PART 1 GENERAL

1.1 CASH ALLOWANCES

.1 Include in Contract Price specified cash allowances.

.2 Cash allowances, unless otherwise specified, cover net cost to Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage, installation and other authorized expenses incurred in performing Work.

.3 Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.

.4 Contract Price will be adjusted by written order to provide for excess or deficit to each cash allowance.

.5 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents.

.6 Total cash allowance as follows:

.1 $16,000 for sieve analysis, compaction testing, concrete testing, and asphalt testing. Allowance at the discretion of the City Representative.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 WORK INCLUDED

.1 This specification outlines the requirements for supply and installation of baskets fabricated from wire mesh and filled with stone. A gabion structure consists of a number of baskets placed and wired together so that joints between baskets are as strong as the wire mesh, making a monolithic structure.

1.2 MEASUREMENT FOR PAYMENT

.1 Gabions of the size and type specified will be measured in cubic metres of stone filled wire mesh baskets incorporated into the work based on the nominal dimensions of the gabion units used.

.2 Only gabions placed within specified lines and grades will be measured for payment.

.3 Where excavation required for gabions overlaps excavation required for the other work, then payment for excavation will be made in accordance with the specification for the other work as though no excavation required for gabions.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Gabion baskets:

.1 Fabricated so that sides, ends, lid and internal diaphragms readily assemble at site into rectangular baskets of sizes indicated.

.2 Single unit construction or with joints having strength and flexibility equal to that of mesh.

.3 When the length exceeds horizontal width, provide diaphragms of same mesh as gabion walls to divide basket into equal cells of a length not in excess of horizontal width.

.4 Wire mesh to be uniform pattern wire woven in a triple twist pattern or welded wire as specified on drawings.

.2 Stone fill:

.1 Stone to be hard, durable and abrasion resistant and such that it will not disintegrate from action of wetting and drying, wave action, freezing and thawing cycles.

.2 Stone to be minimum 100mm to maximum 200mm dimension unless otherwise specified.

.3 Geotextile:

.1 Nonwoven geotextile. Standard of acceptance: Maccaferri Mactex MX225 or approved equal.

2.2 PRODUCTION

.1 Gabions shall be so fabricated that the sides, ends, lid, base and diaphragms can be readily assembled at the construction site into rectangular baskets of the specified sizes. Gabions shall have all components interconnected in such a manner that the strength and flexibility at the point of connection is at least equal to that of the mesh.

.2 Where the length of the gabion exceeds its horizontal width, the gabion shall be divided by diaphragms, of the same mesh and thickness of steel wire as the body of the gabion, into equal cells whose length does not exceed the horizontal width. Diaphragms shall be secured in the proper position on the base section such that no additional tying will be required at this juncture.

.3 Gabions and gabion mats shall be supplied in the sizes and to dimensions indicated in the contract documents.

2.3 CERTIFICATION

.1 Gabions shall be accompanied by a certified report of tests showing that the products to be supplied meet the requirements of this specification, and by a statement of the system to be used identifying the various sizes of gabions to be supplied.

.2 These requirements may be waived for subsequent supply, provided the supplier certifies that the gabions to be furnished are of the same specific material and manufactured as that covered by a certified report of the tests previously submitted and approved.

2.4 INSPECTION AND TESTING

.1 Notwithstanding the acceptance of certification, the authority reserves the right to make inspections and tests, and at such times the Engineer may consider necessary to ensure that the materials supplied are in accordance with this specification.

.2 All materials failing to comply with the requirements of this specification shall be rejected.

.3 Rejection shall constitute automatic withdrawal of the Engineer’s approval. Applications for re-approval shall be substantiated by an up-to-date test report as required for certification.

2.5 SHIPPING AND MARKING

.1 Gabions shall be shipped folded flat in bundles each containing a uniform number of one size only, except as necessary to complete an order, and weighing not more than 230 kg.

.2 Bundles shall be clearly marked to show the size and number of gabions. In addition, each gabion shall be clearly coloured coded, or otherwise suitably identified, to indicate the size.

.3 Gabion mats shall be shipped in rolls of 30m long, 2 or 3m wide with ends, sides and dividers attached to base.

PART 3 EXECUTION

3.1 SITE PREPERATION

.1 All stumps, roots, debris, and loose boulders in excess of 100mm in maximum dimension shall be removed and disposed off the right-of-way prior to placing gabions. The necessary grading and excavation for gabion structures shall be carried out to such lines and grades as indicated in the contract and as required to provide a smooth, uniform gradient.

3.2 INSTALLATION

.1 Install gabions to lines and grades indicated or as directed by Engineer.

.2 The foundation shall be excavated to an even finish and to the required grade.

.3 The Contractor shall assemble gabions according to the manufacturer recommendations.

.4 The Contractor shall unfold each gabion to the open position. The four corner edges shall be wired to secure the gabion shape. The edges of the diaphragms shall be wired to the gabion walls in the correct position.

.5 Each assembled gabion shall be securely wired to the adjacent gabions along the top and the vertical edges prior to placing of stone.

.6 In assembling individual units, the selvedges at the corners shall be bound together and the selvedges of diaphragms shall be bound directly to the fabric with binding wire. The binding wire, throughout the length of the selvedged, shall be tightly lopped around every other mesh opening in such a manner that single and double loops are alternated. Loops shall be separated by a distance not greater than 100mm.

.7 To achieve better alignment and finish, the contractor shall stretch gabions before filling.

.8 Where gabion units are grouped together in whatever configuration is called for in the contract, each unit shall be secured to adjoining units by binding along and throughout the length of each contacting selvedged edge, in a manner similar to that described for assembling individual units.

.9 Gabions shall be assembled so as to leave no wire ends projecting outside the basket on any exposed surface.

3.3 FILLING BASKETS

.1 On exposed faces of gabions, place stones by hand with flattest surfaces bearing against face mesh to produce a satisfactory alignment and appearance. The remaining rock is to be placed randomly by hand.

.2 After the first gabion in a row has been filled to provide the necessary weight, the remaining rock shall be placed only after the baskets have been stretched taut by means of a standard fence stretcher or by other means approved by the Engineer and adjusted to proper alignment. Four or five gabions in a row may be stretched simultaneously.

.3 In order to prevent local deformation, when 0.91m gabions or 0.46m gabions are placed in rows, they shall be filled in stages. When the first basket has been filled, the second

shall have been filled two-thirds of its depth and the third basket shall have been filled to one-third of its depth.

.4 Fill basket cells in lifts of 300mm and connect opposite walls with 2 tie wires after each lift.

3.4 PLACING OF CONNECTING WIRES

.1 When a gabion has been filled to a depth of 0.23m in the case of 0.46m gabions or to a depth of 0.30m in a the case of 0.91m gabions, 2 horizontal connecting wires, one in each direction, shall be placed. In the case of 0.91m gabions, an additional horizontal connecting wire shall be placed in each direction at the end 0.60m mark when the basket has been two-thirds filled. Connecting wires shall be looped around 2 adjoining mesh openings and shall be pulled hand tight.

.2 Where 0.46m depth gabions are used for channelling or revetment, connecting wires are not necessary.

3.5 PLACING GABIONS

.1 Place baskets in position prior to filling with stones.

.2 Wire adjacent baskets together at corners so that joints are as strong as mesh.

.3 For underwater placement, gabions may be prefilled. Provide special devices to handle filled baskets without distortion and to place gabions in position. Connect adjacent basket together when in place using a diver.

3.6 SECURING LIDS

.1 When the basket has been filled, the lid shall be bent over by hand and with the use of a pinch bar, if necessary, inserted at intervals between the selvedges of the lid and the selvedges of the top and sides. The lid shall be pulled until the selvedges coincide and shall be secured to the front and ends by binding wire in a manner in accordance with subsection 3.1 of this specification.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 20 00 – Measurement and Payment.

.2 Section 01 29 83 – Testing and Laboratory Services.

.3 Section 01 33 00 – Shop Drawings and Submittals.

.4 Section 01 35 30 – Health and Safety Requirements.

.5 Section 01 35 43 – Environmental Procedures.

.6 Section 01 45 00 – Quality Control.

.7 Section 01 51 0 – Temporary Utilities.

.8 Section 01 61 00 – Common Product Requirements.

.9 Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

.10 Section 01 74 23 – Closeout Submittals.

.11 Section 01 78 23 – Operation and Maintenance Manual.

.12 Section 01 78 39 – Project Record Drawings.

.13 Section 31 05 16 – Aggregates for Earthworks.

.14 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.15 Section 32 11 23 – Aggregate Base Courses.

.16 Section 33 31 11 – Public Sanitary Sewerage Gravity Piping.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA).

.1 ANSI/AWWA B300-2018, Hypochlorites.

.2 ANSI/AWWA B301-2018, Liquid Chlorine.

.3 ANSI/AWWA B303-18, Sodium Chlorite.

.4 ANSI/AWWA C500-2019, Metal-Seated Gate Valves for Water Supply Service.

.5 ANSI/AWWA C504-2015, Rubber-Seated Butterfly Valves.

.6 ANSI/AWWA C651-2014, Disinfecting Water Mains.

.7 ANSI/AWWA C800-2014, Underground Service Line Valves and Fittings.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM D698-12(2021), Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft;) (600kN-m/m;).

.2 ASTM F714-21a, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

.3 American Water Works Association (AWWA)/Manual of Practice

.1 AWWA M17-2016, Installation, Field Testing, and Maintenance of Fire Hydrants.

.4 Canadian General Standards Board (CGSB)

.1 CGSB 41-GP-25M-2012, Polyethylene, for the Transport of Liquids.

.5 Canadian Standards Association (CSA International)

.1 CSA B137 Series-13, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.3.1, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12.

.1 CSA B137.1-13, Polyethylene (PE) Pipe, Tubing, and Fittings for Cold-Water Pressure Services

.6 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.7 Transport Canada (TC)

.1 Transportation of Dangerous Good Act, 1992 (TDGA).

.8 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S520-M91, Standard for Fire Hydrants.

.2 CAN4-S543-M84, Standard for Internal Lug Quick-Connect Couplings for Fire Hose.

1.3 WORK INCLUDED

.1 The work to be done under this contract consists of furnishing all equipment, materials and labour necessary for the installation of water mains and water services in accordance with the terms of this contract.

.2 Specifically, the work shall include:

.1 The installation of the water mains as specified in this section or shown on the contract drawings, including any connections to access vaults or existing water mains.

.2 Carry out a pressure and leakage test on all new works.

.3 Chlorination and commissioning of the new water mains.

.4 Excavation, backfilling, consolidation and restoration of surfaces.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for distribution piping materials and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Distribution piping materials include, but not limited to:

.1 Pipe.
.2 Fitting.
.3 Valve.
.4 Fire hydrant.
.5 Mechanical restraint.
.6 All materials used for the distribution system.
.7 Pipe certification to be on pipe.

.2 As-built data:

.1 Submit data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, hydrant details.

.1 Include top of pipe, horizontal location and vertical elevation of fittings and type, valves, valve boxes, and hydrants.

.2 Operations and Maintenance Data: submit operation and maintenance data for pipe, valves, valve boxes and hydrants for incorporation into manual.

.3 Record top of pipe elevations for water main and water services every 10 metres and send to Engineer for approval prior to backfilling pipe. If pipe is backfilled and pipe elevations are found to be unacceptable, the Contractor shall excavate buried pipe and realign in accordance with Contract Drawings or alignment deemed acceptable by Engineer.

1.5 RECIRCULATION LINE

.1 All references to water mains within these specifications shall also apply to the installation of recirculation lines.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Polyethylene Pipe

.1 Watermains shall be HDPE DR9 (PE 4710 Resin, Series 250, 1724 kPa, IPS dimensional standard) with 50 mm urethane insulation encased in a 1.27 mm polyethylene black jacket.

.2 Watermain carrier pipe to be HDPE DR11 (PE 4710 Resin, Series 200, 1379 kPa, IPS dimensional standard)

.3 All polyethylene pipe, fittings, stubends, etc., shall be of the same manufacturer's series, wall thickness and the same grade of polyethylene. All gaskets will have the same internal diameters as the series pipe and all bolts and backup rings will be compatible to allow tightening without washers. Standard of acceptance shall be KWH Sclairpipe, Urecon UIP, or approved equal.

.4 No joints shall be allowed in piping covered with shop applied insulation.

.5 All jacketed pipe shall have a permanent factory applied marking indicating manufacturer, size, series, and project identification at not greater than one meter intervals along its length, i.e. “Dupont 200 mm Series 160”.

.2 Pipe Spacers

.1 Casing spacers shall have a minimum spacer length of 200 mm and a minimum runner width of 25 mm. Acceptable manufacturers include PSI, BWM, CCI, advance, silvertip, cascade, or approved equivalent.

.3 Urethane Insulation

.1 Insulation for pipe lines, fittings, etc., shall be rigid closed cell polyurethane insulation to the thickness shown on the drawings. No joints shall be allowed in piping covered with shop applied insulation. Properties of all urethane insulation shall be:

Density (kg per cubic metres core) ASTM D-1622	35
Compressive Strengths kPa @ 25°C 10% Deflection measured axially ASTM D-1621-64	240
Thermal Conductivity W/m°C @ 25°C ASTM D-2326-64T	0.0187
Operating temperature range °C Cyrogenic to +	93
Closed Cell Content – % ASTM D-2856	90 min
Water absorption gm/1000 cc ASTM D-2842	12
Dimensional Stability, % ASTM D-2126 Procedure B & E	3

.4 Warning Tape

.1 The warning tape of water mains shall be 150 mm wide by 0.15 mm polyethylene tape. It shall be blue in colour and have a factory applied marking at one metre intervals, i.e., “Caution Buried Water Line”. The standard of acceptance shall be Decto Tape by Allan Systems.

.5 Field Joint Sleeves

.1 Wrap sleeves for field fusion joints and for flanged connections to vaults shall be 2.7 mm thick. Canusa Wrap LPW or equal. Each wrap will confirm to the manufacturer’s recommended width and length for each size of pipe.

.6 Heat Shrink Tape

.1 Heat shrink tape shall be 150 mm wide with the standard of acceptance being Raychem Thermoclad.

.7 Half Shells

.1 Half shells shall be made of urethane insulation with the properties as described in Section 2.1.6, and shall have a thickness equivalent to the urethane insulation on the pipe.

.8 Field Applied Urethane

.1 Field applied urethane shall be “Portafoam” manufactured by Insta-Foam Products Inc., or equivalent.

.9 Pipe Bedding

.1 Pipe bedding shall be sand conforming to the specifications for Modified Granular “C”, as listed in Section 31 05 16.

.10 Trench Insulation

.1 Trench insulation shall be Styrofoam HI-40, 2440mm wide 50 mm thick.

.11 Valves, Couplings, & Fittings

.1 Valves, couplings, and fittings shall be compression type designated for use with polyethylene piping and properly sized for the pipe used. All connections will include stainless steel inserts 50 mm long and tight fitting within the service pipe. Longitudinally split inserts will not be accepted.

.12 Water Service Saddle

.1 Water service saddles shall be bronze Robar NO. 2706 with double stainless steel straps (or approved equal).

PART 3 EXECUTION

3.1 DRAINAGE

.1 The Contractor shall keep all portions of the work properly and efficiently drained during construction and until completion. He shall be held responsible for all damage that may be caused as the result of water backing up or flowing over, through, from, or along any part of the work or surrounding properties due to his operation.

.2 All costs associated with providing drainage for the work as required, shall be included in the unit prices for the installation of each associated item.

3.2 SITE RESTRICTIONS

.1 When planning the work, the Contractor shall make due allowance for the presence of the existing structures, access, utilities and the operation of others on the site.

.2 Supports, adequate protection and maintenance of all existing underground and surface utility structures, drains, sewers, ducts, conduits, power poles and other obstructions encountered during the progress of the work, shall be provided by the Contractor at his own expense.

3.3 SERVICE CONNECTIONS

.1 Excavation, bedding, backfilling, urethane insulation, piping insulation system, and styrofoam used in the installation of service connections shall conform to the same requirements as for main line installation.

3.4 WATER SERVICE

.1 The water service duct shall be of a size and material as illustrated on the Contract Drawings.

.2 Pipe connections in the water service duct shall be butt fused as described in Clause 3.13.2. No joints or the service pipe will be permitted within the duct.

.3 The Water Service Information Sheet, or equivalent, provided by the local municipal authority must be filled in and submitted for each service.

.4 Drill and tap mains with main under operating pressure after main has been pressure tested, flushed and chlorinated, with a tapping machine capable of inserting corporation stops into main or saddle. Alternatively, the Contractor may dry tap the service connections provided flushing, pressure testing, and chlorination of the services occurs with the main as one system.

.5 Tap main at 3:00 o'clock or 9:00 o'clock position. Service tapping shall be a minimum of 450 mm apart or from any fused connection in the mains. Install saddle using a torque wrench as per manufacturer's instructions. Including re-torquing after set time.

.6 Construct service connection as shown on drawings.

.7 All exposed surfaces including factory coated surfaces of polyurethane are to be coated with mastic.

.8 Flush each service line for a minimum of 5 minutes.

.9 Pressure test the services in coordination with Clause 3.14. Initial pressure test on service is not required.

.10 Joints must be left exposed during pressure test to allow visual inspection.

.11 If water service is not to be connected immediately to house then water lines must be plugged with a water tight plug on the end and ball valve shut off at the main. In these cases, the 100 mm carrier pipe will be installed to 1.0 m into the property for future connection. Sufficient water service pipe (both 25 mm lines) to reach the centre of the lot plus (5) metres will be installed. The length of service pipe that exceeds the carrier pipe will be rolled up and wrapped in plastic. The end of the 100 mm carrier pipe shall be covered with an end cap to prevent debris from entering. Drill holes in the water carrier end cap to allow the 25 mm water service pipe through.

3.5 INSPECTION

.1 All material is subject to inspection and testing for soundness and suitability at the discretion of the Engineer.

.2 All works shall be undertaken in strict adherence to the manufacturer's instructions, which are considered as being part of these Specifications. As each section of the work is

completed, it shall be tested in the manner specified, and in the presence of, and as approved by, the Engineer.

.3 All material found during the progress of the work to have cracks, flows, or other defects, or to be of doubtful quality, will be rejected by the Engineer. All rejected materials shall be promptly removed from the site of the work by the Contractor and all costs associated with the removal and replacement of rejected material shall be borne by the Contractor.

3.6 HANDLING OF MATERIAL

.1 The material shall be delivered and distributed at the site by the Contractor. All pipe and accessories shall be loaded and unloaded by lifting manually or with hoists so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Insulated pipe shall not be skidded on the ground or against pipe already on the ground.

.2 In distributing the polyethylene pipe at the site of the work, each piece shall be unloaded opposite or near the place where it is to be installed.

.3 Pipe shall be handled so the exterior and interior surfaces, prefabricated joints, insulation, etc., will not be damaged. If, however, any part of any surface, coating or lining is damaged, the repair shall be made by the Contractor at his own expense, in a manner satisfactory to the Engineer.

3.7 ALIGNMENT AND GRADE

.1 All pipe sections shall be laid and maintained to the required lines and grades, with fittings, valves, hydrants, access vaults, etc., at the project locations; with joints centred.

.2 No deviation from authorized lines and grades shall be made without the written approval of the Engineer. If, in the opinion of the Engineer, the Contractor’s method of setting grades is inaccurate or insufficient, the Engineer may direct that more suitable equipment and methods be used to ensure that proper grades are established.

3.8 WATER IN EXCAVATION

.1 Work shall be carried out in a dry trench. Water shall not be allowed to run over the invert, reach the joints, or run through the pipe sections during construction.

.2 All water pumped or drained from the work shall be disposed of in a suitable manner satisfactory to the Engineer, without damage to the construction work of other property, structures, or persons.

3.9 PIPE BEDDING

.1 Insulated piping shall be bedded in Modified Granular “C” with a minimum of 0.15 m below the insulation, 0.15 m on both sides and 0.30 m above the insulation of the piping. Mechanical tamping of the pipe bedding shall be carried out in 0.15 m loose layers.

.2 The pipe bedding shall be compacted to 95% Standard Procter Dry Density as per ASTM D698-07e1. Compaction in a wet trench will be not acceptable. The Contractor shall provide daily compaction test results to the Engineer.

.3 Bedding shall be deemed unsatisfactory if, in the opinion of the Engineer, compaction cannot be obtained because of the presence of water.

.4 No extra payment shall be made for the replacement of bedding that has become unsatisfactory due to water from any source.

3.10 WARNING TAPE

.1 A continuous run of "warning" tape shall be laid on the pipe bedding 0.6 m directly above the water main.

3.11 FIELD APPLIED URETHANE

.1 Field spraying of urethane will be carried out by experienced operators only using "Insta-Foam Froth-Pak" kits or approved equal. Exposed urethane shall be coated with 1 mm of Flint Kote-Superior Asphalt Mastic No. 110-14 and heat shrink sleeves. Where geometry does not permit the use of heat shrink sleeves, two layers of Raychem Thermoclad 150 mm wide tape with 50% overlap shall be used.

3.12 PIPE LAYING

.1 Lengths of polyethylene pipe water mains to be laid between flanged fittings on access vaults shall be assembled on dry ground by butt-fusion, complete with flanged ends. The pipe shall be pressure tested (as described in Clause 3.14) and installation of urethane half shells shall be completed prior to laying the pipe in the trench. To prevent the entry of rubbish, blind flanges shall be installed on the ends of mains prior to installation in the trench and shall only be removed immediately prior to connection to the access vault.

.2 The water mains shall be laid to the alignment and grades shown on the drawings.

.3 It is prohibited to drag pipe over the ground which would damage the black jacket or insulation. If the pipe or fused sections of the pipe are to be moved, they must be supported on rollers or completely suspended.

.4 Slings used to lower the insulated pipe into the trench shall support the pipe without causing damage to the jacketing insulation (see Clause 3.6).

3.13 PIPE JOINTS

.1 The insulation shall be cut back 190 mm, as shown on the drawing to allow for the field joining of the pipe. Care shall be taken, when cutting away insulation from the pipe, not to cut the pipe beneath the insulation. Cut pipe shall be rejected from the work. Field cut insulation shall be treated with mastic.

.2 Thermal butt-fusion of polyethylene pipe shall be carried out as recommended by the supplier, but only by a certified butt-fusion technician.

.3 When joining the sections of pipe, it is the fusion equipment that must be moved from joint to joint.

.4 Should it become necessary, and only upon authorization by the Engineer, polyethylene spacer blocks, properly machined, and of the same material as the main, may be used

when required to connect the mains to the access vaults. The spacer blocks shall be installed between the flanges. Only one spacer block is permitted for each connection.

.5 Back up flanges for flange connections shall be ductile iron. Bolts shall be galvanized or cadmium plated. All required bolts and gaskets shall be provided by the Contractor.

.6 Where the drawings call for the use of heat shrink tape or where the geometry of bends and fittings prevents the installation of heat shrink sleeves over the insulation, then two wrappings of heat shrink tape in 150 mm widths shall be applied. The first complete wrapping shall be applied and shrunk down before the second wrapping is applied. The tape shall overlap 50% as it wrapped around the pipe of fitting. These methods shall be used to repair all damage to insulation jacketing.

3.14 PRESSURE TESTING OF POLYETHYLENE PIPE

.1 A pressure test shall be performed on each section of water main, before the insulation of the joints or installation in the trench. A section of water main shall be considered to consist of a length of pipe between two (2) flanged fittings.

.2 The purpose of the pressure test is to verify all joint and pipe integrity.

.3 The Contractor shall provide all necessary labour, materials and equipment for the test including a suitable pump and measuring tank, pressure hoses, connection plugs, caps, gauges and all other apparatus necessary for filling the piping, applying the required test pressure, and record the pressure losses.

.4 Water shall be used for testing. The Contractor shall provide temporary heating and additional insulation as required to keep the water in the pipe from freezing.

.5 Payment for the cost of testing shall be included in the unit price tendered for installation of the water main.

.6 The ends of the pipe to be tested shall be sealed off using blind flanges and gaskets. The flange on the lower end of the pipe shall be tapped to receive the test pump discharge line. The flange on the high end of the pipe shall be tapped to receive a vent cock to discharge air from the line during the filling process. The pipe shall be laid to a continuously rising grade to the vent cock.

.7 The pipe shall be filled with water at a gauge pressure of 1.5 times the series rating of the pipe. No pressure drop will be allowed during this period and maintained for one hour. All leaks or defective material shall be repaired to the Engineer’s requirements, or replaced. Any section requiring repair shall be retested.

.8 Sections of water main shall be installed only after passing the pressure test as outlined above.

3.15 PRESSURE TEST WATER SYSTEM

.1 After the water main system, complete with fittings, valves and hydrants, has been installed, but before making connection to the existing mains, the system shall be pressure tested. The pressure test shall be performed on each section of water main. A section of water main shall be considered to consist of a length of pipe between two (2) valves.

.2 The purpose of the pressure test is to verify the integrity of all joints, pipes and valves.

.3 The Contractor shall provide all necessary labour, materials and equipment for the test including a suitable pump and measuring tank, pressure hoses, connection plugs, caps, gauges and all other apparatus necessary for filling the pipe, applying the required test pressure, and record the pressure losses.

.4 Water shall be used for testing. The Contractor shall provide temporary heating and additional insulation as required to keep the water in the pipe from freezing.

.5 Payment for the cost of testing shall be included in the unit price tendered for installation of the water main.

.6 The valves at each end of a section of pipe shall be closed and the pipe shall be filled with water at a gauge pressure of 1.5 times the series rating of the pipe. The test pressure shall be maintained for an initial period of 4 hours and then reduced by 70 kPa, then held at the reduced pressure for a second period of 1 hour minimum to 3 hours maximum duration. During the second period of the test, the joints on water main fittings, valves, hydrants, etc., in access vaults shall be inspected.

.7 The 70 kPa reduction in pipe pressure after 4 hours of pressurizing compensates for pipe stretch. No water loss allowance shall be made in the second period of the test for pipe stretch.

.8 When testing sections of the pipe, the pressure difference is to be maintained across the valve to test the valve. Therefore, two adjacent sections of pipe cannot be testing simultaneously.

.9 Upon completion of the pressure test, the flanged connection on the exterior of the access vault shall be retightened and the access vault backfilled.

.10 Certificates indicating satisfactory pressure testing must be provided with progress claims.

3.16 DISINFECTION OF WATER MAINS

.1 Prior to disinfection, all water mains shall be thoroughly flushed to remove any debris. The Contractor shall be responsible for making arrangements with the local municipal authority to use local municipal water for flushing.

.2 Before being placed into service, all new water mains shall be chlorinated throughout their entire length. The method to be used to introduce the disinfectant into the line must be approved by the Engineer and the Department of Health and conform to AWWA Standard C651-14. Depending on the chosen disinfection method, chlorine must be added to attain a concentration of 100 parts per million throughout the system and this solution will then be retained for 3 hours, after which time the chlorine concentration must not have dropped below 50 ppm (Slug Method) OR chlorine must be added to attain a concentration of 25 parts per million throughout the system and this solution will then be retained for 24 hours, after which time the chlorine concentration must not have dropped below 10 ppm (Continuous Feed Method). During chlorination, all valves and accessories shall be operated to assure thorough disinfection of all fittings.

.3 After chlorination is completed, the mains shall be flushed throughout until the replacement water is equal chemically and bacteriologically to the supply. Two testing options are acceptable: two (2) consecutive samples taken 16 hours apart OR after 16 hours stagnation, two (2) consecutive samples taken 15 minutes apart. These tests must be made in the presence of the Engineer. Satisfactory bacteriological test results must be obtained prior to commissioning the system.

.4 On completion of the chlorination of the mains, the Contractor shall set the system in operation and supply the necessary labour for the opening or closing of all valves as required or drain the system and pump all mains and services dry, as directed by the Engineer.

.5 The cost of disinfection and putting the mains into service pumping the mains and services dry shall be included in the unit price for the mains.

3.17 TEST FOR OBSTRUCTION

.1 Upon completion of backfilling, water mains shall be tested for obstructions. The Contractor shall provide and pay for all labour, tools, rope, pigs, lights and other equipment required to examine all work as required by the Engineer. The cost of this testing shall be included in the unit prices tendered for the installation of water mains.

.2 The water mains shall be tested for obstructions using a pig test. The pipes shall be deemed unobstructed if a wood or metal ball, having a diameter 19 mm less than the inside diameter of the pipe can be readily pulled through the line. This test shall be performed prior to flushing and chlorination.

3.18 JOINT TESTING

.1 The Owner reserves the right to visually inspect and test fusion joints using non-destructive methods.

3.19 INSPECTION CERTIFICATES

.1 Written inspection certificates shall be issued to the Contractor for various phases of the work after the work has been inspected by the Engineer and has been found to comply with the Plans and Specifications. Inspection certificates are required for work that is to be covered by other work or backfill.

.2 Payment shall not be made for work requiring an inspection certificate until the certificate has been issued by the Engineer. The Engineering shall issue an inspection certificate immediately after approval of a phase of the work.

.3 The issuance of an inspection certificate shall not relive the Contractor from his obligation to maintain the work or replace work subsequently found to be faulty.

.4 The temporary absence of the Engineer from the site shall not relive the Contractor from his obligation to obtain inspection certificates.

3.20 RELOCATION OF MAINS

.1 The Engineer has the right to relocate the mains throughout the project and he will advise the Contractor well in advance of the work if any such work is contemplated.

3.21 TRENCH INSULATION

.1 50mm thick, 2440mm Styrofoam HI-40 trench insulation boards should be laid side by side on 300mm compacted sand fill.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 20 00 – Measurement and Payment.

.2 Section 01 29 83 – Testing and Laboratory Services.

.3 Section 01 33 00 – Shop Drawings and Submittals.

.4 Section 01 35 30 – Health and Safety Requirements.

.5 Section 01 35 43 – Environmental Procedures.

.6 Section 01 45 00 – Quality Control.

.7 Section 01 51 00 – Temporary Utilities.

.8 Section 01 61 00 – Common Product Requirements.

.9 Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

.10 Section 01 74 23 – Closeout Submittals.

.11 Section 01 78 23 – Operation and Maintenance Manual.

.12 Section 01 78 39 – Project Record Drawings.

.13 Section 31 05 16 – Aggregates for Earthworks.

.14 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.15 Section 32 11 23 – Aggregate Base Courses.

.16 Section 33 14 16 – Site Water Utility Distribution Piping.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM D698-12(2021), Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft;)(600kN-m/m;)

1.3 WORK INCLUDED

.1 The work covered by this section shall include the supply and installation of sanitary sewer and sanitary sewer services including excavation, bedding, backfilling, compaction, and all associated work. All materials supplied are workmanship performed shall meet the requirement of the specifications and be guaranteed for the conditions of service applied to the project.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Polyethylene Pipe

.1 Sewer mains shall be HDPE DR9 (PE 4710 Resin, Series 250, 1724 kPa, IPS dimensional standard) with 75 mm urethane insulation encased in a 1.27 mm polyethylene black jacket.

.2 Sewer main carrier pipe to be HDPE DR11 (PE 4710 Resin, Series 200, 1379 kPa, IPS dimensional standard)

.3 Where specified on the drawing for the sanitary sewer service to be metal jacketed, the above described pipe will be wrapped in 26 gauge galvanized steel jacket outside the polyethylene jacket.

.4 All polyethylene pipe, fittings, stub ends, etc. shall be of the same manufacturer's series, wall thickness, and the same grade of polyethylene. All gaskets will have the same internal diameter as the series pipe and all bolts and back up rings will be compatible to allow tightening without washers. Standard of acceptance shall be KWH Sclairpipe, Urecon UIP, or approved equal.

.5 No joints shall be allowed in piping covered with shop applied insulation.

.6 All jacketed pipe shall have a permanent factory applied marking indicating manufacturer, size and series identification at not greater than one metre intervals along its length, i.e. "Dupont 200 mm Series 160".

.2 Urethane Insulation

.1 Insulation for pipe lines, fittings, etc., shall be rigid closed cell polyurethane insulation to the thickness shown on the drawings. No joints shall be allowed in piping covered with shop applied insulation. Propertied of all urethane insulation shall be:

Density (kg per cubic meters core)	
ASTM D-1622	35
Compressive Strengths kPa @ 25°C 10% Deflection measured axially	
ASTM D-1621-64	240
Thermal Conductivity W/m°C @ 25°C	
ASTM D-2326-64T	0.0187
Operating temperature range °C	
Cyrogenic to +	93
Closed cell content –	
% ASTM D-2856	90 min
Water absorption gm/1000 cc	
ASTM D-2842	12
Dimensional Stability, % ASTM	

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.3 Warning Tape

.1 The warning tape of sanitary sewers shall be 150 mm wide by 0.15 mm polyethylene tape. It shall be green in colour and have factory-applied marking at one metre intervals, i.e., “Caution Buried Sewer Line”.

.4 Field Joint Sleeves

.1 Wrap sleeves for field fusion joints and for flanged connections to vaults shall be 2.7 mm thick. Canusa Wrap LPW or equal. Each wrap will conform to the manufacturer’s recommended width and length for each size of pipe.

.5 Heat Shrink Tape:

.1 Heat shrink tape shall be 150 mm wide with the standard of acceptance being Raychem Thermoclad.

.6 Half Shells

.1 Half shells shall be made of urethane insulation with the properties as described in Section 2.2.1, and shall have thickness equivalent to the urethane insulation on the pipe.

.7 Field Applied Urethane

.1 Field applied urethane shall be “Portaform” manufactured by Insta-Foam Products Inc., or equivalent.

.8 Pipe Bedding

.1 Pipe bedding shall be sand conforming to the specifications for modified Granular “C”, as listed in Section 31 05 16: Aggregates for Earthworks.

.9 Valves, Couplings, & Fittings

.1 Valves, couplings, and fittings shall be compression type designated for use with polyethylene piping and properly sized for the pipe used. All connections will include stainless steel inserts 50 mm long and tight fitting within the service pipe. Longitudinally split inserts will not be accepted.

.10 Trench Insulation

.1 Trench insulation shall be Styrofoam HI-40, 2440mm wide 50mm thick Granular Backfill

.11 Sanitary Service Saddle

.1 Sanitary sewer service saddles shall be Dupont stainless steel (TS-8-4 or TS-10-4) with rubber gaskets and couplings (or approved equal).

PART 3 EXECUTION

3.1 DRAINAGE

.1 The Contractor shall keep all portions of the work properly and efficiently drained during construction and until completion. He shall be held responsible for all damage that may

be caused as the result of water backing up or flowing over, through, from, or along any part of the work or surrounding properties due to his operation.

.2 Work shall be carried out in a dry trench. In no case shall water be allowed to run over the invert, reach the joints, or run through the pipe or culvert sections during construction.

3.2 SITE RESTRICTIONS

.1 When planning the work, the Contractor shall make due allowance for the presence of the existing structures, access, utilities and the operation of others on the site.

.2 Supports, adequate protection and maintenance of all existing underground and surface utility structures, drains, sewers, ducts conduits, power poles and other obstructions encountered during the progress of work, shall be provided by the Contractor at his own expense.

3.3 RELOCATION OF MAINS

.1 The Engineer has the right to relocate the mains throughout the project and he will advise the Contractor well in advance of the work if any such move is contemplated.

3.4 SERVICE CONNECTIONS

.1 Excavation, bedding, backfilling, urethane insulation, piping insulation system, and styrofoam used in the installation of service connection shall conform to the same requirements as for main line installation.

.2 The corresponding sections of the specification are to be read in conjunction with this section.

3.5 INSPECTION

.1 All material is subject to inspection and testing for soundness and suitability at the discretion of the Engineer.

.2 All works shall be undertaken in strict adherence to the manufacturer's instructions, which are considered as being part of the Specifications. As each section of the work is completed, it shall be tested in the manner specified, and in the presence of, and as approved by, the Engineer.

.3 All material found, during the progress of the work, to have cracks, flaws, or other defects, or to be of doubtful quality will be rejected by the Engineer. All rejected materials shall be promptly removed from the site of the work by the Contractor and all costs associated with the removal and replacement of rejected material shall be borne by the Contractor.

3.6 HANDLING OF MATERIAL

.1 All material shall be delivered and distributed at the site by the Contractor. All pipe and accessories shall be loaded and unloaded by lifting manually or with hoists so as to avoid shock or damage. Under no circumstances shall such materials be dropped.

.2 In distributing the polyethylene pipe at the site of the work, each piece shall be unloaded opposite or near the place where it is to be installed.

.3 Pipe shall be handled so the exterior and interior surfaces, prefabricated joints, insulation etc., will not be damaged. If, however, any part of any surface, coating or lining is damaged, the repair shall be made by the Contractor at his own expense, in a manner satisfactory to the Engineer.

3.7 ALIGNMENT AND GRADE

.1 All pipe sections shall be laid and maintained to the required lines and grades, with fittings, valves, access vault etc., at the proper locations and grade with joints centered.

.2 No deviated from the authorized lines and grades shall be made without the written approval of the Engineer. If, in the opinion of the Engineer, the Contractor's method of setting grades is inaccurate or insufficient, the Engineer may direct that more suitable equipment and methods be used to insure that proper grades are established.

3.8 WATER IN EXCAVATION

.1 Work shall be carried out in a dry trench. In no case shall water be allowed to run over the invert, reach the joints, or run through the pipe during construction.

.2 The expense of removing the water, regardless of origin, is the responsibility of the Contractor. The Contractor shall be wholly responsible for any damage that may occur due to ground water or storm water entering the trench during the period of construction.

3.9 TRENCHING BY HAND

.1 In any location where the use of trench digging machinery might cause property or utility damage the Contractor shall carry out the trenching by hand at no extra cost to the Owner.

3.10 PIPE BEDDING

.1 Insulated piping shall be bedded in modified Granular "C" with a minimum of 0.15 m below the insulation, 0.15 m on both sides and 0.3 m above the insulation of the piping. Mechanical tamping of the pipe bedding shall be carried out in 0.15m loose layers.

.2 The pipe bedding shall be compacted to 95% Standard Proctor Dry Density as per ASTM D698-07el.

.3 Bedding shall be deemed unsatisfactory if, in the opinion of the Engineer, proper compaction cannot be obtained because of the presence of water.

.4 No extra payment shall be made for the replacement of bedding that has become unsatisfactory due to water from any source.

3.11 WARNING TAPE

.1 A continuous run of "warning" tape shall be laid on the pipe bedding 0.6m directly above the water main.

3.12 FIELD APPLIED URETHANE

.1 Field spraying of urethane will be carried out by experienced operators only using "Insta-Foam Froth-Pak" kits or approved equal. Exposed urethane shall be coated with 1 mm of Flint Kote-Superior Asphalt Mastic No. 110-14 and heat shrink sleeves. Where geometry does not permit the use of heat shrink sleeves, two layers of Raychem Thermoclad 150 mm wide tape with 50% overlap shall be used.

3.13 PIPE LAYING

.1 Lengths of polyethylene pipe sanitary sewer mains to be laid between flanged fittings on access vaults shall be assembled on dry ground by butt-fusion, complete with flanged ends. The pipe shall be pressure tested (as described in Clause 3.15) and installation of urethane half shells shall be installed on the ends of mains prior to installation in the trench and shall only be removed immediately prior to connection to the access vault.

.2 The sanitary sewer mains shall be laid to the alignment and the grades shown on the drawings.

.3 It is prohibited to drag pipe over the ground which would damage the black jacket or insulation. If the pipe or fused sections of pipe are to be moved, they must be supported on rollers or completely suspended.

.4 Slings used to lower the insulated pipe into the trench shall support the pipe without causing damage to the jacketing insulation (see Clause 3.5).

3.14 PIPE JOINTS

.1 The insulation shall be cut back 190 mm, as shown on the drawing to allow for the field joining of the pipe. Care shall be taken, when cutting away insulation from the pipe, not to cut the pipe beneath the insulation. Cut pipe shall be rejected from the work. Field cut insulation shall be treated with mastic.

.2 Thermal butt-fusion of polyethylene pipe shall be carried out as recommended by the supplier, but only by a certified butt-fusion technician.

.3 When joining the sections of the pipe, it is the fusion equipment, which must be moved from joint to joint.

.4 Where the drawings call for the use of heat shrink tape or where the geometry of bends and fittings prevents the installation of heat shrink sleeves over the insulation then two wrappings of heat shrink tape in 150 mm widths shall be applied. The first complete wrapping shall be applied and shrunk down before the second wrapping is applied. The tape shall overlap 50% as it is wrapped around the pipe of fitting. These methods shall be used to repair all damage to insulation jacketing.

3.15 PRESSURE TESTING OF POLYETHYLENE PIPE

.1 A pressure test shall be performed on each section of sewer main, before the insulation of the joints or installation in the trench. A section of sewer main shall be considered to consist of a length of pipe between two flange fittings.

.2 The purpose of the pressure test is to verify all joint and pipe integrity.

.3 The Contractor shall provide all necessary labour, materials and equipment for the test including a suitable pump and measuring tank, pressure hoses, connection plugs, caps, gauges and all other apparatus necessary for filling the pipe, applying required test pressure, and recording the pressure losses.

.4 Water shall be used for testing. The Contractor shall provide temporary heating and additional insulation as required to keep the water in the pipe from freezing.

.5 Payment for the cost of testing shall be included in the unit price tendered for installation of the sewer main.

.6 The ends of the pipe to be tested shall be sealed off using blind flanges and gaskets. The flange on the lower end of the pipe shall be tapped to receive the test pump discharge line, and the flange on the high end of the pipe shall be tapped to receive a vent cock to discharge air from the line during the filling process. The pipe shall be laid to a continuously rising grade to the vent cock.

.7 The pipe shall be filled with water at a gauge pressure of 1.5 times the series rating of the pipe, and maintained for one hour. No pressure drop will be allowed during this period. All leaks or defective material shall be repaired to the Engineer's requirements, or replaced. Any section requiring repairs shall be retested.

3.16 TEST FOR OBSTRUCTIONS

.1 Upon completion of backfilling, sewer mains shall be tested for obstructions. The Contractor shall provide and pay for all labour, tools, ropes, pigs, lights and other equipment required to examine all work as required by the Engineer. The cost of this testing shall be included in the unit prices tendered for the installation of the sewer mains.

.2 The sewer mains shall be tested for obstructions using a pig test. The pipes shall be deemed unobstructed if a wood or metal ball, having a diameter 19 mm or less than the inside diameter of the pipe, can be readily pulled through the line.

3.17 TV INSPECTION OF SEWER MAINS

.1 It is brought to the attention of the Contractor that the Owner reserves the right to have a complete TV inspection done, on completion of the project, of the installed sewer mains. The cost of such TV inspection shall be borne by the Owner. Deficiencies noted by means of the TV inspection shall be rectified by the Contractor at his own expense.

3.18 FLUSHING

.1 Sewer mains to be flushed with a minimum flow of 1.5m/s with in the pipe for the duration of 10 minutes or until all foreign materials have been removed and flushed water is clear.

.2 Flushing operations shall be performed under the direction of the Engineer. Provide 48 hours notice prior to start of flushing operations.

3.19 JOINT TESTING

.1 The Owner reserves the right to visually inspect and test fusion joints using non-destructive methods and visual inspection.

3.20 INSPECTION CERTIFICATES

.1 Written inspection certificates shall be issued to the Contractor for various phases of the work after the work has been inspected by the Engineer and has been found to comply with the Plans and Specifications. Inspection certificates are required for work that is to be covered by other work or backfill.

.2 Payment shall not be made for work requiring an inspection certificate until the certificate has been issued to the Engineer. The Engineer shall issue and inspection certificate immediately after approval of a phase of the work.

.3 The issuance of an inspection certificate shall not relieve the Contractor from his obligation to maintain the work or replace work subsequently found to be faulty.

.4 The temporary absence of the Engineer from the site shall not relieve the Contractor from his obligation to obtain inspection certificates.

3.21 TRENCH INSULATION

.1 50mm thick, 2440mm Dow Chemical Company Styrofoam HI-40 trench insulation boards should be laid side by side on 300mm compacted sand fill.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 74 16 Cleaning and Site Maintenance

.3

1.2 MEASUREMENT AND PAYMENT

.1 Measure erection of roadside steel W-beam guide rail including posts and necessary hardware in metres of guide rail installed and measured from outer tips of steel W-beam guide rail, including guide rail used in anchorages and terminal sections.

1.3 REFERENCE STANDARDS

.1 American Association of State Highway and Transportation Officials (AASHTO)

.1 AASHTO M180-[2000 (2004)], Standard Specification for Corrugated Sheet Steel Beams for Highway Guardrails.

.2 ASTM International

.1 ASTM A123/A123M-[09], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A307-[07b], Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

.3 CSA Group (CSA)

.1 CAN/CSA O80 Series-[08], Wood Preservation.

.4 United States Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for guide rail, wood, and coatings and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings of W-beam and post and rail installation for approval by Consultant.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect guide rails from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Steel W-beam guide rail as indicated and as follows:

.1 Steel rail and terminal sections: to AASHTO M180, class A Type 1 zinc coated.

.2 Bolts, nuts and washers: to ASTM A307, hot dip galvanized to ASTM A123/A123M.

.3 Standard Type (W-beam) consisting of 2.75 mm thick rail. The length shall not be less than 4125 mm, having post bolt slots 3810 mm apart centre to centre.

.4 Workmanship shall be equivalent to good commercial practice and all edges, boltholes and surfaces shall be free of torn metal, burns, sharp edges and protrusions.

.2 Signal Reflectors

.1 Silver signal reflectors and yellow signal reflectors shall be of size 75 mm x 100 mm.

.2 Nails for securing signal reflectors shall consist of 30 mm galvanized flat head nails.

.3 Bolts, Nuts, Washers and Spikes

.1 All bolts, nuts and washers shall conform to the specifications of ASTM A307 or F3125M, except that rail splice bolts shall be button headed.

.2 Post bolts and splice bolts shall have shoulders of such shape and size that they fit into the bolt slots in the rails and thus prevent the bolt from turning.

.3 Post bolts shall be 16 mm diameter and 200 mm long for use with standard 150 mm x 150 mm posts, or 16 mm diameter and 250 mm long for use with 200 mm x 200 mm posts.

.4 Post bolt washers for the back of posts shall be 45 mm in diameter and 4 mm thick.

.5 Bolts for anchors shall be 16 mm diameter and 350 mm long for use with standard 150 mm x 150 mm posts and anchors, or 16 mm diameter and 450 mm long for use with 200 mm x 200 mm posts and anchors. Washers shall be 45 mm round and 4 mm thick.

.6 Spikes for anchors shall be 125 mm galvanized spikes.

.7 Bolts, nuts, washers and other fittings shall be hot-dip galvanized in accordance with ASTM A153 “Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.”

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for guide rail installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 ERECTION

.1 Set posts by instrument for alignment, and locations as indicated.

.2 Excavate post holes to depths as indicated and to diameter of 360 mm plus or minus 20 mm.

.1 Compact bottom to provide firm foundation.

.2 Set post plumb and square in hole.

.3 Backfill around posts using excavated material and compact in uniform layers not exceeding 300 mm compacted thickness.

.4 Leave or make depression approximately 150 mm deep around posts until painting is completed, then fill and compact to ground elevation.

.5 Cut off tops of posts as indicated.

.6 Worker protection: ensure workers wear protective clothing, eye protection and respirators when handling, drilling, sawing, cutting or sanding preservative treated wood and applying preservative materials.

.7 Treat cut tops and cut ends with 2 coats of the same type and chemical composition as that used in the original treatment.

.8 Erect steel W-beam components to details as indicated. Lap joints in direction of traffic.

.1 Tighten nuts to 100 N.m torque.

.1 Maximum protrusion of bolt 12 mm beyond nut.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 16 Cleaning and Site Maintenance

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 16 Cleaning and Site Maintenance.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by guide rail installation.

END OF SECTION