SHEET METAL WORKER.....\$ 30.02 25.29 \_\_\_\_\_ SHEE0020-020 07/01/2017 BENTON, CARROLL, CLINTON, FOUNTAIN, MONTGOMERY, TIPPECANOE, WARREN AND WHITE COUNTIES Rates Fringes Sheet metal worker (Including HVAC Duct Work).....\$ 31.24 23.65 \_\_\_\_\_ TEAM0135-001 04/01/2017 BARTHOLOMEW, BENTON, BLACKFORD, CARROLL, CASS, CLINTON, DELAWARE, FOUNTAIN, GRANT, HOWARD, JAY, MADISON, MARION, MIAMI, MONROE, MONTGOMERY, TIPPECANOE, TIPTON, WABASH, WARREN, & WHITE COUNTIES Rates Fringes TRUCK DRIVER GROUP 1.....\$ 28.49 Α GROUP 2.....\$ 28.99 Α GROUP 3.....\$ 29.19 Α GROUP 4.....\$ 29.34 Α GROUP 5.....\$ 29.84 А A: \$33.70 PER DAY & 426.80 PER WEEK.

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Single Axle Trucks, seven (7) cu. yds. or less than ten and one-half (10 1/2) tons, dupsters, scoop-mobiles five (5) cu.yds. and under or less than seven and one-half (7 1/2) tons, mixer trucks three (3) cu.yds. and under, air compressors and welding machines, including those pulled by separate units, batch trucks-wet or dry- 2"34-E" batches or less, truck driver helpers, warehousemen, mechanic's helpers, greasers and tiremen, all pick-up trucks and other vehicles. Drivers on dumpsters or similar dumpsters, mounted on four (4) wheel truck rated two (2) cu.yds. or less, and small pallet type fork-lift operator and drivers on pallet jacks or similar type equipment.

GROUP 2: Drivers on tandem axle eighteen (18) cu.yds. or twenty- four (24) tons gross, six (6) wheel trucks, Koehring or similar dumpsters, tract trucks, Euclids, hug bottom dumps, tournapulls, trounatrailers, tournarockers, or similar equipment when used for transportation purposes under nine (9) cu.yds. or less than thirteen and one-half (13 1/2) tons, tandems and semi-trailer service trucks, mixer trucks over three (3) cu.yds. and including six and one-half (6 1/2) cu.yds., fork lift, four (4) wheel Aframe trucks when used for transportation purposes, four (4) wheel winch trucks, pavement breakers, batch trucks-wet or dry- over 2 up to and including 4-"34-E" batches two (2) men oil distributors, fork-lift under four (4) ton and vacuum trucks.

GROUP 3: Koehring or similar dumpsters, tract trucks, semitrailer water trucks, Euclids, hug bottom dumps, tournapulls, tournatrailers, tournarockers, tractor trailers, tandems, Q- frame winch trucks, hydrolift turcks or similar equipment when used for transportation purposes, mixer trucks over six and one- half (6 1/2) cu.yds, batch trucks wet or dry over 4 - "34-E" batches single equipment operated by employees withing this Bargaining unit. Six (6) wheel pole trailers and one (1) man oil distributors, fork-lift over four (4) ton and mobile mixers.

GROUP 4: Drivers on heavy equipment over sixteen (16) cu.yds. or twenty-four (24) ton, such as Koehring or similar dumpsters, tract trucks, Euclids, hug bottom dumps, tournapulls, tournarockers or similar equipment when used for transportation purposes, pole trailers over six (6) wheels, water pulls, low-boy trailers tandem axles, quad axle or more no-weight limitation, diesel and/or heavy equipment mechanics.

GROUP 5: Mechanic furnishing his own tools.

\_\_\_\_\_

TEAM0135-012 04/01/2017

HAMILTON, HANCOCK, HENDRICKS, JOHNSON, MORGAN, AND SHELTBY COUNTIES

Rates Fringes

TRUCK DRIVER		
Group 1\$	28.49	A
Group 2\$	28.99	A

A: \$33.70 PER DAY & \$426.80 PER WEEK

TRUCK DRIVER CLASSIFICATIONS: GROUP 1: Truck Driver Helper GROUP 2: Truck Driver on Fork Lifts & Truck Driver on Tandem, Semi, or Tri-axle \_\_\_\_\_ TEAM0364-002 06/01/2017 FULTON COUNTY Rates Fringes TRUCK DRIVER GROUP 1.....\$ 26.66 A+B GROUP 2....\$ 26.87 A+B GROUP 3.....\$ 26.95 A+B GROUP 4.....\$ 27.53 A+B FOOTNOTE: a. FRINGE BENEFITS: \$386.70 per week B. HOLIDAYS: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day. TRUCK DRIVER CLASSIFICATIONS GROUP 1: Pick-up Trucks GROUP 2: Single Axle Trucks GROUP 3: Tandem, Tri-axle and Fuel Trucks GROUP 4: Semi-trailer Trucks \_\_\_\_\_ TEAM0414-001 08/01/2017 ADAMS, ALLEN, DEKALB, HUNTINGTON, NOBLE, STEUBEN, WELLS, AND WHITLEY COUNTIES Rates Fringes TRUCK DRIVER Group 1.....\$ 28.52 712.35/WK Group 2.....\$ 28.71 712.35/WK 712.35/WK Group 3.....\$ 28.81 Group 4.....\$ 28.91 712.35/WK Group 5.....\$ 27.01 712.35/WK TRUCK DRIVER CLASSIFICATIONS: GROUP 1: Truck Driver Helper GROUP 2: Truck Driver on Fork Lifts GROUP 3: Truck Driver on Tandem, Semi, or Tri-axle GROUP 4: Truck Driver on Water Trucks and Mechanic GROUP 5: Truck Driver Euclid/Earth Movers

\_\_\_\_\_

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

### \_\_\_\_\_

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

### \_\_\_\_\_

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

\_\_\_\_\_

### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed. With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations Wage and Hour Division U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board U.S. Department of Labor 200 Constitution Avenue, N.W. Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

\_\_\_\_\_

END OF GENERAL DECISION

				ł	Attachm	ient A								
U.S. Department of Labor Wage and Hour Division		(For Contracts	, e l	Ontional Lleat Saa In	PAYR	OLL or at www	od aov/who	d/forme/v	uh3.47 inct	, htm)				*
		Persons are not r	require	ed to respond to the collectic	on of informs	ation unless it	displays a current	tly valid OM	3 control num	ber.		U.S.	Wage and Hou Rev. Dec.	r Division 2008
NAME OF CONTRACTOR OR SUBCONTRACT	TOR [				ADDF	RESS							OMB No.: Expires: 1	1215-0149 2/31/2011
PAYROLL NO.		FOR WEEK ENDING	0		PRO.	JECT AND LOC	ATION			<u>ш</u>	ROJECT OR (	CONTRACT	ÖN	
(1)	NR DING (5)	(3)	.T2	(4) DAY AND DATE	(2)	(9)	(2)				() TIONS			(6)
NAME AND INDIVIDUAL IDENTIFYING NUMBER	EXEMPTIC	WORK CLASSIFICATION	ЯО .TO	HOURS WORKED EACH D/		L RATE S OF PAY	GROSS AMOUNT EARNED	FICA	WITH- HOLDING TAX			OTHER	TOTAL	NEI WAGES PAID FOR WEEK
			0											
			S											
			0											
			S											
			0											
			S											
			0											
			S											
			0											
			S											
			0											
			S											
			0											
			S											
			0											
			S											
While completion of Form WH-347 is optional, it is mandaton (40 U.S.C. § 3145) contractors and subcontractors performin. 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly.	ry for cove ng work o , a copy o	ared contractors and subc In Federally financed or a f all payrolls to the Federa	contrac issisted al ager	ctors performing work on Federal d construction contracts to "furnis incy contracting the formed of the second of the second	ly financed or h weekly a st e constructior	assisted constri atement with res n project, accom	uction contracts to re pect to the wages p panied by a signed	espond to the baid each emp "Statement of	information coll loyee during the Compliance" in	ection containe preceding we dicating that th	id in 29 C.F.R. sek." U.S. Dep e payrolls are i	§§ 3.3, 5.5( partment of L correct and	a). The Copelanc abor (DOL) regu complete and tha	l Act lations at t each laborer
or mechanic has been paid not less than the proper Davis-Ba	acon prev	ailing wage rate for the w	vork pe	erformed. DOL and federal contra	acting agencie	s receiving this	information review th	the information	to determine th	at employees	have received	legally requi	red wages and fr	inge benefits.
				Public Burden Sta	atement									

(over)

We estimate that is will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

4

(Title) (Name of Signatory Party) (Title) (Title) (Title)	
(1) That I pay or supervise the payment of the persons employed by	
Ontractor or Subcontractor) on the	
; that during the payroll period commencing on the (Building or Work)	
day of,, and ending the day of, day of, and ending the day of,, and ending the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said	
from the full	
weekly wages earned by any person and that no deductions have been made either directly or indirectly from the final mode of the directly or indirectly	
1011 the full wages carried by any person, order their perimenuate becautoring as carried in regulations, r and 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Start. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:	4
	1
(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.	
(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of	

Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

- (4) That: (a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS
- in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below. I

# (b) WHERE FRINGE BENEFITS ARE PAID IN CASH

Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

# IN EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION
REMARKS:	
NAME AND TITLE	SIGNATURE
THE WILLEUL FALSIFICATION OF ANY OF THE ABOV SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. ( 31 OF THE UNITED STATES CODE.	E STATEMENTS MAY SUBJECT THE CONTRACTOR OR SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE

# Attachment B

# **Required Contract Provisions Related to Davis-Bacon Act and Related Acts**

Provisions substantially like the following shall be included in each procurement contract for the actual construction, attention and/or repair, including painting and decorating. The SRF Applicant shall remain responsible for compliance with applicable law (including Davis Bacon and related Acts). Such SRF Applicant has been encouraged to consult with its advisors and counsel regarding such matters and, in any event, understands that the use of the following does not relieve the SRF Applicant from its obligation to comply with applicable law (including Davis Bacon and related Acts) and related provisions of any financial assistance agreement entered into with the Indiana Finance Authority, nor will the State Revolving Fund Loan Programs, the Indiana Finance Authority or the State of Indiana be responsible for or limited by any SRF Applicant's use of the following provision.

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3) ), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in Section (4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The **[SRF Applicant]**, on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination.

The EPA award official shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the [SRF Applicant] agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the [SRF Applicant] to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the **[SRF Applicant]** do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the questions, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The **[SRF Applicant]**, shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

## (3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the **[SRF Applicant]**, that is, the entity that receives the subgrant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the **[SRF Applicant]** shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at

http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and

subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the [SRF Applicant] for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the [SRF Applicant].

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5(a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3; and

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to **[SRF Applicant]**.

(4) Apprentices and trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor is or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of

work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the governing federal agency may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(11) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen and guards shall require or permit any such laborer, mechanic, watchman or guard in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer, mechanic, watchman or guard receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(12) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in the above paragraph (11) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman or guard employed in violation of the clause set forth in the above paragraph (11) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in the above paragraph (11) of this section.

(13) Withholding for unpaid wages and liquidated damages. The **[SRF Applicant]**, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in the above paragraph (12) of this section.

(14) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (11) through (14) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (11) through (14) of this section.

(b) In addition to the clauses contained in paragraph (13), above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in <u>29</u> CFR 5.1, the **[SRF Applicant]** shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers, mechanics, watchmen and guards working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the **[SRF Applicant]** shall insert in any such contract a clause providing hat the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives

of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

[29 CFR 5.5]

# Attachment C

# **Required Wage/Fringe Benefit Certification**

A provision substantially like the following shall be included in each contract between SRF Applicant and a contractor for work related to the Project. A copy of the Wage/Fringe Benefit Certification referenced in the below provision is attached hereto. Additional copies may be obtained from the Indiana Finance Authority.

# Davis-Bacon Wage/Fringe Benefit Certification

(a) Every contractor and subcontractor furnishing work on the Project shall complete a Wage/Fringe Benefit Certification on the form approved by the Indiana Finance Authority and submit this certification to the Labor Standards Administrator prior to commencing work on the Project.

(b) The Contractor shall require the substance of this provision to be included in all contracts with subcontractors.
			Wage/Fring (To be complete	e Benefit Certificed by contractor/subcont	cation ractor)			
COMMUNITY	Click here to	enter text.			PROJECT: C	lick here to enter	text.	
This is to certi	fy that Click her	e to enter text.	plans to us	se the following class	ifications of wo	rkers on the abo	ve referenced project:	
	From Applic	able Wage Decision	E	Base Wage to be paid by Contractor	Fringe Benefits Con	to be provided by tractor	Total package to be paid by	
Classification	Base Wage Due	Fringe Benefits Due	Total Package Due		Benefit	Hourly Amount	Contractor	
								······
Certified by:				Litle:		Date:		

ATTACHMENT D

Labor Standards Administrator

IFA

ATTACHMENT D 00619-1

(must be certified by contractor)

#### Attachment E

#### **Required Contract Provision Related to Suspension and Debarment**

A provision substantially like the below shall be included in each procurement contract related to the Project. The SRF Applicant shall remain responsible for compliance with applicable law (including Suspension, Debarment, and Other Responsibility Matters). Such SRF Applicant has been encouraged to consult with its advisors and counsel regarding such matters and, in any event, understands that the use of the following does not relieve the SRF Applicant from its obligation to comply with applicable law (including Suspension, Debarment, and Other Responsibility Matters) and related provisions of any financial assistance agreement entered into with the Indiana Finance Authority, nor will the State Revolving Fund Loan Programs, the Indiana Finance Authority or the State of Indiana be responsible for or limited by any SRF Applicant's use of the following provision.

Contractor shall fully comply with Subpart C of 2 CFR Part 180 and 2 CFR Part 1532, entitled "Responsibilities of Participants Regarding Transactions (Doing Business with Other Persons)." Contractor is responsible for ensuring that any lower tier covered transaction as described in Subpart B of 2 CFR Part 180 and 2 CFR Part 1532, entitled "Covered Transactions," includes a term or condition requiring compliance with Subpart C. Contractor is responsible for further requiring the inclusion of a similar term or condition in any subsequent lower tier covered transactions. Contractor may access the Excluded Parties List System at <u>www.epls.gov</u>. This term and condition supersedes EPA Form 5700-49, "Certification Regarding Debarment, Suspension, and Other Responsibility matters."

#### Attachment F

#### **Required Bid Instruction Related to GPR Components**

A provision substantially like the following shall be included with the instructions to Bidders if U.S. EPA Green Project Reserve (GPR) components are included in this Project. The SRF Applicant shall remain responsible for compliance with applicable law. Such SRF Applicant has been encouraged to consult with its advisors and counsel regarding such matters and, in any event, understands that the use of the following does not relieve the SRF Applicant from its obligation to comply with applicable law and related provisions of any financial assistance agreement entered into with the Indiana Finance Authority, nor will the State Revolving Fund Loan Program, the Indiana Finance Authority or the State of Indiana be responsible for or limited by any SRF Applicant's use of the following provision.

#### **U.S. EPA Green Project Reserve Program**

Certain portions or components of this Project, which are described in the GPR Bid Breakdown form furnished with the Bid Documents, qualify for the U.S. EPA Green Project Reserve (GPR) Program and/or the Sustainability Incentive offered by the Indiana State Revolving Fund (SRF) Loan Program. Bidder shall complete the GPR Bid Breakdown form and submit the completed form with its Bid. This information is required by the U.S. EPA and the Indiana SRF Program and Bidder's failure to fully and accurately complete the GPR Bid Breakdown form and submit it with its Bid may result in the Bid being rejected as non-responsive.

#### Attachment G

#### State Revolving Fund Loan Program Green Project Reserve (GPR) and Sustainability Incentive GPR BID BREAKDOWN

Certain portions or components of this Project, which are described below, qualify for the U.S. EPA Green Project Reserve (GPR) Program and/or the Sustainability Incentive offered by the Indiana State Revolving Fund (SRF) Loan Program.

The <u>Borrower's Consulting Engineer</u> shall provide a detailed description, consistent with the SRF-approved GPR Checklist, for <u>each</u> GPR portion or component of the Project Contract below. <u>Each Bidder</u> shall provide the dollar amount that Bidder included in its total Bid for each portion or component, including all labor, materials, and equipment necessary to complete each portion or component of the Project Contract.

# Non-distributed costs should be listed as its own line item below <u>or</u> incorporated into the price for each GPR Component/Portion.

- Non-distributed costs are defined as costs that are applied to the overall contract, but not to a specific line item/component (e.g. mobilization, demobilization, site work, bonds, insurance)

# This information is required by the U.S. EPA and the Indiana SRF Loan Program and Bidder's failure to fully and accurately complete this form and submit it with its Bid may result in the Bid being <u>rejected as</u> <u>non-responsive</u>.

GPR Component Description [to be completed by Borrower's Consulting Engineer]	GPR Component Price [to be completed by Bidder]

## TOTAL CONSTRUCTION GPR COST: \$\_\_\_\_

#### <u>Attachment H</u>

#### State Revolving Fund Loan Program Green Project Reserve (GPR) and Sustainability Incentive GPR FINAL BID SUMMARY

Certain portions or components of the Project(s) financed by the SRF Loan qualify for the U.S. EPA Green Project Reserve (GPR) Program and/or the Sustainability Incentive offered by the Indiana State Revolving Fund (SRF) Loan Program.

In Section I, for each Project Contract, the Borrower's Consulting Engineer shall describe the GPR eligible portion or component in detail and provide the dollar amount that the Successful Bidder included in its Bid for each GPR eligible portion or component. The GPR component/portion should be consistent with the description provided in the SRF-approved GPR Checklist and the GPR Bid Breakdown (Attachment G).

In Section II, the Borrower's Engineer(s) shall provide the Planning and Design portion of the Engineering Services Agreement which governs the Project Contract(s) described in Section I. SRF reserves the right to request a copy of the Engineering Services Agreement(s).

#### This information is required by the U.S. EPA and the Indiana SRF Loan Program. Failure of the Borrower's Engineer to fully and accurately complete this form and promptly submit it to SRF may result in delayed SRF loan closing or stopped payments by SRF.

#### Project Contract Name:

#### **Section I**

The following descriptions of work relate to the construction portions or components of the Project that qualify for the GPR Program and/or Sustainability Incentive. Next to each description, state the amount of the total Bid that accounts for all labor, materials, and equipment necessary to complete each portion or component of the Project. Non-distributed costs should be listed as its own line item below or incorporated into the price for each GPR Component/Portion.

<b>GPR Component/Portion Description</b>	GPR Component/Portion Final Bid Amount

#### **Total Construction GPR:**

\$\_

[Sum of all GPR Component/Portion Bid Amounts, including non-distributed costs]

## Section II

Name of Consulting Firm Providing Planning/Design Services	GPR Planning Services Contract Name	GPR Planning Services Cost	GPR Design Services Contract Name	GPR Design Services Cost

#### TOTAL ENGINEERING GPR: \$

[Sum of all GPR Planning and Design Services Cost]

## TOTAL CONTRACT GPR:

**§**\_\_\_\_\_[Construction GPR + Engineering GPR]

#### Attachment I

#### **Required Contract Provisions Related to American Iron and Steel**

A provision substantially like the below will be included in each procurement contract when such contract involves the procurement of iron and steel to be used in the Project. The SRF Applicant shall remain responsible for compliance with applicable law (including American Iron and Steel). Such SRF Applicant has been encouraged to consult with its advisors and counsel regarding such matters and, in any event, understands that the use of the following does not relieve the SRF Applicant from its obligation to comply with applicable law (including American Iron and Steel) and related provisions of any financial assistance agreement entered into with the Indiana Finance Authority, nor will the State Revolving Fund Loan Programs, the Indiana Finance Authority or the State of Indiana be responsible for or limited by any SRF Applicant's use of the following provision.

The Contractor hereby acknowledges to and for the benefit of the ("Owner") and the Indiana Finance Authority (the "Authority") that it understands the work, goods and services under this Agreement are being funded with monies made available by the State Revolving Fund Loan Program and such appropriation contains provisions commonly known as "American Iron and Steel" (and as such is supplemented from time to time by federal rules and guidance) that requires all of the iron and steel products used in the project be produced in the United States ("American Iron and Steel Requirements") including iron and steel products provided by the Contactor pursuant to this Agreement. Contractor hereby represents and warrants to and for the benefit of the Owner and the Authority, and agrees, that (a) the Contractor has reviewed and understands the American Iron and Steel Requirements, (b) all of the iron and steel products used in the project as provided by the Contractor under this Agreement will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirements and (c) the Contractor will provide any further certification or assurance of compliance with this paragraph as may be requested by the Owner or the Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner and the Authority to recover as damages against the Contractor (and the Contractor shall indemnify and hold the Owner and the Authority harmless against) any loss, expense or cost (including without limitation attorney's fees) incurred by the Owner or the Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Authority or any damages owed to the Authority by the Owner). While the Contractor has no direct contractual privity with the Authority, as a lender to the Owner for the funding of its project, the Owner and the Contractor agree that the Authority is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the Authority.

#### **Attachment J**

#### **Required Certification from Contractor Related to American Iron and Steel**

A certification substantially like the below will be obtained in advance of entering each procurement contract when such contract involves the procurement of iron and steel products to be used in the Project. The SRF Applicant shall remain responsible for compliance with applicable law (including American Iron and Steel). Such SRF Applicant has been encouraged to consult with its advisors and counsel regarding such matters and, in any event, understands that the use of the following does not relieve the SRF Applicant from its obligation to comply with applicable law (including American Iron and Steel) and related provisions of any financial assistance agreement entered into with the Indiana Finance Authority, nor will the State Revolving Fund Loan Programs, the Indiana Finance Authority or the State of Indiana be responsible for or limited by any SRF Applicant's use of the following certification.

#### CERTIFICATION

I \_\_\_\_\_\_, of \_\_\_\_\_\_\_\_, (Successful Bidder) hereby certify and agree on behalf of the Successful Bidder as its duly authorized representative (and under penalties of perjury) that the Successful Bidder understands and agrees a material term and consideration applicable to the award and entry into a contract with the Successful Bidder by the related to its

(SRF Applicant) related

(Project Name)

involves the procurement and provision of work, goods and services under a procurement contract to be entered into with the SRF Applicant is the Successful Bidder's compliance with the provisions of H.R. 3547, "Consolidated Appropriations Act, 2014" commonly known as "American Iron and Steel" provisions as contained therein requiring that all of the iron and steel products used in the Project be produced in the United States ("American Iron and Steel Requirements"). The Successful Bidder hereby represents and warrants to and for the benefit of the SRF Applicant and the Indiana Finance Authority, as a lender to the SRF Applicant for the funding of its Project, and agrees, that (a) the Successful Bidder has reviewed and understands the American Iron and Steel Requirements, (b) all of the iron and steel products used in the Project as provided by the Successful Bidder under its agreement related to the Project will be produced in the United States in a manner that complies with the American Iron and Steel Requirements and (c) the procurement contract will include a provision substantially like <u>Attachment I</u>.

I SWEAR OR AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE ABOVE STATEMENTS ARE TRUE TO THE BEST OF MY KNOWLEDGE.

(Signature)

(Date)

 STATE OF \_\_\_\_\_\_ )

 OUNTY OF \_\_\_\_\_\_ )

Before me, a Notary Public in and for said County and State, personally appeared \_\_\_\_\_\_\_, the \_\_\_\_\_\_ of \_\_\_\_\_\_ who, being first duly sworn, acknowledged the execution of the above and foregoing instrument for and on behalf of said entity. Dated this \_\_\_\_\_ day of \_\_\_\_\_\_, 2014.

My commission expires:

(Printed)

\_\_\_\_\_, Notary Public

County of Residence:

# **APPENDIX C**

# **INDOT DOCUMENTS**

#### APPENDIX C - INDOT DOCUMENTS

- HIGHWAY SETTLEMENT MONITORING PLANS
- INDOT UTILITY ACCOMMODATION POLICY
- INDOT PERMIT BOND

Indiana Department of Transportation

# Highway Settlement Monitoring Plans



#### **Settlement Monitoring Procedures**

#### General:

This document shall be used as a guideline for the processes involved with the preparation of Settlement Monitoring plans as required by the INDOT District Permit Section.

Settlement Monitoring surveys are performed to determine the degree of horizontal and vertical displacement of structures, pavements and embankments over a defined period. Severe pavement damage and structural failure can be a direct result of settlement and therefore it is critical that movement outside the design tolerances are detected and measured.

All pipeline or casing boring permits will require that a Settlement Monitoring Plan be submitted as part of the Permitting Process if the pipe or casing (whichever is larger) exceeds 6 inches in outside diameter.

The Production Department Surveyor is available to assist with the development and implementation of a monitoring system to suit individual requirements.

#### **Specific:**

The following information, at a minimum, shall be submitted as a requirement of the Settlement Monitoring Plan:

Set magnetic survey nails over the centerline of the casing or pipe, and along offset lines, which are located 25 feet each side of said centerline.

Set the magnetic nails at the pavement lane centerlines, at the lane edges, and at the paved shoulders.

Nails are to be located one foot (+) from the outside edge of each shoulder.

Set wood hubs (min. length: 18") at the center of any unpaved median, and at the flow line of the side ditches, along said lines.

Survey grade instruments shall be used for all elevation determinations. Pavement and marker elevations shall be to the nearest 0.01 foot and non-pavement elevations shall be to the nearest 0.10 foot.

Provide a plan view drawing of the pavement/shoulder area at the casing/pipe crossing location; together with the numbered spot elevation locations (see Exhibits "A" & "AA").

Provide at least two Temporary Bench Marks of an enduring nature within 300 feet of the casing ends, with a detailed description of their type and location.

A tabular format coordinate table shall be provided, together with coordinate information for at least two section corners or three or more property corners or locatable, referenced control points to assist in the future recovery of the spot elevation locations (see Exhibit B).

A notation shall be included to clarify the basis of the information appearing in the Coordinate table, which note shall state the source of the coordinate reference frame used e.g.: Indiana State Plane Coordinates, East Zone, NAD83, NAVD88; Local Ground coordinates; or any other coordinate system, together with all conversion and translation constants used to produce the stated values.

The establishment and collection of the monitoring information shall be performed by a Professional Surveyor or Professional Engineer who is registered in the State of Indiana or by employees under the direct supervision of said Surveyor or Engineer.





# EXHIBIT "B"

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
006	2286403.0840	495316.0520	992.95	Control Point*
901	2286410.5200	495554.9520	986.37	Control Point*
902	2286423.1067	495310.7128	992.88	Control Point*
903	2286321.4031	495317.2831	992.05	Control Point*
904	2286345.2875	495315.4042		Iron Pin Found
4000	2286399.3120	495452.3540	991.66	Edge Of Shoulder
4001	2286399.3780	495456.9450	991.90	Edge Of Pavement
4002	2286374.5320	495457.5470	992.06	Edge Of Pavement
4003	2286374.2860	495452.8190	991.94	Edge Of Shoulder
4006	2286339.4580	495458.3150	992.35	Edge Of Pavement
4007	2286339.3110	495453.3650	992.13	Edge Of Shoulder
4008	2286339.8650	495470.7600	992.52	Pavement Shot
4010	2286374.8160	495470.0530	992.32	Pavement Shot
4011	2286399.0650	495469.2630	992.19	Pavement Shot
4012	2286400.1470	495503.1020	991.36	Edge Of Pavement
4013	2286400.2860	495511.5920	991.01	Edge Of Shoulder
4014	2286375.1830	495511.1990	991.22	Edge Of Shoulder
4015	2286375.1980	495502.6220	991.55	Edge Of Pavement
4016	2286340.0460	495501.9710	991.89	Edge Of Pavement
4017	2286340.1760	495510.3220	991.55	Edge Of Shoulder
4020	2286398.2550	495397.1070	992.01	Edge Of Pavement
4021	2286398.4480	495402.2870	991.75	Edge Of Shoulder
4022	2286373.5440	495402.7170	991.92	Edge Of Shoulder
4023	2286373.5160	495397.8300	992.13	Edge Of Pavement
	* Site Control D	10, 10, 10, 10, 10	JULY CIT	m" ran sat

\* Site Control Point: 5/8" rebar w/ "XYZ Firm" cap set Points 4000-4039: MAG nail set

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
4026	2286338.3950	495398.5120	992.37	Edge Of Pavement
4027	2286338.4730	495403.4000	992.18	Edge Of Shoulder
4028	2286338. 1010	495362.1480	991.88	Edge Of Pavement
4029	2286337.7750	495353.8870	991.57	Edge Of Shoulder
4032	2286372.9540	495361.4940	991.77	Edge Of Pavement
4033	2286372.9670	495353.1000	991.43	Edge Of Shoulder
4034	2286397.9840	495361.1950	991.58	Edge Of Pavement
4035	2286397.7950	495352.7570	991.29	Edge Of Shoulder
4036	2286338.4830	495385.9610	992.59	Pavement Shot
4038	2286373.1930	495385.7500	992.34	Pavement Shot
4039	2286398.1480	495385.3260	992.17	Pavement Shot
5001	2286397.4657	495334.7253	988.51	Wood Hub
5002	2286397.8206	495428.2129	989.02	Wood Hub
5003	2286400.1896	495531.3931	987.33	Wood Hub
5004	2286374.5562	495335.9850	988.91	Wood Hub
5005	2286370.9791	495428.8854	989.22	Wood Hub
5006	2286375.4493	495530.8512	988.04	Wood Hub
5010	2286337.4896	495337.8444	989.52	Wood Hub
5011	2286338.8914	495429.6563	989.50	Wood Hub
5012	2286340.0627	495529.3122	988.73	Wood Hub

Settlement Monitoring Plan Sanitary Sewer Extension **Coordinate Chart** 

Rev:

May, 2011

## INDOT UTILITY ACCOMMODATION POLICY

July 30, 2013 Revised November 14, 2013 Revised June 12, 2014

> Prepared by Joe Gundersen

Approved By;

7-30-13 Date:

Samuel Sarvis Deputy Commissioner, Capital Program Management INDOT

Approved By;

2013 Date: 2/2 roughli mi

Kenny Franklin Manager, Utilities & Railroads

Date: 2/27/2013 an

Lou Haasis Transportation Engineer, FHWA

#### UTILITY ACCOMODATION POLICY

1.0 Introduction
1.0-(01) Precedence
1.0-(02) Purpose
1.0-(03) Application
1.0-(04) Scope
1.0-(05) Other Requirements
1.0-(06) Exceptions
2.0 Definitions
3.0 General
3.0-(01) Permits
3.0-(02) Driveway Conflicts
3.0-(03) Private Facilities
3.0-(04) Service Lines
3.0-(05) Access Control 12
3.0-(06) Location
3.0-(07) Design
3.0-(08) Construction
4.0 Structures
4.0-(01) Utility Structures
4.0-(02) Highway Structures
5.0 Pipelines
5.0-(01) General
5.0-(02) Liquid Petroleum Lines
5.0-(03) Gas Lines, High Pressure
5.0-(04) Gas Lines, Low Pressure & Medium Pressure
5.0-(05) Water Lines
5.0-(06) Sanitary Sewer Lines
6.0 Overhead Power Lines and Communication Lines
7.0 Underground Power Lines and Communication Lines

7.0-(01) General	32
7.0-(02) Underground Power Lines	33
7.0-(03) Underground Communication Lines	34
8.0 Irrigation and Drainage Pipes, Ditches and Canals	35
Appendix A Minimum Depth of Cover for Utility Lines	36

#### UTILITY ACCOMMODATION POLICY

#### **1.0 Introduction**

#### 1.0-(01) Precedence

This policy supersedes and replaces all policies or portions of policies pertaining to the accommodation of utility facilities in the right of way of the State highway system. The term "accommodation" includes the location, design, installation, maintenance, removal, and relocation of utility facilities within the right of way.

Information regarding reimbursement of utility relocations can be found in IC 8-23-2-6(15), *Indiana Design Manual* Chapter 104 and the Federal Highway Administration Program Guide: Utility Relocation and Accommodation on Federal-Aid Highway Projects. A utility with facilities on public right of way must relocate those facilities at their cost if they are in conflict with the proposed improvement project. A utility that desires reimbursement for their eligible costs as allowed under state and federal law shall provide the necessary documents to support their claim. The utility shall make a good faith effort to provide the required documents in a timely manner to ensure the improvement project is not delayed. The utility may be held accountable for the cost of delays of an improvement project.

This statement of policy and procedure will not be interpreted or applied in a manner in violation of, or inconsistent with state law. INDOT's authority with respect to jurisdiction over state highway right-of-way emanates from state and federal law.

#### 1.0-(02) Purpose

The purpose of this utility accommodation policy is to establish the policy for safely, reasonably and cost effectively managing the right of way of the State highway system. Also, this policy applies to all local public agency projects that use federal funds and are administered by INDOT.

Federal and State law mandates that INDOT manage the State highway system responsibly, reasonably and cost effectively. INDOT's goal in managing the right of way is to preserve the integrity, safe operation, and function of the State highway system. The manner in which utilities occupy the right of way can affect the appearance, operation, construction, and maintenance of the highway and the safety of the traveling public. Therefore, it is necessary that any utility's use and occupancy be authorized and reasonably regulated and managed. References are 23 CFR 645.209 and IC 8-23.

#### 1.0-(03) Application

This policy applies to all privately, municipally, publicly or cooperatively owned utility facilities that are located, installed, maintained, repaired, removed or relocated within the right-of-way of the State highway system. The types of utility facilities are listed in IC 8-1-9-2 and 105 IAC 13-2-7 and include those that supply communication, cable television, power, light, heat, electricity, gas, water, pipeline, sewer, sewage disposal, drain, or like services. These facilities may involve underground, surface, and/or overhead installations. INDOT may at their own discretion elect to address other types of utility facilities in accordance with this policy or other policies.

#### 1.0-(04) Scope

INDOT shall use this policy to responsibly, reasonably and cost effectively manage and/or regulate the location, design, installation, maintenance, repair, removal and relocation of utility facilities within the right of way. This policy is limited to matters which are the responsibility of INDOT for preserving the safe operation and integrity of the State highway system. Laws or orders of public authority, industry or governmental codes that prescribe a higher degree of protection or standards than those describe herein shall prevail over this policy. The INDOT Commissioner or his designated representatives have the authority and responsibility to implement and interpret this policy.

#### **1.0-(05)** Other Requirements

The utility shall comply with all other applicable requirements including but not limited to those specified in the following documents:

- 1. INDOT Standard Specifications.
- 2. INDOT Standard Drawings.
- 3. INDOT Permit General and Special Provisions.
- 4. INDOT Manual on Uniform Traffic Control Devices.
- 5. INDOT *Design Manual* including but not limited to, the following chapters.

- a. Roadside Safety, Chapter 303.
- b. Geometric Design of Existing Non-Freeways, Chapter 302.
- c. Traffic Control Plans/Designs, Chapter 503.
- d. Temporary Erosion and Sediment Control Chapter 205.
- 6. OSHA Standards.
- 7. All other relevant industry standards for the type of facilities being installed.
- 8. All other relevant laws and regulations.

#### 1.0-(06) Exceptions

A utility may submit a letter requesting an exception to any provision of this policy. The request will be submitted to INDOT in writing on the utility's letterhead. The letter will be addressed to Statewide Director, Utilities & Railroads, INDOT IGCN Room N642, 100 North Senate Ave, Indianapolis, Indiana 46204. The INDOT Commissioner or his designated representatives have the authority to review and approve exceptions to this policy. Each exception will be considered thoroughly and individually. An approved exception will not be considered a precedent for the approval of any subsequent request for an exception. INDOT may grant an exception on its own initiative and such will be reasonably documented.

The utility will explain in their request any unusual conditions or hardships that support the need for an exception to this policy. The utility will explain how the proposed exception promotes, or is consistent with, the purpose of this policy. The utility will present in their request the impacts for the alternative when the policy is followed and for the requested exception to the policy. At a minimum, the request will cover the impacts on traffic safety, highway operations, the direct and indirect environmental and economic effects of any loss of productive agricultural land, and any interference or impairment of the use of the highway. The utility will present how the facilities will be maintained and the impact on highway maintenance including drainage, pavement preservations, and possible highway improvements.

#### 2.0 Definitions

The following definitions apply to utility accommodation:

ANSI. American National Standards Institute.

Applicant. An applicant is a person or entity applying for a permit under this policy.

Backfill. Replacement of excavation with suitable material compacted as specified.

Bedding. Soil or other suitable material used to support an underground facility.

Boring. Boring is the process of making a hole below the ground by drilling.

Carrier. A carrier is a pipe directly enclosing a transmitted fluid; liquid, gas or slurry.

Casing. A casing is a pipe enclosing a carrier.

<u>CFR</u>. Code of Federal Regulations.

<u>Clear Zone</u>. The clear zone is the portion of the road side within the highway right-of-way that is free of non-traversable hazards and fixed objects. The INDOT *Design Manual* is the guide for establishing the clear zone for various types of highways and operating conditions.

<u>Conduit</u>. A conduit is a pipe that encloses a communication or electrical line.

<u>Depth of Cover</u>. Depth of cover is the distance between the top of an underground facility including casing to the surface of the ground or pavement.

District. A district is one of the six administrative subdivisions of INDOT.

<u>Distribution Point</u>. A distribution point is a location on a main line where a connection is made to serve one or more customers.

<u>Divided Highway</u>. A divided highway is a highway with separated roadways for traffic in opposite directions.

Electronic Permitting System (EPS). The electronic online system used to record activity related to an INDOT permit including plan submittals, correspondence and payment activity.

Facility. Any privately, municipally, publicly or cooperatively owned systems for supplying: communication, power, light, heat, electricity, gas, water, pipeline, sewer, sewage disposal, drain or like

services directly or indirectly to the public. Facilities do not include plant type components such as solar arrays, wind turbines and oil wells that produce commodities.

FHWA. Federal Highway Administration

<u>Highway</u>. Highway, street, or road means a public way for purposes of vehicular traffic, including the entire area within the right of way.

<u>Frontage Road</u>. A frontage road is a local street or road auxiliary to and located along side of a highway used for access control, and to provide service to adjacent areas.

Gas Line, High Pressure. A pipeline that supplies natural gas with an internal pressure greater than 60 psi.

Gas Line, Low Pressure. A pipeline that supplies natural gas with internal pressure less than or equal to 60 psi.

Gas Line, Medium Pressure. A pipeline that supplies natural gas with internal pressure less than or equal to 60 psi.

IMUTCD. Indiana Manual on Uniform Traffic Control Devices.

INDOT. Indiana Department of Transportation.

<u>Limited Access Facility</u>. A highway or street designed for through traffic, over, from, or to which owners or occupiers of abutting land or other persons have either no right or easement, or a limited right or easement of direct access, light, air or view because their property abuts upon the limited access facility or for any other reason. The highways or streets may be parkways from which trucks, buses, or other commercial vehicles are excluded, or freeways open to use by all customary forms of highway or street traffic.

<u>Manhole</u>. A manhole is an opening in an underground system where workmen may enter for the purpose of working on the facilities.

<u>Median</u>. A median is the portion of a divided highway separating the traveled way for traffic in opposite directions.

<u>Notice to Proceed (NTP)</u>. Formal notification by INDOT to a utility to proceed with installation or relocation of their facilities on public right of way.
Occupancy. The presence of utility facilities within highway right of -way.

## OSHA. Occupational Safety and Health Administration.

<u>Pavement Structure</u>. The combination of the sub-base, base course and surface course placed on a subgrade to support the traffic load and distribute it to the road bed.

<u>Permit</u>. Written formal acceptance by INDOT of the utility's plan to construct, maintain repair or remove their facilities on public right-of-way.

<u>Pipeline</u>. A continuous carrier used primarily for the transportation of fluids (liquid, gas or slurry) from one point to another using either gravity or pressure flow.

<u>Plowing</u>. Direct burial of utility lines by means of a plow type mechanism which breaks the ground, places the utility line, and closes the break in the ground in a single operation.

Private Line. Privately owned facility devoted exclusively to serve the owner of those facilities.

Road. A public way for purposes of vehicular traffic, including the entire area within the right of way.

<u>Roadway</u>. The paved portion of the highway used by vehicular traffic and includes the shoulders.

<u>Roadside</u>. The area abutting the roadway within the right of way. Roadside includes areas between roadways of a divided highway.

Service Line. A facility that supplies a service to an individual customer from a main line.

<u>Shoulder</u>. The portion of the roadway adjacent to the traveled way for the accommodation of stopped vehicles, emergency use, and lateral support of the pavement structure.

<u>State Highway System</u>. Encompasses all highways under state jurisdiction including interstates, US routes, and state routes. This system includes local roads or state park roads when an improvement project is under state administration.

<u>Sub-grade</u>. The prepared earth surface upon which the pavement structure and shoulders are constructed.

<u>Traffic Control Plan</u>. Describes the traffic control devices and other measures that will be used to promote the safe and controlled movement of vehicular traffic around the worksite and the safety of the utility work force.

<u>Traveled way</u>. That portion of the roadway for the movement of vehicles excluding shoulders and auxiliary lanes.

<u>Trenchless Technology</u>. A group of construction methods for underground facility installation, replacement, renovation, inspection, location, and leak detection, with minimum excavation from the ground surface.

<u>Utility</u>. The owner of a facility.

<u>Vent</u>. A pipe to allow the dissipation of gases or vapors into the atmosphere from an underground casing.

## 3.0 General

#### **3.0-(01)** Permits

INDOT is required to responsibly, reasonably, and cost effectively manage the right of way of the State highway system in accordance with federal and state law. INDOT is authorized to make policy and procedures to control the use of that right of way. This control is exercised by requiring a permit for each area of use of the right of way by a utility. Any use of the public right-of-way shall not endanger the traveling public and shall be in accordance with this policy.

A utility that desires to occupy the State highway right-of-way will submit a permit request to INDOT. INDOT will review the permit request to ensure compliance with this policy and any other applicable requirements. INDOT may deny any permit request that does not conform to this policy or any other applicable requirements. Also, INDOT may deny a permit request if the utility has a history of non-compliance with regulations, rules, standards, policies or any other applicable requirements. If INDOT denies a permit request for any reason, a written explanation will be provided. If INDOT approves the request a permit will be issued.

INDOT divides processing requests for utility occupancy into two categories as follows:

1. Utility Initiated. A utility that desires to install or relocate any facility within the public right of way will present a permit application to the appropriate INDOT district office. The utility will

submit their permit application using the Electronic Permitting System (EPS) at <u>http://www.ai.org/indot/2727.htm</u> or present their request in writing to the District Permit Manager. A fee is charged when submitting an application for this permit and generally a permit bond is required.

2. INDOT Initiated. A utility required by INDOT to relocate any facility to accommodate a proposed highway improvement project shall be approved by INDOT before relocating. A fee is not charged for this permit and a permit bond is not required

The utility is responsible for obtaining any other applicable permits or authorizations required for the installation or relocation of their facilities. Agencies that may be contacted regarding other permits include, but are not limited to, the U.S. Army Corps of Engineers, the Indiana Department of Natural Resources, the Indiana Department of Environmental Management, and local public agencies.

A utility shall notify the INDOT office that issued their permit within one month of a facility ownership change. The new owner will have all the obligations and privileges granted to the former owner. A utility with a change in legal status remains bound by the permit and its provisions.

INDOT may revoke a permit. A cause to revoke a permit is the failure of the utility to comply with the terms of their permit and its provisions.

# **3.0-(02)** Driveway Conflicts

Construction, reconstruction, modification or relocation of a driveway on highway right-of-way may require relocation of utility facilities. All work within state right of way is subject to INDOT approval.

INDOT is responsible for coordinating the relocation of utility facilities when the work on the drive is initiated by or incidental to a highway improvement project. The division of costs for this work will be resolved between INDOT and the utility in accordance with state law.

The property owner is responsible for coordinating the relocation of utility facilities when the work on the drive is initiated by the private owner. The division of costs for this work will be resolved between the owner of the drive and the utility.

#### **3.0-(03)** Private Facilities

INDOT does not allow private facilities to be located on public right of way unless they are private service lines which extend from the main line. The utility should request and coordinate the installation and relocation of any such utility service line.

#### 3.0-(04) Service Lines

Generally, it is in the public interest for transverse installations of service lines owned by a public utility to be located on the State highway right-of-way because they connect the main line directly to the customer. INDOT may allow transverse installation of such service lines on state highway right-of-way in accordance with this policy. Also, INDOT may permit installation of longitudinal runs of service lines when a public interest is demonstrated and approved in accordance with section 1.0-(06). A utility that requires the property owner to install a service line will co-sign the permit. All work within state right of way is subject to INDOT approval.

#### 3.0-(05) Access Control

INDOT has the authority to control and regulate access to all highways under its jurisdiction. Access control is used to limit the degree of interference with vehicular traffic from other vehicles or pedestrians which are entering, exiting or crossing the highway. The level of access control determines the type and extent of utility facility installations that are allowed on public right-of-way. Contact the appropriate INDOT District to obtain information on the type of access control in effect for a specific location. The access control line is normally but not always at the same location as the right-of-way line.

Access control generally includes three categories as follows:

- 1. Non-Limited Access. INDOT has the authority to regulate the location and details of access, but INDOT has not purchased access control rights from adjoining properties. This type is typical of most highways with frequent driveways and intersections.
- 2. Partial Limited Access. INDOT has declared or purchased access control rights from adjoining property owners. Access is controlled to give preference to vehicular traffic, but there may still be some intersecting streets at grade and some driveway connections. This type is typical of many divided highways with some intersections and driveways.
- 3. Full Limited Access. INDOT has declared or purchased access control rights from adjoining property owners. Access is controlled to give priority to mainline vehicular traffic by providing

access to other vehicles and pedestrians only from selected public roads, by prohibiting crossings at grade and by prohibiting driveway connections. This level is typical of interstate highways and some divided highways.

A utility facility installed on an existing limited access highway or partial limited access highway will be accessed from outside the access control line. Access may be from such areas as private easements, frontage roads, public roads and private driveways.

#### **3.0-(06)** Location

Utilities will install and relocate facilities with due consideration for the safety, operation, maintenance and aesthetic characteristics of the highway and other users of the highway. Facilities shall be located to minimize relocation due to future highway improvements, to enable future installation of additional facilities on the highway, to enable facility maintenance, repair and upgrade with minimum hazards and minimum interference with highway traffic.

The following guidelines apply to the location of utility facilities.

- 1. The location of above ground facilities within the highway right of way will be in accordance with the INDOT *Design Manual* Chapter 303. New or relocated above ground facility installations will be located outside the clear zone.
- Facilities will cross roadways at right angles or as nearly as practical to right angles. Reasonable latitude may be exercised for existing facilities which are otherwise qualified to remain in place. Where practical aerial lines should not cross the roadway within 100 ft. of a small structure, large culvert (over 48" diameter), or bridge structure to aid in future construction projects.
- 3. Facilities crossing limited access highways will have all supporting structures and above ground appurtenances located outside the access control line and preferably, outside the right-of-way line. Additionally, access for installation, maintenance and relocation of facilities will be from outside the access control line and preferably, outside the right-of-way line of the limited access roadway.
- 4. Longitudinal installations of facilities, individual service connections and facility maintenance points will be located on a uniform alignment as near as possible to the right-of-way line to provide the maximum space for possible future highway construction or facility installations. Variance may be allowed on the distance from the facility to the right-of-way line in order to maintain a uniform alignment. Such variance often occurs where irregularly shaped portions of

the right of way extend beyond the normal right-of-way limits. On highways with a frontage road, the preferred location for longitudinal installation is between the frontage road and the exterior right-of-way line.

- 5. Longitudinal installations of facilities, individual service connections and facility maintenance points on highways with partial access control are discouraged. Installations may be allowed where no other reasonable alternative exists. Factors to consider in evaluating the installation include terrain, cost, prior existence, environmental characteristics, and distance between distribution points. Other factors include access for maintenance from outside the access control line or from drive ways and the effect on agricultural land if not allowed.
- 6. Longitudinal installations of facilities on highways with full access control are not permitted. Exceptions may be issued when the facilities do not include individual service connections and the facilities are installed or serviced by direct access from outside the limited access control line.
- 7. Longitudinal installations of underground power lines, high pressure gas lines and petroleum lines shall not be placed under travel lanes, shoulders or in the median. Longitudinal installations of all other types of facilities are discouraged from being placed under travel lanes, shoulders or in the median. On highways with frontage roads it is preferred that longitudinal installations are located at or near the exterior right-of-way line of the frontage road. On intersecting roadways, longitudinal installations under travel lanes, shoulders or in the median are discouraged where the road way crosses state right of way.
- 8. Utility facilities will not be installed on federally funded roadways within or adjacent to areas of scenic enhancement and natural beauty in accordance with 23 CFR, Part 645, Subpart B, Section 209(h).
- 9. An underground utility line which lacks a continuous and integral metallic component capable of detection by locating instruments will be accompanied in its location by a continuous detectable material such as a metallic tracer wire or metallic tape. This includes service lines.
- 10. A utility shall place a warning device directly above high risk facilities such as gas and petroleum lines. A utility may install a warning device above other facilities. These warning devices will be buried at least 12 inches below the ground surface. This warning device provides notice to excavators that they are in close proximity to a buried facility.
- 11. A utility may indicate their facilities within state right of way with markers or signs. The signs or markers will be placed in close proximity to the facilities. Signs or markers for transverse

crossings will be placed at the right-of-way line. The signs or markers will indicate the facility type, the name of the facility operator and a telephone number to contact the utility. All markers must be break-away type and crashworthy. Markers may be subject to approval by INDOT.

- 12. An existing utility facility within the right of way of an existing or proposed highway improvement project may remain provided it is in compliance with the requirements of the INDOT *Design Manual* and this Utility Accommodation Policy. An existing utility facility that is in conflict with a proposed highway improvement project will be relocated in accordance with 105 IAC.
- 13. Facilities located on urban streets with closely abutting improvements are special cases which will be resolved consistent with the prevailing limitations and conditions.
- 14. Locations that have a high potential to interfere with proposed construction, highway maintenance, roadway operations, highway safety or future highway improvements need to be avoided. These include locations as follows:
  - a. deep highway cut sections;
  - b. near footings of bridges or other highway structures;
  - c. diagonally across intersections;
  - d. cross-drains where flow of water, drift or stream bed load may be obstructed;
  - e. longitudinally in or under a ditch;
  - f. within a basin drained by a pump if the pipeline carries a liquid or liquefied gas;
  - g. within an underpass drained by a pump if the pipeline carries a liquid or liquefied gas;
  - h. wet or rocky terrain where minimum depth of cover would be difficult to attain;
  - i. soft soils subject to excess settlement; and
  - j. median installations.

#### 3.0-(07) Design

The following apply to the design of utilities.

1. Each utility is responsible for the design of their facilities including the preparation of work plan narratives, drawings, cost estimates and specifications. The drawing will be of sufficient detail and scale to show the proposed location of the facility relocation. The relocation drawing shall be on INDOT plans, show stations, offsets and elevations of the utility facilities and comply with the other requirements set forth at Appendix B.

- 2. To support efforts to minimize utility facility relocations the utility shall provide accurate, complete and understandable information on the location of their facilities inside the public right of way within 30 days of a request. The cost to provide this information is the responsibility of the utility.
- 3. Utility facility installations within the highway right of way will comply with current industry standards including but not limited to the following requirements.
  - a. Electric power facilities and communication facilities will be in accordance with the current National Electrical Safety Code.
  - b. Water facilities will be in accordance with the current specifications of the American Water Works Association and Ten State Standards.
  - c. Pressurized pipelines will be in accordance with the current ANSI Code for Pressure Piping (ASME Code B31) and 49 CFR Parts 192, 193 and 195.
  - d. Liquid petroleum pipelines will be in accordance with the current recommended practice of the American Petroleum Institute for pipeline crossings under railroads and highways.
  - e. Pipelines carrying hazardous materials will be in accordance with the rules and regulations of the U.S. Department of Transportation governing the transportation of these materials.
- 3. Facility installations and facility relocations within the highway right of way will be designed for a long service life, be made of durable materials and be relatively free from routine service.
- 4. Facility installations and relocations will be designed to accommodate planned expansion of the facilities. Facilities will be designed to enable facility maintenance, repair and upgrade with minimum interference and hazard to highway traffic.
- 5. If an exception is granted and utility lines are attached to an appurtenance, bridge, small structure, culvert or other drainage structure, shut off valves will be installed at both ends of the attachment. The shut off valves will be automatic where practical.
- 6. Utility facilities crossing state highways underground will be installed without disturbing the existing pavement structure or paved shoulders. Open cut of pavement will not be considered unless it is demonstrated there is no reasonable alternate method available. Casing, pipe, or conduit crossing state highway underground will be installed using trenchless technology in accordance with INDOT Standard Specification 716. Water jetting is not allowed.

- 7. Boring or jacking under state highways with access control will be from pits located at least 30 feet from the edge of pavement. Boring or jacking under state highways with no access control will be accomplished from pits located at least the total distance of 10 feet plus the depth of the pit without shoring. Wet boring or water jetting is not allowed. Boring and jacking under interstate highways will be from pits located outside the access control fence. Boring and jacking pits may be located closer than the required distance when they are protected in accordance with the INDOT *Design Manual* Chapter 303.
- 8. All trenchless underground installations of casings, pipes or conduits will be in accordance with the current INDOT Standard Specification 716. The diameter of the auger shall not exceed the outside diameter of the pulled pipe by more than one inch. Installations with a diameter of six inches or less may be accomplished by either jacking, guided whip auger or auger with the pulled pipe method. Open pits will be clearly marked, protected by barriers and secured from intrusion by pedestrians. Pits used for trenchless underground installations will be located in an area and constructed in such a manner that will not affect highway structural footings or the highway. Shoring may be used to protect the highway.
- 9. The utility shall request an addendum to their permit from INDOT to modify a permitted design for the installation or relocation of facilities. The utility shall provide a revised drawing with their request. The request for an addendum to their permit for a new installation shall be submitted to the District Permit Manager. The request for an addendum to their permit for facility relocation will be presented to the designated utility coordinator.
- 10. Utility tunnels shall be designed so that most repairs or replacement of sections of pipe line can be made without pulling the entire pipe line. The utility tunnel design shall include one or more entrance shafts of a size suitable for removal of one pipe section from the gallery. Utility tunnels shall extend across the full width of the right-of-way.
- 11. INDOT encourages the installation of multiple utility facilities in the same duct or same trench to minimize the impact on the highway right of way and reduce installation costs. One utility may be selected as the lead for the project to complete the design and construction.
- 12. Light poles shall be of single pole construction and located in accordance with the INDOT *Design Manual* Chapter 502. Light poles will not be permitted in the ditch line of any state highway. Light poles in the clear zone shall be breakaway design unless there are sidewalks and the potential for breakaway poles falling on pedestrians.

13. INDOT permits only utility poles, light poles and appurtenances to underground facilities on highway right of way as above ground installations. Appurtenances to underground facilities include pedestals, hydrants, markers, casing vents, regulator vault gage boxes, and pressure regulators.

#### 3.0-(08) Construction

- 1. Preservation, Restoration, Cleanup, Drainage, and Environmental Permits.
  - a. Preservation. The utility shall make every effort to minimize the areas disturbed by their work. The utility shall make reasonable efforts to minimize damage to crops and agricultural land. The utility is responsible for any cost of damage to crops or agricultural land.
  - b. Restoration. The utility shall restore in a timely manner areas disturbed by their own forces or their contractor to a condition equal to or better than the condition prior to work. Restoration of disturbed areas shall be in accordance with the requirements of the work plan, INDOT Standard Specifications and all provisions of the permit including; General Provisions, Special Provisions and any Additional Special Provisions.
  - c. Cleanup. Spraying, Cutting and Trimming of Trees, Shrubs and/or Vegetation. A permit is required for the trimming, cutting, spraying or removal of trees, shrubs or other vegetation located with the highway right of way. A utility shall not spray, cut or trim trees, shrubs and/or other vegetation without the specific written permission of INDOT. INDOT may permit light trimming of a tree or the removal of a tree when requested by the utility. Tree removal includes removing the stump and backfilling the hole in accordance with INDOT specifications. All debris, refuse and waste will be removed from the right of way. Work will be in accordance with INDOT Standard Specifications 200 Earthwork.
  - d. Drainage. The utility shall maintain existing drainage patterns during the installation, maintenance or removal of their facilities. Trenches and bore pits for underground facility installations shall be backfilled in accordance with INDOT standard specifications. Outlets or under drains shall be installed as needed to avoid entrapped water. Test holes shall be back filled in accordance with INDOT specifications.
  - e. Environmental Permits. The utility shall obtain all required environmental permits to support the installation or relocation of their facilities. The utility shall implement erosion control, sediment control, and storm water management measures in accordance with 40 CFR Parts 9, 122, 123, & 124, 327 IAC 15-5 and the Indiana Storm Water Manual. The utility shall

implement such measures to protect all areas disturbed by work performed by their own forces or work performed by their contractor. The utility shall implement such measures during work operations and after work operations until replacement vegetation is established or until the area is disturbed by another party.

- 2. Safety and Convenience.
  - a. Control of Traffic. Traffic control for utility construction and maintenance operations will conform to the Indiana Manual on Uniform Traffic Control Devices or the INDOT Work Zone Safety Handbook. All construction and maintenance operations will be planned with due consideration to the safety of the public and maintaining traffic mobility. Any such work must be planned to minimize closure of intersecting streets, road approaches, traffic lanes, or other access points. On high volume highways, construction operations interfering with traffic should not be allowed during periods of peak traffic flow. In accordance with INDOT *Design Manual*, Chapter 503, a traffic control plan must be prepared and submitted with the permit application. INDOT may inspect traffic control operations for compliance with the IMUTCD and the INDOT Work Zone Safety Handbook.
  - b. Work Site Safety.
  - 1) The utility shall assure that their work site is secure against any hazard to the public at all times until all of their work is completed. The utility shall comply with the requirements of the IMUTCD and OSHHA. All pipe, conduit, wire, poles, cross arms or other materials located within the public right of way prior to installation shall be placed outside of any ditches and at least 30 feet beyond the edge of the traveled way or behind existing guard rails.
  - 2) INDOT may require utility construction or maintenance operations on state highway right of way to be discontinued during periods of inclement weather or when soil conditions are such that the utility work would result in extensive damage to the highway right of way or create an unsafe traveling condition.
  - c. Maintenance and Repairs. The utility shall maintain all facilities in good repair both structurally and aesthetically. Maintenance of facilities crossing limited access highways shall be from city streets, county roads, service roads, and approved openings provided in limited access right-of-way fences unless such alternatives are not practical. Maintenance and repair does not include the installation or relocation of facilities.

- 3. Records. The utility shall maintain accurate, complete and understandable records for all of their facilities on public right of way and shall record such records when applicable. These records will cover active facilities and inactive facilities. The records will include the facility type, function, size, configuration, material, location, elevation and any special features such as encasement, manholes and valves. These records will include all service lines which enter or cross the highway right of way. The utility shall provide copies of these records at no cost within 30 days of a request.
- 4. Trenches, Bedding and Backfill. The essential features for trench construction are (a) restoration of the structural integrity of roadbed after trenching; (b) security of the pipe against deformation likely to cause leakage; and (c) assurance against the trench becoming a drainage channel. The integrity of the pavement structure, shoulders and embankment are of primary concern.

Trenches, bedding and backfill will be in accordance with the INDOT standard specifications and as follows:

- a. Trenches will be cut with vertical faces where soil and depth conditions allow. The width of a trench will be the minimum necessary to accomplish the installation. Shoring will be used when necessary, in accordance with OSHA requirements.
- b. Bedding will be provided to a depth of 6 inches or half the nominal diameter of the pipe, duct, or duct bank, whichever is less. Bedding will consist of pit run sand and gravel mixture or other suitable materials approved by the permit inspector in accordance with section 904 of the INDOT Standard Specifications. Bedding will not be required for pipes, ducts or duct banks encased in concrete or flowable fill. The bottom of the trench will be prepared to provide the pipe, duct or duct bank with uniform bedding support throughout the length of the installation.
- c. Backfill will be provided in accordance with the INDOT standard specifications, section 715.09: Backfilling.
- 5. Underground Plant Protection.

Indiana 811 is the agency that coordinates the protection of underground utility facilities in accordance with IC 8-1-26. Contact will be made with Indiana 811 two days prior to any excavation or survey so that underground facilities may be located and marked.

The location of each underground utility will be marked by the utility with paint, flags or other temporary surface markings color coded for each utility type. The uniform color code system is as follows:

- a. Red: Electric power lines or conduits.
- b. Yellow: Gas, petroleum, steam or other hazardous materials.
- c. Orange: All types of communication lines.
- d. Blue: Water systems and slurry pipelines.
- e. Green: Storm and sanitary sewers.
- f. Purple. Reclaimed water.
- g. Pink. Temporary survey markings
- h. White. Proposed construction.
- 6. Pavement Cuts. Open cutting of pavement on interstate highways is not allowed. Open cutting of pavement on all other highways is highly discouraged because it adversely affects the integrity of the pavement and may disrupt the flow of traffic. A utility that desires to install their facility by open cut shall obtain a "cut road permit" from the appropriate INDOT District prior to starting their work. The permit request will explain the reasons why the utility desires to install their facilities by open cut. At the conclusion of the work, all cuts in the pavement will be repaired with like materials, to a similar or greater depth and to a condition equal to or better than the condition of the pavement prior to the work in accordance with INDOT Standard Specifications. INDOT will inspect all pavement cuts in the roadway to determine the extent of pavement repairs. The utility shall submit their pavement design for the repair of the pavement when the permit is requested. The design for pavement repairs will be approved prior to a permit being issued.
- 7. Road Closures. A utility that requires a road closure to install, service or relocate their facility shall obtain a permit prior to starting their work. The utility shall coordinate with the District Permit Engineer to determine an acceptable plan to address impacts to school busses and emergency vehicles including but not limited to ambulances, fire and law enforcement. The utility shall provide notice of the location and schedule for the proposed road closure to all impacted state and local agencies including but not limited to schools, hospitals, fire departments and law enforcement offices at least three months prior to the date of the planned road closure.
- 8. Emergency Repairs. Emergency repairs may be performed within the right of way when physical conditions or time constraints prevent applying for and obtaining a permit. The utility shall notify the District Permit Manager or INDOT Traffic Management Center as soon as possible about its plan of action for the emergency repairs prior to beginning any work within the right of way. The utility shall make arrangements for the control and protection of traffic or

pedestrians affected by the proposed operations. The utility shall submit a permit application within seven working days of the work to cover the emergency repairs.

- 9. Inactive Facilities.
  - a. Inactive facilities fall into two categories. Facilities that are no longer in use and will be restored to service are called out of service facilities. Facilities that are no longer in use and will not be restored to service are called retired in place facilities. Retired in place facilities remain the responsibility of the utility until such are removed from the State highway right of way. INDOT does not allow a utility to absolve themselves of accountability and responsibility for their facilities by abandoning those facilities on public property. The utility shall maintain accurate, complete and understandable records of all inactive facilities.
  - b. The utility will remove all above ground inactive facilities within sixty calendar days of the facility becoming inactive.
  - c. INDOT prefers that underground facilities that are out of service be removed from the right of way when reasonable. The utility will remove underground out of service facilities that may impair the safety or integrity of the highway or adversely impact the environment. The utility may remove underground out of service facilities provided that such removal does not impair the safety or integrity of the highway or adversely impact the environment.
  - d. A utility may leave retired in place pipes of any material that are 12 inch or less in diameter provided the ends are sealed. A utility may leave retired in place pipes of greater than 12 inches in diameter provided they are filled with flowable fill and the ends are sealed. The flowable fill material shall be in accordance with INDOT Standard Specifications.
  - e. A utility is responsible to remove inactive facilities that are found to be in conflict with a highway improvement project. The cost to remove theses facilities is a cost burden to the utility unless the work is reimbursable. The utility may consider alternate methods of removal such as having the work included in the state highway construction contract.
- 10. INDOT may inspect all utility installations within highway right of way. If any violations or deficiencies are observed, INDOT shall provide notice of such violations or deficiencies to the utility. The utility shall establish with INDOT a reasonable timeframe for corrective action if such is necessary. The cost of subsequent inspections may be charged to the utility.

#### 4.0 Structures

#### 4.0-(01) Utility Structures

INDOT may allow the construction of a bridge or tunnel to facilitate the placement of one or more utility facilities. The utility is responsible for and will pay the cost for design, construction, maintenance and repair of these structures. INDOT will participate in these costs to the extent that the utility is reimbursable for such work as the result of a highway project or to the extent that the structure is also used for highway purposes.

#### 4.0-(02) Highway Structures

INDOT does not allow facilities that supply hazardous, explosive, high voltage, high pressure or heated commodities to occupy or attach to highway structures. These types of commodities include but are not limited to natural gas, petroleum, and electricity. INDOT highly discourages the attachment of all other types of facilities to highway structures. A utility that desires to attach facilities to a highway structure shall submit a letter requesting permission to attach to a specified structure. The letter shall detail the facilities to be attached and explain why other locations for the facility are not reasonable. The letter will be addressed to Statewide Director, Utilities & Railroads, INDOT IGCN Room N642, 100 North Senate Ave, Indianapolis, Indiana 46204. Highway structures include bridges, small structures, culverts or other drainage pipes.

Facilities that are allowed to attach to highway structures will comply with the following.

- 1. In no case will lines be installed where they can be impacted by traffic on or under the bridge or where a leak could flood a roadway on or under the bridge.
- 2. Lines will not be attached to highway structures where they interfere with traffic, routine maintenance operations, the flow of water or degrade the appearance of the structure.
- 3. Facilities will be carried in conduits or casings of sufficient strength to protect the line.
- 4. INDOT may include conduits in the design of a bridge provided that;
  - a. The utility provides a written request providing the details of their requirements prior to the completion of the design of the highway improvement project.
  - b. The utility agrees to pay all additional costs associated with the design and construction to accommodate their requirements.

- 5. Structural Analysis. All requests to attach pipelines to an existing bridge must be accompanied by sufficient information including design details and calculations certified by a professional engineer to determine the effect of the added load on the structure. If the bridge does not have sufficient strength to carry the loads with an adequate margin of safety, the request will be denied. Where the request is to attach lines within or to a new structure, the utility will be responsible for any increase in the cost of the structure to support the extra loads of the pipeline, including any increase in the size or thickness of members necessary to contain lines or conduits installed within the structure.
- 6. Attachment Details. All requests for attachments must be accompanied by sufficient details of the manner and type of attachment to allow for adequate review and approval by INDOT.
- 7. Asbestos Materials. Materials containing asbestos shall not be used on any facilities attached to a highway structure.
- 8. Any time that an attachment must be relocated to accommodate highway work or safety, the utility must apply for a new attachment. Prior existence will not be a basis for reattachment.

#### 5.0 Pipelines

#### 5.0-(01) General

- 1. General. All pipelines will provide sufficient strength to withstand internal design pressures. All pipelines will provide sufficient strength to withstand external design pressures including superimposed loads of soil, roadway, traffic, construction equipment, etc. All pipelines will be of satisfactory durability to withstand the conditions to which they may be subjected. All pipelines must meet any other applicable codes or industry standards.
- 2. Encasement. Pipelines with encasements will consist of a pipe or other separate structure around and outside of the carrier line. Encasements may be metallic or nonmetallic. The encasement will be of sufficient strength to withstand external design pressures including superimposed loads of soil, roadway, traffic, construction equipment, etc. Casing strength will meet or exceed the structural requirements for drainage culverts. Casing materials must be of satisfactory durability to withstand the conditions to which they may be subjected. When used, encasement will extend under the median, from top of back slope to top of back slope for cut sections, 5 ft beyond the toe of slope under fill sections, 5 ft beyond the back of the curb, and 5 ft beyond any structure which the lines passes under or through. Encasement may be omitted under medians that are

substantially wider than normal standards for such roadway, such as when the roadways are on independent alignments.

- 3. Manholes, Vaults, Pits and Hand Holes. Generally, manholes, vaults and pits are discouraged from being placed in the pavement, shoulders or curbs of any roadway. However, if they are permitted in the roadway, they should be installed outside the normal wheel path and away from intersections. In general these types of access points are limited to those necessary to install and service the lines. They will be placed directly in line with the facilities and of the minimum width to accomplish their intended function. They will be installed so the top of the facility is flush with the roadway or ground surface. They will provide sufficient strength to withstand external design pressures including superimposed loads of soil, roadway, traffic, construction equipment, etc.
- 4. Clearances. Vertical and horizontal clearances between a pipeline and a highway structure, other highway appurtenances or utility facilities should be sufficient to allow maintenance of the pipeline and the other items.
- 5. Depths. The table attached at Appendix A summarizes the minimum depths of cover for underground lines as described herein.

# 5.0-(02) Liquid Petroleum Lines

- 1. Depth of Cover for New Lines. All lines that are not under or within 5.0 feet of the roadway will have a minimum depth of cover of 3.0 feet for encased lines and non-encased lines. All lines which are under or within 5.0 feet of the roadway will have a minimum depth of cover under pavement of 4.0 feet for encased and non-encased lines. Further, all lines will be a minimum of 2.0 feet or one half the diameter of the pipe or casing below the pavement structure and sub-grade whichever is lower. All lines must have a minimum depth of cover of 4.0 feet under ditches.
- 2. Depth of Cover for Existing Lines. Existing lines may be allowed to remain in place with a reduction of 0.5 feet in the depths of cover specified above. Also, existing lines may remain in place with a lesser depth of cover if the pipeline is protected by a reinforced concrete slab which complies with the requirements listed below.
  - a. Width. The width shall be three times the pipe diameter or encasement diameter whichever is greater but not less than 4.0 feet.

- b. Thickness. The thickness shall be a minimum of 6 inches.
- c. Reinforcing. The minimum reinforcement shall be No. 4 epoxy coated bars on 12 inch center, or the equivalent.
- d. Cover. The cover shall be at least six inches between the slab and top of pipe.
- 3. Crossings. These may be encased or non-encased. However, only welded steel lines with adequate corrosion protection may be used for non-encased highway crossings.
- 4. Vents. One or more vents will be provided for each casing or series of casings. For casings longer than 150.0 feet, a vent will be provided at both ends of the casing. On casings of 150.0 feet or less, a vent will be provided at both ends of the casing or a vent will be located at the high end with a marker placed at the low end. Vents will be placed at the right-of-way line immediately above the pipeline and situated so they do not interfere with highway maintenance and are not concealed by vegetation. The name of the utility will be shown on the vents.
- 5. Markers. The utility will place a readily identifiable and suitable marker immediately above any liquid petroleum line where it crosses the right-of-way line, except where there is a vent.

# 5.0-(03) Gas Lines, High Pressure

- 1. Depth of Cover for New Lines. All lines that are not under or within 5.0 feet of the roadway will have a minimum depth of cover of 3.0 feet for encased lines and non-encased lines. All lines which are under or within 5.0 feet of the roadway will have a minimum depth of cover under the pavement of 4.0 feet for encased and non-encased lines. Further, all lines will be a minimum of 2.0 feet or one half the diameter of the pipe or casing below the pavement structure and sub-grade whichever is lower. All lines must have a minimum depth of cover of 4.0 feet under ditches.
- 2. Depth of Cover for Existing Lines. Existing lines may be allowed to remain in place with a reduction of 0.5 feet in the depths of cover specified above. Also, existing lines may remain in place with a lesser depth of cover if the pipeline is protected by a reinforced concrete slab which complies with the requirements listed below.
  - a. Width. The width shall be three times the pipe diameter or encasement diameter whichever is greater but not less than 4.0 feet.

- b. Thickness. The thickness shall be a minimum of 6 inches.
- c. Reinforcing. The minimum reinforcement shall be No. 4 epoxy coated bars on 12 inch center, or the equivalent.
- d. Cover. The cover shall be at least six inches between the slab and top of pipe.
- 3. Crossings. These may be encased or non-encased. However, only welded steel lines with adequate corrosion protection or fusion joined plastic lines may be used for non-encased highway crossings.
- 4. Vents. One or more vents will be provided for each casing or series of casings. For casings longer than 150.0 ft, a vent will be provided at both ends of the casing. On casings of 150.0 ft or less, a vent will be provided at both ends of the casing or a vent will be located at the high end with a marker placed at the low end. Vents will be placed at the right-of-way line immediately above the pipeline and situated so they do not interfere with highway maintenance and are not concealed by vegetation. The name of the utility will be shown on the vents.
- 5. Markers. The utility will place a readily identifiable and suitable marker immediately above any high pressure gas line where it crosses the right-of-way line, except where there is a vent.

#### 5.0-(04) Gas Lines, Low Pressure & Medium Pressure

- 1. Depth of Cover for New Lines. All lines that are not under or within 5.0 feet of the roadway will have a minimum depth of cover of 3.0 feet for encased lines and non-encased lines. All lines which are under or within 5.0 feet of the roadway must have a minimum depth of cover under the pavement of 4.0 feet for encased and non-cased lines. Further, all lines will be a minimum of 2.0 feet or one half the diameter of the pipe or casing below the pavement structure and sub-grade whichever is lower. All lines must have a minimum depth of cover of 4.0 feet under ditches.
- 2. Depth of Cover for Existing Lines. Existing lines may be allowed to remain in place with a reduction of 0.5 feet in the depths of cover specified above.
- 3. Crossings. These may be encased or non-encased. Non-encased crossings must be welded steel construction with adequate corrosion protection, fusion joined plastic lines or plastic lines with no joints under or within 5.0 feet of the roadway.

- 4. Vents. One or more vents will be provided for each casing or series of casings. For casings longer than 150.0 feet, a vent will be provided at both ends of the casing. On casings of 150.0 feet or less, a vent will be provided at both ends of the casing or a vent will be located at the high end with a marker placed at the low end. Vents will be placed at the right-of-way line immediately above the pipeline and situated so they do not interfere with highway maintenance and are not concealed by vegetation. The name of the utility will be shown on the vents.
- 5. Markers. The utility will place a readily identifiable and suitable marker immediately above any medium pressure gas line and low-pressure gas line where it crosses the right-of-way line, except where there is a vent.
- 6. Location. In urban areas existing longitudinal lines may remain in place provided they comply with the following:
  - a. the lines can be maintained without violating access control;
  - b. the lines will not interfere with the proposed highway improvement project;
  - c. the lines are of sufficient strength and durability to withstand the changed conditions and have adequate remaining service life to prevent maintenance, repair or replacement;
  - d. service access points are adjusted to be flush with the surface to accommodate any changes in grade;
  - e. service access points are positioned to be out of the normal wheel path to accommodate any changes in traffic patterns and away from intersections; and
  - f. the lines comply with all other requirements of this policy.

# 5.0-(05) Water Lines

1. Depth of Cover for New Lines. All lines that are not under or within 5.0 ft of the roadway will have a minimum depth of cover of 3.0 feet. All lines which are under or within 5.0 ft of the roadway will have a minimum depth of cover under the pavement surface of 4.0 feet. Further, all lines will be a minimum of 2.0 feet or one half the diameter of the pipe or casing below the pavement structure and sub-grade whichever is lower. All lines must have a minimum depth of cover of 4.0 feet under ditches.

- 2. Depth of Cover for Existing Lines. Existing lines may be allowed to remain in place with a reduction of 0.5 feet in the depths of cover specified above.
- 3. Crossings. All crossings under the roadway and within 5.0 ft of the roadway must be encased, except service lines of 2 inches diameter or less.
- 4. Appurtenances. Customer meter pits, sprinkler pits, and similar type features should not be placed within the State highway right of way. Appurtenances will not be located within the pavement. Existing appurtenances may remain if they do not interfere with proposed highway construction, maintenance, operation or safety.
- 5. Casings. All casings will be sealed at both ends.
- 6. Markers. The utility will place a readily identifiable and suitable marker immediately above any water line where it crosses the right-of-way line.
- 7. Location. In urban areas existing longitudinal lines may remain in place provided they comply with the following:
  - a. the lines can be maintained without violating access control;
  - b. the lines will not interfere with the proposed highway improvement project;
  - c. the lines are of sufficient strength and durability to withstand the changed conditions and have adequate remaining service life to prevent maintenance, repair or replacement;
  - d. service access points are adjusted to be flush with the surface to accommodate any changes in grade;
  - e. service access points are positioned to be out of the normal wheel path to accommodate any changes in traffic patterns and away from intersections; and
  - f. the lines comply with all other requirements of this policy.

#### 5.0-(06) Sanitary Sewer Lines

- 1. Depth of Cover for New Lines. All lines that are not under or within 5.0 feet of the roadway must have a minimum depth of cover of 3.0 feet. All lines which are under or within 5.0 feet of the roadway will have a minimum depth of cover under the pavement surface of 4.0 feet. Further, all lines will be a minimum of 2.0 feet or one half the diameter of the pipe or casing below the pavement structure and sub-grade whichever is lower. All lines will have a minimum depth of cover of 4.0 feet.
- 2. Depth of Cover for Existing Lines. Existing lines may be allowed to remain in place with a reduction of 0.5 feet in the depths of cover specified above.
- 3. Crossings. All crossings under the roadway and within 5.0 ft of the roadway must be encased, except non-pressurized lines.
- 4. Markers. The utility will place a readily identifiable and suitable marker immediately above any sanitary line where it crosses the right-of-way line.
- 5. Location. In urban areas existing longitudinal lines may remain in place provided they comply with the following:
  - a. the lines can be maintained without violating access control;
  - b. the lines will not interfere with the proposed highway improvement project;
  - c. the lines are of sufficient strength and durability to withstand the changed conditions and have adequate remaining service life to prevent maintenance, repair or replacement;
  - d. service access points are adjusted to be flush with the surface to accommodate any changes in grade;
  - e. service access points are positioned to be out of the normal wheel path to accommodate any changes in traffic patterns and away from intersections; and
  - f. the lines comply with all other requirements of this policy.

# 6.0 Overhead Power Lines and Communication Lines

- 1. Type of Construction. Longitudinal lines will be limited to single pole construction. Transverse lines will be limited to single pole construction or that type of construction used on the portion of the line adjacent to the highway right of way. INDOT discourages the placement of towers on highway right of way.
- 2. Vertical Clearances. The vertical clearance for overhead power and communication lines above the highway shall be a minimum of 18.0 feet. The vertical clearance of overhead power lines and communication lines relative to a highway bridge or other highway structure shall provide reasonable space for construction and maintenance activities in accordance with OSHA standards.
- 3. Location. The following applies:
  - a. All new utility pole installations and other above ground appurtenances will be located outside of the appropriate clear zone. New installations will not be permitted where the clear zone extends to the right-of-way line. Similarly, existing installations will be relocated outside of the clear zone when they are found within the project limits of any highway improvement project;
  - b. In rural areas and at uncurbed sections in urban areas, poles supporting longitudinal lines shall be located on a uniform alignment as close to the right-of-way line as possible;
  - c. At curbed sections, in urban areas, poles shall be located as far as practical behind the curb and preferably adjacent to the right-of-way line;
  - d. The number of guy wires placed within the right of way will be held to a minimum. Preferably, guy wires and guy poles placed inside the right of way will be in line with the pole line. Preferably, guy wires and guy poles that are not in line with the pole line will be placed outside of the right of way. Guy wires and guy poles may be placed in other locations but in no case shall they be located within the specified clear zone;
  - e. Poles for longitudinal installations shall not be allowed in the center median. Poles for transverse crossing may be allowed where the cost of spanning an extreme width is excessive and where poles can be located in accordance with the other provisions of this policy;
  - f. The horizontal location of overhead power and communication lines relative to a highway bridge or other highway structure shall provide reasonable adequate clearance for construction and maintenance activities in accordance with OSHA standards; and

g. Ground mounted appurtenances will be located at or near the right-of-way line. Ground mounted appurtenances will be installed with a vegetation free area extending one foot beyond the appurtenance in all directions. The vegetation free area may be provided by an extension of the mounting pad, heavy duty plastic or similar material. The housing for ground mounted appurtenances shall be an inconspicuous color. Appurtenances will not be located within the pavement, shoulders or curbs of any roadway. Existing appurtenances may remain if they do not interfere with proposed highway construction, maintenance, operation or safety.

#### 7.0 Underground Power Lines and Communication Lines

#### 7.0-(01) General

- 1. Conduits. Facilities with conduits will consist of a pipe or other separate structure around and outside the power line or communication line. Conduits may be metallic or nonmetallic. The conduit will be of sufficient strength to withstand external design pressures including superimposed loads of soil, roadway, traffic, construction equipment, etc. Conduit strength will meet or exceed the structural requirements for drainage culverts. Conduit materials must be of satisfactory durability to withstand the conditions to which they may be subjected. Where used, conduits will extend under the median, from top of back slope to top of back slope for cut sections, 5 ft beyond the toe of slope under fill sections, 5 ft beyond the back of the curb, and 5 ft beyond any structure which the lines passes under or through. Conduit may be omitted under medians that are substantially wider than normal standards for such roadway, such as when the roadways are on independent alignments. All conduits must meet any other applicable codes or industry standards.
- 2. Manholes, Vaults, Pits and Hand Holes. Generally, manholes, vaults and pits are discouraged from being placed in the pavement, shoulders or curbs of any roadway. However, if they are permitted in the roadway, they should be installed outside the normal wheel path and away from intersections. In general these types of access points are limited to those necessary to install and service the lines. They will be placed directly in line with the facilities and of the minimum width to accomplish their intended function. They will be installed so the top of the facility is flush with the roadway or ground surface. They will provide sufficient strength to withstand external design pressures including superimposed loads of soil, roadway, traffic, construction equipment, etc.
- 3. Appurtenances. Pedestals, switch box and other similar type above ground features should be located near the edge of the State highway right of way. Appurtenances shall be constructed

with a vegetation free area extending one foot beyond the appurtenance in all directions. The vegetation free area may be provided by an extension of the mounting pad, heavy duty plastic or other material. The housing for all appurtenances shall be an inconspicuous color. Appurtenances will not be located within the pavement, shoulders or curbs of any roadway. Existing appurtenances may remain if they do not interfere with proposed highway construction, maintenance, operation or safety.

#### 7.0-(02) Underground Power Lines

- 1. Depth of Cover for New Lines. All lines that are not under or within 5.0 feet of the roadway must have a minimum depth of cover of 3.0 feet. All lines which are under or within 5.0 feet of the roadway must have a minimum depth of cover under the pavement surface of 4.0 feet. Further, all lines will be a minimum of 2.0 feet or one half the diameter of the line or conduit below the pavement structure and sub-grade whichever is lower. All lines will have a minimum depth of cover of 4.0 feet minimum de
- 2. Depth of Cover for Existing Lines. Existing lines may be allowed to remain in place with a reduction of 0.5 feet in the depths of cover specified above. Also, existing lines may remain in place with a lesser depth of cover if the pipeline is protected by a reinforced concrete slab which complies with the requirements listed below.
  - a. Width. The width shall be three times the pipe diameter or encasement diameter whichever is greater but not less than 4.0 feet.
  - b. Thickness. The thickness shall be a minimum of 6 inches.
  - c. Reinforcing. The minimum reinforcement shall be No. 4 epoxy coated bars on 12 inch center, or the equivalent.
  - d. Cover. The cover shall be at least six inches between the slab and top of pipe.
- 3. Crossings. Underground power lines shall be in a conduit. The use of a conduit or other suitable protection will be considered for power lines located near footings of bridges, highway structures or other locations that may be exposed to workers or the public. The use of a conduit or other suitable protection will be considered for communication lines located near footings of bridges, highway structures or other locations where the integrity of the line may be at risk.

- 4. Markers. The utility will place a readily identifiable and suitable marker immediately above any underground power line where it crosses the right-of-way line.
- 5. Location. In urban areas existing longitudinal lines may remain in place provided they comply with the following:
  - a. the lines can be maintained without violating access control;
  - b. the lines will not interfere with the proposed highway improvement project;
  - c. the lines are of sufficient strength and durability to withstand the changed conditions and have adequate remaining service life to prevent maintenance, repair or replacement;
  - d. service access points are adjusted to be flush with the surface to accommodate any changes in grade;
  - e. service access points are positioned to be out of the normal wheel path to accommodate any changes in traffic patterns and away from intersections; and
  - f. the lines comply with all other requirements of this policy.

#### 7.0-(03) Underground Communication Lines

- 1. Depth of Cover. All lines that are not under or within 5.0 feet of the roadway must have a minimum depth of cover of 3.0 feet. All lines which are under or within 5.0 feet of the roadway must have a minimum depth of cover under the pavement surface of 4.0 feet. Further, all lines must be a minimum of 2.0 feet or one half the diameter of the line or conduit below the pavement structure and sub-grade, whichever is greater. All lines must have a minimum depth of cover of 4.0 feet under ditches.
- 2. Existing lines may be allowed to remain in place with a reduction of 0.5 feet in the depths of cover specified above.
- 3. Crossings. Lines crossing highways do not require conduit. The use of a conduit or other suitable protection will be considered for communication lines located near footings of bridges, highway structures or other locations where the integrity of the line may be at risk.

- 4. Markers. The utility will place a readily identifiable and suitable marker immediately above any underground communication lines where it crosses the right of way line.
- 5. Location. In urban areas existing longitudinal lines may remain in place provided they comply with the following:
  - a. the lines can be maintained without violating access control;
  - b. the lines will not interfere with the proposed highway improvement project;
  - c. the lines are of sufficient strength and durability to withstand the changed conditions and have adequate remaining service life to prevent maintenance, repair or replacement;
  - d. service access points are adjusted to be flush with the surface to accommodate any changes in grade;
  - e. service access points are positioned to be out of the normal wheel path to accommodate any changes in traffic patterns and away from intersections; and
  - f. the lines comply with all other requirements of this policy.

#### **8.0 Irrigation and Drainage Pipes, Ditches and Canals**

- 1. Irrigation and drainage pipes crossing state right of way may be permitted. Irrigation and drainage pipes installed across any highway right of way must be designed, constructed and maintained in accordance with INDOT standards for culverts and bridges.
- 2. Ditches and canals may be permitted on state right of way if they comply with the clear zone requirements of the INDOT *Design Manual*, Chapter 303.

# Appendix A Minimum Depth of Cover for Utility Lines

Minimum Depth of Cover for Utility Lines (Feet)	Under or within 5 ft of pavement or structure(1)	Not under or within 5 ft of pavement or structure	Under ditches
Liquid Petroleum Lines Encased	<mark>4.0</mark>	<u>3.0</u>	4.0
Liquid Petroleum Lines Not Encased	4.0	3.0	4.0
High Pressure Gas Lines Encased	<mark>4.0</mark>	<mark>3.0</mark>	4.0
High Pressure Gas Lines Not Encased	4.0	3.0	4.0
Medium & Low Pressure Gas Lines Encased	<mark>4.0</mark>	<mark>3.0</mark>	4.0
Medium & Low Pressure Gas Lines Not Encased	4.0	3.0	4.0
Water Lines(2)	4.0	3.0	4.0
Sanitary Lines	4.0	3.0	4.0
Underground Power Lines Encased	<mark>4.0</mark>	<mark>3.0</mark>	4.0
Underground Power Lines Not Encased	4.0	3.0	4.0
Underground Communication Lines Encased	<mark>4.0</mark>	<mark>3.0</mark>	<mark>4.0</mark>
Underground Communication Lines Not Encased	4.0	<mark>3.0</mark>	<mark>4.0</mark>
Notes			
(1) Minimum 2.0 ft below structure or improvement			
(2) Dependant on Ten State Standards and IDEM			

#### Appendix B Requirements for Drawing of Sufficient Detail

- Overlay the utility relocations on each INDOT plan and profile sheet and on each cross section utilizing INDOT stationing, offsets and elevations. This applies to poles, aerial and underground lateral crossings and underground facilities that are parallel to the INDOT right of way.
- 2. Label the type of utility facility such as high pressure gas, fiber optics etc.
- 3. Include a legend for utility facility symbols.
- 4. Provide a cross section detail of each duct bank and vault.
- Overlay the utility relocations on temporary right of way drawings or runaround drawings such as those used for the construction of bridges, drainage structures, or for the removal of structures.
- 6. Show the clearances over pavement for proposed overhead crossing lines on the cross sections.
- 7. Label the station and offset of each utility pole.
- 8. Dimension each pole foundation giving depth, width, length or diameter.
- 9. Label each guy offset for the attached pole and depth of the anchor.
- 10. Label the stationing of each underground crossing.
- 11. Label the maximum and /or minimum elevation of each underground facility where it crosses under existing or proposed pavement or ditch. Note that the maximum elevation is to be measured from the top of the pipe and the minimum elevation is to be measured from the bottom of the pipe. If it adds clarity, you may add arrows that show the limits of the set elevations. It may be useful to add a note to the drawing stating, " from Station XXX+XX to Station YYY+YY, the top of the line shall not be higher than AAA.AA," or you may state "at Station XXX+XX from 50.0 feet left to 20.0 feet right

the top of the line shall not be higher than AAA.AA."

- 12. Label the maximum or minimum elevation of each underground facility where it crosses a drainage structure or another utility.
- 13. Label the underground utilities as proposed, existing to remain or existing to be removed.
- 14. Label above and underground appurtenances such as control boxes, climate control units, vaults and hand holes and give the size of each.
- 15. Label poles and other above ground appurtenances as proposed, existing to remain or existing to be removed.
- 16. "X" out facilities to be removed from service.
- 17. Label the offset from the centerline or the distance from proposed right of way of each underground utility that is roughly parallel to the centerline especially at change points.
- 18. Note whether a utility facility is a transmission or distribution utility facility.
- 19. Note the method of installation of underground utility facilities such as bore or direct bury.
- 20. Note the material of underground utility facilities.
- 21. Note which manhole covers will need to be adjusted to grade per the work plan narrative. Note utility contact info for the adjustment of manhole covers.
- 22. Note which out of service pipes are to be filled with cellular grout.
- 23. Note that utility facilities being installed in contaminated soil will be bored and will use suitable pipe material when no provisions have made to remove the contaminated soil.
- 24. Provide any bore pit location and size.
- 25. Note where non metallic lines have metal tracing wires.
- 26. Identify pipes made with asbestos or made with an asbestos casing.
- 27. Identify the location of the utility facility's easements.

Table of Revisions

Revision Date	By	Description	Effective
			Date
14NOV2013	JFG	Revised Appendix A:	14NOV2013
		1. All lines under or within 5 ft of pavement or	
		structure now buried 4.0 ft	
		2. All lines not under or within 5 ft of pavement now	
		buried 3.0 ft	
		3. All lines under ditches now buried 4.0 ft deep.	
		4. Revised the notes	
12JUN2014	JFG	Revised definition of:	12JUN2014
		1. Gas line, high pressure	
		2. Gas line, low pressure	
		3. Gas line, medium pressure	
		4. OSHA	
12JUN2014	JFG	Revised Gas Line, High Pressure:	12JUN2014
		1. Lines allowed for crossings now include 'fusion	
		joined plastic lines'.	
12JUN2014	JFG	Revised Gas Line, Low Pressure & Medium	12JUN2014
		Pressure:	
		1. Lines allowed for crossings now include 'fusion	
		joined plastic lines'.	
14NOV2014	JFG	Revised 'permissions' to 'permission'	14NOV 2014
14NOV2014	JFG	Added requirements for utility relocation drawing of	14NOV2014
		sufficient detail including the use of INDOT plans,	
		stations, offsets, elevations.	
14NOV2014	JFG	Added Appendix B Requirements for a Drawing of	14NOV2014
		Sufficient Detail.	
14NOV2014	JFG	Added the utility is responsible for the removal of	14NOV2104
		inactive facilities that are in conflict with the	
		highway project.	

PERMIT BOND



State Form 415 23 (R4 / 3-00)

Approved by State Board of Accounts, 2000

Driveway Excava	ation Pole Line	Bridge Attac	chment	☐ Misc	Appli
Know all men by these p	presents that we, the Un	dersigned			catio
(address)				as Principal and	
(address)				as Surety, are	—         mbei
hereby held and firmly b payment of which well a executors, administrator	ound unto the State of Ir nd truly to be made, we s successors and assigr	າdiana in the pena hereby jointly and າຣ:	l sum of _ severally	, for the / bind ourselves, our heirs,	
DATED THIS					π
The conditions of the ab	oove obligation are such	that, whereas, the	above na	amed	- I oad nur
 did on		make applicat	tion for a	permit with the State of Indiana for	nber
which permit is made a	part of this bond the sam	ie as though set fo	orth hereii		
Now, if said		(Pr	rincipal - /	Applicant) shall well and faithfully d	lo
and perform the things a to be done and performe	agreed by the ed according to the term:	s of said permit an	nd to the s	(Principal - Applicar satisfaction of the Indiana	it) Cou
Department of Transpor	tation, and shall pay all I	awful claims of the	e contract	tor, vendors and laborers for labor	nty -
performed and materials	s furnished, or other serv	ices rendered in th	he carryin	ng forward, performing and	num
otherwise the same sha	II, (on life with the Depar	effect it being ex	nation), th pressly u	inderstood and agreed that the	ber
liability of the Surety for	any and all claims hereu	inder except as pr	ovided be	elow shall in no event exceed the	
penal sum of this obligation	tion as herein stated. In	event of noncomp	bliance the	e surety shall be liable for the	
court costs and attorney	r fees spent in the collect	ion of this bond ov	ver and a	bove the penal sum of this	Rea
obligation.					ceiv
IN WITNESS WHER	EOF, we hereunto set ou 20	ur hands and seals	s this	day of	f da
Surety			Princ	 cipal	
(Attach Powe	r of Attorney)				
State of		, County of		s	s: S: SC
Personally appeared	before me.				l e d
	as Principa	al and			ate
	as S	urety and each ac	cknowledg	ged the execution of the above bor	nd
this	day of	, 2	20		
Witness my hand and	d		_seal the	said last named date.	
My Commission Expires	s	, 20			_
l reside in	C	county,	Notar	ry Public (Written Signature)	Perm
		(State)	Notary	Public (Printed or Typed Name)	lit n
Bond number			RMINAT		m
		ELLED		, 20 DATE	—    ber
Submit all 5 copies	By:				
		PERMI		 B	

# **APPENDIX D**

# **GEOTECHNICAL REPORTS**

# APPENDIX D – GEOTECHNICAL REPORTS

- GEOTECHNICAL INVESTIGATION BY CTL ENGINEERING, INC. DATED JANUARY 27, 2018
- SOIL BORINGS BRIDGE PLANS FOR SPANS OVER 20' ROUTE, HIGH SCHOOL ROAD, PROJECT NO. IM-70-3


Consulting Engineers – Testing – Inspection Services – Analytical Laboratories

January 27, 2018

Wessler Engineering, Inc. 6219 South East Street, Indianapolis, IN 46227

Attention:	Mr. William Leber, PE, LEED AP Senior Project Manager
Reference:	Geotechnical Investigation Stormwater and Deicing Capacity Projects – Hanna and Seerley IAA Project I-17-077
	Indianapolis International Airport
	Indianapolis, Indiana
	CTL Project No.: 17050063IND

Dear Mr. Leber:

CTL Engineering, Inc. has completed the geotechnical investigation on the above referenced site. Enclosed is an electronic copy of the report.

Thank you for the opportunity to be of service to you on this project. If you have any questions or need further information, please contact us at (317) 295-8650.

Sincerely,

CTL ENGINEERING, INC.

her M Max

Shawn M. Marcum, PE Senior Project Engineer

#### **GEOTECHNICAL INVESTIGATION**

## STORMWATER AND DEICING CAPACITY PROJECTS HANNA AND SEERLEY IAA PROJECT I-17-077 INDIANAPOLIS INTERNATIONAL AIRPORT INDIANAPOLIS, INDIANA CTL PROJECT NO.: 17050063IND

**PREPARED FOR:** 

## WESSLER ENGINEERING, INC. 6219 SOUTH EAST STREET, INDIANAPOLIS, IN 46227

#### **PREPARED BY:**

CTL ENGINEERING, INC. 1310 S. FRANKLIN ROAD INDIANAPOLIS, INDIANA 46239

**JANUARY 27, 2018** 





Consulting Engineers – Testing – Inspection Services – Analytical Laboratories

January 27, 2018

Wessler Engineering, Inc. 6219 South East Street, Indianapolis, IN 46227

Attention:	Mr. William Leber, PE, LEED AP Senior Project Manager
Reference:	Geotechnical Investigation
reference.	Stormwater and Deicing Capacity Projects – Hanna and Seerley
	IAA Project I-17-077
	Indianapolis International Airport
	Indianapolis, Indiana
	CTL Project No.: 17050063IND

Dear Mr. Leber:

In accordance with your authorization, CTL Engineering, Inc. has completed the geotechnical investigation on the above referenced site. The attached report includes the results of the field and laboratory testing, foundation recommendations and soil parameters required for the design of the proposed facility improvements.

Thank you for the opportunity to be of service to you on this project. If you have any questions, please contact our office at (317) 295-8650.

Sincerely,

CTL ENGINEERING, INC.

have M Maca

Shawn M. Marcum, PE Senior Project Engineer

# **Table of Contents**

I.	PROJECT LOCATION AND DESCRIPTION	1
II.	SUBSURFACE INVESTIGATION	2
III.	FINDINGS	3
А	. Subsurface Conditions	3
B	Groundwater	5
IV.	DISCUSSIONS AND RECOMMENDATIONS	5
А	. Excavations	5
B	. Groundwater Management	7
С	. Hanna North Structure Support	8
D	. Hanna South Structure Support 1	0
E.	Hanna Stormwater Basins 1	1
F.	West Seerley Storage Structure Support 1	4
G	. Lateral Earth Pressure and Below-Grade Walls 1	5
Н	. Pipe Support (Open-Cut Method) 1	6
I.	Pipe Support (Trenchless Installation Method) 1	7
J.	Site Preparation and Earthwork 1	8
Κ	. Seismic Considerations 1	9
V.	CHANGED CONDITIONS 1	9
VI.	TESTING AND OBSERVATION 1	9
VII.	CLOSING	20

# List of Tables

Table 1 – Soil Parameters for Earth Retention	6
---	---

#### **List of Appendices**

- APPENDIX A SCOPE OF WORK PLAN OVERALL CONSTRUCTION LAYOUT PLAN
- APPENDIX B TEST BORING RECORDS PIEZOMETER CONSTRUCTION RECORDS WATER LEVEL READINGS
- APPENDIX C LABORATORY TESTING
- APPENDIX D SOIL PROFILES SETTLEMENT, SLOPE STABILITY AND SEEPAGE ANALYSES



## I. <u>PROJECT LOCATION AND DESCRIPTION</u>

The project is located at the Indianapolis International Airport located on the west side of Indianapolis, Indiana. The overall project consists of design and construction of new stormwater and deicing runoff transport and storage facilities to be located along High School Road north of Hanna Avenue extending to the existing Seerley basins north of Perimeter Road (Seerley and Hanna facilities, I-17-077) and an area located south of Runway 5R-23L between South Perimeter Road and Interstate 70 (West facility, I-17-078). This report covers the proposed Hanna and Seerley facility improvements. The general layout of the Hanna and Seerley improvements are shown on the attached Scope of Work Plan, Overall included in Appendix A. The Hanna facility improvements will consist of two new pump stations (Hanna North Structure and Hanna South Structure), the Dollar Creek water quality treatment structure, two new basins and a future basin and associated piping and access drives. The general layout of the Hanna facility improvements are shown on the Construction Layout Plan included in Appendix A. The Seerley facility improvements will consist of two new below-grade storage structures (Seerley West and Seerley East) and associated piping and demolition and backfilling of the existing basins. The general layout of the Seerley facility improvements are shown on the Construction Layout Plan included in Appendix A.

The proposed Hanna North pump station will be a multi-level structure with floor slab elevations varying from El 730 to El 775. The structure will have plan dimensions on the order of 64 feet by 90 feet.

The proposed Hanna South structures will consist of the Hanna underdrain pump station, Hanna Dollar Hide Creek pump station and a Vortechs structure. The pump stations will be multi-level structures with floor slab elevations varying from El 722 to El 747. The pump station structures will have plan dimensions on the order of 27 feet by 30 feet and 18 feet by 23 feet. The Vortechs structure will have plan dimensions of approximately 10 feet by 16 feet will a base slab level of approximately El 746.

The Hanna stormwater basins will have a rectangular shape with dimensions on the order of 500 feet by 525 feet (crest to crest). The crest of the basin is planned at El 769 with the base at El 738. Approximately 9 to 17 feet of fill will be needed to construct the perimeter berms and 14 to 19 feet of cut will be needed to establish the basin base. The interior side slopes of the basin are currently designed at a rate 3:1 (H:V) and the exterior slopes are designed at 4:1 (H:V). The basins will have a 45 mil reinforced polypropylene (RPP) liner overlying an underdrain system consisting of perforated piping.

The existing Seerley Creek basins will be demolished and backfilled to match the surrounding site grade. The base of the existing Seerley West basin varies from approximately El 745 (east end) to El 752 (west end). The finish grade will vary from El



758 to El 776 to match the surrounding grade. Therefore, approximately 20 feet of fill will be needed to establish the design grade within the Seerley West basin area.

The Seerley West storage structure will be located north of South Perimeter Road east of the existing Seerley basin. The storage structure will have plan dimensions of approximately 458 feet by 230 feet with base slab elevations varying from El 741.5 to 739.5 and top of structure between approximately El 764 and El 762.

A new 78 inch diameter sewer will be constructed to connect the proposed Seerley storage structures and the Hanna North Structure. The new sewer will cross below Interstate 70 and then cross below High School Road, then turn south to parallel High School Road to the Hanna North Structure.

Two new 24 feet by 10 feet reinforced concrete culverts will be constructed along the south side of the existing Seerley West basin and connect to the new Seerley West Storage structure.

# II. <u>SUBSURFACE INVESTIGATION</u>

Twenty nine (29) test borings were drilled to depths varying from 35 feet to 74.5 feet below the existing ground surface. Piezometers were installed at boring locations W-1 through W-5 at a depths ranging from 35 to 45 feet below existing grade. The test borings B-1 through 12, W-1 and W-2 were drilled in the vicinity of Hanna Structures. The test borings B-24 through 27 and W-5 were drilled in the vicinity of Seerley West Structures. The test borings B-24 through 27 and W-5 were drilled in the vicinity of sewer alignments. The test borings were drilled at the approximate locations as overlaid on the attached Scope of Work, Overall plan and the Construction Layout Plans in Appendix A. The Test Boring Records are included in Appendix B.

The test borings were advanced with an ATV mounted drilling rig utilizing hollow stem augers (HSA) between October 19, 2017 and December 6, 2017. Standard Penetration tests were conducted using a 140-pound automatic hammer falling 30 inches to drive a 2-inch O.D. split barrel sampler for 18 inches.

Soil samples obtained from the drilling operation were preserved in glass jars and visually classified in the field by the drilling crew and in the laboratory by a geotechnical engineer. Representative soil samples were tested for Natural Moisture Content, pH, Atterberg Limits, Grain Size Distribution, Unit Weight and Unconfined Compressive Strength. Triaxial, Permeability and Consolidation testing were performed on representative Shelby tube samples.



Drilling, soil sampling and laboratory testing were performed following standard geotechnical engineering practices and current ASTM procedures. Results from field tests are shown on the enclosed Test Boring Records in Appendix B and laboratory test sheets in Appendix C.

The test boring locations were designated by Wessler and modified based on the 30% Design Plans. Northing and easting coordinates of the test borings were determined in the field by CTL using a Geo7X handheld GPS system. Surface elevations of the test borings were estimated from topographic mapping and Marion County GIS. Boring locations, coordinates and surface elevations shown on the plans in Appendix A and the Test Boring Records in Appendix B should be considered approximate.

# III. <u>FINDINGS</u>

#### A. <u>Subsurface Conditions</u>

#### Hanna Structures

Fourteen (14) test borings (B-1 through 12, W-1 and W-2) were drilled to depths varying from 35.0 feet to 50.0 feet below the existing ground surface in the vicinity of the proposed structures. The test borings were drilled at the approximate locations as shown on the attached Construction Layout Plan in Appendix A. The Test Boring Records are included in Appendix B.

The test borings encountered approximately 4 to 18 inches of topsoil at the surface. Below the surface cover of topsoil, the test borings typically encountered lean clay, silty and clayey sands overlying silty clay, lean clay or silty clayey sand glacial tills. The top of the glacial till layer was encountered at elevations ranging from 751.0 to 734.5. Zones of sand and gravel were encountered in borings B-7 and B-12 between approximately elevations 743.5 and 738.0 and elevations 745.0 and 740.0, respectively.

Standard penetration blowcount values in the upper layers of lean clay, silty and clayey sands typically ranged from 0 to 42 blows per foot (bpf) and in the lower glacial till soils it ranged between 7 to above 50 bpf. Natural moisture content values of soil overburden ranged from 7 to 31 percent.

Auger refusal on large cobbles or boulders was encountered at boring location B-2. The boring was offset and redrilled to the design boring depth. Cobbles and boulders should be expected within the soils at this site.



#### Seerley West Structure

Five (5) test borings (B-24 through 27 and W-5) were drilled to depths varying from 35.0 feet to 69.9 feet below the existing ground surface in the vicinity of the proposed storage structure. Test boring logs (DFIM-21 and DFIM-22) for two borings drilled during a previous study are also included. The test borings were drilled at the approximate locations as shown on the attached Construction Layout Plan in Appendix A. The Test Boring Records are included in Appendix B.

The test borings encountered approximately 4 to 12 inches of topsoil at the surface. Below the surface cover of topsoil, the test borings typically encountered lean clay and silty clay overlying silty clay glacial till. Zones of granular soils were encountered in borings B-24, B-25, DFIM-21 and DFIM-22. The top of the hard glacial till layer was encountered at elevations ranging from El 745± to El 738±. Shale bedrock was encountered below the glacial till in boring B-24 at approximately El 701±.

Standard penetration blowcount values (N-values) in the upper layers of the lean clay, silty clay and silty sand soils typically ranged from 3 to 24 blows per foot (bpf) and in the lower glacial till soils the N-values ranged between 22 to above 50 bpf. Natural moisture content values of soil overburden ranged from 8 to 23 percent.

Auger refusal on large cobbles or boulders was encountered at boring locations B-25, B-26 and B-26A. The borings were offset and redrilled to the design boring depths. Cobbles and boulders should be expected within the soils at this site.

#### Sewer Alignment

Nine (9) test borings (B-13 through 20, W-3 and W-4) were drilled to depths varying from 35.0 feet to 74.5 feet below the existing ground surface in the vicinity of the sewer alignments. The test borings were drilled at the approximate locations as shown on the attached Scope of Work, Overall plan in Appendix A. The Test Boring Records are included in Appendix B.

The test borings encountered approximately 4 to 12 inches of topsoil at the surface. 12 inches of sand with limestone was encountered at the surface in boring B-13. Below the surface cover, the test borings typically encountered lean clay, silty clayey sands overlying silty clay glacial tills. The top of the glacial till layer was encountered at elevations ranging from 755.5 to 743.0. Shale bedrock was encountered in boring B-17 at an elevation of 704.5. Zones of sand and gravel were encountered in borings B-19 and W-4 between approximately elevations 753.5 and 751.0 and elevations 752.0 and 745.0, respectively.



Standard penetration blowcount values in the upper layers of lean clay, silty clayey sands typically ranged from 3 to 41 blows per foot (bpf) and in the lower glacial till soils it ranged between 10 to above 50 bpf. Natural moisture content values of soil overburden ranged from 4 to 27 percent.

Auger refusal on large cobbles or boulders was encountered at boring locations B-2, B-18, B-25 and B-26. The borings were offset and redrilled to the design boring depth. Cobbles and boulders should be expected within the soils at this site.

# B. <u>Groundwater</u>

Groundwater levels were recorded during drilling operations as shown on the attached Test Boring Records and Summary of Groundwater Depths in Appendix B. Two-inch diameter piezometers were installed at borings W-1 through W-5 to depths ranging from 35.0 to 45.0 feet in order to obtain additional delayed groundwater readings. Delayed groundwater readings obtained from the piezometers indicated that the groundwater was encountered at approximate elevations ranging from 749 to 754. It should be noted that groundwater levels recorded during this subsurface investigation borings are generally not a reliable indication of longterm groundwater levels. Fluctuations in the groundwater level can occur with seasonal and weather conditions.

## IV. DISCUSSIONS AND RECOMMENDATIONS

Based upon the preceding discussion as well as the subsurface information obtained from the field and laboratory testing, the following recommendations are provided.

## A. <u>Excavations</u>

The 60% design plans indicate that the depth of the proposed pump structures, storage structures and storage basins will typically extend as deep as 20 to 30 feet below the existing ground surface. Temporary retention systems may be necessary for the construction of the proposed structures. Estimated soil parameters are provided in Table 1 below. These parameters may be used in the design of temporary and permanent earth retention structures for this project along with the recommendations provided in the following paragraphs.



	Material Type			
Parameters	Lean Clay	Silty Clayey Sand	Glacial Till	Sand and Gravel
Total Unit Weight, pcf	125	125	135	130
Cohesion, psf	50	0	400	0
Angle of Internal Friction, Degrees	25	30	28	32
At Rest Pressure Coefficient, Ko	0.58	0.50	0.53	0.47
Active Pressure Coefficient, K <sub>a</sub>	0.41	0.33	0.36	0.31
Passive Pressure Coefficient, K <sub>p</sub>	2.46	3.00	2.77	3.25

Table 1 – Soil Parameters	for Earth Retention
---------------------------	---------------------

- 1. Care should be taken while excavating adjacent to existing utilities, roadways or other structures so as not undermine the existing support. The effect of the excavation on the adjacent structures should be considered. Depending upon the type of foundation system of nearby structures, underpinning may be required.
- 2. Nearby structures and other surface supported features should be monitored on a daily basis to evaluate the effect of the excavation and any dewatering. Results of the monitoring should be provided to the Structural Engineer on a daily basis. The Structural Engineers should determine acceptable limits of lateral and vertical deflections prior to excavation. In the event that excessive lateral or vertical movement is noted, the Structural Engineers should be notified immediately.
- 3. Temporary excavations in excess of 5.0 feet in depth should be sloped or shored in accordance with OSHA regulations. Preliminary analysis indicates that temporary excavation sidewalls less than 20 feet in height should be laid back at a slope rate no steeper than 2:1 H:V (Horizontal to Vertical). Slope rates for excavation sidewalls in excess of 20 feet in height should be designed by a Professional Engineer.

Temporary shoring systems, where required, should be designed by a Licensed Engineer familiar with the design of earth retention systems. The design of the shoring system should also take into account loading adjacent to the excavation such as foundation or vehicular loads and soil stockpiles.



4. Cobbles and boulders are likely to be present within the subsurface soils at these sites which could make installation of sheet piling difficult. Sheet piling may need to be relocated and re-driven if large cobbles or boulders are encountered.

## B. <u>Groundwater Management</u>

Excavations to the anticipated depths for this project will likely encounter groundwater. In the vicinity of the Hanna structures and basins, groundwater was generally encountered at elevations ranging from approximately El 752 to El 748. Based on the ground water level readings taken in piezometers installed at borings W-1, W-2 and W-3, it appears that the natural phreatic surface is between approximately El 749± and 751±. Temporary dewatering will be required during excavation and construction of the proposed structures for excavations extending below El 752±.

In the vicinity of the Seerley West storage structure, groundwater was encountered at elevations ranging from approximately El 759.4 to El 737.8. Based on the ground water level readings taken in piezometer installed at boring W-5 and the existing monitoring well, it appears that the natural phreatic surface is between approximately El 750 $\pm$  and 746 $\pm$ . Temporary dewatering will be required during excavation and construction of the proposed structure for excavations extending below El 750 $\pm$ . Perched groundwater will likely be contained in discontinuous granular zones within the glacial till above El 750.

It is recommended that the groundwater level be maintained at least 3 feet below the deepest anticipated excavation at the structures during construction. The ground water level should be maintained at this level until the structure is complete and the backfill is placed around the structure.

The design of a construction dewatering system or systems for this project is beyond the scope of this investigation. An experienced Dewatering Contractor familiar with projects of similar scope and size should design, install and monitor the dewatering system for any proposed excavation where water will likely be encountered. The dewatering system should be carefully designed so that adjacent structures are not adversely affected by the operation. The pumping rate should be calculated and screen sizes determined so as to prevent removal of finegrained soils, which could result in settlement of adjacent buildings and utilities, or the collapse of excavation sidewalls and pavements.



> Most of the proposed below-grade structures will need to be designed to resist uplift forces resulting from the difference between the highest expected groundwater level and the lowest expected level in the structures. It is assumed that, at the time of construction, and at least for maintenance and cleaning, the structures will be empty at some point. Fluctuations in the groundwater levels should be anticipated.

> Raising the structures or permanently lowering the groundwater level could reduce the uplift forces. It is assumed that neither of these options is practical for this project. Increasing the dead weight of the structures could raise the uplift resisting force. This could be accomplished by thickening the base slab, or extending the base slab beyond the edge of the structures. Extending the base slab would increase the effective weight of the structures by the weight of the additional concrete and the soil overlying the projecting concrete lip. Alternatively, due to the size and depth of the structures as well as the anticipated groundwater level, it may be necessary to install tie-down elements that are structurally connected to the bottom slab to resist uplift forces on the structure. Considerations may be given to installing soil nails, micro piles or rammed aggregate piers with tension elements to provide resistance against uplift. Discussions with specialty contractors regarding suitability of these options will be needed.

## C. <u>Hanna North Structure Support</u>

The proposed Hanna North pump station will be a multi-level structure with floor slab elevations varying from El 730 to El 775. Foundation and slab support recommendations are provided in the following paragraphs.

# 1. <u>Foundation Support</u>

Based upon the information stated above, the pump station structure will be supported on spread footings or mat foundations bearing on hard glacial till soils, upper medium stiff to very stiff cohesive soils or on newly placed fills. The following recommendations are based on these assumptions.

1. The proposed Hanna North structure and equipment may be supported on spread footings or mat foundations bearing on the existing soils. Foundation units bearing below El 745 may be proportioned using an allowable soil bearing capacity not exceeding 4,000 psf. A Modulus of Subgrade Reaction value of 125 pounds per cubic inch (pci) may be used in the evaluation of subgrade soils for mat foundations.



> Foundation units bearing on natural soils above El 745 may be proportioned using an allowable soil bearing capacity not exceeding 2,000 psf. A Modulus of Subgrade Reaction value of 100 pounds per cubic inch (pci) may be used in the evaluation of subgrade soils for mat foundations. Foundation units bearing on compacted aggregate fill or flowable fill placed on the very stiff to hard natural soils below El 745 after the upper natural soils are removed may be proportioned using an allowable soil bearing capacity not exceeding 3,000 psf. It will be necessary to extend the undercut excavation at a rate of 1(H):2(V) below the outside edge of the foundation unit. All foundation bearing surfaces should be observed and approved by the Geotechnical Engineer.

- 2. Minimum widths for individual columns and continuous wall footings should be 24 and 18 inches, respectively. Minimum widths are required to provide a margin of safety against local or punching shear failure.
- 3. Exterior footings should be constructed at a minimum depth of 3 feet below the lowest adjacent exterior grade to offset the effects of frost penetration.
- 4. Exposed foundation materials should be protected from freezing weather, severe drying, and water. Foundation subgrade materials that become unsuitable due to weather exposure should be removed prior to concrete placement and excavate only the footings that can be replaced with concrete the same day.

# 2. <u>Slab Support</u>

- 1. On-grade slabs may be supported directly on a base course of approved granular materials placed on top of engineered fill or native soils conforming to the dry density and moisture recommendations presented in IV.J.
- 2. Granular base should be a minimum of 6 inches thick to provide adequate support.
- 3. A Modulus of Subgrade Reaction value of 100 pounds per cubic inch (pci) may be used in the evaluation of subgrade soils for slab support.



#### D. Hanna South Structure Support

The proposed Hanna South structures will consist of the Hanna underdrain pump station, Hanna Dollar Hide Creek pump station and a Vortechs structure. The pump stations will be multi-level structures with floor slab elevations varying from El 722 to El 747. The Vortechs structure will have a base slab level of approximately El 746.

## 1. Foundation Support

Based upon the information stated above, the structures will be supported on spread footings or mat foundations bearing on firm natural soils. The following recommendations are based on these assumptions.

- 1. The proposed Hanna South structures and equipment may be supported on spread footings or mat foundations bearing on the existing soils. Foundation units bearing below El 745 may be proportioned using an allowable soil bearing capacity not exceeding 4,000 psf. A Modulus of Subgrade Reaction value of 125 pounds per cubic inch (pci) may be used in the evaluation of subgrade soils for mat foundations. Foundation units bearing above El 745 may be proportioned using an allowable soil bearing capacity not exceeding 2,000 psf. A Modulus of Subgrade Reaction value of 100 pounds per cubic inch (pci) may be used in the evaluation of subgrade soils for mat foundations. Foundation units bearing on compacted aggregate fill or flowable fill placed on the very stiff to hard natural soils below El 745 after the upper natural soils are removed may be proportioned using an allowable soil bearing capacity not exceeding 3,000 psf. It will be necessary to extend the undercut excavation at a rate of 1(H):2(V) below the outside edge of the foundation unit. All foundation bearing surfaces should be observed and approved by the Geotechnical Engineer.
- 2. Minimum widths for individual columns and continuous wall footings should be 24 and 18 inches, respectively. Minimum widths are required to provide a margin of safety against local or punching shear failure.
- 3. Exterior footings should be constructed at a minimum depth of 3 feet below the lowest adjacent exterior grade to offset the effects of frost penetration.



4. Exposed foundation materials should be protected from freezing weather, severe drying, and water. Foundation subgrade materials that become unsuitable due to weather exposure should be removed prior to concrete placement and excavate only the footings that can be replaced with concrete the same day.

# 2. <u>Slab Support</u>

- 1. On-grade slabs may be supported directly on a base course of approved granular materials placed on top of engineered fill or native soils conforming to the dry density and moisture recommendations presented in IV.J.
- 2. Granular base should be a minimum of 6 inches thick to provide adequate support.
- 3. A Modulus of Subgrade Reaction value of 100 pounds per cubic inch (pci) may be used in the evaluation of subgrade soils for slab support.

## E. <u>Hanna Stormwater Basins</u>

The Hanna stormwater basins will have a rectangular shape with dimensions on the order of 500 feet by 525 feet (crest to crest). The crest of the basin is planned at El 769 with the base at El 738. Approximately 9 to 17 feet of fill will be needed to construct the perimeter berms and 14 to 19 feet of cut will be needed to establish the basin base. The interior side slopes of the basin are currently designed at a rate 3:1 (H:V) and the exterior slopes are designed at 4:1 (H:V).

Slope stability performed on the proposed basin embankment indicated a factor of safety of 2.1 for interior side slopes of 3:1 (H:V). Steepening the slopes to a rate of 2.5:1 (H:V) results in a factor of safety of 1.4, which is slightly below the recommended factor of safety of 1.5.

Total settlements on the order of 3 to 5 inches are anticipated near the centerline of the crest due to the fill placed for the construction of the perimeter berms. A waiting period of approximately 8 weeks is anticipated for the remaining settlement to be less than approximately 1/2 inch. The results of the settlement analysis are included within Appendix D.

Due to the anticipated settlements, construction sequencing will need to be analyzed to determine the affect of the settlements on piping connections and structure foundations. Proposed piping and structure foundations above



approximately El 745 may experience significant settlements if placed prior to the proposed perimeter berm embankment fill. In these areas, it may be prudent to over excavate the settlement susceptible soils above El 745 and place engineered fill to reestablish the invert or bearing elevations.

It is estimated that the maximum infiltration pumping rate needed for each basin will be on the order of 800 to 1,000 gallons per minute. This pumping rate was estimated assuming a high ground water level of El 752 and estimating that approximately one-third of the base and side areas of the basin excavation will encounter granular materials. These values are based on the results of the test borings and laboratory infiltration testing and should be considered estimates of the groundwater pumping rate that may be experienced.

General guidelines and recommendations are provided in the following

- 1. All topsoil encountered within the proposed construction limits should be stripped and may be stockpiled separately for landscaping.
- 2. The soils encountered at this site within the depths of the proposed basin could be excavated using standard excavation equipment. The clay soils encountered in the upper 4 to 6 feet of borings B-6, B-8, and W-2 are plastic, and would be well suited for use as clay liner material. It is recommended that these soils be stockpiled separately for later use.
- 3. Excavations for the equalization basin constructed to or below elevation 751 will likely encounter groundwater. The groundwater is generally associated with the underlying silty sand and sand and gravel seams and layers. Temporary dewatering will be required during excavation and construction of the proposed basin. Groundwater management provided in Section IV.B may be considered for this basin. Dewatering should be continued until the drainage system designed below the basin is in operation and/or the water level in the basin exceeds the general groundwater level, so that hydrostatic forces do not lift and potentially damage the anticipated pond liner.
- 4. During earthwork operations, care should be taken to provide adequate drainage on the surface of the exposed soils. Absorption of groundwater or heavy rainfall accumulations may result in moisture absorption and related swelling.
- 5. The soils at the proposed subgrade should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. Soft/loose soils and/or unstable soils should be disked, dried and recompacted.



- 6. The liner material should be placed in layers not to exceed 8 inches in loose thickness, with each layer compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. The surface of each soil lift should be scarified slightly to ensure bonding with the subsequent lift. The fill should be placed with moisture content values between 2 to 4 percent above the optimum moisture content.
- 7. The compacted lifts of the clay liner should be protected from drying at all time during and subsequent to placement. Clay liner exposed to drying would result in cracking.

# F. <u>Seerley West Basin Backfill</u>

The existing Seerley Creek basins will be demolished and backfilled to match the surrounding site grade. The base of the existing Seerley West basin varies from approximately El 745 (east end) to El 752 (west end). The finish grade will vary from El 758 to El 776 to match the surrounding grade. Therefore, approximately 20 feet of fill will be needed to establish the design grade within the Seerley West basin area. The following recommendations are based on this information.

- 1. All soft, wet and/or unstable soils encountered after removal of the liner and associated structures should be removed.
- 2. Excavations for the basin demolition will likely encounter groundwater. The groundwater is generally associated with the underlying silty sand and sand and gravel seams and layers. Temporary dewatering will likely be required during demolition and backfilling of the existing basin. Groundwater management provided in Section IV.B may be considered for this basin.
- 3. During earthwork operations, care should be taken to provide adequate drainage on the surface of the exposed soils. Absorption of groundwater or heavy rainfall accumulations may result in moisture absorption and related swelling.
- 4. The backfill soils should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. Soft/loose soils and/or unstable soils should be disked, dried and recompacted.
- 5. New embankment fills placed on existing and/or against already built embankments should be benched. Soft soils and/or loose soils if encountered



at or below the proposed fill should be removed and replaced with compacted engineered fill.

- 6. The backfill should be placed in layers not to exceed 8 inches in loose thickness, with each layer compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. The surface of each soil lift should be scarified slightly to ensure bonding with the subsequent lift. The fill should be placed with moisture content values between -1 to 2 percent above the optimum moisture content.
- 7. Due to the thickness of the expected backfill zone (20 feet), approximately 1 to 3 inches of settlement may take place within the newly placed cohesive backfill after completion of the backfilling procedures. Lime modification of the backfill soils or dynamic compaction could be utilized to reduce settlement of the backfill materials. Alternatively, granular fill or in-place modification of the backfill soils could be performed in the vicinity of settlement sensitive structures constructed on the backfill materials.

## G. <u>West Seerley Storage Structure Support</u>

The proposed storage structure will have a base slab between El 741.5 and El 739.5 and a channel structure with a base slab at El 732. Foundation and slab support recommendations are provided in the following paragraphs.

- 1. The proposed storage structure may be supported on spread footings or mat foundations bearing on the hard glacial till below El 744. Foundation units may be proportioned using an allowable soil bearing capacity not exceeding 4,000 psf. These values apply to the total of all design loads. A Modulus of Subgrade Reaction value of 125 pounds per cubic inch (pci) may be used in the evaluation of subgrade soils for slabs-on-grade. All foundation bearing surfaces should be observed and approved by the Geotechnical Engineer.
- 2. Minimum widths for individual columns and continuous wall footings should be 24 and 18 inches, respectively. Minimum widths are required to provide a margin of safety against local or punching shear failure.
- 3. Exterior footings should be constructed at a minimum depth of 3 feet below the lowest adjacent exterior grade to offset the effects of frost penetration.
- 4. Exposed foundation materials should be protected from freezing weather, severe drying, and water. Foundation subgrade materials that become unsuitable due to weather exposure should be removed prior to concrete



placement and excavate only the footings that can be replaced with concrete the same day.

Due to the size and depth of the structure as well as the anticipated groundwater level, it will be necessary to install tie-down elements that are structurally connected to the bottom slab to resist uplift forces on the structure. Considerations may be given to installing soil nails, micro piles or rammed aggregate piers with tension elements to provide resistance against uplift. Discussions with specialty contractors regarding suitability of these options will be needed.

# H. Lateral Earth Pressure and Below-Grade Walls

It has been assumed that the below-grade walls will be designed as rigid, nonyielding structures that are not allowed to rotate. A soil unit weight of 130 pounds per cubic foot and at-rest lateral earth pressures should be used to design the below-grade walls. An at-rest lateral earth pressure coefficient,  $(K_o)$ , of 0.6 should be used if cohesive soils are used as backfill around the proposed belowgrade portions of the structure. An at-rest lateral earth pressure coefficient,  $(K_o)$ , of 0.45 can be used if granular soils are used as backfill around the proposed below-grade structure. For the granular, at-rest coefficient value of 0.45 to be valid, the granular backfill must extend out from the base of the wall at an angle of a least 45 degrees from the vertical. In areas where a sheeted excavation will be constructed to construct the below-grade portions of a proposed structure, the soil properties in Table 2 can be used to design those portions of the proposed below-grade structure.

An equivalent fluid pressure of 90 pounds per square foot per foot of depth may be used for the design of below grade structures where granular backfill is used as described above. This pressure includes hydrostatic pressure due to groundwater.

The design of the walls should also take into account the influence of surcharge loads that will be applied adjacent to the below-grade structures, such as foundation, floor or vehicle loads as well as hydrostatic pressures.



# I. <u>Pipe Support (Open-Cut Method)</u>

- 1. The subgrade for pipe support will vary greatly along the alignments. The soils at this site, in their native conditions, would generally be expected to provide adequate support for the pipe. However, cohesive soils exposed to standing water can swell and soften. In addition, silt and fine sand soils can easily become disturbed by construction activities, particularly in the presence of water. In such an event, it is recommended that a minimum of 6 inches be over excavated, and that this over excavation be backfilled with coarse angular gravel. The gravel will provide uniform support for the pipe, can be utilized in the dewatering process, and can act as a mudmat to protect the soils from disturbance by water and construction activities.
- 2. Groundwater may be encountered in excavations depending on the depth and location of the excavation. Seepage water trapped in the upper soil layers could also be encountered depending upon time of construction and amount of precipitation. Dewatering can be accomplished as recommended above in section IV.B.
- 3. On-site excavated soils, except topsoil, are considered suitable for use for backfill provided proper moisture content is maintained during placement. A portion of the excavated soils may exhibit natural moisture content above the optimum moisture. Such soils may require air-drying and/or chemical modification for re-use. Additional fill, if required, may consist of sandy silt, sand and gravel materials, flowable fill, or as otherwise directed by the Engineer.
- 4. If the excavated material is used in place of flowable fill, the backfill material should be placed in layers not exceeding 8 inches in loose lift thickness, with each layer compacted to meet the appropriate requirements listed below, or as otherwise specified by the Engineer. Loose lift thicknesses greater than 8 inches may be used provided the contractor can demonstrate that the required compaction targets are being achieved. The engineered fill should not be placed in a frozen condition or over a frozen subgrade.
  - Trenches within the influence zone of roadways or any structures should be compacted to 95 percent of the material's modified Proctor maximum dry density (MDD) as determined by ASTM D 1557 to reduce the potential risk for settlement of the fill beneath the surface supported features.



- Trenches in existing lawn areas and areas outside the influence line for support of any structures or pavement should be compacted to at least the density of the surrounding ground but not less than 90 percent of the material's modified Proctor maximum dry density (MDD) as determined by ASTM D 1557, or as otherwise specified by the Engineer.
- 5. Pipe installation, trench width, bedding and backfill compaction should be performed in accordance with applicable project specifications.

#### J. <u>Pipe Support (Trenchless Installation Method)</u>

Trenchless installation may be used on this project in some locations. Below are preliminary recommendations regarding the trenchless installation methods.

- 1. Lean clay, fat clay, sand, silty gravel, clayey glacial till deposits along with cobbles and boulders in isolated locations and shale bedrock should be expected for trenchless and/or bore and jack method of pipe installations. Groundwater is expected during the trenchless operation in deep excavations.
- 2. Placement of the proposed casings will require bore and jack machines capable of extending the casings into dense silty sand/gravel deposits and hard glacial tills with the chance of encountering cobbles and/or boulders.
- 3. Trenchless installation should have minimal effect on surface settlements of the existing roadways and surface features provided that all boreholes are cased during installation. Soil subsidence could occur if boreholes are left uncased due to the cohesionless nature of the underlying soils within and above the proposed casings in some locations. Also, pumps should be appropriately sized to limit fine soil migration during boring. Excessive pumping and loss of fines may result in settlement of roadways and other surface supported features.
- 4. The recommendations contained in this report are based on the results of the soil borings taken at specific locations and at the time designated on the boring logs. It must be noted that soil conditions can vary between boring locations significantly and the nature and extent of these variations may not become evident until construction is underway. Variation in soil conditions between borings should be expected.



## K. <u>Site Preparation and Earthwork</u>

- 1. All surface objects, trees including stumps, grass, vegetation, topsoil and roots, shall be removed from within the construction limits. Topsoil can be stockpiled separately and reused for landscaping purposes.
- 2. Excavation into the underlying soils may be accomplished using high powered excavation equipment. Mechanical means (i.e., hoe-rams, jack-hammering) may be needed for excavations extending into shale bedrock.
- 3. Below ground utilities located within 5 feet of the new footings of the proposed structures should be relocated. Excavations resulting from removal of any existing underground utilities should be backfilled with compacted approved fill.
- 4. During earthwork operations, care should be taken to provide adequate drainage on the exposed soils. Absorption of heavy rainfall, accumulations of water and heavy construction traffic may result in softening of these soils, hence, severely weakening the strength of the subgrade soils.
- 5. On-site excavated soils (except topsoil, fat clays and soils with more than 5 percent organics) are considered suitable for use for backfill provided proper moisture content is maintained during placement. A portion of the excavated soils may exhibit natural moisture content above the optimum moisture. Such soils may require air-drying and/or chemical modification prior to placement.
- 6. Borrow material required for the project should consist of silt-clay soil and/or sand and gravel material. Topsoil, organically contaminated material, soils with more than 50 percent silt and/or soils with Liquid Limit of more than 50 percent are not suitable for use as fill (with the exception for clay liner construction). Additionally, soils with a maximum dry weight of less than 100 pounds per cubic foot should not be used in the upper 12 inches of the subgrade beneath sidewalks and paving areas. All fill material should be inspected and approved by the Engineer.
- 7. Fill supporting structures or pavements should be compacted to 95 percent of the material's modified Proctor maximum dry density (MDD) as determined by ASTM D 1557. A reduced percentage of compaction can be used in lawn or grass areas. The engineered fill should not be placed in a frozen condition or over a frozen subgrade.



- 8. New embankment fills placed on existing and/or against already built embankments should be benched. Soft soils and/or loose soils if encountered at or below the proposed fill should be removed and replaced with compacted engineered fill.
- 9. Embankment side slopes constructed at a rate no steeper than 2.5:1 (Horizontal to Vertical) are considered safe against deep-seated failure.
- 10. Depending upon the time of construction and seasonal amount of precipitation, ponding and/or perched water may be encountered in some locations. In such an event, water should be diverted through trenches or otherwise as directed by the Engineer.

## L. <u>Seismic Considerations</u>

The soils encountered in this area are generally medium dense to dense granular soils. Based on test borings drilled for the project and Table 1615.1.1 of the 2012 International Building Code, the soil profile at this site is likely to be a Site Class C. Therefore, it is recommended that the earthquake loads be calculated using Site Class C.

## V. <u>CHANGED CONDITIONS</u>

The evaluations, conclusions, and recommendations in this preliminary report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project and our experience with similar sites and subsurface conditions using generally accepted geotechnical engineering practices. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates drilled, they are not necessarily representative of the subsurface conditions between boring locations or subsurface conditions during other seasons of the year.

## VI. <u>TESTING AND OBSERVATION</u>

During the design process, it is recommended that CTL work with the project designers to confirm that these geotechnical recommendations are properly incorporated into the final plans and specifications, and to assist with establishing criteria for the construction observation and testing. CTL is not responsible for independent conclusions, opinions and recommendations made by others based on the data and the recommendations provided in this report.



# VII. <u>CLOSING</u>

The preliminary report was prepared by CTL Engineering, Inc. (Consultant) solely for the use of the Client in accordance with an executed contract. The Client's use of or reliance on this preliminary report is limited by the terms and conditions of the contract and by the qualifications and limitations stated in the report. It is also acknowledged that the Client's use of and reliance of this report is limited for reasons which include actual site conditions that may change with time; hidden conditions, not discoverable within the scope of the assessment, may exist at the site; and the scope of the investigation may have been limited by time, budget and other constraints imposed by the Client.

Neither the report, nor its contents, conclusions or preliminary recommendations are intended for the use of any party other than the Client. Consultant and the Client assume no liability for any reliance placed on this report by such party. The rights of the Client under contract may not be assigned to any person or entity, without the consent of the Consultant which consent shall not be unreasonably withheld.

This preliminary geotechnical report does not address the environmental conditions of the site. The Consultant is not responsible for consequences or conditions arising from facts that were concealed, withheld, or not fully disclosed at the time the assessment was conducted.

To the fullest extent permitted by law, the Consultant and Client agree to indemnify and hold each other, and their officers and employees harmless from and against claims, damages, losses and expenses arising out of unknown or concealed conditions. Furthermore, neither the Consultant nor its employees shall be liable to the Owner in an amount in excess of the available professional liability insurance coverage of the Consultant. In addition, Client and Consultant agree neither shall be liable for any special, indirect or consequential damages of any kind or nature.

The Consultant's services have been provided consistent with its professional standard of care. No other warranties are made, either expressed or implied.

Sincerely,

CTL ENGINEERING, INC.

her M Marci

Shawn M. Marcum, PE Senior Project Engineer



Sulaiman Dawood, PE Project Engineer

# **APPENDIX A**

# SCOPE OF WORK PLAN OVERALL CONSTRUCTION LAYOUT PLAN









# **APPENDIX B**

# TEST BORING RECORDS PIEZOMETER CONSTRUCTION RECORDS WATER LEVEL READINGS


SOIL	DESCRIPTIO	NS BASED C	ON THE UNIFI	ED SOIL CLA	SSIFICATION SYSTEM					
		AST	M D 2487 an	d D 2488						
	Major Division		Group Symbol	Letter Symbol	Group Name*					
		Gravel with <		GW	Well Graded GRAVEL					
		5% Fines		GP	Poorly Graded GRAVEL					
	Gravel -	Gravel with		GW-GM	Well Graded GRAVEL with silt					
	Percent	Between 5		GW-GC	Well Graded Gravel with clay					
	percent	and 15%		GP-GM	Poorly Graded GRAVEL with silt					
	SAND	Fines		GP-GC	Poorly Graded GRAVEL with clay					
Coarse Grained Soils		Gravel with >		GM	Silty GRAVEL					
Less Than 50		15% Fines		GC	Clayey GRAVEL					
Percent		Sand with <		SW	Well Graded SAND					
200 Sieve		5% Fines		SP	Poorly Graded SAND					
	Sand -	Sand with		SW-SM	Well Graded SAND with silt					
	Percent	Between 5		SW-SC	Well Graded SAND with clay					
	percent	and 15%		SP-SM	Poorly Graded SAND with silt					
	GRAVEL	rines		SP-SC	Poorly Graded SAND with clay					
		Sand with >		SM	Silty SAND					
		15% Fines		SC	Clayey SAND					
				ML	SILT					
Fine Grained		Liquid Limit		CL	Lean CLAY					
Soils	Less Than 50			CL-ML	SILTY CLAY					
more Passing	SILT and CLAY			OL	Organic SILT, CLAY, or SILTY CLAY					
the # 200		Liquid Limit		MH	Elastic SILT					
Sieve		50 or Greater		СН	Fat CLAY					
				ОН	Organic SILT or CLAY					
Hig	ghly Organic Soil	S		PT	Peat					
	Coarse	with si	It or clay	5 to 2	12 % Silt or Clay by weight					
* Additional	Grained Soils	Silty o	r Clayey	more the	an 12 % Silt or Clay by weight					
woattiers	Fine Grained	with san	d or gravel	15 to 29	9 % Sand or Gravel by weight					
	Soils	Sandy o	r Gravelly	30 % or n	nore Sand or Gravel by weight					
		'	'A" LINE GR	RAPH						
60										
50										
<u> </u>		CL or OL		CH or OH						
G 40										
30				"Line						
ASTIC				"A"						
<b>d</b> 20				MH or OH						
10										
2	CL-ML	MLO	r OL							
0	0 10	20 30	40 50	60 70						
			LIQUIDLII	VIT						

# **SOIL DESCRIPTION**

#### NON-COHESIVE SOIL DESCRIPTION

#### STANDARD PENETRATION BLOWCOUNTS PER FOOT (BPF)

v CI y LOUSC
Loose
Medium Dense
Dense
Very Dense Over 50

#### COHESIVE SOIL DESCRIPTION

#### STANDARD PENETRATION BLOWCOUNTS PER FOOT (BPF)

Very Soft	0 - 1
Soft	
Medium Stiff	
Stiff	
Very Stiff	
Hard	Over 30

#### GRADATION COMPONENT

## SIZE

Boulde	rsLarger than 8"
Cobble	s
Gravel	Passing 3" Retained on #4
Sand	Passing #4 Retained on #200
Silt	0.075 mm to 0.005 mm
Clay	Smaller than 0.005 mm

#### COMPONENT MODIFIERS

### **SIZE**

Traces		. 0	-	10%
Little		11	- (	20%
Some	,	21	- (	35%
And	,	36	_ }	50%
1 1110		50		20/0

#### MOISTURE TERMS

## **DESCRIPTION**

Dry	Powdery
Damp	Below Plastic
Moist	Above Plastic Limit & Below Liquid Limit
Wet	Above Liquid Limit



		TES	T BORI	NG	RECO	ORD	)							
CLIENT	Г	: Indianapolis Airport Authority					_		BOF		0.:	B-	1	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	\$				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STA	RTED	: <u>10-1</u>	9-17	
PROJE	CT NO.	: 17050081IND							DAT	ECOM	IPLETED	: 10-1	9-17	
Boring	Elevation	n: 756 Feet Boring Depth : 48.9	Feet	Boring	Method	: HS	A		Ham	imer	: <u>A</u>		atic	
	Northing Easting	:158,756 Station:		Rig Ty	ig Type : <u>CME-550</u> Hammer Efficiency: 86.0% Driller : JS									
1	Datum	: NAD83, Indiana East Line :		Casing	Diamete	er : 3.2	5"		Tem	peratur	e <u>:8</u>	,0° F		
		$\Box_{1} = \nabla \Box_{1} = \nabla \Box_{1$	plation 7.9	Core S	ize	:			Wea	ather	: 5			
GROOI				1		1	1					1 <u>0.5</u>		
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION	I	atum th		T per 6"	T per 12" (N)	covery %)	sture ntent (%)	al Unit ght (pcf)	confined npression (ksf)	Atterberg Limits		rg
Stra Elev	San Dep			Stra Dep	San Nur	SP	dS	Rec	Moi Cor	Tot Wei	Cor	LL	PL	PI
754.5_		TOPSOIL (18") (Visual)		_1.5		3		100	10					
		Denne Denne to Maint Lance OU TV		•	SS-1	3	7	100	16					
	-	CLAYEY SAND (SC-SM) with Traces of Roc in SS-1	ots	· · · ·	SS-2	2 2	5	44	19			20	15	5
740 5	5			6.5		7								
749.3 	<u> </u>	Brown, Moist to Wet, Medium Dense, SANI	DY	0.5	SS-3	5 6	11	100	22			NP	NP	NP
747.0		Lab 2		9.0		35								
_	10			T	SS-4	15 16	31	100	18			NP	NP	NP
	-	Brown and Gray, Wet, Dense to Medium Dense, <b>SANDY SILT (ML)</b> Lab 3												
742.0_	15			_14.0	SS-5	10 9 11	20	100	9					
	-													
	20	Brown to Gray, Moist to Wet, Very Stiff to Hard, <b>SILTY CLAY with SAND (CL-ML)</b> wit Sand Seams <b>(TILL)</b> Lab 4	h		SS-6	28 10 15	25	67	10					
	25	Continued on next page			SS-7	21 28 35	63	89	12			22	15	7
			BORING	S METH	IOD	S	AMPLI	NG ME	THOD	)	ABBR		rions	i
Image: Control of the second seco			HSA - Hollov SFA - Solid RC - Rock MD - Mud I WD - Wash	w Stem Flight A Coring Drilling	Auger Auger	SS ST CR BS AC	- Split - Shel - Rock - Bag - Auge	Spoor by Tub Core Samp er Cutt	n Samp be Sam Samp le ings	ple * nple Li le P P S	- Han L - Liqu L - Plas I - Plas PT - Star	Ind Penetrometer Juid Limit Stic Limit Sticity Index Index		

TEST BORING RECORD														
CLIEN	Г	: Indianapolis Airport Authority					-		BOR	ING NO	).:	B-	1	
PROJE	CT	: Stormwater and Deicing Capacity Projects	3						SHE	ET	2	O	= ;	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION	ı	atum oth	nple nber	r per 6"	T per 12" (N)	sovery %)	isture ntent (%)	al Unit ight (pcf)	confined npressior (ksf)	At	terbei Limits	rg
Stra Elev	San Dep			Stra Dep	San Nur	SPT	SP	Rec	Moi Cor	Tot Wei	Cor	LL	PL	PI
	30				SS-8	15 32 36	68	100	19					
	35	Brown to Gray, Moist to Wet, Very Stiff to			SS-9	21 16 21	37	100	9					
	40	Hard, SILTY CLAY with SAND (CL-ML) with Sand Seams (TILL) Lab 4	n		SS-10	38 21 28	49	100	16					
	45_ - -	Cobbles at SS-11			SS-11	50/3"		83						
707.1_	50	Bottom of Boring at 48.9 feet Boring backfilled according to Aquifer Prote Guidelines.	ection	_48.9	SS-12	50/5"		83	16					
	55_													
			BORING	METH		S/		NG ME	THOD		ABBR	EVIAT	TIONS	oter
		<i>ENGINEERING ≦</i> CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	Flight A Coring Prilling Drilling Auger	l	ST · CR · BS · AC ·	- Shel - Rock - Bag - Auge	by Tub Core Sampler Cutt	e Sam Sampl le ings	ple LL e PL PI SF	- Han - Liqu - Plas - Plas 2T - Star Pen	id Lim itic Lin iticity I idard etratic	nit nit ndex n Tes	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

# **TEST BORING RECORD**

CLIEN	Г	: Indianapolis Airport Authority							BOF	RING NO	D.:	B-	2			
PROJE	СТ	: Stormwater and Deicing Capacity Projects	S			SHEET OF										
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAF	RTED	: 10-2	23-17			
PROJE	CT NO.	: 17050081IND							DAT	DATE COMPLETED : 10-23-17						
Boring	Elevation	n: 753 Feet Boring Depth : 22.0	Feet	Boring	Method	: HSA Hammer : Automatic										
	Northing Fasting	: 1,624,315 Station:		Rig Type : CME-550						Hammer Efficiency: 86.0%						
	Datum	:NAD83, Indiana East Line :		Casing	Casing Diameter : 3.25"				- Tem	peratur	e :7	′0° F				
				Core S	ize	:			Wea	ather	: F	Rain				
GROU	NDWAT	ER:														
atum vation	mple pth	SOIL/MATERIAL DESCRIPTION	N	atum pth	mple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	tal Unit ight (pcf)	confined mpression (ksf)	A	tterbei Limits	rg		
Str	Sal De					SP	Р	Re	õВо	Tot We	ΰČ	LL	PL	PI		
752.0_		TOPSOIL (12") (Visual)		1.0												
	-4				SS-1	4 3 3	6	33	12							
	5_1	Brown, Moist, Very Loose to Dense, SILTY	, , , , , , , , , , , , , , , , , , ,		SS-2	1 0 0	0	0								
	-X	Gravel As Lab 5			SS-3	11 10 13	23	33	12							
743.5_	-			9.5	SS-4	12 21 21	42	100	9							
	-	Brown, Damp, Dense to Medium Dense, <b>SILTY SAND (SM)</b> with Traces of Gravel As Lab 11				0										
738.5_	15			14.5	SS-5	9 7 10	17	100	10							
	20	Brown, Moist, Medium Dense to Loose, <b>SII CLAYEY SAND (SC-SM) (TILL)</b> Lab 28	LTY		SS-6	3 4 5	9	100	10			17	12	5		
731.0		Bottom of Boring at 22 feet		22.0												
		Auger refusal encountered on boulder. Bor	ing													
	25_	Dacknined to Aquirer Protection Guidelines.														
			BORIN	IG METH	IOD	S	AMPLI	NG ME	THOD	)	ABBR	EVIA	<b>FIONS</b>	L		
	HSA - Hollov SEA - Solid			ow Stem	Auger	SS ST	- Split	Spool by Tub	n Sam be San	ple * nple II	e * - Hand Penetrometer					
		ENGINEERING 🛎	RC - Rock	ock Coring CR - Roc			- Rocl	Rock Core Sample			PL - Plastic Limit					
	CTL Engineering, Inc.		MD - Mud	) - Mud Drilling BS - D - Wash Drilling AC			S - Bag Sample			P	PI - Plasticity Index SPT - Standard					
	Phone: 317-295-8650 WD - Wash		sn Drilling AC -			C - Auger Cuttings				SPT - Standard Penetration Test						

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	<b>ST BOR</b>	ING	RECO	DRD	)							
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NO	).:	B-2	2 <b>A</b>	
PROJE	CT	: Stormwater and Deicing Capacity Project	s				_		SHE	ET	1	0	=:	2
LOCAT	ION	: Indianapolis, IN				DATE STARTED : 10-23-17								
PROJE	CT NO.	: 17050081IND							DAT	E COMP	PLETED	: 10-2	3-17	
Boring	Elevatio Northing	n: 753 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	nmer Imer Effi	<u>: A</u> ciency: 8	utoma 6.0%	atic	
	Easting	: 159,076 Offset :			Diamota	CME-550 Driller JS								
	Datum	: NAD83, Indiana East Line :		Core S	ize	·	5		Vea	perature	e <u>:7</u> :R	0° F Rain		
GROU	NDWATI	ER: I Encountered at Dry I At cor	npletion 4.8	00.00		-			1	Ra C	aved in a	t <u>28.1'</u>		
SOIL/MATERIAL DESCRIPTION				th	nple 1ber	. per 6"	r per 12" (N)	overy 6)	sture tent (%)	al Unit ght (pcf)	:onfined npression ksf)	Atterberg Limits		g
Stra Elev	San Dep			Stra Dep Sam Nun		SPT SPT		Rec (°	Mois Con	Tota Weię	Con Con	LL	PL	PI
۲ 31.0_		Refer to B-2 for soil description Brown, Moist, Hard, SILTY CLAY with SAI (CL-ML) with Intermittent Layers of Sand (TILL) As Lab 4	٩D	-22.0	SS-7	18 21 15	36	100	17					
		Continued on next page		r.										
	BORING METHOD					SAMPLING METHOD ABBREVIATIONS								
	SFA - Solid Flight Au				luger	ST	- Spiit - Shel	by Tub	be San	nple LL	- Han - Liqu	id Lim	it	ະເປເ
	ENGINEERING RC - Rock Coring					CR BS	- Rock	Core Samn	Samp le	le PL PI	- Plas - Plas	stic Lin	nit Index	
	CTL Engineering, Inc. MD - Mud Drilling F Phone: 317-295-8650 WD - Wash Drilling / HA - Hand Auger				AC - Auger Cuttings SPT - Standard Penetration Test				t					

TEST BORING RECORD														
CLIENT	Г	: Indianapolis Airport Authority					_		BOR	ING NO	.:	B- 2	2A	
PROJE	СТ	: Stormwater and Deicing Capacity Projects					1		SHE	ET	2	OF	= ;	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION		atum oth	nple nber	r per 6"	T per 12" (N)	sovery %)	isture ntent (%)	al Unit ight (pcf)	confined mpression (ksf)	At L	terber _imits	rg
Stra	Sar Dej			Stra Dej	Sar Nui	.dS	SP	Rec )	C O O	Tot We	C O C	LL	PL	PI
<u>internet services</u>	<u>a</u> - 30				SS-8	11 18 28	46	78	9					
	35	Brown, Moist, Hard, SILTY CLAY with SAND			SS-9	16 20 21	41	100	19					
	40	Brown, Moist, Hard, <b>SILTY CLAY with SAND</b> ( <b>CL-ML)</b> with Intermittent Layers of Sand ( <b>TILL)</b> As Lab 4			SS-10	19 18 21	39	100	13					
	45				SS-11	16 19 23	42	100	9					
703.0_	50	Bottom of Boring at 50 feet Boring backfilled according to Aquifer Protection Guidelines.	on	_50.0	SS-12	18 26 36	62	100	12					
	- 55 -													
			METH	OD Auger	<b>S</b> S	AMPLI	NG ME	IETHOD ABBR			REVIATIONS			
		HSA - HoENGINEERING ≦CTL Engineering, Inc.Phone: 317-295-8650HSA - HaHA - Ha			Flight Auger SS - Sp Flight Auger ST - Sh Coring CR - Ro Drilling BS - Ba h Drilling AC - Au			Shelby Tube Sample Rock Core Sample Bag Sample Auger Cuttings			LL - Liquid Limi PL - Plastic Lim PI - Plasticity Ir SPT - Standard Penetratior			t

TEST BORING RECORD															
CLIENT	Г	: Indianapolis Airport Authority					_		BOR	ING NC	).:	B-	3		
PROJE	СТ	: Stormwater and Deicing Capacity Projects					_		SHE	ET	1	0	F	2	
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	TED	: 10-2	23-17		
PROJE	CT NO.	: 17050081IND					DATE COMPLETED : 10-24-17								
Boring	Elevatio Northinc	n: <u>752 Feet</u> Boring Depth: <u>50.0 F</u> 1: 1.624.312 Station:	eet	Boring	Method	: HS	HSA Hammer Efficiency 86.0%								
	Easting	: <u>159,385</u> Offset :		Rig Type : CME-550					Drille	er	: J	S			
	Datum	: NAD83, Indiana East Line :		Core S	ize	· <u> </u>	5		Vea	perature ther	e <u>:5</u> :F	50° F Rain			
GROUI	NDWAT	ER: 👤 Encountered at Dry 🛛 🖳 At com	pletion Dry			-			1	髾 C	aved in a	nt <u>34.8</u>			
SOIL/MATERIAL DESCRIPTION				atum oth	nple nber	r per 6"	T per 12" (N)	sovery %)	sture ntent (%)	al Unit ight (pcf)	confined mpression (ksf)	A	rg		
Stra Elev	San Dep			Stra Dep	San Nur	SPT	dS	Rec	Moi Cor	Tot Wei	Cor	LL	PL	PI	
750.8		TOPSOIL (14") (Visual)		1.2		~									
	_X				SS-1	3	6	100	25						
	-	Brown and Gray, Moist, Loose to Medium				3									
	-1	Traces of Wood in SS-1 and with Traces of				3	10	100							
	5	Gravel As Lab 5			55-2	4 8	12	100	9						
			, , , , , , , , , , , , , , , , , , ,												
745.5_	N			6.5	SS-3	4 5	11	100	11						
	4					6									
						21									
	10	Grav and Brown Moist Stiff to Hard SAND	v []		SS-4	27	54	67	10			22	13	9	
		LEAN CLAY (CL) (TILL)				21									
	-	Labo													
	-														
	-														
738.0_	-1/			14.0	SS-5	8 8	16	100	9						
	15_/\					8									
	-														
	_														
	_														
		Gray, Moist to Damp, Stiff to Very Stiff, SIL	ГΥ			6									
	20	CLAY with SAND (CL-ML) with Intermittent Layers of Sand (TILL)			SS-6	6 8	14	100	8						
		As Lab 4													
	1														
	-					F									
					SS-7	5 7	15	100	8						
	25_/\	Continued on next page	paada	4		8									
			BORIN	G METH	OD	S	AMPLI	NG ME	THOD		ABBR	REVIA	TIONS	<u> </u>	
			HSA - Hollo SFA - Solid	w Stem Fliaht A	Auger	SS ST	- Split - Shel	Spoor by Tub	n Samp be Sam	ole  * Iple  I	- Han	id Pen Jid Lim	etrom	eter	
	<i>ENGINEERING ≦</i> RC - Rock			Coring		CR	- Rock	Core	Sampl	e PL	Plas	stic Lir	nit		
	CTL Engineering, Inc. MD - Mud WD - Was			ud Drilling BS - Bag Sa ash Drilling AC - Auger (			y Sample PI - Plasticity Index yer Cuttings SPT - Standard								
	Phone: 317-295-8650 WD - Was HA - Han			nd Auger					-	Penetration Test					

		TEST	BORI	NGI	RECC	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NO	.:	B-	3	
PROJE	CT	: Stormwater and Deicing Capacity Projects					1		SHE	ET	2	O	= ;	2
itum /ation	th	SOIL/MATERIAL DESCRIPTION		itum th	nple nber	- per 6"	r per 12" (N)	overy %)	sture itent (%)	al Unit ght (pcf)	:onfined npression ksf)	At	terber Limits	.g
Stra Elev	Dep			Stra Dep	San Nun	SPT	SP	Rec (°	Moi Cor	Tot: Wei	Con	LL	PL	PI
	30				SS-8	6 8 10	18	100	9					
Жа	- - - 35 -	Cray Maiat to Dama Stiff to Vany Stiff SILTY			SS-9	6 8 10	18	100	9					
	40	CLAY with SAND (CL-ML) with Intermittent Layers of Sand (TILL) As Lab 4			SS-10	5 6 8	14	100	9					
	45				SS-11	5 6 7	13	100	10					
702.0_	50	Bottom of Boring at 50 feet Boring backfilled according to Aquifer Protecti Guidelines.	ion	_50.0	SS-12	6 8 9	17	100	9					
	55_													
			BORING	METH	OD Auger	SS S	MPLI	NG ME	THOD	ole *	ABBR	EVIAT	IONS	eter
		ENGINEERING ≥SICTL Engineering, Inc.MPhone: 317-295-8650H	FA - Solid F C - Rock ( D - Mud D /D - Wash A - Hand /	Flight A Coring prilling Drilling Auger	uger	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tub Core Samp er Cutt	e Sam Sampl le ings	ple LL e PL PI SF	- Liqu - Plas - Plas 2T - Star Pen	id Lim stic Lin sticity I ndard etratio	it nit ndex n Test	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	ST BOR	ING	RECO	ORD	)							
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NC	D.:	B-	4	
PROJE	CT	: Stormwater and Deicing Capacity Project	S				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	RTED	: 10-2	24-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 10-2	4-17	
Boring	Elevation	: 155 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	imer	<u>: A</u>		atic	
	Easting	:159,695 Offset :		Rig Ty	be	: CM	1E-550			er	: J	S		
	Datum	: NAD83, Indiana East Line :		Casing	Diamete	r : 3.2	5"		Tem	perature	e <u>:5</u>	50° F		
GROUI		$\overline{R}$ : $\nabla$ Encountered at 29.0' $\nabla$ At con	moletion 34	Core S	Ize				vvea	iner kal c	avod in a			
				<u>-</u>						- <u>-</u>		11 <u>57.0</u>		
atum vation	mple pth	SOIL/MATERIAL DESCRIPTIO	N	atum pth	mple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	tal Unit ight (pcf)	confined mpressior (ksf)	At	tterbe Limits	rg
Str Ele	Sai De		1	Str	Sai Nu	SP	SP	Re C	မီပိ	Ve	5°C	LL	PL	PI
754.7-		<b>TOPSOIL</b> (4") (Visual)		0.3										
	-X				SS-1	5 5 5	10	100	14					
		Brown and Gray, Damp to Moist, Medium Dense to Dense, <b>SILTY CLAYEY SAND</b>			SS-2	4 5	12	100	12			19	13	6
	5_/\	<b>(SC-SM)</b> Lab 5				7								
	-8				SS-3	18 28 18	46	17	19					
746.5_		Brown, Damp, Dense, <b>SILTY CLAYEY SA</b> ( <b>SC-SM)</b> Lab 7	ND	8.5	SS-4	22 23 25	48	100	8			16	12	4
743.5_				11.5	SS-5	35 35 35	70	389	8					
	20	Brown to Gray, Damp, Hard, SILTY CLAY SAND (CL-ML) with Intermittent Layers of Sand (TILL) As Lab 4	with		SS-6	20 19 13	32	100	12					
730.0_	25_	Continued on routiness		_25.0	SS-7	19 29 33	62	100	7					
		Continued on next page	BORIN		IOD	S	AMPLI	ng me	THOD		ABBR	REVIAT	TIONS	
			HSA - Holle	ow Stem	Auger	SS	- Split	Spoor	n Samp	ole *	- Har	d Pen	etrom	eter
			SFA - Solio RC - Roc	a ⊢light A k Corina	luger	ST CR	<ul> <li>Shel</li> <li>Rocł</li> </ul>	by Tub Core	be Sam Samp	npie   LL le   PL	Liqu Plas	ud Lim stic Lir	nt nit	
		CTL Engineering, Inc.	MD - Mud	I Drilling	_	BS	- Bag	Samp	le	PI	- Plas	sticity	ndex	
		Phone: 317-295-8650	HA - Han	sn Drilling d Auger	)	AC	- Auge	er Cutt	ings	SF	ا۔ - Stai Per	ndard letratic	on Tes	st

		TES	T BORII	NG I	RECC	ORD								
CLIENT	Г	Indianapolis Airport Authority					_		BOR	ING NO	.:	B-	4	
PROJE	CT	: Stormwater and Deicing Capacity Projects				1	1		SHE	ET	2	O	F :	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION		atum oth	nple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined mpression (ksf)	At	tterbei Limits	g
Stra	Sar Dej			Stra Dej	Sar Nui	.dS	SP	Rec	Mo Col	Tot We	CO	LL	PL	PI
-	- - 30				SS-8	10 15 19	34	100	13			NP	NP	NP
Z	- 35				SS-9	8 19 25	44	100	10					
E.	40	Brown to Gray, Damp, Dense to Very Dense SILTY SAND (SM) (TILL) Lab 29			SS-10	10 16 17	33	100	10					
	45				SS-11	13 16 19	35	100	9					
705.0_	50	<b>Bottom of Boring at 50 feet</b> Boring backfilled according to Aquifer Protec Guidelines.	ction	_50.0	SS-12	16 21 30	51	100	8					
	55													
			BORING	METH	OD Auger	<b>S</b> 2	MPLI	NG ME	THOD		ABBR	EVIAT	FIONS etrom	oter
		CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand /	Flight A Coring rilling Drilling Auger	uger	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tub Core Samp er Cutt	be Sam Sample le ings	ple LL e PL PI SF	- Liqu - Liqu - Plas - Plas 2T - Star Pen	id Lim stic Lin sticity I ndard etratio	nit nit Index on Tes	t

		TES	T BOR	ING	RECO	ORD	)							
CLIENT	г	: Indianapolis Airport Authority					_		BOF	RING NC	D.:	B-	5	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	S				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	RTED	: 10-2	25-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 10-2	25-17	
Boring	Elevatio Northing	n: 757 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	nmer Imer Eff	<u>: A</u> iciency: 8	utoma 6.0%	atic	
	Easting	: <u>158,565</u> Offset :			pe L Diamete	$\frac{1}{2}$	E-330		Drille	er	: J	S		
	Datum	: <u>NAD83, Indiana Eas</u> t Line : <u></u>		Core S	ize	:	0		- Tem Wea	perature ather	e <u>:5</u> :5	0° F Sunnv		
GROUI	NDWAT	ER: $\Psi$ Encountered at <u>12.5'</u> $\Psi$ At cor	npletion 22.	<u>8'</u>						廢C	aved in a	t <u>43.6</u>		
atum vation	mple pth	SOIL/MATERIAL DESCRIPTION	N	atum pth	mple mber	T per 6"	T per 12" (N)	covery (%)	isture ntent (%)	tal Unit ight (pcf)	confined mpression (ksf)	A	tterbei Limits	rg
Str	Sal De			Str	Sal Nu	SP	R	Re	မိုင္စ	Ve Ve	ာပိ	LL	PL	PI
756.0_		TOPSOIL (12") (Visual)		1.0		5								
	-//				SS-1	4	8	100	20					
	-	Brown, Damp to Moist, Loose, CLAYEY SA	AND											
	-\	Lab 29A			SS-2	2	4	33	18			39	21	18
	5_/\					2								
751.0_				6.0		3								
	-X				SS-3	4	7	100	14			17	13	4
	_													
	-17				SS 4	2	14	100	11					
	10				33-4	8	14	100						
	_	Brown, Damp to Moist, Loose to Very Dens SILTY CLAYEY SAND (SC-SM)	se,											
		Lab 30												
					00 F	35		10	11					
	15_				55-5	49 50/3"		40						
741.0				16.0										
				7										
	-													
						24								
	20				SS-6	18	47	100	13					
	20_/	Gray to Brown, Moist, Very Stiff to Hard, SANDY LEAN CLAY (CL) (TILL)		2		29								
	-	Lab 30A												
	-													
	-\/				SS-7	13 25	55	100	11					
	25_/\	Continued on next name	(//			30								
<sup> </sup>			BORIN		IOD	S	AMPLI	ng me	THOD	)	ABBR	EVIA	TIONS	<u> </u>
			HSA - Holle	ow Stem	Auger	SS ST	- Split	Spool	n Sam	ple *	- Han	d Pen	etrom	eter
		ENGINEERING Z	RC - Roc	k Coring	agei	CR	- Rocl	Core	Samp	le PL		stic Lir	nit	
		CTL Engineering, Inc.	MD - Mud WD - Was	Drilling h Drilling	a	BS AC	- Bag - Auge	Samp er Cutt	le inas	PI   SF	- Plas PT - Stai	sticity ndard	index	
		Phone: 317-295-8050	HA - Han	d Auger	,						Pen	etratic	on Tes	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TEST	BORII	NGI	RECC	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NO	D.:	B-	5	
PROJE	CT	: Stormwater and Deicing Capacity Projects					1		SHE	ET	2	O	F	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION		atum oth	nple nber	r per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined npression (ksf)	At	terber Limits	rg
Stra Ele	Sar Dej			Str Dej	Sar Nui	.dS	SP	Rec ,	Mo	Tot We	Col	LL	PL	PI
	30				SS-8	10 11 15	26	100	12	136.7	11.9 @ 7.1%	28	13	15
	35				SS-9	9 10 15	25	89	15					
	40	Gray to Brown, Moist, Very Stiff to Hard, <b>SANDY LEAN CLAY (CL) (TILL)</b> Lab 30A			SS-10	10 11 15	26	100	12					
<u>ظ</u>	45				SS-11	6 8 12	20	100	16					
707.0_	50	Bottom of Boring at 50 feet Boring backfilled according to Aquifer Protecti Guidelines.	on	_50.0	SS-12	7 12 20	32	100	12					
	55_													
			BORING	METH	OD Auger	SS	AMPLI	NG ME	THOE	) ple *	- Han	EVIAT	TONS etrom	eter
		ENGINEERING ≥SFCTL Engineering, Inc.MIPhone: 317-295-8650W	FA - Solid F C - Rock ( D - Mud D D - Wash A - Hand	Flight A Coring Drilling Drilling Auger	uger	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tub Core Samp er Cutt	be San Samp le ings	nple LL le Pl Pl Sf	- Liqu - Plas - Plas - Plas PT - Star Pen	id Lim itic Lin iticity I idard etratic	it nit Index on Tes	t

		TES	ST BOR	ING	RECO	ORD	)							
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NC	D.:	B-	6	
PROJE	СТ	: Stormwater and Deicing Capacity Project	s				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	RTED	: 10-2	25-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 10-2	25-17	
Boring	Elevatio	n: 754 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	nmer mor Eff	<u>: A</u>	Automa	atic	
	Easting	: <u>158,882</u> Offset :		Rig Ty	be Di	: CN	IE-550		Drille	er	: J	S		
	Datum	: NAD83, Indiana East Line :		Casing	Diamete	er : 3.2	5		Tem	perature	e <u>:5</u>	60° F		
GROU	NDWAT	ER: I Encountered at 6.0' I At cor	mpletion <u>2.7'</u>	Core S	ize				10000	國 C	aved in a	nt <u>25.5</u>		
atum vation	mple pth	SOIL/MATERIAL DESCRIPTIO	N	atum pth	mple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	tal Unit ight (pcf)	confined mpression (ksf)	A	tterbe Limits	rg
Str	Sar Del			Str Del	Sar Nui	Ъ	SP	Rec	° S S S	Tot We	S C L	LL	PL	PI
752.5_		TOPSOIL (18') (Visual)		1.5		3	_							
<u> </u>	Į   ́				SS-1	3		100	24					
	-1	Brown, Moist, Medium Stiff to Soft, SAND LEAN CLAY (CL) Lab 31			SS-2	2	4	67	19			34	15	19
740.0	5_/					2			10					
740.0				<u> </u>	SS-3	3 5 12	17	100	23					
	-				SS-4	3	13	100	17			NP	NP	NP
	10_/	Brown, Wet, Medium Dense, <b>SILTY SAND</b> (SM) with Traces of Gravel Lab 11				8								
740.0_	15			14.0	SS-5	7 10 10	20	100	9					
	20	Gray, Moist, Very Stiff to Hard, <b>SANDY LE CLAY (CL) (TILL)</b> Lab 32	AN		SS-6	10 27 36	63	100	10			24	13	11
	25	Heaving sand at 20 feet			SS-7	18 25 30	55	100	10					
		Continued on next page												
			BORIN			S.	AMPLI		THOD		ABBR	EVIA	TIONS	otor
			SFA - Solic	d Flight A	luger	ST	- Shel	by Tub	be San	nple   LL	- nar Liqu	uid Lim	nit	elel
			RC - Rock	Coring		CR	- Rock	Core	Samp le	le PL	- Plas	stic Lir	nit Index	
		CIL Engineering, Inc. Phone: 317-295-8650	WD - Was	h Drilling d Auger	9	AC	- Auge	er Cutt	ings	SF	PT - Stai PT - Stai	ndard	on Tes	it

		TEST	BORI	NGI	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NC	.:	B-	6	
PROJE	CT	: Stormwater and Deicing Capacity Projects					1		SHE	ET	2	OF	= ;	2
atum vation	nple pth	SOIL/MATERIAL DESCRIPTION		atum pth	nple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined mpression (ksf)	At	terbeı _imits	g
Str Ele	Sar Del			Str Del	Sar Nui	Ъ	SP	Re	°ã S	Tot We	й С С С	LL	PL	PI
<u>第</u>	30 				SS-8	10 12 15	27	100	14					
	35				SS-9	10 12 18	30	100	18					
	40	Gray, Moist, Very Stiff to Hard, <b>SANDY LEAN</b> <b>CLAY (CL) (TILL)</b> Lab 32			SS-10	9 12 20	32	100	14					
	45				SS-11	14 23 29	52	100	15					
704.0_	50	Bottom of boring at 50 feet Boring backfilled according to Aquifer Protectic Guidelines.	nc	_50.0	SS-12	15 16 19	35	100	11					
	- - 55_ -													
			BORING	METH	OD Auger	SS SS	AMPLI		THOD	le *	ABBR	EVIAT	IONS	eter
		ENGINEERING ≥SF.ENGINEERING ≥RCCTL Engineering, Inc.MDPhone: 317-295-8650WDHA	A - Solid F - Rock ( ) - Mud D ) - Wash - Hand	Flight A Coring Drilling Drilling Auger	luger	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tub Core Samp er Cutt	e Sam Sampl le ings	ple LL e PL PI SF	- Liqu - Plas - Plas 2T - Star Pen	id Lim tic Lin ticity I dard etratio	it nit ndex n Tes	t

		TES	T BOR	ING	RECO	ORD	)							
CLIEN	Т	: Indianapolis Airport Authority					_		BOF	RING NO	D.:	B-	7	
PROJE	CT	: Stormwater and Deicing Capacity Projects	3				_		SHE	ET	1	0	F	2
LOCAT	TION	: Indianapolis, IN					_		DAT	E STAF	RTED	:2	26-17	
PROJE	ECT NO	. : 17050081IND							DAT	E COM	PLETED	: 10-2	26-17	
Boring	Elevatio	m: 752 Feet Boring Depth : 49.0	Feet	Boring	Method	: HS	A		Ham	imer	<u>: A</u>		atic	
	Easting	:159,193 Offset :		Rig Ty	ре	: CN	1E-550			er	: J	S		
	Datum	: NAD83, Indiana East Line :		Casing	Diamete	er : 3.2	5"		Tem	perature	e <u>:5</u>	50° F		
GROU		$\mathbf{FR}$ $\mathbf{V}$ Encountered at 7.5' $\mathbf{V}$ At corr	nletion 24'	Core S	ize				vea		aved in a	t 8 1'		
												<u>0.1</u>		
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION	I	atum oth	nple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined mpressio (ksf)	A	tterbe Limits	rg
Stra	Sar Dej			Str	Sar Nui	SP.	SP	Rec	0 U Q Q	Tot We	CO	LL	PL	PI
750.5		TOPSOIL (18') (Visual)		15		2								
7		Brown, Moist, Soft, LEAN CLAY with SANE	> //		SS-1	2	4	100	31			49	19	30
748.5		Lab 8		3.5										
	-[	Brown and Cray Maiat Vany Lagas to Lag			SS-2	2 1	3	100	13			20	14	6
	5_/	SILTY CLAYEY SAND (SC-SM)	se,			2								
745.4				6.6		3	_							
ļ		Brown, Moist, Loose, SILTY CLAYEY SANI	כ		55-3	3 2	5	100	13			20	13	
743.4		Lab 9		8.6		_								
					SS-4	10	17	100	21					
	-	Gray, Wet, Medium Dense, <b>POORLY</b> <b>GRADED SAND with SILT and GRAVEL</b> ( <b>SP-SM</b> ) As Lab 10												
738.0_	15_			14.0	SS-5	8 9 12	21	100	9			17	12	5
	-	Brown, Moist to Wet, Medium Dense, SILT	Y											
	20	Lab 34	_)		SS-6	7 8 9	17	100	10					
729.0_	25_	Brown, Moist to Wet, Very Stiff to Hard, SIL CLAYEY SAND (SC-SM) with Cobbles and Intermittent Sand Layers (TILL) As Lab 4 Continued on next page	.TY	23.0	SS-7	8 8 6	14	100	14					
			BORIN	G METH	OD	S		NG ME	THOD		ABBR		TIONS	otor
			SFA - Solid	Flight A	Auger	ST	- Split - Shel	Spoor by Tub	i Sam be San	pie   ^ nple   LL	- нап Liqu	ia Pen iid Lim	etrom it	eler
			RC - Rock	Coring		CR	- Rock	Core Samp	Samp	le Pl	Plas	stic Lir	nit Index	
		CIL Engineering, Inc. Phone: 317-295-8650	WD - Was HA - Hand	h Drilling Auger	]	AC	- Auge	er Cutt	ings	SI	PT - Stai Pen	ndard etratic	on Tes	st

		TES	T BORII	NGI	RECO	ORD								
CLIEN	Т	: Indianapolis Airport Authority					-		BOR	ING NO	.:	B-	7	
PROJE	CT	: Stormwater and Deicing Capacity Projects	;			1			SHE	ET	2	OF	- 2	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION	I	atum oth	nple nber	r per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined mpressior (ksf)	At L	terber _imits	rg
Stra Elev	San Dep			Stra Dep	San Nur	SPT	.dS	Rec	Moi Cor	Tot Wei	Cor	LL	PL	PI
					SS-8	10 9 10	19	17	23					
	35	Brown, Moist to Wet, Very Stiff to Hard, <b>SIL</b>	.TY		SS-9	8 3 5	8	100	19					
	40	CLAYEY SAND (SC-SM) with Cobbles and Intermittent Sand Layers (TILL) As Lab 4			SS-10	27 49 50	99	0						
	45				SS-11	27 25 12	37	100	16					
703.0_	- 50_ - -	Bottom of Boring at 49 feet Boring backfilled according to Aquifer Prote Guidelines.	ection	_49.0	SS-12	50/6"		100	18					
	- - 55_ -													
			BORING	METH	OD Auger	SS ·	MPLI	NG ME	THOD	ole *	ABBR	EVIAT	IONS	eter
		ENGINEERING SE CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	Flight A Coring Prilling Drilling Auger	luger	ST · CR · BS · AC ·	- Shel - Rock - Bag - Auge	by Tub Core Samp er Cutt	be Sam Sampl le ings	iple LL le PL PI SF	- Liqu - Plas - Plas 2T - Star Pen	id Limi itic Lim iticity I idard etratio	it nit ndex	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	<b>ST BOR</b>	ING	RECC	DRD	)							
CLIENT	г	: Indianapolis Airport Authority					_		BOF	RING NC	).:	B-	8	
PROJE	СТ	: Stormwater and Deicing Capacity Project	S				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	TED	: 10-3	30-17	
PROJE	CT NO	. : 17050081IND							DAT	E COM	PLETED	: 10-3	31-17	
Boring	Elevatio	on: 753 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	nmer Imer Effi	<u>: A</u> iciency: 8	utoma	atic	
	Easting	: <u>159,510</u> Offset :		Rig Ty	pe Diamata	: CM	E-550		Drill	er	: J	S		
	Datum	: NAD83, Indiana East Line :		Core S		· <u> </u>	5		Tem	perature	e <u>:4</u> ·F	.5° F ≀ain		
GROUN	NDWA	TER: $\mathbf{\Psi}$ Encountered at <u>24.0'</u> $\mathbf{\Psi}$ At cor	npletion Dry	0010 0	120	•			1100	⊠ C	aved in a	t 14.9	,	
			·											
atum vation	mple pth	SOIL/MATERIAL DESCRIPTIO	N	atum pth	mple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	tal Unit ight (pcf)	confined mpressio (ksf)	A	tterbei Limits	rg ;
Str	Sal De			Str De	Sal Nu	SP	Ъ	Re	δo Co	Ve	ာပိ	LL	PL	PI
751.8	+	TOPSOIL (14") (Visual)		1.2		0					0.7			
		Brown Moist Medium Stiff FAT CLAY with	h //		SS-1	2	7	100	20	118.1	@	51	17	34
	_	SAND (CH)				4					10.2%			
749.0_	1			4.0		4								
	5_/	Brown, Damp, Medium Dense, SILTY			SS-2	8 13	21	100	10					
747.0		As Lab 5		6.0										
	Ň				SS-3	15 18	35	100	8					
	-/	N				17		100						
	-					4.0								
					SS-4	10	26	100	8					
	10_/					12								
	-													
	-													
	_													
	-	7			00 5	7		100	10			10	10	
Lie Ale	15_	Brown, Moist, Loose to Very Dense, SILTY			55-5	5 4	9	100	12			10	12	4
		Sand Layers (TILL)												
		Lab 36												
		7				1								
					SS-6	2	6	44	9					
	20					4								
	-													
	-													
	-													
	L -[	7			SS-7	11 11	28	100	8					
	25_/					17								
		Continued on next page	BORIN			5				)		EVIA		
			HSA - Hollo	ow Stem	Auger	SS	- Split	Spoor	n Sam	ple *	- Har	id Pen	etrom	eter
			SFA - Solic RC - Rock	a Flight A « Corina	Auger	ST CR	<ul> <li>Shel</li> <li>Rock</li> </ul>	by Tuk Core	be San Samp	nple   LL le   PL	Liqu - Plas	ud Lim stic Lir	iit nit	
		CTL Engineering, Inc.	MD - Mud	Drilling	~	BS	- Bag	Samp	le	PI	- Plas	sticity	Index	
		Phone: 317-295-8650	HA - Hand	d Auger	J	AC	- Auge	er Cutt	ngs	SF	Pen	etratio	on Tes	t

		TEST	T BORI	NGI	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority		_		BOR	ING NO	.:	B-	8				
PROJE	CT	: Stormwater and Deicing Capacity Projects				1	1		SHE	ET	2	O	= ;	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION		atum oth	nple nber	r per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined mpression (ksf)	At	terber Limits	g
Stra Elev	San Dep			Stra Dep	San Nur	SPT	.dS	Rec	Moi Cor	Tot Wei	Cor	LL	PL	Ы
	30				SS-8	28 25 13	38	100	13					
	35				SS-9	30 13 22	35	100	15					
	40	Brown, Moist, Loose to Very Dense, <b>SILTY</b> <b>CLAYEY SAND (SC-SM)</b> with Intermittent Sand Layers <b>(TILL)</b> Lab 36			SS-10	50/3"		83	15					
	45	Sand and Gravel Layer at SS-11			SS-11	21 16 18	34	100	14					
703.0_	50	<b>Bottom of Boring at 50 feet</b> Boring backfilled according to Aquifer Protec Guidelines.	ction	_50.0	SS-12	13 13 17	30	67	12					
	- 55 -													
			BORING	METH	OD Augor	S/	MPLI	NG ME	THOD		ABBR	EVIAT	IONS	otor
		<i>ENGINEERING</i> CTL Engineering, Inc. Phone: 317-295-8650	SFA - Hollow SFA - Solid F RC - Rock ( MD - Mud D MD - Wash HA - Hand J	Coring Coring Drilling Drilling Auger	Auger luger	ST CR BS AC	- Split - Shel - Rock - Bag - Auge	Spoor by Tuk Core Samp er Cutt	i Samp be Sam Sampl le ings	e PL PI SF	- Han - Liqu - Plas - Plas T - Star Pen	id Lim itic Lin iticity I idard etratio	it nit ndex n Test	eter t

		TES	T BOR	ING	RECC	DRD								
CLIENT	Г	: Indianapolis Airport Authority					_		BOF	RING NC	D.:	B-	9	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	3				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	TE STAR	RTED	: 10-3	30-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 10-3	30-17	
Boring	Elevatio	n: 760 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	nmer nmer Eff	<u>: A</u> iciency: 8	Automa	atic	
	Easting	: <u>158,715</u> Offset :		Rig Typ		: CM	E-550		Drill	er	: J	S		
	Datum	: NAD83, Indiana East Line :		Casing	Diamete	. 3.2	0		Tem	nperature	e <u>:4</u>	0° F		
GROUN	NDWAT	ER: I Encountered at 23.0' I At com	npletion 34.0	0'	126	•			1000	LE C	aved in a	nt 39.9	,	
			·			9	12"	~	(%)	it pcf)	ned ssion	A	tterbe	rg
itratum elevatio	ample Jepth	SOIL/MATERIAL DESCRIPTION	4	tratum Jepth	ample lumber	PT per	SPT per (N)	tecover (%)	Aoisture Content	otal Un Veight (	Jnconfii compre (ksf)		Limits	; 
ош 759.5_		TOPSOIL (6") (Visual)		0.5	σz	S	0)	œ	20	->	50	LL	PL	Ы
		Brown, Damp, Medium Dense, SILTY CLAYEY SAND (SC-SM)			SS-1	6 10 10	20	100	8					
750.5	5	Lab 37			SS-2	7 8 9	17	100	10			19	14	5
753.5		Brown, Moist, Medium Dense, <b>SILTY CLAY SAND (SC-SM)</b> Lab 38	/EY	0.5	SS-3	5 5 7	12	100	11					
751.0		Brown, Moist, Stiff, <b>LEAN CLAY with SAND</b> (CL) As Lab 8		9.0	SS-4	4 4 5	9	100	11	146.4	4.3 @ 4.7%	17	13	4
	15				SS-5	17 22	39	100	16					
	20	Gray to Brown, Damp to Moist, Very Stiff to Hard, <b>SILTY CLAY with SAND (CL-ML)</b> with Cobbles ( <b>TILL</b> ) As Lab 4	n n		SS-6	7 16 12	28	6						
	25				SS-7	20 23 31	54	22	14					
		Continued on next page	POPIN			6			TUOP					
			HSA - Hollo	ow Stem	Auger	SS	- Split	Spoor	n Sam	ple *	- Har	d Pen	etrom	eter
		ENGINEERING CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid RC - Rocl MD - Mud WD - Was HA - Han	d Flight A k Coring Drilling h Drilling d Auger	uger	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tub c Core Samp er Cutt	be San Samp le ings	nple LL de PL PI SF	Liqu - Plas - Plas - Plas PT - Star Pen	uid Lim stic Lir sticity I ndard ietratic	nit nit Index on Tes	st

		TEST	r Borii	NG I	RECO	DRD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NO	.:	B-	9	
PROJE	CT	: Stormwater and Deicing Capacity Projects				1	1		SHE	ET	2	OF	- 2	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION		atum oth	nple nber	r per 6"	T per 12" (N)	covery %)	sture ntent (%)	al Unit ight (pcf)	confined mpression [ksf]	At	terber _imits	g
Stra Elev	San Dep			Stra Dep	San Nur	SP1	SP.	Rec	Moi Cor	Tota Wei	Cor	LL	PL	Ы
	30				SS-8	5 7 9	16	33	18					
Ž	 35				SS-9	6 9 13	22	100	14					
1 Maria	- - - - - - -	Gray to Brown, Damp to Moist, Very Stiff to Hard, SILTY CLAY with SAND (CL-ML) with Cobbles (TILL) As Lab 4			SS-10	10 8 12	20	100	15					
	45				SS-11	12 19 22	41	100	11					
710.0_	50	<b>Bottom of Boring at 50 feet</b> Boring backfilled according to Aquifer Protec Guidelines.	tion	_50.0	SS-12	9 10 14	24	100	16					
	- 55 -													
			BORING	METH Stem	<b>OD</b> Auger	SS S	- Split	NG ME	THOD	le *	ABBR	EVIAT	IONS etrom	eter
		ENGINEERING ≦ CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid F RC - Rock ( MD - Mud D VD - Wash HA - Hand /	Flight A Coring rilling Drilling Auger	uger	ST CR BS AC	- Shell - Rock - Bag - Auge	by Tuk Core Samp er Cutt	be Sam Sample ings	ple LL e PL PI SF	- Liqu - Plas - Plas 2T - Star Pen	id Lim tic Lim ticity I ndard etratio	it nit ndex n Test	t

		TES	<b>ST BORI</b>	NG	RECC	RD	)							
CLIEN	г	: Indianapolis Airport Authority					_		BOF	RING NO	D.:	B-'	10	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	S				_		SHE	EET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	TE STAF	RTED	: 10-3	31-17	
PROJE	CT NC	. : 17050081IND							DAT	TE COM	PLETED	: 10-3	31-17	
Boring	Elevatio	bn: 754 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Han	nmer	<u>: A</u>	Automa	atic	
	Easting	g : <u>1,024,939</u> Station J : 159,043 Offset :		Rig Ty	pe	: CM	IE-550		Drill	nmer En er	iciency <u>.</u> c : J	S		
	Datum	: NAD83, Indiana East Line :		Casing	Diameter	: 3.2	5"		Tem	nperatur	e <u>:4</u>	5° F		
				Core S	ize	:			Wea	ather	: 8	Sunny		
GROU	NDWA	IER: <u>-</u> Encountered at <u>5.5</u> - At cor	npletion <u>4.0°</u>							ाह्य (	aved in a	it <u>30.5</u>	-	
ratum evation	mple pth	SOIL/MATERIAL DESCRIPTION	N	ratum pth	mple imber	T per 6"	T per 12" (N)	covery (%)	oisture intent (%)	tal Unit eight (pcf)	iconfined mpression (ksf)	A	tterbe Limits	rg
Ele Sti	Sa De			Sti	Sa Nu	SP	R	Re	ĕ°	°₽≋	ъо	LL	PL	PI
752.8_		TOPSOIL (14") (Visual)		1.2		4					37			
					SS-1	3	6	67	25	121.1	@	51	18	33
		-				3					8.0%			
		7				3								
	5	Brown, Moist, Medium Stiff, FAT CLAY (CH	-I)	1	SS-2	2 2	4	33	27					
		Lab 39												
	T	7			SS-3	4 4	q	100	13					
	-1/	N				5								
745.5_				8.5		0								
	-)				SS-4	6 8	17	100	10			17	12	5
	10_/	Rrown Moist Modium Donso SILTY CLAN				9								
	_	SAND (SC-SM)												
	_	Lab 40												
740 5	_			13.5										
740.5	1			15.5	00 F	6	10	100	22					
	15_/	Brown, Moist, Medium Dense, SANDY SIL	т		55-5	6 7	13	100	22			NP	NP	NP
		( <b>ML)</b> Lab 41												
737.0				17.0										
		7				7					10.1			
					SS-6	8	16	100	9	146.7	@	16	12	4
	20_/	Brown, Moist, Medium Dense to Very Dense	se,			ð					0.7%			
	-	SILTY CLAYEY SAND (SC-SM) with Intermittent Sand Layers (TILL)												
	_	Lab 42												
	_													
	-[	7			SS-7	5	11	100	8					
	25_/	<u>N</u>			33-7	5	''		0					
		Continued on next page	BOBINI											
			HSA - Hollo	w Stem	Auger	SS	- Split	Spool	n Sam	ple *	- Har	d Pen	etrom	eter
			SFA - Solid	Flight A	uger	ST	- Shel	by Tul	be San	nple LI	Liqu	uid Lin	nit mit	
		ENGINEERING≦ CTL Engineering. Inc.	MD - Mud	Drilling		BS	- Bag	Samp	le le		L - Plas I - Plas	sticity	Index	
		Phone: 317-295-8650	WD - Wash HA - Hand	n Drilling Auger	9	AC	- Auge	er Cutt	ings	S	PT - Stai Pen	ndard ietratio	on Tes	t

		TEST	<b>BORI</b>	NG	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	RING NC	).:	<b>B-</b> 1	0	
PROJE	СТ	: Stormwater and Deicing Capacity Projects				1	1		SHE	ET	2	OF	= ;	2
tratum :levation	ample Jepth	SOIL/MATERIAL DESCRIPTION		itratum Jepth	ample lumber	PT per 6"	SPT per 12" (N)	tecovery (%)	Aoisture Content (%)	otal Unit Veight (pcf)	Jnconfined compression (ksf)	At	terber Limits	rg
ωш	00			00	02	0		Ľ.	20	->	50	LL	PL	Ы
Ŕ	30 30 30				SS-8	5 5 5	10	100	11					
	35	Heaving Sand at 35 feet			SS-9	9 20 24	44	100	17					
	40	Brown, Moist, Medium Dense to Very Dense SILTY CLAYEY SAND (SC-SM) with Intermittent Sand Layers (TILL) Lab 42			SS-10	11 20 48	68	100	12					
	45				SS-11	10 15 20	35	100	16					
704.0_	50	<b>Bottom of Boring at 50 feet</b> Boring backfilled according to Aquifer Protec Guidelines.	tion	_50.0	SS-12	7 25 50/6"		94	13					
	- 55 -													
			BORING		OD Augor	S/		NG ME	ETHOD		ABBR	EVIAT	IONS	otor
		<i>ENGINEERING ≦</i> CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid I RC - Rock MD - Mud D VD - Wash HA - Hand	Flight A Coring Drilling Drilling Auger	l	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tub Core Samp er Cutt	Samples Sample	nple LL le PL PI SF	- Han - Liqu - Plas - Plas - Plas PT - Star Pen	id Lim stic Lin sticity I ndard etratio	it nit ndex n Tes	t

ſ

# **TEST BORING RECORD**

CLIEN	Т	: Indianapolis Airport Authority					_		BOF	RING NO	D.:	B-1	<b>0A</b>	
PROJE	ECT	: Stormwater and Deicing Capacity Projects					_		SHE	ET	1	0	F	1
LOCA	TION	: Indianapolis, IN					_		DAT	E STAF	RTED	:_10-3	31-17	
PROJE	ECT NO	. : 17050081IND							DAT	E COM	PLETED	: 10-3	31-17	
Boring	Elevatio	Boring Depth : 6.0 Fe	eet	Boring	Method	: HS	A		Ham	nmer	<u>: A</u>	Autom	atic	
	Easting	g : <u>1,624,939</u> Station: : 159.046 Offset :		Rig Ty	ре	: CN	1E-550		Han	nmer Eff er	iciency <u>: 8</u> : J	86.0% IS		
	Datum	:NAD83, Indiana East Line :		Casing	Diamete	er : 3.2	25"		Tem	perature	e <u>:4</u>	5° F		
GROU	NDWAT	TER:		Core S	lize	:			Wea	ather	: 5	Sunny		
							12"		(%	ct)	ed sion	Α	tterbe	ra
atum vation	mple pth	SOIL/MATERIAL DESCRIPTION		atum pth	mple mber	T per 6	T per 1 (N)	covery (%)	isture ntent ('	tal Unit eight (p	confine mpres (ksf)		Limits	;
Str	Sal De			Str	Sai Nu	SP	S	Re	C Mo	Tot We	ភំបំ	LL	PL	PI
		Refer to B-10 for soil description												
	5_				ST-1			92						
748.0_		Pottom of Poring at 6 feat		6.0										
		Guidelines.	ction											
	-													
	15_													
	-													
	-													
	20_													
	25_													
			BORIN	G METH	IOD	S	AMPLI	NG ME	THOD	)	ABBR	REVIA	TIONS	;
			HSA - Hollo	w Stem	Auger	SS	- Split	Spoor	n Sam	ple *	- Har	nd Per	etrom	eter
		ENGINEERING Z	RC - Rock	Coring	Auger	CR	- Snel	Core	Samp	le Pl	Liqu Plas	stic Lin	nit	
		CTL Engineering, Inc.	MD - Mud	Drilling h Drilling	r	BS	- Bag	Samp	le	PI	- Plas	sticity	Index	
		Phone: 317-295-8650	νυ - vvas ΗΔ - Hand		9	AC	- Auge		nys	101	i - Sidi Pen	nual U etratio	n Tes	et.

		TES	T BOR	ING	RECO	ORD	)							
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NC	D.:	B-′	11	
PROJE	CT	: Stormwater and Deicing Capacity Projects	3				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	RTED	: 10-3	31-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 11-0	)1-17	
Boring	Elevation	n: 753 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Han	nmer	<u>: A</u>		atic	
	Easting	:159,354 Offset :		Rig Ty	pe	: CN	IE-550		Drill	er	: J	S.0%		
	Datum	NAD83, Indiana East Line :		Casing	Diamete	r : 3.2	5"		Tem	nperature	e <u>: 4</u>	0° F		
GROUI		EP: $\mathbf{\nabla}$ Encountered at 15.0' $\mathbf{\nabla}$ At con	aplation 26 /	Core S	IZE	:			vvea	atner kal c	: c			
			101011 <u>20</u>	<u>-</u>			1			U		11 <u>57.4</u>		
ratum evation	ample epth	SOIL/MATERIAL DESCRIPTION	ı	ratum epth	ample umber	oT per 6"	PT per 12" (N)	scovery (%)	oisture ontent (%)	otal Unit eight (pcf)	nconfined ompressior (ksf)	A	tterbei Limits	rg ;
шă	õõ			D CC	ΰź	5 S	S	Ř	ΞŬ	μŇ	Ξŭ	LL	PL	PI
752.0_				1.0		2								
	-X	Brown, Moist, Medium Stiff, SANDY LEAN CLAY (CL)		2	SS-1	2	5	78	17			44	16	28
749 5		Lab 43		35										
140.0_	5_	Brown, Moist, Medium Dense, <b>SILTY CLAY</b> SAND (SC-SM) Lah 44	/EY		SS-2	5 5 7	12	100	10			17	13	4
746.0	$\square$			7.0	66.2	6	22	100	12					
/40.0_		Gray, Damp, Very Stiff, LEAN CLAY with		1.7.0	55-5	9 13	22	100	12					
		SAND (CL)												
/44.0_				<u>/</u> 9.0	SS-4	9 20	44	100	7					
	10 <u> </u>				SS-5	8 9 9	18	0						
	20	Gray, Moist, Medium Dense to Very Dense SILTY CLAYEY SAND (SC-SM) with Cobble and Intermittent Sand and Gravel Layers (TILL) Lab 45	es		SS-6	5 6 10	16	100	9	148.5	9.1 @ 3.0%	17	12	5
	25_	Continued on next page			SS-7	5 9 17	26	67	11					
			BORIN	G METH	OD	S	AMPLI	NG ME	THO	)	ABBR		IONS	otor
		CTL Engineering, Inc. Phone: 317-295-8650	HSA - Hollo SFA - Solio RC - Rock MD - Mud WD - Was HA - Hano	ow Stem I Flight A Coring Drilling h Drilling d Auger	Auger Auger	SS ST CR BS AC	<ul> <li>Split</li> <li>Shel</li> <li>Rock</li> <li>Bag</li> <li>Auge</li> </ul>	Spoor by Tub Core Samp er Cutt	n Sam be San Samp le ings	pie * nple LL ile PL PI SF	Han - Liqu - Plas - Plas PT - Star Pen	id Pen iid Lim stic Lir sticity I ndard ietratic	etrom it nit Index on Tes	eter

		TEST	BORI	NGI	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NC	).:	B-1	1	
PROJE	СТ	: Stormwater and Deicing Capacity Projects							SHE	ET	2	OF	- :	2
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION		Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Neight (pcf)	Unconfined Compression (ksf)	At	terber _imits PI	rg Pl
					•• =									
Ī	Z - - 30				SS-8	12 13 19	32	89	11					
	35	Gray, Moist, Medium Dense to Very Dense,			SS-9	15 22 27	49	6						
, M	<u>₹</u> - 40	SILTY CLAYEY SAND (SC-SM) with Cobbles and Intermittent Sand and Gravel Layers (TILL) Lab 45			SS-10	19 24 50/5		89	14					
	45				SS-11	39 35 17	52	100	11					
703.0_	50	Bottom of Boring at 50 feet		_50.0	SS-12	25 25 35	60	67	13					
	-	Boring backfilled according to Aquifer Protecti Guidelines.	ion											
	55_			MET									1049	
			BORING SA - Hollow	VIEIH Stem	Auger	SS SS	- Split	Spoor	n Samp	le *	- Han	d Pen	etrome	eter
		CTL Engineering, Inc. Phone: 317-295-8650	FA - Solid F C - Rock ( D - Mud D (D - Wash A - Hand J	Flight A Coring prilling Drilling Auger	uger	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tub Core Samp er Cutt	be Sam Sampl le ings	ple LL e PL PI SF	- Liqu - Plas - Plas PT - Star Pen	iid Lim stic Lim sticity I ndard etratio	it nit ndex n Test	t

ſ

		TES	T BOR	ING	RECO	ORD	)							
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NC	).:	<b>B-</b> '	12	
PROJE	CT	: Stormwater and Deicing Capacity Projects					_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	TED	: <u>11-0</u>	)1-17	
PROJE	CT NO.	: 17050081IND	Г						DAT	E COM	PLETED	: 11-0	)1-17	
Boring	Elevation	n: 754 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	nmer Smor Effi	<u>A :</u>		atic	
	Easting	: <u>159,668</u> Offset :		Rig Ty	pe	: CM	1E-550		Drille	er	<u>: J</u>	IS		
	Datum	: NAD83, Indiana East Line :		Casing	Diamete	r : 3.2	5"		Tem	perature	e <u>: 4</u>	0° F		
GROU	NDWAT	ER: V Encountered at 13.0' V At com	pletion 9.4	Core S	IZE				1100		aved in a	<u>t 14 0</u>	•	
										_ 0				
ratum evation	mple pth	SOIL/MATERIAL DESCRIPTION	I	ratum spth	mple imber	T per 6"	Per 12" (N)	covery (%)	oisture ontent (%)	tal Unit eight (pcf)	iconfined ompressio (ksf)	At	tterbei Limits	rg
ШĞ	De De			D S	Sa Nu	R	S	Å	žŭ	°ĽŠ	Σŭ	LL	PL	PI
753.0_		TOPSOIL (12") (Visual)		1.0		3								
		Brown, Damp, Stiff, LEAN CLAY with SANI	כ (		SS-1	4	9	100	17					
750 5		As Lab 8		25		5								
/ 50.5_		Proug Domo Modium Donoo SILTY		/_0.0	66.2	7	10	17	10					
	5	CLAYEY SAND (SC-SM) with Cobbles			33-2	10	10		10					
748.0_		AS Lab 5		6.0										
	l JX				SS-3	20 40	58	100	8					
	Д	Brown, Damp, Hard, SANDY LEAN CLAY ( As Lab 6	CL)			18								
745.0				9.0		14								
	10				SS-4	22 24	46	100	5			NP	NP	NP
	- - -	Brown, Moist, Dense to Medium Dense, POORLY GRADED SAND with SILT and GRAVEL (SP-SM) Lab 10												
740.0	a _//			14.0	99.5	3	15	100	12					
	15				33-5	9	15	100	13					
	-	Gray, Wet, Medium Dense, <b>SILT with SAN</b> ( <b>ML)</b> with Traces of Gravel Lab 46	D											
734.5	-∏			19.5	SS-6	7	15	100	19			NP	NP	NP
	20_/\					8								
	-	Gray, Moist, Hard, <b>SILTY CLAY with SAND (CL-ML) (TILL)</b> As Lab 4				11								
	25				SS-7	16	38	100	12					
		Continued on next page												
	·i		BORIN	G METH	OD	S	AMPLI	NG ME	THOD		ABBR		TIONS	
			SFA - Solic	bw Stem I Flight A	Auger	SS	- Split - Shel	Spoor by Tub	be San	pie   * nple   LL	- Har Liqu	ia Pen Jid Lim	ietrom nit	eter
			RC - Rock	Coring		CR	- Rock	Core	Samp le	le PL	- Plas	stic Lir	nit Index	
		Phone: 317-295-8650	WD - Was	h Drilling d Auger	)	AC	- Auge	er Cutt	ings	SF	PT - Stai Pen	ndard	on Tes	:t

		TEST	<b>F BORI</b>	NGI	RECO	ORD								
CLIENT	Г	: Indianapolis Airport Authority					_		BOR	ING NC	).:	<b>B</b> -'	12	
PROJE	CT	: Stormwater and Deicing Capacity Projects				1	1		SHE	ET	2	0	F :	2
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION		Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	rotal Unit Neight (pcf)	Jnconfined Compression (ksf)	At	tterber Limits	rg DI
ол Ш				0, 1	0,2			-	20					
	30	Heaving Sand at 30 feet			SS-8	9 13 17	30	100	12					
	35				SS-9	11 19 23	42	100	11					
	40	Gray, Moist, Hard, <b>SILTY CLAY with SAND</b> (CL-ML) (TILL) As Lab 4			SS-10	13 14 19	33	100	12					
	45				SS-11	13 14 16	30	100	11					
704.0_	50	Bottom of Boring at 50 feet Boring backfilled according to Aquifer Protec Guidelines.	tion	_50.0	SS-12	16 19 29	48	100	11					
	- - 55_ -													
			BORING	METH	OD Auger	<b>S/</b>	AMPLI		THOD	* 9	ABBR	EVIA1	TIONS	otor
		ENGINEERING S CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	Flight A Coring Prilling Drilling Auger	luger	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tuk Core Samp er Cutt	e Sam Sampl le ings	ple LL e PL PI SF	- Han - Liqu - Plas - Plas 2T - Star Pen	id Lim tic Lir ticity dard etratic	nit nit Index on Tes	t

ſ

		TES	T BOR	ING	RECC	RD								
CLIENT	Г	: Indianapolis Airport Authority					_		BOR	RING NC	).:	B-'	13	
PROJE	СТ	: Stormwater and Deicing Capacity Projects					_		SHE	ET	1	0	F	3
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	TED	: 11-1	16-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 11-1	17-17	
Boring	Elevatio	n: 758 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	imer	<u>: A</u>	Automa	atic	
	Easting	:158,775 Offset :		Rig Ty	pe	: CM	E-550			er	iciency <u>. a</u> : J	IS		
1	Datum	: NAD83, Indiana East Line :		Casing	Diamete	r <u>: 3.2</u>	5"		Tem	perature	e <u>: 4</u>	0° F		
GROUM		EP: $\nabla$ Encountered at 7.2' $\nabla$ At com	pletion 7.0'	Core S	IZE	:			vvea	itner Barc			ist '	
			piction <u>7.0</u>				1			- <u>-</u> U		at <u>57.0</u>		
tratum levation	ample epth	SOIL/MATERIAL DESCRIPTION		tratum epth	ample umber	PT per 6"	PT per 12" (N)	ecovery (%)	oisture ontent (%)	otal Unit /eight (pcf)	nconfined ompressior (ksf)	A	tterbei Limits	rg
юш	ΩÖ	SAND with LIMESTONE and CLAY (12")	<u></u>	<u>م</u> م ا	ΰZ	S	S	R	Συ	ř≤	⊃ບ	LL	PL	PI
757.0_		(Visual)		1.0										
	-	Brown, Moist, Medium Stiff, <b>SANDY LEAN</b> <b>CLAY (CL)</b> with Traces of Gravel As Lab 14			SS-1	3 2 4	6	33	25					
754.5_	5_	Brown, Moist, Loose to Medium Dense, SIL	ТҮ	3.5	SS-2	3 4 4	8	100	17					
750.7		As Lab 15		7.3	SS-3	4 4 11	15	100	11					
749.5_	-	GRADED SAND with SILT and GRAVEL (SP-SM) As Lab 16		8.5		17								
748.5_	10	Brown, Moist, Hard, SILTY CLAY with SAN (CL-ML) As Lab 4		9.5	SS-4	17 19	36	100	7					
743.0_		Brown, Wet, Dense to Loose, <b>SILTY CLAYE</b> <b>SAND (SC-SM)</b> As Lab 13	EY	_15.0	SS-5	3 4 3	7	100	8					
		Brown, Moist, Hard to Stiff, <b>SILTY CLAY wit SAND (CL-ML)</b> with Intermittent Sand and Gravel Layers <b>(TILL)</b> As Lab 4	th		SS-6	17 24 40	64	100	8					
		Continued on next page		r										
			BORIN	G METH		Sc Sc			THOD		ABBR	REVIA		otor
			SFA - Solid	Flight A	luger	ST	- Shel	by Tub	be Sam	nple LL	- Han - Liqu	uid Lin	nit	CICI
			RC - Rock	Coring		CR BS	- Rock	Core	Sampl le	le PL PI	- Plas	stic Lir sticity	nit Index	
		Phone: 317-295-8650	WD - Wasl	h Drilling Auger	]	AC	- Auge	er Cutt	ings	SF	PT - Stai Pen	ndard	on Tes	st

		TES	<b>ST BORI</b>	NG F	RECC	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NO	.:	<b>B-</b> 1	13	
PROJE	CT	: Stormwater and Deicing Capacity Project	S				1		SHE	ET	2	0	= ;	3
tum ation	iple th	SOIL/MATERIAL DESCRIPTIO	u	th	ıple 1ber	per 6"	7 per 12" (N)	overy 6)	sture tent (%)	al Unit ght (pcf)	onfined ıpression ksf)	At	terber: Limits	rg
Stra Elev	San Dep			Stra Dep	Sarr Nun	SPT	SP1	Rec (%	Moi Con	Tota Wei	Con	LL	PL	PI
	25				SS-7	12 14 11	25	100	11					
	30	Brown, Moist, Hard to Stiff, <b>SILTY CLAY w</b>	ith		SS-8	8 4 6	10	33	11					
	35	SAND (CL-ML) with Intermittent Sand and Gravel Layers (TILL) As Lab 4			SS-9	43 44 37	81	89	8					
ية الت	<u>a</u> 40				SS-10	12 21 32	53	100	8					
	45	Continued on next page			SS-11	13 17 23	40	100	4					
			BORING HSA - Hollow	METH Stem	OD Auger	SS S	- Split	NG ME Spoor	THOD	le *	- Han	d Pen	etrom	eter
		CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	light A Coring rilling Drilling Auger	uger	ST CR BS AC	- Shell - Rock - Bag - Auge	by Tub Core Sampl er Cutt	be Sam Sampl le ings	ple LL e PL PI SP	- Liqu - Plas - Plas T - Star Pen	id Lim itic Lin iticity I idard etratic	it nit ndex on Tes	t

	TEST BORING RECORD													
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NC	.:	B-′	13	
PROJE	СТ	: Stormwater and Deicing Capacity Projects					_		SHE	ET	3	0	F;	3
stratum Elevation	ample Jepth	SOIL/MATERIAL DESCRIPTION		stratum Depth	ample Jumber	SPT per 6"	SPT per 12" (N)	tecovery (%)	Aoisture Content (%)	otal Unit Veight (pcf)	Jnconfined Compression (ksf)	A	tterber Limits	g
ωш	00			00	02	0		Ľ.	20	+>	50	LL	PL	PI
708.0_		Brown, Moist, Hard to Stiff, SILTY CLAY with SAND (CL-ML) with Intermittent Sand and Gravel Layers (TILL) As Lab 4 Bottom of Boring at 50 feet Boring backfilled according to Aquifer Protect Guidelines	h xtion	_50.0	SS-12	6 13 17	30	100	10					
	- 555_ -	Guideines												
	60_													
	- 65													
	70_													
			BORING	METH	OD Auger	<b>S</b> /	MPLI	NG ME	THOD		ABBR	EVIA1	FIONS	ater
		ENGINEERING ¥ CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid F RC - Rock ( MD - Mud D ND - Wash HA - Hand	Flight A Coring rilling Drilling Auger	l	ST CR BS AC	- Shell - Rock - Bag - Auge	by Tub Core Sampler Cutt	e Sam Sampl e ings	ple LL e PL PI SF	- Liqu - Plas - Plas - Plas PT - Star Pen	id Lim stic Lir sticity I ndard etratic	nit nit Index on Test	t

Г

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

CLENT : Indiangolis Arport Authonly       BORING NO: B-14         COLONTO: I Stormangolis Arport Authonly         DOUBLING TO STORE THE INCOMPARIANCE INCOMP			TES	T BORI	NG	RECC	RD	)							
PROJECT       Stormwater and Delong Capacity Projects       SHEET       1       0.F       2         LOCATION       Indianapolis, IN       Data STARTED       11-16-17         PROJECT NO:       Staton       Boring Method       HISA       Hammer       2.004-500         Norting:       156,387       Boring Method       HISA       Hammer       1.06-2       0.00         Rig Type       Cases Dumeter       32.27       Composition       1.0       S.5       1.0       1.0       1.0       S.5       1.0       1.0       1.0       1.0 <td< td=""><td>CLIENT</td><td>Г</td><td>: Indianapolis Airport Authority</td><td></td><td></td><td></td><td></td><td>_</td><td></td><td>BOF</td><td>RING NC</td><td>D.:</td><td>B-′</td><td>14</td><td></td></td<>	CLIENT	Г	: Indianapolis Airport Authority					_		BOF	RING NC	D.:	B-′	14	
LOCATION       : Indianapolis, IN       DATE STARTED       : 11-16-17         PROJECT NO. : 17950861100       Doring Depth : 50.0 Feet       Boring Method       : HSA       Hammer II: 200       Hammer II: 2	PROJE	СТ	: Stormwater and Deicing Capacity Projects	3				_		SHE	ET	1	0	F	2
PROJECT NO.: 17050081ND       DATE COMPUTE: 11-11-17.         Boring Elevation: 255 Fed. bashing : 1253.97 bashing : 1255.97 bashing : 1253.97 bashing : 1253.97	LOCAT	ION	: Indianapolis, IN					_		DAT	E STAF	RTED	: 11-1	6-17	
Boring Leardon: 755 Feet Narthing: 1562.397         Boring Depth: 50.0 Feet Station: 1562.397         Boring Minde: 1:HSA Eng Type         Hammer Finderny: 80.0 Feet Station: 1562.397         Hammer Finderny: 80.0 Feet Station: 1562.397           CROUNDWATER:         ¥ Encountered at Z_0'         ¥ A completin 5.0'         Core Size         :	PROJE	CT NO	. : 17050081IND							DAT	E COM	PLETED	: 11-1	6-17	
Normality         User-Adv         Station:         Pig Type         CMIE-So         Pig Type         Construct         So         Pig Type         Construct         Pig Type	Boring	Elevatio	755 Feet         Boring Depth : 50.0           1 205 207         24-bins	Feet	Boring	Method	: HS	A		Ham	imer	<u>: A</u>		atic	
Datum         NADB3. Indiana East         Line         Casing Diameter         32.7         Temperature         132.7         Temperature		Northing Easting	: 159,116 Station:		Rig Ty	ре	: CN	IE-550		- Ham	imer ≞π er	iciency <u>: a</u> : J	16.0% IS		
GROUNDWATER:       Caconitation of a transmission of a transmissint of a transmi		Datum	: NAD83, Indiana East Line :		Casing	) Diameter	: 3.2	5"		Tem	perature	e <u>:3</u>	5° F		
GRUCHUMMENT 12 Enclorate unit 20         ALCOMPARIENT 120         Solumparient 120         Solumparient 120         Solumparient 120         Solution 1120         Solution				aplation E 9'	Core S	size	:			Wea	ither	: 5	Junny		
Under the section of the sectin of the section of the section of the section of the sect	GROUI	NDVVAI	The second seco	ipietion <u>5.6</u>							™a C	aved in a	it <u>12.5</u>		
3 G 0         3 G 0         3 G 0         3 G 0         2 G P3         5 G L         PL         PL         PL           754-0         10         TOPSOIL (12') (Visual)         1.0         5         5         56         24         1.5         5         56         24         1.5         1.8         29           749.0         1.0         5         55.2         3         6         100         24         1.5         1.8         29           749.0         10         Brown, Moist, Loose, SILTY CLAYEY SAND         6.0         SS-3         4         9         56         13         1.7         17         12         5           743.0         Interving Sands at 18 feat         9.5         SS-5         6         10         14         17         12         5           743.0         Ints	ratum evation	ample epth	SOIL/MATERIAL DESCRIPTION	1	rratum epth	ample umber	Per 6"	PT per 12" (N)	ecovery (%)	oisture ontent (%)	otal Unit eight (pcf)	nconfined ompression (ksf)	At	tterbe Limits	rg
764.0       10       10       SS-1       2       5       56       24       47       18       29         749.0       100       100       24       47       18       29         749.0       100       100       24       47       18       29         749.0       100       100       24       47       18       29         749.0       10       10       10       10       10       24       47       18       29         746.5       10       Brown, Moist, Loose, SILTY CLAYEY SAND (SC-SM) with Traces of Gravel       8.5       SS-4       9       15       100       14       17       12       5         743.0       15       10       14       17       12       5       5       6       13       14       17       12       5         743.0       15       10       14       17       12       5       15       10       14       17       12       5         743.0       15       10       12.0       SS-5       6       15       12       100       18       17       12       17       12       5         720 <td< td=""><td>ы</td><td>ů ŭ</td><td></td><td></td><td>۵ŭ</td><td>ΰź</td><td>S</td><td>ō</td><td>Ř</td><td>ΞŬ</td><td>Ĕ≥</td><td>Ξŭ</td><td>LL</td><td>PL</td><td>PI</td></td<>	ы	ů ŭ			۵ŭ	ΰź	S	ō	Ř	ΞŬ	Ĕ≥	Ξŭ	LL	PL	PI
ABROWN and Gray, Moist, Medium Stiff, LEAN       SS-1       3       5       56       24       47       18       29         749.0       Brown, Moist, Loose, SILTY CLAYEY SAND       5.0       SS-2       3       6       100       24       47       18       29         746.5       Brown, Moist, Loose, SILTY CLAYEY SAND       5.0       SS-3       4       9       56       13       17       12       5         746.5       Brown, Moist, Stiff, SILTY CLAYEY SAND       8.5       SS-4       8       15       100       14       17       12       5         743.0       Brown, Moist, Stiff, SILTY CLAYEY SAND       SS-5       6       10       14       17       12       5         743.0       Brown, Moist, Stiff, SILTY CLAYEY SAND       SS-5       6       13       23       100       10       14       17       12       5         743.0       SS-5       6       13       23       100       10       14       17       12       5         743.0       SS-5       6       13       23       100       10       18       14       14       17       12       5         20       Artinitization Samologititito S	754.0_	+			1.0		2								
T49.0         Brown and Gray, Moist, Medium Stiff, LEAN CLAP with SAND (CL)         SS-2         3 3 3         6 100         100         24         47         18         29           749.0         Frown, Moist, Loose, SILTY CLAYEY SAND (SC-SM) with Traces of Gravel Lab 13         6.0         SS-3         4 4         9         56         13         4         9         56         13         4         17         12         5           746.5         10         Brown, Moist, Stiff, SILTY CLAYEY SAND (SC-SM) with Traces of Gravel         8.5         SS-4         8         15         100         14         17         12         5           743.0         SS-5         6 15         23         100         10         14         17         12         5           743.0         SS-5         6 13         23         100         10         14         17         12         5           743.0         SS-5         6 13         23         100         10         18         14         17         12         5           20         Continued on next page         SS-6         15         12         100         18         18         18         18         18         14         17         12		- X				SS-1	3 2	5	56	24					
749.0       5       CLAY with SAND (CL)       55.2       3       6       100       24       47       18       29         749.0       6.0       S5.2       3       6       100       24       47       18       29         746.5       10       Brown, Moist, Loose, SILTY CLAYEY SAND       S5.3       4       9       56       13       17       12       5         743.0       8.5       8.5       SS.4       8       15       100       14       17       12       5         743.0       15       10       14       17       12       5       5       6       13       17       12       5         743.0       15       15       100       14       17       12       5         743.0       15       13       23       100       10       14       17       12       5         743.0       15       13       23       100       10       10       14       17       12       5         75       15       13       23       100       10       10       14       17       12       5         76       10       S5.		-	Brown and Gray, Moist, Medium Stiff, LEA	N //											
5       -		-1	Lab 12			SS-2	3	6	100	24			47	18	29
749.02       Brown, Moist, Loose, SILTY CLAYEY SAND       6.0       SS-3       4/4       9       56       13         746.5       Brown, Moist, Stiff, SILTY CLAYEY SAND       8.5       SS-4       8/7       15       100       14       17       12       5         743.0       Brown, Moist, Stiff, SILTY CLAYEY SAND       8.5       SS-4       8/7       15       100       14       17       12       5         743.0       Image: Comparison of Gravel Lab 13       12.0       SS-5       60       13       10       14       17       12       5         743.0       Image: Comparison of Gravel Lab 13       12.0       SS-5       60       13       100       14       17       12       5         743.0       Image: Comparison of Gravel Moist, Yory Stiff to Stiff, SILTY CLAYEY Stiff to Stiff, SILTY		5_/	N			002	3								20
746.5       10       Brown, Moist, Loose, SILTY CLAYEY SAND (SC-SM) with Traces of Gravel       8.5       SS-3       4/4       9       56       13         746.5       10       Brown, Moist, Sliff, SILTY CLAYEY SAND (SC-SM) with Traces of Gravel       8.5       SS-4       8/7       15       100       14       17       12       5         743.0       15       10       Heaving Sands at 18 feet Brown and Gray, Moist, Very Sliff to Sliff, SILTY CLAY with SAND (CL-MU) with Intermittent Layers of Sand (TILL)       12.0       SS-5       6/0       13       23       100       10       14       17       12       5         20       15       15       10       18       12.0       SS-5       15       10       10       18       16       11       10       18       16       11       11       10       18       18       16       11       11       100       18       18       18       18       18       18       18       18       18       18       18       10       11       11       100       18       18       18       18       18       18       18       18       18       18       18       18       18       18       18       10       11	749.0	L			6.0										
746.5       10       As Lab 5       8.5       SS-4       8       15       100       14       17       12       5         743.0       Brown, Moist, Stiff, SILTY CLAYEY SAND (SC-SM) with Traces of Gravel Lab 13       12.0       SS-4       8       15       100       14       17       12       5         743.0       15       15       10       14       17       12       5         743.0       15       15       10       14       17       12       5         15       15       15       10       10       14       17       12       5         16       15       15       13       23       100       10			Brown, Moist, Loose, SILTY CLAYEY SAN	D	•	SS-3	4 4	9	56	13					
746.5       10       Brown, Moist, Stiff, SiLTY CLAYEY SAND       SS-4       8       15       100       14       17       12       5         743.0       12.0       12.0       SS-4       8       15       100       14       17       12       5         15       15       15       10       14       17       12       5         15       15       15       10       10       14       17       12       5         15       15       13       12.0       SS-5       6       10       23       100       10 <td< td=""><td></td><td></td><td>As Lab 5</td><td></td><td></td><td></td><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>			As Lab 5				5								
10       Brown, Moist, Stiff, SiLTY CLAYEY SAND (SC-SM) with Traces of Gravel Lab 13       SS-4       7       15       100       14       17       12       5         743.0       15       10       14       17       12       5         15       15       15       100       14       17       12       5         15       15       15       100       10       10       10       10       10       10       117       12       5         15       15       15       10	746.5_		Λ		8.5		8								
743.0       12.0       12.0       12.0       12.0       12.0       12.0       10       10         15       15       13       23       100       10       10       10       10         15       15       13       23       100       10 <t< td=""><td></td><td>10</td><td>Brown, Moist, Stiff, <b>SILTY CLAYEY SAND</b> (SC-SM) with Traces of Gravel</td><td></td><td></td><td>SS-4</td><td>7 8</td><td>15</td><td>100</td><td>14</td><td></td><td></td><td>17</td><td>12</td><td>5</td></t<>		10	Brown, Moist, Stiff, <b>SILTY CLAYEY SAND</b> (SC-SM) with Traces of Gravel			SS-4	7 8	15	100	14			17	12	5
Image: Section of the section of th	743.0	1			12.0										
15       -		<u>x</u>													
15       -			7				6								
113       113       113       113       113       113       110       118         20       111       11		15				SS-5	10	23	100	10					
Heaving Sands at 18 feet         Brown and Gray, Moist, Very Stiff to Stiff,         SILTY CLAY with SAND (CL-ML) with         Intermittent Layers of Sand (TILL)         As Lab 4         SS-6         1         20         21         25         Continued on next page         BORING METHOD         SS-7         5         6         25         Continued on next page         BORING METHOD         SS-7         5         6         15         25         Continued on next page         BORING METHOD         SAMPLING METHOD         ABBREVIATIONS         HSA - Hollow Stem Auger         ST - Shelby Tube Sample         CTL Engineering, Inc.         Phone: 317-295-8650         WD - Wash Drilling         WD - Wash Drilling         WD - Wash Drilling         AC - Auger Cuttings         SPT - Standard		15					15								
Heaving Sands at 18 feet Brown and Gray, Moist, Very Stiff to Stiff, SILTY CLAY with SAND (CL-ML) with Intermittent Layers of Sand (TILL)       SS-6       15 10 11       21       100       18         20       Image: Single state st		-													
Heaving Sands at 18 feet         Brown and Gray, Moist, Very Stiff to Stiff,         SILTY CLAY with SAND (CL-ML) with         Intermittent Layers of Sand (TILL)         As Lab 4         S5-6         10         11         20         1         21         10         11         21         10         11         25         Continued on next page         SS-7         5         15         25         Continued on next page         BORING METHOD         SS-7         5         15         15         25         Continued on next page         BORING METHOD         SS - Split Spoon Sample         SS - Split Spoon Sample         ST - Shelby Tube Sample         CTL Engineering, Inc.         Phone: 317-295-8650		-													
Brown and Gray, Moist, Very Stiff to Stiff, SILTY CLAY with SAND (CL-ML) with intermittent Layers of Sand (TILL) As Lab 4       SS-6       15 10 11       21       100       18         20		-	Heaving Sands at 18 feet												
20       As Lab 4         1       11         1		-17	SILTY CLAY with SAND (CL-ML) with			SS-6	15 10	21	100	18					
25       Continued on next page       SS-7       5       15       67       10         BORING METHOD         SS-7       5       15       67       10         Monther the second of the secon		20	As Lab 4				11								
25       Continued on next page       SS-7       5       15       67       10         BORING METHOD       SAMPLING METHOD       ABBREVIATIONS         Image: SS-7       6       15       67       10         Image: SS-7       5       6       15       67       10         Image: SS-7       5       67       10       Image: SS-7       10       Image: SS-7<		_													
25       Continued on next page       SS-7       5       15       67       10         BORING METHOD       SAMPLING METHOD       ABBREVIATIONS         Image: SS - Split Spoon Sample         Image: SS - Split Spoon Sample         Continued on next page         BORING METHOD       SAMPLING METHOD         BORING METHOD         Continued on next page         Image: SS - Split Spoon Sample         FA - Hollow Stem Auger         SS - Split Spoon Sample         CTL Engineering, Inc.         Phone: 317-295-8650       MD - Mud Drilling         MD - Wash Drilling       AC - Auger Cuttings       SPT - Standard         Standard Auger		_													
25_       Continued on next page       SS-7       5/6       15       67       10       ABBREVIATIONS         Continued on next page         BORING METHOD       SAMPLING METHOD       ABBREVIATIONS         FRAMEWING SET Continued on next page         BORING METHOD       SAMPLING METHOD       ABBREVIATIONS         FRAMEWING SET Continued on next page         SS-7       5/6       9       15       67       10       -															
25       Continued on next page       SS-7       6       15       67       10         BORING METHOD       SAMPLING METHOD       ABBREVIATIONS         BORING METHOD       SAMPLING METHOD       ABBREVIATIONS         Image: SS - Split Spoon Sample       *       - Hand Penetrometer         SFA - Solid Flight Auger       ST       - Shelby Tube Sample       *       - Hand Penetrometer         CTL Engineering, Inc.       MD - Mud Drilling       BS       - Bag Sample       PL       - Plastic Limit         MD - Wash Drilling       WD - Wash Drilling       AC       - Auger Cuttings       SPT - Standard			7				5								
Continued on next page       BORING METHOD       SAMPLING METHOD       ABBREVIATIONS         Image: State of the sta		25				SS-7	6 9	15	67	10					
BORING METHOD       SAMPLING METHOD       ABBREVIATIONS         Image: Boring method       HSA - Hollow Stem Auger       SS - Split Spoon Sample       * - Hand Penetrometer         Image: Boring method       SFA - Solid Flight Auger       ST - Shelby Tube Sample       Image: LL - Liquid Limit         Image: Boring method       RC - Rock Coring       CR - Rock Core Sample       PL - Plastic Limit         Image: Boring method       MD - Mud Drilling       BS - Bag Sample       PI - Plasticity Index         Image: Boring method       WD - Wash Drilling       AC - Auger Cuttings       SPT - Standard			Continued on next page		1		-								
Insk = Holdwistern Adger       SS = Split Spoort Sample       - Haid Penetonneter         Insk = Holdwistern Adger       SS = Split Spoort Sample       - Haid Penetonneter         SFA = Solid Flight Auger       ST = Shelby Tube Sample       LL = Liquid Limit         RC = Rock Coring       RC = Rock Core Sample       PL = Plastic Limit         MD = Mud Drilling       BS = Bag Sample       PI = Plasticity Index         WD = Wash Drilling       AC = Auger Cuttings       SPT = Standard				BORING	G METH		<b>S</b>	AMPLI		ETHOD		ABBR	EVIAT	TIONS	otor
ENGINEERINGRC- Rock CoringCR- Rock Core SamplePL- Plastic LimitCTL Engineering, Inc.MD- Mud DrillingBS- Bag SamplePI- Plasticity IndexPhone:317-295-8650WD- Wash DrillingAC- Auger CuttingsSPT- Standard				SFA - Solid	Flight A	Auger	ST	- Shel	by Tub	be Sam	nple   LL	- nar - Liqu	uid Lim	nit	elei
Phone: 317-295-8650 WD - Wash Drilling AC - Auger Cuttings SPT - Standard				RC - Rock	Coring Drilling		CR BS	- Rock	Core	Samp le	le PL	- Plas	stic Lin	nit Index	
			Phone: 317-295-8650	WD - Wash	n Drilling	9	AC	- Auge	er Cutt	ings	SF	PT - Sta	ndard		

IEST BORING RECORD														
CLIEN	Г				_		BOR	ING NO	).:	<b>B-</b> 1	14			
PROJE	CT	: Stormwater and Deicing Capacity Projects				1	1		SHE	ET	2	OF	=;	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION		atum oth	nple nber	. per 6"	- per 12" (N)	overy 6)	sture tent (%) I Unit	al Unit ight (pcf)	confined npression ksf)	At	terber: Limits	rg
Stra Elev	San Dep				San Nur	SPT	SP <sup>-</sup>	Rec	Moi Cor	Tot: Wei	Cor Cor	LL	PL	PI
	30	Brown and Gray, Moist, Very Stiff to Stiff, SILTY CLAY with SAND (CL-ML) with Intermittent Layers of Sand (TILL) As Lab 4 Bottom of Boring at 50 feet			SS-8	7 9 15	24	67	10					
	35				SS-9	5 9 14	23	100	13					
	40				SS-10	8 8 11	19	78	16					
	45				SS-11	6 9 13	22	100	13					
705.0_	50			_50.0	SS-12	9 12 15	27	100	14					
		Boring backfilled according to Aquifer Protecti Guidelines.	ion											
			BORING	METH	OD	S	AMPLI	NG ME	THOD		ABBR	REVIATIONS		
		CTL Engineering, Inc. Phone: 317-295-8650	SA - Hollow FA - Solid F C - Rock ( D - Mud D /D - Wash A - Hand	v Stem Flight A Coring Drilling Drilling Auaer	Auger luger	SS ST CR BS AC	- Split - Shel - Rock - Bag - Auge	Spoor by Tub Core Samp er Cutt	n Samp be Sam Sampl le ings	ole  * ple  LL e  PL  PI  SF	- Han - Liqu - Plas - Plas 2T - Star Pen	d Pen- id Lim itic Lin iticity I idard etratio	etrome it nit ndex on Tes	eter t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	<b>ST BOR</b>	ING	RECC	ORD	)									
CLIENT : Indianapolis Airport Authority									BOF	RING NC	0.:	B-′	15			
PROJECT : Stormwater and Deicing Capacity Projects							_		SHE	ET	1	0	F	3		
LOCAT	LOCATION : Indianapolis, IN								DAT	E STAR	TED	: 11-2	2-17			
PROJE	CT NO.	: 17050081IND							DAT	E COMP	PLETED	: 11-2	2-17			
Boring	Elevation	n: 754 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	HSA Hammer : Automatic									
	Easting	: <u>159,443</u> Offset :		Rig Ty	pe Diamata	: CN	1E-550		Drille	er	<u>: J</u>	S				
	Datum	: NAD83, Indiana East Line :		Core S		·	.0		Tem	perature	e <u>:3</u>	5° F				
GROU	NDWATI	ER: I Encountered at 4.5' I At cor	npletion 27.2	2'	126				1000	E C	aved in a	nt 43.0'	,			
atum vation	mple pth	SOIL/MATERIAL DESCRIPTION		atum oth nple nber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	tal Unit ight (pcf)	confined npressio (ksf)	Atterberg Limits					
Str	Sal De			Str De	Sal Nu	SP	SP	Re	နိုင်	Ve	5°∟	LL	PL	PI		
753.5_		TOPSOIL (6") (Visual)		0.5												
		Brown, Moist, Medium Stiff to Soft, LEAN CLAY with SAND (CL) As Lab 12 Brown, Moist, Soft to Hard, SILTY CLAYEY SAND (SC-SM) with Traces of Gravel As Lab 15			SS-1	2 3 3	6	100	24							
749.5	5_5			4.5	SS-2	2 1 2	3	67	25							
			·		SS-3	5 7 11	18	100	9							
745.0_	10			9.0	SS-4	11 21 22	43	100	6							
		Brown and Gray, Moist, Stiff to Hard, <b>SILT</b> <b>CLAY with SAND (CL-ML) (TILL)</b> As Lab 4	Y		SS-5	7 11 9	20	100	6							
	20	Continued on next page			SS-6	4 6 9	15	100	9							
			HSA - Holl	IG METH		<b>S</b> S	AMPLI	NG ME	THOD	n k	ABBR	EVIAT	ilons	eter		
ENGINEERING SHSA - HoENGINEERING SSFA - SoCTL Engineering, Inc.MD - MuPhone: 317-295-8650WD - Wa			SFA - Hold SFA - Solid RC - Rocl MD - Mud WD - Was HA - Han	id Flight Auger     SS     - Split Spoon Sample     - Hand       id Flight Auger     ST     - Shelby Tube Sample     LL     - Liquid       ck Coring     CR     - Rock Core Sample     PL     - Plast       d Drilling     BS     - Bag Sample     PI     - Plast       ash Drilling     AC     - Auger Cuttings     SPT     - Stand					id Fen id Lim stic Lin sticity I ndard ietratic	nit nit Index	eler					

TEST BORING RECORD														
CLIEN	-	: Indianapolis Airport Authority					_		BOR	ING NO	).:	<b>B</b> -'	15	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	3			1	1		SHEET 2		2	OF 3		3
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	4	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	A	tterber Limits PL	g PI
		Brown and Gray, Moist, Stiff to Hard, SILT CLAY with SAND (CL-ML) (TILL) As Lab 4	Y		SS-7 SS-8 SS-9 SS-10	6 10 10 5 6 6 7 8 11 6 9 14	20 12 19 23	100 100 100	9 9 11 19 14					
屠	45_	Cobble Encountered at SS-11 Continued on next page			SS-11	17 15 19	34	22	12					
			BORING	METH	OD	S		NG ME	THOD		ABBR	EVIA	TIONS	
CTL Engineering, Inc. Phone: 317-295-8650			HSA - Hollow SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	V Stem Flight A Coring Prilling Drilling Auger	Auger uger	SS ST CR BS AC	- Split - Shell - Rock - Bag - Auge	Spoor by Tuk Core Samp er Cutt	n Samp be Sam Sampl le ings	ole * iple LL e PL PI SF	- Han - Liqu Plas - Plas 2T - Star Pen	id Pen iid Lim stic Lir sticity ndard etratic	etrome nit nit Index on Tesi	eter t

1

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

TEST BORING RECORD																	
CLIENT : Indianapolis Airport Authority							_		BOR	ING NC	).:	B-1	15				
PROJECT : Stormwater and Deicing Capacity Projects									SHE	ET	OF 3						
stratum Elevation	ample Jepth	SOIL/MATERIAL DESCRIPTION		itratum Depth	ample Jumber	SPT per 6"	SPT per 12" (N)	tecovery (%)	Aoisture Content (%)	<sup>-</sup> otal Unit Veight (pcf)	Jnconfined Compression (ksf)	At	terber Limits	g			
ωш	00			00	02	0		Ľ.	20	+>	50		PL	PI			
704.0_		Brown and Gray, Moist, Stiff to Hard, SILTY CLAY with SAND (CL-ML) (TILL) As Lab 4		_50.0	SS-12	34 39 27	66	67	12								
	_ _ 55 _ _	Guidelines.															
	60_																
	65_																
	70_																
			BORING	METH		S/			THOD		ABBR						
			SFA - Solid F	light A	uger	ST	- Shell	by Tub	e Sam	iple LL	- Han - Liqu	id Lim	it	ਰਦਾ			
		ENGINEERING≝	RC - Rock ( MD - Mud D	CR - Rock Core Sample PL - BS - Bag Sample PI -					- Plas - Plas	tic Lin ticity I	nit ndex						
Phone: 317-295-8650			ND - Wash HA - Hand	AC - Auger Cuttings				SF	SPT - Standard Penetration Test								

Г
		TES	T BOR	ING	RECC	DRD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NC	).:	B-′	16	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	3				_		SHE	ET	1	0	F	3
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	TED	: <u>11-1</u>	7-17	
PROJE	CT NC	D. : 17050081IND							DAT	E COMP	PLETED	: 11-1	7-17	
Boring	Elevati	on: <u>754 Feet</u> Boring Depth : <u>50.0</u>	Feet	Boring	Method	: HS.	A		Ham	imer mer Effi	<u>: A</u>		atic	
	Easting	g : <u>159,471</u> Offset :		Rig Typ		: <u>CM</u>	E-550		Drille	er	<u>: J</u>	S		
	Datum	: NAD83, Indiana East Line :		Casing	Diametei	· <u> </u>	5		Tem	perature	e <u>:4</u>	<u>5° F</u>		
GROU	NDWA	TER: $\mathbf{\Psi}$ Encountered at <u>5.0'</u> $\mathbf{\Psi}$ At con	npletion 27.4	<u>4'</u>	126				1000	國 C	aved in a	t <u>36.7</u>		
ratum evation	mple pth	SOIL/MATERIAL DESCRIPTION	I	ratum pth	mple imber	T per 6"	T per 12" (N)	covery (%)	bisture Intent (%)	tal Unit eight (pcf)	iconfined mpression (ksf)	At	tterbei Limits	rg
E	Sa De			De Sti	Sa Nu	SP	ß	Re	ĕů	¶0 ₩	ΰČ	LL	PL	PI
753.0_	+	TOPSOIL (12") (Visual)		1.0		0								
		Brown, Moist to Wet, Medium Stiff, <b>LEAN</b>			SS-1	3 4 4	8	100	27					
1		As Lab 8			SS-2	2 2 3	5	56	11					
748.0_		Brown, Moist, Loose, SILTY CLAYEY SAN (SC-SM) As Lab 5	D	6.0	SS-3	3 4 5	9	100	15					
745.0_	10	Sand Seams Encountered in SS-4		9.0	SS-4	9 26 47	73	100	9					
	- - 15_/ -	Brown and Gray, Moist, Stiff to Hard, SILTY CLAY with SAND with Intermittent Sand Layers (TILL) As Lab 4	r		SS-5	6 8 11	19	100	16					
	20	Continued on next page			SS-6	6 9 13	22	100	11		10.1 @ 6.7%			
			BORIN		OD	S		NG ME	THOD		ABBR	EVIAT	'IONS	otor
			SFA - Solic	d Flight A	Auger	SS ST	- Split - Shel	Spoor by Tub	i Samp be Sam	ne   " nple   LL	- Han - Liqu	id Lim	eirom iit	eler
			RC - Rock	Coring		CR BS	- Rock	Core Samp	Samp le	le PL PI	- Plas	stic Lin	nit Index	
		Phone: 317-295-8650	WD - Was HA - Han	h Drilling d Auger	J	AC	- Auge	er Cutt	ings	SF	PT - Stai Pen	ndard	on Tes	st

		TES	T BORI	NGI	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NC	).:	B-'	16	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	5				1		SHE	ET	2	0	F ;	3
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	J	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	A	tterber Limits PL	g PI
Strat Elevi		Brown and Gray, Moist, Stiff to Hard, SILT CLAY with SAND with Intermittent Sand Layers (TILL) As Lab 4	Y	Strat	SS-9 SS-10	Lds 6 7 7 5 5 5 5 5 16 20 26 11 16 20 26	14 10 46	100 44 100	14 14 20 9 11	Total	Uncc		PL	PI
		Sand Seams Encountered in SS-11 Continued on next page			SS-11	16 27 36	63	100	11					
			BORING	METH	OD Auger	<b>S/</b>	AMPLI		THOD		ABBR	EVIA	FIONS	ator
		ENGINEERING≦ CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	Flight A Coring Drilling Drilling Auger	luger	ST CR BS AC	- Shell - Rock - Bag - Auge	by Tub Core Samp er Cutt	be Sam Sampl le ings	iple LL le PL PI SF	- Liqu - Plas - Plas - Plas PT - Star Pen	iid Lim stic Lir sticity ndard etratic	nit nit Index on Test	t

1

	TEST BORING RECORD													
CLIENT	Г	: Indianapolis Airport Authority					_		BOR	ING NC	.:	B-′	16	
PROJE	СТ	: Stormwater and Deicing Capacity Projects					_		SHE	ET	3	O	= ;	3
itratum :levation	ample Jepth	SOIL/MATERIAL DESCRIPTION		itratum Jepth	ample lumber	PT per 6"	SPT per 12" (N)	tecovery (%)	Aoisture Content (%)	otal Unit Veight (pcf)	Inconfined compression (ksf)	At	Limits	g
ωш	00			00	0 Z	0 O	0)	Ľ	20	->	50	LL	PL	Ы
704.0_	50	Brown and Gray, Moist, Stiff to Hard, SILTY CLAY with SAND with Intermittent Sand Layers (TILL) As Lab 4 Bottom of Boring at 50 feet	tion	_50.0	SS-12	13 14 20	34	100	14					
	-	Guidelines	cuon											
	- 55 -													
	60													
	65_													
	- - 70_													
			BORING	METH	OD	S/			THOD		ABBR	EVIAT	TIONS	ator
		<i>ENGINEERING</i> CTL Engineering, Inc. Phone: 317-295-8650	SFA - Hollow SFA - Solid F RC - Rock ( MD - Mud D MD - Wash HA - Hand /	r Stem Flight A Coring rilling Drilling Auger	Auger luger	SS ST CR BS AC	- Spiit - Shell - Rock - Bag - Auge	Spoor by Tub Core Sampl er Cutt	e Samp Sampl e ings	ple   LL e   PL   PI   SF	- Han - Liqu - Plas - Plas PT - Star Pen	id Lim tic Lin ticity I idard etratio	etrome iit nit ndex on Test	eter t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	ST BOR	RING	RECO	ORD	)							
CLIENT	Г	: Indianapolis Airport Authority					_		BOF	RING NC	).:	B-′	17	
PROJE	СТ	: Stormwater and Deicing Capacity Project	s				_		SHE	EET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	TE STAR	TED	: 11-1	4-17	
PROJE	CT NO.	: 17050081IND							DAT	TE COM	PLETED	: 11-1	4-17	
Boring	Elevation Northing	n: <u>765 Feet</u> · <u>1 626 005</u> Boring Depth : <u>50.0</u> Station:	Feet	Boring	Method	: HS	A		Han	nmer nmer Eff	<u>: A</u> iciency: 8	Automa 86.0%	atic	
	Easting	: 158,273 Offset :			Diamoto	: <u>CIV</u> 	5"		Drill	er	<u>: J</u>	S		
	Datum	: NAD83, Indiana East Line :		Core S	ize	:	0		Vea	nperature ather	e <u>:5</u> :5	50° F Sunnv		
GROUI	NDWATE	ER: $\Psi$ Encountered at <u>13.5'</u> $\Psi$ At cor	mpletion <u>12</u>	<u>.5'</u>		-			1	窗 C	aved in a	nt <u>15.9</u>		
atum vation	mple pth	SOIL/MATERIAL DESCRIPTION	N	atum pth	mple mber	T per 6"	T per 12" (N)	covery (%)	isture ntent (%)	tal Unit ight (pcf)	confined mpression (ksf)	A	tterbe Limits	rg
Str Ele	Sal De			Str	Saı Nu	SP	SP	Re	နိုင္ပ	Ve	5°	LL	PL	PI
764.0_		TOPSOIL (12") (Visual)		1.0		1								
	-Д	Brown, Moist, Stiff, <b>SANDY LEAN CLAY (C</b> Lab 14	;L)		SS-1	5 6	11	100	10			28	20	8
761.5_				3.5		3								
	5				SS-2	4 7	11	100	11					
		Brown, Moist, Medium Dense, <b>SILTY CLA' SAND (SC-SM)</b> Lab 15	YEY		SS-3	4 8 13	21	100	9			19	13	6
755.5_	10			9.5	SS-4	11 11 18	29	100	9					
R Z	  15 <sup>2</sup>	Drawn Maint Vary Stiff to Lord SANDY I			SS-5	32 21 24	45	100	19					
	20	CLAY (CL) with Gravel and Cobbles (TILL) Lab 51			SS-6	8 6 9	15	100	13	141.1	4.0 @ 10.9%	22	13	9
740.0_	25	Continued on next page		25.0	SS-7	10 11 16	27	22	15					
			BORI		OD	S	AMPLI	NG ME		)	ABBR		TIONS	- 4
		CTL Engineering, Inc.	HSA - Holl SFA - Soli RC - Roc MD - Muc	ow Stem d Flight A k Coring d Drilling sh Drilling	Auger Nuger	SS ST CR BS AC	<ul> <li>Split</li> <li>Shel</li> <li>Rock</li> <li>Bag</li> <li>Auge</li> </ul>	Spoor by Tul Core Samp er Cutt	n Sam be Sar Samp le ings	ple  * nple LL ble PL PI SF	- Har Liqu - Plas - Plas - PT - Stau	id Pen uid Lim stic Lir sticity I ndard	etrom nit nit Index	eter
		FILUIR. 311-293-003U	HA - Har	nd Auger	•				35		Per	etratic	n Tes	t

		TEST	BORII	NGI	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NC	).:	B-′	17	
PROJE	CT	: Stormwater and Deicing Capacity Projects							SHE	ET	2	0	F	2
atum vation	nple pth	SOIL/MATERIAL DESCRIPTION		atum pth	nple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined mpressior (ksf)	At	tterber Limits	rg
Str Ele	Sar De			Str De	Sar Nu	SP	SP	Re.	0 Ŭ Ŭ	Tot We	ů ů C Č	LL	PL	PI
	30				SS-8	15 9 11	20	67	22					
	35				SS-9	49 44 27	71	56	15			34	14	20
	40	Brown, Moist, Very Stiff to Hard, <b>SANDY LEAN</b> <b>CLAY with GRAVEL (CL)</b> with Cobbles ( <b>TILL</b> ) Lab 52	N		SS-10	10 12 19	31	100	11					
	45				SS-11	9 12 16	28	100	12					
715.0_	50	Bottom of Boring at 50 feet Boring backfilled according to Aquifer Protection	on	_50.0	SS-12	9 10 15	25	100	12					
	- - 55_ -	Guidelines.												
				METH	OD Auger	SS SS	AMPLI	NG ME	THOD	le *	ABBR	EVIAT	<b>IONS</b>	eter
		ENGINEERING ≦SFENGINEERING ≦RCCTL Engineering, Inc.MEPhone: 317-295-8650WIHA	A - Solid F C - Rock ( D - Mud D D - Wash A - Hand	Flight A Coring Drilling Drilling Auger	luger	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tub Core Sampler Cutt	e Sam Sampl le ings	ple LL e PL PI SF	- Liqu - Plas - Plas - Plas PT - Star Pen	id Lim itic Lin iticity I idard etratic	nit Index on Tes	t

		TES	ST BOR	ING	RECO	ORD	)							
CLIEN <sup>-</sup>	Г	: Indianapolis Airport Authority							BOF	RING NC	).:	B-1	7A	
PROJE	CT	: Stormwater and Deicing Capacity Project	ts				_		SHE	ET	1	0	=	4
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	TED	: 11-3	0-17	
PROJE	CT NO.	: 17050081IND							DAT	E COMP	PLETED	: 11-3	0-17	
Boring	Elevatio	n: 765 Feet Boring Depth : 74.5	5 Feet	Boring	Method	: HS	A		Ham	imer	: A		atic	
	Easting	: 158,273 Offset :		Rig Ty	ре	: CN	IE-550		Drill	imer ≞πi er	ciency <u>: 8</u> : J	6.0% S		
	Datum	: NAD83, Indiana East Line :		Casing	Diamete	er : 3.2	5		Tem	perature	: 5	0° F		
			malation 9.1	Core S	ize	:			Wea	ather	: : 			
					1	1	1					11 <u>39.0</u>		
atum evation	mple pth	SOIL/MATERIAL DESCRIPTIO	N	atum pth	mple mber	T per 6"	T per 12" (N)	covery (%)	visture ntent (%)	tal Unit eight (pcf)	confined mpression (ksf)	A	terbeı Limits	rg
E	Sa De			Str De	Sa Nu	SP	SР	Re	õВо	Υ <sup>ο</sup>	ů	LL	PL	PI
<u> </u>		Continued on next page	BORIN	G METH	IOD	S	AMPLII	NG ME	THO		ABBR		TIONS	
			HSA - Hollo	ow Stem	Auger	SS	- Split	Spool	n Sam	ple *	- Han	d Pen	etrometrometrometrometrometrometrometrom	eter
			SFA - Solid	d Flight A	luger	ST	- Shel	by Tul	be San	nple LL	- Liqu	id Lim	it ait	
		ENGINEERING≦ CTL Engineering. Inc.	MD - Mud	Drilling		BS	- Bag	Samp	le le	PI	- Plas	sticity	ndex	
		Phone: 317-295-8650	WD - Was	h Drilling	9	AC	- Auge	er Cutt	ings	SF	PT - Star	ndard	n Tes	t

		TES	ST BORI	NGI	RECO	DRD								
CLIEN	Г	: Indianapolis Airport Authority					-		BOF	RING NC	).:	B-1	7 <b>A</b>	
PROJE	СТ	: Stormwater and Deicing Capacity Project	S						SHE	ET	2	0	F	4
atum vation	nple pth	SOIL/MATERIAL DESCRIPTIO	N	atum oth	nple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined mpressio (ksf)	At	tterbei Limits	rg
Str Ele	Sar Dej			Str Del	Sar Nui	SP.	SP	Rec	G C Q O	Tot We	ло С С	LL	PL	PI
	- - - 25_ - -													
	30_ - - 35_ -	Refer to RB-17 for soil description												
726.5_	40	Gray Moist Very Stiff to Hard <b>J FAN CLA</b>	•	_38.5	SS-1	8 11 14 22	25	100	12					
		with SAND (CL) with Traces of Gravel Lab 53, 54, 55 Cobble Encountered in SS-2			SS-2	30 33 9	63	0			9.8			
	45	Continued on next page			SS-3	10 17	27	100	13	142.9	@ 14.2%	26	13	13
			BORING	METH	OD	S/		NG ME		) plo *	ABBR	EVIAT	TIONS	otor
		CTL Engineering, Inc. Phone: 317-295-8650	SFA - Hollow SFA - Solid I RC - Rock ( MD - Mud D WD - Wash HA - Hand	Flight A Coring Drilling Drilling Auger	Auger luger	ST CR BS AC	- Spilt - Shell - Rock - Bag - Auge	by Tub Core Samp er Cutt	be Sam Samp le ings	nple LL le PL SF	- ⊣an Liqu - Liqu - Plas - Plas PT - Star Pen	id Pen id Lim itic Lin iticity   ndard ietratic	nit nit Index	eter

		TES	ST BORI	NG	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NC	).:	B-1	7 <b>A</b>	
PROJE	СТ	: Stormwater and Deicing Capacity Project	S			1	1		SHE	ET	3	0	F ·	4
tratum levation	ample epth	SOIL/MATERIAL DESCRIPTIO	N	tratum epth	ample umber	PT per 6"	PT per 12" (N)	ecovery (%)	loisture ontent (%)	otal Unit /eight (pcf)	Inconfined compression (ksf)	A	tterbei Limits	rg
сп	SD			SD	νz	S	S	8	≥o	۲۶	<u>⊃∪</u>	LL	PL	PI
					SS-4	17 19 23	42	33	13					
	50				SS-5	9 10 15	25	100	18	133.4	10.8 @ 10.2%	31	17	14
		Gray, Moist, Very Stiff to Hard, <b>LEAN CLA</b> with SAND (CL) with Traces of Gravel	Y		SS-6	11 11 16	27	100	16					
	55	Lad 53, 54, 55			SS-7	11 10 15	25	100	17	136.0	9.0 @ 15.0%	37	12	25
					SS-8	9 13 19	32	100	15					
¥ 704.5_	<u>ه</u> 60			_60.5	SS-9	10 10 23	33		11					
		Gray, Highly Weathered, Soft, <b>SHALE</b> (Vis	sual)	1	SS-10	32 27 50/5"		71	15					
700.5_	-X 65_			_64.5	SS-11	48 50/5"		74	25					
	-	Gray, Highly to Moderately Weathered, Sc Hard, <b>SHALE</b> (Visual)	oft to		RC-1 RQD= 60%			82						
	70_H		-											
		Continued on next page				-								
		CTL Engineering, Inc. Phone: 317-295-8650	BORING HSA - Hollov SFA - Solid I RC - Rock MD - Mud I WD - Wash HA - Hand	<b>METH</b> v Stem Flight A Coring Drilling Drilling Auger	OD Auger luger	SS ST CR BS AC	AMPLII - Split - Shell - Rock - Bag - Auge	NG ME Spoor by Tul Core Samp er Cutt	THOE n Sam be San Samp le ings	) ple * nple LL le PL PI SF	ABBR - Han - Liqu - Plas - Plas PT - Star Pen	EVIAT d Pen id Lim stic Lin sticity I ndard etratic	etrome nit nit Index on Tes	eter t

		TES	T BORII	NG I	RECC	ORD								
CLIENT	-	: Indianapolis Airport Authority					_		BOR	ING NO	.:	B-1	7 <b>A</b>	
PROJE	СТ	: Stormwater and Deicing Capacity Projects							SHE	ET	4	O	- 2	4
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION		Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	At I	terber Limits PL	g Pl
690.5_		Gray, Highly to Moderately Weathered, Soft Hard, <b>SHALE</b> (Visual) <b>Bottom of Boring at 74.5 feet</b> Boring backfilled according to Aquifer Protec Guidelines.	to	_74.5	RC-2 RQD= 92%			100						
	- 80_ - -													
	- 85 -													
	90_													
	95_													
		CTL Engineering, Inc. Phone: 317-295-8650	BORING HSA - Hollow SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand /	METH Stem Flight A Coring rilling Drilling Auger	<b>OD</b> Auger uger	SS · ST · CR · BS · AC ·	- Split - Shell - Rock - Bag 3 - Auge	NG ME Spoor by Tub Core Sampler Cutt	THOD Samp Sampl Sampl e ings	ple * ple LL e PL PI SP	ABBR - Han - Liqu - Plas - Plas Plas T - Star Pen	EVIAT d Pen id Lim stic Lin sticity I ndard etratio	TIONS etrome it nit ndex n Test	eter

## **TEST BORING RECORD**

CLIEN	Т	: Indianapolis Airport Authority							BOF	RING NC	D.:	B-'	18	
PROJE	СТ	: Stormwater and Deicing Capacity Projects					_		SHE	ET	1	0	F	1
LOCAT	TION	: Indianapolis, IN					_		DAT	E STAR	RTED	: <u>11-1</u>	4-17	
PROJE	ECT NO.	: 17050081IND							DAT	E COM	PLETED	: 11-1	5-17	
Boring	Elevatio Northing Easting Datum	n: 765 Feet     Boring Depth : 13.0       : 1,625,852     Station:       : 158,276     Offset :       : NAD83, Indiana East     Line :	Feet	Boring Rig Typ Casing Core S	Method be Diamete ize	: HS : CM er : 3.2 :	A IE-550 5"		Ham Ham Drille Tem Wea	nmer nmer Effi er nperature ather	: <u>A</u> iciency: <u>8</u> : <u>J</u> e : 5 : S	utoma 6.0% S 0° F Sunny		
GROU	NDWAT	ER:												
tratum levation	ample epth	SOIL/MATERIAL DESCRIPTION	I	tratum epth	ample umber	PT per 6"	PT per 12" (N)	ecovery (%)	loisture ontent (%)	otal Unit /eight (pcf)	nconfined ompression (ksf)	A	tterber Limits	rg
ωш	0 D			00	σz	S	0)	œ	20	->	50	LL	PL	РІ
764.0_		Brown, Moist, Medium Stiff, SANDY LEAN CLAY (CL) As Lab 14		1.0	SS-1	3 2 3	5	100	14					
761.5_	5_			3.5	SS-2	4 3 5	8	67	11					
		Brown, Moist, Loose to Medium Dense, SIL CLAYEY SAND (SC-SM)	.TY		SS-3	10 10 12	22	100	8					
	10	As Lab 15			SS-4	18 13 16	29	89	9					
752.0_	- 15_	Bottom of Boring at 13 feet Auger refusal encountered on boulder. Bori backfilled according to Aquifer Protection	ng	13.0										
	-	Guidelines.												
	20_													
	25_													
			BORIN	G METH	OD	S	AMPLI	NG ME	THOD	)	ABBR	EVIA	rions	
		CTL Engineering Inc	HSA - Hollc SFA - Solid RC - Rock MD - Mud	w Stem I Flight A Coring Drillina	Auger	SS ST CR BS	- Split - Shel - Rock - Bao	Spoor by Tub Core Samp	n Sam be San Samp le	ple * nple LL le PL PI	- Han - Liqu - Plas - Plas	d Pen id Lim stic Lin sticitv	etrome iit nit Index	eter
		Phone: 317-295-8650	WD - Was HA - Hand	h Drilling d Auger	]	AC	- Auge	er Cutt	ings	SF	PT - Star Pen	ndard etratic	on Tes	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	<b>ST BORI</b>	NG	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NC	D.:	B-1	8 <b>A</b>	
PROJE	СТ	: Stormwater and Deicing Capacity Project	S				_		SHE	ET	1	0	F:	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	RTED	: 11-1	4-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 11-1	5-17	
Boring	Elevation Northing	n: 765 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	nmer nmer Eff	<u>: A</u> iciency: 8	utoma 6 0%	atic	
	Easting	: <u>158,276</u> Offset :			pe Diamoto	: <u>CIV</u>	E-550		Drille	er	: J	S		
	Datum	: NAD83, Indiana East Line :		Core S	ize	:	0		Vea	nperature ather	e <u>:5</u> :5	i0° F Sunnv		
GROUI	NDWAT	ER: 👤 Encountered at Dry 🛛 🖳 At co	mpletion 28.1	<u>.</u>					1	函 C	aved in a	t <u>37.6</u>		
							=			6	_ u			
u no		SOII /MATERIAL DESCRIPTIO	N		0 5	ir 6"	er 12	ery	re it (%	nit (pcf	fined essic	A	terber Limits	rg
ratur evati	pth			pth	mple	T pe	D D	(%)	oistu onter	tal U eight	mpr (ksf		]	
Ē	Sa De			Sti	Sa Nu	S	R	Re	ĕů	To W€	<b>ວົ</b> ບິ	LL	PL	PI
751.5_	5	Refer to B-18 for soil description		13.5		8								
		Brown, Moist, Very Stiff to Hard, <b>SILTY CL</b> with <b>SAND (CL-ML)</b> with Gravel and Cobb (TILL) As Lab 4	AY les		SS-5 SS-6 SS-7	8 8 7 11 17 35 27	16 28 69	100	11					
	20_/	Continued on next page	PHH PHH	1		42								
			BORING	G METH	IOD	S	AMPLI	NG ME	THOD	)	ABBR	EVIA	IONS	
			HSA - Hollov SFA - Solid	w Stem Flight A	Auger Auger	SS ST	<ul> <li>Split</li> <li>Shel</li> </ul>	Spoor by Tub	n Sam be San	ple  * nple   LL	- Han - Liqu	id Pen iid Lim	etrome iit	eter
		ENGINEERING	RC - Rock	Coring	-	CR	- Rock	Core	Samp	le PL	Plas	stic Lir	nit	
		CIL Engineering, Inc. Phone: 317-295-8650	WD - Wash	n Drilling	9	AC	- Баў - Auge	er Cutt	ings	SF	Plas PT - Stai	ndard	nuex	
			HA - Hand	Auger			-				Pen	etratic	n Tes	t

		TEST	BORII	NGI	RECO	DRD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NO	).:	B-18	BA	
PROJE	СТ	: Stormwater and Deicing Capacity Projects					1		SHE	ET	2	OF	= ;	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION		atum oth	nple nber	r per 6"	T per 12" (N)	covery %)	sture ntent (%)	al Unit ight (pcf)	confined npression ksf)	At	terbeı _imits	rg
Stra Elev	San Dep			Stra Dep	San Nur	SPT	.dS	Rec	Moi Cor	Tot		LL	PL	Ы
Ž	- - 30				SS-8	40 25 19	44	100	8					
	35	Brown, Moist, Very Stiff to Hard, SILTY CLAY			SS-9	25 25 19	44	67	11					
Inter-	<u>40</u> -	with SAND (CL-ML) with Gravel and Cobbles (TILL) As Lab 4			SS-10	34 14 25	39	78	11					
	45_ -	Cobbles Encountered in SS-11			SS-11	50/4"		42	14					
715.0_	50	<b>Bottom of Boring at 50 feet</b> Boring backfilled according to Aquifer Protecti Guidelines.	ion	_50.0	SS-12	14 20 31	51	100	14					
	_ 55 _													
			BORING	METH	OD Auger	SS SS	MPLI	NG ME	THOD	le *	ABBR	EVIAT	IONS	eter
		ENGINEERING≦SFCTL Engineering, Inc.MiPhone: 317-295-8650Hi	FA - Solid F C - Rock ( D - Mud D D - Wash A - Hand	Flight A Coring prilling Drilling Auger	luger	ST CR BS AC	- Shell - Rock - Bag - Auge	by Tub Core Samp er Cutt	e Sam Sampl le ings	ple LL e PL PI SF	- Liqu - Plas - Plas - Plas PT - Star Pen	id Lim stic Lim sticity I ndard etratio	it nit ndex n Tes	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

CLIENT       : Indianapolis Airport Authority       BORING NO:       B-19         PROJECT       : Stormwater and Deloing Capacity Projects       SHEET       1       0.6       2         LOCATION       : Indianapolis, IN       DATE COMPLETED: 11.00-17       DATE STARTED       : 11.00-17         PROJECT NO: 17050061IND       DATE COMPLETED: 11.00-17       DATE COMPLETED: 11.00-17       Boring Elevation: 783 Feet       Hammer Filenery B0.0%       Hammer Filenery B0.0%         Northing: 1625.657       Datum       :NAD83, Indiana East       Differ:       Core Size       :       Use Size       Topercature       :487 F         COUNDWATER:       Tencountered at 27.0       X A completion 26.1       Iso Size			TES	T BOR	ING	RECO	ORD	)							
PROJECT       SHEET       1       0F       2         LOCATION       Indianapolis, IN       DATE STARTED       IIIO7.17         PROJECT NO. :       Indianapolis, IN       DATE STARTED       IIIO7.17         PROJECT NO. :       INTROSOBEIND       DATE STARTED       IIIO7.17         Boring Elevation: 763 Feet Basing :       Boring Depth : 50.0 Feet Station:	CLIENT	Г	: Indianapolis Airport Authority					_		BOF	RING NC	).:	<b>B</b> -'	19	
LOCATION       : Indianapolis, IN       DATE STARTED       : 11:07:17         PROJECT NO.       : 17050081IND       DATE STARTED       : 11:08:17         Boring Elevation: 763 Feet       Boring Method       : HSA       Hammer       : Holdmate         Northing: 1625.654       Easting: 158.617       Driller       :       Driller       :         Casing Diameter       : 32.5"       Core Size       :       Use Size       :       :       Use Size       :       :       Use Size	PROJE	СТ	: Stormwater and Deicing Capacity Projects	6				_		SHE	ET	1	0	F	2
PROJECT NO.:       17080061IND       DATE COMPLETED:       1108-17         Boring Elevation:       763 Feet       Boring Depth :       60.0 Feet       Boring Method       : HSA       Hammer Efficiency 66.0%       Driller       :: GRUE-550         Datum       :185.617       Datum       :MD83.Indiana East       Line :       Casing Diameter       :325"       Driller       :: GRUE-550       Driller       :: GRUE-550         GROUNDWATER:       ¥ Encountered at 27.0"       ¥ At completion 26.1"       ¥ Caved in at 39.5"       Immer Efficiency 66.0%       Driller       :: GRUE-550	LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	TED	: 11-0	)7-17	
Boring Elevation: 763 Feet         Boring Depth: 50.0 Feet         Boring Method: :HSA         Hammer ::Automatic           Northing: 1.625,654         Offset :         Case offset :         Common Method: :HSA         Hammer ::Automatic           Datum: :NADB3, Indiana East         Line :         Core Size         :         Case of Size         :           GROUNDWATER:         ¥ Encountered at 27.0'         ¥ At completion 26.1'         ¥ Caved in at 39.6'         It - Pt           Feed         SOIL/MATERIAL DESCRIPTION         If feed	PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 11-0	8-17	
Notifing       Construction       Con	Boring	Elevatio	n: 763 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	imer	<u>: A</u>		atic	
Datum         NADB3, Indiana East         Line          Casing Julanceir         32.5° Core Size         Temperature         165° F Weather         Temperature         165° F Weather           GROUNDWATER:         Image: Core of the state of th		Easting	: <u>158,517</u> Offset :		Rig Ty	be	: CN	IE-550		Drille	er	<u>: J</u>	IS		
Colle Size       Overlast         GROUNDWATER: I Encountered at 27.0" I At completion 26.1"       I Colle Size       I College Size       I Colle Size       I Colle Size<		Datum	: NAD83, Indiana East Line :		Casing	Diamete	r : 3.2	5"		Tem	perature	e <u>: 4</u>	5° F	ot	
Image: Solume transformed by the second sec	GROUN	NDWAT	ER: I Encountered at 27.0' I At con	npletion 26.	1'	IZE				1000	LE C	aved in a	at 39.6	<u>,</u>	
Understand         SOIL/MATERIAL DESCRIPTION         Understand         Source         Source         Source         Source         Attember 2         Attember					_			_							
$\vec{m}$ $\vec{u}$ $\vec{m}$ $\vec{k}$ $\vec{m}$ $\vec{k}$	ratum evation	mple pth	SOIL/MATERIAL DESCRIPTION	N	ratum spth	mple imber	T per 6"	<sup>oT</sup> per 12" (N)	covery (%)	oisture ontent (%)	tal Unit eight (pcf)	iconfined ompressio (ksf)	At	terbe Limits	rg \$
762.0       IOPSOL (12') (Visual)       1.0       SS-1       4/5       10       100       26         759.5       Image: Single Control of Control	шĸ	De De			۳ مر	Sa Nu	R	S	Å	žŭ	μŇ	Ξŭ	LL	PL	PI
759.5       As Lab 14       SS-1       \$\frac{5}{5}\$       10       100       26         759.5       5       As Lab 14       3.5       SS-2       \$\frac{5}{7}\$       13       100       11         759.5       5       Forwn, Moist, Loose to Medium Dense, SILTY       SS-3       \$\frac{4}{5}\$       9       100       11         753.5       10       Forwn, Moist, Dense, POORLY GRADED       SS-4       \$\frac{6}{14}\$       34       100       12         751.0       15       5       10       11       SS-5       10       11       NP       NP       NP         751.0       15       5       10       12       10       11       10       11	762.0_		TOPSOIL (12") (Visual)		1.0		4								
759.5       5       As Lab 14       3.5       SS-2       5       13       100       11         5       5       5       5       13       100       11       10       11         753.5       10       10       11       5       5       13       100       11         753.5       10       10       11       5       10       11       11       10       11         753.5       10       10       12       5       5       5       14       100       12       10       11         751.0       15       10       12       11       12       10       11       10       11       10       11       10       11       10       11       10       11       10       11       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       10			Brown, Moist, Stiff, SANDY LEAN CLAY (C	:L)		SS-1	5 5	10	100	26					
5       5       5       13       100       11         753.5       10       10       11       100       11         753.5       10       10       11       100       11         8rown, Moist, Loose to Medium Dense, SILTY       SS-3       4/4       9       100       11         9.5       SS-4       6/4       100       12       10       11         8rown, Moist, Dense, POORLY GRADED       9.5       SS-4       6/14       100       12         751.0       10       12       100       11       100       12         751.0       10       12       100       11       100       12         15       10       12       100       11       100       12         15       10       12       100       11       100       11         15       10       11       100       11       100       11	759.5_	-	AS Lad 14		3.5										
75.10       5.10       7       7       7       7       7       7       7       10       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       10       11       1						SS-2	5 6	13	100	11					
Proven, Moist, Loose to Medium Dense, SILTY       SS-3       4/4       9       100       11         Proven, Moist, Loose to Medium Dense, SILTY       Proven, Moist, Corese, Silty       Proven, Moist, Corese, Silty       Proven, Moist, Dense, POORLY GRADED       Proven, Moist,		5_/\					7								
753.5       10       As Lab 15       9       100       11         753.5       10       10       9.5       SS-3       4       9       100       11         753.5       10       10       12       9.5       SS-4       6       14       20       34       100       12       NP		+	Brown, Moist, Loose to Medium Dense, SI				4								
753.5       10       10       12       NP		-//	As Lab 15			SS-3	4 5	9	100	11					
753.5       10       10       12       NP		-													
10     Brown, Moist, Dense, POORLY GRADED     20     20       5AND with SILT and GRAVEL (SP-SM)     12.0     12.0       15     15	753.5	-17			9.5	SS-4	6 14	34	100	12			NP	NP	NP
751.0       -       -       SAND with SiLT and GRAVEL (SP-SM)         12.0       12.0       12.0         15       -       -         15       -       -         15       -       -         15       -       -         15       -       -         15       -       -         15       -       -         15       -       -         15       -       -         16       -       -         15       -       -         16       -       -         16       -       -         15       -       -         16       -       -         17       -       -         18       -       -         19       -       -         10       -       -         10       -       -         10       -       -         10       -       -         10       -       -         10       -       -         10       -       -         10       -       - </td <td></td> <td>10_/\</td> <td>Brown, Moist, Dense, POORLY GRADED</td> <td></td> <td></td> <td></td> <td>20</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		10_/\	Brown, Moist, Dense, POORLY GRADED				20								
751.0 12.0 SS-5 10 11 SS-5 10 11		-	SAND with SILT and GRAVEL (SP-SM) Lab 16												
15     10     11       15     10     11	751.0_	-			12.0										
15_1     SS-5     10 14 11     25     100     11		-													
		-17				SS-5	10	25	100	11					
		15				33-5	11	25	100						
		_													
Brown Moist Very Stiff to Hard SII TY CLAY			Brown Moist Very Stiff to Hard SILTY CL	ΔΥ											
with SAND (TILL)			with SAND (TILL)				8								
20_/     As Lab 4         20_/         11         11		20				SS-6	8 11	19	100	10					
							11								
SS-7 9 18 100 16		25				SS-7	9	18	100	16					
Continued on next page			Continued on next page	****	x										
BORING METHOD SAMPLING METHOD ABBREVIATIONS				BORIN		OD Augor	S.	AMPLI	NG ME	THOD		ABBR	EVIA	TONS	otor
Image:				SFA - Solic	d Flight A	uger	ST	- Shel	by Tub	be Sam	nple LL	- nar Liqu	uid Lim	nit	CICI
ENGINEERING     RC     - Rock Coring     CR     - Rock Core Sample     PL     - Plastic Limit       CTL     Engineering     Inc     MD     - Mud Drilling     BS     - Bag Sample     PL     - Plasticity Index			ENGINEERING 2	RC - Rock	< Coring Drilling		CR BS	<ul> <li>Rock</li> <li>Bad</li> </ul>	Core Samp	Samp le	le PL PI	- Plas - Plas	stic Lir sticitv	nit Index	
Phone: 317-295-8650 WD - Wash Drilling AC - Auger Cuttings SPT - Standard			Phone: 317-295-8650	WD - Was	h Drilling	1	AC	- Auge	er Cutt	ings	SF	PT - Sta	ndard	n T	.+

		TEST	BORI	NG I	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NO	.:	<b>B-</b> 1	9	
PROJE	СТ	: Stormwater and Deicing Capacity Projects					1		SHEI	ΞT	2	OF	- 2	2
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION		atum oth	nple nber	T per 6"	T per 12" (N)	sovery %)	isture ntent (%)	al Unit ight (pcf)	confined mpression (ksf)	At	terber _imits	g
Stra Elev	San Dep			Stra Dep	San Nur	SP1	.dS	Rec (	Moi Cor	Tota Wei	Cor	LL	PL	Ы
	30				SS-8	20 20 21	41	100	9					
	35				SS-9	11 14 16	30	67	12					
a a	40 	Brown, Moist, Very Stiff to Hard, <b>SILTY CLAY</b> with SAND (TILL) As Lab 4			SS-10	8 21 22	43	89	11					
	- -X 45_ - -	Cobble Encountered at SS-11			SS-11	28 50/5"		9	15					
713.0_	50	<b>Bottom of Boring at 50 feet</b> Boring backfilled according to Aquifer Protect Guidelines.	ion	_50.0	SS-12	12 20 20	40	100	10					
	55_													
			BORING SA - Hollow	METH	<b>OD</b> Auaer	SS -	- Split	NG ME	THOD	le *	ABBR	EVIAT	IONS etrome	eter
		ENGINEERING ≦SICTL Engineering, Inc.MPhone: 317-295-8650H	FA - Solid F C - Rock ( D - Mud D /D - Wash A - Hand	Flight A Coring Drilling Drilling Auger	uger	ST CR BS AC	- Shell - Rock - Bag - Auge	by Tuk Core Sampl er Cutt	be Sam Sample le ings	ple LL e PL PI SP	- Liqu - Plas - Plas T - Star Pen	id Lim stic Lin sticity I ndard etratio	it nit ndex n Test	t

			TES	T BOR	ING	RECO	ORD	)							
CLIENT	Г	: Indianapolis Airport	Authority					_		BOR	ING NO	).:	B-2	20	
PROJE	СТ	: Stormwater and De	icing Capacity Project	S				_		SHE	ET	1	0	=:	2
LOCAT	ION	: Indianapolis, IN						_		DAT	E STAR	TED	: 11-1	6-17	
PROJE	CT N	D.: 17050081IND								DAT	E COMF	PLETED	: 11-1	6-17	
Boring	Eleva	on: 762 Feet	Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	mer	<u>: A</u>		atic	
	Eastir	g : 158,784	Offset :		Rig Ty	ре	: CM	IE-550			er	: J	S.078		
	Datun	: NAD83, Indiana Eas	t Line :		Casing	j Diamete	r <u>: 3.2</u>	5"		Tem	perature	: 4	5° F	ot	
GROUN			lat 18.5' V At cor	nnletion 13	Core S	lze	:			vvea	iner ka c	. C	+ 16 2	si	
					<u> </u>	1		1					t <u>10.2</u>		
atum evation	mple oth	SOIL/MA	TERIAL DESCRIPTION	N	ratum ipth	mple imber	'T per 6"	T per 12" (N)	covery (%)	oisture Intent (%)	tal Unit eight (pcf)	iconfined mpression (ksf)	At	terbeı Limits	rg
шī	Sa				<u>5</u> 	Sa Nu	R	S	Å	žŭ	Ϋ́	Ъŏ	LL	PL	PI
761.0_	-	SAND AND GRAVEL	with CLAY (12") (Vis	sual)	1.0		3								
	-	CLAY (CL)	m Stiff, SANDY LEAN			SS-1	3 5	8	100	21					
758.5_	-	As Lab 14			3.5										
	-	X				SS-2	5	9	100	12					
	5_	Brown Moist Loose	to Medium Dense SI				5								
	53.0V					SS-3	10 11 12	23	100	8					
753.0_	-	7		9.0	00.4	10		100	0						
	10_	Brown, Moist, Dense SAND with SILT and As Lab 16			55-4	21 20	41	100	6						
750.0	- - - 15_	Encountered Cobble Brown, Moist, Hard,	in SS-5 SILTY CLAY with SAM	٩D	12.0	SS-5	25 16 21	37	0						
743.5	ء _ 	<b>(CL-ML) (TILL)</b> (Visual)			18.5										
	- 20_ - -	Brown, Wet, Very De <b>SAND with SILT and</b> As Lab 16	ense, <b>POORLY GRAD</b> I I GRAVEL (SP-SM)	ED		SS-6	17 21 33	54	100	16					
738.0_	-	₫			24.0	SS-7	22 50/5"		93	11					
	25_	Cont	inued on next name	FEED FEED	Ж.										
			inaga on next page	BORIN		IOD	S	AMPLI	ng me	THOD		ABBR	EVIAT	IONS	Ĺ
				HSA - Holle	ow Stem	Auger	SS ST	- Split	Spoor	n Samp		- Han	d Pen	etrom	eter
		ENGINEERING 🛎	4	RC - Roc	k Coring	uyei	CR	- Rock	< Core	Sampl	le PL	- Liqu	stic Lin	nit	
		CTL Engineering	g, Inc.	MD - Mud	Drilling	r	BS AC	- Bag	Samp	le	PI	- Plas	sticity I	ndex	
		Phone: 317-295	-8650	HA - Han	d Auger	e e e e e e e e e e e e e e e e e e e		- ruye		nys	J SF	Pen	etratio	n Tes	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TEST	BORII	NGI	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NC	).:	B-2	20	
PROJE	СТ	: Stormwater and Deicing Capacity Projects				1	1		SHE	ET	2	0	F :	2
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION		Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	A	tterber Limits PI	rg Pl
				0, 1				-						
	30				SS-8	11 18 20	38	100	11					
	35				SS-9	10 18 24	42	100	13					
	40	Brown, Moist, Hard to Very Stiff, <b>SILTY CLAY</b> with SAND (CL-ML) (TILL) As Lab 4			SS-10	7 9 12	21	100	17					
	45				SS-11	6 10 14	24	100	15					
712.0_	50	Traces of Wood in SS-12		_50.0	SS-12	7 12 17	29	100	14					
		Boring backfilled according to Aquifer Protection Guidelines.	on											
	- 55 -													
			BORING	METH	IOD	S	AMPLI	NG ME	THOD		ABBR	EVIA	TIONS	
		CTL Engineering, Inc. Phone: 317-295-8650	SA - Hollow A - Solid F C - Rock ( D - Mud D D - Wash A - Hand J	/ Stem Flight A Coring Drilling Drilling Auger	Auger Auger	SS ST CR BS AC	- Split - Shel - Rock - Bag - Auge	Spoor by Tub Core Samp er Cutt	n Samp be Sam Sample le ings	ole  * ple LL e PL PI SF	- Han - Liqu - Plas - Plas PT - Star Pen	d Pen id Lim stic Lir sticity ndard etratic	etromo nit nit Index on Tes	eter t

ſ

		TES	T BOR	ING	RECC	DRD	)							
CLIENT	Г	: Indianapolis Airport Authority					_		BOF	RING NO	D.:	B-2	24	
PROJE	СТ	: Stormwater and Deicing Capacity Projects					_		SHE	ET	1	0	=	3
LOCAT	ION	: Indianapolis, IN					_		DAT	TE STAF	RTED	: 11-2	8-17	
PROJE	CT NO	: 17050081IND							DAT	E COM	PLETED	: 11-2	9-17	
Boring	Elevatio	m: 763 Feet Boring Depth : 69.9	Feet	Boring	Method	: HS	A		Han	nmer	<u>: A</u>		atic	
	Easting	: <u>158,360</u> Offset :		Rig Ty	be Di	: CM	1E-550		Drill	er	<u>: J</u>	S.070		
	Datum	: NAD83, Indiana East Line :		Casing	Diameter	r : <u>3.2</u>	5"		Tem	nperature	e <u>:5</u>	5° F		
GROUI	NDWAT	ER: Encountered at 17.5' At com	pletion 19.	0'	120				1000		aved in a	ot 59 0		
atum vation	nple pth	SOIL/MATERIAL DESCRIPTION	·	atum pth	nple mber	T per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined mpression (ksf)	A	terbe: Limits	rg
Str Ele	Sar De			Str De	Sar Nu	SP	SP	Re	δο Ω	Tot	ů ů	LL	PL	PI
762.3_		TOPSOIL (8") (Visual)		0.7										
	-/	Brown, Moist, Loose to Medium Dense, <b>SIL</b> CLAYEY SAND (SC-SM) with Traces of	.TY		SS-1	4 4 4	8	67	13					
757.0	5_	Gravel As Lab 13			SS-2	4 10 7	17	100	12					
757.0_				<u>}  </u> 6.0	SS-3	4 7 7	14	100	16	142.1	9.5 @ 6.3%			
	10				SS-4	2 2 4	6	100	23			37	16	21
		Brown and Gray, Moist, Stiff to Medium Stif SANDY LEAN CLAY (CL) Lab 23	f,		SS-5	3 3 3	6	100	13					
	15				SS-6	2 2 3	5	100	24	140.6	12.5 @ 8.3%			
746.0_		Gray Wet Loose to Dense, SILTY SAND		17.0	SS-7	2 2 4	6	100	22					
744.0 <u>\</u>	- 	(SM) As Lab 17		19.0	SS-8	31 13	35	67	8					
742.0_	20_/	Brown and Gray, Moist, Hard, SILTY CLAY with SAND (CL-ML) (TILL) As Lab 4		21.0		22								
		Continued on next page							TUOT		4000			
		CTL Engineering, Inc.	HSA - Holk SFA - Solic RC - Roc MD - Mud WD - Was	by Stem d Flight A k Coring Drilling	Auger	SS ST CR BS AC	- Split - Shel - Rock - Bag - Auge	Spoor by Tuk Core Samp er Cutt	n Sam be San Samp le ings	ple * nple LL ble Pl Pl Sf	- Har - Har - Liqu - Plas - Plas PT - Star	id Pen id Lim stic Lin sticity I ndard	etrom it nit ndex	eter
		THONE. 017-200-0000	HA - Han	d Auger			5		-		Per	etratic	<u>n T</u> es	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	<b>ST BORI</b>	NG	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOF		0.:	<b>B-</b> 2	24	
PROJE	СТ	: Stormwater and Deicing Capacity Project	s			1			SHE	ET	2	0	F	3
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTIO	N	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Neight (pcf)	Unconfined Compression (ksf)	A	tterbe Limits	rg
	 					42				1 -	7.9			
	-\ - 25	Gray, Moist to Wet, Medium Dense to Ver Dense, <b>SILTY SAND (SM)</b> with Cobbles Lab 24	y		SS-9 SS-10	28 36 11 13 14	64 27	67	13	135.7	@ 15.0%			
734 5				28.5	SS-11	38 46 46	92	100	11	137.5	9.0 @ 14.3%	NP	NP	NP
104.0_	30			_20.0	SS-12	19 22 27	49	100	10					
		Sand seam encountered in SS-13			SS-13	25 35 31	66	100	12					
	35_				SS-14	14 22 43	65	100	9					
		Brown and Gray, Moist to Wet, Very Stiff to Hard, <b>SANDY LEAN CLAY</b> with Intermitter Sand Layers ( <b>TILL</b> )	o It		SS-15	21 26 52	78	100	12	138.6	3.3 @ 6.5%	23	15	8
	40_	Lab 60, 61, 62, 63			SS-16	23 31 50/5"		101	8					
	-				SS-17	14 17 25	42	100	11					
	45				SS-18	8 14 18	32	100	13			29	15	14
		Continued on next page			SS-19	8 11	26	100	23					
			BORING	METH	OD Auger	<b>S/</b>	AMPLI	NG ME	ETHOE	) nle *	ABBR	EVIA	FIONS etrom	eter
		<i>ENGINEERING ≦</i> CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	Flight A Coring Drilling Drilling Auger	l	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tuk Core Samp er Cutt	Samp Samp le ings	nple Ll le P S	L - Liqu L - Plas I - Plas PT - Star Pen	id Lim stic Lin sticity ndard	nit nit Index on Tes	st

CLIENT : Indianapolis Airport Authority         PROJECT       Stormwater and Deicing Capacity Projects         upper state       upper state         soll/MATERIAL DESCRIPTION       upper state         upper state       Soll/MATERIAL DESCRIPTION         upper state       SS-20       10         state       SS-20       10         state       SS-21       7         state       SS-22       12         state       SS-22       12       27	(N) Recovery (%)	Recovery (%)	Moisture Content (%) Potel I Init	ight (pcf) confined mpression (ksf)	B-2	24 F	3 rg
PROJECT       : Stormwater and Deicing Capacity Projects         until state       SOIL/MATERIAL DESCRIPTION       until state       and Las       is       <	(N) Recovery (%)	Recovery (%)	Moisture Content (%) Lotal Unit	ight (pcf) confined mpression (ksf)	0 A	F tterbei	3 rg
Lungton       SOIL/MATERIAL DESCRIPTION       Lungton       Longton       Longton <thlongton< th=""> <thlongton< th=""> <thlongton< th=""> <th< th=""><th>(N) Recovery (%)</th><th>Recovery (%)</th><th>Moisture Content (%)</th><th>ight (pcf) ight (pcf) confined mpressior (ksf)</th><th>A</th><th>tterbei</th><th>rg</th></th<></thlongton<></thlongton<></thlongton<>	(N) Recovery (%)	Recovery (%)	Moisture Content (%)	ight (pcf) ight (pcf) confined mpressior (ksf)	A	tterbei	rg
0.11       0.12							
50       50       8       24         50       10       24         50       14       24         50       14       24         51       Brown and Gray, Moist to Wet, Very Stiff to       SS-21       12       28         55       Brown and Gray, Moist to Wet, Very Stiff to       SS-22       12       27         55       Sand Layers (TILL)       Lab 60, 61, 62, 63       8       8         SS-23       14       34					LL	PL	PI
Brown and Gray, Moist to Wet, Very Stiff to Hard, SANDY LEAN CLAY with Intermittent Sand Layers (TILL) Lab 60, 61, 62, 63	4 100	100	17				
Brown and Gray, Moist to Wet, Very Stiff to Hard, SANDY LEAN CLAY with Intermittent Sand Layers (TILL) Lab 60, 61, 62, 63	8 100	100	16		33	15	18
SS-23 14 34	7 100	100	20				
	4 100	100	13		30	13	17
超 60 60 60 60 60 51 51 51	7 100	100	8				
701.561.5 SS-25 12 31 49	9 100	100	15				
65SS-26 SS-26 SS-26 SS-26	0 100	100	14				
Gray and Black, Highly Weathered, Soft, SHALE (Visual) SS-27 26 68 42	8 100	100	18		54	26	28
693.1 70 Bottom of Boring at 69.9 feet SS-28 30 50/5"	95	95	15				
Auger refusal at 68 feet. Boring backfilled according to Aquifer Protection Guidelines.							
BORING METHOD     SAMP       HSA - Hollow Stem Auger     SS - Sp       SFA - Solid Flight Auger     ST - Sh       CTL Engineering, Inc.     MD - Mud Drilling     BS - Ba       WD - Wash Drilling     AC - Au							

		TES	<b>ST BOR</b>	ING	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NC	D.:	<b>B-</b> 2	25	
PROJE	СТ	: Stormwater and Deicing Capacity Project	s				_		SHE	ET	1	0	F	1
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	RTED	: 11-0	)6-17	
PROJE	ECT NO	D. : 17050081IND							DAT	E COM	PLETED	: 11-0	)6-17	
Boring	Elevati	on: <u>749 Feet</u> Boring Depth : <u>13.5</u>	Feet	Boring	Method	: HS	A		Ham	nmer Imer Eff	<u>: A</u> iciency: 8		atic	
	Easting	g : <u>157,899</u> Offset :			Diamate	: <u>CM</u>	E-550		Drille	er	<u>: J</u>	S		
	Datum	: NAD83, Indiana East Line :		Core S	ize	· <u></u>	5		- Tem	perature other	e <u>:5</u> :0	0° F )verca	ist	
GROU	NDWA	TER: I Encountered at 6.0' I At cor	npletion 6.8'						1	櫰 C	aved in a	ıt <u>7.0'</u>		
ratum evation	ample epth	SOIL/MATERIAL DESCRIPTIO	N	ratum epth	ample umber	PT per 6"	PT per 12" (N)	ecovery (%)	oisture ontent (%)	otal Unit eight (pcf)	nconfined ompression (ksf)	A	tterbe Limits	rg \$
Ξ	йŏ			5 5 5	ΰź	S	0	Ř	ΞŬ	Ĕ≥	Ξŭ	LL	PL	PI
748.0_				1.0		3								
	_	X			SS-1	4	9	67	14					
						5								
		Brown, Moist, Stiff to Hard, SILTY CLAYE				7								
	-	As Lab 13			SS-2	12	37	11						
	5_					25								
743.0				6.0										
i i		Encountered Cobble in SS-4			SS-3 SS-4	7 10 9 50/5"	19	100 83	22 20			NP	NP	NP
735 5	10	Brown, Moist, Medium Dense to Very Den: SILTY SAND (SM) Lab 17	se,											
100.0_		Bottom of Boring at 13.5 feet		10.0										
	15_	Auger refusal encountered on boulder. Bou backfilled according to Aquifer Protection Guidelines.	ing											
	20													
	20_													
	II		BORIN	G METH	OD	S	AMPLI	NG ME	THOD		ABBR	EVIA	TIONS	;
			HSA - Hollo SFA - Solid	ow Stem I Flight A	Auger	SS ST	<ul> <li>Split</li> <li>Shel</li> </ul>	Spool by Tul	n Sam be San	pie   * nple   LL	- Har Liqu	id Pen uid Lim	etrom	eter
			RC - Rock	Coring	-	CR	- Rocl	Core	Samp	le PL	Plas	stic Lir	nit Index	
		CIL Engineering, Inc. Phone: 317-295-8650	WD - Was	h Drilling	9	AC	- Auge	er Cutt	ings	SF	PT - Sta	ndard		
			HA - Hand	d Auger							Per	etratic	on Tes	st

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	<b>ST BOR</b>	ING	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NO	D.:	B-2	5A	
PROJE	CT	: Stormwater and Deicing Capacity Project	S				_		SHE	ET	1	0	F	3
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAF	RTED	: 11-0	)6-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 11-0	)6-17	
Boring	Elevatio	n: 749 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	nmer Imer Eff	<u>: A</u> iciency: 8	utoma	atic	
	Easting	: <u>157,902</u> Offset :		Rig Ty	pe Diamata	: CM	E-550		Drille	er	<u>: J</u>	S		
	Datum	: NAD83, Indiana East Line :		Casing	i Diamete	er : 3.2	5		- Tem	perature	e <u>:5</u>	i0° F	et	
GROU	NDWAT	ER: I Encountered at 6.0' I At cor	npletion 5.8'	COIEG	NZC				10000		aved in a	of 44 6		
										_ 0		<u> </u>		
atum evation	mple pth	SOIL/MATERIAL DESCRIPTIO	N	atum pth	mple mber	T per 6"	T per 12" (N)	covery (%)	visture Intent (%)	tal Unit eight (pcf)	confined mpressio (ksf)	A	tterbei Limits	rg
Str	Sa De			Str De	Sa Nu	SP	S	Re	နိုင်	τ <sub>ο</sub> Υ	ъз	LL	PL	PI
735.5_		Refer to B-25 for soil description		13.5		17								
	15	Brown, Moist, Hard to Very Stiff, <b>SILTY CL</b> with SAND (CL-ML) with Cobbles (TILL) As Lab 4 <i>Continued on next page</i>	AY		SS-5 SS-6	21 32 20 49 50/3"	53	103	8					
			BORIN	G METH	IOD	S	AMPLI	NG ME	THOD	)	ABBR		TIONS	-4
			HSA - Hollo SFA - Solid	w Stem	Auger Auger	SS ST	<ul> <li>Split</li> <li>Shel</li> </ul>	Spoor by Tub	n Sam be San	ple  * nple   LL	- Han Liqu	id Pen iid Lim	etrome nit	eter
			RC - Rock	Coring	0 -	CR	- Rock	< Core	Samp	le Pl	Plas	stic Lir	nit	
		CTL Engineering, Inc.	WD - Mud WD - Was	brilling h Drilling	9	AC	- вад - Auge	Samp er Cutt	ie ings	PI   SI	- Plas PT - Stai	ndard	Index	
		FIIUIR. 317-293-0030	HA - Hand	Auger		-			0-	.	Pen	etratic	on Tes	t

		TES	<b>ST BORI</b>	NG I	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NO	.:	B-2	5A	
PROJE	СТ	: Stormwater and Deicing Capacity Project	S			1	1		SHE	ET	2	0	= ;	3
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTIO	N	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	A	tterber Limits PL	g Pl
Str		Brown, Moist, Hard to Very Stiff, SILTY CL with SAND (CL-ML) with Cobbles (TILL) As Lab 4	AY	Str	SS-7 SS-8 SS-9 SS-10	<b>b</b> 37 44 35 35 45 24 8 9 14 7 9 13	<b>b</b> 79 69 23 22	2 100 6 100	<ul> <li><b>8 3</b></li> <li>6</li> <li>14</li> <li>15</li> <li>31</li> </ul>	To		LL	PL	PI
<u>k</u>	45	Continued on next page			SS-11	11 22	33	100	15					
			BORING	METH	OD	S	AMPLI	NG ME	THOD	1- *	ABBR	EVIA	IONS	
		CTL Engineering, Inc. Phone: 317-295-8650	HSA - Hollow SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	/ Stem Flight A Coring prilling Drilling Auger	Auger uger	SS ST CR BS AC	- Split - Shell - Rock - Bag - Auge	Spoor by Tub Core Sampl er Cutt	n Samp be Sam Sampl le ings	ple  * ple  LL e  PL  PI  SF	- Han - Liqu - Plas - Plas 2T - Star Pen	d Pen iid Lim stic Lir sticity I ndard etratic	etrome lit nit ndex on Test	eter t

1

		TES	<b>F BORII</b>	NG I	RECO	ORD								
CLIEN	г	: Indianapolis Airport Authority					_		BOR	ING NC	).:	B-2	5A	
PROJE	CT	: Stormwater and Deicing Capacity Projects							SHE	ET	3	O	= ;	3
stratum Elevation	àample Ìepth	SOIL/MATERIAL DESCRIPTION		stratum Depth	ample Jumber	SPT per 6"	SPT per 12" (N)	tecovery (%)	Aoisture Content (%)	otal Unit Veight (pcf)	Jnconfined Compression (ksf)	At	Limits	g
00	00			01	02	0)		ш	20	->			PL	PI
699.0_		Brown, Moist, Hard to Very Stiff, SILTY CLA with SAND (CL-ML) with Cobbles (TILL) As Lab 4 Bottom of Boring at 50 feet	Y	_50.0	SS-12	9 13 24	37	100	12					
	_	Boring backfilled according to Aquifer Protect	tion											
	_ - 55 - -													
	_													
	60													
	65													
	-													
	70													
			BORING	METH	OD	SA	MPLI	NG ME	THOD		ABBR	EVIAT	IONS	
			HSA - Hollow SFA - Solid F	<sup>,</sup> Stem Flight A	Auger	SS ST	- Split - Shell	Spoor by Tub	n Samp be Sam	ole  * ple   LL	- Han - Liqu	d Pen id Lim	etrome iit	eter
		ENGINEERING Z	RC - Rock ( MD - Mud D	Coring rillina		CR BS	- Rock - Bao	Core Sampl	Sampl le	e PL PI	- Plas - Plas	tic Lin	nit ndex	
		Phone: 317-295-8650	ND - Wash HA - Hand	Drilling Auger	]	AC	- Auge	er Cutt	ings	SF	PT - Star Pen	ndard etratio	n Test	t

		TES	T BOR	NG I	RECO	ORD	)							
CLIEN	Г	: Indianapolis Airport Authority							BOF	RING N	0.:	B-2	26	
PROJE	CT	: Stormwater and Deicing Capacity Projects	3				_		SHE	ET	1	0	=	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STA	RTED	: 11-2	27-17	
PROJE	CT NO	. : 17050081IND							DAT		<b>IPLETED</b>	: 11-2	27-17	
Boring	Elevatio	on: 759 Feet Boring Depth : 23.5	Feet	Boring	Method	: HS	A		Ham	nmer	: A	utoma	atic	
	Northin	g : <u>1,626,978</u> Station:		Rig Typ	be	: CM	E-550		Ham	nmer Ef	fficiency: 8	6.0%		
	Datum	:NAD83, Indiana East Line :		Casing	Diamete	er : 3.2	5"		Tem	ei iperatui	re : 5	0° F		
				Core S	ize	:			Wea	ather	: 5	Sunny		
GROU	NDWAT	TER: $\mathbf{\Psi}$ Encountered at <u>15.0</u> '												
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	l	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	A	tterbe Limits PL	rg ; PI
		TOPSOIL (12") (Visual)												
758.0_	+			1.0		5								
					SS-1	6	12	100	14					
	4	4				6								
		_												
	-\	Design and Orea Maint Office Madium Of			55-2	4	10	100	15					
	5_/	SANDY LEAN CLAY (CL)	π,	1	00-2	6								
		As Lab 23		1										
	$\uparrow$	7				3								
					SS-3	2	5	100	27					
	-	4				3								
750.5_				8.5										
	-\	/			SS-4	1	3	100	19					
	10_/	N				2	Ŭ							
		Grav. Moist. Soft. SANDY LEAN CLAY (CL												
	-	with Traces of Gravel												
	_			1										
				1										
745.5_				13.5										
	-)>				SS-5	16		28						
						0010								
	-													
	-	Cobble Encountered in SS-5 and SS-6												
	_	with SAND (CL-ML) (TILL)												
		AS Lab 4												
					3-22			0						
	-					50/1"								
	20_													
		Continued on next page												
			BORING	G METH		<b>S/</b>	AMPLI	NG ME		) nle *	ABBR	EVIA	TIONS	otor
			SFA - Solid	Flight A	uger	ST	- Shel	by Tu	be San	nple L	L - Liqu	id Lin	it	CICI
			RC - Rock	Coring		CR	- Rock	Core Samp	Samp le	le F	PL - Plas	stic Lir	nit Index	
		CIL Engineering, Inc. Phone: 317-295-8650	WD - Wash	n Drilling	1	AC	- Auge	er Cutt	ings	s	SPT - Star	ndard		
			HA - Hand	I Auger							Pen	etratic	n Tes	,t

		TES	<b>ST BORI</b>	NGI	RECO	ORD								
CLIENT	-	: Indianapolis Airport Authority					_		BOF	RING NC	.:	B-2	26	
PROJE	СТ	: Stormwater and Deicing Capacity Project	S						SHE	ET	2	O	= ;	2
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTIO	N	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	At	tterber Limits PL	rg Pl
735.5	-	Brown and Gray, Moist, Hard, <b>SILTY CLAN with SAND (CL-ML) (TILL)</b> As Lab 4	,	23.5										
	25_	Bottom of Boring at 23.5 feet Boring terminated due to boulder. Boring backfilled to Aquifer Protection Guidelines												
	30													
	35_													
	40													
	45_													
		CTL Engineering, Inc. Phone: 317-295-8650	BORING HSA - Hollow SFA - Solid RC - Rock MD - Mud I WD - Wash HA - Hand	<b>METH</b> v Stem Flight A Coring Drilling Drilling Auger	<b>OD</b> Auger uger	SS · ST · CR · BS · AC ·	- Split - Shell - Rock - Bag - Auge	NG ME Spoor by Tub Core Samp er Cutt	THOD n Samp Samp le ings	ole * nple LL le PL PI SF	ABBR - Han - Liqu Plas - Plas 2T - Star Pen	EVIAT d Pen id Lim stic Lin sticity I ndard etratio	etrome it nit ndex	eter t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	ST BO	RING	RECC	ORD	)							
CLIEN	г	: Indianapolis Airport Authority					_		BOF	RING NO	D.:	B-2	6 <b>A</b>	
PROJE	CT	: Stormwater and Deicing Capacity Project	s				_		SHE	ET	1	OF	=	1
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAF	RTED	: 11-2	7-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 11-2	7-17	
Boring	Elevatio	n: 759 Feet Boring Depth : 12.0	Feet	_ Boring	Method	: HS	A		Ham	imer	<u>: A</u>		tic	
	Easting	:158,343 Offset :		- Rig Typ	pe	: CN	IE-550		Drille	er	: J	S.0%		
	Datum	: NAD83, Indiana East Line :		Casing	Diameter	r : <u>3.2</u>	5"		Tem	perature	e <u>:5</u>	i0° F		
GROUI		ER: Encountered at 15.0'		Core S	ize				wea	liner		burniy		
atum vation	nple oth	SOIL/MATERIAL DESCRIPTIO	N	atum	nple nber	r per 6"	T per 12" (N)	covery %)	isture ntent (%)	al Unit ight (pcf)	confined mpressiol (ksf)	At	terbeı _imits	rg
Stra Elev	San Dep			Stra	San Nur	SPT	SP	Rec	Moi Cor	Tot Wei	Cor	LL	PL	PI
747.0_	5	Refer to RB-26 for soil description  Bottom of Boring at 12 feet Encountered boulder at 12 feet. Boring backfilled according to Aquifer Protection Guidelines.	BOR	12.0	OD	S	AMPLI		THOD		ABBR	EVIAT	IONS	
		CTI-	BOR HSA - Ho	NING METH	Auger	SS	- Split	NG ME Spoor	THOD	ole *	- Har	d Pen	tions etrometrometrometrometrometrometrometrom	eter
		L	SFA - Sc	olid Flight A	uger	ST	- Shel	by Tub	e San	nple LL	- Liqu	id Lim	it	
		<i>ENGINEERING≦</i> CTL Engineering Inc	MD - Mu	ud Drilling		BS	- Rock - Bag	Samp	Samp le	ie Pl Pl	Plas - Plas	stic Lin sticity I	ndex	
		Phone: 317-295-8650	WD - W HA - Ha	ash Drilling and Auger	)	AC	- Auge	er Cutt	ings	SI	PT - Stai Per	ndard etratio	n Tes	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	ST BOR	ING	RECO	ORD	)							
CLIEN	Г	: Indianapolis Airport Authority					_		BOF	RING NO	D.:	B-2	6B	
PROJE	CT	: Stormwater and Deicing Capacity Project	S				_		SHE	ET	1	OF	-	3
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	RTED	: 11-2	7-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 11-2	7-17	
Boring	Elevatio Northing	n: 759 Feet Boring Depth : 50.0	Feet	Boring	Method	: HS	A		Ham	imer Imer Eff	<u>: A</u> iciency: 8	utoma	atic	
	Easting	: <u>158,343</u> Offset :				: <u>CIV</u>	1E-550 5"		Drille	er	<u>: J</u>	S		
	Datum	: NAD83, Indiana East Line :		Core S	ize	·	5		- Tem	perature	e <u>:5</u> :5	0° F Sunnv		
GROU	NDWATI	ER: $\mathbf{\Psi}$ Encountered at <u>16.0'</u> $\mathbf{\Psi}$ At cor	npletion 21.2	<u>2'</u>					1.1.00	廢 C	aved in a	t <u>39.0'</u>		
											Ľ			
- 5			N	_		r 6"	r 12'	Ž	.e t (%)	nit (pcf	ined essic	At	terbei _imits	rg
atum vatio	pth	SOIL/MATERIAL DESCRIPTION	N	atun pth	mbe	Tpe	De C	%)	istur nten	tal U ight	conf mpre (ksf)	-		
Str Ele	Sar Dej			Str Del	Sar Nu	.dS	SP	Re.	° S S S	Tot We	с С С С	LL	PL	PI
745.5_	5	Refer to RB-26 for soil descriptions		13.5		16								
1	15 	Brown and Gray, Moist, Hard to Very Stiff, SILTY CLAY with SAND (CL-ML) with Cob and Traces of Gravel (TILL) As Lab 4 Continued on next page	bles		SS-5 SS-6	30 39 18 24 31	69 55	33	7					
			BORIN	G METH	IOD	S	AMPLI	NG ME	THOD		ABBR	EVIAT	IONS	
			HSA - Hollo SFA - Solio	w Stem	Auger Auger	SS ST	- Split - Shel	Spool by Tub	n Sam be Sam	ole *	- Han - Liou	d Pen iid Lim	etrom it	eter
		ENGINEERING 2	RC - Rock	Coring		CR	- Rock	< Core	Samp	le PL	Plas	stic Lin	nit	
		CTL Engineering, Inc.	WD - Mud WD - Was	Drilling h Drilling	9	AC	- Bag	Samp er Cutt	ie ings	PI   SF	- Plas PT - Stai	sticity I ndard	ndex	
		1 HUHE. 317-293-0030	HA - Hand	d Auger	-				5		Pen	etratio	n Tes	t

		TES	T BORI	NG F	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					-		BOR	ING NO	.:	B-2	6B	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	5						SHE	ET	2	0	= ;	3
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	N	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	A	tterber Limits PL	·g Pl
Str Electron		Brown and Gray, Moist, Hard to Very Stiff, SILTY CLAY with SAND (CL-ML) with Cob and Traces of Gravel (TILL) As Lab 4	bles	Str	SS-7 SS-8 SS-9 SS-10	43 50/5" 9 13 20 18 16 18 6 9 14	<b>d</b> 33 34 23	0 100 100	<b>₽</b> <b>9</b>	Tot			PL	PI
	·~ +	Continued on next page	runn											
	II		BORING	METH	OD	SA	MPLI	NG ME	THOD		ABBR	EVIA	IONS	
		CTL Engineering, Inc. Phone: 317-295-8650	HSA - Hollow SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	V Stem Flight A Coring Prilling Drilling Auger	Auger uger	SS ST CR BS AC	- Split - Shell - Rock - Bag - Auge	Spoor by Tub Core Sampl er Cutt	n Samp be Sam Sampl le ings	ole * iple LL e PL PI SF	- Han - Liqu - Plas - Plas 2T - Star Pen	d Pen id Lim stic Lir sticity ndard etratic	etrome iit nit Index on Test	eter t

1

		TEST	<b>F BORII</b>	NG I	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NC	).:	B-2	6B	
PROJE	СТ	: Stormwater and Deicing Capacity Projects					_		SHE	ET	3	O	= ;	3
tratum levation	ample epth	SOIL/MATERIAL DESCRIPTION		tratum epth	ample lumber	PT per 6"	SPT per 12" (N)	ecovery (%)	loisture ontent (%)	otal Unit Veight (pcf)	Inconfined compression (ksf)	At	terber Limits	g
сп	SD			νD	νz	S	S	R	20	⊢S	50	LL	PL	PI
709.0_	- - - 50	Brown and Gray, Moist, Hard to Very Stiff, SILTY CLAY with SAND (CL-ML) with Cobble and Traces of Gravel (TILL) As Lab 4 Bottom of Boring at 50 feet	es	_50.0	SS-12	16 33 44	77	100	10					
	-	Boring backfilled according to Aquifer Protec Guidelines.	tion											
	55													
	- 60_ - -													
	65_													
	70_													
			BORING	METH Stem	OD Auger	SS S	- Split	NG ME	THOD	le *	- Han	d Pen	tions	eter
		ENGINEERING Z	SFA - Solid F RC - Rock (	light A	uger	ST CR	- Shell	by Tub Core	e Sam Sampl	ple LL e PL	- Liqu	id Lim tic Lin	it nit	
		CTL Engineering, Inc. Phone: 317-295-8650	//D - Mud D VD - Wash IA - Hand /	rilling Drilling Auger	I	BS AC	- Bag - Auge	Sampl er Cutt	e ings	PI SF	Plas - T - Star Pen	ticity I dard etratio	ndex n Test	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	T BOR	ING	RECO	ORD	)							
CLIEN	г	: Indianapolis Airport Authority					_		BOF	RING NO	D.:	B-2	27	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	;				_		SHE	ET	1	0	F	3
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	RTED	: 11-2	28-17	
PROJE	CT NO	0. : 17050081IND							DAT	E COM	PLETED	: 11-2	28-17	
Boring	Elevatio	on: 762 Feet Boring Depth : 49.8	Feet	Boring	Method	: HS	A		Ham	nmer Imer Eff	<u>: A</u> iciency: 8	utoma	atic	
	Easting	g : <u>158,217</u> Offset :		Rig Typ	Diamata	: <u>CN</u>	IE-550		Drille	er	<u>: J</u>	S		
	Datum	: NAD83, Indiana East Line :		Core S	ize	· <u></u>	5		Ver	perature	e <u>:5</u>	i0° F Sunnv		
GROUI	NDWA	TER: $\mathbf{Y}$ Encountered at <u>18.0'</u> $\mathbf{Y}$ At com	pletion 21.2	<u>2'</u>					1	櫰 C	aved in a	t <u>42.2</u>		
atum vation	mple pth	SOIL/MATERIAL DESCRIPTION	I	atum pth	mple mber	T per 6"	T per 12" (N)	covery (%)	isture ntent (%)	tal Unit ight (pcf)	confined mpression (ksf)	A	tterbe Limits	rg
Ele	Sa De			Str	Sal Nu	SP	Ъ	Re	စိပိ	μ	ភិបិ	LL	PL	PI
761.0		TOPSOIL (12') (Visual)		1.0										
		Brown, Moist, Stiff to Very Stiff, <b>SANDY LE</b> <b>CLAY (CL)</b> As Lab 23	AN		SS-1	345	9	100	17					
757.5_	5	Brown and Gray, Damp, Medium Dense, SILTY CLAYEY SAND (SC-SM) As Lab 13		4.5	SS-2	10 11 13 5	24	100	9					
		Brown and Gray, Moist, Very Stiff to Stiff, <b>SANDY LEAN CLAY (CL)</b> As Lab 26			SS-3	5 8 4 5	9	100	20					
748.5_	- - 15 - 	Gray, Moist, Soft, <b>SANDY LEAN CLAY</b> Lab 27		13.5	SS-5	2 1 2	3	39	13			26	14	12
744.0	20	Gray, Moist, Hard, SILTY CLAY with SAND (CL-ML) As Lab 4 Continued on next page		10.0	SS-6	12 15 22	37	89	10					
			BORIN	G METH	OD	S	AMPLI	NG ME	THOD		ABBR	EVIA	TIONS	
		CTL Engineering, Inc. Phone: 317-295-8650	HSA - Holic SFA - Solic RC - Rock MD - Mud WD - Was HA - Hang	w Stem I Flight A Coring Drilling h Drilling d Auger	Auger Auger	SS ST CR BS AC	<ul> <li>Split</li> <li>Shel</li> <li>Rock</li> <li>Bag</li> <li>Auge</li> </ul>	Spoor by Tub Core Samp er Cutt	n Samp be San Samp le ings	ple * nple LL le PL PI SF	- Han - Liqu - Plas - Plas PT - Star Pen	id Pen iid Lim stic Lir sticity ndard etratic	etrom nit nit Index	eter

		TES	T BORI	NG F	RECC	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NO	.:	B-2	27	
PROJE	CT	: Stormwater and Deicing Capacity Project	5				1		SHE	ET	2	O	= ;	3
itum ⁄ation	th	SOIL/MATERIAL DESCRIPTION	4	thm	nple nber	. per 6"	r per 12" (N)	overy %)	sture itent (%)	al Unit ght (pcf)	onfined npression ksf)	At	terber: Limits	rg
Stra Elev	San Dep			Stra Dep	Sarr Nun	SPT	SP1	Rec (%	Moi Con	Tota Wei	Con	LL	PL	Ы
Ţ	25				SS-7	7 15 27	42	100	10					
	30	Grav Moist Hard SILTY CLAY with SAN			SS-8	15 22 32	54	100	12					
	35	(CL-ML) As Lab 4			SS-9	15 28 34	62	100	9					
南	40				SS-10	12 24 41	65	100	9					
	45	Continued on next page			SS-11	18 21 33	54	100	9					
		CTL Engineering, Inc. Phone: 317-295-8650	BORING HSA - Hollow SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	METH Stem Sight A Coring Drilling Drilling Auger	<b>OD</b> Auger uger	SS ST CR BS AC	AMPLII - Split - Shell - Rock - Bag - Auge	NG ME Spoor by Tuk Core Sampler Cutt	THOD In Samp De Sam Sample le ings	e * ple LL e PL PI SP	ABBR - Han - Liqu - Plas - Plas PT - Star Pen	EVIAT d Pen id Lim stic Lin sticity I ndard etratic	TONS etrome lit nit ndex on Tes	eter

		TEST	<b>F BORI</b>	NGI	RECO	ORD								
CLIENT       : Indianapolis Airport Authority       BORING NO.:         PROJECT       : Stormwater and Deicing Capacity Projects       SHEET										).:	B-2	27		
PROJE	СТ	: Stormwater and Deicing Capacity Projects					1		SHE	ET	3	O	= ;	3
itum ⁄ation	ith th	SOIL/MATERIAL DESCRIPTION		itum th	nple nber	. per 6"	r per 12" (N)	overy %)	sture itent (%)	al Unit ght (pcf)	onfined npression ksf)	At	terber Limits	g
Stra Elev	San Dep			Stra Dep	San Nun	SPT	SP	Rec (°	Moi	Tota Wei	Con	LL	PL	Ы
712.2_		Gray, Moist, Hard, SILTY CLAY with SAND (CL-ML) As Lab 4 Bottom of Boring at 49.8 feet		_49.8	SS-12	24 39 50/4"		103	8					
	- - 555 -	Boring backfilled according to Aquifer Protec Guidelines	tion											
	60													
	65_ _ _ _ 70_													
			BORING	METH	OD	SA	MPLI	NG ME	THOD		ABBR	EVIAT	IONS	
		CTL Engineering, Inc. Phone: 317-295-8650	HSA - Hollow SFA - Solid F RC - Rock ( MD - Mud D VD - Wash HA - Hand	/ Stem Flight A Coring prilling Drilling Auger	Auger uger	SS · ST · CR · BS · AC ·	- Split - Shell - Rock - Bag - Auge	Spoor by Tub Core Sampl er Cutt	n Samp be Sam Sampl le ings	ole * ple LL e PL PI SF	- Han - Liqu - Plas - Plas Plas T - Star Pen	d Pen id Lim stic Lin sticity I ndard etratio	etrome it nit ndex n Test	eter

ſ

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	T BORI	NG I	RECO	ORD	)							
CLIENT	Г	: Indianapolis Airport Authority							BOF	RING NC	).:	W	-1	
PROJE	CT	: Stormwater and Deicing Capacity Projects					_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAR	TED	: <u>11-0</u>	)2-17	
PROJE	CT NO	. : 17050081IND							DAT	E COM	PLETED	: 11-0	)3-17	
Boring	Elevatio	on: 755 Feet Boring Depth : 35.0 F	eet	Boring	Method	: HS	A		Ham	mer	: A	utoma	atic	
	Northing	g: <u>1,624,456</u> Station:		Rig Typ	be	: CN	IE-550		Ham	imer Effi	iciency: 8	6.0%		
	Datum	: NAD83, Indiana East Line :		Casing	Diamete	er : 4.2	5"		Tem	perature	e : 5	0° F		
				Core S	ize	:			Wea	ther	: C	)verca	ist	
GROUN	NDWAT	ER: $\mathbf{\Psi}$ Encountered at <u>22.5'</u>												
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION		Stratum Depth	sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Fotal Unit Neight (pcf)	Jnconfined Compression (ksf)	At	tterbei Limits	rg ;
0,11		TOPSOIL (14") (Visual)			072	0,		-	20				FL.	
753.8_	$\pm$			1.2		4								
	_ X				SS-1	5	13	100	8					
	ŀ					8								
		Brown, Moist, Medium Dense to Loose,												
	-1)	Lab 47			SS-2	4	9	100	12			16	13	3
	5_/					5								
740.0				6.0										
749.0_	t			0.0		5								
	- X				SS-3	8	20	100	9					
	ŀ	Brown, Moist, Medium Dense, SILTY SAND				12								
	1	(SM) Lab 48												
	-1/				55-4	4	12	100	11			16	13	3
745.0	10_/			10.0	00-4	6	12							
	-													
		Brown and Gray, Loose, SANDY SILT (ML)												
	-1/	As Lab 3			SS-5	4	0	100	13					
	15				00-0	4	5		15					
	-													
738.0_	_			17.0										
		Creve Maint Lland CILTY CLAY with CAND												
	1	(CL-ML) with Intermittent Sand Seam Layers	s											
	-1/	A (TILL) As Lab 4			SS-6	7		101	7					
	20				00-0	50/5"			,					
		Continued on next page												
				G METH	OD	S.		NG ME	THOD		ABBR	EVIAT	TIONS	otor
			SFA - Solid	Flight A	uger	ST	- Shel	by Tub	be San	nple   LL	- Han - Liqu	uid Lim	nit	GICI
		ENGINEERING	RC - Rock	Coring		CR	- Rock		Samp	le PL	- Plas	stic Lir	nit Indev	
		CIL Engineering, Inc. Phone: 317-295-8650	WD - Wash	n Drilling	I	AC	- Auge	er Cutt	ings	SF	PT - Star	ndard	IIIUCX	
			HA - Hand	Auger							Pen	etratic	on Tes	st

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	ST BOR	ING	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR		D.:	W	-1	
PROJE	CT	: Stormwater and Deicing Capacity Project	S						SHE	ET	2	0	F	2
itum ation	th	SOIL/MATERIAL DESCRIPTIO	N	thm	nple nber	per 6"	_ per 12" (N)	overy 6)	sture tent (%)	al Unit ght (pcf)	onfined 1pressior ksf)	A	tterbe Limits	rg
Stra Elev	Sam Dep			Stra Dep	Sam Nun	SPT	SPT	Rec (%	Mois Con	Tota Wei	Unc Con (I	LL	PL	PI
720.0_		Gray, Moist, Hard, SILTY CLAY with SANI (CL-ML) with Intermittent Sand Seam Laye (TILL) As Lab 4 Bottom of Boring at 35 feet Piezometer installed at a depth of 35 feet.	Ders	_35.0	SS-7 SS-8 SS-9	21 18 18 10 20 23 9 26 27	36 43 53	100 100	20 6 24		ABBR	EVIA	FIONS	
			HSA - Holl	ow Stem	Auger	SS	- Split	Spool	n Samp	ole *	- Han	id Pen	etrom	eter
		ENGINEERING <sup>2</sup>	RC - Roc	u Flight A k Coring	Nuger	CR	- Snel - Rock	Core	Sampl	ipie   LL le   PL	Liqu Plas	na Lin stic Lir	nit	
		CTL Engineering, Inc.	MD - Muc	l Drilling sh Drilling	1	BS AC	- Bag	Samp er Cutt	le inas	PI SF	- Plas PT - Star	sticity ndard	Index	
		Phone: 317-295-8650	HA - Han	d Auger	2		, ugi	. out			Pen	etratio	on Tes	t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	<b>ST BORI</b>	NG	RECO	ORD								
CLIENT	Г	: Indianapolis Airport Authority							BOF		0.:	W	-2	
PROJE	СТ	: Stormwater and Deicing Capacity Project	S				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN							DAT	E STAI	RTED	: 11-(	)1-17	
PROJE	CT NC	. : 17050081IND					_		DAT	E CON	IPLETED	: 11-0	)2-17	
Boring	Elevati	on: 753 Feet Boring Depth : 35.0	Feet	Boring	Method	: HS	A		Ham	nmer	: A	\utom:	atic	
	Northin	g : 1,624,762 Station:		Rig Ty	be	: CN	IE-550		Ham	nmer Ef	ficiency: 8	6.0%		
	Easting Datum	I : <u>159,449</u> Offset : <u></u>		Casing	Diamete	er : 4.2	5"		Drille	er Ineratur	<u>: J</u>	<u>S</u> 0° F		
	Batam			Core S	ize	:			Wea	ather	: 0	)verca	st	
GROUN	NDWA	TER: $\mathbf{\Psi}$ Encountered at <u>18.0</u> '												
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTIO	N	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Fotal Unit Neight (pcf)	Jnconfined Compression (ksf)	A	tterbei Limits	rg ; PI
								_						
751.5	+			1.5		3								
	-/	Brown and Gray, Moist, Medium Stiff to Sti LEAN CLAY with SAND (CL) As Lab 8	iff,		SS-1	4 4	8	100	24					
749.0_	5_			4.0	SS-2	4 4 5	9	0						
	-/	Brown, Moist, Loose to Medium Dense, <b>SI</b> <b>CLAYEY SAND (SC-SM)</b> Lab 49	LTY		SS-3	7 8 13	21	100	8			16	12	4
744.0_	-10			9.0	SS-4	15 20 30	50	100	7					
		Gray, Damp, Medium Dense to Dense, <b>SIL</b> <b>CLAYEY SAND with GRAVEL (SC-SM)</b> wit Traces Cobbles and intermittent Sand Lay <b>(TILL)</b> Lab 50	.TY h ers		SS-5	6 12 13	25	100	9					
-	20_	Continued on next page			SS-6	6 8 9	17	100	9			16	12	4
			BORING		OD Augor	S.		NG ME	THOD		ABBR		TIONS	otor
		CTL Engineering, Inc. Phone: 317-295-8650	HSA - Hollo SFA - Solid RC - Rock MD - Mud WD - Wast HA - Hand	w Stem Flight A Coring Drilling Drilling Auger	Auger Auger	SS ST CR BS AC	<ul> <li>Split</li> <li>Shel</li> <li>Rock</li> <li>Bag</li> <li>Auge</li> </ul>	Spoor by Tub Core Samp er Cutt	i Samp Samp le ings	pie * nple L le P S	Har - Har L - Liqu L - Plas I - Plas PT - Stai Pen	id Pen id Lim stic Lir sticity ndard netratic	etrom nit nit Index on Tes	eter

		TES	T BOF	RING	RECO	ORD	)							
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	RING NC	).:	W	2	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	6						SHE	ET	2	O	= ;	2
tratum :levation	ample Jepth	SOIL/MATERIAL DESCRIPTION	I	itratum Jepth	ample lumber	PT per 6"	SPT per 12" (N)	tecovery (%)	Aoisture Content (%)	otal Unit Veight (pcf)	Inconfined compression (ksf)	At	Limits	g
718.0_		Gray, Damp, Medium Dense to Dense, SIL CLAYEY SAND with GRAVEL (SC-SM) with Traces Cobbles and intermittent Sand Laye (TILL) Lab 50 Bottom of Boring at 35 feet Piezometer installed at a depth of 35 feet.	TY	at de la constant de	SS-7 SS-8 SS-9	<b>LG</b> 5 6 6 41 17 26 41 26 17	Las 12	100 67 78	9 9 14	Tot			PL	PI
	45_													
		CTL Engineering, Inc. Phone: 317-295-8650	BORI HSA - Hol SFA - Sol RC - Rou MD - Mu WD - Wa HA - Hai	ING METH Ilow Stem lid Flight A ck Coring id Drilling ash Drilling nd Auger	<b>OD</b> Auger J	SS ST CR BS AC	AMPLI - Split - Shel - Rock - Bag - Auge	NG ME Spoor by Tub Core Samp er Cutt	n Samp De Sam Sampl le ings	ple * nple LL le PL PI SF	ABBR - Han - Liqu - Plas - Plas PT - Star Pen	EVIAT d Pen id Lim stic Lin sticity I ndard etratic	tions etrome it nit ndex on Tes	eter t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18
		TES	ST BOR	ING	RECO	ORD	)							
CLIEN	Г	: Indianapolis Airport Authority					_		BORI	ING NC	).:	W	-3	
PROJE	СТ	: Stormwater and Deicing Capacity Project	s				_		SHEE	ΞT	1	0	F	3
LOCAT	ION	: Indianapolis, IN					_		DATE	E STAR	TED	: 12-0	)5-17	
PROJE	CT NO.	: 17050081IND							DATE	E COM	PLETED	: 12-0	6-17	
Boring	Elevatio	n: 755 Feet Boring Depth : 45.0	Feet	Boring	Method	: HS	A		Hamr	mer	<u>: A</u>	utoma	atic	
	Northing Fasting	: 1,625,287 Station: : 159,526 Offset :		Rig Typ	be	: CN	E-550		Hamr Drille	mer Effi r	iciency <u>: 8</u> : J	<u>6.0%</u> S		
	Datum	: NAD83, Indiana East Line :		Casing	Diamete	er : 4.2	5"		Temp	berature	: 3	0° F		
				Core S	ize	:			Weat	ther	: C	)verca	st	
GROU	NDWAT	ER: <u> -</u> Encountered at <u>Dry</u>												
tratum levation	ample epth	SOIL/MATERIAL DESCRIPTIO	N	tratum epth	ample umber	PT per 6"	PT per 12" (N)	ecovery (%)	loisture ontent (%)	otal Unit /eight (pcf)	nconfined ompression (ksf)	A	tterbe	rg ;
<u> თ ш</u> 754 7_	SD	<b>TOPSOIL</b> (4") (Visual)		<b>0</b> 3	νz	S	0 O	2	20	⊢≤	⊃ U	LL	PL	PI
104.1					SS-1	3 4 9	13	100	8					
	5	Brown, Moist, Loose to Medium Dense, <b>SI CLAYEY SAND (SC-SM)</b> As Lab 15	LTY		SS-2	4 3 4	7	100	10					
					SS-3	6 8 11	19	100	9					
746.0_	10			9.0	SS-4	8 16 18	34	100	7					
		Gray, Moist, Medium Stiff to Hard, <b>SILTY CLAY with SAND (CL-ML)</b> with Traces of Gravel and Intermittent Sand Layers <b>(TILL</b> As Lab 4	)		SS-5	16 16 18	34	11	11					
	20	Continued on next page			SS-6	6 7 8	15	100	9					
			BORIN	G METH	OD Auger	<b>S</b> S	- Split	NG ME	THOD	le *	- Han	d Pen	etrom	eter
		<i>ENGINEERING ≦</i> CTL Engineering, Inc. Phone: 317-295-8650	SFA - Solid RC - Rock MD - Mud WD - Was HA - Hanc	Flight A Coring Drilling h Drilling d Auger	l	ST CR BS AC	- Shel - Rock - Bag - Auge	by Tub Core Sampler Cutt	e Samp Sample le ings	ple LL e PL PI SF	- Han Liqu - Plas - Plas - Plas PT - Star Pen	id Lim stic Lin sticity ndard etratic	nit nit Index on Tes	st

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	T BORII	NG F	RECO	ORD								
CLIEN	Г	: Indianapolis Airport Authority					_		BOR	ING NO	.:	W-	3	
PROJE	CT	: Stormwater and Deicing Capacity Projects	6				1		SHE	ET	2	O	= ;	3
atum vation	nple oth	SOIL/MATERIAL DESCRIPTION	ı	atum oth	nple nber	r per 6"	T per 12" (N)	:overy %)	sture ntent (%)	al Unit ight (pcf)	confined npression ksf)	At	terber Limits	rg
Stra Elev	San Dep			Stra Dep	San Nur	SP1	SP <sup>-</sup>	Rec (	Moi Cor	Tot: Wei	Cor Cor	LL	PL	PI
	25				SS-7 SS-8	6 6 7 8 10	13	78	9					
	30 _/ _	Gray, Moist, Medium Stiff to Hard, <b>SILTY</b> <b>CLAY with SAND (CL-ML)</b> with Traces of Gravel and Intermittent Sand Layers ( <b>TILL</b> ) As Lab 4			SS-9	25 13 17	30	100	10					
	40				SS-10 SS-11	31 22 26	48	89	10					
						50/1								
710.0_	45	Continued on payt name		45.0										
		Continued on next page	BORING	METH	OD	SA		NG ME	THOD		ABBR	EVIAT	IONS	
		CTL Engineering, Inc. Phone: 317-295-8650	HSA - Hollow SFA - Solid F RC - Rock ( MD - Mud D WD - Wash HA - Hand	v Stem Flight A Coring prilling Drilling Auger	Auger uger	SS ST CR BS AC	- Split - Shell - Rock - Bag - Auge	Spoor by Tuk Core Samp er Cutt	n Samp be Sam Sampl le ings	ole * iple LL e PL PI SP	- Han - Liqu - Plas - Plas 7T - Star Pen	d Pen iid Lim stic Lin sticity I ndard etratio	etrome it nit ndex n Tes	eter t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	T BOR	ING	RECO	ORD								
CLIENT	-	: Indianapolis Airport Authority							BOR	ING NO	.:	W	3	
PROJE	СТ	: Stormwater and Deicing Capacity Projects	8						SHE	ET	3	0	= ;	3
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	1	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Fotal Unit Neight (pcf)	Jnconfined Compression (ksf)	At	tterber Limits	g BI
0,8		Bottom of Boring at 45 feet			072		••		20				F L	
	-	Encountered cobble at 43.5 feet. Piezomet installed at a depth of 45 feet.	er											
	50													
	55													
	- 60_ - - -													
	65_													
	70_													
		CTL Engineering, Inc. Phone: 317-295-8650	BORINHSA- HolloSFA- SolidRC- RockMD- MudWD- WasHA- Hand	G METH w Stem I Flight A Coring Drilling h Drilling d Auger	Auger Auger	SS - ST - CR - BS - AC -	MPLII - Split - Shell - Rock - Bag - Auge	NG ME Spoor by Tub Core Sampl er Cutt	THOD Samp Sampl Sampl le ings	ole * iple LL e PL PI SF	ABBR - Han - Liqu - Plas - Plas PT - Star Pen	EVIAT d Pen id Lim stic Lin sticity I ndard etratic	etrome it nit ndex	eter t

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

Г

		TES	ST BOR	ING I	RECO	ORD	)							
CLIEN	Г	: Indianapolis Airport Authority							BOF		0.:	W	-4	
PROJE	СТ	: Stormwater and Deicing Capacity Project	S				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	E STAI	RTED	: 11-(	)8-17	
PROJE	CT NO.	: 17050081IND					_		DAT	E CON	IPLETED	: 11-0	)8-17	
Boring	Elevatio	n: 761 Feet Boring Depth : 35.0	Feet	Boring	Method	: HS	A		Ham	nmer	: A	\utoma	atic	
	Northing	: <u>1,625,586</u> Station:		Rig Typ	be	: CN	1E-550		Ham	nmer Ef	ficiency: 8	6.0%		
	Easting Datum	: NAD83, Indiana East Line :		Casing	Diamete	er : 4.2	5"		- Drille	er Iperatur	re :5	<u>5</u> 50° F		
				Core S	ize	:			Wea	ather	: 5	Sunny		
GROUI	NDWAT	ER: I Encountered at <u>16.0'</u>												
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTIO	N	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	At	tterbei Limits	rg ; PI
700.0		TOPSOIL (12") (Visual)		1.0										
760.0_		Brown, Moist, Medium Stiff, <b>SANDY LEAN CLAY (CL)</b> As Lab 14		1.0	SS-1	3 3 4	7	100	19					
757.5_	5			3.5	SS-2	5 6 7	13	100	9					
	-	Brown, Moist, Stiff, <b>SILTY CLAYEY SAND</b> (SC-SM) As Lab 15			SS-3	4 5 6	11	100	10					
752.0_	10			9.0	SS-4	7 13 15	28	100	12					
745.0		Brown and Gray, Moist, Medium Dense to Dense, <b>POORLY GRADED SAND with SIL</b> <b>and GRAVEL (SP-SM)</b> As Lab 16 Encountered Cobble at SS-5	T	16.0	SS-5	21 21 25	46	6						
	20	Gray, Moist, Very Stiff to Hard, <b>SILTY CLA</b> with SAND (CL-ML) with Intermittent Sand Layers (TILL) As Lab 4	Y		SS-6	6 11 11	22	100	14					
		Continued on next page	BORIN	G METH	OD	S		NG MF		)	ABBR		LIONS	 
		CTL Engineering Inc.	HSA - Hollo SFA - Solid RC - Rock MD - Mud	w Stem I Flight A Coring Drilling	Auger uger	SS ST CR BS	- Split - Shel - Rock - Bao	Spoor by Tul Core Samp	n Samp be San Samp le	ple * nple L le P	- Han L - Liqu L - Plas	id Pen id Lim stic Lir sticitv	etrom nit nit Index	eter
		Phone: 317-295-8650	WD - Wasl	h Drilling Auger	I	AC	- Auge	er Cutt	ings	s	PT - Star Pen	ndard	on Tes	st

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	<b>ST BORI</b>	NGI	RECO	ORD								
CLIENT	г	: Indianapolis Airport Authority					_		BOR	ING NC	).:	W	4	
PROJE	СТ	: Stormwater and Deicing Capacity Project	s				_		SHE	ET	2	O	F ;	2
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTIO	N	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	At	tterber Limits PL	g Pl
726.0_		Gray, Moist, Very Stiff to Hard, SILTY CLA with SAND (CL-ML) with Intermittent Sand Layers (TILL) As Lab 4 Bottom of Boring at 35 feet Piezometer installed at a depth of 35 feet.	Y	_35.0	SS-7 SS-8 SS-9	0       35       40       43       9       10       19       13       14       25	83 29 39	6 100	13 11 11					
		CTL Engineering, Inc. Phone: 317-295-8650	HSA - Hollov SFA - Solid RC - Rock MD - Mud I WD - Wash HA - Hand	<b>METH</b> v Stem Flight A Coring Drilling Drilling Auger	Auger Auger	SS ST CR BS AC	- Split - Shell - Rock - Bag - Auge	Spoor by Tub Core Samp er Cutt	samp Samp Sampl e ings	ple * ple LL e PL PI SF	ABBR - Han - Liqu - Plas - Plas PT - Star Pen	d Pen id Lim stic Lin sticity I ndard etratic	etromo it nit ndex on Tes	eter

Г

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	T BOR	ING	RECO	ORD	)							
CLIENT	Г	: Indianapolis Airport Authority							BOF	RING NO	D.:	W	-5	
PROJE	CT	: Stormwater and Deicing Capacity Projects	3				_		SHE	ET	1	0	F	2
LOCAT	ION	: Indianapolis, IN					_		DAT	TE STAF	RTED	: 11-0	)7-17	
PROJE	CT NO.	: 17050081IND							DAT	E COM	PLETED	: 11-(	)7-17	
Boring	Elevatio	n: 751 Feet Boring Depth : 35.0	Feet	Boring	Method	: HS	A		Han	nmer	: A	Automa	atic	
	Northing Easting	:1,626,845 Station:		Rig Ty	ре	: CN	1E-550		Han	nmer Efl er	ficiency: 8	<u>86.0%</u> IS		
	Datum	: NAD83, Indiana East Line :		Casing	Diamete	er : 4.2	5"		- Terr	nperatur	e :5	50° F		
				Core S	ize	:			Wea	ather	: (	Dverca	ıst	
GROU	NDWAT	ER: <u>F</u> Encountered at <u>17.0'</u>												
tratum levation	ample epth	SOIL/MATERIAL DESCRIPTION	I	tratum epth	ample umber	PT per 6"	PT per 12" (N)	ecovery (%)	loisture ontent (%)	otal Unit /eight (pcf)	nconfined ompression (ksf)	A	tterbe Limits	rg
ωш	SD			00	νz	S	0	2	≥o	->	50	LL	PL	PI
750.0_				1.0		2								
	X				SS-1	3	7	100	19					
	-4			1		4								
	-													
	-1				00.0	4	10	100	10			25	14	01
	5 N				55-2	5	12	100	12			35	14	21
				1										
	$\overline{\mathbf{h}}$			]		7								
	-X	Brown, Moist, Medium Stiff to Very Stiff, SANDY LEAN CLAY (CL)			SS-3	8	22	100	13					
	A	Lab 26				14								
	-\/			1	SS-4	7	20	100	12					
	10_/					12								
	-													
	-													
738.0				13.0										
						12								
	ΞX				SS-5	12	51	100	13					
	15_/					32								
		Brown and Gray, Moist, Hard, LEAN CLAY												
		with SAND (CL) (TILL)		1										
		AS Lab 0		1										
	_													
						7								
731.5_	٦X			19.5	SS-6	16	35	100	10					
	20 /	Continued on payt page	HHH	H H		19								
		Continued on next page	BORIN	G METH	IOD	S	AMPLI	ng me	 Ethor	) )	ABBR	REVIA	L FIONS	<u> </u> ;
			HSA - Hollo	w Stem	Auger	SS	- Split	Spoo	n Sam	ple *	- Har	nd Pen	etrom	eter
			SFA - Solid RC - Rock	Flight A Corina	luger	ST CR	- Shel	by Tul < Core	be San Samn	npie   Ll ble   Pi	L - Liqu L - Plas	uid Lim stic Lir	nit nit	
		CTL Engineering, Inc.	MD - Mud	Drilling		BS	- Bag	Samp	le	P	I - Plas	sticity	Index	
		Phone: 317-295-8650	WD - Wash HA - Hand	n Drilling I Auger	)	AC	- Auge	er Cutt	ings	S	PT - Star Pen	ndard ietratio	on Tes	st

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	<b>ST BORI</b>	NGI	RECO	ORD								
CLIENT	-	: Indianapolis Airport Authority					_		BOR	ING NC	).:	W-	5	
PROJE	СТ	: Stormwater and Deicing Capacity Project	S				1		SHE	ET	2	O	= ;	2
Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	N	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	At I	terber Limits PL	g Pl
716.0_		Gray, Moist, Hard to Very Stiff, SILTY CLA with SAND (CL-ML) with Intermittent Sand Layers (TILL) As Lab 4 Bottom of Boring at 35 feet Piezometer installed at a depth of 35 feet.	Y	_35.0	SS-7 SS-8 SS-9	12 26 36 10 13 20 9 12 14	62	100	22 10 14					
		CTL Engineering, Inc. Phone: 317-295-8650	BORING HSA - Hollow SFA - Solid RC - Rock MD - Mud E WD - Wash HA - Hand	<b>METH</b> v Stem Flight A Coring Drilling Drilling Auger	OD Auger uger	SS ST CR BS AC	AMPLII - Split - Shell - Rock - Bag - Auge	NG ME Spoor by Tuk Core Sampler Cutt	THOD of Samp Sample e ings	e PL Ple LL PL PI SF	ABBR - Han - Liqu - Plas - Plas T - Star Pen	EVIAT d Pen id Lim tic Lin ticity I dard etratio	tions etrome it nit ndex n Test	eter

Г

CTL\_BORING LOG\_SO\_NE 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

		TES	T BO	RING F	RECO	ORD			-				-	
CLIENT	r 🦸	Indianapolis Airport Authority							BOR	ING NO	).:	DIFN	-21	
PROIE	ст	Deicing Force Main & Equalization - Phas	e II						SHE	ET	1	OF		1
		The New Indianapolis International Airpor	t						DAT	F STAR	TED :	02-2	1-06	
DDO	OTNO	IAA Droject No : T 012 DES/CTI Broject	No : 0605			-	-		DAT	E COM	PLETED	02-2	1-06	
PROJE	CTNU.	TAA Project No.: 1-013, DES/CTE Project	NO 0005	METHOD	LICA			-			LLILD		tio	
BORIN	G ELE	274110N 764.0 Feet	BORING	METHOD	HSA			-						
	EAS	STING : 87242.8	RIG TYP	Έ	CME-5	50 AT	V		DRIL		E	. <u>D</u>	-	
	STA	TION : 80+75	CASING	DIA.	3.25"1	.D.		-	ILEM	IPERAI	URE : 4	0° F		
	DEF	PTH : 20.0 Feet	CORE SI	IZE				_	WEA	ATHER	: S	unny		
GROU	NDWAT	ER: $\underline{\Psi}$ Encountered at <u>19.0'</u> $\underline{\Psi}$ At cor	npletion <u>1</u>	<u>2.5'</u> ¥ D	elayed F	Reading	<u>8.0'</u>		()	Ra C	aved in a	t <u>9.5'</u>		
ratum evation	ample epth	SOIL/MATERIAL DESCRIPTION	N	epth	ample umber	PT per 6"	PT per 12" (N)	ecovery (%)	oisture ontent (%)	otal Unit /eight (pcf)	nconfined ompression (ksf)	A	terbei Limits	rg
ця	ů ů	TOPPOIL (51) (Jinual)		ŭ ŭ	ΰŻ	S	S	R.	ΣU	ř\$	20	LL	PL	PI
763.6_			1	-0.4										
	-X	Dark Brown, Damp, Very Stiff, SANDY LE/ CLAY with Traces of Gravel CL	AN		SS-1	5 9 14	23	100	15					
759.0_	5_	AS Lao 14		5.0	SS-2	8 10 13	23	100	12					
7					SS-3	3 4 5	9	100	10					
<u>b</u>	10	Brown, Moist, Stiff, CLAYEY SAND SC As Lab 13			SS-4	3 4 6	10	100	11					
751.0	15	Gray, Damp, Hard, SANDY LEAN CLAY (1 CL As Lab 2	TILL)	13.0	SS-5	8 18 23	41	100	9					
747.0_	20	Brown, Wet, Very Dense, <b>SAND</b> (Visual)		20.0	SS-6	15 26 31	57	100	7					
	-	Boring backfilled with soil cuttings.												
0.001			BO			e			FTHO		ARRE			3
		CIL Engineering of Indiana, Inc.	HSA - H	Iollow Stem	Auger	SS	- Split	t Spoo	n Sam	ple *	- Har	nd Per	netrom	neter
T.	6-1	6848 Hillsdale Court	SFA - S	olid Flight A	uger	ST	- She	lby Tu	be Sar	nple L	L - Liqu	uid Lin	nit	
15	IL	Indianapolis, Indiana 46250	RC - R	Rock Coring		CR	- Roc	k Core	e Samp	ole P	L - Pla	stic Li	nit Indov	
ENGINE	ERING	Phone: 317-585-8277	WD - W	vuo Drilling Vash Drilling		AC	- вад - Аид	ວamp er Cut	ne tinas	S	PT - Sta	ndard	muex	
	CTL Engineering of Indiana, Inc.       BORING METHOD       SAMPLING METHOD       ABBREVI         6848 Hillsdale Court       HSA - Hollow Stem Auger       SS - Split Spoon Sample       * - Hand P         Indianapolis, Indiana 46250       FA - Solid Flight Auger       ST - Shelby Tube Sample       LL - Liquid L         Phone: 317-585-8277       MD - Mud Drilling       BS - Bag Sample       PI - Plastici         Fax: 317-585-8621       Hand Auger       AC - Auger Cuttings       SPT - Standa	netrati	on Tes	st										

AIRPORT 06050001.GPJ CTL.GDT 3/12/06

		TE	ST BOR	RING	REC	ORD	)							
CLIEN	г	Indianapolis Airport Authority							BOR		D.:	DIFN	1-22	
PROJE	СТ	: Deicing Force Main & Equalization - Pha	ase II				2		SHE	ET	1	0	F	1
LOCAT	ION	: The New Indianapolis International Airpo	ort						DAT	E STAF	RTED	: 02-2	21-06	
PROJE	CT NO.	: IAA Project No.: T-013, DES/CTL Project	ct No.: 060500	001IND					DAT	E COM	PLETED	: 02-2	21-06	
BORIN	G ELE	VATION : 763.8 Feet	BORING N	IETHOD	: HSA				HAN	IMER	: A	utoma	atic	
	NO	RTHING : 14308.1	RIG TYPE		CME-	550 AT	v		DRIL	LER	s E	D		
	EAS	STING : 87095.1 ATION 82+60	CASING D	IA.	: 3.25"	I.D.			TEM	IPERAT	URE : 4	1° F		
	DEF	PTH : 20.0 Feet	CORE SIZ	E	:				WEA	ATHER	: S	Sunny		
GROUN	NDWAT	ER: $\mathbf{Y}$ Encountered at <u>8.0'</u> $\mathbf{Y}$ At co	ompletion 6.0	<u>r</u> ⊻ı	Delayed	Readin	g <u>4.6'</u>			櫰 C	aved in a	t <u>5.0'</u>		
ratum evation	ample epth	SOIL/MATERIAL DESCRIPTIC	ол	pth	umple	oT per 6"	PT per 12" (N)	ecovery (%)	oisture ontent (%)	otal Unit eight (pcf)	nconfined ompression (ksf)	At	iterbei Limits	rg ;
Ϋ́Ξ	őő	TOPSON (4") (Viewel)		50	Šž	S	N	æ	žŭ	₽Š	50	LL	PL	PI
763.5-	X	Brown, Damp, Stiff, LEAN CLAY with SA with Traces of Roots CL As Lab 12	ND	-0.3	SS-1	3 4 5	9	100	13					
758.8	, - - 	Brown, Moist, Very Stiff, CLAYEY SAND SC As Lab 13		5.0	SS-2	6 10 12	22	100	13					
755.8		Brown, Damp, Hard, <b>SANDY LEAN CLAY (TILL)</b> CL As Lab 5		8.0	SS-3	11 15 18	33	100	8					
	10	Brown, Wet, Medium Dense, SAND (Visu	ial)		SS-4	7 8 9	17	100	20					
751.8_	15	Grayish Brown, Wet, Dense, SAND & GRAVEL (Visual)	n n n n n n n n n n n n n n n n n n n	12.0	SS-5	8 23 27	50	100	14					
745.8		Gray, Damp, Hard, <b>SANDY LEAN CLAY (</b> CL As Lab 2	(TILL)	18.0	SS-6	16 19 23	42	100	9					
, +0.0	-	Bottom of Boring at 20.0 feet Boring backfilled with soil cuttings	//	20.0		20								
		CTL Engineering of Indiana Jac	BORIN		IOD	9			THOD		ARRP	EVIAT	IONS	-
	TL	6848 Hillsdale Court Indianapolis, Indiana 46250 Phone: 317-585-8277	HSA - Hold SFA - Solid RC - Rock MD - Mud WD - Was	ow Stem d Flight A k Coring Drilling	Auger Auger	SS ST CR BS AC	- Split - Shel - Rock - Bag - Auge	Spoor by Tub Core Sampl or Cutt	Samp Sample e ings	ole * nple LL le PL PI SF	- Hand - Liqu - Plas - Plas PT - Stan	d Pen id Lim itic Lin iticity I	etromo it nit ndex	eter

AIRPORT 06050001.GPJ CTL GDT 3/12/06











di-ove	Donth (ft)	nepui (Iu)	8.5	28.1	34.8	37.0	43.6	25.5	8.1	14.9	39.9	30.5	37.4	14.0	37.8	12.5	43.0	36.7	15.9	59.0	37.6	39.6	16.2	59.0	44.6	39.0	42.2				
	l/4/2018	Elevation																										750.9	749.0	753.9	749.5
	Reading 1	Depth (ft)																										4.1	4.0	7.2	1.5
	2/22/2017	Elevation																										750.9	748.9	753.9	749.7
dwater	Reading 1.	Depth (ft)																										4.1	4.1	7.1	1.4
Ground	pletion	Elevation	748.2	748.2		720.3	734.2	751.3	749.6		726.0	750.0	726.6	744.6	751.0	749.2	726.8	726.6	752.5	756.9	736.9	736.9	748.8	744.0	743.2	737.8	740.8				
	At Com	Depth (ft)	7.8	4.8	Dry	34.7	22.8	2.7	2.4	Dry	34.0	4.0	26.4	9.4	7.0	5.8	27.2	27.4	12.5	8.1	28.1	26.1	13.2	19.0	5.8	21.2	21.2				
	Drilling	Elevation	749.0		-	726.0	744.5	748.0	744.5	729.0	737.0	748.5	738.0	741.0	750.8	748.0	749.5	749.0	751.5	751.5		736.0	743.5	745.5	743.0	743.0	744.0	732.5	735.0	745.0	734.0
	During	Depth (ft)	7.0	Dry	Dry	29.0	12.5	0.9	7.5	24.0	23.0	5.5	15.0	13.0	7.2	7.0	4.5	5.0	13.5	13.5	Dry	27.0	18.5	17.5	6.0	16.0	18.0	22.5	18.0	16.0	17.0
Surface		Elevation	756	753	752	755	757	754	752	753	760	754	753	754	758	755	754	754	765	765	765	763	762	763	749	759	762	755	753	761	751
	<b>Boring Location</b>		B- 1	B- 2/B-2A	B- 3	B- 4	B-5	B- 6	B- 7	B-8	B- 9	B-10	B-11	B-12	B-13	B-14	B-15	B-16	B-17	B-17A	B-18/B-18A	B-19	B-20	B-24	B-25/B-25A	B-26/B-26A/B-26B	B-27	W-1	W-2	W-4	W-5

Summary of Groundwater Depths

APPENDIX C

LABORATORY TESTING



Lub         Description         Membrane         <			-			1			1	1	-	-		_	1		1	-	-			1	1	-	_	_		
Unity         Description         Description <th< td=""><th></th><td>100%</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>		100%																										
Lub         Derivation         Derivation <th>:BR (%</th> <td>95%</td> <td></td>	:BR (%	95%																										
Lab         Dention         Monthing         Easing         Results         Solid         Monthing         Monthin	0	%06																										
Lab         Dentity         Series         Series <th>Optimum Moisture</th> <td>Content (%)</td> <td></td> <td>SULTS</td> <td></td> <td></td> <td></td>	Optimum Moisture	Content (%)																							SULTS			
Lab         Depth         Cassification         ASM         Grand         State Destination         WC         L         L         L         L         L         L         L         L         L         Cassification         Sam         Sam         Sam         Sam         V         L         L         L         L         L         L         L         L         L         L         L         L         D <thd< th="">         D         D         <thd< th=""></thd<></thd<>	Max. Dry	(pcf)																							EST RE			
Lab         Denth         Sample         Denth         Classification         ATM         Calination         ATM         Classification         Calination         Control         Contro         Control         Control		<u> </u>	5	AN 0	AN 0	~	9	6 ~	4	30	~	AN 0	AN 0	3 29	2	8	ی ۳	AN 0	AN 0	21	AN NP	F 21	1 12	2	E			
Lab         Boring No.         Nonthing         Easting Easting         Sample No.         Depth         Classification Council To the Easting         Classification No.         Motion From Easting         Motion No.         Motion No.         Motion No.         Motion No.         Motion No.         Motion No.         Motion Second         Motion Easting         Motion No.         Motion Easting         Motion Second         Motion Easting         Motion Second         Motion Second         Motion Second			20 15	IN N	IZ Z	22 15	19	22 13	16 12	49 19	20 13	I Z Z	ЦР ЦР	47 18	17 12	28 2(	19 13	Т Ц Д	IZ Z	37 16	IZ Z	35 14	26 14	17 12	Į	s		
Lab         Northing         Sample         Depth         Cassification         ASTM         Grain Size Distribution           Lab         B-1         1624318         158756         SS-2         3.5-5         SILTY. CLAYEY SAND         SC-SM         3.3-5         451         211           Lab         B-1         1624318         158756         SS-2         3.5-5         SILTY. CLAYEY SAND         SC-SM         3.3-5         451         213           Lab         B-1         1624318         158756         SS-2         3.5-5         SILTY. CLAYEY SAND         SC-SM         13.5         469         23.2         23.2         23.3         24.3         13.5         46.9         23.2         23.3         24.3         14.4         10.7         26.7         23.3         24.3 <th></th> <td>- ) }</td> <td>19</td> <td>22</td> <td>18</td> <td>42</td> <td>12</td> <td>9</td> <td>0</td> <td>31 ,</td> <td>13</td> <td>2</td> <td>17</td> <td>24</td> <td>4</td> <td>10</td> <td>റ</td> <td>12</td> <td>22</td> <td>23</td> <td>1 1 1</td> <td>42</td> <td>13</td> <td>10</td> <td>S</td> <td>oject</td> <td></td> <td></td>		- ) }	19	22	18	42	12	9	0	31 ,	13	2	17	24	4	10	റ	12	22	23	1 1 1	42	13	10	S	oject		
Lab         Ronno         Sample         Depth         Cassification         Ram         Grain SizeDistribution           Lab         B-1         1624318         188756         SS-2         3.5.5.0         SILTY: CLAYEY SAND         SC-SM         13.5         44.9         20.1           Lab         B-1         1624318         188756         SS-2         3.5.5.0         SILTY: CLAYEY SAND         SC-SM         13.5         45.9         56.0           Lab         B-1         1624318         188756         SS-2         3.5.5.0         SILTY: CLAYEY SAND         CL-ML         0.0         32.4         45.7           Lab         B-1         162431         186766         SS-2         3.5.5.0         SILTY: CLAYEY SAND         CL-ML         0.0         32.3         26.7           Lab         B-1         162431         169695         SS-3         8.5-10         SILTY: CLAYEY SAND         CL-ML         0.7         2.2         2.23         33.5           Lab         B-1         162430         19913         SS-3         8.5-10         SILTY: CLAYEY SAND         CL-ML         0.7         2.2         2.23         33.5           Lab         B-1         162430         SS-1         10.55 <th>tion</th> <td>Clay</td> <td>19.6</td> <td>12.1</td> <td>4.9</td> <td>22.4</td> <td>13.6</td> <td>24.3</td> <td>19.9</td> <td>39.6</td> <td>15.1</td> <td><del>.</del></td> <td>3.7</td> <td>36.6</td> <td>17.0</td> <td>22.2</td> <td>20.3</td> <td>۲. ۲.</td> <td>12.7</td> <td>29.3</td> <td>12.2</td> <td>26.6</td> <td>18.3</td> <td>10.5</td> <td>SIFI(</td> <td>ity Pr</td> <td></td> <td></td>	tion	Clay	19.6	12.1	4.9	22.4	13.6	24.3	19.9	39.6	15.1	<del>.</del>	3.7	36.6	17.0	22.2	20.3	۲. ۲.	12.7	29.3	12.2	26.6	18.3	10.5	SIFI(	ity Pr		
Lab         Boring         Northing         Easting         Sample         Grant Start S	stribu	Silt	20.1	54.5	56.0	49.3	32.9	26.3	22.8	31.5	33.5	10	15.7	47.0	24.6	47.0	29.2	8.9	29.1	36.0	35.9	30.0	32.0	31.3	ASS	apac		
Lab         Boring         Nonthing         Easting         No.         Solid         ASTM	Size Di (%)	Sand	46.9	33.4	39.2	28.0	40.7	46.1	46.6	28.9	42.3	68.9	74.9	15.7	51.1	25.7	46.1	74.4	56.7	32.6	48.1	41.9	36.2	47.1		cing C		
Lab         Boring         Nonthing         Easting         Sample         Depth         Classification         ASTM           Lab         1         1624318         158756         SS-2         3.5.5.0         SILTY. CLAYEY SAND         SC-SM           Lab         1         1624318         158756         SS-3         6.07.5         SANDY SILT         ML           Lab         1         1624318         158756         SS-3         6.07.5         SILTY. CLAYEY SAND         SC-SM           Lab         2         B-1         1624318         158756         SS-3         8.5-10.0         SILTY. CLAYEY SAND         SC-SM           Lab         5         B-4         1624311         159695         SS-4         8.5-10.0         SILTY. CLAYEY SAND         SC-SM           Lab         1         B-7         1624311         159695         SS-4         8.5-10.0         SILTY. CLAYEY SAND         SC-SM           Lab         1         B-11         1624311         159695         SS-4         8.5-10.0         SILTY. CLAYEY SAND         SC-SM           Lab         1         B-11         B-12         1624393         159116         SS-3         3.5-10.0         SNDY LEAN CLAY         CL	Grain	Gravel	13.5	0.0	0.0	0.4	12.8	3.3	10.7	0.0	9.2	21.0	5.8	0.7	7.3	5.2	4.4	15.5	1.6	2.1	3.8	1.5	13.6	11.1	N OF	nd Deid	Z	QNI
Lab         Boring         Northing         Easting         Sample         Depth         Classification           Lab         1         11224318         158756         SS-3         6.0-7.5         SANDY SILT           Lab         1         1624318         158756         SS-3         6.0-7.5         SANDY SILT           Lab         2         8-1         1624318         158756         SS-3         6.0-7.5         SANDY SILT           Lab         3         8-1         1624318         158756         SS-3         6.0-7.5         SANDY SILT           Lab         5         B-4         1624311         159695         SS-3         6.0-7.5         SILTY, CLAYEY SAND           Lab         B-1         1624311         159695         SS-4         8.5-10.0         SILTY, CLAYEY SAND           Lab         B-7         1624619         159695         SS-4         8.5-10.0         SILTY, CLAYEY SAND           Lab         B-1         1624619         159695         SS-4         8.5-10.0         SILTY, CLAYEY SAND           Lab         B-17         1624619         1598165         SS-4         8.5-10.0         SILTY, CLAYEY SAND           Lab         B-14         162160         <	ASTM	Group	SC-SM	ML	ML	CL-ML	SC-SM	ರ	SC-SM	Ъ	SC-SM	SP-SM	SM	Ъ	SC-SM	ы	SC-SM	SP-SM	SM	ರ	SM	J	ъ	SC-SM	MMAR	nwater ai	anapolis	7050081
Lab         Boring         Northing         Easting         Sample         Depth           Lab 1         B-1         1624318         158756         SS-2         3.5-5.0           Lab 1         B-1         1624318         158756         SS-3         6.0-7.5           Lab 2         B-1         1624318         158756         SS-3         6.0-7.5           Lab 2         B-1         1624318         158756         SS-3         6.0-7.5           Lab 3         B-1         1624318         158756         SS-3         6.0-7.5           Lab 4         B-1         1624318         158756         SS-3         6.0-7.5           Lab 5         B-4         1624311         158955         SS-4         8.5-10.0           Lab 1         B-14         1624339         159185         SS-4         8.5-10.0           Lab 1         B-14         1625397         159186         SS-3         6.0-7.5           Lab 11         B-16         1624839         159868         SS-4         8.5-10.0           Lab 12         B-14         1625397         159116         SS-3         6.0-7.5           Lab 12         B-14         1625397         1591868         SS-4 <th>Soil</th> <td>Classification</td> <td>SILTY, CLAYEY SAND</td> <td>SANDY SILT</td> <td>SANDY SILT</td> <td>SILTY CLAY with SAND</td> <td>SILTY, CLAYEY SAND</td> <td>SANDY LEAN CLAY</td> <td>SILTY, CLAYEY SAND</td> <td>LEAN CLAY with SAND</td> <td>SILTY, CLAYEY SAND</td> <td>POORLY GRADED SAND with SILT and GRAVEL</td> <td>SILTY SAND</td> <td>LEAN CLAY with SAND</td> <td>SILTY, CLAYEY SAND</td> <td>SANDY LEAN CLAY</td> <td>SILTY, CLAYEY SAND</td> <td>POORLY GRADED SAND with SILT and GRAVEL</td> <td>SILTY SAND</td> <td>SANDY LEAN CLAY</td> <td>SILTY SAND</td> <td>SANDY LEAN CLAY</td> <td>SANDY LEAN CLAY</td> <td>SILTY, CLAYEY SAND</td> <td>S</td> <td>Project: Storr</td> <td>Location: Indi</td> <td>Project No.: 1</td>	Soil	Classification	SILTY, CLAYEY SAND	SANDY SILT	SANDY SILT	SILTY CLAY with SAND	SILTY, CLAYEY SAND	SANDY LEAN CLAY	SILTY, CLAYEY SAND	LEAN CLAY with SAND	SILTY, CLAYEY SAND	POORLY GRADED SAND with SILT and GRAVEL	SILTY SAND	LEAN CLAY with SAND	SILTY, CLAYEY SAND	SANDY LEAN CLAY	SILTY, CLAYEY SAND	POORLY GRADED SAND with SILT and GRAVEL	SILTY SAND	SANDY LEAN CLAY	SILTY SAND	SANDY LEAN CLAY	SANDY LEAN CLAY	SILTY, CLAYEY SAND	S	Project: Storr	Location: Indi	Project No.: 1
Lab         Boring         Northing         Easting         Sample           No.         No.         No.         No.         No.           Lab 1         B-11         1624318         158756         SS-2           Lab 2         B-11         1624318         158756         SS-3           Lab 2         B-11         1624318         158756         SS-3           Lab 3         B-1         1624318         158756         SS-3           Lab 4         B-1         1624318         158756         SS-3           Lab 5         B-3         1624311         159695         SS-4           Lab 6         B-3         1624319         159695         SS-4           Lab 1         B-14         1624319         159695         SS-4           Lab 1         B-14         1624620         159193         SS-1           Lab 1         B-14         1624620         159193         SS-1           Lab 1         B-14         1624619         158193         SS-1           Lab 1         B-14         1625397         159116         SS-4           Lab 13         B-14         16256397         159116         SS-4           Lab 13<	d tro U	הפאוו	3.5-5.0	6.0-7.5	8.5-10.0	23.5-25.0	3.5-5.0	8.5-10.0	8.5-10.0	1.0-2.5	6.0-7.5	8.5-10.0	8.5-10.0	3.5-5.0	8.5-10.0	1.0-2.5	6.0-7.5	8.5-10.0	6.0-7.5	8.5-10.0	26.0-27.5	3.5-5.0	13.5-15.0	18.5-20.0				
Lab       Boring       Northing       Easting         No.       No.       No.       Easting         Lab       B-1       1624318       158756         Lab       B-1       1624318       158756         Lab       B-1       1624318       158756         Lab       B-1       1624318       158756         Lab       B-1       1624311       158756         Lab       B-1       1624311       158756         Lab       B-1       1624311       159695         Lab       B-4       1624311       159695         Lab       B-4       1624311       159695         Lab       B-1       1624620       159193         Lab       B-1       1624620       159193         Lab       B-14       1624620       159193         Lab       B-14       1625397       159193         Lab       B-14       16256397       159193         Lab       B-13       1626605       158273         Lab       B-14       16256397       159193         Lab       B-13       1626605       158360         Lab       B-14       16256397       1583	Sample	No.	SS-2	SS-3	SS-4	SS-7	SS-2	SS-4	SS-4	SS-1	SS-3	SS-4	SS-4	SS-2	SS-4	SS-1	SS-3	SS-4	SS-3	SS-4	SS-11	SS-2	SS-5	SS-6			c	;0
Lab No No. No. No. No. No. No. No. No. No	Eaeting	Газші	158756	158756	158756	158756	159695	159385	159695	159193	159193	159668	158882	159116	159116	158273	158273	158517	157899	158360	158360	158655	158217	159073			<i>ERING≦</i> ineering Inc	317-295-865
Lab       Boring         Lab       B-1         Lab       B-4         Lab       B-4         Lab       B-1         Lab       B-14         Lab       B-25         Lab       B-24         Lab       B-24         Lab       B-24         Lab       B-25         Lab       B-27         Lab       B-27         Lab       B-27         Lab       B-27         Lab       B-27         Lab       B-28	Northind		1624318	1624318	1624318	1624318	1624311	1624312	1624311	1624620	1624620	1624939	1624619	1625397	1625397	1626005	1626005	1625654	1626666	1626707	1626707	1626845	1627017	1624315			CTI FDO	
Lab No. Lab 1 Lab 2 Lab 3 Lab 4 Lab 5 Lab 5 Lab 10 Lab 13 Lab 13 Lab 13 Lab 14 Lab 15 Lab 15 Lab 15 Lab 15 Lab 15 Lab 24 Lab 24 Lab 27 Lab 23 Lab 26 Lab 27 Lab 23 Lab 26 Lab 23	ing	No.	B- 1	B- 1	В- 1	B- 1	B-4	B- 3	B-4	B- 7	B- 7	B-12	B- 6	B-14	B-14	B-17	B-17	B-19	B-25	B-24	B-24	W-5	B-27	B- 2				
	Bol							6		œ	6	0	5	2	33	4	15	16	17	53	4	50	21	8				

CLASSIFICATION SUMMARY (NE) 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

Lab	Boring		n oction oc	Sample	4+00 1	Soil	ASTM	Grain (	Size Di (%)	stribution			Maj	x. Dry	Optimum Moisture		CBR (%	(9
No.	No.		Гаэши	No.	nepul	Classification	Group	Gravel	Sand	Silt Clay				pcf)	Content (%)	%06	95%	100%
Lab 29	B-4	1624311	159695	SS-8	28.5-30.0	SILTY SAND	SM	2.1	73.5	19.5 5.0	13 N	P NP	ЧN					
Lab 29A	B-5	1624624	158565	SS-2	3.5-5.0	CLAYEY SAND	sc	5.9	45.6	28.8 19.8	3 18 3	9 21	18					
Lab 30	B-5	1624624	158565	SS-3	6.0-7.5	SILTY, CLAYEY SAND	SC-SM	8.5	47.7	33.9 9.9	14	7 13	4					
Lab 30A	B-5	1624624	158565	SS-8	28.5-30.0	SANDY LEAN CLAY	С	3.6	34.5	43.1 18.8	3 12 2	8 13	15					
Lab 31	B-6	1624619	158882	SS-2	3.5-5.0	SANDY LEAN CLAY	СГ	0.9	39.6	32.5 26.9	9 19 3	4 15	19					
Lab 32	B-6	1624619	158882	SS-6	18.5-20.0	SANDY LEAN CLAY	CL	5.4	34.2	38.4 22.0	0 10 2	4 13	11					
Lab 33	B- 7	1624620	159193	SS-2	3.5-5.0	SILTY, CLAYEY SAND	SC-SM	6.1	48.1	30.2 15.5	5 13 2	0 14	9					
Lab 34	B- 7	1624620	159193	SS-5	13.5-15.0	SILTY, CLAYEY SAND	SC-SM	8.3	47.2	34.4 10.7	6	7 12	5					
Lab 35	B-8	1624620	159510	SS-1	1.0-2.5	FAT CLAY with SAND	СН	3.2	17.0	47.5 32.4	t 20 5	1 17	34					
Lab 36	B- 8	1624620	159510	SS-5	13.5-15.0	SILTY, CLAYEY SAND	SC-SM	3.4	57.0	31.0 8.7	12 1	6 12	4					
Lab 37	B-9	1624945	158715	SS-2	3.5-5.0	SILTY, CLAYEY SAND	SC-SM	5.6	53.0	31.5 9.9	10	9 14	5					
Lab 38	B-9	1624945	158715	SS-4	8.5-10.0	SILTY, CLAYEY SAND	SC-SM	3.7	51.1	36.6 8.6		7 13	4					
Lab 39	B-10	1624939	159043	SS-1	1.0-2.5	FAT CLAY	СН	0.0	8.8	53.6 37.6	3 25 5	1 18	33					
Lab 40	B-10	1624939	159043	SS-4	8.5-10.0	SILTY, CLAYEY SAND	SC-SM	6.7	51.4	32.2 9.8	10	7 12	5					
Lab 41	B-10	1624939	159043	SS-5	13.5-15.0	SANDY SILT	ML	2.1	36.9	48.8 12.2	22 N	P NP	ЧN					
Lab 42	B-10	1624939	159043	SS-6	18.5-20.0	SILTY, CLAYEY SAND	SC-SM	4.6	47.7	35.7 12.7	6	6 12	4					
Lab 43	B-11	1624939	159354	SS-1	1.0-2.5	SANDY LEAN CLAY	СГ	7.9	29.1	36.3 26.7	7 17 4	4 16	28					
Lab 44	B-11	1624939	159354	SS-2	3.5-5.0	SILTY, CLAYEY SAND	SC-SM	3.5	46.9	38.4 11.2	101	7 13	4					
Lab 45	B-11	1624939	159354	SS-6	18.5-20.0	SILTY, CLAYEY SAND	SC-SM	4.2	50.5	35.7 9.6	6	7 12	5					
Lab 46	B-12	1624939	159668	SS-6	18.5-20.0	SANDY SILT	ML	3.4	41.2	52.6 2.8	19 N	P NP	dN					
Lab 47	W-1	1624456	158845	SS-2	3.5-5.0	SANDY SILT	ML	11.1	26.8	52.8 9.2	12	6 13	с м					
Lab 48	W-1	1624456	158845	SS-4	8.5-10.0	SILTY SAND	SM	8.9	53.9	30.2 6.9	111	6 13	3					
						S	MMAF	N OF		ASSIF	ICAT	NO	TES	T RE	SULTS			
						Project: Stor	mwater a	nd Deir	cina C	anacity F	roiects							
		ENGINE	=FRING ≦						הות הות	apadity -		_						
		CTL Eng	ineering, Ir	.0		Location: Ind	ianapolis	Z,										
		Phone:	317-295-86	350		Project No.:	1705008	DN										

CLASSIFICATION SUMMARY (NE) 17050081IND\_HANNA.GPJ CTL.GDT 1/26/18

CBR (%)	100%																
	95%																
	%06																
Optimum Moisture	Content (%)													<b>ESULTS</b>			
Max. Dry Density (pcf)														EST RE			
		4	4	0 10	4 20	3 13	7 14	2 25	5	5 14	5 18	3 17	6 28				
-	∟ -!	1	9	2	4	50		37 1:	33	10	33 1	20 7	2	<u></u>	S		
	ן כ כ	8	, б	13	15	13	8	1	42	13	10	13	18	No.	oject		
ч	lay v	0.6	<u>8</u> .6	7.5	1.6	0.2	3.9	2.5	5.6	2.1	6.2	6.5	5.9	E	y Pro		
ain Size Distributi (%)	silt O	8.1	6.6	1.4	5.7 2	3.9 2	9.7 2	0.1 3	3.5 1	7.6 2	9.12	6.7 2	1.4 5	SS	oacit		
	, pu	0.2 2	3.3	5.0 4	5.9 3	+.+ 4	1.6 5	7.2 5	9.8 5	5.2 4	3.5 4	5.1 3	2.6 3	CLA	g Cal		
	vel Sa	1 50	5 48	36	8	37	47	2	53	2	53	36	1	Р Г О	Jeicin		0
Ű	Gra	11	1 16		16			0	<del>~</del>	4	<u>~</u>	~	ō	RY	and [	lis, IN	81 <b>I</b> NE
ASTN	Group	SC-SN	SC-SN	5	Ы	Ъ	5	Ы	Ъ	5	ы	Ъ	ъ	MMM	mwater	lianapo	170500
Soil Classification		SILTY, CLAYEY SAND	SILTY, CLAYEY SAND with GRAVEL	SANDY LEAN CLAY	SANDY LEAN CLAY with GRAVEL	SANDY LEAN CLAY	LEAN CLAY with SAND	LEAN CLAY with SAND	SANDY LEAN CLAY	SANDY LEAN CLAY	LEAN CLAY with SAND	SANDY LEAN CLAY	FAT CLAY	S	Project: Stor	Location: Ind	Project No.:
Depth		6.0-7.5	18.5-20.0	18.5-20.0	33.5-35.0	43.5-45.0	48.5-50.0	53.5-55.0	36.0-37.5	43.5-45.0	51.0-52.5	56.0-57.5	66.0-67.5				
Sample	No.	SS-3	SS-6	SS-6	SS-9	SS-3	SS-5	SS-7	SS-15	SS-18	SS-21	SS-23	SS-27			5	
n oction oc	Гаэши	159449	159449	158273	158273	158273	158273	158273	158360	158360	158360	158360	158360			eeewes ineering Ir	317-295-86
Northing		1624762	1624762	1626005	1626005	1626002	1626002	1626002	1626707	1626707	1626707	1626707	1626707		2	CTI Fno	Phone:
3oring No.		W-2	W-2	B-17	B-17	B-17A	B-17A	B-17A	B-24	B-24	B-24	B-24	B-24				
Lab	No.	Lab 49	Lab 50	Lab 51	Lab 52	Lab 53	Lab 54	Lab 55	Lab 60	Lab 61	Lab 62	Lab 63	Lab 64				

Sheet 3 of 3

CLASSIFICATION SUMMARY (NE) 170500811ND\_HANNA.GPJ CTL.GDT 1/26/18

(%)	100%														
CBR ( <sup>5</sup>	95%														
	%06														
Optimum Moisture	Content (%)											ESULTS			
Max. Dry	(pcf)											EST RE			
Ē		40	ی ب	ი თ	dZ 0	d Z o	4	3 10	7	24	~	E	/est		
	ב ר	0 20	0 14	5	Ъ Ц	Ц Ц	7 13	3 13	33	1	0 13	Ó	> 		
	ב כ	9	2	1 2 2	Z	Z		і П Л	N N	4	10 0	A	ects		
2	∑	2	4	<u> </u>	~	7	4	6.	.5	3	ю.		Pro		
butio	t Ci	7 48	2 22	2 28	4	6 7.	14	3 24	3 23	7 32	4 20	<b>S</b>	acity		
) )	Sil	46.	31.	30.		23.	33.	31.	32.	40.	31.	A	Cape		
Size [ (%	Sand	5.1	39.7	37.7	80.3	62.0	47.9	39.9	34.9	27.0	44.9	F C	icing (		
Grain	Gravel	0.0	6.8	3.9	13.0	7.2	4.7	3.9	9.2	0.0	3.4	N N	nd Dei	Z	,
ASTM	Group	Ю	CL-ML	ы	SP-SM	SM	SC-SM	С	С	ы	CL-ML	MMAR	nwater al	ananolis	מוימריייי
Soil	Classification	FAT CLAY	SANDY SILTY CLAY	SANDY LEAN CLAY	POORLY GRADED SAND with SILT	SILTY SAND	SILTY, CLAYEY SAND	SANDY LEAN CLAY	SANDY LEAN CLAY	LEAN CLAY with SAND	SANDY SILTY CLAY	NS SU	Project: Storr	l ocation: Indi	
4+000	nehili	1.0-2.5	18.5-20.0	18.5-20.0	28.5-30.0	6.0-7.5	3.5-5.0	2.0-6.0	6.1-10.1	1.1-4.1	6.1-10.1				
Sample	No.	SS-1	SS-6	SS-6	SS-8	SS-3	SS-2	BS-1	BS-2	BS-1	BS-1				
too T	Еахши	147437	149082	148213	148213	148582	148388	148213	148213	148582	148369			ERING 🕰	ineering, In
Morthiod		1620536	1619991	1620553	1620553	1620593	1620540	1620553	1620553	1620593	1620580			ENGINE	CTL Eng
Boring	No.	B-30	B-35	B-32	B-32	B-34	B-33	B-32	B-32	B-34	M-6				
Lab	No.	Lab 18	Lab 19	Lab 20	Lab 21	Lab 22	Lab 25	Lab 56	Lab 57	Lab 58	Lab 59				

Sheet 1 of 1

CLASSIFICATION SUMMARY (NE) 170500811ND\_WEST1.GPJ CTL.GDT 1/26/18

Project No.: 17050081IND














































































































































































## One Dimensional Consolidation and Swell Properties of Soil - ASTM D 2435 CTL ENGINEERING, INC.

2860 Fisher Road

Columbus, OH 43204

Project No.: Project: Client: Boring No.: Sample No.: Soil Description:	170500811ND IAA Deicing Indianapolis Airp B-5 ST-2, 4'-6' Brown, Sandy Let	ort Authority an Clay (CL)				Sample Type: Test Date: Checked By: Tested By: LL:	Shelby Tube 12/23-12/27/17 SM MW NA
Specific Gravity:	2.695					PL:	NA
	Step No.	Applied Stress (tsf)	Final Displacement (in)	Void Ratio	Strain at End (%)	Sqrt T <sub>90</sub> (min)	Cv (ft <sup>2</sup> /sec)
	1 2 3 4 5 6 7 8 9 10 11	0.125 0.25 0.5 1 2 4 8 16 4 1 0.25	0.003941 0.0102 0.02202 0.03987 0.06374 0.09148 0.1229 0.1546 0.1467 0.1313 0.1137	0.641 0.63 0.611 0.581 0.542 0.496 0.444 0.392 0.405 0.431 0.46	0.39 1.02 2.2 3.99 6.38 9.16 12.3 15.48 14.68 13.14 11.38	38.7 38.2 28.9 27.9	5.68E-07 5.45E-07 6.74E-07 6.51E-07
	Preconsolida Comp Recomp	tion Pressure (tsf): ression Index (C <sub>c</sub> ): ression Index (C <sub>r</sub> ):	CONSOLIDATI 0.76 0.17 0.048	ON PARAME	TERS Ca Rec	Initial Void Ratio ompression Ratio ompression Ratio	: 0.64 : 0.11 : 0.029





Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
	T I I D IVU			
Boring No.: B-5	lested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND		
Boring No.: B-5	Tested By: MW	Checked By: SM		
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'		
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA		
Description: BROWN, SANDY LEAN CLAY (CL)				
Remarks:				



Project: IAA DEICING	Location: NA	Project No.: 17050081IND
Boring No.: B-5	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA
Description: BROWN, SANDY LEAN CLAY (	CL)	
Remarks:		

CONSOLIDATION TEST DATA SUMMARY REPORT



					Before Test	After Test
Overburder	Pressure, tsf:			Water Content, %	23.96	18.28
Preconsolic	dation Pressure,	tsf:		Dry Unit Weight, pcf	102.15	113.1
Compressio	on Index:	and the second second second		Saturation, %	99,81	101,05
Diameter: :	2.5 in	Height: 0.9	99 in	Void Ratio	0.65	0.49
LL;	PL:	PI:	GS: 2.69	Bock Pressure, tsf	0	0

Project: IAA DEICING	Location: NA	Project No.: 17050081IND	
Boring No.: B-5	Tested By: MW	Crecked By: SM	3
Sample No.: ST-2	Test Date: 12/23/17	Depth: 4'-6'	- 1
Test No.: 1	Sample Type: Shelby Tube	Elevation: NA	
Description: BROWN, SANDY L	EAN CLAY (CL)		-11
Remarks:			

CTL ENGINEERING, INC. 2860 Fisher Road Columbus, Ohio 43204	Client: Indianapolis Airport Authority PID NO. NA Project: IAA Deicing Location: NA	Project No. 170500811ND	County, Rt. & Sec.: NA Station & Offset: NA	Sample ID: B-5, ST-1, 2'-4'	Lab Code No. 17050795COL	Reviewed by: SM						POST SHEAR	1440 psf	A THE AVERAGE AND A THE AVERAGE	Contraction of the second seco					POST SHEAR 2880 psf		a the second sec				POST SHEAR	4370 nsf		a constant and a constant	
D TRIAXIAL TEST ON COHESIVE SOILS O T 297 & ASTM D4767		/pe Shelby Tube 12/28/2017 12/28/2017	ed: 1/4/2018 1/4/2018 1/4/2018 0.0.1 5 7733 5 8007 5 8173	(1, 2.8250 2.8500 2.8250	tio: 2.04 2.04 2.06	ef): 120.3 128.0 118.6	rio: 0.790 0.564 0.746	cd): 2.7 2.7 2.7 2.7	(b): 27.9 18.9 22.9	2): 0.044 0.044 0.044	3): 0.02 0.02 0.02	sf): 1440 2880 4320	in): 0.2079 0.2069 0.2065	sf): 2986 2388 4010	sf): 1440 2880 4320	sf): 4426 5268 8330	%): Deviator Stress @ 15% Axial Strain	β: 0.98 0.99 0.99	on: Wet Method			gg: 1	idi: 28	ilt: 35	ay: 36	õ	46		11: 22	on: Brown, Lean Clay with Sand (CL)
CONSOLIDATED UNDRAINEI AASHTC		Sample Tyj Date Set-u	Date Sheare	Avg. Sample Diameter (in	Height-to-diameter rati	Wet Density (pc)	Void Rati	Specific Gravity (assumed	Moisture Content (%)	Cross Sectional Area (ft^2	Volume (ft^3	Confining Pressure (pst	Rate of Axial Strain (%/min	Compressive Strength (psf	Minor Principal Stress at Failure (psf	Major Principal Stress at Failure (psf	Failure Criterian (%	đ	Specimen Saturatio		Grading (ASTM D422)	% Ag	% Sanc	% Si	% Cla	Attarhard I imits (ASTM D 431)		Id		Visual Descriptio













CTL ENGINEERING, INC.	2860 Fisher Road Columbus, Ohio 43204	Client: Indianapolis Airport Authority PID NO. NA Project: IAA Deicing Location: NA		Project No. 17050081IND	County, Rt. & Sec.: NA	Station & Offset: NA	Sample ID: B-8, ST-1, 13'-15'	Lab Code No. 17050795COL	Reviewed by: SM							POST SHEAR	1440 psf	Contraction of the Association o			and the second se			POST SHEAR 3600 psf	and the second se	and the second se										
ST ON COHESIVE SOILS	M D4767		Shelby Tube	2017 12/28/2017	018 1/5/2018	5.7067	500 2.8500	01 2.00	7.5 147.7	1.6 134.2	52 0.255	7 2.7	6 10.1	44 0.044	0.02	40 3600	0.2103	53 8834	40 3600	03 12434	Drop in Pore Pressure	1.00	Wet Method			10	49	25	16		16	11	5	h	silty, Clayey Sand (SC-SM)	
CONSOLIDATED UNDRAINED TRIAXIAL TE	AASHTO T 297 & AST		Sample Type	Date Set-up: 12/28/	Date Sheared: 1/5/20	Avg. Sample Height (in.): 5.72	Avg. Sample Diameter (in.): 2.85	Height-to-diameter ratio: 2.0	Wet Density (pcf): 147	Dry Density (pcf): 134.	Void Ratio: 0.25	Specific Gravity (assumed): 2.7	Moisture Content (%): $9.6$	Cross Sectional Area $(\hat{\mathbf{f}}^{\wedge}2)$ : 0.04	Volume ( $ft^{\vee}3$ ): 0.0	Confining Pressure (psf): 144	Rate of Axial Strain (%/min): 0.20	Compressive Strength (psf): 566	Minor Principal Stress at Failure (psf): 144	Major Principal Stress at Failure (psf): 710	Failure Criterian (%): D	β: 0.9	Specimen Saturation:		Grading (ASTM D422)	% Agg:	% Sand.:	% Silt:	% Clay:	Atterberg Limits (ASTM D 4318)		· 1 d	- T-d		Visual Description: Brown, S	













AN EMPLOYEE OWNED COMPANY

Consulting Engineers – Testing – Inspection Services – Analytical Laboratories

Client: Indianapolis Airport Auth	nority			Date Tested: 1/4/2018
Project: IAA Deicing				Project #: 17050081IND
Sample: B-2, ST-1, 3'-5'				Technician(s): MW
-				Reviewed by: SM
Confining Pressure, Cp =	34	psi	or	2392 cm water
Head Pressure (air), Hp =	32	psi	or	2251 cm water
Back Pressure (air), Bp =	30	psi	or	2110 cm water
Pipette Area, a =	0.869	cm^2	2	(0.869(pipette), 3.476(annulus) or 4.345(both))
Pipette Length, Lp =	28.77	cm		
Pipette Volume, Vp =	25	cm^3	3	Vo = Pipette reading out
Sample Length, L =	7.630	cm		Vi = Pipette reading in
Sample Area, A =	41.157	cm^2	2	t = Time in seconds
Temperature, T =	21	deg.0	С	

Hydraulic Conductivity - Method C - ASTM D 5084

$$\begin{array}{c} K = (aL/2At) * & \frac{\ln[(Hp - Bp + ((Vo - Vi) * Lp / Vp)))}{(Hp - Bp + ((Vo - Vi) * Lp / Vp))]} & (t = 1) \\ (t = 2) \end{array}$$

					Permeatior	1			
Date	Time	t (sec)	Vi*	dVi	Vo*	dVo	dVo/dVi	K	Notes
01/04/18	08:00	0	6.1		20.9				INITIAL
	08:50	3000	6.7	0.6	20.3	0.6	1.00	2.4E-07	
	09:50	3600	7.4	0.7	19.6	0.7	1.00	2.3E-07	
	11:05	4500	8.2	0.8	18.8	0.8	1.00	2.1E-07	
	12:35	5400	9.2	1.0	17.7	1.1	1.10	2.4E-07	FINAL

\* Inner Pipette

Specimen Information:

Type of Permeant: Distilled Water

Average of four consecutive readings:	2.3E-07	cm/sec
Corrected permeability $(K_{20})$ :	2.2E-07	cm/sec

Weight (lbs):	1.4	Initial Moisture Content (%):	21.5
Height (in):	3.004	Initial Dry Unit Weight (pcf):	103.9
Diameter (in:)	2.850	Initial Volume (ft^3):	0.0111
Height-to-Diameter Ratio:	1.054	Initial Saturation (%):	93.2
Specific Gravity (assumed):	2.7	Final Moisture Content (%):	22.4
β:	0.99	Final Dry Unit Weight (pcf):	103.3
		Final Volume(ft^3):	0.0111
		Final Saturation (%):	95.7

Established 1927



Established 1927

AN EMPLOYEE OWNED COMPANY

Consulting Engineers – Testing – Inspection Services – Analytical Laboratories

-		-	
Client: Indianapolis Airport Auth	nority		Date Tested: 1/3/2018
Project: IAA Deicing			Project #: 17050081IND
Sample: B-8, ST-1, 13'-15'			Technician(s): MW
			Reviewed by: SM
Confining Pressure, Cp =	34	psi or	2392 cm water
Head Pressure (air), Hp =	32	psi or	2251 cm water
Back Pressure (air), Bp =	30	psi or	2110 cm water
Pipette Area, a =	0.869	cm^2	(0.869(pipette), 3.476(annulus) or 4.345(both))
Pipette Length, Lp =	28.77	cm	
Pipette Volume, Vp =	25	cm^3	Vo = Pipette reading out
Sample Length, L =	7.348	cm	Vi = Pipette reading in
Sample Area, A =	39.020	cm^2	t = Time in seconds
Temperature, T =	20.7	deg.C	

Hydraulic Conductivity - Method C - ASTM D 5084

$$\begin{array}{c} K = (aL/2At) * & \underline{ln[(Hp - Bp + ((Vo - Vi) * Lp / Vp)))} & (t = 1) \\ \hline (Hp - Bp + ((Vo - Vi) * Lp / Vp))] & (t = 2) \end{array}$$

				-	Permeatior	l			
Date	Time	t (sec)	Vi*	dVi	Vo*	dVo	dVo/dVi	K	Notes
01/03/18	08:05	0	5.2		20.8				INITIAL
	09:25	4800	5.4	0.2	20.6	0.2	1.00	5.0E-08	
	01:10	12900	5.9	0.5	20.1	0.5	1.00	4.6E-08	
	03:50	9600	6.3	0.4	19.7	0.4	1.00	5.0E-08	
	04:45	3300	6.5	0.2	19.6	0.2	0.75	6.4E-08	FINAL

cm/sec cm/sec

\* Inner Pipette

Specimen Information:

Type of Permeant: Distilled Water

Average of four consecutive readings:	5.3E-08
Corrected permeability $(K_{20})$ :	5.2E-08

Weight (lbs):	1.565	Initial Moisture Content (%):	9.7
Height (in):	2.893	Initial Dry Unit Weight (pcf):	140.9
Diameter (in:)	2.775	Initial Volume (ft <sup>3</sup> ):	0.0101
Height-to-Diameter Ratio:	1.043	Initial Saturation (%):	133.8
Specific Gravity (assumed):	2.7	Final Moisture Content (%):	8.1
β.	0.99	Final Dry Unit Weight (pcf):	138.9
		Final Volume(ft <sup>3</sup> ):	0.0103
		Final Saturation (%):	102.5



Established 1927

)

AN EMPLOYEE OWNED COMPANY

Consulting Engineers – Testing – Inspection Services – Analytical Laboratories

Client: Indianapolis Airport Auth	nority	Date Tested: 1/3/2018
Project: IAA Deicing		Project #: 17050081IND
Sample: B-34, ST-2, 4'-6'		Technician(s): MW
-		Reviewed by: SM
Confining Pressure, Cp =	34 psi or	2392 cm water
Head Pressure (air), Hp =	32 psi or	2251 cm water
Back Pressure (air), Bp =	30 psi or	2110 cm water
Pipette Area, a =	0.869 cm^2	(0.869(pipette), 3.476(annulus) or 4.345(both))
Pipette Length, Lp =	28.77 cm	
Pipette Volume, Vp =	25 cm^3	Vo = Pipette reading out
Sample Length, L =	7.746 cm	Vi = Pipette reading in
Sample Area, A =	41.883 cm^2	t = Time in seconds
Temperature, T =	20.7 deg.C	

Hydraulic Conductivity - Method C - ASTM D 5084

$$\begin{array}{c} K = (aL/2At) * & \frac{\ln[(Hp - Bp + ((Vo - Vi) * Lp / Vp)))}{(Hp - Bp + ((Vo - Vi) * Lp / Vp))]} & (t = 1) \\ (t = 2) \end{array}$$

Permeation									
Date	Time	t (sec)	Vi*	dVi	Vo*	dVo	dVo/dVi	K	Notes
01/03/18	08:00	0	4.2		21.8				INITIAL
	08:35	2100	4.4	0.2	21.6	0.2	1.00	1.1E-07	
	09:45	4200	4.8	0.4	21.2	0.4	1.00	1.1E-07	
	10:50	3900	5.2	0.4	20.8	0.4	1.00	1.2E-07	
	12:15	5100	5.7	0.5	20.3	0.5	1.00	1.1E-07	FINAL

\* Inner Pipette

Specimen Information:

Type of Permeant: Distilled Water

Average of four consecutive readings:	1.1E-07	cm/sec
Corrected permeability $(K_{20})$ :	1.1E-07	cm/sec

1.493	Initial Moisture Content (%):	19.7
3.05	Initial Dry Unit Weight (pcf):	108.8
2.875	Initial Volume (ft <sup>3</sup> ):	0.0115
1.061	Initial Saturation (%):	97.1
2.7	Final Moisture Content (%):	20.5
0.99	Final Dry Unit Weight (pcf):	109.7
	Final Volume(ft^3):	0.0113
	Final Saturation (%):	103.2
	1.493 3.05 2.875 1.061 2.7 0.99	1.493Initial Moisture Content (%):3.05Initial Dry Unit Weight (pcf):2.875Initial Volume (ft^3):1.061Initial Saturation (%):2.7Final Moisture Content (%):0.99Final Dry Unit Weight (pcf):Final Volume(ft^3):Final Saturation (%):



AN EMPLOYEE OWNED COMPANY

Consulting Engineers - Testing - Inspection Services - Analytical Laboratories

Client: Indianapolis Airport Auth	nority		Date Tested: 1/9/2018
Project: IAA Deicing			Project #: 17050081IND
Sample: B-5, BS 1'-6'			Technician(s): MW/JK
-			Reviewed by: SM
Confining Pressure, Cp =	34	psi or	2392 cm water
Head Pressure (air), Hp =	32	psi or	2251 cm water
Back Pressure (air), Bp =	30	psi or	2110 cm water
Pipette Area, a =	0.869	cm^2	(0.869(pipette), 3.476(annulus) or 4.345(both))
Pipette Length, Lp =	28.77	cm	
Pipette Volume, Vp =	25	cm^3	Vo = Pipette reading out
Sample Length, L =	7.492	cm	Vi = Pipette reading in
Sample Area, A =	41.331	cm^2	t = Time in seconds
Temperature, T =	21.2	deg.C	

Hydraulic Conductivity - Method C - ASTM D 5084

K = (aL/2At) *	$\ln[(Hp - Bp + ((Vo - Vi) * Lp / Vp))]$	(t = 1)
	(Hp - Bp + ((Vo - Vi) * Lp / Vp))]	(t=2)

					Permeation	1			
Date	Time	t (sec)	Vi*	dVi	Vo*	dVo	dVo/dVi	K	Notes
01/09/18	07:35	0	5.2		20.9				INITIAL
	09:45	7800	5.7	0.5	20.4	0.5	1.00	7.3E-08	
	12:30	9900	6.3	0.6	19.9	0.5	0.83	6.4E-08	
	14:15	6300	6.6	0.3	19.6	0.3	1.00	5.5E-08	
	13:45	5400	6.9	0.3	19.3	0.3	1.00	6.5E-08	FINAL

cm/sec cm/sec

\* Inner Pipette

Specimen Information:

Type of Permeant: Distilled Water

Average of four consecutive readings:	6.4E-08
Corrected permeability $(K_{20})$ :	6.3E-08

Weight (lbs):	1.467	Initial Moisture Content (%):	12.3
Height (in):	2.95	Initial Dry Unit Weight (pcf):	119.5
Diameter (in:)	2.856	Initial Volume (ft <sup>3</sup> ):	0.0109
Height-to-Diameter Ratio:	1.033	Initial Saturation (%):	80.6
Specific Gravity (assumed):	2.7	Final Moisture Content (%):	16.4
β:	0.99	Final Dry Unit Weight (pcf):	114.9
		Final Volume(ft <sup>3</sup> ):	0.0114
		Final Saturation (%):	94.6

Established 1927
















Sheet 1 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	рН
B- 1	1624318	158756	SS-1	1.0-2.5	15.8							
B- 1	1624318	158756	SS-2	3.5-5.0	18.8							8.7
B- 1	1624318	158756	SS-3	6.0-7.5	22.2							8.6
B- 1	1624318	158756	SS-4	8.5-10.0	18.2							8.8
B- 1	1624318	158756	SS-5	13.5-15.0	8.8							
B- 1	1624318	158756	SS-6	18.5-20.0	9.7							
B- 1	1624318	158756	SS-7	23.5-25.0	11.9							8.1
B- 1	1624318	158756	SS-8	28.5-30.0	18.5							
B- 1	1624318	158756	SS-9	33.5-35.0	9.4							
B- 1	1624318	158756	SS-10	38.5-40.0	15.8							
B- 1	1624318	158756	SS-12	48.5-48.9	16.1							
B- 2	1624315	159073	SS-1	1.0-2.5	12.5							
B- 2	1624315	159073	SS-3	6.0-7.5	11.9							8.8
B- 2	1624315	159073	SS-4	8.5-10.0	9.2							
B- 2	1624315	159073	SS-5	13.5-15.0	10.3							
B- 2	1624315	159073	SS-6	18.5-20.0	10.1							8.4
B- 2A	1624315	159076	SS-7	23.5-25.0	16.8							
B- 2A	1624315	159076	SS-8	28.5-30.0	9.4							
B- 2A	1624315	159076	SS-9	33.5-35.0	19.0							
B- 2A	1624315	159076	SS-10	38.5-40.0	13.5							
B- 2A	1624315	159076	SS-11	43.5-45.0	9.1							
B- 2A	1624315	159076	SS-12	48.5-50.0	11.8							
B- 3	1624312	159385	SS-1	1.0-2.5	25.2							
B- 3	1624312	159385	SS-2	3.5-5.0	8.8							
B- 3	1624312	159385	SS-3	6.0-7.5	10.7							
B- 3	1624312	159385	SS-4	8.5-10.0	9.7							8.6
B- 3	1624312	159385	SS-5	13.5-15.0	8.7							
B- 3	1624312	159385	SS-6	18.5-20.0	8.4							
B- 3	1624312	159385	SS-7	23.5-25.0	8.4							
B- 3	1624312	159385	SS-8	28.5-30.0	9.1							
B- 3	1624312	159385	SS-9	33.5-35.0	9.2							
B- 3	1624312	159385	SS-10	38.5-40.0	8.8							
B- 3	1624312	159385	SS-11	43.5-45.0	9.9							
B- 3	1624312	159385	SS-12	48.5-50.0	8.9							



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 2 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	pН
B- 4	1624311	159695	SS-1	1.0-2.5	13.5							
B- 4	1624311	159695	SS-2	3.5-5.0	12.4							9.1
B- 4	1624311	159695	SS-3	6.0-7.5	19.4							
B- 4	1624311	159695	SS-4	8.5-10.0	8.1							8.7
B- 4	1624311	159695	SS-5	13.5-15.0	7.7							
B- 4	1624311	159695	SS-6	18.5-20.0	12.0							
B- 4	1624311	159695	SS-7	23.5-25.0	7.3							
B- 4	1624311	159695	SS-8	28.5-30.0	12.6							8.4
B- 4	1624311	159695	SS-9	33.5-35.0	9.6							
B- 4	1624311	159695	SS-10	38.5-40.0	9.7							
B- 4	1624311	159695	SS-11	43.5-45.0	9.1							
B- 4	1624311	159695	SS-12	48.5-50.0	8.2							
B- 5	1624624	158565	SS-1	1.0-2.5	20.0							
B- 5	1624624	158565	SS-2	3.5-5.0	17.5							8.6
B- 5	1624624	158565	SS-3	6.0-7.5	14.4							8.9
B- 5	1624624	158565	SS-4	8.5-10.0	10.6							
B- 5	1624624	158565	SS-5	13.5-14.8	11.4							
B- 5	1624624	158565	SS-6	18.5-20.0	13.4							
B- 5	1624624	158565	SS-7	23.5-25.0	10.7							
B- 5	1624624	158565	SS-8	28.5-30.0	12.3	136.7	121.8	11871	7.1			7.5
B- 5	1624624	158565	SS-9	33.5-35.0	15.5							
B- 5	1624624	158565	SS-10	38.5-40.0	12.2							
B- 5	1624624	158565	SS-11	43.5-45.0	16.0							
B- 5	1624624	158565	SS-12	48.5-50.0	12.1							
B- 6	1624619	158882	SS-1	1.0-2.5	23.9							
B- 6	1624619	158882	SS-2	3.5-5.0	19.4							8.6
B- 6	1624619	158882	SS-3	6.0-7.5	23.1							
B- 6	1624619	158882	SS-4	8.5-10.0	16.5							9.4
B- 6	1624619	158882	SS-5	13.5-15.0	8.6							
B- 6	1624619	158882	SS-6	18.5-20.0	10.2							8.7
B- 6	1624619	158882	SS-7	23.5-25.0	9.7							
B- 6	1624619	158882	SS-8	28.5-30.0	13.7							
B- 6	1624619	158882	SS-9	33.5-35.0	18.4							
B- 6	1624619	158882	SS-10	38.5-40.0	14.2							



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 3 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	pН
B- 6	1624619	158882	SS-11	43.5-45.0	15.2							
B- 6	1624619	158882	SS-12	48.5-50.0	11.3							
B- 7	1624620	159193	SS-1	1.0-2.5	31.4							8.7
B- 7	1624620	159193	SS-2	3.5-5.0	12.6							8.8
B- 7	1624620	159193	SS-3	6.0-7.5	12.9							8.4
B- 7	1624620	159193	SS-4	8.5-10.0	20.6							
B- 7	1624620	159193	SS-5	13.5-15.0	9.4							7.1
B- 7	1624620	159193	SS-6	18.5-20.0	9.5							
B- 7	1624620	159193	SS-7	23.5-25.0	13.6							
B- 7	1624620	159193	SS-8	28.5-30.0	22.6							
B- 7	1624620	159193	SS-9	33.5-35.0	18.9							
B- 7	1624620	159193	SS-11	43.5-45.0	16.2							
B- 7	1624620	159193	SS-12	48.5-49.0	17.8							
B- 8	1624620	159510	SS-1	1.0-2.5	19.7	118.1	98.6	2655	10.2			8.0
B- 8	1624620	159510	SS-2	3.5-5.0	9.7							
B- 8	1624620	159510	SS-3	6.0-7.5	7.5							
B- 8	1624620	159510	SS-4	8.5-10.0	7.9							
B- 8	1624620	159510	SS-5	13.5-15.0	11.5							8.7
B- 8	1624620	159510	SS-6	18.5-20.0	9.1							
B- 8	1624620	159510	SS-7	23.5-25.0	7.5							
B- 8	1624620	159510	SS-8	28.5-30.0	12.5							
B- 8	1624620	159510	SS-9	33.5-35.0	14.8							
B- 8	1624620	159510	SS-10	38.5-38.8	15.4							
B- 8	1624620	159510	SS-11	43.5-45.0	14.4							
B- 8	1624620	159510	SS-12	48.5-50.0	11.9							
B- 9	1624945	158715	SS-1	1.0-2.5	7.9							
B- 9	1624945	158715	SS-2	3.5-5.0	9.5							7.7
B- 9	1624945	158715	SS-3	6.0-7.5	10.5							
B- 9	1624945	158715	SS-4	8.5-10.0	10.8	146.4	132.2	4291	4.7			
B- 9	1624945	158715	SS-5	13.5-15.0	16.4							
B- 9	1624945	158715	SS-7	23.5-25.0	13.7							
B- 9	1624945	158715	SS-8	28.5-30.0	18.1							
B- 9	1624945	158715	SS-9	33.5-35.0	13.5							
B- 9	1624945	158715	SS-10	38.5-40.0	14.7							



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 4 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	рН
B- 9	1624945	158715	SS-11	43.5-45.0	11.4							
B- 9	1624945	158715	SS-12	48.5-50.0	16.4							
B-10	1624939	159043	SS-1	1.0-2.5	24.6	121.1	97.2	3735	8.0			7.6
B-10	1624939	159043	SS-2	3.5-5.0	26.9							
B-10	1624939	159043	SS-3	6.0-7.5	12.6							
B-10	1624939	159043	SS-4	8.5-10.0	10.0							7.6
B-10	1624939	159043	SS-5	13.5-15.0	21.5							8.4
B-10	1624939	159043	SS-6	18.5-20.0	8.6	146.7	135.1	10062	6.7			7.5
B-10	1624939	159043	SS-7	23.5-25.0	8.4							
B-10	1624939	159043	SS-8	28.5-30.0	10.7							
B-10	1624939	159043	SS-9	33.5-35.0	16.7							
B-10	1624939	159043	SS-10	38.5-40.0	12.0							
B-10	1624939	159043	SS-11	43.5-45.0	15.7							
B-10	1624939	159043	SS-12	48.5-50.0	12.9							
B-11	1624939	159354	SS-1	1.0-2.5	17.4							8.4
B-11	1624939	159354	SS-2	3.5-5.0	10.3							8.1
B-11	1624939	159354	SS-3	6.0-7.5	12.2							
B-11	1624939	159354	SS-4	8.5-10.0	6.6							
B-11	1624939	159354	SS-6	18.5-20.0	9.2	148.5	136.0	9063	3.0			
B-11	1624939	159354	SS-7	23.5-25.0	10.8							
B-11	1624939	159354	SS-8	28.5-30.0	11.2							
B-11	1624939	159354	SS-10	38.5-40.0	13.6							
B-11	1624939	159354	SS-11	43.5-45.0	11.4							
B-11	1624939	159354	SS-12	48.5-50.0	12.7							
B-12	1624939	159668	SS-1	1.0-2.5	17.3							
B-12	1624939	159668	SS-2	3.5-5.0	18.1							
B-12	1624939	159668	SS-3	6.0-7.5	8.0							
B-12	1624939	159668	SS-4	8.5-10.0	4.6							9.6
B-12	1624939	159668	SS-5	13.5-15.0	13.2							
B-12	1624939	159668	SS-6	18.5-20.0	18.9							
B-12	1624939	159668	SS-7	23.5-25.0	11.9							
B-12	1624939	159668	SS-8	28.5-30.0	11.6							
B-12	1624939	159668	SS-9	33.5-35.0	11.0							
B-12	1624939	159668	SS-10	38.5-40.0	12.1							



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 5 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	рН
B-12	1624939	159668	SS-11	43.5-45.0	11.3							
B-12	1624939	159668	SS-12	48.5-50.0	10.5							
B-13	1625422	158775	SS-1	1.0-2.5	25.3							
B-13	1625422	158775	SS-2	3.5-5.0	17.5							
B-13	1625422	158775	SS-3	6.0-7.5	11.4							
B-13	1625422	158775	SS-4	8.5-10.0	6.8							
B-13	1625422	158775	SS-5	13.5-15.0	8.3							
B-13	1625422	158775	SS-6	18.5-20.0	8.3							
B-13	1625422	158775	SS-7	23.5-25.0	10.9							
B-13	1625422	158775	SS-8	28.5-30.0	11.1							
B-13	1625422	158775	SS-9	33.5-35.0	8.2							
B-13	1625422	158775	SS-10	38.5-40.0	8.3							
B-13	1625422	158775	SS-11	43.5-45.0	4.4							
B-13	1625422	158775	SS-12	48.5-50.0	9.8							
B-14	1625397	159116	SS-1	1.0-2.5	24.2							
B-14	1625397	159116	SS-2	3.5-5.0	24.1							8.1
B-14	1625397	159116	SS-3	6.0-7.5	13.1							
B-14	1625397	159116	SS-4	8.5-10.0	13.8							8.8
B-14	1625397	159116	SS-5	13.5-15.0	10.4							
B-14	1625397	159116	SS-6	18.5-20.0	17.7							
B-14	1625397	159116	SS-7	23.5-25.0	10.5							
B-14	1625397	159116	SS-8	28.5-30.0	9.9							
B-14	1625397	159116	SS-9	33.5-35.0	13.1							
B-14	1625397	159116	SS-10	38.5-40.0	15.7							
B-14	1625397	159116	SS-11	43.5-45.0	13.1							
B-14	1625397	159116	SS-12	48.5-50.0	14.5							
B-15	1625404	159443	SS-1	1.0-2.5	24.3							
B-15	1625404	159443	SS-2	3.5-5.0	25.0							
B-15	1625404	159443	SS-3	6.0-7.5	9.1							
B-15	1625404	159443	SS-4	8.5-10.0	6.1							
B-15	1625404	159443	SS-5	13.5-15.0	5.9							
B-15	1625404	159443	SS-6	18.5-20.0	8.6							
B-15	1625404	159443	SS-7	23.5-25.0	9.0							
B-15	1625404	159443	SS-8	28.5-30.0	11.2							



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 6 of 11

B-15         1625404         159443         SS-9         33.5-35.0         18.7         Image: Constraint of the state of t	Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	pН
B-15         1625404         159443         SS-10         38.5-40.0         14.2         I <thi< th="">         I         <thi< td=""><td>B-15</td><td>1625404</td><td>159443</td><td>SS-9</td><td>33.5-35.0</td><td>18.7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></thi<></thi<>	B-15	1625404	159443	SS-9	33.5-35.0	18.7							
B-15         1625404         159443         SS-11         43.5-45.0         11.7         Image: Constraint of the state of	B-15	1625404	159443	SS-10	38.5-40.0	14.2							
B-15         1625404         159443         SS-12         48.5-50.0         11.6         Image: Constraint of the consto the constraint of the constraint of the consto t	B-15	1625404	159443	SS-11	43.5-45.0	11.7							
B-16         1625166         159471         SS-1         1.0-2.5         26.5         Image: Constraint of the state of the	B-15	1625404	159443	SS-12	48.5-50.0	11.6							
B-16         1625166         159471         SS-2         3.5-50         10.9         Image: Constraint of the state of the	B-16	1625166	159471	SS-1	1.0-2.5	26.5							
B-16         1825166         159471         SS-3         6.0-7.5         15.3         Image: Constraint of the state of the	B-16	1625166	159471	SS-2	3.5-5.0	10.9							
B-16         1625166         159471         SS-4         8.5-10.0         9.2         Image: Constraint of the state of the	B-16	1625166	159471	SS-3	6.0-7.5	15.3							
B-16         1625166         159471         SS-5         13.5-15.0         16.2         Image: Constraint of the state of t	B-16	1625166	159471	SS-4	8.5-10.0	9.2							
B-16         1625166         159471         SS-6         18.5-20.0         11.0         10062         6.7            B-16         1625166         159471         SS-7         23.5-25.0         13.9 </td <td>B-16</td> <td>1625166</td> <td>159471</td> <td>SS-5</td> <td>13.5-15.0</td> <td>16.2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	B-16	1625166	159471	SS-5	13.5-15.0	16.2							
B-16         1625166         159471         SS-7         23.5-25.0         13.9	B-16	1625166	159471	SS-6	18.5-20.0	11.0			10062	6.7			
B-16         1625166         159471         SS-8         28.5-30.0         19.6         Image: Constraint of the state of t	B-16	1625166	159471	SS-7	23.5-25.0	13.9							
B-16         1625166         159471         SS-9         33.5-35.0         9.3	B-16	1625166	159471	SS-8	28.5-30.0	19.6							
B-16         1625166         159471         SS-10         38.5-40.0         11.2         Image: Constraint of the state of	B-16	1625166	159471	SS-9	33.5-35.0	9.3							
B-16         1625166         159471         SS-11         43.5-45.0         10.7	B-16	1625166	159471	SS-10	38.5-40.0	11.2							
B-16         1625166         159471         SS-12         48.5-50.0         14.2             8.1           B-17         1626005         158273         SS-1         1.0-2.5         9.9            8.1           B-17         1626005         158273         SS-2         3.5-50         10.7            8.7           B-17         1626005         158273         SS-4         8.5-10.0         8.7            8.7           B-17         1626005         158273         SS-5         13.5-15.0         18.8               8.7           B-17         1626005         158273         SS-6         18.5-20.0         12.7         141.1         125.1         4018         10.9         7.6           B-17         1626005         158273         SS-7         23.5-20.0         12.2               7.6           B-17         1626005         158273         SS-8         28.5-30.0         22.2 </td <td>B-16</td> <td>1625166</td> <td>159471</td> <td>SS-11</td> <td>43.5-45.0</td> <td>10.7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	B-16	1625166	159471	SS-11	43.5-45.0	10.7							
B-17         1626005         158273         SS-1         1.0-2.5         9.9            8.1           B-17         1626005         158273         SS-2         3.5-5.0         10.7             8.1           B-17         1626005         158273         SS-3         6.0-7.5         9.4            8.7           B-17         1626005         158273         SS-4         8.5-10.0         8.7            8.7           B-17         1626005         158273         SS-5         13.5-15.0         18.8                     8.7                    8.7            8.7           8.7              8.7          8.7                8.7	B-16	1625166	159471	SS-12	48.5-50.0	14.2							
B-17         1626005         158273         SS-2         3.5-5.0         10.7                   8.7           B-17         1626005         158273         SS-3         6.0-7.5         9.4            8.7           B-17         1626005         158273         SS-5         13.5-15.0         18.8               8.7           B-17         1626005         158273         SS-6         18.5-20.0         12.7         141.1         125.1         4018         10.9         7.6           B-17         1626005         158273         SS-7         23.5-25.0         15.2                 7.6           B-17         1626005         158273         SS-8         28.5-30.0         22.2               7.6           B-17         1626005         158273         SS-10         38.5-40.0         11.4               7	B-17	1626005	158273	SS-1	1.0-2.5	9.9							8.1
B-17         1626005         158273         SS-3         6.0-7.5         9.4            8.7           B-17         1626005         158273         SS-4         8.510.0         8.7               8.7           B-17         1626005         158273         SS-5         13.5-15.0         18.8	B-17	1626005	158273	SS-2	3.5-5.0	10.7							
B-17       1626005       158273       SS-4       8.5-10.0       8.7       Image: Constraint of the state of the sta	B-17	1626005	158273	SS-3	6.0-7.5	9.4							8.7
B-17       1626005       158273       SS-5       13.5-15.0       18.8   <	B-17	1626005	158273	SS-4	8.5-10.0	8.7							
B-17       1626005       158273       SS-6       18.5-20.0       12.7       141.1       125.1       4018       10.9       7.6         B-17       1626005       158273       SS-7       23.5-25.0       15.2 <td>B-17</td> <td>1626005</td> <td>158273</td> <td>SS-5</td> <td>13.5-15.0</td> <td>18.8</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	B-17	1626005	158273	SS-5	13.5-15.0	18.8							
B-17       1626005       158273       SS-7       23.5-25.0       15.2   <	B-17	1626005	158273	SS-6	18.5-20.0	12.7	141.1	125.1	4018	10.9			7.6
B-17       1626005       158273       SS-8       28.5-30.0       22.2       Image: Constraint of the state of the s	B-17	1626005	158273	SS-7	23.5-25.0	15.2							
B-17       1626005       158273       SS-9       33.5-35.0       14.7           7.6         B-17       1626005       158273       SS-10       38.5-40.0       11.4 <td>B-17</td> <td>1626005</td> <td>158273</td> <td>SS-8</td> <td>28.5-30.0</td> <td>22.2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	B-17	1626005	158273	SS-8	28.5-30.0	22.2							
B-17       1626005       158273       SS-10       38.5-40.0       11.4	B-17	1626005	158273	SS-9	33.5-35.0	14.7							7.6
B-17       1626005       158273       SS-11       43.5-45.0       11.7	B-17	1626005	158273	SS-10	38.5-40.0	11.4							
B-17       1626005       158273       SS-12       48.5-50.0       12.2	B-17	1626005	158273	SS-11	43.5-45.0	11.7							
B-17A       1626002       158273       SS-1       38.5-40.0       12.0       Image: Constraint of the state of the	B-17	1626005	158273	SS-12	48.5-50.0	12.2							
B-17A       1626002       158273       SS-3       43.5-45.0       13.0       142.9       126.4       9817       14.2       7.8         B-17A       1626002       158273       SS-4       46.0-47.5       12.8             7.8         B-17A       1626002       158273       SS-4       46.0-47.5       12.8	B-17A	1626002	158273	SS-1	38.5-40.0	12.0							
B-17A         1626002         158273         SS-4         46.0-47.5         12.8         Image: Constraint of the state of	B-17A	1626002	158273	SS-3	43.5-45.0	13.0	142.9	126.4	9817	14.2			7.8
B-17A         1626002         158273         SS-5         48.5-50.0         17.9         133.4         113.2         10835         10.2         7.4           B-17A         1626002         158273         SS-6         51.0-52.5         16.1              7.4           B-17A         1626002         158273         SS-6         51.0-52.5         16.1   <	B-17A	1626002	158273	SS-4	46.0-47.5	12.8							
B-17A         1626002         158273         SS-6         51.0-52.5         16.1 <th< th=""></th<>	B-17A	1626002	158273	SS-5	48.5-50.0	17.9	133.4	113.2	10835	10.2			7.4
B-17A         1626002         158273         SS-7         53.5-55.0         16.5         136.0         116.7         9045         15.0         7.5	B-17A	1626002	158273	SS-6	51.0-52.5	16.1							
	B-17A	1626002	158273	SS-7	53.5-55.0	16.5	136.0	116.7	9045	15.0			7.5



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 7 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	рН
B-17A	1626002	158273	SS-8	56.0-57.5	14.8							
B-17A	1626002	158273	SS-9	58.5-60.0	10.9							
B-17A	1626002	158273	SS-10	61.0-62.4	14.9							
B-17A	1626002	158273	SS-11	63.5-64.4	25.2							
B-18	1625852	158276	SS-1	1.0-2.5	13.6							
B-18	1625852	158276	SS-2	3.5-5.0	11.0							
B-18	1625852	158276	SS-3	6.0-7.5	7.8							
B-18	1625852	158276	SS-4	8.5-10.0	8.8							
B-18A	1625849	158276	SS-5	13.5-15.0	10.8							
B-18A	1625849	158276	SS-6	18.5-20.0	13.3							
B-18A	1625849	158276	SS-7	23.5-25.0	7.5							
B-18A	1625849	158276	SS-8	28.5-30.0	7.7							
B-18A	1625849	158276	SS-9	33.5-35.0	11.4							
B-18A	1625849	158276	SS-10	38.5-40.0	10.8							
B-18A	1625849	158276	SS-11	43.5-43.9	14.2							
B-18A	1625849	158276	SS-12	48.5-50.0	13.5							
B-19	1625654	158517	SS-1	1.0-2.5	26.4							
B-19	1625654	158517	SS-2	3.5-5.0	10.8							
B-19	1625654	158517	SS-3	6.0-7.5	11.1							
B-19	1625654	158517	SS-4	8.5-10.0	12.2							8.9
B-19	1625654	158517	SS-5	13.5-15.0	11.0							
B-19	1625654	158517	SS-6	18.5-20.0	10.0							
B-19	1625654	158517	SS-7	23.5-25.0	15.9							
B-19	1625654	158517	SS-8	28.5-30.0	9.5							
B-19	1625654	158517	SS-9	33.5-35.0	12.1							
B-19	1625654	158517	SS-10	38.5-40.0	10.8							
B-19	1625654	158517	SS-11	43.5-44.4	15.0							
B-19	1625654	158517	SS-12	48.5-50.0	10.5							
B-20	1625683	158784	SS-1	1.0-2.5	20.6							
B-20	1625683	158784	SS-2	3.5-5.0	12.3							
B-20	1625683	158784	SS-3	6.0-7.5	8.1							
B-20	1625683	158784	SS-4	8.5-10.0	6.2							
B-20	1625683	158784	SS-6	18.5-20.0	15.8							
B-20	1625683	158784	SS-7	23.5-24.4	10.6							



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 8 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	рН
B-20	1625683	158784	SS-8	28.5-30.0	11.4							
B-20	1625683	158784	SS-9	33.5-35.0	12.7							
B-20	1625683	158784	SS-10	38.5-40.0	17.4							
B-20	1625683	158784	SS-11	43.5-45.0	14.5							
B-20	1625683	158784	SS-12	48.5-50.0	14.1							
B-24	1626707	158360	SS-1	1.0-2.5	13.4							
B-24	1626707	158360	SS-2	3.5-5.0	12.1							
B-24	1626707	158360	SS-3	6.0-7.5	16.1	142.1	127.0	9544	6.3			
B-24	1626707	158360	SS-4	8.5-10.0	23.4							8.9
B-24	1626707	158360	SS-5	11.0-12.5	13.2							
B-24	1626707	158360	SS-6	13.5-15.0	23.9	140.6	124.9	12505	8.3			
B-24	1626707	158360	SS-7	16.0-17.5	21.8							
B-24	1626707	158360	SS-8	18.5-20.0	8.3							
B-24	1626707	158360	SS-9	21.0-22.5	13.3	135.7	117.1	7889	15.0			
B-24	1626707	158360	SS-10	23.5-25.0	14.7							
B-24	1626707	158360	SS-11	26.0-27.5	10.7	137.5	121.9	8993	14.3			8.9
B-24	1626707	158360	SS-12	28.5-30.0	10.2							
B-24	1626707	158360	SS-13	31.0-32.5	12.3							
B-24	1626707	158360	SS-14	33.5-35.0	9.4							
B-24	1626707	158360	SS-15	36.0-37.5	11.9	138.6	117.0	3293	6.5			8.8
B-24	1626707	158360	SS-16	38.5-39.9	8.4							
B-24	1626707	158360	SS-17	41.0-42.5	11.2							
B-24	1626707	158360	SS-18	43.5-45.0	12.5							7.5
B-24	1626707	158360	SS-19	46.0-47.5	22.6							
B-24	1626707	158360	SS-20	48.5-50.0	16.7							
B-24	1626707	158360	SS-21	51.0-52.5	15.9							7.8
B-24	1626707	158360	SS-22	53.5-55.0	19.6							
B-24	1626707	158360	SS-23	56.0-57.5	12.8							7.6
B-24	1626707	158360	SS-24	58.5-60.0	8.0							
B-24	1626707	158360	SS-25	61.0-62.5	15.5							
B-24	1626707	158360	SS-26	63.5-65.0	13.8							
B-24	1626707	158360	SS-27	66.0-67.5	18.5							7.9
B-24	1626707	158360	SS-28	68.5-69.9	15.4							
B-25	1626666	157899	SS-1	1.0-2.5	13.7							
					SUMM		F SPEC		RATOR	Y TES		TS



ARY OF SPECIAL LABORATORY TEST RI 301 -301 13

Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 9 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	pН
B-25	1626666	157899	SS-3	6.0-7.5	21.7							8.3
B-25	1626666	157899	SS-4	8.5-8.9	20.0							
B-25A	1626666	157902	SS-5	13.5-15.0	7.6							
B-25A	1626666	157902	SS-6	18.5-19.8	8.1							
B-25A	1626666	157902	SS-7	23.5-25.0	6.0							
B-25A	1626666	157902	SS-8	28.5-30.0	14.4							
B-25A	1626666	157902	SS-9	33.5-35.0	15.4							
B-25A	1626666	157902	SS-10	38.5-40.0	30.6							
B-25A	1626666	157902	SS-11	43.5-45.0	14.9							
B-25A	1626666	157902	SS-12	48.5-50.0	11.7							
B-26	1626978	158343	SS-1	1.0-2.5	14.3							
B-26	1626978	158343	SS-2	3.5-5.0	14.5							
B-26	1626978	158343	SS-3	6.0-7.5	27.5							
B-26	1626978	158343	SS-4	8.5-10.0	18.8							
B-26B	1626980	158343	SS-5	13.5-15.0	7.4							
B-26B	1626980	158343	SS-6	18.5-20.0	7.1							
B-26B	1626980	158343	SS-8	28.5-30.0	11.9							
B-26B	1626980	158343	SS-10	38.5-40.0	14.3							
B-26B	1626980	158343	SS-11	43.5-45.0	9.1							
B-26B	1626980	158343	SS-12	48.5-50.0	9.9							
B-27	1627017	158217	SS-1	1.0-2.5	16.8							
B-27	1627017	158217	SS-2	3.5-5.0	9.4							
B-27	1627017	158217	SS-3	6.0-7.5	20.4							
B-27	1627017	158217	SS-4	8.5-10.0	14.5							
B-27	1627017	158217	SS-5	13.5-15.0	12.6							8.8
B-27	1627017	158217	SS-6	18.5-20.0	9.6							
B-27	1627017	158217	SS-7	23.5-25.0	10.5							
B-27	1627017	158217	SS-8	28.5-30.0	11.5							
B-27	1627017	158217	SS-9	33.5-35.0	8.7							
B-27	1627017	158217	SS-10	38.5-40.0	8.9							
B-27	1627017	158217	SS-11	43.5-45.0	9.1							
B-27	1627017	158217	SS-12	48.5-49.8	8.1							
W-1	1624456	158845	SS-1	1.0-2.5	8.1							
W-1	1624456	158845	SS-2	3.5-5.0	12.0							8.0



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 10 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	рН
W-1	1624456	158845	SS-3	6.0-7.5	8.9							
W-1	1624456	158845	SS-4	8.5-10.0	10.8							8.1
W-1	1624456	158845	SS-5	13.5-15.0	13.2							
W-1	1624456	158845	SS-6	18.5-19.9	6.8							
W-1	1624456	158845	SS-7	23.5-25.0	20.0							
W-1	1624456	158845	SS-8	28.5-30.0	6.0							
W-1	1624456	158845	SS-9	33.5-35.0	23.9							
W-2	1624762	159449	SS-1	1.0-2.5	23.9							
W-2	1624762	159449	SS-3	6.0-7.5	8.2							7.9
W-2	1624762	159449	SS-4	8.5-10.0	6.8							
W-2	1624762	159449	SS-5	13.5-15.0	8.9							
W-2	1624762	159449	SS-6	18.5-20.0	8.8							7.6
W-2	1624762	159449	SS-7	23.5-25.0	9.4							
W-2	1624762	159449	SS-8	28.5-30.0	7.7							
W-2	1624762	159449	SS-9	33.5-35.0	13.7							
W-3	1625287	159526	SS-1	1.0-2.5	8.1							
W-3	1625287	159526	SS-2	3.5-5.0	10.4							
W-3	1625287	159526	SS-3	6.0-7.5	9.2							
W-3	1625287	159526	SS-4	8.5-10.0	7.1							
W-3	1625287	159526	SS-5	13.5-15.0	10.9							
W-3	1625287	159526	SS-6	18.5-20.0	8.8							
W-3	1625287	159526	SS-7	23.5-25.0	9.4							
W-3	1625287	159526	SS-8	28.5-30.0	8.6							
W-3	1625287	159526	SS-9	33.5-35.0	9.8							
W-3	1625287	159526	SS-10	38.5-40.0	10.3							
W-4	1625586	158608	SS-1	1.0-2.5	19.2							
W-4	1625586	158608	SS-2	3.5-5.0	9.1							
W-4	1625586	158608	SS-3	6.0-7.5	10.4							
W-4	1625586	158608	SS-4	8.5-10.0	12.2							
W-4	1625586	158608	SS-6	18.5-20.0	13.9							
W-4	1625586	158608	SS-7	23.5-25.0	12.9							
W-4	1625586	158608	SS-8	28.5-30.0	10.9							
W-4	1625586	158608	SS-9	33.5-35.0	11.1							
W-5	1626845	158655	SS-1	1.0-2.5	19.0							



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

Sheet 11 of 11

Boring No.	Northing	Easting	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	pН
W-5	1626845	158655	SS-2	3.5-5.0	12.2							8.9
W-5	1626845	158655	SS-3	6.0-7.5	13.3							
W-5	1626845	158655	SS-4	8.5-10.0	12.4							
W-5	1626845	158655	SS-5	13.5-15.0	13.0							
W-5	1626845	158655	SS-6	18.5-20.0	10.3							
W-5	1626845	158655	SS-7	23.5-25.0	22.2							
W-5	1626845	158655	SS-8	28.5-30.0	10.2							
W-5	1626845	158655	SS-9	33.5-35.0	13.6							



Project: Stormwater and Deicing Capacity Projects

Location: Indianapolis, IN

CTL Project No.: 17050081IND

# **APPENDIX D**

SOIL PROFILES SETTLEMENT, SLOPE STABILITY AND SEEPAGE ANALYSES



0//2	\$	9		40				060		: Authority apacity Projects IN	Page 1 of 1
	B-24 1.626.707 158.360 158.360 0.7 B-7 B-7 B-7 1-13	0 6 6 6 - 1 - 1 - 2 - 2 - 2 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 2 - 2 - 3 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	24 <b>★</b> 60	28 50 15 28 50 11 86 10 86 12	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	8 8 8 - 13 - 16 - 16 - 16	8	8	SOIL PROFILE	Indianapolis Airport Stomwater and Deicing C Indianapolis,	Project No. 17050081IND
										Scale As Shown Date 1/26/18 Drawn By CG	Reviewed By
			Slab of Discharge Channel El 746.0	Slab of Discharge Channel						емо — М. моясние солтелти — М. моясние солтелти г.т. П. В. О. – Билизеренстиломи - Вилизеренстиломи	
			lab. of Storage Structure to 739.5							Сероно мите ои видио сеором изек ои сеором изек сеором сеором зак сеором за сеором зак сеором зак	
	B-26 1626,978 1686,943	758 63-74 69-74 15 15 15 15 15 15 15 15 15 15 15 15 15	Bottom S EI 741.5	2 2 2					LEGEND		
	B-268 1.626,980 158,343	۰ ۳ هو	1360-77		-13		50\67_100101				
										SILTY SAN	SHALE
	B-27 1,627,017 1583217 762 1.9		135 - 13 <b>X</b> <b>X</b> <b>X</b> - 13 - 13 - 13	60-110 60-10 60-12	6   	6				TOPSOIL CLAYEY SILTY	LEAN CLAY
										CTL Engineering. Inc. 1310 S. Franklin Rd. Indianapolis. Indiana 46239 Phone: 317-295-8650 Website: www.ctleng.com	APE NE 170600841ND HANNA GDI CT 1/3
0/1	ver e		6	740	/ 30	120		069		ENGINEERING S	

766	22	B-4 (00 B-4 (10 B-12 (1624,311 B-12 (1524,331 B-12 (1526) (1526,339 (155,68 (156,68 (156,68 (156,68 (156,68 (156,68 (156,58 (1	$\begin{array}{c} 0.0 \\$	60 - 10 - 10 - 118 - 700 8.60 - 1 - 8 - 18 - 700 8.60 - 1 - 8 - 18 - 745	1.5 1 1.5 1	3	1969-147-172	- 00		0-1 1-10 0. 0. 11-12		00.00 20.00	200	SOIL PROFILE	Indianapolis Airport Authority	Stormwater and Detcing Capacity Projects in Indianapolis, IN	By Project No. Page 17050081IND 1 of 1
		W-2 B-8 1,624,762 1,624,620	159,449 $159,510753$ $7531.69-77-24$ $1.20-767-20$	100-11 4.80-11 10 20-11 - 8 800-1-8				<ul> <li>(4)</li> <li>(4)</li> <li>(5)</li> <li>(6)</li> <li>(7)</li> <li>(7)</li></ul>	6.9 - 14 - 15 - 15	- 12 (503)-	Hanna East Basin Base El. 738	50.90- <u>1</u> -12			Scale As Show	V MOSTURE CONTENT IN Date V PERCENT (W) 1/18/15 STANDARD PENETRATION IN DTAWN E BLOWS PER FOOT (N) CTAWN E	Reviewed
		B-7 1,624,939 B-3	1624,620 159,334 154,335 169,193 753 159,335 169,2385 762 753 752 752 752 752 752 752 752 752 752 752	$\begin{array}{c} 36 \\ -13 \\ -13 \\ -13 \\ -12 \\ -12 \\ -12 \\ -12 \\ -11 \\ $				→	-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	5000 - 14 - 14 - 14 - 14 - 14 - 14 - 14 -			ure 30 and 760				<u> </u>
	lanna South Structure 3ase El. between 722 and 747	19 B-2B-2A 1524,039 22 1.524,015 1524,039	$\begin{bmatrix} -24 & 1.0 \\ -24 & 1.0 \\ -24 & 1.0 \\ -24 \end{bmatrix} \begin{bmatrix} 1.0 \\ -26 \\ -26 \\ -45 \\ -45 \\ -45 \end{bmatrix}$		9.62-67-9 8.8		-10 20 51 -17 0 23.0		-18 (1) -19 (2) -17 (8)	-14 @		-11 50.9 - 112 - 12 - 12 - 13 - 13 - 13	Hanna North Struc Base EI. between	LEGEND	LEAN CLAY	SAND WITH SILT POORLY GRADED	FAT CLAY
	δ. 6 7 	-8 W-1 B 6 6 1,624,456 B 6 188,845 1,624,6 -10 755 158,88	$-11$ $1^{1}$	6.80-11-9 <b>£</b> 0-11-11 (0)-11-11	()		-18 3 -118		-15 35.87 THERT 24		Hanna West Basin Base El. 738	50.99-FZ			SILTY CLAY	SILTY	SILTY SAND
	B-9 1.624.9 1.6371.0 B-5	168.566 16.4 18.76 185.66 16.4 3.18 05 186.756 15.87 188.756 05 198.756 05	(b)		603-27			69	60	60	50 <sup>99</sup> -12 328 110				TL Engineering, Inc.	dianapolis, Indiana 46239 hone: 317-295-8650 sosite: www.ctleng.com	
765	3	100	86	750 745	740	735	730	725	720	715	710	705	200		0º		





# Settle3D Analysis Information Stormawater and Deicing Capacity Projects

# **Project Settings**

Document Name	Hanna B
Project Title	Stormaw
Analysis	Settleme
Author	SD
Company	CTL Eng
Date Created	1/18/201
Stress Computation Method	Boussine
Time-dependent Consolidation Analysis	
Time Units	days
Permeability Units	feet/day
Minimum settlement ratio for subgrade modulus	0.9

Hanna Basin\_Settlement Stormawater and Deicing Capacity Projects Settlement Analysis SD CTL Engineering I/18/2018, 2:45:50 PM Boussinesq

Use average properties to calculate layered stresses

Improve consolidation accuracy

Ignore negative effective stresses in settlement calculations

# Stage Settings

Stage #	Name	Time [days]
1	Stage 1	0
2	Stage 2	100
3	Stage 3	10000

# Results

Time taken to compute: 0.0640909 seconds

## Stage: Stage 1 = 0 d



Data Type	Minimum	Maximum
Total Settlement [in]	0	2.34279
Total Consolidation Settlement [in]	0	1.51089
Virgin Consolidation Settlement [in]	0	0
Recompression Consolidation Settlement [in]	0	1.51089
Immediate Settlement [in]	0	0.831896
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	1.03367e-011	1.82914
Loading Stress XX [ksf]	-0.335481	1.75484
Loading Stress YY [ksf]	-0.435849	2.86696
Effective Stress ZZ [ksf]	1.03367e-011	2.2876
Effective Stress XX [ksf]	0.11458	2.89864
Effective Stress YY [ksf]	-0.147165	4.01076
Total Stress ZZ [ksf]	1.03367e-011	5.23045
Total Stress XX [ksf]	0.11458	5.84149
Total Stress YY [ksf]	-0.147165	6.95361
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	6.13137e-005	0.0808945
Pore Water Pressure [ksf]	0	2.94285
Excess Pore Water Pressure [ksf]	0	1.78093
Degree of Consolidation [%]	0	47.0874
Pre-consolidation Stress [ksf]	2.4	22.8644
Over-consolidation Ratio	1.06364	443.402
Void Ratio	0.297009	0.639899
Permeability [ft/d]	4.56377e-005	0.165429
Coefficient of Consolidation [ft <sup>2</sup> /d]	1	1
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0

# Stage: Stage 2 = 100 d



Data Type	Minimum	Maximum
Total Settlement [in]	0	4.26101
Total Consolidation Settlement [in]	0	3.42912
Virgin Consolidation Settlement [in]	0	0.0533213
Recompression Consolidation Settlement [in]	0	3.3758
Immediate Settlement [in]	0	0.831896
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	1.03367e-011	1.82914
Loading Stress XX [ksf]	-0.335481	1.75484
Loading Stress YY [ksf]	-0.435849	2.86696
Effective Stress ZZ [ksf]	1.03367e-011	2.62695
Effective Stress XX [ksf]	0.11458	3.5844
Effective Stress YY [ksf]	-0.147165	4.71203
Total Stress ZZ [ksf]	1.03367e-011	5.23045
Total Stress XX [ksf]	0.11458	5.84149
Total Stress YY [ksf]	-0.147165	6.95361
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	0.000375519	0.0808945
Pore Water Pressure [ksf]	0	2.61945
Excess Pore Water Pressure [ksf]	0	0.997052
Degree of Consolidation [%]	0	96.2057
Pre-consolidation Stress [ksf]	2.4	22.8644
Over-consolidation Ratio	1	443.402
Void Ratio	0.29525	0.638277
Permeability [ft/d]	4.56377e-005	0.165429
Coefficient of Consolidation [ft <sup>2</sup> /d]	1	1
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	51.2192	94.4765
Undrained Shear Strength	0	0.168139



# Stage: Stage 3 = 10000 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	4.57665
Total Consolidation Settlement [in]	0	3.74476
Virgin Consolidation Settlement [in]	0	0.273224
Recompression Consolidation Settlement [in]	0	3.47153
Immediate Settlement [in]	0	0.831896
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	1.03367e-011	1.82914
Loading Stress XX [ksf]	-0.335481	1.75484
Loading Stress YY [ksf]	-0.435849	2.86696
Effective Stress ZZ [ksf]	1.03367e-011	3.60805
Effective Stress XX [ksf]	0.11458	4.21909
Effective Stress YY [ksf]	-0.147165	5.33121
Total Stress ZZ [ksf]	1.03367e-011	5.23045
Total Stress XX [ksf]	0.11458	5.84149
Total Stress YY [ksf]	-0.147165	6.95361
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	0.000395619	0.0808945
Pore Water Pressure [ksf]	0	1.6224
Excess Pore Water Pressure [ksf]	-0.000651379	0.000303953
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	2.4	22.8644
Over-consolidation Ratio	1	443.402
Void Ratio	0.295084	0.638277
Permeability [ft/d]	4.56377e-005	0.165429
Coefficient of Consolidation [ft <sup>2</sup> /d]	1	1
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	99.9998	100
Undrained Shear Strength	0	0.185238

# Embankments

#### 1. Embankment: "Embankment Load 1"

Embankment Load 1
(0, 0) to (0, 300)
1
90 degrees
90 degrees
110

Layer	Stage	Left Bench Width (ft)	Left Angle (deg)	Height (ft)	Unit Weight (kips/ft <sup>3</sup> )	Right Angle (deg)	Right Bench Width (ft)
1	Stage 1 = 0 d	0	14	14	0.13	18	0



# Soil Layers

Ground Surface Drained: Yes

Layer #	Туре	Thickness [ft]	Depth [ft]	<b>Drained at Bottom</b>
1	Lean Clay	14	0	No
2	Till	16	14	No



# Soil Properties

Property	Lean Clay	Till
Color		
Unit Weight [kips/ft <sup>3</sup> ]	0.125	0.135
Saturated Unit Weight [kips/ft <sup>3</sup> ]	0.125	0.135
К0	0.57	0.5
Immediate Settlement	Enabled	Enabled
Es [kst]	675	700
Esur [kst]	675	700
Primary Consolidation	Enabled	Enabled
Material Type	Non-Linear	Non-Linear
Cc	0.17	0.05
Cr	0.05	0.005
e0	0.64	0.3
Pc [ksf]	2.4	-
OCR	-	10
Cv [ft <sup>2</sup> /d]	1	1
Cvr [ft <sup>2</sup> /d]	1	1
B-bar	1	1
Undrained Su A [kips/ft2]	0	0
Undrained Su S	0.2	0.2
Undrained Su m	0.8	0.8
Piezo Line ID	1	1



# Groundwater

Groundwater method Piezometric Lines Water Unit Weight 0.0624 kips/ft<sup>3</sup>

# **Piezometric Line Entities**

ID	Depth (ft)
1	4 ft

# **Query Lines**

Line #	<b>Query Line Name</b>	<b>Start Location</b>	End Location	<b>Horizontal Divisions</b>	Vertical Divisions
1	Query Line 1	-55, 159.412	55, 159.412	5	Auto: 47

# Time Points

Point #	(X,Y) Location	Depth	Goal Type	Goal	<b>Time Until Goal</b>
1	0, 142.984	0 ft	Total Settlement	4.08 in	57.5373 d







# Slide Analysis Information Stormawater and Deicing Capacity Projects

## **Project Summary**

File Name:	Slope Stability_Hanna Basin_Undrained
Slide Modeler Version:	7.029
Project Title:	Stormawater and Deicing Capacity Projects
Analysis:	Slope Stability Analysis - Hanna Basin
Author:	SD
Company:	CTL Engineering
Date Created:	1/18/2018, 11:05:05 AM

### **General Settings**

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Failure Direction:	Left to Right
Data Output:	Standard
Maximum Material Properties:	20
Maximum Support Properties:	20

### **Analysis Options**

Slices Type:	Vertical
Analysis Methods Used	
GLE/Morgenstern-Price with interslice force function:	Half Sine
	Spencer
Number of clicocy	50
	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

### **Groundwater Analysis**

Groundwater Method:	Steady State FEA
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Tolerance:	1e-006
Maximum number of iterations:	500
Use negative pore pressure cutoff:	No
Advanced Groundwater Method:	None
Mesh Element Type:	3 noded triangles
Number of Elements:	840
Number of Nodes:	511



#### **Random Numbers**

Pseudo-random Seed: 10116 Random Number Generation Method: Park and Miller v.3

# Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	10
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

#### Seismic

Advanced seismic analysis:					
Staged pseudostatic analysis:	No				

### **Material Properties**

Property	<b>Clayey Silty Sand</b>	Lean Clay	Till	New Fill
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	125	125	135	125
Cohesion [psf]	25	1500	1000	1500
Friction Angle [deg]	28	0	25	0
Unsaturated Shear Strength Angle [deg]	0	0	0	0
Air Entry Value [psf]	0	0	0	0
Ks [feet/second]	7.2e-009	7.2e-009	1.7e-009	2e-009
K2/K1	1	1	1	1
K Angle [deg]	0	0	0	0
Groundwater Model	Simple	Simple	Simple	Simple
GW Model Properties	Soil Type: Silt	Soil Type: Clay	Soil Type: Clay	Soil Type: Silt
Unsat. Shear Strength Phi b [deg]	0	0	0	0
Unsat. Shear Strength Air Entry Value [psf]	0	0	0	0

## **Global Minimums**

#### Method: spencer



FS	3.271110
Center:	204.525, 817.318
Radius:	97.669
Left Slip Surface Endpoint:	120.727, 767.149
Right Slip Surface Endpoint:	258.623, 736.000
Resisting Moment:	2.81502e+007 lb-ft
Driving Moment:	8.60571e+006 lb-ft
Resisting Horizontal Force:	255323 lb
Driving Horizontal Force:	78053.8 lb
Total Slice Area:	3136.23 ft2
Surface Horizontal Width:	137.896 ft
Surface Average Height:	22.7434 ft

#### Method: gle/morgenstern-price

FS	3.262470
Center:	204.565, 817.379
Radius:	97.785
Left Slip Surface Endpoint:	120.675, 767.135
Right Slip Surface Endpoint:	258.781, 736.000
Resisting Moment:	2.81659e+007 lb-ft
Driving Moment:	8.63331e+006 lb-ft
Resisting Horizontal Force:	255369 lb
Driving Horizontal Force:	78275 lb
Total Slice Area:	3145.02 ft2
Surface Horizontal Width:	138.106 ft
Surface Average Height:	22.7725 ft

### Valid / Invalid Surfaces

#### **Method: spencer**

Number of Valid Surfaces:1650Number of Invalid Surfaces:0

#### Method: gle/morgenstern-price

Number of Valid Surfaces:1650Number of Invalid Surfaces:0

#### Slice Data

Global Minimum Query (spencer) - Safety Factor: 3.27111



Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base	Base Material	Base Cohesion [psf]	Base Friction Angle	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress	Pore Pressure [psf]	Effective Normal Stress	Base Vertical Stress Instl	Effective Vertical Stress
1	2 86486	026 578	57 5262	Now Fill	1500	[uegrees]	158 56	1500	254 062	970 171	25/ 062	165 558	165 558
1	2.80480	220.278	-57.5202	New Fill	1500	0	458.50	1500	234.903	-603 1/1	234.903	403.338 957 901	403.338
2	2.86486	/325.85	-54.5152	Now Fill	1500	0	458.50	1500	835 011	-363 575	835 011	1/15 8/	1/15 8/
5	2.80480	4323.83	-31.7033		1500	0	438.30	1300	855.011	-303.375	855.011	1413.04	1413.04
4	2.63581	5115.18	-49.1705	Clay	1500	0	458.56	1500	1253.78	-154.218	1253.78	1784.48	1784.48
5	2.63581	6081.02	-46.8572	Clay	1500	0	458.56	1500	1618.29	26.7779	1591.51	2107.59	2080.81
6	2.63581	6973.14	-44.6399	Lean Clay	1500	0	458.56	1500	1960.44	185.549	1774.89	2413.27	2227.72
7	2.63581	7799.88	-42.5045	Lean Clay	1500	0	458.56	1500	2282.32	328.74	1953.58	2702.58	2373.84
8	2.63581	8443.05	-40.4399	Lean Clay	1500	0	458.56	1500	2543.9	458.804	2085.1	2934.72	2475.92
9	2.63581	8880.56	-38.437	Lean Clay	1500	0	458.56	1500	2736.32	577.21	2159.11	3100.25	2523.04
10	2.76797	9769.71	-36.4406	Till	1000	25	613.067	2005.41	2843.77	687.653	2156.12	3296.43	2608.78
11	2.76797	10198	-34.4468	Till	1000	25	624.363	2042.36	3028.25	792.91	2235.34	3456.51	2663.6
12	2.76797	10573.9	-32.4995	Till	1000	25	634.785	2076.45	3196.02	887.546	2308.47	3600.41	2712.87
13	2.76797	10900.9	-30.5936	Till	1000	25	643.873	2106.18	3348.11	975.906	2372.2	3728.8	2752.89
14	2.76797	11181.8	-28.7245	Till	1000	25	651.748	2131.94	3485.25	1057.79	2427.46	3842.43	2784.64
15	2.76797	11419.2	-26.8883	Till	1000	25	658.743	2154.82	3607.91	1131.39	2476.52	3941.94	2810.55
16	2.76797	11615.2	-25.0815	Till	1000	25	664.618	2174.04	3716.68	1198.95	2517.73	4027.75	2828.8
17	2.76797	11771.7	-23.301	Till	1000	25	669.485	2189.96	3812.04	1260.17	2551.87	4100.38	2840.21
18	2.76797	11890.3	-21.5441	Till	1000	25	673.368	2202.66	3894.35	1315.25	2579.1	4160.2	2844.95
19	2.76797	11972.5	-19.8082	Till	1000	25	676.413	2212.62	3963.92	1363.45	2600.47	4207.55	2844.1
20	2.76797	12019.5	-18.091	Till	1000	25	678.516	2219.5	4021.09	1405.87	2615.22	4242.75	2836.88
21	2.76797	12032.2	-16.3906	Till	1000	25	679.678	2223.3	4066.07	1442.68	2623.39	4265.99	2823.31
22	2.76797	12011.8	-14.7048	Till	1000	25	679.91	2224.06	4099.04	1474.02	2625.02	4277.47	2803.45
23	2.76797	11958.9	-13.032	Till	1000	25	679.375	2222.31	4120.17	1498.91	2621.26	4277.42	2778.51
24	2.76797	11873.7	-11.3705	Till	1000	25	678.014	2217.86	4129.38	1517.65	2611.73	4265.72	2748.07
25	2.76797	11756.6	-9.71855	Till	1000	25	675.697	2210.28	4126.71	1531.27	2595.44	4242.43	2711.16
26	2.76797	11609	-8.07476	Till	1000	25	672.445	2199.64	4112.52	1539.86	2572.66	4207.92	2668.06
27	2.76797	11431.1	-6.43764	Till	1000	25	668.284	2186.03	4086.76	1543.31	2543.45	4162.17	2618.86
28	2.76797	11223.3	-4.80578	Till	1000	25	663.509	2170.41	4049.46	1539.52	2509.94	4105.24	2565.72
29	2.76797	10985.9	-3.17783	Till	1000	25	657.722	2151.48	4000.61	1531.24	2469.37	4037.12	2505.88
30	2.76797	10719	-1.55244	Till	1000	25	650.941	2129.3	3940.08	1518.27	2421.81	3957.72	2439.45
31	2.76797	10422.8	0.0717004	Till	1000	25	643.167	2103.87	3867.78	1500.5	2367.28	3866.98	2366.48
32	2.76797	10097.7	1.6959	Till	1000	25	634.855	2076.68	3783.79	1474.86	2308.93	3765	2290.14
33	2.76797	9744.79	3.32146	Till	1000	25	625.619	2046.47	3688.38	1444.21	2244.17	3652.08	2207.87
34	2.76797	9362.59	4.9497	Till	1000	25	615.225	2012.47	3580.69	1409.45	2171.24	3527.41	2117.96
35	2.76797	8950.72	6.58197	Till	1000	25	604.059	1975.94	3460.54	1367.62	2092.92	3390.84	2023.22
36	2.76797	8508.94	8.21962	Till	1000	25	591.77	1935.75	3327.54	1320.82	2006.72	3242.06	1921.24
37	2.76797	8036.9	9.86407	Till	1000	25	578.252	1891.53	3181.31	1269.43	1911.88	3080.76	1811.33
38	2.76797	7534.2	11.5168	Till	1000	25	563.795	1844.24	3021.55	1211.08	1810.47	2906.67	1695.59
39	2.76797	7000.32	13.1793	Till	1000	25	548.222	1793.29	2847.74	1146.52	1701.22	2719.37	1572.85
40	2.76797	6434.66	14.8531	Till	1000	25	531.441	1738.4	2659.33	1075.82	1583.51	2518.39	1442.57
41	2.76797	5836.52	16.5401	Till	1000	25	513.296	1679.05	2455.64	999.42	1456.22	2303.21	1303.79
42	2.76797	5205.07	18.242	Till	1000	25	494.24	1616.71	2236.21	913.657	1322.55	2073.31	1159.65
43	2.76797	4529.53	19.9607	Till	1000	25	474.018	1550.57	1996.35	815.663	1180.69	1824.19	1008.53
44	2.76797	3804.06	21.6983	Till	1000	25	450.255	1472.83	1731.9	717.904	1013.99	1552.73	834.83
45	2.76797	3110.72	23.4572	Till	1000	25	427.504	1398.41	1476.59	622.197	854.396	1291.09	668.891
46	2.76797	2621.48	25.2399	Till	1000	25	417.987	1367.28	1305.94	518.307	787.638	1108.9	590.592
47	2.76797	2113.62	27.0492	Till	1000	25	408.719	1336.96	1126.3	403.672	722.624	917.601	513.929
48	2.76797	1564.21	28.8881	Till	1000	25	395.957	1295.22	925.472	292.376	633.096	706.999	414.623
49	2.76797	971.055	30.7603	Till	1000	25	379.862	1242.57	701.7	181.506	520.194	475.613	294.107
50	2.76797	331.625	32.6697	Till	1000	25	362.346	1185.27	458.347	61.0262	397.32	225.995	164.969

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 3.26247



Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base	Base Material	Base Cohesion [psf]	Base Friction Angle	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress Insfl	Pore Pressure [psf]	Effective Normal Stress Insfl	Base Vertical Stress Insfl	Effective Vertical Stress Insfl
1	2.86173	934.35	-57.5204	New Fill	1500	[005:000]	459.774	1500	-383.445	-869.511	-383.445	338.824	338.824
2	2.86173	2716.95	-54.5145	New Fill	1500	0	459.774	1500	317.015	-602.799	317.015	961.941	961.941
3	2.86173	4318.72	-51.7168	New Fill	1500	0	459.774	1500	912.54	-363.458	912.54	1495.07	1495.07
				Lean		-							
4	2.63345	5110.39	-49.183	Clay	1500	0	459.774	1500	1357.26	-154.269	1357.26	1889.59	1889.59
5	2.63345	6075	-46.8739	Lean Clay	1500	0	459.774	1500	1724.16	26.6716	1697.48	2215.03	2188.36
6	2.63345	6966.1	-44.6605	Lean Clay	1500	0	459.774	1500	2055.83	185.404	1870.42	2510.18	2324.78
7	2.63345	7792.02	-42.5287	Lean Clay	1500	0	459.774	1500	2358.78	328.862	2029.92	2780.51	2451.65
8	2.63345	8441.67	-40.4676	Lean Clay	1500	0	459.774	1500	2596.53	458.974	2137.55	2988.76	2529.79
9	2.63345	8879.62	-38.468	Lean Clay	1500	0	459.774	1500	2759.18	577.411	2181.77	3124.49	2547.07
10	2.77367	9798.32	-36.472	Till	1000	25	612.48	1998.2	2828.69	688.052	2140.64	3281.44	2593.39
11	2.77367	10229.2	-34.4756	Till	1000	25	620.634	2024.8	2991.32	793.615	2197.7	3417.48	2623.86
12	2.77367	10607.4	-32.526	Till	1000	25	628.223	2049.56	3139.44	888.665	2250.77	3540.06	2651.4
13	2.77367	10936.3	-30.618	Till	1000	25	634.905	2071.36	3274.82	977.282	2297.54	3650.57	2673.29
14	2.77367	11219	-28.7468	Till	1000	25	640.849	2090.75	3398.53	1059.43	2339.1	3750.07	2690.64
15	2.//36/	11457.8	-26.9086	1111	1000	25	646.43	2108.96	3511.43	1133.28	23/8.15	3839.51	2706.23
10	2.77307	11055.1	-25.1	т:Ш	1000	25	651.448	2125.33	2707.64	1201.04	2413.27 2445.10	2000 4	2718.44
17	2.77307	11012.0	-25.5177	т:Ш	1000	25	660 128	2140.21	2701.04	1202.40	2445.10	3990.4 4052.61	2727.94
10	2.77367	1201/ 9	-10 8215	Till	1000	25	663 957	2155.08	3866.88	1366.00	2474.09	4052.01	2734.91
20	2.77367	12014.9	-19.0213	Till	1000	25	667 329	2100.14	3033 02	1/08 6/	2500.79	4100.2	2740.11
20	2.77367	12002.5	-16/1027	тіШ	1000	25	670 213	2177.14	3000 12	1400.04	2524.50	4131.17	2742.55
21	2 77367	12075.4	-14 7134	Till	1000	25	672 564	2100.33	4038	1476 99	2561.01	4214.61	2737.62
23	2.77367	12002.1	-13.0391	Till	1000	25	674.474	2200.45	4076.32	1501.97	2574.35	4232.52	2730.55
24	2.77367	11916.6	-11.3761	Till	1000	25	675.81	2204.81	4104.51	1520.76	2583.75	4240.48	2719.72
25	2.77367	11799.1	-9.72267	Till	1000	25	676.365	2206.62	4122.01	1534.42	2587.59	4237.9	2703.48
26	2.77367	11650.9	-8.07744	Till	1000	25	676.068	2205.65	4128.59	1543.04	2585.55	4224.54	2681.5
27	2.77367	11472.4	-6.43888	Till	1000	25	674.854	2201.69	4123.52	1546.5	2577.02	4199.68	2653.18
28	2.77367	11263.7	-4.80561	Till	1000	25	672.932	2195.42	4106.3	1542.69	2563.61	4162.87	2620.18
29	2.77367	11025.3	-3.17624	Till	1000	25	669.805	2185.22	4076.08	1534.38	2541.7	4113.25	2578.87
30	2.77367	10757.3	-1.54945	Till	1000	25	665.398	2170.84	4032.28	1521.38	2510.9	4050.28	2528.9
31	2.77367	10459.8	0.0761008	Till	1000	25	659.632	2152.03	3974.08	1503.56	2470.52	3973.2	2469.64
32	2.77367	10133.3	1.70171	Till	1000	25	652.895	2130.05	3901.19	1477.79	2423.4	3881.8	2404.01
33	2.77367	9778.83	3.32869	Till	1000	25	644.714	2103.36	3813.22	1447.06	2366.16	3775.72	2328.66
34	2.77367	9394.9	4.95837	Till	1000	25	634.807	2071.04	3709.08	1412.22	2296.86	3654	2241.78
35	2.77367	8981.16	6.59208	Till	1000	25	623.534	2034.26	3588.26	1370.28	2217.98	3516.21	2145.93
36	2.77367	8537.35	8.23119	Till	1000	25	610.518	1991.8	3450.27	1323.35	2126.92	3361.96	2038.61
37	2.77367	8063.14	9.87713	Till	1000	25	595.649	1943.29	3294.76	1271.87	2022.89	3191.04	1919.17
38	2.77367	7558.1	11.5313	Till	1000	25	579.274	1889.86	3121.61	1213.28	1908.33	3003.42	1790.14
39	2.77367	7021.73	13.1954	Till	1000	25	561.239	1831.02	2930.68	1148.54	1782.14	2799.09	1650.55
40	2.77367	6453.41	14.8708	Till	1000	25	541.534	1766.74	2722	1077.73	1644.27	2578.21	1500.48
41	2.77367	5852.44	16.5594	Till	1000	25	520.141	1696.94	2495.7	1001.1	1494.6	2341.05	1339.95
42	2.77367	5217.99	18.2629	Till	1000	25	497.693	1623.71	2252.33	914.788	1337.55	2088.1	1173.31
43	2.77367	4538.29	19.9833	Till	1000	25	473.985	1546.36	1988.19	816.514	1171.68	1815.83	999.319
44	2.77367	3809.25	21.7228	Till	1000	25	446.968	1458.22	1701.72	719.062	982.66	1523.65	804.584
45	2.77367	3122.66	23.4835	Till	1000	25	421.896	1376.42	1430.6	623.363	807.239	1247.3	623.937
46	2.77367	2635.87	25.2682	Till	1000	25	409.498	1335.98	1239.61	519.106	720.504	1046.32	527.213
47	2.77367	2125.26	27.0795	Till	1000	25	397.435	1296.62	1040.22	404.111	636.106	837.018	432.907
48	2.77367	1572.85	28.9206	Till	1000	25	382.51	1247.93	825.068	293.385	531.683	613.732	320.347
49	2.77367	976.436	30.795	Till	1000	25	365.523	1192.51	594.973	182.136	412.837	377.121	194.985
50	2.77367	333.468	32.7068	Till	1000	25	348.053	1135.51	351.323	60.7204	290.603	127.819	67.0987

#### Interslice Data



#### Global Minimum Query (spencer) - Safety Factor: 3.27111

Slice	X	Y coordinate - Bottom	Interslice	Interslice	Interslice
Number	[ft]	[ft]	[lbs]	[lbs]	[degrees]
1	120.727	767.149	0	0	0
2	123.591	762.647	-2461.33	-385.711	8.90629
3	126.456	758.629	-2522.39	-395.279	8.90628
4	129.321	755	-805.96	-126.301	8.90632
5	131.957	751.95	1810.03	283.647	8.9063
6	134.593	749.137	5152.84	807.493	8.90629
7	137.229	746.534	9047.04	1417.75	8.90631
8	139.864	744.119	13351.7	2092.33	8.90632
9	142.5	741.872	17857.8	2798.47	8.9063
10	145.136	739.78	22373.3	3506.08	8.90629
11	147.904	737.737	26488.4	4150.96	8.90631
12	150.672	735.838	30509.7	4781.13	8.9063
13	153.44	734.075	34388.5	5388.96	8.90628
14	156.208	732.438	38085.7	5968.35	8.9063
15	158.976	730.921	41568.8	6514.18	8.9063
16	161.744	729.518	44809.4	7022.02	8.90631
17	164.512	728.222	47785	7488.31	8.90629
18	167.28	727.03	50476.4	7910.08	8.9063
19	170.048	725.937	52868.4	8284.93	8.9063
20	172.816	724.94	54948.2	8610.84	8.90629
21	175.584	724.036	56706.2	8886.34	8.9063
22	178.352	723.222	58135.4	9110.31	8.9063
23	181.119	722.495	59231.2	9282.02	8.90629
24	183.887	721.855	59990.5	9401.01	8.90629
25	186.655	721.298	60412.4	9467.14	8.9063
26	189.423	720.824	60498.6	9480.63	8.90629
27	192.191	720.431	60252.3	9442.05	8.9063
28	194.959	720.119	59679.1	9352.21	8.90629
29	197.727	719.886	58785	9212.1	8.90629
30	200.495	719.733	57579.4	9023.17	8.90629
31	203.263	719.658	56073.3	8787.15	8.90629
32	206.031	719.661	54279.7	8506.09	8.9063
33	208.799	719.743	52212.5	8182.14	8.9063
34	211.567	719.904	49888.4	7817.93	8.90629
35	214.335	720.143	47327.3	7416.58	8.90629
36	217.103	720.463	44550.1	6981.38	8.9063
37	219.871	720.862	41581.8	6516.21	8.90629
38	222.639	721.344	38450.1	6025.46	8.90631
39	225.407	721.908	35185.5	5513.87	8.90631
40	228.175	722.556	31822.4	4986.83	8.90628
41	230.943	723.29	28399.3	4450.41	8.9063
42	233.711	724.112	24960.1	3911.45	8.90628
43	236.479	725.024	21552	3377.38	8.9063
44	239.247	726.03	18233.1	2857.28	8.9063
45	242.015	727.131	15079.3	2363.06	8,90632
46	244.783	728.332	12122.6	1899.71	8.90628
47	247.551	729.637	9261.61	1451.37	8.90628
48	250.319	731.05	6538.53	1024.64	8.90627
49	253.087	732.578	4029.18	631.406	8.90629
50	255.855	734.225	1821.8	285.491	8.90628
51	258.623	736	0	0	0

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 3.26247



Slice	х	Y	Interslice	Interslice	Interslice
Number	coordinate	coordinate - Bottom	Normal Force	Shear Force	Force Angle
	[ft]	[ft]	[lbs]	[lbs]	[degrees]
1	120.675	767.135	0	0	0
2	123.537	762.64	-3041.31	-38.2197	0.71999
3	126.398	758.626	-3086.28	-77.4055	1.43671
4	129.26	755	-1095.15	-41.055	2.1469
5	131.894	751.951	1830.77	89.2801	2.7919
6	134.527	749.139	5465.98	327.249	3.42622
7	137.16	746.537	9603.7	679.548	4.04744
8	139.794	744.121	14089	1146.76	4.65327
9	142.427	741.875	18710	1716.4	5.24147
10	145.061	739.782	23270.7	2367.82	5.80991
11	147.835	737.732	27369.3	3062.7	6.38499
12	150.608	735.828	31342.7	3811.55	6.93363
13	153.382	734.059	35150.9	4598.84	7.45375
14	156.156	732.417	38763.2	5408.75	7.94337
15	158.929	730.896	42154.1	6225.31	8.40071
16	161.703	729.488	45301.7	7032.58	8.82409
17	164.477	728.189	48188.4	7815.18	9.21201
18	167.25	726.993	50799.1	8558.38	9.5631
19	170.024	725.897	53121	9248.37	9.87621
20	172.798	724.898	55142.8	9872.36	10.1503
21	175.571	723,991	56855.5	10418.9	10.3844
22	178.345	723.175	58251.5	10878.1	10.5778
23	181.119	722.446	59324.6	11241.4	10.7297
24	183,892	721.804	60069.7	11502.4	10.84
25	186.666	721.246	60483.3	11656	10.908
26	189 44	720 771	60563.7	11699 7	10 9337
27	192 213	720 377	60311.2	11632 5	10 9168
28	194 987	720.064	59727.6	11455 9	10.8576
20	197 761	719 831	58816.1	11173 2	10.7562
30	200 534	719.631	57583.2	10789 7	10.6128
31	200.334	719.602	56037.7	10703.7	10.0120
32	205.500	719.605	54191	9752 74	10.4273
32	200.002	719.688	52056 1	911972	9 9365
24	208.855	719.000	19650 1	9119.42	9.9303
25	211.023	719.849	49030.4	7695 69	0 20012
35	214.403	720.03	40334.7	7085.08 6014	9.28813
27	217.170	720.41	44112.7	6126.27	8.90778
20	219.95	720.812	41032.7	5228.20	8.49100
20	222.724	721.294	37707.2	JJJJ0.JJ	0.04125 7 EE 921
39	223.497	721.00	20047.2	4505.97	7.55621
40	220.271	722.511	30947.2	3824.11	7.04427
41	231.045	723.247	27438.3	3120.88	0.5014
42	233.818	724.072	23935.4	2486.84	5.93163
43	236.592	724.987	20491.5	1914.36	5.3372
44	239.366	/25.996	1/109.8	1417.79	4.72047
45	242.139	/2/.101	14047.9	1002.99	4.08387
46	244.913	728.306	11152.1	668.435	3.43009
47	247.687	729.615	8391.82	404.815	2.76176
48	250.46	731.033	5812.85	211.288	2.0817
49	253.234	732.566	3486.1	84.7572	1.39275
50	256.008	734.219	1487.33	18.1168	0.697871
51	258.781	736	0	0	0

# List Of Coordinates

#### **External Boundary**



Х	Y
0	755
0	751
0	749.5
0	742
0	700
730	700
730	746
730	751
730	759
678	759
638	769
625	769
594.032	759
536.869	740.541
523	736
243	736
236.769	738
183.806	755
140	769
128	769
73	755

#### **Material Boundary**

х	Y
0	749.5
70	749.5
70.8182	751
73	755

### **Material Boundary**

х	Υ
678	759
683	751
730	751

#### **Material Boundary**

х	Y
0	742
68	742
207	738
236.769	738

#### **Material Boundary**

х	Y
536.869	740.541
703	746
730	746

#### **Material Boundary**

х	Y
73	755
183.806	755

#### **Material Boundary**



Х	Y
594.032	759
678	759

#### **Material Boundary**

Х	Υ
0	751
70.8182	751
140	751

#### **Material Boundary**

Х	Υ
625	751
683	751














R0 andress lained by red Water in Baserieton Of Material Description Of Material Baserieton Of Material Laries Description (Control of Material Baserieton Of Ma	Big         Big <th>By Plane to final the second second</th> <th>Statistics         Borney Market         Borney Mark</th>	By Plane to final the second	Statistics         Borney Market         Borney Mark
Other sponse & ANALAS CONSULT United United Constrained and a presence over Advices Advi	10/95 10/24 - min counting a set & all accord in a source age of Act (a) 10/95 10/24 - min counting a set & all 10/95 10/24 - min counting a set (b) 10/25 10/24 - min counting a se	1.155 URAN Territory of the Status Conception and the Status Conceptio	16/35 10/20 - Print Collaboration of Languages
a a a a a a a a a a a a a a a a a a a		A155	11/265 100 100 1000 1000 1000 A & Lab No. 44 10 100
de date date	12:05	Erits Internet of A text series Internet of	12/08 4 1 13/43 1 13/1
H STYT DDAT with promote and same terms - H Text - main pay Adv. Lie No. 20223 Text - DDAT	14/05 UK COUP very fance very cy (final very ing)	5/55	14/55 2020
	DBC DF SOMET 60 2.000 DF 4.3004 DF Deally = 1.54.407	655 m	15/55 10/10 10 10 10 10 10 10 10 10 10 10 10 10 1
HETY CAM with not used 6 bit series - 73,8,645	Der Dereiter = 122.Quet 1966 Co. 2 Mart Org Dereiter = 122.Bert Org Dereiter = 122.Bert		16/35 2010 10 000 00 00 00 00 00 00 00 00 00 00 00
en User Glammin      Buring Barmin 4-5-03     Drawn An EW     Accross P(L)     work biring     Buring Barmin 4-5-03     Office Indianes Fau: 25038     work biring     Buring Barmin 4-5-03     Office Indianes     Fau: 25038     Sale: Series John Section 4-5     Sale: Series Section 4-5     Sale: Series Section 4-5	"Savet (B. 20" Makeda resons of super- Works: Charry, M <sup>5</sup> ." Nexe: The stratificance live indicatal forein are specialized in the time between soft types may be griduled	Bits (and Deminant)         Energ Samet: 3-14-03         Demin ty BM         Approve: PSL           10 1/2	***Convert 0-421 (damang berown of Augent.           Watter: During 2014           Name: The entrational behavior berowing and hyper new to

( P.IS		INDIANA	SCALE	BRIDGE FILE 1-70-73-8533
(10 Barriers 20) No.	FOR APPROVAL DESIGN ENGINEER DATE	DEPARTMENT OF TRANSPORTATION	UNLESS NOTED	DESIGNATION 9910310
(19600442) BAR 0 S	DESIGNED, TDJ DRAWN SJM	1 A. A. MANTAN	SURVEY BOOK	SHEETS
To One The Contract of the Con	CHECKED MHZ CHECKED: TDJ	SOIL BORINGS	CONTRACT B-26922	PROJECT

YREFERENCES - TITLES FILE NAME : P\\Beege\Bridge\BSUU\Paus\BSUI-SOL BORRAS-Zareg

Damis         Bench Michanel M Gaade & Dingles, Inc.         Amr. P. 197.2         Barry Ling         Phofessional           Harr Type Max (BC/2017)         Discribition Michanel Michanel Merris VI (M Harris Michanel Michael Mich	Open         Product Notification of Bands & Disciples, Inc.         Product Notification of Bands & Disciples, Inc. <th>Annu Annu Annu Annu Annu Annu Annu Annu</th> <th>Device         Image: Probability of PTE-0.1         Image: Probability of PTE-0.1           Present: Publish No.15 PTE-0.1         Lamme 10 PTE-0.1         Lamme 10 PTE-0.1           Present: Publish No.15 PTE-0.1         Lamme 10 PTE-0.1         Lamme 10 PTE-0.1           Present: Publish No.15 PTE-0.1         Lamme 10 PTE-0.1         Lamme 10 PTE-0.1           Present: Publish No.15 PTE-0.1         Description CH Material         Lamme 10 PTE-0.1           Present: Publish No.15 PTE-0.1         Description CH Material         Description CH Material           Present: Publish No.15 PTE-0.1         Control Publish No.15 C MBR PTE-0.1         Description CH Material           1055         Present: Publish No.15 C MBR PTE-0.1         Description CH Material         Description CH Material           1055         Present: Publish No.15 C MBR PTE-0.1         Description CH Material         Description CH Material           1055         Present: Publish No.15 C MBR PTE-0.1         Present: Publish No.15 C MARK         Description CH Material           0.055         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK           0.055         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK           0.055         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK         Present:</th> <th>HEGHE 1 2 Yourner TE-1200 Professional Service Industries, Inc. Service Industries, Inc. Servic</th> <th>Owner         Owner           Precision Boreclashing of Cuscles &amp; Dougles           Precision Boreclashing of Cuscles &amp; Dougles           The Precision Boreclashing of Cuscles Research Resea</th> <th>Image: Display of the second second</th> <th>1205 Professional Service Industries, Inc.</th>	Annu Annu Annu Annu Annu Annu Annu Annu	Device         Image: Probability of PTE-0.1         Image: Probability of PTE-0.1           Present: Publish No.15 PTE-0.1         Lamme 10 PTE-0.1         Lamme 10 PTE-0.1           Present: Publish No.15 PTE-0.1         Lamme 10 PTE-0.1         Lamme 10 PTE-0.1           Present: Publish No.15 PTE-0.1         Lamme 10 PTE-0.1         Lamme 10 PTE-0.1           Present: Publish No.15 PTE-0.1         Description CH Material         Lamme 10 PTE-0.1           Present: Publish No.15 PTE-0.1         Description CH Material         Description CH Material           Present: Publish No.15 PTE-0.1         Control Publish No.15 C MBR PTE-0.1         Description CH Material           1055         Present: Publish No.15 C MBR PTE-0.1         Description CH Material         Description CH Material           1055         Present: Publish No.15 C MBR PTE-0.1         Description CH Material         Description CH Material           1055         Present: Publish No.15 C MBR PTE-0.1         Present: Publish No.15 C MARK         Description CH Material           0.055         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK           0.055         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK           0.055         Present: Publish No.15 C MARK         Present: Publish No.15 C MARK         Present:	HEGHE 1 2 Yourner TE-1200 Professional Service Industries, Inc. Service Industries, Inc. Servic	Owner         Owner           Precision Boreclashing of Cuscles & Dougles           Precision Boreclashing of Cuscles & Dougles           The Precision Boreclashing of Cuscles Research Resea	Image: Display of the second	1205 Professional Service Industries, Inc.
14.1/2         wire billing         mong Cerement         3/12.03         other billing         mong Cerement         3/12.03         other billing         mong Cerement         5/12.03         other billing         mong Cerement         Mon	Hones the Uter Manage denoted in water. Concern, 60%	Altern serve and Types carry to produce	331/2 who stells 60*** 0 a sometime is a sometime is a sometime is a sometime is a sometime. The set of the sometime is a sometime is a sometime in the set of the sometime is a sometime in the set of the solution is a sometime in the set of the solution is a sometime in the set of the solution is a solution in the solution in the solution is a solution in the solution in the solution is a solution in the solution in the solution is a solution in the solution is a solution in the solution in the solution is a solution in the solution in the solution is a solution in the solution in the solution in the solution is a solution in the solution in the solution is a solution in the solution in the solution in the solution is a solution in the solution in the solution in the solution is a solution in the solution in the solution in the solution is a solution in the solution in the solution in the solution is a solution in the solution	17402 Other Indiana Ten 212038     One ML Ress     of eith pair protocol of either and	A factory CREARE TS 	ng menenia af kagent	er son types may be gradue
					1		_
				Location Location	Location Bent No.1	110 Bent Nos. 2,3&4	Bent No.5
				Factor of	Sofety 2	2	2
				Factored Design	Loads (Tons) 220	220	220
				Friction in Scour	Zone (Tons) N/A	N/A	N/A
				Down Drog Frid	tion (Tons) N/A	N/A	N/A
				Ultimate Loc	d (Tons) 220	220	220
					Note: 1 PDA Test Pile is Requived Required of Either Bent No.	at Bent Na.1 and t PDA Test F 2, Bent Na.3 or Bent Na.4.	še is
			1		NDIANA	SCALE	BRIDGE
		No.	RECOMMENDED FOR APPROVAL DESIGN ENDINE	ER DAVE DEPARTMENT	NDIANA OF TRANSPORTATIO	SCALE 3/8" - 1"=0 UNLESS NOTED	BRDCE 1-70-73 DESIGN 99102
		(1) 0. 453 No. 19800442 Ring of	RECOMMENDED FOR APPROVAL DESIGNED. TDJ ORANY.	ER DEPARTMENT	NDIANA OF TRANSPORTATIC	SCALE 3/8" = 1"-0. UNLESS NOTED SURVEY BOOK	9910 5 d

CONTRACT B-26922

THEFTHERE : THE AND PLANED PLANED FOR A STRUCTURE AND A STRUCT



