



100 North Senate Avenue, Room 1275 Indianapolis, Indiana 46204 www.srf.in.gov

#### **MEMORANDUM**

TO: US EPA

FROM: **Indiana Finance Authority** 

DATE: February 23, 2018

RE: Fort Wayne AIS waiver request

Attached please find a request from the City of Fort Wayne for a project specific waiver from the American Iron and Steel Act.

The Fort Wayne Three Rivers Protection and Overflow Reduction Tunnel will install large diameter tunnels to alleviate the combined sewer overflow problems in the City of Fort Wayne by 90%, and allow Fort Wayne to comply with a Consent Decree. When complete, the tunnels will hold approximately 800 million gallons of untreated waste from area rivers and convey the wastewater to the Fort Wayne Water Pollution Control Plant. The project will improve the water quality of the St Mary River, the Maumee River and Lake Erie.

The construction of the tunnels includes precast concrete segmental tunnel liner panels, which require reinforcement from steel fibers. As outlined in the attached information from Fort Wayne and their contractor, Salini Impregilo/ Lane Joint Venture (SIL-JV), the steel fibers necessary for the proper construction of segmental tunnel liner panels are not currently produced in the United States.

As outlined in the attached letter from Bekaert, the leading supplier of the required steel fibers, In recognition of the recent "Buy America" compliance requirements, Bekaert has recently installed a Dramix® line at the Bekaert, Shelbyville KY plant... The decision to convert this line into a glued fiber production line has been taken in October 2017 and we target to be operational with glued fiber production by the end of the second quarter of 2018.

To comply with the construction schedule, the contractors will need to purchase 25% of the segmental tunnel liners manufactured using foreign steel fibers. If the domestic fibers are available at the end of second quarter of 2018, as expected, the contractors will then procure the remaining 75% of segmental tunnel liners from the domestic source.

Without this project specific waiver, the construction schedule will need to be delayed, which could impact the City's ability to meet the requirements of their Consent Decree and extend the time the City's collection system discharges untreated sewage to the environment during rain events.

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THOMAS C. HENRY, MAYOR



February 19, 2018

Sent by Email

Amy Henninger Compliance Officer Indiana State Revolving Fund 100 North Senate Avenue, Rm. 1275 Indianapolis, IN 46204

Dear Ms. Henninger:

Fort Wayne City Utilities is sending the following correspondence relative to the American Iron and Steel (AIS) Provisions under the Indiana State Revolving Loan Program for the Tunnel and Shafts portion of the Three Rivers Protection and Overflow Reduction Tunnel (3RPORT) project.

The 3RPORT project includes the Tunnel and Shafts project, the Deep Dewatering Pump Station project and seven Consolidation Sewer projects. The 3RPORT project is being completed as a part of the requirements to comply with a Consent Decree executed in 2008 with the US Environmental Protection Agency, the Indiana Department of Environmental Management and the US Department of Justice.

The Tunnel and Shafts project consists of 24,500 feet of 16-foot finished diameter tunnel, a 33-foot diameter working shaft, a 66-foot diameter deep dewatering pump station shaft, a 30-foot diameter retrieval shaft (that includes a drop structure), seven drop shafts with adit tunnel connections, one diversion structure and consolidation sewer, and four vent shafts.

The contractor, Salini Impregilo/Lane Joint Venture (SIL-JV, and formerly known as Salini Impregilo/Healy Joint Venture), has formally requested relief from the AIS provisions on the basis of iron and steel products are not produced in the United States in sufficient and reasonably available quantities. This waiver request is specifically related to the steel fiber reinforcement to

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be used in the production of precast concrete segmental tunnel liner panels that will serve as a liner for the tunnel. The precast concrete segmental tunnel liner panels are being manufactured domestically and provided by CSI Tunnel Systems-Forterra, JV. A copy of their letter endorsing the contractor's request for a waiver is attached (Attachment 1). The letter includes a discussion of domestically produced steel fibers and also the issue regarding use of loose steel fibers vs. glued steel fibers. Further they provide a list of steel fiber suppliers (Attachment 2), and both a position paper on fibers for tunnel liners (Attachment 3) and a letter regarding fiber availability by Bekaert (Attachment 4).

Fort Wayne City Utilities has followed the waiver process outlined in the Implementation of American Iron and Steel Provisions issued by the US EPA Office of Wastewater Management and Office of Ground Water and Drinking Water, dated March 20, 2014. AIS requirements were incorporated within the bidding documents advertised on November 11, 2016 and November 18, 2016. The Advertisement for Bids is included in the bidding documents. Volume 1 of 2 of the Project Manual is attached and also includes:

- Attachment I Required Contract Provisions Related to American Iron and Steel (Attachment 5)
- Attachment J Required Certification from Contractor Related to American Iron and Steel (Attachment 6)
- Supplementary Condition SC-GC-6.09 M. Buy American Provision (Attachment 7)

Bids were received and opened on February 17, 2017. The bids were reviewed and then subsequently awarded to SIL-JV on April 5, 2017 in the amount of \$187,663,000.00 which included the Base Bid and Alternate B (copy of the Award, Attachment 8, and Bid Tab, Attachment 9, attached). A Notice to Proceed was issued to SIL-JV on May 1, 2017 and is attached (Attachment 10). The contractor is obligated to have the work at Substantial Completion on July 29, 2021 and Final Completion on October 27, 2021.

Steel reinforcement in the precast concrete segmental lining was addressed in Specification Section 31 74 16.11 Precast Concrete Segmental Tunnel Lining. The specification was modified during the bidding period by Addendum No. 3 to allow steel fibers as reinforcement for the precast concrete segmental lining. A copy of the specification that was modified by Addendum No. 3 is a part of the contractor's request for the waiver.

This letter serves as Fort Wayne City Utilities' formal request for relief from the AIS requirements for the steel fiber reinforcement to be utilized for the precast concrete segmental tunnel liner panels for the 3RPORT Tunnel and Shafts project. Fort Wayne City Utilities believes that not waiving this requirement may well lead to a delay in our construction schedule that could potentially impact our ability to meet our Consent Decree requirement. A delay in the

project will also likely lead to additional costs to the project that will create an additional burden on the ratepayers of Fort Wayne, Indiana.

Sincerely,

Matthew Wirtz, PE

Deputy Director

# Enclosed List of Attachments:

Attachment 1	Precast Concrete Segmental Liner Manufacturer's Letter Endorsing					
	Contractor's Request for Waiver					
Attachment 2	List of Steel Fiber Suppliers					
Attachment 3	Position Paper on Fibers for Tunnel Liners					
Attachment 4	Letter Regarding Fiber Availability by Bekaert					
Attachment 5	Attachment I Required Contract Provisions Related to American Iron and					
	Steel					
Attachment 6	Attachment J Required Certification from Contractor Related to					
	American Iron and Steel					
Attachment 7	Supplementary Condition SC-GC-6.09 M. Buy American Provision					
Attachment 8	Notice of Award					
Attachment 9	Bid Tab					
Attachment 10	Notice to Proceed					

# Attachment 1

Precast Concrete Segmental Liner Manufacturer's Letter
Endorsing Contractor's Request for Waiver



76003-RFI-017 – Waiver Request for Steel Fiber Reinforcement of Pre-Cast Concrete Segmental Tunnel Liners

Please see attached letter received by SIHJV regarding the Availability Waiver Request from the American Iron and Steel (AIS) Requirements for Steel Fiber Reinforcement of Pre-Cast Concrete Segmental Tunnel Liners for the City of Fort Wayne, Three Rivers Protection & Overflow Reduction Tunnel (3RPORT), dated November 8, 2017.



November 8, 2017

**Salini Impregilo / Healy JV** 1707 S. Harrison Street Fort Wayne, Indiana 46802

Attention: Mr. Manfred Lechner, Project Manager

RE: Availability Waiver Request from the American Iron and Steel (AIS)
Requirements for Steel Fiber Reinforcement of Pre-cast Concrete Segmental
Tunnel Liners for the City of Fort Wayne, Three Rivers Protection & Overflow
Reduction Tunnel (3RPORT)

Dear Mr. Lechner,

CSI-Forterra Fort Wayne JV ("CSI") respectfully requests an availability waiver from the State Revolving Fund American Iron and Steel ("AIS") requirements of the Clean Water Act, specific to steel fiber reinforcement for use in the precast concrete segmental tunnel liner for the City of Fort Wayne, Indiana, Three Rivers Protection and Overflow Reduction Tunnel ("3RPORT") Project. In accordance with the United States Environmental Protection Agency's (USEPA) AIS waiver process, the City of Fort Wayne should submit this waiver application to the State of Indiana, who should submit this waiver application to the USEPA for final action.

The steel fiber reinforcement specification for this project cannot be achieved while still satisfying the AIS requirement in the contract documents. The conformed specifications for the Precast Concrete Segmental Tunnel Lining, Section 31 74 16.11-6 Part 2 Products 2.1 A.3 Steel Fiber Reinforcement, calls for:

# 3. Steel fiber reinforcement:

- a. Conforming to ASTM A820.
- b. Fibers shall be domestically produced and comply with the requirements of the American Iron and Steel provisions.
- c. Do not use loose steel fibers that may cause balling during mixing.

The complete specification section 31 74 16 is attached in Exhibit A. The AIS requirements for the project are provided in Exhibit B.

# **Domestically Produced Steel Fibers**

Through our search for domestically produced steel fibers we identified domestic suppliers of loose steel fibers, but these fibers are used primarily for industrial concrete floor applications. These domestic loose fibers have never been used in segmental tunnel liners nor are they designed to be used in tunnel liners. Specifically we have found fibers that are produced by Helix in the US or are starting to be produced in the US by Bekaert-Maccaferri. The attached chart in Exhibit C shows the current specification and the different characteristics from the major overseas and domestic material supplier alternatives. In addition, the fibers from Helix do not meet the required contract specification, do not meet our production requirements, nor can they demonstrate any experience in the use of high performance steel fiber reinforced concrete for precision precast concrete tunnel liners. The proven technology of hooked end steel fiber concrete for use in precast concrete tunnel liners originates from Europe where the first tunnel liners were developed using Bekaert Dramix fibers in the 1990's.

# **Glued Steel Fibers**

The specifications call for not using loose steel fibers that may cause balling during mixing. The only steel fibers recommended for tunnel liners that do not cause balling during mixing, and the industry standard for use in segmental tunnel liners, are glued steel fibers in clips. (See Exhibit D for a comparison of the fiber types).

Loose steel fibers are known to exhibit problems with fiber balling and uneven distribution in the concrete mix. Bekaert, the major global supplier of loose and glued steel fibers, markets and promotes only glued steel fibers for reinforcement in precast tunnel liners, "to avoid fibers balling during mixing and ensure that the fibers are evenly spread throughout the concrete mix". See Exhibit E for a sample of Bekaert's commentary on this matter.

Bekaert, the leading foreign supplier of glued steel fibers used in segmental tunnel liners, recently started manufacturing only loose steel fibers in the U.S. for the industrial flooring market. Bekaert has shared plans to install a glued steel fiber reinforcement line in the U.S. to produce steel fibers for tunnel liner applications by end of the second quarter of 2018. (Bekaert letter is attached in Exhibit F). Until this domestic source of steel fibers is available, an AIS waiver will be required to manufacture tunnel liners for the 3RPORT project. Based on the current segment production schedule for the 3RPORT project, approximately 25% of the segmental tunnel liners would be manufactured using foreign steel fibers if the Bekaert domestically produced steel fiber becomes available as planned. The result would be that approximately 75% of the precast concrete segmental tunnel liners will be produced in full compliance with the project technical specifications and the AIS requirements.

There is precedent for EPA waivers for use of foreign steel fibers on tunnel segment projects. The EPA granted waivers for the Dugway Project for the Northeast Ohio Regional Sewer District in July 2015 and the Blacklick Creek Sanitary Interceptor Sewer Project for City of Columbus, Ohio in November 2016. The EPA through their engineering and market analysis, concluded in agreement with the tunneling industry,

that the use of glued steel fibers is most prudent for applications involving segmental tunnel liners.

Using steel fiber reinforcement on the 3RPORT project cannot be achieved while still satisfying the AIS requirement in the contract documents until a domestic source of glued steel fiber reinforcement suitable for tunnel linings is available. Seeking a waiver from the EPA is the only option to meet the contract document requirements and without the Owner assuming significant risk and responsibility for performing the extensive research, prototyping, and testing associated with using alternatives, if any. We respectfully request that the City of Fort Wayne and the State of Indiana submit an availability waiver application to the USEPA for a waiver from the American Iron and Steel ("AIS") requirements specific to steel fiber reinforcement for use in the precast concrete segmental tunnel liner for the 3RPORT Project.

Sincerely,

Leonard A. Worden

CEO

# **EXHIBIT A: Precast Concrete Segmental Tunnel Lining**

### SECTION 31 74 16.11

# PRECAST CONCRETE SEGMENTAL TUNNEL LINING

#### PART I GENERAL

#### 1.1 SCOPE

A. This Section specifies requirements for the design, fabrication, and erection of bolted and doweled, gasketed, precast concrete segments as support for the tunnel boring machine (TBM) excavated tunnel and to serve as the final lining. Requirements for tunnel excavation by TBM and segment tail void grouting are specified elsewhere.

#### 1.2 RELATED SECTIONS

- A. Section 03 21 10 Steel Reinforcement.
- B. Section 03 30 00 Cast-in-Place Concrete.
- C. Section 31 09 13 Geotechnical Instrumentation and Monitoring.
- D. Section 31 71 26 Rock Tunneling.
- E. Section 31 73 13 Tunnel and Shaft Grout.
- F. Section 31 74 14 Concrete in Shafts and Tunnels.

#### 1.3 REFERENCES

- A. American Concrete Institute (ACI):
  - 1. 347: Guide to Formwork for Concrete.
  - 2. 350: Code Requirements for Environmental Engineering Concrete Structures.
  - 3. 517.2R: Accelerated Curing of Concrete at Atmospheric Pressure State of the Art.
  - 4. 533R: Guide for Precast Concrete Wall Panels.
- B. American Plywood Association (APA)
- C. American Society for Testing and Materials (ASTM) International:
  - 1. A325: Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - 2. A490: Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
  - 3. A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
  - 4. A820: Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.
  - 5. A1064: Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
  - 6. C39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

- 7. C128: Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
- 8. C1116: Specification for Fiber-Reinforced Concrete and Shotcrete.
- 9. C1550: Standard Test Method for Flexural Toughness of Fiber Reinforced Concrete.
- 10. C1609: Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading).
- 11. D395: Standard Test Methods for Rubber Property Compression Set.
- 12. D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension.
- 13. D471: Standard Test Method for Rubber Property Effect of Liquids.
- 14. D573: Standard Test Method for Rubber Deterioration in an Air Oven.
- 15. D1149: Standard Test Methods for Rubber Deterioration Cracking in an Ozone Controlled Environment.
- 16. D2240: Standard Test Method for Rubber Property Durometer Hardness.
- 17. D6048: Standard Practice for Stress Relaxation Testing of Raw Rubber, Unvulcanized Rubber Components, and Thermoplastic Elastomers.

# 1.4 DEFINITIONS

- A. Precast Concrete Segments (Precast Tunnel Lining): Support system designed for specified construction and handling, ground and groundwater loads comprising bolted and doweled, gasketed, reinforced precast concrete segments erected as a ring within the TBM tail shield, that serves as the initial support and final lining, and against which the TBM thrusts in order to perform tunnel excavation.
- B. Circumferential Joints: Joints between adjacent segment rings, perpendicular to the direction of the tunnel.
- C. Leading Edge: The edge of the segment ring against which the TBM thrusts.
- D. Radial Joints: Joints between adjacent segments within the same ring, parallel to the direction of the tunnel.
- E. Lost Ground: As defined elsewhere.
- F. Gap: Distance between segment edges at joints, dependent in part on the amount of gasket compression and packing thickness.
- G. Gasket: Mechanical seal that is installed in a groove between two segments to prevent leakage between the two segments while under compression.
- H. Packing: Load-distributing elements cut to the geometries of the radial or circumferential joints in which they are placed. The term "packing" does not mean "shimming" as used herein.
- I. Proof Grouting: As defined elsewhere.
- J. Tail Void Grouting: As defined elsewhere.

### 1.5 SUBMITTALS

A. All submittals shall be made in accordance with Section 01 33 00 – Submittal Procedures.

#### B. Product Data:

- 1. Manufacturer's product data sheets, including recommendations and requirements for handling, storage, and protection. Provide:
  - a. Three samples each of gaskets, gasket adhesive, packing, inserts, grout sockets, steel fibers, and each type of connection.
  - b. Gasket information including test data demonstrating ability to meet specified performance criteria.
  - c. Gasket lubricant.
  - d. Concrete mix design.

# C. Shop Drawings:

- 1. Shop drawings shall be stamped by a Professional Engineer licensed in the State of Indiana.
- 2. Fully dimensioned details of precast concrete segment geometries and features comprising:
  - a. Layout and size of each segment.
  - b. Number of segments per ring.
  - c. Taper configuration.
  - d. Key configuration.
  - e. Concrete grade and type.
  - f. Reinforcement.
  - g. Joint configuration connection and details.
  - h. Bolts, dowels, or other positively interlocking elements.
  - i. Gaskets and gasket grooves.
  - j. Packing, if used.
  - k. Grout sockets/ports or grout port with combined lifting socket, if used.
  - 1. Segment identification information.
  - m. Shear pockets or lifting sockets.
- 3. Details for construction of each type of mold used to cast the precast concrete segments. Include for each type of segment:
  - a. The number of molds to be fabricated.
  - b. Details for securing embedded items in place during casting.
  - c. Form release geometry.
  - d. Mold tolerances.
- D. Manufacture of Segments: No later than 90 days prior to the start of segment production, submit the following:
  - 1. Shop drawings providing physical description and properties of the precast concrete segment lining design, including details and dimensions for the manufacture, transportation, and erection of the segments. Include details of lifting segment points for transport into tunnel and erection.
  - 2. Supporting design calculations demonstrating compliance with specified performance criteria, and complete information and details. Include calculations for the handling, stacking, transport, and installation load cases, joint design and reinforcement details for applied loads, and design of the gasket groove for the selected gasket. Include structural calculations specifying minimum compressive strengths when segments may be cured.

stripped from molds, handled, stacked, transported, and erected. Calculations demonstrating the ability of the segments to handle design loads in conjunction with:

- a. Gasket line loads developed at the expected gaps. Integrate with other information including maximum accumulative packing limits for longitudinal and circumferential joints, where used, and line loads where no packing is used.
- b. The Contractor's means and methods to achieve the leakage criteria limits under the given hydrostatic and segment tail void and proof grouting pressures, adjusted by the factor of safety specified herein.
- c. Temporary construction loads, such as handling, transporting, and erecting and TBM jacking, with and without full benefit of segment tail void grouting, and other loads as may be applied during construction of the final precast tunnel lining.
- 3. All calculations shall be stamped by a Professional Engineer licensed in the State of Indiana, whose qualifications are as specified herein.
- 4. Details of segment production, comprising:
  - a. Name, address, and contact information for the segment manufacturer.
  - b. Location of casting and storage yards.
  - c. Means and methods for:
    - 1) Casting, curing, and demolding segments.
    - 2) Affixing segment gaskets and packing, if used.
    - 3) Handling and storing segments.
    - 4) Measuring segments to show they meet the tolerances shown in the Contract Documents.
  - d. Segment production schedule.
- 5. Delivering, handling, storing, and protecting of segments, gaskets, and appurtenant items.

# E. Working Drawings and Method Statements:

- 1. Erection method and details integrated with the requirements of Related Sections. Include calculations showing ability of the segments, both individually and as an erected ring, to handle TBM thrust loads.
- Details that show integration of the segment lining with initial support and final lining at shafts, portals, and connections Adits. Provide separate details, sequence drawings and calculations for temporarily supporting or removing segments as part of detailed break-in or break-out work sequences.
- 3. Details of segment repair and patching, comprising:
  - a. Detailed procedure for process of repairing segments during fabrication and installation.
  - b. Detailed procedure for repairing segments after temporary supports at connection locations as may be warranted based on Contractor's means and methods.

## F. Quality Control:

- 1. Qualifications:
  - a. Segment manufacturer.
  - b. Segment designer.
  - c. Test laboratory.
- 2. Certifications:
  - a. Certificates of Compliance for materials specified in Part 2 herein.
  - b. By segment manufacturer: that precast concrete segments meet minimum fabrication criteria specified.

- c. Separately, by segment designer and segment manufacturer: that precast concrete segments are capable of accommodating storage, transportation, handling, erection, TBM thrust, and grouting loads.
- 3. Quality Control Plans:
  - a. Segment Fabrication:
    - 1) Methods for measuring and assuring that specified tolerances are met with due consideration for thermal, moisture, and ambient temperature influences.
    - 2) Methods for testing and sampling to verify minimum required compressive strength before stripping. Quality control will be provided by Contractor, and QA and acceptance testing will be provided by Engineer at the precast plant.
    - 3) Methods for controlling shrinkage and temperature cracking.
    - 4) Record keeping and procedures for resolving quality defects.
    - 5) Concrete mixes and batching. Include:
      - a) Methods for testing fiber reinforced concrete.
      - b) Methods for assuring a uniform distribution of fibers.
  - b. Segment Protection: Methods for protecting segments and appurtenances from damage while handling, transporting, storing, installing, and maintaining during construction.
  - c. Segment Ring Mockups: Measurements assuring compliance with specified and submitted tolerances and segment interchangeability requirements.
  - d. Segment Delivery: Proposed casting, curing, and delivery schedule integrated with expected range of tunnel excavation advance rates.
  - e. Segment Erection:
    - 1) Methods for maintaining circularity and position of segment rings within specified limits.
    - 2) Contingency plan addressing excessive deformation of segment rings, including threshold values for deformation.
    - 3) Methods for assuring compliance with specified limits for leakage.
  - f. Segment Performance:
    - 1) Methods for measuring segment ring deformation and position.
    - 2) Methods for measuring water inflows both collectively and individually.
    - 3) Methods for demonstrating conformance of gasket material to specified design criteria.
  - g. Segment Remedial Work after erection:
    - 1) Proposed methods of repairs for damage within allowed parameters, or replacement.
    - 2) Proposed methods to:
      - a) Correct misaligned segments and gaskets.
      - b) Support and repair, or replace structurally damaged segments.
      - c) Seal leaks to achieve specified leakage criteria limits.
  - h. Revise work plan addressing fabrication, erection, and monitoring procedures if the Quality Control plans as specified herein are implemented on a recurring basis as determined by the Engineer.
- 4. Recordkeeping:
  - a. Daily, no later than the end of the next shift, and integrated with TBM shift reports:
    - 1) Segment ring information:
      - a) Sequentially numbered accounting of segment rings erected in the tunnel correlated to tunnel station.
      - b) Segment type and ring orientation.

- c) Measurements of segment ring eccentricity with respect to the tail shield.
- d) Measurements of segment ring roll.
- e) Measurements of segment ring circularity.
- f) Notations of damage to segments, gasket, or appurtenances.
- 2) Water flow measurements, including contributory flow from Contractor operations:
  - a) At individual sources by station ahead of the trailing end of the trailing gear.
  - b) Cumulative flow.
- b. Within 30 days of completion of tunnel construction: As-built survey as specified herein.

#### 5. Notifications:

- a. 15 days in advance of assembling demonstration segment rings.
- b. Within 1 day of removing a segment casting mold from service for repair or replacement. Survey results to verify conformance of repaired or replacement mold to tolerance requirements. In cases of repair, additionally submit written report including the nature of the damage and the method of repair.
- c. Immediately upon discovering precast segments, gaskets, or appurtenances that do not conform to the requirements of the Contractor's design and the minimum design requirements set forth herein.
- G. Submit a Certificate of Design confirming responsibility for the design of precast concrete segments by Contractor's Engineer in accordance with Section 01 33 00 – Submittal Procedures.

# 1.6 SYSTEM DESCRIPTION

# A. Design Criteria:

- 1. General:
  - a. The precast concrete segments provide support for the tunnel and provide a finished structure for conveying flows. The precast concrete segments:
    - 1) Provide initial support for ground, groundwater, and other construction loads during tunnel construction.
    - 2) Account for Contractor-controlled variables such as Lost Ground.
    - 3) Serve as the tunnel final lining with a design life of 100 years.
  - b. The minimum design requirements for the bolted, gasketed, precast concrete segments are based on loading conditions and other requirements specified herein:
    - 1) Minimum 28-day concrete compressive strength: 8,000 psi in accordance with ASTM C39, or as needed to accommodate TBM thrust forces, erection, handling, storage, transport, and loads from TBM back-up system, whichever is greater.
    - 2) Minimum concrete cover to steel reinforcement, if any: 2 inches.
    - 3) Minimum steel reinforcement for bar reinforcement alternative: 0.5% of the gross concrete area in circumferential and radial directions.
    - 4) Design requirements for steel fiber reinforcement alternative shall be as specified herein. (A3)
- 2. Design Requirements:
  - a. Segment:
    - 1) The segment design shall meet the minimum specified herein.
    - 2) Base design on ACI 350. Do not increase allowable stresses for temporary loads, or reduce load factors to account for temporary structure design.
    - 3) Size segments to allow for their fabrication, handling, erection, and to withstand TBM jacking forces and other design, handling, and construction loads.

- 4) Stagger joints so that radial joints do not align with radial joints in adjacent segment rings, forming cruciform joints.
- 5) Design segment joints to accommodate a gasket groove of the width required to accommodate the required gasket with the minimum clearances between:
  - a) The segment extrados and the outer edge of the gasket groove to prevent spalling of the concrete due to required gasket line loads.
  - b) The joint packing if used, and the inside edge of the gasket groove to prevent damage to the gasket when the packing is compressed, all while maintaining:
    - i. The required minimum segment gap width.
    - ii. The required dimensions of the packing relative to the segment joint.
- 6) Provide chamfers for tapered radial joints to reduce stress concentrations as necessary to comply with specified requirements.
- b. Segment Taper: Utilize only tapered segments. Straight segments are not acceptable.
- c. Segment Reinforcement and Design: Steel fibers shall be used for segment reinforcement. Fibers used for segment reinforcement shall be steel (A3) Fibers made of other materials are specifically prohibited. Additional reinforcement may be required for segment handling, transport, stacking and installation shall be based upon the Contractor's final segment design configuration, stamped by the Segment Designer as specified herein, and subject to Engineer review and acceptance.
  - 1) The minimum design requirements for steel fiber reinforced precast concrete segments are specified herein, and are based on loading conditions and other requirements specified herein:
    - a) Minimum concrete strength: as specified herein.
    - b) Minimum required Toughness Performance Level (TLP) by Round Determined Panel Test: 4.
    - c) Minimum required energy absorption at 28-days by ASTM C1550 Centrally Loaded Round Panel Test: 400 Joules.
    - d) Minimum required dosage of steel fiber: 60 lbs/CY.
    - e) Minimum flexural tensile strength at 28-days per ASTM C1609: 670 psi.
    - f) Minimum post-crack equivalent residual flexural tensile strength at any deflection at or beyond the deflection of L/600 per ASTM C1609: 460 psi.
- d. Gasket: Design gaskets for the design pressure and leakage criteria specified herein and indicated. Coordinate packing thickness if any, with the gasket system design to assure specified performance.
  - 1) Provide gaskets capable of handling the following, with consideration of the degree of allowable segment ring out of roundness.
    - a) The 150 percent of the maximum segment tail void grouting pressure specified.
    - b) Minimum 8 bar hydrostatic.
  - 2) Coordinate design of the gasket system with the gasket properties and the gasket groove depth to achieve the required design and performance criteria over the range of anticipated gap widths, and at the allowable tolerances as they relate to gasket seating offset and segment ring out of roundness.
  - 3) Fulfill specified requirements when subject to offsets and gaps commensurate with those permitted under maximum allowable erection tolerances.
  - 4) Of such durability that residual contact pressure between the gasket surfaces is capable of resisting the maximum hydrostatic head and environmental conditions indicated in the GBR continuously for the design life of the tunnel.

- e. Bolted and Dowelled Connections:
  - 1) Design bolted, dowelled, or other positively interlocking mechanical joint connections between segment panels. Radial joints shall be connected by bolts only.
  - 2) Provide a minimum of three connections at each joint face for each segment except at circumferential joints for key segments which may utilize a single connection if connection spacing does not allow two connections.
  - 3) Size connections to maintain adjacent gaskets sufficiently compressed to perform in accordance with specified requirements.
  - 4) Minimum dimensions of contact between segment joints:
    - a) 50 percent of the segment thickness along the short dimension of the radial joint.
    - b) 90 percent of the segment length along the long dimension of the radial joint.
    - c) 90 percent of the circumferential distance along the circumferential joint.
  - 5) Design joints to allow sufficient closure of the gaskets to assure sealing against design pressures with compression packing in place. The packing shall distribute compressive stresses across the segment joint without affecting the ability of the segment gasket to withstand existing hydrostatic pressures, grout pressures, and jacking pressures.
- f. Shimming: Prohibited.
- g. Grout sockets:
  - 1) Provide a minimum of one grout socket per segment for contact grouting purposes.
  - 2) Equip with a threaded sleeve and cap.
  - 3) Design to withstand maximum hydrostatic and grouting pressures as specified.

# B. Performance Requirements:

- 1. Tolerances:
  - a. Fabrication:
    - 1) Segment geometry tolerance: As indicated
    - 2) Cast with such accuracy and uniformity of dimensions that segment panels of the same type are interchangeable from segment ring to segment ring.
  - b. Erection
    - 1) Circularity tolerance: Limit the inside diameter measured across any internal diameter to  $\pm 0.50$  percent of the theoretical diameter.
    - 2) Variation between adjacent segment joint surfaces: The lesser of 7/16-inch and the tolerance established by the maximum allowable amount of gasket offset.
    - 3) Limit ring roll to the following maximum absolute values:
      - a) Relative ring roll between adjacent rings: 1/8-inch.
      - b) Total ring roll: 2-inches.
    - 4) Such that propulsion shoes from TBM do not cross radial joints
  - c. Line and Grade:
    - 1) Maintain tunnel profile within 3 inches of theoretical grade without ponding. Return to theoretical grade at no more than 1 inch every 20 feet, or as needed to eliminate ponding.
    - 2) Maintain tunnel alignment within 12 inches of theoretical horizontal alignment. Return to theoretical alignment at no more than 1 inch every 20 feet

## 2. Tunnel Leakage Criteria:

- a. After segment tail void grouting:
  - 1) Cumulative: 3 gpm per 1000 feet of tunnel. 100 gallons per day per inch of pipe diameter per mile (100 gpd/in-dia/mi) (A3)
  - 2) For any five-foot length of tunnel: 0.02 gpm.

## C. Options:

- 1. Grout Sockets: One guide block out per segment may be used in lieu of a cast grout socket. Grout sockets may be combined with threaded lifting insert.
- 2. Packing: At the option of the Contractor subject to the following:
  - a. Marine-grade plywood conforming to APA requirements. Maximum thickness: 1/8-inch.
  - b. Maintain 1/4-inch clearance from gaskets under compression and segment edges.
  - c. Compatible and coordinated with gasket design while under compression.
  - d. If not used, demonstration by stamped calculation that chipping/spalling of segments during installation will not occur.

# 1.7 QUALITY ASSURANCE

# A. Qualifications:

- Segment Manufacturer: Required to have provided bolted, gasketed precast concrete tunnel segments for two projects comparable to the work of this Contract in size and type within the last seven years.
- Segment Designer: Civil Engineer currently registered in the State of Indiana with a
  minimum of 7 years of recent design experience in underground construction and in the
  design of bolted, gasketed, precast concrete segments in similar ground conditions and size
  to the work of this Contract.
- 3. Test Laboratory: Independent materials testing laboratory with a minimum of 5-year experience testing the materials of the type and for the purpose specified herein.

#### B. Acceptance Criteria:

- 1. No segments with visible damage or cracks shall be accepted inside the tunnel for installation.
- 2. Casting of segments to:
  - Individual panel and collective ring tolerances specified on approved Contractor shop drawings.
  - b. Meet or exceed design requirements as specified, and verified and expanded by accepted Contractor-responsible design criteria.
- 3. Erection of segments to:
  - a. Meet or exceed specified leakage criteria.
  - b. Tolerances specified and indicated.

# C. Preconstruction Meeting:

Schedule and conduct a prefabrication conference with the Engineer and the Segment
Manufacturer within 30 days of the intended start of fabrication of the segments. Discuss
issues such as record keeping, tests, inspection logistics, quality control plan, and other
fabrication-related matters.

2. Schedule and conduct a pre-installation conference with the Engineer within 30 days of the intended start of tunnel excavation. Discuss issues such as mock-ups of the segment rings and other installation-related issues.

#### 1.8 SITE CONDITIONS

A. Refer to and comply with requirements as specified.

# 1.9 SEQUENCING AND SCHEDULING

A. Ensure that segment production is adequate for tunnel excavation rates.

#### 1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Transport the required amounts of segment panels in complete ring assemblies and as required to maintain a sufficient number of segment rings available to the tunneling operation.
- B. Transport, store, and handle segments, avoiding damage to surfaces, edges and corners, and avoiding the development of stresses exceeding the capacity of the segment.

#### **PART 2 PRODUCTS**

#### 2.1 MATERIALS

- A. Reinforcing Steel:
  - 1. Welded wire fabric conforming to ASTM A1064. Welded wire fabric shall be domestically produced and comply with the requirements of the American Iron and Steel provisions.
  - 2. Bar reinforcement conforming to ASTM A615. Bar reinforcement shall be domestically produced and comply with the requirements of the American Iron and Steel provisions.
  - 3. Steel fiber reinforcement:
    - a. Conforming to ASTM A820.
    - b. Fibers shall be domestically produced and comply with the requirements of the American Iron and Steel provisions.
    - c. Do not use loose steel fibers that may cause balling during mixing.
- B. Mechanical Joint Connector Systems:
  - 1. Minimum sizes are indicated; select actual sizes to meet specified design and performance requirements.
  - 2. Structural bolts, nuts and washers: ASTM A325 or ASTM A490.
  - 3. Plastic dowels for circumferential joints:
    - a. Fiber reinforced engineered thermoplastic.
    - b. Ring formed pliable elastic surfaces.
    - c. Dowel size and load capacity to meet design criteria specified herein.
  - 4. Acceptable manufacturers: Bolted and doweled connections: Optimas, <u>www.optimas.com</u>, or equal.
- C. Concrete: As specified for concrete where water may fall more than four feet onto the concrete surface.

#### D. Gaskets:

- 1. EPDM rubber (Ethlene proplyene, diene monomer).
- 2. Continuous over joint surfaces and of uniform gasket thickness along the entire length of mating surfaces.
- 3. Free of imperfections including: voids, blisters, inclusions, flow marks, porosity, and pitting.
- 4. Vulcanized corners mitered on each side.
- 5. Adhesive and its application as recommended by the gasket manufacturer.
- 6. Acceptable manufacturers: Datwyler Rubber and Plastics, <u>sealing.datwyler.com</u> or Accepted Equal.

# E. Grout Sockets:

- 1. Size to assure placement of grout as needed.
- 2. Acceptable Manufacturers: Optimas, www.optimas.com, or equal.
- F. Gasket and Packing Primers and Adhesives: As recommended by packing and gasket manufacturers.
- G. Packing: As specified herein.

# 2.2 SOURCE QUALITY CONTROL

#### A. Fabrication:

- 1. Utilize molds fabricated from steel in accordance with ACI 347.
- 2. Cast and cure segments in a controlled environment protected against rain, dust, and direct sunlight.
- 3. Cast segments with blockouts that indicate where the segment may be drilled or cored such that segment bar reinforcement, if any, is not cut or damaged.
- 4. Provide hard steel trowel finish or similar to the extrados surface.
- 5. Steam cure segments and protect during storage in accordance with ACI 533R and ACI 517.2R for steam curing:
  - a. After the segments are cast and have attained the required strength, place the segment forms in an enclosure or chamber large enough to allow complete circulation of steam.
  - b. Do not release segment forms until the required stripping strength is attained, as determined by test cylinders.
  - c. Enclosure or chamber ambient temperature shall not exceed 100 degree F for the first 3.5 hours of curing; maintain temperature between 100 degree F and 120 degree F until the required stripping strength is attained.
  - d. Control cooling rate to limit temperature differential to avoid thermal cracking.
  - e. Secondary steam cure at 85 degree F until 70% of f'c is obtained.
- 6. Segment Identification:
  - a. Cast the segment type, taper, and mold identification directly on the segment intrados. Affix durable UPC bar code with the following information:
    - 1) Serial number
    - 2) Segment type
    - 3) Mold number
    - 4) Date/time of casting including cycle of shift
    - 5) QC inspection record pre and post manufacture

- 6) Cross referenced to associated concrete testing
- b. Paint or cast the casting date adjacent to the above-cast information.
- 7. Segment alignment: Cast alignment indicators into the intrados of each segment to assist in their alignment.

# B. Quality Control:

- 1. Mockup or Ring Fit-Up:
  - a. Prior to beginning production fabrication of the precast concrete segments, assemble and survey two rings of each different segment ring combination cast from proposed molds, and packing. Gaskets and mechanical connectors may be omitted except as needed to achieve ring geometry.
  - b. Utilize three sets of two segment rings:
    - 1) Assemble each set of rings separately at the place of manufacture by stacking segment rings one on top of another on a level, flat surface with joints staggered.
    - 2) Survey the rings to verify that the segments as cast meet specified fabrication tolerances.
    - 3) Adjust or replace forms as required to meet specified requirements.
  - c. The Engineer will select the bottom ring from each of the sets to be retained as the master ring for the duration of segment casting operations to verify compliance with fabrication tolerances for the production segments using the same 2-ring configuration.
    - 1) Select segments for the upper trial ring in accordance with the following:
      - a) Segments: Every 250th segment cast from each mold.
      - b) Mold repair or replacement: First segment ring cast.
    - 2) Survey the segment rings to verify that the molds and segments meet specified fabrication tolerances.
    - 3) Adjust or replace forms as required to meet specified requirements.

#### 2. Testing:

- a. Gasket Physical Testing: Perform gasket tests of type required and recommended by gasket manufacturer to demonstrate compliance with design criteria specified herein. Perform such tests for a range of gasket offsets, as agreed between the Contractor and the Engineer. Include the following:
  - 1) Water tightness tests.
  - 2) Reaction load tests.
  - 3) Gasket line load tests.
  - 4) Stress Relaxation
    - a) Stress relaxation testing for gaskets shall be performed in accordance with ASTM D6048.
    - b) Show by long-term tests that residual contact stress after 100 years is greater than 60 percent of measured stress after 15 minutes at a 40 percent vertical deformation at room temperature in accordance with ASTM D6048.
  - 5) Shrinkage Logarithmic extrapolation to a 100-year life based on immersion of the gasket material in a hexane solution for 200 continuous days at room temperature in accordance with ASTM D471 Indicate weight of gasket material specimen does not exceed 1.20 Wo or is less than 1.05 Wo, Where Wo is weight of material specimen before immersion in the hexane solution.

- b. Gasket Material Tests: Material requirement tests shall be performed on specimens prepared from processed gasket compound to ensure that finished gaskets conform to the following minimum requirements:
  - 1) Tensile Strength ASTM D412, greater than 1800 psi.
  - 2) Elongation ASTM D412, greater than 300 percent.
  - 3) Hardness ASTM D2240. Durometer A: 65+/5.
  - 4) Compression Set ASTM D395, Method B.
    - a) Short-term Less than 12 percent compression after 25 percent compression at 70 C for 22 hours.
    - b) Long-term Less than 15 percent compression after 25 percent vertical compression after 72 hours at room temperature.
  - 5) Ozone Resistance In accordance with ASTM D1149, Procedure A, with following stipulation: No surface cracking of untensioned specimen (zero percent elongation) when immersed in a 200 parts per hundred million ozone solution for 100 hours at room temperature and 55 percent humidity.
  - 6) Fire Rating Self-extinguishing.
  - 7) Aging ASTM D573, 70 hours at 100 C. Limit changes in material properties as follows:
    - a) Shore Hardness Less than six units increase.
    - b) Tensile Strength Less than ten percent decrease.
    - c) Elongation Less than 15 percent decrease
- c. The Contractor shall furnish to the Engineer detailed notarized certifications for gasket conformance to the specifications, and the results of the tests performed
- d. Perform testing for steel fiber reinforced concrete, as follows:
  - 1) Fiber testing by contractors lab witnessed by Engineer
  - 2) Provide companion samples as directed by Engineer for verification.
  - 3) Flexural strength testing:
    - a) In accordance with ASTM C1609.
    - Testing frequency during development of mix designs: Six beams for each mix.
  - 4) Steel fiber distribution testing:
    - a) For each sample, collect a minimum of 0.15 cubic feet of fiber reinforced concrete, with the sample taken directly from the mixer.
    - b) Weigh the samples in air and water similar to requirements of ASTM C128.
    - c) Wash out the steel fibers and collect using a magnetic device, or similar. Clean, dry and weigh fibers. Fiber volume shall be equal to the weight of fibers divided by the volume of the sample, in pounds per cubic yard.
    - d) Testing frequency:
      - i. One set of three samples for each mix design.
      - ii. One set of three samples per mixing unit per 24 hours during fabrication of segments.
    - e) Allowable tolerances for fibers:
      - i. An average of 95% to 115% of the design fiber content from a set of three samples.
      - ii. A minimum of 80% and a maximum of 130% of the design fiber content for each sample.
  - 5) Steel fiber quality testing:
    - a) Conform to the requirements of ASTM A820.

- b) Testing frequency:
  - i. Once during development of mix designs.
  - ii. Once per month during fabrication of segments.

#### PART 3 EXECUTION

#### 3.1 GENERAL

- A. Coordinate tunnel excavation and segment installation.
- B. Use tapered rings as the exclusive means for negotiating curves and correcting horizontal and vertical misalignment.
- C. Do not use packing of variable thickness, or more than one packing in a segment joint.
- D. Regardless of the type of segment positive interlocking mechanism, do not remove interlocking elements subsequent to their installation unless immediately replaced.

#### 3.2 PREPARATION

- A. Clean the segment erection area and prior erected segment surfaces to remove water, dirt, debris, and other foreign material prior to erecting each segment ring.
- B. Examine segments for structural damage.
- C. Lubricate key segment gaskets prior to installation.

#### 3.3 INSTALLATION

- A. Grip and erect segments in a manner to accurately position and align segments and gaskets within specified tolerances.
- B. Clean all faces of each segment and gasket prior to fitting adjacent segments.
- C. Set segments to the required joint gap using the TBM segment erector.
- D. Do not use the segment bolts or other positively interlocking elements to compress segment gaskets, but only to maintain segment gaskets in the compressed position.
- E. Completely erect and fasten segments within the TBM tail shield before thrusting TBM forward.
- F. Where the tunnel exceeds specified tolerances, perform remedial work in accordance with such submittal receiving acceptable disposition.
- G. Perform tail void grouting as specified.

#### 3.4 MAINTENANCE AND REPAIR OR REPLACEMENT

- A. Repair or replace misaligned or structurally damaged segments to maintain tolerances, to maintain water-tightness, and to ensure stability and safety during construction.
- B. Do not install segments, which exhibit any of the following:
  - 1. Visible rebar, if used.
  - 2. Cracks in excess of 0.008" (0.2mm) width at any location or which affect design parameters.
  - 3. Spalling in any amount affecting gasket or positively interlocking elements.
  - 4. Spalling or cracking on the circumferential joint which is greater than 0.2mm.
- C. Replace segments which exhibit features that are grounds for rejection prior to their installation if the TBM has not advanced sufficiently to expose the first set of tail shield steel brushes in whole or part.
- D. Repair segments exhibiting damage ahead of the trailing end of the trailing gear which exhibit any of the following:
  - 1. Spalling to a depth in excess of 1-inch.
  - 2. Chipping or flaking in excess of ½-inch measured in any direction.
- E. Correct improper installation of any segment if the TBM has not advanced sufficiently to expose the first set of tail shield steel brushes in whole or part.
- F. Modify construction methods to eliminate future reoccurrence and implement additional monitoring of the segment ring to assure compliance with specified leakage and tolerance requirements.
- G. Perform regularly scheduled tasks to:
  - 1. Clean the tunnel interior and invert of muck, grout, debris, and other foreign materials.
  - 2. Maintain sumps, collection points, and pumps clear of trash and in good operating order.
  - 3. Maintain clear passage for the flow of personnel, equipment and materials.

# 3.5 FIELD QUALITY CONTROL

- A. Inspect precast concrete segments:
  - 1. Before transporting and again before engaging the TBM segment erector.
  - 2. Immediately after each shove of the TBM.
  - 3. During and upon completion of segment tail void grouting.
- B. Monitor the installation of each segment ring as related to the uniformity of the annulus between the segment ring extrados and the tail shield intrados. Record the distance between the tail shield intrados and the segment ring extrados using two sets of four longitudinal measurements along the transverse horizontal and vertical centerlines of the segment ring at the leading edge:
  - 1. Take the first set of measurements upon erecting the segment ring, but prior to thrusting against the ring.

- 2. Take the last set of measurements upon completing the TBM shove, but prior to installing the next segment ring.
- 3. The Engineer may elect to eliminate some or all of these measurements if it becomes evident to the Engineer through visual or other means that the Contractor is consistently erecting the segment rings in accordance with other specified requirements.
- C. Monitor the installation of each segment ring as related to the specified circularity tolerance in accordance with the requirements as specified herein.
- D. Perform an as-built survey of installed segment rings for verifying the initial lining installation in accordance with specified tolerances:
  - 1. Record measurements at the crown, invert, and springline, totaling four locations at every 5th segment ring.
  - 2. Maintain the survey no less than 1,500 feet and no greater than 3,000 feet behind completed segment backfill grouting operations.

++END OF SECTION++

# **EXHIBIT B: Project AIS Specifications**

# 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.

- D. Indiana State Revolving Fund Loan Program Required Documents This project is being financed in whole or in part by the Indiana State Revolving Fund Loan Programs. The Contractor is required to comply with all federal and state laws, rules, regulations, and contract provisions included in Indiana Finance Authority (IFA) State Revolving Fund (SRF) documents, included in the project manual. The following IFA SRF documents shall be submitted, by the successful bidder, with the signed Owner-Contractor Agreement:
  - 1. Section 00 54 62 SRF Good Faith Efforts Worksheet.
  - 2. Section 00 54 63 SRF Bidders List Form.
  - 3. Section 00 54 67 SRF Attachment D IFA Wage-Fringe Benefit Certification Form.
  - 4. Section 00 54 69 SRF Attachment I US Iron and Steel Requirement.
  - Section 00 54 70 SRF Attachment J Required Certification from Contractor Related to American Iron and Steel.
  - 6. Section 00 54 72 SRF EPA Form OEE-1.
  - 7. Section 00 54 73 SRF EPA Form OEE-2.

#### ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

20.02 As part of its Bid, Bidder shall submit certificates of insurance evidencing proof of the liability insurance coverages required by Article 5 of the General and Supplementary Conditions in addition to copies of pertinent endorsements related to such specifications, or written evidence from an insurance company, broker, or agent indicating the signatories have Article 5 of the General and Supplementary Conditions and that Bidder is capable of obtaining such insurance in the coverages and under the conditions listed in Article 5. With respect to Builder's Risk coverage required in Article 5.06, Bidder shall submit a detailed quote or proposal outlining the extent of coverage and cost of its proposed Builder's Risk policy. (A2)

#### ARTICLE 21 - SIGNING OF AGREEMENT

- When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents, which are identified in the Agreement as attached thereto. Within fifteen (15) calendar days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within thirty (30) calendar days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings, if applicable, with appropriate identification.
- 21.2 If required by City Ordinance, the contract for the work specified herein, although executed on behalf of the City by the Mayor and the Board, shall not be binding upon the City; unless, and until the contract has been ratified and approved by the Common Council of the City of Fort Wayne, Indiana. And, if the Common Council fails to approve the contract within one hundred and twenty (120) days after the date of the bid opening, then the contractor shall not be bound unless the contractor elects to be bound.

# ARTICLE 22 - SALES AND USE TAXES

22.01 Owner is exempt from Indiana state sales and use taxes and use taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Bid. Refer to Paragraph SC-GC-6.10 of the Supplementary Conditions for additional information.

#### **ARTICLE 23 - RETAINAGE**

23.01 Provisions concerning retainage are set forth in the Agreement in accordance with IC 36-1-12-14.

# **EXHIBIT C: Fiber Suppliers**

# OVERSEAS AND US DOMESTIC STEEL FIBER SUPPLIERS

Fort Wayne, IN 3RPORT Project Specifications	Bekaert- Maccaferri Dramix 3D 80/60 BG	Bekaert- Maccaferri Dramix 4D 80/60 BG	Kosteel Bundrex KF 80/60 High	Bekaert- Maccaferri Dramix 4D 67/50 BL	Bekaert- Maccaferri Dramix 3D 67/50 BL	FIBERCON CAR50EDM	FIBERCON CAR35EDM	Helíx 8-52 (Or 8-50)
Conforms with ASTM A820	Conforms	Conforms	Conforms	Conforms	Conforms	Does Not Conform	Does Not Conform	Conforms
Domestically Produced	Overseas	Overseas	Overseas	Domestic	Domestic	Domestic	Domestic	Domestic
Do not use loose steel fibers	Glued	Glued	Glued	Loose	Loose	Loose	Loose	Loose
Suitable for Tunnel Liner Applications	Yes	Yes	Yes	No	No	No	No	Never Used in Tunnel Liners

# **EXHIBIT D : Picture of Loose Fibers & Glued Fibers**

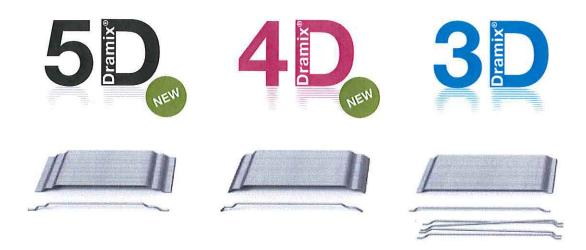


Loose Fibers – known balling issues in the mix

Fibers in Glued Clips – the standard in the industry for segmental liners

# **EXHIBIT E: Bekaert Position on Fibers for Tunnel Liners**

# A full range for all your reinforcement needs



Since its introduction,
Bekaert has continuously
expanded its Dramix® range
with numerous varieties of
steel fibres—all in order to
meet your exact project
requirements. Innovative
packaging and delivery
methods continually
enhanced usability, saving
time on the construction
site, while at the same
time enabling exact dosage
and automation.

Today, Bekaert provides you with a full range for all your reinforcement needs.

Coatings: bright or galvanized.

Different length/diameter (I/d) ratios are available in all Dramix® series.

Glued bundles (available for all Dramix® series) avoid fibre-balling during mixing and ensure that the fibres are evenly spread throughout the concrete mix. For most basic applications, the lower I/d ratios of the 3D series are available in loose form.

Packaging. Dramix® is available in different types of packaging, from 10 kg and 20 kg bags to big bags for large-scale usage. Bekaert also developed the Dramix® Booster automatic dosing equipment enabling you to automate the dosing process using premeasured volumes in water-soluble 250 g bags.

#### At your service!

Not sure which type of Dramix® best suits your project? Let us know, we'll help you find out!









# Investigating the possibilities - together

Since its introduction, Bekaert has continuously expanded its Dramix® range with numerous varieties of steel fibres - all in order to meet your exact project requirements. Innovative packaging and delivery methods continually enhanced usability, saving time on the construction site, while at the same time enabling exact dosage and automation.

With more than 40 years of experience we have the knowledge and expertise trusted supplier of customized reinforcement solutions based on our innovative range of Dramix® steel fibres.

#### Coatings

Dramix® steel fibres are available with a bright or galvanized surface finish.

# Length/diameter (I/d) ratios

Depending on your design, handling and process equipment, our steel fibres can be supplied with different length/diameter (I/d) ratios.

### Glued bundles

To avoid fibre-balling during mixing and ensure that the fibres are evenly spread throughout the concrete mix the steel fibres are glued in bundles.

#### Steel quality

Dramix® steel fibres are available in various grades of steel quality, tensile strength and ductility.

#### Packaging

Dramix® is available in different types of packaging, from 10 kg and 20 kg bags to big bags for large-scale usage.

Not sure which type of Dramix® best suits your project? Let us know, we'll help you find out!

# EXHIBIT F: Bekaert Letter Regarding Fiber Availability



better together

CSI Tunneling Systems – sent via e-mail Attn.: Mr. John Hart Jhart@csigroup.com NV Bekaert SA
Bekaertstraat 2
BE-8550 Zwevegem
Belgium
T +32 56 76 72 35
tom.hautekiet@bekaert.com
www.bekaert.com

Date October 26th, 2017

Dear John,

Over the past twenty years Bekaert have become the world leader in fiber technology using their Dramix<sup>®</sup> glued collated fibers for optimum dispersion in homogeneous concrete for use in structural concrete tunnel liners.

In recognition of the recent 'Buy America' compliance requirements, Bekaert have recently installed a Dramix<sup>®</sup> line at the Bekaert, Shelbyville, Kentucky plant, to produce loose fibers beginning with the production of Dramix<sup>®</sup> 3D loose fibers intended for the shotcrete and flooring fiber markets, which are provided in a loose format and are not glued. This plant has not yet been equipped with a gluing line to enable production of collated fibers to meet our recommended standard for fibers for use in structural precast concrete tunnel liners but will do so once the line has been converted. The decision to convert this line into a glued fiber production line has been taken in October 2017 and we target to be operational with glued fiber production by the end of the second quarter of 2018.

When equipped with the gluing line, this factory will produce Dramix<sup>®</sup> 4D fibers as well, intending to provide the new Dramix<sup>®</sup> double hooked fibers, which can provide improved embedment at lower dose rates.

Bekaert has a long tradition and track record of providing glued fibers for structural precast concrete tunnel liners. Bekaert-Maccaferri is committed to provide assistance and support in this endeavor and should you have any questions regarding this information, please contact me.

Kind regards,

Tom Hautekiet

VP Building Products

NV Bekaert SA

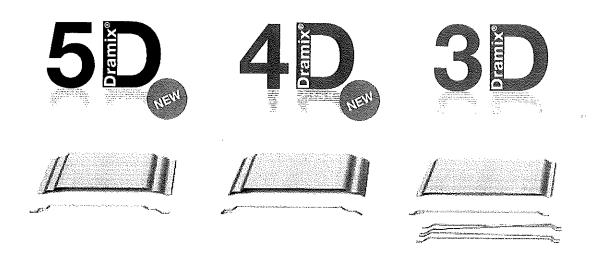
List of Steel Fiber Suppliers

### OVERSEAS AND US DOMESTIC STEEL FIBER SUPPLIERS

Fort Wayne, IN 3RPORT Project Specifications	Bekaert- Maccaferri Dramix 3D 80/60 BG	Bekaert- Maccaferri Dramix 4D 80/60 BG	Kosteel Bundrex KF 80/60 High	Bekaert- Maccaferri Dramix 4D 67/50 BL	Bekaert- Maccaferri Dramix 3D 67/50 BL	FIBERCON CAR50EDM	FIBERCON CAR35EDM	Helix 8-52 (Or 8-50)
Conforms with ASTM A820	Conforms	Conforms	Conforms	Conforms	Conforms	Does Not Conform	Does Not Conform	Conforms
Domestically Produced	Overseas	Overseas	Overseas	Domestic	Domestic	Domestic	Domestic	Domestic
Do not use loose steel fibers	Glued	Glued	Glued	Loose	Loose	Loose	Loose	Loose
Suitable for Tunnel Liner Applications	Yes	Yes	Yes	No	No	No	No	Never Used in Tunnel Liners

Position Paper on Fibers for Tunnel Liners

## A full range for all your reinforcement needs



Since its introduction,
Bekaert has continuously
expanded its Dramix® range
with numerous varieties of
steel fibres—all in order to
meet your exact project
requirements. Innovative
packaging and delivery
methods continually
enhanced usability, saving
time on the construction
site, while at the same
time enabling exact dosage
and automation.
Today Bekaert provides your

Today, Bekaert provides you with a full range for all your reinforcement needs.

Coatings: bright or galvanized.

Different length/diameter (I/d) ratios are available in all Dramix® series.

Glued bundles (available for all Dramix® series) avoid fibre-balling during mixing and ensure that the fibres are evenly spread throughout the concrete mix. For most basic applications, the lower I/d ratios of the 3D series are available in loose form.

Packaging. Dramix® is available in different types of packaging, from 10 kg and 20 kg bags to big bags for large-scale usage. Bekaert also developed the Dramix® Booster automatic dosing equipment enabling you to automate the dosing process using premeasured volumes in water-soluble 250 g bags.

At your service!

Not sure which type of Dramix® best suits your project? Let us know, we'll help you find out!







### Investigating the possibilities - together

Since its introduction, Bekaert has continuously expanded its Dramix® range with numerous varieties of steel fibres - all in order to meet your exact project requirements. Innovative packaging and delivery methods continually enhanced usability, saving time on the construction site, while at the same time enabling exact dosage and automation.

With more than 40 years of experience we have the knowledge and expertise trusted supplier of customized reinforcement solutions based on our innovative range of Dramix® steel fibres.

#### Coatings

Dramix® steel fibres are available with a bright or galvanized surface finish.

#### Length/diameter (I/d) ratios

Depending on your design, handling and process equipment, our steel fibres can be supplied with different length/diameter (I/d) ratios.

#### Glued bundles

To avoid fibre-balling during mixing and ensure that the fibres are evenly spread throughout the concrete mix the steel fibres are glued in bundles.

#### Steel quality

Dramix® steel fibres are available in various grades of steel quality, tensile strength and ductility.

### Packaging

Dramix® is available in different types of packaging, from 10 kg and 20 kg bags to big bags for large-scale usage.

Not sure which type of Dramix® trest stills your project? Let us know, we'll help you find out!

Letter Regarding Fiber Availability by Bekaert



localitate (engla)tiqual

CSI Tunneling Systems – sent via e-mail Attn.: Mr. John Hart Jhart@csigroup.com NV Bekaert SA
Bekaertstraat 2
BE-8550 Zwevegem
Belgium
T +32 56 76 72 35
tom.hautekiet@bekaert.com
www.bekaert.com

Date October 26th, 2017

Dear John,

Over the past twenty years Bekaert have become the world leader in fiber technology using their Dramix<sup>®</sup> glued collated fibers for optimum dispersion in homogeneous concrete for use in structural concrete tunnel liners.

In recognition of the recent 'Buy America' compliance requirements, Bekaert have recently installed a Dramix<sup>®</sup> line at the Bekaert, Shelbyville, Kentucky plant, to produce loose fibers beginning with the production of Dramix<sup>®</sup> 3D loose fibers intended for the shotcrete and flooring fiber markets, which are provided in a loose format and are not glued. This plant has not yet been equipped with a gluing line to enable production of collated fibers to meet our recommended standard for fibers for use in structural precast concrete tunnel liners but will do so once the line has been converted. The decision to convert this line into a glued fiber production line has been taken in October 2017 and we target to be operational with glued fiber production by the end of the second quarter of 2018.

When equipped with the gluing line, this factory will produce Dramix<sup>®</sup> 4D fibers as well, intending to provide the new Dramix<sup>®</sup> double hooked fibers, which can provide improved embedment at lower dose rates.

Bekaert has a long tradition and track record of providing glued fibers for structural precast concrete tunnel liners. Bekaert-Maccaferri is committed to provide assistance and support in this endeavor and should you have any questions regarding this information, please contact me.

Kind regards

Tom Hautekiet

VP Building Products

NV Bekaert SA

Attachment I Required Contract Provisions Related to

American Iron and Steel

### 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

### 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

, of	
(Name and Title of Certifying Officer)	Successful Bidder)
hereby certify and agree on behalf of the Successful Bidder as its du	ly 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	th the Successful Bidder by the
related to its	
	ct 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 co	empliance 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	a 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	ng of its Project, and agrees, that
(a) the Successful Bidder has reviewed and understands the Americ	an Iron and Steel Requirements,
(b) all of the iron and steel products used in the Project as provided	I 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 production	curement contract will include a
provision substantially like <u>Attachment I</u> .	
I SWEAR OR AFFIRM UNDER THE PENALTIES FOR PI	
STATEMENTS ARE TRUE TO THE BEST OF MY KNOWLEDG	E.
	•
(C:zastwa)	(Date)
(Signature)	(Date)

Supplementary Condition SC-GC-6.09 M. Buy American Provision

- E. Indiana Legal Requirements: Each Bidder shall submit under oath with the Bid a statement of experience, a proposed plan for performing the Work, the equipment available to perform the Work, and a financial statement. The statements shall be submitted on questionnaire Form No. 96 of the Indiana State Board of Accounts.
- F. Before any work is started, Contractor shall obtain from the Indiana Industrial Board and file with a certificate showing compliance with Sections 40-1205, 40-1601, and 40-1602 of the Indiana Workmen's Compensation Law.
- G. Safety and Health Regulations: OSHA "Safety and Health Regulations for Construction", Chapter XVII of Title 29 CFR Part 1926, shall apply to Work under this Contract. The U.S. Department of Labor will be responsible for compliance review and enforcement of the regulations.
- H. Employment Requirements: Employment requirements shall be as specified herein and in an attachment to the Supplementary Conditions.
- I. Funding Agency Requirements: Specific funding agency requirements shall be as specified herein and in an attachment to the Supplementary Conditions.
- J. *Nondiscrimination in Employment*: Contractor and Subcontractors shall not discriminate in employment practices and shall comply with applicable labor standards, laws, and regulations.
- K. Contractor acknowledges that it understands and shall be bound by the equal opportunity requirements of EPA regulations (40 CFR Part 8, particularly Section 8.4(b)), which shall be applicable throughout the performance of Work under this Contract. Contractor shall similarly bind contractually each Subcontractor. Contractor shall engage in affirmative action directed at promoting and ensuring equal employment opportunity in the workforce used under the Contract, and Contractor shall require contractually the same effort of all Subcontractors whose subcontracts exceed \$10,000. "Affirmative action" as used herein shall constitute a good faith effort to achieve and maintain that amount of minority employment in the onsite workforce used on the Project which corresponds, for each trade used, to the minority population in the serving labor market area from which workers are reasonably available for hire for the Project.
- L. Preconstruction Equal Opportunity Compliance Conference: As part of the procedure for determining the ability of contractors to comply with the Equal Opportunity clause, prospective Bidders may be required to attend a meeting scheduled by the Environmental Protection Agency prior to opening of Bids where they will be instructed in the equal employment opportunity requirements of the Agency.
- M. Buy American Provision: The Buy American Provision of Public Law 95-217 (Section 215 of Public Law 92-500 as amended), as implemented by EPA regulations and guidance, generally requires that preference be given to the use of domestic construction material in the performance of this Contract.
- N. Archaeological Deposits: If, during the course of construction, evidence of deposits of historical or archaeological interest is found, Contractor shall cease operations affecting the find and shall notify Owner, who shall notify the Regional Office of the



Notice of Award

### Notice of Award

Date: April 5, 2017

nafts Package
76003

You are notified that your Bid dated <u>February 16, 2017</u> for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for <u>Three Rivers Protection and Overflow Reduction Tunnel (3RPORT) Tunnel and Shafts Package</u>

Base Bid: Tunnel and Shafts Package includes the construction of the 3RPORT tunnel, including shafts, adits, and appurtenances. The Work includes, but is not limited to, the following: approximately 24,500 feet of CSO tunnel, with a minimum finished diameter of 16 feet; seven drop shafts; one drop structure within the Retrieval Shaft; four vent shafts; six adits with a finished diameter of 7 feet; one diversion structure and consolidation sewer; Working Shaft with a minimum excavated diameter of 33 feet through the overburden and 29 feet through rock; Pump Station Shaft with a minimum excavated diameter of 68 feet through the overburden and 64 feet through rock; and Retrieval Shaft with a minimum finished diameter of 25 feet through the overburden and 21 feet through rock.

Alternate B: East Dwenger Avenue Muck Disposal Site – Trucking & Site Preparation and Onsite Handling

The Contract Price of your Contract is <u>One Hundred Eighty Seven Million Six Hundred Sixty Three Thousand Dollars and Zero Cents</u> (\$187,663,000.00) that consists of **Base Bid and Alternate B**.

- 2\_copies of the proposed Owner-Contractor Agreement (except Drawings) accompany this Notice of Award.
- 3\_copies of the proposed Escrow Agreement accompany this Notice of Award (if award amount is greater than \$200,000).
- 5 sets of Drawings will be delivered separately or otherwise made available to you immediately

You must comply with the following conditions precedent within [15] days of the date you receive this Notice of Award.

- 1. Deliver to the Owner [2] fully executed counterparts of the Owner-Contractor Agreement.
- 2. Deliver with the executed Contract Documents the Contract security [Bonds] as specified in the Instructions to Bidders (Article 20), General Conditions (Article 5), and Supplementary Conditions (to Article 5 General Conditions).
  - a. Performance Bond
  - b. Payment Bond
  - c. Guaranty Bond

- d. Certificates of Insurance
- 3. Deliver evidence of successful Bidder's Affirmative Action Plan; OR, executed City of Fort Wayne Affirmative Action Program document, pursuant to Article 19 of the Instructions to Bidders. (Received)
- 4. Deliver executed Drug Policy Acknowledgement Form.
- 5. Deliver executed E-Verify Affidavit.
- 6. Deliver completed SRF Good Faith Efforts Worksheet. (Received)
- 7. Deliver completed SRF Bidders List Form. (Received)
- 8. Deliver executed SRF EPA Form OEE-1. (Received)
- 9. Deliver executed SRF EPA Form OEE-2. (Received)
- 10. SRF Attachment I AIS Contract Provisions (Received)
- 11. SRF Attachment J AIS Contractor Certification (Received)
- 12. Vendor Disclosure Statement (Received)

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited. Contractor will be allowed an additional 11 calendar days to submit Bonds.

Per SC-GC-5.03B- Contractor shall deliver to Owner (i) a complete certified copy of each insurance policy and all endorsements thereto. Insurance policies must be received at least 7 days before the Notice to Proceed is issued.

Within thirty days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

BOARD GFAUBLIC WORKS

Robert P. Kennedy, Chair

Mike Avila, Member

Kumar Menon, Member

Lyndsey Richards, Cler

cc: Engineer

Construction Manager - Contract Admin

Bid Tab

							Bid Tabulation								
	PROJECT:	3RPORT Tunnel	and Shafts												
		76003						1							
		76003 February 16,20	17								Ceritlied By:				
		SRF Sewer Bone													
	BID			engineer's estimate	Extension	Salini Impreg Unit Price	lio/ S A Healy	Shea /	Jay Dee Extension	Strabag / Unit Price	Walsh Extension	Traylor / M Unit Price	IcNally Extension	Kiewit Infra Unit Price	structure Co Extension
Item#	Description	Quantity	Unit	Unit Price			Extension								
1-1-1	Mobilization	1	LS	\$ 5,000,000.00	\$ 5,000,000.00	\$ 9,000,000.00		\$ 10,250,000.00	\$ 10,250,000.00	\$ 11,200,000.00 \$	11,200,000.00 \$	11,280,000.00 \$	11,280,000.00	\$ 11,000,000.00	\$ 11,000,000.00
2	Slurry Mode Tunnel Boring Machine	1	LS	\$ 18,575,000.00	\$ 18,575,000.00	\$ 20,000,000.00	\$ 20,000,000.00	\$ 17,145,400.00	\$ 17,145,400.00	\$ 21,515,000.00 \$	21,515,000.00 \$	18,100,000.00 \$	18,100,000.00	\$ 18,100,000.00	\$ 18,100,000,00
3	Bonds	1	LS	\$ 1,000,000.00	\$ 1,000,000.00	\$ 1,300,000.00	\$ 1,300,000.00	\$ 1,740,000.00	\$ 1,740,000.00	\$ 1,600,000.00 \$	1,600,000.00 \$	1,560,000.00 \$	1,560,000.00	\$ 1,100,000.00	\$ 1,100,000.00
4	Insurance	1	LS	\$ 1,000,000.00	\$ 1,000,000.00	\$ 4,500,000.00	\$ 4,500,000.00	\$ 9,600,000.00	\$ 9,600,000.00	\$ 7,961,000.00 \$	7,961,000.00 \$	6,275,000.00 \$	6,275,000.00	\$ 3,000,000.00	\$ 3,000,000.00
-	Temporary Construction Utilities	,	L\$	\$ 2,000,000.00	\$ 2,000,000.00	\$ 5,000,000.00	\$ 5,000,000.00	\$ 4,000,000.00	\$ 4,000,000.00	\$ 4,200,000.00 \$	4,200,000.00	7,000,000.00	7,000,000.00	\$ 3,000,000.00	\$ 3,000,000.00
				\$ 250,000.00		\$ 1,500,000.00	\$ 1,500,000.00	\$ 1,000,000.00	\$ 1,000,000.00	\$ 500,000.00	\$ 500,000.00 \$	5,000,000.00 \$	5,000,000.00		
- 6	Temporary Site Offices	1	LS		\$ 250,000.00										
7	General Construction Using Slurry Mode TBM	1	LS	\$ 136,948,266.00	\$ 136,948,266.00	\$ 133,633,966.00	\$ 133,633,966.00	\$ 144,125,060.00	\$ 144,125,060.00	\$ 164,727,627.00 \$	164,727,627.00 \$	159,960,000.00 \$	159,960,000.00	\$ 171,747,000.00	\$ 171,747,000.00
8	Muck Disposal	1	LS	\$ 3,400,000.00	\$ 3,400,000.00	\$ 2,900,000.00	\$ 2,900,000.00	\$ 1,080,000.00	\$ 1,080,000.00	\$ 3,098,000.00 \$	3,098,000.00 \$	2,175,000.00 \$	2,175,000.00	\$ 3,400,000.00	\$ 3,400,000.00
9	Vortex Flow Inserts	1	LS	\$ 1,092,734.00	\$ 1,092,734.00	\$ 1,092,734.00	\$ 1,092,734.00	\$ 1,092,734.00	\$ 1,092,734.00	\$ 1,092,734.00 \$	1,092,734.00 \$	1,092,734.00 \$	1,092,734.00	\$ 1,092,734.00	\$ 1,092,734.00
	Vertical Soil Drilling (at Surface) for Pre-Excavation Grouting of		.												
10	Working Shaft, Pump Station Shaft, Retrieval Shaft, and Adits	19000	ŁF	\$ 80.00	\$ 1,520,000,00	\$ 1.00	\$ 19,000.00	\$ 60.00	\$ 1,140,000.00	\$ 1.10 \$	20,900.00 \$	40.00 \$	760,000.00	\$ 6.00	\$ 114,000.00
	Vertical Rock Drilling (at Surface) for Pre-Excavation Grouting of Working Shaft, Pump Station Shaft, Retrieval Shaft, and														
11	Adits	41000	LF	\$ 55.00	\$ 2,255,000.00	\$ 1.00	\$ 41,000.00	\$ 65.00	\$ 2,665,000.00	\$ 0.90 \$	36,900.00 \$	66.00 \$	2,706,000.00	\$ 4.00	\$ 164,000.00
	Vertical Rock Drilling (Below Grade) for Pre-Excavation Grouting of Working Shaft, Pump Station Shaft, and Retrieval			T-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F											
12	Shaft	8600	LF	\$ 65.00	\$ 559,000.00	\$ 1.00	\$ 8,600.00	\$ 25.00	\$ 215,000.00	\$ 0.90 \$	7,740.00 \$	10.00 \$	86,000.00	\$ 35.00	\$ 301,000.00
	Horizontal Rock Drilling (Below Grade) for Adits, Starter	1		Ì				and the same of th							
13	Tunnel, and Tail Tunnel	12500	LF	\$ 80.00	\$ 1,000,000.00	\$ 1.00	\$ 12,500.00	\$ 42.00	\$ 525,000.00	\$ 1.00 \$	12,500.00 \$	20.00 \$	250,000.00	\$ 360.00	\$ 4,500,000.00
	Cement for Pre-Excavation Grouting of Working Shaft, Pump Station Shaft, Retrieval Shaft, Adits, Starter Tunnel, and Tail			-				Arteria de la constanta de la							
14	Tunnel	4000	TONS	\$ 225.00	\$ 900,000,000	\$ 1.00	\$ 4,000,00	\$ 615.00	\$ 2,460,000.00	\$ 20.80 \$	83,200.00 \$	10.00 \$	40,000,00	\$ 5.00	\$ 20,000.00
15	Demobilization and Site Restoration	1	ĹS	\$ 2,000,000.00	\$ 2,000,000.00	\$ 250,000.00	\$ 250,000.00	\$ 250,000.00	\$ 250,000.00	\$ 164,015.00 \$	164,015.00 \$	650,000.00	650,000.00	\$ 2,500,000.00	\$ 2,500,000.00
Total Lu	emp Sum/Unit Price Items				\$ 177,500,000.00		\$ 179,261,800.00		\$ 197,288,194.00		216,219,616.00		216,934,734.00	TAXABORE STATE OF THE STATE OF	\$ 221,188,734.00
		İ													
	Cash Allowances								A 050 000 00	\$ 250,000,00 \$	050,000,00	250,000.00	250,000.00	\$ 250,000.00	\$ 250,000.00
16	Impacted Soil Disposal	1	LS	\$ 250,000.00	\$ 250,000.00	\$ 250,000.00			\$ 250,000.00		\$ 250,000.00 \$				
17	Interventions - Time Above GBR Baseline	1200	HRS	\$ 3,000.00	\$ 3,600,000.00	\$ 1.00	\$ 1,200.00	\$ -	\$ -	\$ 52.82 \$	63,384.00 \$	50.00 \$	60,000.00	\$ 1.00	\$ 1,200.00
18	Intervention Grouting - Grouting Materials	1	LS	\$ 1,400,000.00	\$ 1,400,000.00	\$ 1,400,000.00	\$ 1,400,000.00	\$ 1,400,000.00	\$ 1,400,000.00	\$ 1,400,000.00 \$	1,400,000.60 \$	1,400,000.00 \$	1,400,000.00	\$ 1,400,000.00	\$ 1,400,000.00
19	Downtime Due to Gas in Tunnel and Shafts	1	LS	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00 \$	150,000.00 \$	150,000.00 \$	150,000.00	\$ 150,000.00	\$ 150,000.00
20	Field Office Building	1	LS	\$ 900,000.00	\$ 900,000.00	\$ 900,000.00	\$ 900,000.00	\$ 900,000.00	\$ 900,000,000	\$ 900,000.00 \$	900,000.00 \$	900,000.00	900,000.00	\$ 900,000.00	\$ 900,000.00
20					\$ 450,000.00					\$ 450,000.00 \$	450,000,00 \$	450,000.00 \$	450,000.00	\$ 450,000.00	\$ 450,000.00
21	Schedule Incentive	1	L,S	\$ 450,000.00											
22	Materials Testing	1	LS	\$ 550,000.00	\$ 550,000.00	\$ 550,000.00	\$ 550,000.00	\$ 550,000.00	\$ 550,000.00	\$ 550,000.00 \$	550,000.00 \$	550,000.00 \$	550,000.00		
23	Risk Register Workshops and Risk Meetings	1	LS	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00 \$	150,000.00 \$	150,000.00 \$	150,000.00	\$ 150,000.00	\$ 150,000.00
24	Disputes Review Board (DRB)	1	LS	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00	\$ 150,000.00 \$	\$ 150,000.00 \$	150,000.00 \$	150,000.00	\$ 150,000.00	\$ 150,000.00
25	Utility Relocation	1	LS	\$ 200,000.00	\$ 200,000.00	\$ 200,000.00	\$ 200,000.00	\$ 200,000.00	\$ 200,000.00	\$ 200,000.00	200,000.00 \$	200,000.00 \$	200,000.00	\$ 200,000.00	\$ 200,000.00
26	Owner Work Allowance	,	LS	\$ 3,000,000.00	\$ 3,000,000.00	\$ 3,000,000.00	\$ 3,000,000.00	\$ 3,000,000.00	\$ 3,000,000.00	\$ 3,000,000.00	3,000,000.00 \$	3,000,000.00 \$	3,000,000.00	\$ 3,000,000.00	\$ 3,000,000.00
								\$ 1,450,000.00	\$ 1,450,000.00	\$ 1,450,000.00 \$	1,450,000.00 \$	1,450,000.00	1,450,000.00	\$ 1,450,000.00	\$ 1,450,000.00
27	Geotechnical Instrumentation and Monitoring	1	LS	\$ 1,450,000.00	\$ 1,450,000.00		\$ 1,450,000.00								
28	DDPS Site Coordination	1	LS	\$ 50,000.00	\$ 50,000.00	\$ 50,000,00	\$ 50,000.00	\$ 50,000.00	\$ 50,000.00	\$ 50,000.00 \$	50,000.00 \$	50,000.00 \$	50,000.00		\$ 50,000.00
Total Ca	ash Allowances				\$ 12,300,000.00		\$ 8,701,200.00		\$ 8,700,000.00		8,763,384.00		8,760,000.00		\$ 8,701,200,00
Total Ba	se Bid				\$ 189,800,000.00		\$ 187,963,000.00		\$ 205,988,194.00	ļt	224,983,000.00		225,694,734.00		\$ 229,889,934.00
29	3RPORT Tunnel Extension Using Slurry Mode TBM	,	LS	\$ 14,600,000.00	\$ 14,600,000.00	\$ 25,500,000.00	\$ 25,500,000.00	\$ 24,029,425.00	\$ 24,029,425.00	\$ 41,679,000.00 \$	41,679,000.00 \$	22,700,000.00 \$	22,700,000.00	\$ 26,178,617.00	\$ 26,178,617.00
		<b> </b>	LV	,,555,000,000	\$ 14,600,000.00	2-1-55,555,66	\$ 25,500,000.00	,, ,,	\$ 24,029,425.00		41,679,000.00		22,700,000.00		\$ 26,178,617.00
	Total Bid Alternate A to be Added to Base Bid			_							·				
Alt 8.1	East Dwenger Avenue Muck Disposal Site - Trucking	250,000	CY	\$ 8.80	\$ 2,200,000.00	\$ 7.20	\$ 1,800,000.00	\$ 5.25	\$ 1,312,500.00	\$ 16.10 \$	4,025,000.00 \$	3.50 \$	875,000.00	\$ 8,40	\$ 2,100,000.00
Alt 8.2	East Dwenger Avenue Muck Disposal Site - Site Preparation and Onsite Handling	, ,	LS	\$ 800,000.00	\$ 800,000.00	\$ 800,000.00	\$ 800,000.00	\$ 800,000.00	\$ 800,000.00	\$ 800,000.00 \$	\$ 800,000.00 \$	800,000.00	800,000.00	\$ 800,000.00	\$ 800,000,00
		1		250,000.00		300,000,000	\$ 2,600,000.00	,,	\$ 2,112,500.00		4,825,000.00		1,675,000.00		\$ 2,900,000.00
	Total Bid Alternate B to be Replaced In Base Bid				\$ 3,000,000.00		g 2,600,000.00		2,112,500,00		4,040,000,00		1,070,000.00		2,500,000,00
	Basis of Award: Base Bid and Alternate B				\$ 189,400,000.00		\$ 187,663,000.00		\$ 207,020,694.00		\$ 226,710,000.00		225,194,734.00		\$ 229,389,934.00
	Dadis Vi Awalu, Dase Dit allu Alternate B				+ ,,40,,400,000.00		,,,					,,	Company of the Company of the		
	Bid Forms														
	Bid Form	<b> </b>					x x		x x		x x		x x		X X
	Bid Security State Board of Accounts Form 96						X X		хх		хх		хх		хх
	Financial Statement or Certification in Lieu of Financial Statem	ent					хх		х х		х х		х х		х х
	Employee Drug Testing Program						x		X		X		<u> </u>		X
	Joint Venture Agreement if Joint Venture						X X		x x		X X		x x		x x
/	TBM Summary Sheet Proposed Subcontractor Form						X		X		X		x		x
	Proof of Liability and Builder's Risk Insurance Coverage						x		X		х	I	x		x
	Addanda	The state of the s		I				T TO SECURITY OF THE PARTY OF T		I		T			
	Addenda Addendum No. 1						Х		x		x		x		X
	Addendum No. 2						X		х		X		x		х
	Addendum No. 3	<u> </u>					X		X		X X		x x		x x
<u> </u>	Addendum No. 4 Addendum No. 5	-			***		x x		X X		X		x		x
	Addendum No. 5 Addendum No. 6						x		X		×		X		X

Notice to Proceed

### **Notice to Proceed**

Date: May 1, 2017	Owner: City of Fort Wayne	Work Order # 76003				
Project: Three Rivers	Protection and Overflow Reduction Tunnel (3RPORT)	Project # 76003				
Contractor:	Salini Impregilo S.p.A. and S.A. Healy Joint Venture					
Contractor's Address:	The Lane Construction Corporation					
A STATE OF THE STA	90 Fieldstone Court					
	Cheshire, CT 06410	TO THE REPORT OF THE PARTY OF T				

You are notified that the Contract Times under the above contract will commence to run on May 1, 2017. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is July 29, 2021 and the number of days to achieve this is 1,550 days. The date of readiness for final payment is October 27, 2021 and the number of days to achieve this is 1,640 days. Milestone No. 1: The Pump Station Shaft will be provided to the DDPS contractor within 1,275 calendar days after the date when the Contract Times commence to run.

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insured's) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Within the next 30-days, you must submit:

- 1. Subcontractor/Suppliers List
- 2. Insurance Policies supporting Certificate of Insurance

Owner: City of Fort Wayne BOARD OF PUBLIC WORKS

Michelle Nelson Manager

C: En

Engineer Vendor Compliance

File

SIHJV 1707 S. Harrison St. Fort Wayne, In 46802