Winnipeg

Corporate Finance Department
Materials Management Division

473-2016 ADDENDUM 5

WAVERLEY STREET UNDERPASS AT CN MILE 3.89 RIVERS SUB: CONTRACT 2 – UNDERPASS STRUCTURE, RAILWAYS, ROADWORKS, LAND DRAINAGE SEWER, PUMPING STATION AND LANDSCAPING WORKS

ISSUED: March 3, 2017
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URGENT

PLEASE FORWARD THIS DOCUMENT TO WHOEVER IS IN POSSESSION OF THE BID OPPORTUNITY

THIS ADDENDUM SHALL BE INCORPORATED INTO THE BID OPPORTUNITY AND SHALL FORM A PART OF THE CONTRACT DOCUMENTS

Template Version: A20160708

Please note the following and attached changes, corrections, additions, deletions, information and/or instructions in connection with the Bid Opportunity, and be governed accordingly. Failure to acknowledge receipt of this Addendum in Paragraph 10 of Form A: Bid may render your Bid non-responsive.

PART A – BID SUBMISSION

Replace: 473-2016_Addendum_4-Bid Submission with 473-2016_Addendum_5-Bid Submission. The following is a summary of changes incorporated in the replacement Bid Submission:

Form B(R5): Revise Line Items: J and J.1

Page numbering on some forms may be changed as a result.

PART B – BIDDING PROCEDURES

Add: B14.7

Further to B14.3(a) the Bidder and/or any proposed Subcontractor undertaking the Midtown Feeder Main offline replacement must be able to demonstrate the following qualifications in accordance with B14.5. Senior project site personnel (foremen, superintendents, or similar) which can demonstrate the following qualifications will be considered when evaluating the qualifications of the Bidder or Subcontractor:

(a) A minimum of three (3) successful trenchless installations of 1200 mm or larger pipe beneath active rail lines.

(b) A minimum of three (3) successful trenchless installations of 900 mm or larger steel casing pipe.

(c) A minimum of three (3) successful installations of 600 mm or larger PVC or PCCP pressure pipe.

PART D – SUPPLEMENTAL CONDITIONS

Revise D2.1.10 to read: Part J – **Offline Replacement of the** Midtown Feeder Main ~~Protection~~

(a) offline replacement with casing under CN right-of-way including a new air release valve chamber.

Add: D27.3

Construction Access to Part J – Offline Replacement of the Midtown Feeder Main

(a) As noted on Drawing C2-CU-028, there is an existing easement for the feeder main through the 1360 Taylor Avenue (Piazza De Nardi) property that the Contractor may elect to use to access the Part J works.

(b) Note that access to the feeder main work area from Waverley Street along the south side of the CN tracks will be limited after embankment construction is complete and handed over to CN forces as per D31.1(a)(i), as this area is required for ballast and track installation by CN.

(c) If the Contractor elects to install a temporary construction crossing of CN tracks to assist in provision of construction access, said crossing shall be approved and installed in accordance with E14.2.

(d) As noted on Drawing C2-CU-028, there is an existing easement for the feeder main through 45 Hurst Way (Winnipeg Humane Society) and 850 to 830 Waverley Street (Storageville/Shindico) that the Contractor may elect to use to access the Part J works. This easement is further delineated in the figure shown in Appendix M.

(e) Any temporary upgrades the Contractor deems necessary to facilitate Contractor travel along any easements, including, but not limited to, clearing and grubbing, surfacing materials, culverts, security gates, or other temporary drainage will be incidental to the feeder main work in E80. The Contractor is responsible to accommodate existing drainage patterns on or around this area. The City of Winnipeg Real Estate branch will assist the Contractor in discussions with landowners before temporary upgrades commence.

(f) The Contractor shall be aware that the 830 Waverley Street (Storageville) facility is a secured storage compound. The Contractor is responsible for managing and monitoring access through any temporary gates, maintaining security of the temporary gates, and restoring any modifications to security fences to original conditions after construction is complete. Temporary access gates should only be used for passage of the Contractors' equipment and materials.

(g) The Contractor shall not store equipment or material on the easements noted in (a) and (d) without written consent of the Contract Administrator.

(h) After completion of the Part J works, the Contractor shall remove any temporary upgrades and restore the area to pre-existing conditions. Removal of the temporary works and restoration, which may include, but not be limited to, landscaping and tree replacement will be incidental to the feeder main work in E80.

Revise D31.1 (a) to read: Phase I – Detour Construction

(i) Shoofly Rail Embankment shall be completed and ready for laying of ballast and track by Others by July 15, 2017;

(ii) All roadworks on Waverley Street north of Mathers Avenue and all roadworks on Grant Avenue shall be completed by September 22, 2017;

(iii) Detour roadway shall be open to traffic by October 2, 2017; ~~and,~~

(iv) Stage 2 must occur and be completed on a weekend between 17:30 Friday and 04:00 Monday (specific weekend subject to Contract Administrator approval)**; and,**

(v) Part J – Offline Replacement of the Midtown Feeder Main works shall be completed by October 6, 2017.

Revise D36.1 (a) to read: Phase I – Detour Construction

(i) D31.1(a)(i) - Twenty thousand dollars ($20,000.00);

(ii) D31.1(a)(ii) - Four thousand dollars ($4,000.00);

(iii) D31.1(a)(iii) - Five thousand dollars ($5,000.00); ~~and,~~

(iv) D31.1(a)(iv) - One thousand dollars ($1,000.00) per hour**; and,**

(v) D31.1(a)(v) – Ten thousand dollars ($10,000.00).

Revise D42.1 (a) (iii) to read: Part J – **Offline Replacement of the** Midtown Feeder Main ~~Protection~~

PART E – SPECIFICATIONS

Revise E61.3.11 to read: Formwork

(a) Formwork materials shall conform to CSA Standard A23.1, and American Concrete Publication SP4, "Formwork for Concrete."

(b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121-08, a minimum of 20 mm thick.

(c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-08. Approved Manufacturers are "Evans" and "C-Z."

(d) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.

(e) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal.

(f) Items to be left in place, **i.e., within the structural concrete component, but not within the outer 50 mm,** must be made from a non-rusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

(g) **Nothwithstanding Clause E61.3.11(f), where the structural concrete component is reinforced with black steel reinforcing (refer to Table 62 - 1 for permissible components), the use of black steel formwork accessories will be permitted.**

(h) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.

(i) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.

(j) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.

(k) Stay-in-place formwork or false work is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

Revise E64.2.1(q) to read: AWS C2.23-03/SSPC-CS 23.00 – **NACE No. 12** - Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc and Their Alloys and Composites for the Corrosion Protection of Steel.

Add E64.2.1(aa): CSA G189-1966(R2003) – Sprayed Metal Coatings for Atmospheric Corrosion Protection.

Revise E64.3.1(n) to read: **If hot-dip galvanizing of steel girders is specified,** submit three (3) weeks prior to steel girder hot-dip galvanizing a hot-dip galvanizing plan for the steel girder galvanizing in accordance with ASTM A143/ A143M.

Revise E64.4.7(a) to read: The following areas shall be zinc metallized **in accordance with the Specification E114 "Surface Preparation and Zinc Spray Metallizing of Structural Steel" to** ~~with~~ a minimum coating of 0.25 mm **and** in accordance with AWS C2.23-03/SSPC-CS 23.00 / **NACE No.12**:

(i) ~~Girder bottom flanges, to the extent shown on the Drawings. Girder metallizing is not required.~~ **All steel girders and cross bracings.**

Revise E64.5.2(I) to read: Hot-Dip Galvanizing **of Structural Steel Members, if specified to be applied:**

Revise E64.5.2(I)(ii) to read: Field Applied Touch-up Galvanizing

- Any areas of damaged galvanizing on the ~~sign structures~~ **structural steel members** shall receive field applied touch up galvanizing.
- Surfaces to receive touch up galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose scale, rust, paint, grease, dirt, or other contaminants.
- For self-fluxing, low temperature, zinc based alloy rods, preheat the surface to 315°C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field applied galvanizing shall be blended into existing galvanizing of surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400°C and to not apply direct flame to the alloy rods.
- For pure zinc paint on systems, the approved product Zinga shall be applied by either a brush or roller. The Zinga shall be applied in three (3) coats, with each coat having a dry film. thickness of 60 µm (2.36 mils). Each coat shall be left to dry for a minimum of one (1) hour before the application of the next coat.
- The maximum area to be repaired in the field on a single repair shall be 5,000 mm^2. Any damaged article with a damaged area greater shall be rejected, removed, and replaced at the Contractor's expense.

Revise E66.2.1(a) to read: Perform work in accordance with the requirements of the latest issue of the following specifications and standards:

(i) **ASTM D6386-16a – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Iron and Steel Product and Hardware Surfaces for Painting**

(ii) SSPC-SP1 Solvent Cleaning;

(iii) SSPC-SP2 Hand Tool Cleaning;

(iv) SSPC-SP3 Power Tool Cleaning;

(v) SSPC-SP7 Brush Off Blast Clean

(vi) SSPC-SP10 Near White Blast Cleaning;

(vii) SSPC-SP11 Power_Tool Cleaning to Bare Metal;

(viii) **SSPC- SP 16 Brush-Off Blast Cleaning of Non-Ferrous Metals**

(ix) SSPC-Vis 1 Guide to Pictorial Surface Preparation Standards for Painting Steel Surfaces;

(x) Specification D21; and,

(xi) SSPC specifications are available from:

The Society of Protective Coatings

Telephone: (412) 281-2331

40 - 24th Street, 6th Floor

Pittsburgh, PA 15222-4656

USA

Website: http://www.sspc.org

Revise E66.5.1 to read: Preparation of Metal Surfaces

(a) **Preparation of zinc coated surfaces shall be in accordance with ASTM D6386.**

(b) Clean all surfaces by removing paint, rust, mill scale, welding slag, dirt, oil, grease and other foreign substances by cleaning in accordance with the manufacturer's instructions.

(c) Remove all salts and surface contaminants by water blasting or steam cleaning prior to dry abrasive blasting.

(d) When cleaning by air blasting with sand, provide adequate separators and traps to remove detrimental amounts of water and oil from compressed air before reaching nozzle. Remove traces of blast products from surface and from pockets and corners by brushing with clean brushes, by blowing with clean compressed air, or by vacuum cleaning. Do not damage partially or completed work adjacent to area being cleaned.

(e) Abrasives used in shop cleaning shall be free of chlorides and other contaminants which could affect the coating being applied, and shall produce the anchor pattern required by the coating system.

(f) Hand and power tool clean areas inaccessible to blasting equipment. Such cleaning shall be in accordance with SSPC-SP2 and SSPC-SP3.

(g) The Contractor shall prepare only as much surface as can be coated with primer the same day. If unusual circumstances occur which prevent all prepared surfaces from being primed the same day, a light blast cleaning will be required over all unprimed surfaces prior to recommencement of painting.

(h) For seal coat application, surface shall be rough. If surface is smooth, sand it down using rough grit sandpaper.

Revise E66.5.2 to read: Degree of Cleanliness of Surfaces

(a) Prior to commencing paint application, the degree of cleanliness of surfaces must conform to the following Steel Structures Painting Council Specification:

(i) ~~Commercial Blast Finish to SSPC-SP10 for Commercial Blast Cleaning~~ **Soluble salts to SSPC Guide 15.**

(ii) **Solvent cleaning to SSPC –SP 1.**

(iii) Hand and power tool clean to SSPC-SP 2 or SSPC-SP 3.

(iv) **Brush-Off Blast Cleaning to SSPC-SP 16.**

(v) Provide necessary equipment for access to assist Contract Administrator to carry out tests for cleanliness.

Replace E67.2.2(a) to read: Rigid conduits shall be 150 mm **and 200 mm** ~~nominal~~ **inside** diameter**s, as indicated on the Drawings,** unplasticized PVC in accordance with CSA C22.2 No. 136 complete with the appropriate approved fittings, couplings and expansion joints as detailed on the Drawings. The conduit shall be manufactured by IPEX Electrical Inc. or as accepted by the Contract Administrator, in accordance with B8.

Replace: E80 to read: **OFFLINE REPLACEMENT OF THE MIDTOWN FEEDER MAIN**

E80.1 Description

E80.1.1 This Section details the offline replacement of the Midtown Feeder Main across the CN Rivers Subdivision at Mile 3.79 and construction of an air release valve chamber on the Midtown Feeder Main.

E80.1 Schedule Restrictions

(a) Further to E15.5 shutdown of the Midtown Feeder Main for completion of tie-in's to the existing feeder main will be limited to a maximum of fourteen (14) Calendar Days, measured from the date of turn over to the Contractor after draining by City forces to turn over of system back to the City of Winnipeg to facilitate re-commissioning of the feeder main.

(b) The Midtown Feeder Main may be taken out of service for the above referenced shutdown between May 2017 and September 30, 2017. This schedule may be adjusted in accordance with E15.5 due to third party work occurring on the City's regional water system and system operational constraints.

E80.2 Submittals

E80.2.1 Submit shop drawings for the following in accordance E4:

(a) casing spacers and hardware;

(b) casing end seal;

(c) PVC joint restraints;

(d) AWWA C219 steel sleeve couplings;

(e) all corrosion protection system products; and,

(f) all other materials specified herein.

E80.2.2 Submit shop drawings for the following Air Release Chamber materials in accordance E4:

(a) manhole components;

(b) concrete and reinforcing steel in accordance with CW 2160;

(c) water proofing and sealant products;

(d) sump grating;

(e) small diameter piping and valves;

(f) spray applied polyurethane insulation

(g) pipe seals; and,

(h) all other products specified herein.

E80.2.3 Further to E15.4.2, the Contractor shall submit a Construction Method Statement in accordance with E4 with the following additional information:

(a) excavation method around existing utilities and temporary support methods. Existing utilities include buried fibre optics, buried hydro, and overhead hydro;

(b) a laying schedule for the installation detailing the location of each length of PVC pipe, all bends, closures and intended field cuts. The laying schedule shall be prepared to minimize the number of field cuts required;

(c) feeder main construction sequencing, including:

(i) casing pipe installation method in accordance with E83.4;

(ii) feeder main installation through casing pipe;

(iii) thrust block construction;

(iv) feeder main cleaning, disinfection, and pressure testing procedures;

(v) tie-in's to the existing feeder main;

(vi) means of removal for the existing feeder main piping; and,

(vii) abandonment of the existing feeder main.

(d) construction methods and sequencing for construction of the air release chamber; and,

(e) protection of the existing feeder main piping from contamination.

E80.2.4 Submit the following documentation for inclusion in the City's feeder main shutdown protocol for each planned feeder main shutdown:

(a) a step by step list of a tasks to be undertaken during the shutdown;

(b) contingency plans to mitigate risks identified in a joint planning session with the Contactor, Contractor Administrator and the Water and Waste's Water Services; and,

(c) check list of equipment, materials, tools required to complete the work that need to be on site prior to undertaking the shutdown.

E80.2.5 Submit a shoring plan including the following:

(a) Shop Drawings for all excavation shoring shall be prepared and submitted in accordance with E4. All shop drawings shall be sealed by a Professional Engineer, registered in the Province of Manitoba, experienced in the design of shoring systems for the excavation method proposed;

(b) shoring installation and staging plan; and,

(c) means of protecting the feeder main during shoring installation and removal.

E80.3 Materials

E80.3.1 Steel Casing Pipe

(a) The 1450 mm steel casing pipe is being supplied under a separate Contract. The Contract Administrator will provide the Contractor with a contact for the supply contractor upon award.

(b) The following casing pipe is being supplied for completion of the work:

(i) 1450 mm steel casing pipe;

(ii) Pipe Dimensions:

- Outside Diameter: 1473 mm (58")
- Inside Diameter: 1429 mm
- Wall Thickness: 22.2 mm (7/8")
- Pipe Length: 3.05 m

(iii) Joint: Permalok T5;

(iv) Number of Pipes: 15;

(v) Inner and Outer Coatings: Epoxy (16 mil minimum) or polyrethane (40 mil minimum);

(vi) the pipe is being supplied without grouting ports. The addition of grouting ports to suit the Contractors preferred installation method will be the responsibility of the installation contractor; and,

(vii) the supply contractor will be supplying 7.5 L (2 gallon) of repair product for the casing pipe. The installation contractor is responsible for procuring additional repair product as required to complete the installation.

(c) The casing pipe supplied by others is to arrive in Winnipeg by July 14, 2017.

(d) The casing pipe will be delivered to Site by the supply contractor. The Contractor shall provide the Contract Administrator with notice a minimum of ten (10) Business Days prior to the intended delivery date. The Contractor shall coordinate with the supply contractor for delivery to the Site.

(e) The Contractor shall attend a delivery inspection, with the pipe supply contractor, and Contract Administrator. The pipe supply

contractor shall rectify any damage noted during the delivery inspection. Written acceptance of the pipe by a duly completed "Certificate of Equipment Delivery (Form 200)" (Supplied by the Contract Administrator) shall constitute acceptance for installation from the installation contractor.

(f) Shop drawings for the casing pipe will be provided upon receipt and review by the Contract Administrator.

E80.3.2 PVC Feeder Main Piping and Fittings

(a) The 900 mm PVC feeder main piping and fittings are being supplied under a separate Contract. The Contract Administrator will provide the Contractor with a contact for the supply contractor upon award.

(b) The following feeder main pipe and fittings are being supplied for completion of the work:

(i) 900 mm AWWA C900 DR25 PVC feeder main piping.

- Pipe Length: 6.10 m
- Pipe Dimensions to conform to AWWA C900, Table 1A.
- Bells conform to the requirements of Section 4.3.2.3 a).
- Number of Pipes: 13

(ii) 900 mm AWWA C900 DR25 Fabricated PVC 45 deg bend (Bell x Bell)

- Quantity: 2

(iii) 900 mm AWWA C900 DR25 Fabricated PVC 50 deg bend (Bell x Bell)

- Quantity: 2

(iv) 900 mm AWWA C900 DR25 Fabricated PVC Testing Plug complete with two 75 mm threaded ports (Plain End)

- Quantity: 2

(v) 900 mm AWWA C900 DR25 Fabricated PVC Slide Collars (closures)

- Quantity: 2

(c) The feeder main pipe and fittings are to arrive in Winnipeg by July 14, 2017.

(d) The feeder main pipe and fittings will be delivered to Site by the supply contractor. The Contractor shall provide the Contract Administrator with notice a minimum of ten (10) Business Days prior to the intended delivery date. The Contractor shall coordinate with the supply contractor for delivery to the Site.

(e) The Contractor shall attend a delivery inspection, with the pipe supply contractor, and Contract Administrator. The pipe supply contractor shall rectify any damage noted during the delivery inspection. Written acceptance of the pipe and fittings by a duly completed "Certificate of Equipment Delivery (Form 200)" (Supplied by the Contract Administrator) shall constitute acceptance for installation from the installation contractor.

(f) Shop drawings for the casing pipe will be provided upon receipt and review by the Contract Administrator.

(g) The installation contractor is responsible for determining the correct outside diameter of the pipe/fitting barrel and bell for sizing of casing spacers and joint restraints.

E80.3.3 PCCP Pipe Fittings

(a) Cement

(i) Portland Cement shall be Type HS Sulphate resistant Cement.

(ii) External mortar coating shall contain ten percent (10%) silica fume by weight of cement.

(iii) Approval in writing is required if the Contractor proposed to use fly ash or pozzolan as a supplementary cementing material in conformance with AWWA Standard C301, Section 4.4.1.

(iv) Approval requests should be accompanied by a submission from an independent testing laboratory complete with sampling and testing results of the material conforming to ASTM Standard C311.

(b) Joints

(i) For connection to existing 900 mm pipe joints, standard single gasket joints will be permitted. Existing joint diameter and joint depth are provided on the Drawings. 'O' ring size is unknown and to be determined by the Contractor.

(c) Fittings

(i) Fittings shall be manufactured using minimum steel thicknesses specified in Table 1, Section 4.7 of AWWA C301.

(ii) Fittings shall be supplied complete with mortar lining and coating in accordance with AWWA C301. A 450 mm hold back on mortar coating shall be left for all plain ends unless otherwise specified on the Drawings.

(iii) Exposed steel joints and plain ends shall be coated in accordance with AWWA C210 and as specified herein for liquid epoxy coatings.

(d) Pipe Marking

(i) Each section of pipe and each fitting shall be plainly marked with a waterproof marking material both inside (on the bell or spigot end) and outside (at the pipe's midspan) the classification, the date of manufacture and marks of identification sufficient to show its proper location in the line by the reference to the laying schedule specified.

(e) Fitting Design

(i) All fittings shall be design and constructed to withstand maximum design working pressure of 700 kilopascals, a test pressure of 830 kilopascals, and all external pressures caused by overburden, traffic or other loads to which the pipe might be subjected, all in accordance with the applicable requirements of AWWA Standard C301 and C304.

(f) Affidavit of Compliance

(i) An affidavit of compliance signed by an officer of the pipe manufacturing company shall be provided stating that the pipe and fittings comply with this Specification, in accordance with Section 6.3 of AWWA C301.

E80.3.4 Metallic Casing Spacers

(a) Casing spacers shall be constructed from type 304 stainless steel.

(b) Casing spacers shall be supplied complete with glass reinforced polyester or nylon runners, capable of providing di-electric insulation between the casing pipe and runner.

(c) Minimum band thickness: 14 Gauge

(d) Minimum band thickness: 305 mm

(e) Minimum riser thickness: 10 gauge

(f) Hardware shall be 304 stainless steel.

(g) Midtown Feeder Main:

(i) Estimated Full Pipe Weight: 7.63 kN/m

(ii) Max casing spacer separation: 3.05 m

(iii) Spacers shall be placed on both sides of pipe joints within 600 mm of the joint.

(iv) The casing spacer supplier shall confirm the load carrying capacity of the spacer and provide maximum spacing recommendations based on the applied loads and capacity of the casing spacer.

(h) Approved Products:

(i) Model S Metallic Casing Spacer produced by Pipeline Seal and Insulator, Inc.

(ii) or approved equal in accordance with B8.

E80.3.5 Casing End Seals

(a) Ends of the casing shall be sealed against the carrier pipe to prevent water and soil transfer in to the annulus.

(b) End seal shall be a pull on or wrap around style complete with stainless steel bands for both the casing and carrier pipe connections.

(c) Seal shall be manufactured from 3.175 mm (1/8”) thick EPDM 60 rubber.

(d) The overlap portions of the rubber shall be sealed to provide a water tight membrane.

(e) Approved products:

(i) Model “S” Standard Pull-on or Model “W” Wrap Around End Seal produced by Pipeline Seal and Insulator, Inc.

(ii) or approved equal in accordance with B8.

E80.3.6 Pipe Couplings

(a) Pipe couplings shall conform to AWWA C219 for bolted, Sleeve Type Couplers for Plain End Pipe. Minimum requirements are:

(i) Material: Steel

(ii) Minimum sleeve length: 250 mm

(iii) Minimum centre steel sleeve thickness 9.5 mm

(iv) Couplings capable of accommodating up to 2 degrees deflection

(v) Bolts and nuts to be 316 Stainless Steel complete with di-electric isolating washers and sleeves.

(vi) Design pressure 150 psi

(b) Buried pipe couplers shall be protected against corrosion by wrapping with AWWA C217 petrolatum corrosion protection system in accordance with E80.3.8 and E80.4.13.

(c) Couplings to be supplied with two di-electric insulating boots.

(d) Couplings to be supplied complete with a fusion bonded epoxy coating in accordance with AWWA C213 and as specified herein, and meeting the requirements of ANSI/NSF 61 “Standard for Drinking Water System Components – Health Effects”.

(e) All transition couplings, larger than 300 mm in diameter, with differential outside pipe diameters greater than 25 mm shall be restrained to prevent movement of the coupling due to differential thrust forces. Tie rods placed in compression for the purpose of restraining differential thrust forces shall be no longer than 150 mm and the Contractor must demonstrate they are capable of withstanding the applied forces.

E80.3.7 Joint Restraint Harnesses

(a) Utilize joint restraint harnesses specially designed for PVC.

(b) PVC fitting joint restraints shall be constructed of ductile iron to ASTM A536 Grade 65-45-12.

(c) Accepted Products:

(i) EBAA Iron Series 2500 or 2800

(ii) Uniflange Series 1360 or 1390

(iii) Romac 611 Restraining System

(iv) or approved equal in accordance with B8

(d) Joint restraint harnesses to be supplied complete with a fusion bonded epoxy coating in accordance with AWWA C213 and as specified herein.

(e) Notwithstanding the accepted products noted above, the Contractor shall be responsible to source a joint restraint system compatible with the dimensional constraints of the PVC pipe and steel casing pipe being supplied.

(f) All joint restraint harnesses shall be protected against corrosion by wrapping with AWWA C217 petrolatum corrosion protection system in accordance with E80.3.8 and E80.4.13.

E80.3.8 Petrolatum Tape Corrosion Protection System

(a) All buried pipe couplers and flanged connections shall be protected against corrosion by a petrolatum tape corrosion protection system consisting of the following components:

(i) Petrolatum paste primer

(ii) Void-filling mastic filler

(iii) Petrolatum tape

(iv) Protective outerwrap

(b) Petrolatum tape systems shall conform to AWWA C217.

(c) Approved Products and Manufacturers:

(i) Petrolatum tape system manufactured by Denso North America Inc.

(ii) Trenton Corporation,

(iii) Petro Coating Systems Ltd,

(iv) or approved equal in accordance with B8.

E80.3.9 Continuity Bonding For Anodes

(a) Wires for continuity bonding shall be No.10 American Wire Gauge (AWG) 7-strand copper conductor with black TWU insulation.

(b) Thermite weld products shall be properly selected based on the wire size, pipe size and material.

(c) Thermite weld caps shall be constructed from 20 mil high-density polyethylene and may be either pre filled or field filled with a bituminous mastic coating or approved equal in accordance to B8.

E80.3.10 Galvanic Anodes

(a) Galvanic anodes for cathodic protection of buried ferrous pipes and fittings shall be 11.5 kg pre-packaged zinc anodes to City of Winnipeg specification.

E80.3.11 Manhole Materials

(a) All manhole materials shall conform to CW 2130.

E80.3.12 Concrete and Reinforcement

(a) All concrete works shall conform to CW 2160 unless otherwise stated on the Drawings.

E80.3.13 Sump Grating

(a) Sump grating shall be either FRP or Aluminum.

(b) FRP Sump Grating:

(i) FRP grating shall be a 38 mm deep by 38 mm square mesh.

(ii) Grating shall come complete with a 38 x 38 angle channel cast into the chamber floor and anchored with integral concrete anchoring ribs.

(iii) Approved Products: Fibergrate molded grating or approved equal in accordance with B8.

(c) Aluminum Sump Grating:

(i) Aluminum grating shall be a 38 x 4.76 mm swage or pressure locked aluminum grating with 102 mm on center cross bars.

(ii) Grating shall come complete with a 38 x 38 x 6.35 mm aluminum angle channel cast into the chamber floor and anchored with 9.5 x 102 mm anchor studs. Minimum two (2) anchor studs per side located 150 mm from corner.

E80.3.14 Flange Gaskets

(a) 3 mm, full-faced, SBR rubber gaskets or neoprene in accordance with AWWA C207.

(b) Gaskets shall be one piece construction where possible.

(c) Segmented gaskets shall be constructed of a minimum number of segments and joints shall be of dovetailed construction, or other jointing methods approved by the Contract Administrator.

E80.3.15 Blind Flanges

(a) Steel blind flanges shall be AWWA C207 Class D.

(b) Cast and ductile blind flanges shall be ASME/ANSI B16.1 Class 125.

(c) Steel blind flanges to be fusion bonded epoxy coated in accordance with AWWA C213 and as specified herein for fusion bonded epoxies.

(d) Cast and ductile iron blind flanges shall be fusion bonded epoxy coated in accordance with AWWA C116 and as specified herein for fusion bonded epoxies.

E80.3.16 Flanged Ball Valves

(a) Small diameter ball valves (75 mm diameter and less) shall be constructed from Type 316, stainless steel, including the body, ball, and stem. Flanges shall conform to ASME B16.1 CLASS 125. Approved Product: Series 4001 as manufactured by American Valve Inc. or approved equal in accordance with B8.

E80.3.17 Threaded Piping, Fittings and Flanges

(a) Small Diameter steel threaded fittings and flanges (75 mm diameter and less) shall be in accordance with ANSI B16.5 - Class 150.

(b) Small diameter steel pipe nipples shall be Schedule 80 steel.

(c) All steel piping and piping components shall be coated (interior and exterior) with liquid epoxy coating in accordance with AWWA C210 and as specified herein, and meeting the requirements of ANSI/NSF 61 “Standard for Drinking Water System Components – Health Effects”.

E80.3.18 Flange Isolation Kits

(a) Flange isolation kits shall be used where noted, where dissimilar metal piping or fittings are joined.

(b) Flange isolation kits shall be to City of Winnipeg specification except as modified below.

(c) Each kit shall be double flange isolation kit with insulating sleeves and washers for each flange of the bolted connection.

(d) Bolt sleeves shall be comprised of G10 or G11 epoxy glass.

E80.3.19 Liquid Epoxy Coatings

(a) Liquid epoxy coatings shall conform to AWWA C210.

(b) All paint shall be NSF 61 certified for immersion service in pipelines.

(c) All coatings shall be applied in a minimum of two (2) or more layers (5 mils dry film thickness minimum each coat) for a minimum final coating dry film thickness of the greater of 16 mils or as recommended by the manufacturer for immersion service applications.

(d) Coatings for all exposed steel, piping, valves, and actuators shall be Polyamide Epoxy.

(e) Interior pipe linings shall be a one hundred percent (100%) solids liquid epoxy product.

(f) Approved interior lining products: Enviroline 230, Bar-Rust 234P, Specialty Polymer Coatings SP-7888, or approved equal in accordance with B8.

(g) Approved exterior products: Enviroline 230, Bar-Rust 234P, Specialty Polymer Coatings SP-7888, Tnemec Series 140F Pota-Pox Plus, Amerlock 2 or approved equal in accordance with B8.

E80.3.20 Fusion Bonded Epoxy Coatings

(a) Fusion bonded epoxy coatings shall conform to AWWA C213.

(b) Fusion bonded epoxies shall be NSF 61 certified for immersion service in pipelines.

(c) The final minimum coating thickness shall be the greater of 10 mils or as recommended by the manufacturer for buried applications.

E80.3.21 Molded Polystyrene Insulation

(a) Molded polystyrene insulation shall conform to CSA S307 Type 1.

E80.3.22 Extrudable Polyurethane Waterstop

(a) Extrudable polyurethane waterstop shall be a Gun Grade extrudable polyurethane base waterstop.

(b) Approved Products: SikaSwell S by Sika, or approved equal in accordance with B8.

E80.3.23 Pipe Seals

(a) EPDM sheets shall conform to ASTM D7465 or D4637.

(b) All stainless steel components shall be Type 316.

(c) Stainless steel banding shall be 19 mm wide with a minimum 0.76 mm thickness.

(d) EPDM sealant shall be compatible with the EPDM rubber sheet material and suitable for adhesion to a concrete substrate.

(e) The pressure ring shall be oval or oversized to accommodate curvature of manhole barrel without obstructing the 75 mm annulus between the pipe and manhole wall. No gaps shall be permitted between the two (2) halves of the pressure ring once installed.

E80.4 Methods

E80.4.1 Groundwater Dewatering

(a) The Contractor should be cognizant of the presence of clay cut off collars along the length of the Midtown Feeder Main. Their precise location is unknown and there is the potential to encounter high levels of groundwater flow from the existing feeder main pipe bedding. The Contractor's contingency planning shall have means to address the groundwater flow.

(b) Further to Clause 3.1.4 of CW 2030, water from dewatering systems shall be directed to the LDS system and adequate steps put into place to ensure sediment is intercepted prior to entering the LDS system.

(c) As a means of limiting dewatering efforts, the Contractor may choose to install cut off collars on Midtown Feeder Main on either end of the job site prior to commencement of the shoring and excavation work. Cut off collars may be constructed from either clay or via ground modification methods. The Contractor shall submit a plan in writing to the Contract Administrator prior to undertaking this work.

E80.4.2 Shoring

(a) Shoring shall be provided for excavations in accordance with CW 2030.

(b) Excavation shoring shall be designed to accommodate the existing Midtown Feeder Main, installation of the casing pipe and all pipe and fittings.

(c) All shoring systems shall comply with Manitoba Workplace Safety and Health requirements.

(d) Shoring Restrictions:

(i) Shoring shall not encroach onto private property without written permission from the land owner.

(ii) Shoring shall not be installed beyond the limited outlined on the drawings. Shoring closer to the tracks that that shown on the drawing shall meet all CN requirements for temporary shoring and be approved by CN prior to construction. The Contractor shall bare all costs from CN for the approval of shoring.

E80.4.3 Trenchless Casing Pipe Installation

(a) Install casing pipe in accordance with E83 and as specified herein:

(i) Equipment used for trenchless pipe installation shall be capable of articulated steering capable of maintaining the alignment with the specified tolerances for the anticipated ground conditions. The Contractor must be able to demonstrate the steering capabilities of the proposed equipment and their ability to steer within the anticipated ground conditions.

(ii) The Contractor shall be aware of the possibility of encountering former excavation shafts from the original feeder main installation within the proposed bore path. Backfill of former construction shafts could contain debris and other foreign material. Notify the Contract Administrator immediately upon encountering changes in ground conditions reflective of a former construction shaft.

(iii) In conjunction with the Contract Administrator, develop a monitoring protocol for loss of ground monitoring to ensure that there is no deleterious loss of ground impact from the trenchless installation on either the CN tracks or the existing feeder main casing pipe. The Contract Administrator will implement the loss of ground monitoring program and the Contractor shall take all necessary precautions to ensure that the trenchless installation does not impact the CN Railway or the existing feeder main. While the monitoring program will be implemented at no cost to the Contractor, any mitigative or restorative work associated with inadvertent loss of ground will be the Contractor's responsibility.

(b) Damage to casing pipe coating shall be repaired in accordance with the manufacturer's recommendations.

(c) 1500 mm steel casing pipe shall be installed in accordance with the manufacturer's recommendations, including assembly of pipe joints. Permalok joint shall be assembled complete with RTV silicone recommended by the manufacturer.

(d) The Contractor shall complete a 75 mm long on weld each joint of the casing pipe prior to installation of the feeder main piping for the purposes of electrical conductivity. Coating at the weld location shall be repaired in accordance with the manufacturer's recommendations. Welding may occur during casing installation or after completion of the installation process.

(e) Repair all interior coating damage after completion of the casing pipe installation.

(f) The Contractor is responsible for plugging all grouting ports with water tight plug and coating with a product compatible with the casing pipe's coating.

E80.4.4 Installation of AWWA C900 PVC Feeder Main Pipe in an Open Trench

(a) Installation of Pipe

(i) Pipe bedding structure shall meet the requirements of ASTM D2321 except as modified herein and on the Drawings.

(ii) The sand bedding shall be levelled and compacted to 95% SPMDD, such that it forms a continuous solid bedding for the full length of the pipe except at the midpoint of each pipe and at the joints. The middle of the trench bedding for a width of one third of the pipe outside diameter shall remain uncompacted.

(iii) A small groove shall be left at the midpoint to facilitate the removal of the sling after the pipe has been laid. Another groove shall be provided at each joint to facilitate placing of the pipe bell. Both grooves shall be filled with compacted sand after placement of pipe and removal of the sling.

(iv) Sand bedding shall be placed to 50 millimetres above the haunch of the pipe and thoroughly compacted to ninety-five percent (95%) SPMDD, to provide adequate lateral support of the pipe wall. Sand initial backfill shall then be place to a depth above the pipe to a depth of 150 millimetres above the top of the pipe, for the full trench width. The Contractor shall ensure that disturbance of the pipe or damage to the pipe coating does not occur during sand bedding and backfilling operations.

(v) The pipe shall be laid and fitted together so that when complete, the pipe will have a smooth and uniform invert. The trench shall be free of water while the pipe is being installed. The excavation of the trench shall be fully completed a sufficient distance in advance so as not to interfere with the laying of the pipe.

(vi) Pipe shall be installed utilizing trench methods except as noted on the drawings.

(vii) The exposed end of the pipe shall be fully protected with an approved stopper to prevent foreign matter from entering the pipe. The interior of the pipe shall be kept free of all dirt, concrete or superfluous material as the Work proceeds.

(b) Jointing

(i) Pipe shall be joined in accordance to manufacturer's instructions and accepted industry practice. Over-insertion of pipe joints shall not be permitted.

E80.4.5 Installation of AWWA C900 PVC Feeder Main Pipe in an Encasement Pipe

(a) Complete installation in accordance with CW 2110 and as noted herein.

(b) The Contractor shall install the feeder main piping in such a manner as to not separate or over insert the PVC pipe joints. Proper installation of joint restraints is critical to maintaining joint integrity.

(i) Protection of the joint from over insertion may be accomplished by placing the joint restraint ring at the insertion limit for the joint.

(c) Install casing spacers and joint restraints as per the manufactures recommendations.

E80.4.6 PCCP Jointing

(a) Immediately prior to connecting two (2) lengths of pipe, the spigot end of the pipe shall be thoroughly cleaned. Prior to insertion of the

rubber gasket in the spigot groove, the spigot grove shall be lubricated with vegetable soap. The gasket shall then be thoroughly cleaned and then lubricated with a vegetable soap approved by the pipe manufacturer, the consistency of which shall be approximately that of soft No. 2 cup grease. In stretching the gasket, care shall be exercised to maintain a uniform tension or volume of rubber around the whole circumference of the spigot. The bell of the pipe already in place shall be carefully cleaned and lubricated with vegetable soap.

(b) The spigot shall then be pushed into the bell and against steel inserts placed between the top of the spigot and the shoulder of the bell to provide a space for inserting the feeler gauge. The entire circumference of the joint shall be gauged to determine that the rubber gasket is in its proper position. If the gasket cannot be felt all around the pipe, the pipe shall be withdrawn and the gasket examined for cuts. If the gasket is undamaged it may be reused, but only after the bell ring and gasket have been lubricated with soap again, as previously specified, before the pipe is re-laid. When it has been determined that the gasket is in its proper position, the steel inserts shall be removed and the pipe pushed completely “home”.

(c) Diaper bands to hold grout in place shall be used according to the manufacturer’s instructions. Immediately before pouring cement grout, the entire joint shall be thoroughly wetted. A cement grout of one part Sulphate-Resistant cement to two parts sand shall be poured between the diaper and the pipe, to ensure a thorough sealing of the joint around the portion of the pipe covered by the band. Silt, slush, water or polluted mortar grout shall be carefully forced out by the pouring and removed. The upper portion of the joint shall then be filled with mortar and a bead made around the outside of the top half of the pipe joint with a sufficient amount of additional mortar. The completed joints shall immediately be protected from the air, sun or cold with proper coverings and shall be kept protected for such a period as necessary to secure satisfactory curing of the mortar. No backfilling around joints shall be done until the joints have fully cured.

(d) The inside joint recess of the concrete pipe, sizes 600 millimetres and larger, shall be completely filled with mortar made from one part cement and one part sand so as to provide a smooth continuous flush surface across the joint. The Contractor shall comply with all requirements and regulations of the Workplace, Safety and Health Division concerning air supply for workers performing operations inside the pipe and any associated costs shall be considered incidental to the installation.

(e) Delay grouting and diapering of short pipe joints immediately outside of chambers, until completion of construction and partial backfill of chamber, to allow maximum differential deflection and settlement prior to final backfill.

E80.4.7 Frost Condition Work Procedures

(a) In the event the work is delayed and carried out under cold weather conditions, frost condition work procedures shall be followed.

(b) No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when there is danger of the formation of ice or the penetration of frost at the bottom of the excavation. Every precaution must be taken to prevent frost from penetrating the ground to depths below the foundations during construction. Any pipe which has been injured through neglect of this provision of the

specifications, shall be removed and made good by the Contractor their expense.

(c) Heating of the pipe, sand, mortar and gaskets shall commence when the ambient temperature falls below -5°C. The pipe shall be heated throughout with a low heat immediately prior to installation (warm to the touch).

(d) All mortar for joints shall be heated, and heated sand shall be placed around the pipe for the full height of the specified bedding and initial backfill and to at least 600 millimetres on either side of the joint, all to the satisfaction of the Contract Administrator.

E80.4.8 Thrust Blocks

(a) Thrust blocks shall be installed at all tees, wyes, elbows, bends, plugs, reducers and crosses and at location shown on the Drawings. Thrust blocks shall consist of concrete as specified in Specification CW2160 and shall be installed as shown on the Drawings. The thrust block shall bear against undisturbed soil, shoring walls (where indicated on the drawings), or compacted granular as shown on the drawings. No horizontal struts or braces required for trench bracing shall remain in the concrete thrust block. A bond breaker consisting of 0.20 millimetre (8 mil) polyethylene sheeting shall be installed between fittings, valves or plugs and the concrete of the thrust block to allow future removal of the thrust block without disturbing the fitting, valve or plug. Before any concrete is placed, all thrust block formwork shall be inspected by the Contract Administrator.

(b) Where indicated, leave shoring in place behind thrust block and cut off above the thrust block. All timber lagging is to be removed prior to construction of the thrust block.

E80.4.9 Connections to Existing Pipes

(a) Connections to existing pipes shall be made at the locations shown on the Drawings.

(b) Connections between existing PCCP and AWWA C900 PVC pipe shall be made by means of a bell or spigot plain end adaptor and bolted sleeve coupling as indicated on the drawings. Alternate connection methods for connection of PVC pipe to existing PCCP may be permitted upon review and approval of the Contract Administrator. Design and fabrication of alternate connections will be the responsibility of the Contractor.

(c) The Contractor is responsible for obtaining the correct gaskets for connections to the existing pipe. If incorrect gaskets are obtained prior to disassembly of the existing pipe, new gaskets are to be obtained immediately in order to expedite the feeder main shutdown.

(d) All non-tested pipe joints included in connection sections shall be exposed after recommissioning to inspect for leakage.

E80.4.10 Demolition, Removal and Abandonment of Existing Pipe and Fittings

(a) Where indicated on the Drawings and directed by the Contract Administrator, remove designated portions of pipe. Removal methods shall be employed that preclude damage to adjacent pipes and joints that are to remain in place.

(b) Salvage a minimum of one (1) complete length of each type of pipe and return to designated City facility for examination and testing purposes.

(c) Piping required to be cut and/or demolished to facilitate removal of adjacent pipe shall be a minimum of one complete pipe length away from proposed connection points.

(d) All gaskets from existing pipes shall be carefully salvaged, cleaned and inspected. Due to changes in gasket design, existing gaskets may require re-use when connecting to existing pipe joints.

(e) All pipe and valves removed shall be salvaged, and returned to a designated City of Winnipeg facility.

(f) Abandon pipes with flowable fill where indicated on the Drawings. Flowable fill shall meet requirements of CW 2160.

E80.4.11 Line and Grade

(a) The pipe shall be installed to the line and grade shown on the Drawings and as set in the field by the Contract Administrator. Vertical variance from grade shall not exceed 25 millimetres and horizontal variance from line shall not exceed 100 millimetres. Sharp bends will not be permitted even though the pipe remains within these tolerances. Alignment corrections allowed in main line piping but not at closures. Tees and bends shall be installed to the grades and at the locations shown on the Drawings or where required to connect to existing pipelines.

E80.4.12 Casing End Seals

(a) Install casing end seal in accordance with the manufacturer's recommendation.

(b) Pipe and casing shall be carefully bedded and backfilled with sand to 150 mm above the casing as shown on the Drawings in a manner to ensure no damage occurs to the end seal.

E80.4.13 Installation of Petrolatum Tape Corrosion Protection Systems

(a) Install in accordance with AWWA C217 and the manufacturer's recommendations.

(b) For all surfaces to be wrapped with the corrosion protection system, remove loose rust, paint and foreign matter by hand, and/or power tool cleaning in accordance with SSPC-SP-2 or SSPC-SP-3.

(c) Apply a thin uniform coat of petrolatum paste primer, using a glove or brush, to all surfaces to be wrapped with the corrosion protection system.

(d) Apply void-filling mastic filler, by hand, to all flanges designated to be wrapped with the corrosion protection system. Mold the mastic to a rounded configuration around the flange, filling all spaces around fasteners and eliminating sharp edges and irregular shapes.

(e) Spirally wrap the petrolatum tape, using a minimum 25 mm overlap, over the primed and mastic-filled pipe and flange surfaces. While wrapping, press out all air pockets and smooth all lap seams.

(f) Spirally wrap clear outerwrap, using sufficient tension to make a tight-fitting cover, over the petrolatum tape.

E80.4.14 Installation of Lead Wires, Continuity Bonding and Galvanic Anodes

(a) Anodes and continuity bonding shall be installed on new and existing pipes and fittings where shown on the Drawings or as directed by the Contract Administrator.

(b) Thermite Welding Procedure:

(i) Prepare steel surface to bare metal by grinding or filing. Remove all coatings, dirt, mill scale, oxide, grease, moisture, and other foreign matter from weld areas in an area required to complete the weld.

(ii) Before welding, remove wire insulation as required to fit mold, avoiding damage to the exposed copper wire. If wire is cut or nicked over halfway through its diameter, cut off and strip new end. If manufacturer requires the use of a copper sleeve, crimp it securely to wire and remove excess wire protruding from the end of the sleeve.

(iii) After charge is set, remove mold and slag from weld area with welder's hammer. Strike top and sides of weld with hammer to test secureness of connection. If weld does not hold, remove scrap weld material, clean, and begin weld process again.

(iv) After welding and before coating the cleaned weld area, the Contract Administrator may test the joint bond for and wires for electrical continuity.

(c) When the weld passes test for soundness and electrical continuity, repair the coating in the weld area with mastic and weld cap placed over the weld. Clean weld area to remove any loose material, and welding residuals. Cover exposed metal on the pipe and wire with mastic filled weld cap. Ensure weld cap covers the entire area of coating removed for installation of the thermite weld. If not, repair coating as per the coating manufactures recommendations prior to installing weld cap.

(d) Anodes shall be installed below the base of the excavation and fully encapsulated with native clay backfill material. Installation of anodes with the CLSM material is not permitted.

E80.4.15 Coatings

(a) Where indicated on the Drawings and directed by the Contract Administrator, prepare metal surfaces for recoating using the following methods:

(i) Steel - Prepare steel surfaces for recoating by blast cleaning to near-white metal as specified by Joint Surface Preparation Standard NACE No.2/SSPC-SP10.

(ii) Cast and Ductile Iron - Prepare ductile iron surface in accordance with NAPF 500-03.

(iii) Remove all dust and loose residues from the prepared surfaces and chamber floor. The surface shall be roughened to a degree suitable for the coating system employed.

(b) Protect valve seals, machined surfaces, threads, and nameplates from sandblasting.

(c) Primer coat to follow immediately after completion of sandblasting and prep.

(d) Apply liquid epoxies of prepared surfaces in accordance with AWWA C210, E80.3.19, and the manufactures recommendations.

(e) Apply fusion bonded epoxies of prepared surfaces in accordance with AWWA C213, E80.3.20, and the manufactures recommendations.

(f) Provide adequate ventilation and heat to facilitate curing of coatings.

(g) Interior linings for pipes and fittings shall be applied and cured as recommended by the manufacturer prior to placing into service. Linings must be fully cured for immersion service prior to installation and reinstating the line into service.

E80.4.16 Temporary Thrust Bracing

(a) Temporary thrust bracing is required for pressure testing of the newly installed feeder main piping. The Contractor is responsible for ensuring that all joint restraints are properly installed and thrust blocks have obtained adequate strength prior to pressure testing the feeder main piping.

(b) The calculated thrust force at test pressure for the 900 mm feeder main piping is 520 kN (117,020 lb).

E80.4.17 Construction of Air Release Chamber

(a) Chamber Construction:

(i) All concrete works shall conform to CW 2160.

(ii) Install manhole components in accordance with CW 2131.

(b) Spray Applied Polyurethane Insulation

(i) Spray applied polyurethane insulation shall be applied to the exterior of the manhole chamber as shown on the drawings.

(ii) Insulation shall be applied as per the manufactures recommendations.

(c) Extrudable Polyurethane Waterstop

(i) Install extrudable polyurethane waterstop where shown on the drawings as the manufacturers recommendations.

(d) Pipe Seals

(i) Pipe seals shall be constructed as shown on the Drawings.

(ii) Remove all rough edges and high spots from existing pipe and manhole.

(iii) Clean the existing pipe and manhole as per the sealant manufactures recommendations.

(iv) Seal seams in EPDM sheets as per the manufacturers recommendations.

E80.4.18 Hydrostatic Leakage Testing

(a) Testing shall be completed in accordance to CW 2125. The Contractor shall slowly fill the feeder main with potable water and ensure all air is expelled from the line prior to commencing the test.

(b) Notwithstanding CW 2125, the feeder main piping identified on the drawings shall be tested to 830 kPa (120 psi).

(c) Water for hydrostatic leakage testing may be obtained from hydrants located on Taylor Avenue.

E80.4.19 Protection of Feeder Mains from Contamination.

(a) The Contractor shall install temporary closures on the existing piping to prevent contamination of feeder mains when not on site or actively working on the piping itself.

(b) Temporary closures shall be constructed to prevent the ingress of water, air contaminates, debris, and animals. Closures shall be constructed and installed in such a manner as to prevent in

inadvertent puncture, displaced or otherwise damaged in a manner that could result in the contamination of feeder mains.

(c) Closures shall be gasketed and securely fastened to the existing pipe flanges.

E80.4.20 Disinfection of Feeder Main Piping

(a) Cleaning and disinfection of feeder main piping and shall be completed in accordance with CW2125 and AWWA C651 except initial flushing will not be required.

(b) Further to CW 2125, disinfection of segments of feeder mains not disinfected as noted above, shall be completed by swabbing as outlined in Section 3.3.16 of CW 2125.

(c) In accordance with Section 4.3 of AWWA Standard 651, the Contractor shall take all preventative and corrective measures during construction to prevent debris from entering the pipeline. If deleterious substances have entered the pipeline, the Contractor shall clean and flush the pipeline with sanitized pipeline cleaning equipment.

(d) Disinfection of pipelines shall be performed by persons having a minimum Class II Water Distribution Operator and Class III Water Treatment Operator certification from the Manitoba Water and Waste Association or approved equivalent association.

(e) After the City has completed refilling of the associated feeder mains with potable water, water samples for health tests shall be taken in accordance with CW 2125. Notwithstanding CW 2125, test samples shall be taken each day at least twenty-four (24) hours apart for three (3) successive days. The Contractor shall assist the Contract Administrator and City in procuring health samples as described herein. The sampling location will be identified by the City prior to refilling of the feeder main(s).

(f) If required, chlorinated water shall be treated by one of the following methods, as recommended in AWWARF - GUIDANCE MANUAL FOR THE DISPOSAL OF CHLORINATED WATER:

(i) Discharged into a nearby WWS manhole if possible at a rate which will does not overload the WWS system.

(ii) De-chlorination of water with discharge into the LDS system or directly to the river. If discharging directly to the river the Contractor shall take all necessary precautions to prevent erosion of the river bank. De-chlorination may be accomplished using the following:

- Sodium Ascorbate,
- Vita-D-Chlor TM by Integra Chemical,
- or approved equal in accordance with B8.

(iii) Contain chlorinated water on Site until chlorine has dissipated to acceptable limits.

(g) Water for disinfection may be obtained from hydrants located on Taylor Avenue.

E80.5 Lock-out and Tag-out Procedures

E80.5.1 The City will endeavour to provide redundant valve closures (double blocking) of pressurized pipelines that enter the work space where possible. However, there are locations within the system where it is impractical to provide double blocking without widespread service

disruption. Where regional water system network does not allow double blocking, non-redundant valve closures (single blocking) will be provided.

E80.5.2 At locations where only single valve blocking is practical, additional safety measures and monitoring will be required in order to provide a safe work environment for employees. Development of adequate safety plans in accordance to the Workplace Safety and Health Act and Regulation 217/06 are the responsibility of the Contractor, but as a minimum shall include:

(a) Provision of adequate egress from confined spaces including removal of removable roof slabs and manhole covers, and provision of ladders and other means of site exit.

(b) Use of body harnesses and safety hoisting equipment at all times when pressurized systems are disassembled and protected only by single block valves.

(c) Monitor and assess water leakage in closed system prior to disassembly of system. Monitor water leakage rate and advise Contract Administrator immediately of change in inflow rates. Evacuate confined space if necessary.

E80.5.3 The Contractor, City Water and Waste Department, and Contract Administrator will all be required to lock out all valves closed in order to facilitate this work. Where site access and lockout space on system valves is limited, the following lockout/tag out procedures will be implemented;

(a) Lockout locations for valves will be identified by the City.

(b) City will provide a single lock, chains and other devices to adequately secure valves within pits and chambers. The Contractor has the right to inspect the installation and satisfy that the lockout system is adequate. All locks utilized will be commonly keyed.

(c) Key(s) for single locked valves will be place in secure lock box at the site. City staff, Contractors, and Contract Administrator will place personal/company locks complete with identification and tag out information on this lock box.

(d) Key(s) placed within the secure lock box will not be removed until all City staff, Contractor, and Contract Administrator locks have been removed from the lock box, and verified that the work is completed.

(e) City staff will then unlock all valves, and will commence with restoration of the systems to service.

E80.6 Measurement and Payment

E80.6.1 Completion of the offline replacement of the Midtown Feeder Main will be paid on a lump sum basis as listed in the Form B Prices.

E80.6.2 Payment will be made at the Contract Unit Price for “Offline Replacement of the Midtown Feeder Main” as listed in the Form B Prices.

E80.6.3 Payment for feeder main casing installation shall include the following:

(a) Design, supply, installation, and removal of shoring;

(b) Erection of all temporary fencing;

(c) Development of site access;

(d) Excavation and disposal of all unused excavated material;

(e) Installation of casing pipe;

(f) Installation of feeder main piping and fittings;

(g) Supply and installation of PCCP to PVC adaptors and PCCP fittings

(h) Supply and installation of casing spacers, end seals, and joint restraints;

(i) Construction of thrust blocks;

(j) Supply and placement of backfill;

(k) Supply and construction of the air release chamber; and,

(l) Any and all other work and materials specified herein and required to complete the work as specified.

Delete: E112

Add E114: **SURFACE PREPARATION AND ZINC SPRAY METALLIZING OF STRUCTURAL STEEL**

E114.1 Description

E114.1.1 General

(a) This Specification covers all operations relating to the surface preparation and application of thermal spray metallizing to all new structural steel, or portions thereof as detailed on the Drawings, in the shop, and as specified herein including the following:

(i) Steel girders

(ii) Intermediate girder bracings.

(b) The quality control testing of all materials

(c) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E114.2 References

E114.2.1 Reference Standards

(a) Perform work in accordance with the requirements of the latest issue of the following specifications and standards:

(i) American Society of Testing Material

- ASTM D 4285, Standard Test Method for Indicating Oil or Water in Compressed Air
- ASTM B833, Standard Specifications for Zinc Wire for Thermal Spraying (Metallizing)
- ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

(ii) Society of Protective Coatings

- SSPC-AB 1, Mineral and Slag Abrasives
- SSPC-AB 2, Specification for Cleanliness of Recycled Ferrous Metallic Abrasives
- SSPC-AB 3, Newly Manufactured or Re-Manufactured Steel Abrasives
- SSPC-PA 2, Measurement of Dry Coating Thickness with Magnetic Gages

- SSPC-QP 1, Standard Procedure for Evaluating Painting Shop Contractors (Field Application to Complex Structures)
- SSPC-QP 2, Standard Procedure for Evaluating the Qualifications of Painting Shop Contractors to Remove Hazardous Paint
- SSPC-SP 1, Solvent Cleaning
- SSPC-SP 5/NACE No. 1, White Metal Blast Cleaning
- SSPC-SP 11, Power Tool Cleaning to Bare Metal
- SSPC-SP 12/NACE No. 5, Surface Preparation and Cleaning of Metals by Water Jetting Prior to Recoating
- SSPC-SP 16, Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals
- SSPC-PA 17, Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements.
- SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
- SSPC-VIS 5, Guide and Reference Photographs for Steel Prepared by Wet Abrasive Blast Cleaning
- SSPC-Guide 15, Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Surfaces
- SSPC-CS 23.00/AWS C2.23M/NACE No. 12, Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel

(iii) American National Standards Institute/American Welding Society

- ANSI/AWS C2.25/C2.25M, Specification for Solid and Composite Wires, and Ceramic Rods for Thermal Spraying
- AWS C2.6/C2.6M, Guide for Thermal-Spray Operator Qualification

(b) Metallizing wire and coating manufacturer's application instructions, MSDS and product data sheets.

E114.3 Submittals

E114.3.1 The Contractor shall submit the following to the Contract Administrator fourteen (14) days prior to the Work execution, in accordance with the Specification:

(a) Shop Prequalification: The Contractor performing the shop work shall have either an SSPC-QP 3 Certification or an AISC Sophisticated Paint Endorsement certification. The certification(s) shall remain current throughout the duration of the Works.

(i) The Contractor performing the shop work shall have satisfactorily performed a minimum of three (3) previous projects involving abrasive blast cleaning, metallizing, and paint application. At least one project within the past two (2) years shall have involved a bridge or similar industrial type application. The suitability of the Contractor's qualifications and prior experience will be considered by the Contract Administrator before granting approval to proceed.

(b) Contractor Personnel Qualifications: Evidence of experience and the names and qualifications/experience/training of the personnel managing and implementing the Quality Control program, and for those performing the quality control tests. QC personnel qualification requirements are found under Quality Control (QC) Section . All metallizing applicators shall be qualified in accordance with AWS C2.16/C2.16M .

(c) Quality Control (QC) Plan: A Quality Control Plan that identifies: test instruments to be used, a schedule of required measurements and observations, procedures for correcting unacceptable work, and procedures for improving surface preparation and metallizing quality as a result of quality control findings. The program shall incorporate the Quality Control Daily Report Forms approved by the Contract Administrator.

(d) Surface Preparation Plan: The surface preparation plan shall include the methods of surface preparation and types of equipment that will be used to prepare the surfaces as specified herein. Also any solvents proposed for solvent cleaning shall be identified and MSDS provided.

(e) Abrasives: Identify the type and brand name of the abrasive proposed for use, provide MSDS and manufacturer's data indicating that the abrasive meets requirements of the SSPC-AB 1 or AB 3 standards as specified herein.

(f) Metallizing Plan: Written procedures for the shop application of metallizing, including the brand name and type of metallizing wire and application equipment to be used. Proof that the metallizing wire complies with ASTM B-833 and ANSI/AWS C2.25/C2.25M shall also be provided. Provide written documentation verifying that all metallizing applicators are qualified in accordance with ANSI/AWS C2.16/C2.16M.

(g) Shipping and Handling Plan: A written plan outlining the precautions that shall be taken for the protection of the finished surface during shipping and handling. The plan shall address the steps to be taken, such as insulating padding, wood dunnage, load securing strapping, binding apparatus, etc.

E114.3.2 The Contract Administrator will provide written notification to the Contractor when submittals are complete and acceptable. No surface preparation work shall begin until that notification is received.

E114.3.3 This acceptance shall not be construed to imply approval of any particular method or sequence for conducting the work, or for addressing health and safety concerns. Acceptance does not relieve the Contractor from the responsibility to conduct the work according to the requirements of Federal, Provintial, or Local regulations and this specification, or to adequately protect the health and safety of all workers involved in the project and any members of the public who may be affected by the Work.

E114.3.4 The Contractor remains solely responsible for the adequacy and completeness of the programs and work practices, and adherence to them.

E114.4 Materials

E114.4.1 General

(a) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator. There shall be no charge

to the City for any material taken by the Contract Administrator for testing purposes.

(b) Materials called for under these Specifications and on the Drawings shall, unless otherwise specified, satisfy the testing procedures and be in strict accordance with the requirements set out in the latest edition of the standards identified.

E114.4.2 Metalizing Wire

(a) All thermal spray feedstock (metallizing wire) shall be the products of a single manufacturer, meet the requirements below, and meet the thermal spray equipment manufacturer's specifications:

(i) The metallizing wire shall consist of 99.9% zinc complying with ASTM B-833 and ANSI/AWS C2.25/C2.25M.

(ii) The Contractor shall provide a certificate of chemical composition of the proposed metallizing wire from the metallizing wire manufacturer.

E114.4.3 Coating Material Supply Requirements

(a) All metallizing material shall be delivered in the original unopened spools with manufacturer's labels intact. Any material that has been damaged or otherwise deteriorated shall not be used. The Contractor shall provide, if and when requested by the Contract Administrator, a listing, updated weekly, of the weight and number of spools and the type of metallizing material (as identified by a mill test report and corresponding heat number for each spool) received from the metallizing manufacturer on this project.

(b) All material shall be stored under cover in a secured place as approved by the Contract Administrator and shall be kept within storage temperature limitations recommended by the manufacturer.

E114.4.4 Abrasive for Blast Cleaning

(a) The blast-cleaning abrasive shall be free of corrosion-producing contaminants. Acceptable angular shaped abrasives include, but are not limited to, aluminum oxide, steel grit, and crushed slag. Silica sand shall not be used. Steel shot and other abrasives producing a rounded surface profile are not acceptable, even if mixed with angular grit abrasives. The blast-cleaning abrasive and grit size employed shall be capable of achieving an average profile peak-to-valley height of at least 3.5 mils and not exceeding 4.5 mils.

(b) Abrasive suppliers shall provide written certification that expendable abrasives and recyclable steel grit abrasives meet the requirements of SSPC-AB 1 and AB 3, respectively. Abrasive suppliers shall certify that abrasives are not oil contaminated and shall have a water extract pH value within the range of 6 to 8.

E114.4.5 Incidental and Miscellaneous Materials

(a) Incidental and miscellaneous materials utilized in undertaking the surface preparation and coating Works shall be supplied strictly in accordance with the manufacturer's guidelines, as approved in advance by the Contract Administrator, and in accordance with these Specifications.

(b) This will include solvent mixtures associated with solvent cleaning operations, and any other incidental materials used in conjunction with the Works of this Specification.

(c) The use of all such materials shall be reviewed with the Contract Administrator to ensure conformance with the Specification, prior to the use of same in the Works. The Contract Administrator's decision in these matters shall be final.

E114.5 Surface Preparation and Metallizing Equipment

E114.5.1 All equipment shall be of a type approved by the Contract Administrator and capable of preparing the existing structural steelwork surfaces in accordance with these Specifications.

E114.5.2 The coating application equipment shall be designed such that the coating will be applied uniformly to all surfaces in the locations required as shown on the Drawings and approved by the Contract Administrator and shall be kept in good working order.

E114.5.3 The Contractor shall provide surface preparation, metallizing, and painting equipment as needed to perform the work as specified herein.

E114.5.4 Metallizing application equipment shall be portable electric arc thermal spray units that are set-up, adjusted and operated in accordance with the manufacturer’s written instructions.

E114.5.5 All cleaning and painting equipment shall include gages capable of accurately measuring fluid and air pressures and shall have valves capable of regulating the flow of air, water or paint as recommended by the equipment manufacturer. The equipment shall be maintained in proper working order.

E114.5.6 Diesel or gasoline powered equipment shall be positioned or vented in a manner to prevent deposition of combustion contaminants on any part of the structure.

E114.5.7 Hand tools, power tools, pressure washing, water jetting, abrasive blast cleaning equipment, brushes, rollers, and spray equipment shall be of suitable size and capacity to perform the work required by this specification. Appropriate filters, traps and dryers shall be provided for the compressed air used for abrasive blast cleaning and conventional spray application.

E114.6 Construction Methods

E114.6.1 General

(a) The surface preparation and metallizing shall be according to the SSPC Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc and their Alloys and Composites for the Corrosion Protection of Steel, SSPC-CS 23.00/AWS C2.23M/NACE No. 12 except as modified herein. In the event of a conflict, the requirements of this specification shall prevail.

(b) The Contractor shall notify the Contract Administrator 24-hours in advance of beginning surface preparation operations.

E114.6.2 Test Areas (Sections)

(a) Prior to proceeding with production work on the project, the Contractor shall prepare test sections of at least 10 square feet (0.93 sq. m). More than one test section may be needed to represent the various design configurations of the structure. The test section(s) shall be blast cleaned, metallized and painted (if specified) in accordance with the requirements specified herein using the same equipment, materials and procedures that will be used for the production.

(b) During the blast cleaning, metallizing, and painting of the test section(s), in the presence of the Contract Administrator, the Contractor shall perform all quality control tests and inspections required by this specification including complete documentation. In addition, the Contractor shall allow sufficient time for the Contract Administrator to perform any or all quality assurance tests and inspections desired.

(c) Production work shall not proceed until the Contract Administrator agrees that the blast cleaning, metallizing, and painting work, along with the quality control testing, inspection, and documentation are acceptable.

(d) No additional compensation will be paid for the preparation of the test section(s).

E114.6.3 Protective Coverings and Damage

(a) The Contractor shall apply protective coverings to all surfaces of the structural steel that are not scheduled for surface preparation, metallizing, and painting. The coverings shall be maintained and remain in place until the work is completed and then shall be removed prior to shipping.

(b) Metallized or painted surfaces damaged by any Contractor's operation shall be repaired, and re-metallized and/or re-painted, as directed by the Contract Administrator, at no additional cost to the City.

E114.6.4 Ambient Conditions

(a) Surfaces prepared for metallizing or painting shall be free of moisture and other contaminants. The Contractor shall control operations to insure that dust, dirt, or moisture do not come in contact with surfaces on which work will take place.

(b) Under no circumstances shall the metallizing be applied until the surface preparation has been inspected and approved by the Contract Administrator immediately prior to commencement of metallizing application operations.

(c) Metallizing shall not be carried out:

(i) When the temperature of the air or steel is below 5°C

(ii) Unless the temperature of the steel is at least 5°C above the dewpoint

(iii) If the temperature is expected to drop below 0°C during the metallizing drying period

(iv) If the relative humidity exceeds the coating manufacturer's written recommendations.

(d) The manufacturers' published literature shall be followed for specific temperature, dew point, and humidity restrictions during the application of each paint coat.

(e) Metallizing or paint shall not be applied in rain, wind, snow, fog or mist. Ambient conditions shall be maintained during the drying period specified by the manufacturer.

E114.6.5 Compressed Air Cleanliness

(a) Prior to using compressed air for abrasive blast cleaning, blowing down surfaces, and metallizing or painting application, the Contractor shall verify that the compressed air is free of moisture and oil contamination according to the requirements of ASTM D 4285.

(b) The tests shall be conducted at least one time per shift for each compressor system in operation. If air contamination is evident, the Contractor shall change filters, clean traps, add moisture separators or filters, or make other adjustments as necessary to achieve clean, dry air.

(c) The Contractor shall also examine the work performed since the last acceptable test for evidence of defects or contamination caused by the contaminated compressed air. Contaminated work shall be repaired at no additional cost to the City.

E114.6.6 Solvent Cleaning

(a) All traces of oil, grease, and other detrimental contaminants on the steel surfaces to be metallized shall be removed by solvent cleaning in accordance with SSPC-SP 1. The brand name of proposed cleaning solvent(s) and/or proprietary chemical cleaners including manufacturers' product data sheet and MSDS shall be submitted for the Contract Administrator's acceptance prior to use.

(b) Under no circumstances shall blast cleaning be performed in areas containing surface contaminants or in areas where the Contract Administrator has not accepted the solvent cleaning. Rejected surfaces shall be re-cleaned to the specified requirements at no additional cost to the City.

E114.6.7 Abrasives

(a) Abrasive blast cleaning shall be performed using either expendable abrasives or recyclable steel grit abrasives. Expendable abrasives shall be used one time and discarded. The abrasive shall be angular in shape.

(b) On a daily basis, the Contractor shall verify that recycled abrasives are free of oil and contamination by performing a vial test in accordance with SSPC-AB 2.

(c) All surfaces that are found to have been prepared using abrasives not meeting the SSPC-AB 1, AB 2, or AB 3 requirements, as applicable, are oil contaminated, or have a pH outside the specified range, shall be solvent cleaned or low pressure water cleaned, and re-blast cleaned at no cost to the City.

E114.6.8 Surface Preparation

(a) The following method of surface preparation shall be used:

(i) Flame Cut Steel: Prior to blast cleaning, all flame cut edges shall be ground to remove hardened steel and any sharp or irregular shapes.

(ii) Near-White Metal Blast Cleaning: All steel surfaces to be metallized shall be near white metal blast cleaned in accordance with SSPC-SP 10 using dry abrasive blast cleaning methods.

(iii) Base Metal Irregularities: If hackles, burrs, or slivers in the base metal are visible on the steel surface after cleaning, the Contractor shall remove them by grinding followed by re-blast cleaning.

E114.6.9 Surface Profile

(a) Blast cleaning abrasives shall be of the size and grade that will produce a uniform angular surface profile depth of 3.5 to 4.5 mils (89 to 114 microns).

(b) If the metallizing wire manufacturer's profile requirements are more restrictive, the Contractor shall advise the Contract Administrator and comply with those requirements. For recycled abrasives, an appropriate operating mix shall be maintained in order to control the profile within these limits.

(c) The average surface profile shall be determined each work day with a minimum frequency of one location per every 200 sq ft (18.6 sq m) per piece of equipment. All surfaces, including flame cut edges, shall be tested in accordance with SSPC-PA 17.

(d) Surface profile replica tape or electronic profilometer shall be used. The tape shall be retained and included with the daily QC report. Single measurements less than 3.5 mils (89 microns) are unacceptable. In that event, additional testing shall be done to determine the limits of the deficient area and, if it is not isolated, work will be suspended.

(e) The Contractor shall submit a plan for making the necessary adjustments to insure that the specified surface profile is achieved on all surfaces. Work shall not resume until the Contract Administrator provides written acceptance.

E114.6.10 Surface Condition Prior to Metallizing

(a) Prepared surfaces shall meet the requirements of SSPC-SP 10 immediately prior to metallizing, and shall be metallized within six hours of blast cleaning. If rust appears or bare steel has been exposed for more than six hours, the affected area shall be re-blasted at no additional cost to the City.

(b) All dust and surface preparation residue on steel surfaces shall be removed prior to metallizing.

(c) The quality of surface preparation and cleaning of surface dust and debris shall be accepted by the Contract Administrator prior to metallizing.

(d) The Contract Administrator has the right to reject any work that was performed without adequate provision for quality assurance observations to accept the degree of cleaning. Rejected metallizing work shall be removed and replaced at no additional cost to the City.

E114.6.11 Daily Metallizing Operator-Equipment Qualification - Bend Tests

(a) Unless directed otherwise by the Contract Administrator, each day that metallizing will be applied, the Contractor shall perform bend testing prior to beginning production work.

(b) For each metallizing applicator, five carbon steel coupons measuring 2 inch wide x 8 inch long x 0.05 inch (50 mm x 200 mm x 1.3 mm) thick shall be blast cleaned using the same equipment and abrasive used for the production work. Each applicator shall apply the metallizing to five coupons in accordance with the requirements of this Specification to a dry film thickness of 8.0 to 12.0 mils (200 to 300 µm).

(c) 180 degree bend testing shall be performed on all five coupons using a 13 mm (1/2") mandrel in accordance with the requirements and acceptance criteria of SSPC-CS 23/AWS C2.23M/NACE 12. Minor cracks that cannot be lifted from the substrate with knife blade are acceptable. If lifting occurs on any coupon, the surface preparation and/or metallizing process shall be modified until acceptable results are achieved before proceeding with production work.

E114.6.12 Application of Metallizing

(a) Application shall be done in overlapping passes in a cross-hatch pattern (i.e., a second set of overlapping passes shall be applied at right angles to the first set of overlapping passes) to ensure uniform coverage.

(b) The gun shall be held at such a distance from the work surfaces that the metal is still molten on impact. The metallizing shall be applied as a continuous film of uniform thickness, firmly adherent, and free from thin spots, misses, lumps or blisters, and have a fine sprayed texture. Thin spots and misses shall be re-metallized.

(c) If touch up metallizing or the application of additional metallizing to previously applied metallizing does not occur within 24 hours, the surface of the metallizing shall be brush off blast cleaned according to SSPC-SP7 to remove oxidation and surface contaminates prior to the application of additional metallizing.

(d) The final appearance of the metallizing when left un-top coated shall be uniform without excessive blotchiness or contrast in color. If the surface does not have a uniform appearance, remove and replace the metallizing at no cost to the City.

(e) If the configuration of the surface being metallized does not allow for a proper gun-to-work piece standoff distance, the Contractor shall notify the Contract Administrator.

E114.6.13 Metallizing Thickness

(a) The thickness of the metallizing shall be 8.0 to 12.0 mils (200-300 microns). Thickness shall be measured as specified by SSPC-PA 2 (use a Type 2 Electronic Gauge only).

E114.6.14 Metallizing Adhesion

(a) Adhesion testing of metallizing applied each day shall be determined with a self-adjusting adhesion tester in accordance with ASTM D 4541.

(b) Unless otherwise directed by the Contract Administrator, a minimum of one test shall be conducted for every 500 square feet (46 square metres) of metallized surface.

(c) The tests shall be conducted prior to application of any coating. If any of the tests exhibit less than 700 psi (4.83 MPa) for 85/15 or less than 500 psi (3.45 MPa) for zinc, additional tests shall be conducted to determine the extent of the deficient material.

(d) All deficient metallizing shall be removed by blast cleaning and re-applied at no additional cost to the City

(e) At the discretion of the Contract Administrator, a representative blast cleaned test panel (or steel companion panel approximately 12 inch x 12 inch x 1/4 inch thick) can be metallized at the same time each 500 square feet (46 square metres) of surface area, or portion thereof, is metallized. Adhesion testing can be performed on the companion panel rather than on the structure

(f) If the adhesion tests on the panels are acceptable, the metallizing on the structure is considered acceptable and testing on the structure is not required. If adhesion testing of the panels fails, testing shall be conducted on the structure.

(g) If adhesion testing on the structure is acceptable, the metallizing on the structure is considered to be acceptable.

(h) If tests on the structure are unacceptable, complete removal of the failing metallizing and re-metallizing in accordance with this Specification shall be performed at no additional cost to the City.

E114.6.15 Touch-Up of Completed Coating System

(a) The Contractor shall repair all damaged and/or unacceptable areas of the completed coating system (all metallizing, and paint layers) prior to shipment as defined below. The same process shall be followed for the repair of shipping, handling, and erection damage.

(b) Damage to the metallizing, and/or paint that does not expose the substrate shall be prepared by solvent cleaning in accordance with SSPC-SP 1 followed by power tool cleaning in accordance with SSPC-SP 3 to remove loose material.

(c) For the repair of damaged metallizing that exposes the substrate, the surface shall be spot blast cleaned in accordance with SSPC-SP 10. If blast cleaning cannot be performed, as authorized by the Contract Administrator, the damage shall be spot power tool cleaned to SSPC-SP11.

(d) The metallizing, and/or paint surrounding each repair area shall be feathered for a distance of 1 to 2 inches (25 to 50 mm) to provide a smooth, tapered transition into the existing intact material. The surrounding intact paint shall be roughened to promote adhesion of the repair coats.

(e) Damage to metallizing extends to the substrate shall be repaired. For metallizing it is critical that all remnants of sealer or paint have been removed from the porosity of the metallizing before applying new metallizing or an adhesion failure can occur.

(f) If it is no longer feasible to apply metallizing, spot-apply an organic zinc primer meeting the requirements of Section E64.5.2 (l) (ii). After priming, apply the same intermediate and finish coats used on the surrounding steel. If the damage does not expose the substrate, only the effected paint coat(s) shall be applied.

E114.7 Shipping and Handling

E114.7.1 The Contractor shall take special care in handling the steel in the shop and when loading for shipment. Painted or metallized steel shall not be moved or handled until sufficient cure time has elapsed to prevent handling damage.

E114.7.2 During shipping, the steel shall be insulated from the moving apparatus (i.e., chains, cables, hooks, clamps, etc.) by softeners approved by the Contract Administrator. Apparatus used to hoist the steel shall be padded. Steel shall be placed on wood dunnage and spaced in such a manner that no rubbing will occur during shipment that could damage the paint or metallizing.

E114.8 Quality Control

E114.8.1 The Contractor performing the shop work shall perform first line, in process QC inspections. The Contractor shall implement the accepted QC Program to insure that the work complies with these specifications.

E114.8.2 The designated Quality Control inspector shall be onsite full time during any operations that affect the quality of the system (e.g., surface preparation, metallizing application, paint application, and final inspection at project completion).

E114.8.3 The Contractor shall use the Contractor Daily (QC) Metallizing & Painting Report form to record the results of quality control tests and inspections. The completed reports shall be given to the Contract Administrator before work resumes the following day.

E114.8.4 QC inspections shall include, but are not limited to the following

(a) Ambient conditions

(b) Surface preparation (solvent cleaning, abrasive blast cleanliness, surface profile depth, etc.).

(c) Metallizing application (specified materials used, bend test, continuity and coverage, adhesion, dry film thickness)

(d) Verification that the MISTIC test ID number for the paint system has been issued when painting is specified

(e) Paint Application (when specified)(specified materials used, continuity and coverage, dry film thickness, freedom from overspray, dry spray, pinholes, skips, misses, etc.).

E114.8.5 The personnel managing the QC Program shall possess a minimum classification as a NACE CIP Level 2, or shall provide evidence of successful inspection of three projects of similar or greater complexity and scope completed in the last two years. References shall include the name, address, and telephone number of a contact person employed by the facility owner.

E114.8.6 The personnel performing the QC tests shall be trained in all tests, inspections, and instrument use required for the inspection of surface preparation, metallizing and paint application. Documentation of training shall be provided. The QC personnel shall be solely dedicated to quality control activities and shall not perform any production work. QC personnel shall take the lead in all inspections, but applicators shall perform wet film thickness measurements during application of the coatings, with QC personnel conducting random spot checks. The Contractor shall not replace the QC personnel assigned to the project without advance notice to the Contract Administrator, and acceptance of the replacement(s), by the Contract Administrator.

E114.8.7 The Contractor performing the shop work shall supply all necessary equipment to perform the QC tests and inspections as specified. Equipment shall include the following at a minimum.

(a) Psychrometer or comparable equipment for measurement of dew point and relative humidity, including weather bureau tables or psychrometric charts

(b) Surface temperature thermometer

(c) SSPC Visual Standard VIS 1

(d) Surface profile replica tape and spring micrometer or electronic micrometer designed for use with replica tape; or electronic profilometer designed for measuring blast profile

(e) Blotter paper for compressed air cleanliness checks

(f) Type 2 Electronic Dry Film Thickness Gage

(g) Calibration standards for dry film thickness gage

(h) Bend test coupons and bend test mandrel

(i) Adhesion testing instrument

(j) Companion panels for adhesion testing (if that option is selected)

(k) All applicable ASTM, ANSI, AWS, and SSPC Standards used for the work (reference list included).

E114.8.8 The instruments shall be verified for accuracy and adjusted by the Contractor's personnel in accordance with the equipment manufacturer's recommendations and the Contractor's QC Program. All inspection equipment shall be made available to the Contract Administrator for quality assurance observations as needed.

E114.9 Quality Assurance

E114.9.1 The Contract Administrator will conduct quality assurance observations of any or all phases of the work. The presence or activity of the Contract Administrator observations in no way relieves the Contractor of the responsibility to perform all necessary daily QC inspections of their own and to comply with all requirements of this Specification.

E114.9.2 The Contract Administrator has the right to reject any work that was performed without adequate provision for quality assurance observations.

E114.9.3 Specific inspection and testing requirements within this specification are designated as Hold Points. Unless other arrangements are made, the Contractor shall provide the Engineer with a minimum four-hour notification in advance of the Hold Point. If four-hour notification is provided and the work is ready for inspection at that time, the Engineer will conduct the necessary observations. If the work is not ready at the appointed time, unless other arrangements are made, an additional four-hour notification is required. Permission to proceed beyond a Hold Point without a quality assurance inspection will be at the sole discretion of the Engineer and will only be granted on a case-by-case basis.

E114.10 Measurement and Payments

E114.10.1 The "Surface Preparation and Zinc Spray Metallizing of Structural Steel" will not be measured. This Item of Work is considered incidental to the Contract Lump Sum price for the work under "E64 - Supply, Fabrication and Delivery of Structural Steel for Bridge" and no separate payment will be made.

DRAWINGS

Replace: 473-2016 _Addendum_3-Drawing_C2-GE-025-R1 with 473-2016 _Addendum_5-Drawing_C2-GE-025-R2

473-2016 _Addendum_3-Drawing_C2-GE-027-R2 with 473-2016 _Addendum_5-Drawing_C2-GE-027-R3

473-2016 _Addendum_3-Drawing_C2-GE-035-R2 with 473-2016 _Addendum_5-Drawing_C2-GE-035-R3

473-2016 _Drawing_C2-BE-006-R0 with 473-2016 _Addendum_5-Drawing_C2-BE-006-R1

473-2016 _Drawing_C2-BE-007-R0 with 473-2016 _Addendum_5-Drawing_C2-BE-007-R1

473-2016 _Addendum_1-Drawing_C2-CS-003-R1 with 473-2016 _Addendum_5-Drawing_C2-CS-003-R2

473-2016 _Addendum_1-Drawing_C2-CS-006-R1 with 473-2016 _Addendum_5-Drawing_C2-CS-006-R2

473-2016 _Drawing_C2-CS-017-R0 with 473-2016 _Addendum_5-Drawing_C2-CS-017-R1

473-2016 _Drawing_C2-CS-019-R0 with 473-2016 _Addendum_5-Drawing_C2-CS-019-R1

473-2016 _Drawing_C2-CS-022-R0 with 473-2016 _Addendum_5-Drawing_C2-CS-022-R1

473-2016 _Addendum_4-Drawing_C2-CS-027-R1 with 473-2016 _Addendum_5-Drawing_C2-CS-027-R2

473-2016 _Drawing_C2-CS-035-R0 with 473-2016 _Addendum_5-Drawing_C2-CS-035-R1

473-2016 _Addendum_1-Drawing_C2-CS-036-R1 with 473-2016 _Addendum_5-Drawing_C2-CS-036-R2

473-2016 _Addendum_4-Drawing_C2-CS-040-R2 with 473-2016 _Addendum_5-Drawing_C2-CS-040-R3

473-2016 _Addendum_1-Drawing_C2-CS-041-R1 with 473-2016 _Addendum_5-Drawing_C2-CS-041-R2

473-2016 _Drawing_C2-CS-042-R0 with 473-2016 _Addendum_5-Drawing_C2-CS-042-R1

473-2016 _Drawing_C2-CS-043-R0 with 473-2016 _Addendum_5-Drawing_C2-CS-043-R1

473-2016 _Addendum_1-Drawing_C2-CS-044-R1 with 473-2016 _Addendum_5-Drawing_C2-CS-044-R2

473-2016 _Addendum_1-Drawing_C2-CS-046-R1 with 473-2016 _Addendum_5-Drawing_C2-CS-046-R2

473-2016 _Drawing_C2-CS-049-R0 with 473-2016 _Addendum_5-Drawing_C2-CS-049-R1

473-2016 _Drawing_C2-CS-063-R0 with 473-2016 _Addendum_5-Drawing_C2-CS-063-R1

473-2016 _Addendum_1-Drawing_C2-CS-065-R1 with 473-2016 _Addendum_5-Drawing_C2-CS-065-R2

473-2016 _Drawing_C2-CU-028-R0 with 473-2016 _Addendum_5-Drawing_C2-CU-028-R1

473-2016 _Drawing_C2-CU-029-R0 with 473-2016 _Addendum_5-Drawing_C2-CU-029-R1

473-2016 _Addendum_1-Drawing_C2-CU-030-R1 with 473-2016 _Addendum_5-Drawing_C2-CU-030-R2

473-2016 _Addendum_1-Drawing_C2-CU-031-R1 with 473-2016 _Addendum_5-Drawing_C2-CU-031-R2

473-2016 _Addendum_1-Drawing_C2-CU-032-R1 with 473-2016 _Addendum_5-Drawing_C2-CU-032-R2

NMS SPECIFICATION

Section 26 32 14

Replace: 2.2.4 to read: Cooling System:

.1 Liquid cooled: Heavy duty industrial radiator mounted on generating set base with engine driven pusher type fan to direct air through radiator from engine side, anti-freeze non-sludging above minus 46C. Include coolant drain valve.

.2 To maintain manufacturer's recommended engine temperature range at 10% continuous overload in ambient temperature of 40C.

.3 Heavy duty block heater: thermostatically controlled lube oil or liquid coolant heater to allow engine to start in room ambient -50C. Heater to disconnect during engine run period.

.4 Refer to Mechanical Section 23.

APPENDICES

Add: 473-2016_Addendum_5-Appendix M-Midtown Feeder Main Easement South of CN Mainline