

**Part 1 General**

**1.1 PRECEDENCE**

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other divisions of this specification

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises includes: removal and replacement of asphalt roadway, removal and replacement of concrete sidewalks including curb and gutter and wheelchair ramps, water line demolition and replacement, sanitary sewer line demolition and replacement, water line and sanitary service connections to homes and other park facilities, sanitary lift station and force main installation, storm sewer replacement and catch basin installation, tree planting, topsoil and seeding, pavement markings, and other work.

**1.3 WORK SCHEDULE**

- .1 This project will be undertaken in two distinct phases:
  - .1 Phase A1 – Evergreen Ave south of Cameron Falls, Anemone Road, Columbine Avenue
    - .1 Commence – September 8<sup>th</sup>, 2015
    - .2 Completion – June 20<sup>th</sup>, 2016
    - .3 Surface Works – September 6, 2016 – December 15, 2016
  - .2 Phase A2 – Waterton Avenue
    - .1 Commence – Spring, 2016
    - .2 Completion – June 20<sup>th</sup>, 2016
    - .3 Surface Works - September 6, 2016 – December 15, 2016
  - .3 Phase B – Evergreen Avenue north of Cameron Falls, Fern Street, Firgrove Street (including surface works)
    - .1 Commence – Spring, 2016
    - .2 Completion – December 15, 2016
  - .4 Landscaping (if necessary):
    - .1 Commence – Spring, 2017
    - .2 Completion – June 19, 2017
- .2 No construction will be allowed during the long weekends; “no work” periods as follows:
  - .1 Thanksgiving Day 2015
    - .1 Friday, October 9<sup>th</sup> to Monday, October 12<sup>th</sup>
  - .2 Victoria Day 2016
    - .1 Friday, May 20<sup>th</sup> to Monday May 23<sup>rd</sup>
  - .3 Canada Day 2016

- .1 Thursday, June 30<sup>th</sup> to Sunday, July 3<sup>rd</sup>
- .4 Civic Holiday 2016
  - .1 Friday July 29<sup>th</sup> to Monday, August 1<sup>st</sup>
- .5 Labour Day 2016
  - .1 Friday, September 2<sup>nd</sup> to Monday, September 5<sup>th</sup>
- .6 Thanksgiving Day 2016
  - .1 Friday, October 7<sup>th</sup> to Monday, October 10<sup>th</sup>
- .7 Victoria Day 2017
  - .1 Friday, May 19<sup>th</sup> to Monday May 22<sup>nd</sup>
- .3 Construction equipment will operate only between 08:00 and 18:00 on weekends and between 08:00 and 19:00 on weekdays to minimize disturbance to residents and businesses.
- .4 No additional compensation will be provided to the Contractor for cold weather work or other weather-related delays or costs.

#### **1.4 WORK SEQUENCE**

- .1 Contractor shall proceed with Phase A utility/underground work immediately upon contract award and work must be completed by June 20<sup>th</sup>, 2016. All surface works must be completed by December 15, 2016. Contractor is made aware there is a possibility of encountering ground frost during April in Waterton.
- .2 No construction activities shall occur between June 21<sup>st</sup> and September 5<sup>th</sup>, 2016 for all Phase A work. Contractor shall not begin any new or additional construction activities that cannot be completed prior to June 20<sup>th</sup>, 2016.
- .3 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage. All Phase A surfaces disrupted during the spring phase of construction shall be returned to a finished, safe and useable condition, approved by Departmental Representative, prior to June 20<sup>th</sup>, 2016.
- .4 Contractor shall prepare a meaningful bar chart or network diagram showing proposed schedule of major works which shall be provided to Departmental Representative within one week of Contract award and prior to commencement of any work.
- .5 When schedule has been approved by Departmental Representative, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.

#### **1.5 CONTRACTOR USE OF PREMISES**

- .1 For the purpose of this contract, Contractor will not be permitted to set up camp in Waterton Lakes National Park
- .2 Parks Canada regulations prohibit anyone working with the Park from using campground facilities.

**1.6 NATIONAL PARK REGULATIONS**

- .1 Contractor and all sub-contractors shall ensure that all work is performed in accordance with ordinances, laws, rules and regulations set out in the National Park Act.
- .2 Contractor and all sub-contractors shall obtain business licenses from Parks Canada Administration Office prior to commencement of work.
- .3 Contractor and all sub-contractors shall comply with all laws and government regulations applicable to work under this contract.
- .4 All Contractor's and all sub-contractor's business and private vehicles are required to obtain vehicle passes from Parks Canada Administration Office.
- .5 Contractor to equip all service vehicles and supervisory vehicles with Emergency Spill Kit DOT-E-10102 or equivalent.
- .6 Contractor is responsible to ensure all sub-contractors comply with the National Park Regulations

**1.7 EXISTING SERVICES**

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 72 hours notice for necessary interruption of residential services throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to residents
- .3 Provide alternative routes for pedestrian and vehicular traffic.
- .4 Establish location and extent of residential service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including water, sewer, power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems for any shutdown over two (2) hours.
- .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .10 Record locations of maintained, re-routed and abandoned service lines.
- .11 Construct barriers in accordance with Section [01 56 00 - Temporary Barriers and Enclosures].

**1.8 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Other documents as specified.

**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                WATER**

- .1        The unit price bid for “150 mm dia. SDR 18 PVC” shall be considered full compensation for all materials, labour and equipment required for the installation of water line including: temporary water services, supply and delivery of pipe, excavation and trenching to the required depth, supply and placement of granular bedding material, pipe installation to the specified line and grade, fittings, connections, tracer wire, thrust blocks, mechanical thrust protection, bends, reducers, tees, couplings, plugs, backfilling to roadway subgrade elevation, compaction, soil conditioning, dewatering, care of water, disposal of excess material off site, pressure testing, flushing, chlorinating and all other work necessary to complete the Work to the satisfaction of the Departmental Representative.
  - .1        Pipe will be measured horizontally, along the top of the pipe, from centreline of connection to centreline of connection.
  - .2        Payment will be made for each field measured lineal metre of pipe installed, pending approval of pressure, chlorination and bacterial testing results.
- .2        The unit price bid for “200 mm dia. SDR 18 PVC” shall be considered full compensation for all materials, labour and equipment required for the installation of water line including: temporary water services, supply and delivery of pipe, excavation and trenching to the required depth, supply and placement of granular bedding material, pipe installation to the specified line and grade, connections, tracer wire, thrust blocks, mechanical thrust protection, beds, tees, couplings, plugs, backfilling to roadway subgrade elevation, compaction, soil conditioning, dewatering, care of water, disposal of excess material off site, pressure testing, flushing, chlorinating and all other work necessary to complete the Work to the satisfaction of the Departmental Representative.
  - .1        Pipe will be measured horizontally, along the top of the pipe, from centreline of connection to centreline of connection.
  - .2        Payment will be made for each field measured lineal metre of pipe installed, pending approval of pressure, chlorination and bacterial testing results.
- .3        The unit price bid for “Water Line Tie-In – Mains” shall be considered full compensation for all materials, labour and equipment required for tie-ins of new water lines to existing water lines including: digging, trenching, placing, backfilling to roadway subgrade elevation, compacting, disposal of excess material off site, coordination and notification required for water service interruption, flushing, testing, chlorination and all work incidental to the completed tie-in.
  - .1        Each tie-in will be counted.
  - .2        Payment will be made for each completed connection to an existing water line.
- .4        The unit price bid for “Water Line Service – 25 mm” shall be considered full compensation for all materials, labour and equipment required for tie-ins of new water lines to existing services including: digging, trenching, placing, backfilling to subgrade elevation, compacting, disposal of excess material off site, coordination and notification required for water service interruption, supply and installation of new curb stop, supply and install pipe, supply and install union and connect to existing, supply and install of

saddle and connection to the watermain, flushing, testing, chlorination and all work incidental to the completed tie-in.

.1 Each tie-in will be counted.

.2 Payment will be made for each completed connection to an existing service.

- .5 The unit price bid for “Water Line Service – 50 mm” shall be considered full compensation for all materials, labour and equipment required for tie-ins of new water lines to existing services including: digging, trenching, placing, backfilling to subgrade elevation, compacting, disposal of excess material off site, coordination and notification required for water service interruption, supply and installation of new curb stop, supply and install pipe, supply and install union and connect to existing, supply and install of saddle and connection to the watermain, flushing, testing, chlorination and all work incidental to the completed tie-in.

.1 Each tie-in will be counted.

.2 Payment will be made for each completed connection to an existing service.

- .6 The unit price bid for “150 mm dia. Gate Valve” shall be considered full compensation for the supply off all materials, labour and equipment required for the installation of gate valves including: supply of valves, supports, operating rods, valve boxes and cathodic protection, excavation and trenching to the required depth, supply and placement of granular bedding material, valve insertion to the specified line and grade, connections, thrust blocking, mechanical thrust protection, backfilling to plan subgrade, compactions, soil conditioning, dewatering, care of water, testing, flushing, chlorination, and all work incidental to the completed valve installation.

.1 Each valve will be counted.

.2 Payment will be made for each valve supplied and installed.

- .7 The unit price bid for “200 mm dia. Gate Valve” shall be considered full compensation for the supply off all materials, labour and equipment required for the installation of gate valves including: supply of valves, supports, operating rods, valve boxes and cathodic protection, excavation and trenching to the required depth, supply and placement of granular bedding material, valve insertion to the specified line and grade, connections, thrust blocking, mechanical thrust protection, backfilling, compactions, soil conditioning, dewatering, care of water, testing, flushing, chlorination, and all work incidental to the completed valve installation.

.1 Each valve will be counted.

.2 Payment will be made for each valve supplied and installed

- .8 The unit price bid for “Fire Hydrant incl. Valve” shall be considered full compensation for the supply off all materials, labour and equipment required for the installation of fire hydrants including: supply and delivery of hydrants, excavating and trenching to the required depth, supply and placement of granular bedding material, hydrant installation to the specified line and grade, connections, thrust blocking, mechanical thrust protections, cathodic protection, supply and install of mainline tee, PVC lead and hydrant isolation valve, backfilling to subgrade elevation, compaction, soil conditioning, dewatering, care of water, testing, flushing, disposal of excess material off site, and all work incidental to the completed hydrant installation.

.1 Each hydrant will be counted.

- .2 Payment will be made for each hydrant installed.
- .9 The unit price bid for “Drain Valve in Chamber” shall be considered full compensation for the supply off all materials, labour and equipment required for the installation of the Drain Valve in Chambers including: supply and delivery of chamber materials, excavating and trenching to the required depth, supply and placement of granular bedding material, chamber installation to the specified line and grade, connections, thrust blocking, mechanical thrust protection, cathodic protection, mainline tee, supply and install PVC lead, drain isolation valve, backfilling to subgrade elevation, compaction, soil conditioning, dewatering, care of water, testing, flushing, disposal of excess material off site, and all work incidental to the completed drain valve chamber installation.
  - .1 Each Drain Valve Chamber will be counted.
  - .2 Payment will be made for each Drain Valve Chamber installed.
- .10 The unit price bid for “25 mm Standpipe Installation” shall be considered full compensation for the supply off all materials, labour and equipment required for the installation of the Standpipes as shown on the drawings and/or location determined by Departmental Representative including: supply and delivery of materials, excavating and trenching to the required depth, supply and placement of granular bedding material, standpipe installation to the specified line and grade, saddle connection to water main, connections, mechanical thrust protection, cathodic protection, supply and install tee with 2 (Two) 19 mm hose bibs, supply and install curb stop and copper lead, supply and install irrigation box, backfilling, compaction, soil conditioning, dewatering, care of water, testing, flushing, and all work incidental to the completed drain valve chamber installation.
  - .1 Each Standpipe will be counted.
  - .2 Payment will be made for each Standpipe installed.
- .11 The unit price bid for “Pipe Bursting” shall be considered full compensation for all materials, labour and equipment required to replace mains by pipe bursting, including: supply and placement of pipe, insertions and retrieval pits, machine pits, pavement removal and replacement, testing and all work incidental to the completed pipe replacing.
  - .1 Pipe will be measured horizontally, by GPS survey, from centreline of connection to centreline of connection.
  - .2 Payment will be made for each field measured lineal metre of pipe replaced by pipe bursting.
- .12 The unit price bid for “Decommissioning of Valve/Hydrant” shall be considered full compensation for all materials, labour and equipment required for the decommissioning of an existing valve or hydrant, including: removal to 1 metre below finish grade, removal of stems, filling remaining structure with pipe bedding material, backfilling with compacted free draining native material, rehabilitation of disturbed area to match immediate surrounding terrain, cleaning and all work incidental to the decommissioning of an existing valve or hydrant.
  - .1 Each decommissioned valve or hydrant will be counted.
  - .2 Payment will be made for each valve or hydrant successfully decommissioned.
- .13 The unit price bid for “150 mm dia. DR 11 HDPE” shall be considered full compensation for all materials, labour and equipment required for the supply of 150 mm DR 11 HDPE

including: procuring, loading, hauling, handling, and all work incidental to the installation of DR 11 HDPE Pipe.

- .1 Pipe will be measured horizontally, along the top of the pipe, from end to end.
- .2 Payment will be made for each field measured lineal metre of pipe supplied.

## 1.2 SANITARY SEWER

- .1 The unit price bid for “150 mm dia. SDR 35 PVC Pipe” shall be considered full compensation for all materials, labour and equipment required for the installation of sanitary sewer line including: confirmation of existing tie-in inverts, supplying, loading, hauling, unloading of pipe, trenching to the required depth, supply and placement of granular bedding material, pipe installation to the specified line and grade, backfilling to roadway subgrade elevation, trench compaction, disposal of excess materials off site, connection to manholes or sanitary pipes, flushing, cleaning and all work incidental to the completed installation of sanitary sewer line. This item will be used for services extending beyond 15 metres from the sanitary sewer main, and will be paid only for pipe beyond this 15 metres.
  - .1 Pipe will be measured horizontally, along the top of the pipe, from 15 metres from the centreline of the sanitary main of connection to centreline of connection.
  - .2 Payment will be made for each field measured lineal metre of pipe installed.
- .2 The unit price bid for “200 mm dia. SDR 35 PVC Pipe” shall be considered full compensation for all materials, labour and equipment required for the installation of sanitary sewer line including: confirmation of existing tie-in inverts, supplying, loading, hauling, unloading of pipe, trenching to the required depth, supply and placement of granular bedding material, pipe installation to the specified line and grade, backfilling to roadway subgrade elevation, trench compaction, disposal of excess materials off site, connection to manholes, flushing, cleaning, CCTV inspection, and all work incidental to the completed installation of sanitary sewer line.
  - .1 Pipe will be measured horizontally, along the top of the pipe, from centreline of connection to centreline of connection.
  - .2 Payment will be made for each field measured lineal metre of pipe installed.
- .3 The unit price bid for “300 mm dia. SDR 35 PVC Pipe” shall be considered full compensation for all materials, labour and equipment required for the installation of sanitary sewer line including: confirmation of existing tie-in inverts, supplying, loading, hauling, unloading of pipe, trenching to the required depth, supply and placement of granular bedding material, pipe installation to the specified line and grade, backfilling to roadway subgrade elevation, trench compaction, disposal of excess materials off site, connection to manholes, flushing, cleaning, CCTV inspection, and all work incidental to the completed installation of sanitary sewer line.
  - .1 Pipe will be measured horizontally, along the top of the pipe, from centreline of connection to centreline of connection.
  - .2 Payment will be made for each field measured lineal metre of pipe installed.
- .4 The unit price bid for “Type I Manhole” shall be considered full compensation for all materials, labour and equipment required for the installation of Type I manholes, including: excavation, disposal of waste excavation off-site, supply and install granular



material, manhole base, manhole barrel, slab top, collars, frame & cover, grouting, all pipe tie-ins to manholes, backfilling, associated cleanup and all items incidental to complete the work.

- .1 Each new manhole installed will be measured vertically in metres from top of cover (rim) to lowest pipe invert..
  - .2 Payment will be made for total vertical metres of manhole installed.
- .5 The unit price bid for “Sanitary Sewer Line Tie-In –Main” shall be considered full compensation for all materials, labour and equipment required for tie-ins of new sanitary sewer lines to existing manholes including: digging, trenching, placing, supply and install couplers, sealing, backfilling, compacting, coordination and notification required for sanitary sewer service interruption, testing, and all work incidental to the completed tie-in.
  - .1 Each tie-in will be counted.
  - .2 Payment will be made for each completed connection to an existing manhole.
- .6 The unit price bid for “Sanitary Sewer Service – 100 mm” shall be considered full compensation for all materials, labour and equipment required for tie-ins of new sanitary sewer lines to existing services including: digging, trenching, placing, backfilling to subgrade, compacting, disposal of excess material off site, coordination and notification required for sanitary sewer service interruption, supply and install pipe, supply and install saddle and connection to the sewer main, supply and install coupler to connect existing service to new service pipe, flushing, testing, and all work incidental to the completed tie-in.
  - .1 Each tie-in will be counted.
  - .2 Payment will be made for each completed connection to an existing service.
- .7 The unit price bid for “Sanitary Sewer Service – 150 mm” shall be considered full compensation for all materials, labour and equipment required for tie-ins of new sanitary sewer lines to existing services including: digging, trenching, placing, backfilling to subgrade, compacting, disposal of excess material off site, coordination and notification required for sanitary sewer service interruption, supply and install 15 lineal metres of pipe, supply and install saddle and connection to the sewer main, supply and install coupler to connect existing service to new service pipe, flushing, testing, and all work incidental to the completed tie-in.
  - .1 Each tie-in will be counted.
  - .2 Payment will be made for each completed connection to an existing service.
- .8 The unit price bid for “Adjust Existing Manhole to Grade” shall be considered full compensation for all materials, labour and equipment required to adjust an existing manhole to new asphalt grade including: special fittings, disposal of waste material off-site, and all work incidental to the completed manhole adjustment.
  - .1 Each manhole adjusted will be counted.
  - .2 Payment will be made for each adjusted manhole to final asphalt grades.
- .9 The unit price bid for “Packaged Sewage Lift Station” shall be considered full compensation for all materials, labour and equipment required to supply and install a sanitary sewage lift station, including: excavation regardless of material encountered, sheathing and shoring, supply and install the complete packaged lift station and a

concrete base designed by Contractor, including all piping, valves, instruments, electrical & controls system, backfill to subgrade elevation, compaction, disposal of waste and surplus material off site, flushing, cleaning, start-up and commissioning of packaged lift station, and all work incidental to the new lift station.

- .1 The entire lift station will be counted as a unit.
  - .2 Payment will be made for a lift station successfully installed and commissioned.
- .10 The unit price bid for “100 mm dia. DR 11 HDPE Forcemain” shall be considered full compensation for all materials, labour and equipment required for the installation of sanitary force main including: excavation regardless of material encountered, confirmation of existing tie-in inverts, supplying, loading, hauling, unloading of pipe, trenching to required depth, sheathing and shoring, supply and install granular bedding, supply and install all bends, tees, crosses, couplings, reducers, plugs and concrete blocking, thrust blocks, pipe crossings, #8 tracer wire and any special fitting, backfill to subgrade elevation, compaction, and surface restoration, disposal of waste and surplus material off-site, flushing, cleaning, and pressure testing of force mains, and all work incidental to the installation of new force main.
- .1 Pipe will be measured horizontally, along the top of the pipe, from centreline of connection to centreline of connection.
  - .2 Payment will be made for each field measured lineal metre of pipe installed.
- .11 The unit price bid for “Decommissioning of Manhole” shall be considered full compensation for all materials, labour and equipment required for the decommissioning of an existing manhole, including: removal to 1 metre below finish grade, power washing, plugging pipes with concrete, introduction of six 4 inch dia. holes in the base, backfilling with compacted free draining native material, disposal of waste and surplus material off-site, rehabilitation of disturbed area to match immediate surrounding terrain, cleaning and all work incidental to the decommissioning of an existing manhole.
- .1 Each decommissioned manhole will be counted.
  - .2 Payment will be made for each manhole successfully decommissioned.
- .12 The unit price bid for “Dump Station” shall be considered full compensation for all materials, labour and equipment required for the dump station, including: removal of existing dump station to 1 metre below finish grade, construction of new dump station as show in the plans including sewer pipe and connection to manhole, concrete works, steel flex beam guide rail, bollards structure, pipe bedding material, backfilling with compacted free draining native material, rehabilitation of disturbed area to match immediate surrounding terrain.
- .1 The entire dump station will be counted as a unit.
  - .2 Lump Sum payment will be made for Dump Station installed.

### **1.3 STORM SEWER**

- .1 The unit price bid for “300 mm dia. SDR 35 PVC Pipe” shall be considered full compensation for all materials, labour and equipment required for the installation of storm sewer line including: confirmation of existing tie-in inverts, supplying, loading, hauling, unloading of pipe, trenching to the required depth, supply and placement of granular bedding material, pipe installation to the specified line and grade, backfilling to roadway subgrade elevation, trench compaction, disposal of excess materials off site,

connection to manholes and catch basins, and all work incidental to the completed installation of storm sewer line.

- .1 Pipe will be measured horizontally, along the top of the pipe, from centreline of connection to centreline of connection.
  - .2 Payment will be made for each field measured lineal metre of pipe installed.
- .2 The unit price bid for “New Catch Basin – Type 1 Rolled c/w Frame and Grate” shall be considered full compensation for all materials, labour and equipment required for the installation of a catch basins, including: excavation, disposal of waste excavation off-site, supply and install granular material, catch basin base, barrel, weep holes, filter cloth, slab top, collars, concrete benching, mortar, pre-cast frames, block out(s), grouting, covers, bricks, all pipe tie-ins, bedding, backfilling, associated cleanup and all items incidental to complete the work.
  - .1 Each new catch basin installed will be counted.
  - .2 Payment will be made for each catch basin installed.
- .3 The unit price bid for “Core Hole into Existing Manhole for 300 mm Catch Basin Lead” shall be considered full compensation for all materials, labour and equipment required for tie-ins of new storm sewer lines to existing manholes or catch basins including: disconnecting, sealing, testing, disposal of waste material off-site, and all work incidental to the completed tie-in.
  - .1 Each tie-in will be counted.
  - .2 Payment will be made for completed connection to an existing manhole or catch basin.

#### **1.4 CONCRETE**

- .1 The unit price bid for “Remove and Dispose Concrete Surfaces” shall be considered full compensation for all materials, labour and equipment required for the removal of concrete surfaces, including: cutting, jackhammering, excavating, breaking, demolishing, loading, hauling, disposal of waste material outside Waterton Park, cleaning, and all work incidental to the removal of concrete. Thickness of existing concrete surfaces to be removed estimated to be up to 200mm.
  - .1 Each surface will be measured individually in neat horizontal lines to the nearest square metre.
  - .2 Payment will be made for each square metre of concrete removed and disposed.
- .2 The unit price bid for “Combined Sidewalk and Rolled Curb & Gutter” shall be considered full compensation for all materials, labour and equipment required to supply and install combined sidewalk and curb & gutter structures in accordance with the sections, alignments and grades specified, including: excavation, subgrade preparation, supply and install 100 mm depth of granular base, extruding, forming, tie-bar, doweling, placement, vibrating, finishing, stripping, curing and protection of the concrete, control joints expansion joints, isolation joints, backfilling between concrete and property line to subgrade elevation, compaction, associated clean up , and all work incidental to the installation of concrete sidewalk and curb & gutter.
  - .1 Each surface will be measured individually along the top of the curb.

- .2 Payment will be made for each metre of combined sidewalk and curb & gutter installed.
- .3 The unit price bid for “Wheelchair Ramp – Type 1” shall be considered full compensation for all materials, labour and equipment required to construct wheel chair ramps as shown on the drawings, including: excavation, subgrade preparation, supply and install 100 mm depth granular base, extruding, forming, tie-bar, doweling, placement, vibrating, finishing, stripping, curing and protection of the concrete, backfilling between concrete and property line to subgrade elevation, compaction, associated clean up, and all work incidental to the installation of wheelchair ramps.
  - .1 Each wheelchair ramp will be counted.
  - .2 Payment will be made for each wheelchair ramp installed.
- .4 The unit price bid for “Wheelchair Ramp – Type 2” shall be considered full compensation for all materials, labour and equipment required to construct wheel chair ramps as shown on the drawings, including: excavation, subgrade preparation, supply and install 100 mm depth granular base, extruding, forming, tie-bar, doweling, placement, vibrating, finishing, stripping, curing and protection of the concrete, backfilling between concrete and property line to subgrade elevation, compaction, associated clean up, and all work incidental to the installation of wheelchair ramps.
  - .1 Each wheelchair ramp will be counted.
  - .2 Payment will be made for each wheelchair ramp installed.
- .5 The unit price bid for “Rolled Curb & Gutter” shall be considered full compensation for all materials, labour and equipment required to supply and install standard curb & gutter structures in accordance with the sections, alignments and grades specified, including: excavation, subgrade preparation, supply and install 100 mm depth granular base, extruding, forming, tie-bar, doweling, placement, vibrating, finishing, stripping, curing and protection of the concrete, control joints expansion joints, isolation joints, backfilling between concrete and property line to subgrade elevation, compaction, associated clean up, and all work incidental to the installation of concrete curb & gutter.
  - .1 Each surface will be measured individually along the top of the curb.
  - .2 Payment will be made for each metre of standard curb & gutter installed.
- .6 The unit price bid for “Lane Crossing” shall be considered full compensation for all materials, labour and equipment required to construct lane crossings as shown on the drawings, including: excavation, subgrade preparation, supply and install 100 mm depth granular base, extruding, forming, tie-bar, doweling, placement, vibrating, finishing, stripping, curing and protection of the concrete, control joints expansion joints, isolation joints, backfilling between concrete and property line to subgrade elevation, compaction, associated clean up, and all work incidental to the installation of lane crossings.
  - .1 Each lane crossing will be counted.
  - .2 Payment will be made for each lane crossing installed.
- .7 The unit price bid for “Separate Sidewalk – 130 mm Depth” shall be considered full compensation for all materials, labour and equipment required to supply and install sidewalk structures in accordance with the sections, alignments and grades specified, including: excavation, subgrade preparation, supply and install 100 mm depth granular base, extruding, forming, tie-bar, doweling, placement, vibrating, finishing, stripping,

curing and protection of the concrete, control joints expansion joints, isolation joints, backfilling between concrete and property line to subgrade elevation, compaction, associated clean up, and all work incidental to the installation of concrete sidewalk.

- .1 Each surface will be measured individually along the top of the sidewalk.
  - .2 Payment will be made for each metre of sidewalk installed.
- .8 The unit price bid for “Concrete Surfacing – 130 mm Depth” shall be considered full compensation for all materials, labour and equipment required to supply and install concrete structures in accordance with the sections, alignments and grades specified, including: excavation, subgrade preparation, supply and install 100 mm depth granular base, extruding, forming, tie-bar, doweling, placement, vibrating, finishing, stripping, curing and protection of the concrete, control joints expansion joints, isolation joints, backfilling between concrete and property line to subgrade elevation, compaction, associated clean up, and all items incidental to complete the work.
- .1 Each area of approved concrete surfacing will be measured by length and average width to produce an area in square metres.
  - .2 Payment will be made for each area of Concrete Surfacing.

## **1.5 SURFACE WORKS**

- .1 The unit price bid for “Saw Cutting” shall be considered full compensation for all materials, labour and equipment required for cutting, excavating, removing, breaking, loading, hauling, disposal off-site, associated clean-up and all work incidental to saw cutting asphalt.
  - .1 Saw cuts will be measured down the centreline of the cut.
  - .2 Payment will be made for each metre of saw cut.
- .2 The unit price bid for “Asphalt Removal” shall be considered full compensation for all materials, labour and equipment required for removing all asphalt as shown on the drawings, including: removing, breaking, crushing or milling to 25 mm minus for use as road bed, loading, hauling, stockpile to Upper Compound, associated clean-up and all work incidental to asphalt milling. Estimated quantity is 20,500 m<sup>2</sup>.
  - .1 All milling will be counted as a unit.
  - .2 Lump sum payment will be made for asphalt milling.
- .3 The unit price bid for “Subgrade Preparation” shall be considered full compensation for all materials, labour and equipment required for preparing the subgrade surface for surfacing, including scarifying, placing, blading, mixing, shaping, grading, moisture conditioning, compacting, maintaining, proof rolling, associated clean up and all work incidental to complete the work. This shall include the undercut and subsequent prep of minor “soft spots” to ensure an approved subgrade surface.
  - .1 Each area of approved prepared subgrade will be measured by length and average width to produce an area in square metres.
  - .2 Payment will be made for each square metre of approved prepared subgrade surface.
- .4 The unit price bid for “Type III Asphalt Concrete Paving – 100 mm Depth” shall be considered full compensation for all materials, labour and equipment required for preparation of the job mix design and job mix formula, supply and placement of prime

coat and tack coat where required, supply of aggregates and asphalt cement, mixing, transporting, placing, spreading, shaping, raking, ramping around appurtenances and compacting the asphalt to the specified thickness and density, associated clean up and all work incidental to complete the work.

- .1 Each area will be measured by GPS survey.
- .2 Payment will be made for each area of asphalt correctly placed to specifications.
- .5 The unit price bid for “Granular Base Course – 75 mm Depth” shall be considered full compensation for all materials, labour and equipment required for the supply, placement and compaction of granular base course in accordance with limit lines, compacted depths, densities, moisture content and grades specified, including: procurement, loading, processing, hauling, placing, shaping, grading, compacting, applying blotting sand when required, moisture conditioning, proof rolling, maintaining, interim lane marking, material certification, quality control, associated clean up and all items incidental to complete the work.
  - .1 Each area of approved granular base course will be measured by length and average width to produce an area in square metres.
  - .2 Payment will be made for each area of approved granular base course.
- .6 The unit price bid for “Recycled Asphalt Base Course – 75 mm Depth” shall be considered full compensation for all materials, labour and equipment required for RAP surfacing, including processing, loading, hauling, placing and compacting of millings on the road surface, associated clean up and all items incidental to complete the work.
  - .1 Recycled Asphalt Pavement Surfacing will be measured by length and average width of approved surface.
  - .2 Payment will be made for each area of approved recycled asphalt pavement surfacing.
- .7 The unit price bid for “100 mm Wide Line Painting – White Parking Stalls” shall be considered full compensation for all materials, labour and equipment required for completing 100 mm wide line painting, including inspecting the areas to be painted, sweeping and cleaning of surfaces, supplying of paint and glass beads, completing temporary markings, traffic accommodation, painting to the specified locations and colours, associated clean up and all items incidental to complete the work.
  - .1 Lines will be measured along the centreline of the completed painted 100 mm line.
  - .2 Payment will be made for each lineal metre of painted 100 mm line.
- .8 The unit price bid for “600 mm Wide Line Painting” shall be considered full compensation for all materials, labour and equipment required for completing 600 mm wide line painting, including inspecting the areas to be painted, sweeping and cleaning of surfaces, supplying of paint and glass beads, completing temporary markings, traffic accommodation, painting to the specified locations and colours, associated clean up and all items incidental to complete the work.
  - .1 Lines will be measured along the centreline of EACH 600 mm line.
  - .2 Payment will be made for each lineal metre of painted 600 mm line.
- .9 The unit price bid for “100 mm Wide Line Painting – Yellow Directional Dividing” shall be considered full compensation for all materials, labour and equipment required for

completing 100 mm wide line painting, including inspecting the areas to be painted, sweeping and cleaning of surfaces, supplying of paint and glass beads, completing temporary markings, traffic accommodation, painting to the specified locations and colours, associated clean up and all items incidental to complete the work.

- .1 Lines will be measured along the centreline of the completed painted 100 mm line.
  - .2 Payment will be made for each lineal metre of painted 100 mm line.
- .10 The unit price bid for “2.5 m Asphalt Pathway” shall be full payment for the preparation of the job mix design and job mix formula, subgrade preparation, supply and placement of granular base course, supply and placement of a prime coat and/or tack coat as required, supply of aggregates and asphalt cement, mixing, transporting, placing, spreading, shaping, raking, ramping around appurtenances and compacting the granular and asphalt concrete to the specified thickness and density, and all items incidental to complete the work. This item shall also include the adjustment of all utility structures, unless noted to be measured and paid for separately. Construction joints will be considered incidental to paving
- .1 Each area will be measured by length and average width.
  - .2 Payment will be made for each area of asphalt pathway correctly placed to specifications.

## **1.6 MISCELLANEOUS**

- .1 The unit price bid for “Remove and Reinstall Fence” shall be considered full compensation for all materials, labour and equipment required for the removal, salvage, and reinstallation of existing fence, including: removal, safeguarding, loading, hauling, storing, reinstallation, associated clean up and all items incidental to complete the work.
  - .1 Measurement will be taken along the centreline of reinstalled fence.
  - .2 Payment will be made for each lineal metre of reinstalled fence.
- .2 The unit price bid for “Remove and Reinstall Wooden Bollard Fence” shall be considered full compensation for all materials, labour and equipment required for the removal, salvage, and reinstallation of existing bollard fence, including: removal, safeguarding, loading, hauling, storing, reinstallation, associated clean up and all items incidental to complete the work.
  - .1 Measurement will be taken along the centreline of reinstalled fence.
  - .2 Payment will be made for each lineal metre of reinstalled fence.
- .3 The unit price bid for “Remove and Reinstall Wooden Bollard” shall be considered full compensation for all materials, labour and equipment required for the removal, salvage, and reinstallation of existing wooden bollards, including: removal, safeguarding, loading, hauling, storing, reinstallation, associated clean up and all items incidental to complete the work.
  - .1 Each reinstalled bollard will be counted.
  - .2 Payment will be made for each bollard reinstalled.
- .4 The unit price bid for “Remove and Dispose Tree” shall be considered full compensation for all materials, labour and equipment required for the removal and off-site disposal of roots, stumps and branches under 75 mm diameter, including: cutting of all wood 75 mm

diameter and greater into 400 mm lengths to be hauled to an area designated by the Departmental Representative, excavating roots to a 1 metre depth, excavating, loading, hauling, backfilling, compacting, associated clean up and all items incidental to complete the work.

- .1 Each removed tree will be counted.
  - .2 Payment will be made for each tree removed.
- .5 The unit price bid for “Remove and Dispose Bush” shall be considered full compensation for all materials, labour and equipment required for the removal and off-site disposal of existing bushes, including: cutting, excavating, excavating roots to a 1 metre depth, loading, hauling, backfilling, compacting, associated clean up and all items incidental to complete the work.
- .1 Each area of bushes removed will be measured by length and average width to produce an area in square metres.
  - .2 Payment will be made for each square metre of bushed removed.
- .6 The unit price bid for “Supply and Plant Approved Tree” shall be considered full compensation for all materials, labour and equipment required for the supply and planting of trees, including: procurement, loading, hauling, handling, safeguarding, transporting, excavation, planting, backfilling, compacting, watering, staking, associated clean up and all items incidental to complete the work.
- .1 Each planted tree will be counted.
  - .2 Payment will be made for each tree planted.
- .7 The unit price bid for “Supply and Plant Approved Bush” shall be considered full compensation for all materials, labour and equipment required for the supply and planting of bushes, including: procurement, loading, hauling, handling, safeguarding, transporting, excavation, planting, backfilling, compacting, watering, staking, associated clean up and all items incidental to complete the work.
- .1 Each planted bush will be counted.
  - .2 Payment will be made for each bush planted.
- .8 The unit price bid for “Remove and Reinstall Garbage Bin” shall be considered full compensation for all materials, labour and equipment required for the removal and reinstallation of bear-proof garbage bins, including: excavating, loading, hauling, handling, safeguarding, transporting, excavation, construction of concrete base, backfilling, compacting, installing, associated clean up and all items incidental to complete the work.
- .1 Each reinstalled garbage bin will be counted.
  - .2 Payment will be made for each relocated garbage bin.
- .9 The unit price bid for “Remove and Reinstall Sign” shall be considered full compensation for all materials, labour and equipment required for the removal and reinstallation of signs, including: removing, loading, hauling, handling, safeguarding, transporting, backfilling, compacting, installing, shaping, associated clean up and all items incidental to complete the work.
- .1 Each reinstalled sign will be counted.
  - .2 Payment will be made for each relocated sign.



- .10 The unit price bid for “Remove and Reinstall Street Light” shall be considered full compensation for all materials, labour and equipment required for the removal and reinstallation of street lights, including: disconnecting, removing, loading, hauling, handling, safeguarding, transporting, backfilling, compacting, installing, connecting, shaping, associated clean up and all items incidental to complete the work.
  - .1 Each reinstalled street light will be counted.
  - .2 Payment will be made for each relocated street light.
- .11 The unit price bid for “Topsoil Placement and Grading” shall be considered full compensation for all materials, labour and equipment required for the placement of topsoil including: spreading, trimming, blading, shaping finishing, associated clean up and all items incidental to complete the work. Topsoil stripping shall be considered incidental to the work.
  - .1 Each topsoiled area will be measured by length and average width to produce an area in square metres.
  - .2 Payment will be made for each square metre of area topsoil placed and graded prior to seeding
- .12 The unit price bid for “Imported Topsoil” shall be considered full compensation for the supply and import of topsoil from a supplier approved by the Departmental Representative, mixing of imported topsoil with native topsoil stockpiled in the Upper Compound, all labour, materials, equipment, tools and incidentals necessary to complete the Work to the satisfaction of the Departmental Representative.
  - .1 Measurement of Imported Topsoil will in cubic meters base on truck box measurement. The capacity of the hauling vehicles will be measured by the Departmental Representative. The measurements will be to the nearest 0.1 cubic metre capacity.
  - .2 Payment for Imported Topsoil will be made at the unit price bid per cubic metre.
- .13 The unit price bid for “Hydro-Seeding” shall be considered full compensation for the supply and placement of seed, hydro-mulch and reseeding as applicable, and includes all labour, materials, equipment, tools and incidentals necessary to complete the Work to the satisfaction of the Departmental Representative. The repair of eroded areas prior to seeding will be considered incidental to the Work and no separate payment will be made.
  - .1 Seeding will be measured in square meters to the based on horizontal measurements as determined by the Departmental Representative. No allowance will be made for uneven or sloping ground, overlap.
  - .2 Payment for Hydro-Seeding will be made at the unit price bid per square metre
- .14 The unit price for “PVC Conduits” shall be considered full compensation for the supply and placement of conduits, backfill, installation of warning tape, and includes all labour, materials, equipment, tools and incidentals necessary to complete the Work to the satisfaction of the Departmental Representative. Conduits shall be Polytubes, Carlon or approved equivalent.
  - .1 Measurement will be taken along the centreline of installed conduit.
  - .2 Payment will be made for each lineal metre installed conduit.

**1.7 APPLICATIONS FOR PROGRESS PAYMENT**

- .1 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.
- .2 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Departmental Representative may reasonably require to establish value and delivery of products.

**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 ADMINISTRATIVE**

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representatives review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review.
- .10 Keep one reviewed copy of each submission on site.

**1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional Departmental Representative registered or licensed in Alberta of Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 7 days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit PDF copies of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit PDF of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit PDF copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative
- .13 Delete information not applicable to project.

- .14 Supplement standard information to provide details applicable to project.
- .15 If upon review by Departmental Representative no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .16 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

### **1.3 SAMPLES**

- .1 Submit for review samples in duplicates requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's site office
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

### **1.4 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic copy of colour digital photography in jpeg, standard resolution or PDF
- .2 Take daily photographs of all utility and underground work
- .3 Take photographs of site conditions before, during, and after construction. Take photographs of any unique or unusual items.
- .4 Photographs to be submitted on CD. All photographs to be labelled with meaningful titles.

**1.5 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **PART1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Mechanics and administration of the submittal process for:
    - a. Operation and Maintenance Manuals.
  - 2. Content requirements for Operation and Maintenance Manuals.

### **1.2 DEFINITIONS**

- A. Operation and Maintenance (O&M) Manuals:
  - 1. Contain the information required for proper installation and maintenance of building materials and finishes.
  - 2. Contain the technical information required for proper installation, operation and maintenance of process, electrical and mechanical equipment and systems.

### **1.3 SUBMITTAL SCHEDULE**

- A. Operation and Maintenance Manuals and Completed Equipment Record Sheets:  
Initial submittal within 30 working days after date Shop Drawings are approved.

### **1.4 PREPARATION OF SUBMITTALS**

- A. General:
  - 1. All submittals and all pages of all copies of a submittal shall be completely legible.
  - 2. Submittals which, in the Departmental Representative's sole opinion, are illegible will be returned without review.
- B. Operation and Maintenance Manuals:
  - 1. Owner's use of manufacturer's Operation and Maintenance materials:
    - a. Materials are provided for Owner's use, reproduction and distribution as training and reference materials within Owner's organization.
      - 1) Applicable to hard copy or electronic media.
      - 2) Applicable to materials containing copyright notice as well as those with no copyright notice.
    - b. Notify manufacturer of this intended use of materials provided under the Contract.
  - 2. Number each Operation and Maintenance Manual transmittal with the original root number of the associated Shop Drawing.
    - a. Identify resubmittals with the original number plus a suffix letter starting with "A."
  - 3. Submittal format:
    - a. Interim submittals: Submit two (2) paper copies until manual is approved.
    - b. Final submittals:
      - 1) Within 20 days of receipt of approval, submit one (1) additional paper copy and two (2) electronic copies on Compact Disc (CD-ROM) in Portable Document Format (PDF).
        - a) Compact discs to be secured in jewel cases.
      - 2) Electronic copies will be reviewed for conformance with the approved paper copy and the electronic copy (PDF) requirements of this Specification.
      - 3) Non-conforming CDs will be returned with comments.
        - a) Provide final CDs within 20 days of receipt of comments.
  - 4. Paper copy submittals:
    - a. Submit Operation and Maintenance Manuals printed on 8-1/2 x 11 IN size heavy first quality paper with standard three-hole punching and bound in appropriately sized three-

- ring (or post) vinyl view binders with clear overlays front, spine and back.
- 1) Provide binders with titles inserted under clear overlay on front and on spine of each binder.
    - a) As space allows, binder titles shall include, but not necessarily be limited to, Project Name and number, related Specification Number and Equipment Name(s) & Tag Numbers.
  - 2) Provide a Cover Page for each manual with the following information:
    - a) Manufacturer(s).
    - b) Date.
    - c) Project Owner and Project Name.
    - d) Specification Section.
    - e) Project Equipment Tag Numbers.
    - f) Model Numbers.
    - g) Engineer.
    - h) Contractor.
  - 3) Provide a Table of Contents or Index for each manual.
  - 4) Use plastic-coated dividers to tab each section of each manual per the manual's Table of Contents/Index for easy reference.
  - 5) Provide plastic sheet lifters prior to first page and following last page.
  - b. Reduce Drawings or diagrams bound in manuals to an 8-1/2 x 11 IN or 11 x 17 IN size.
    - 1) Where reduction is not practical to ensure readability, fold larger Drawings separately and place in vinyl envelopes which are bound into the binder.
    - 2) Identify vinyl envelopes with Drawing numbers.
  - c. Mark each sheet to clearly identify specific products and component parts and data applicable to the installation for the Project.
    - 1) Delete or cross out information that does not specifically apply to the Project.
  5. Electronic copy submittals:
    - a. Electronic copies of the approved paper copy Operation and Maintenance Manuals are to be produced in Adobe Acrobat's Portable Document Format (PDF) Version 5.0 or higher.
    - b. Do not password protect and/or lock the PDF document.
    - c. Create one (1) PDF document (PDF file) for each equipment O&M Manual.
    - d. Drawings or other graphics must be converted to PDF format and made part of the one (1) PDF document.
      - 1) Scanning to be used only where actual file conversion is not possible.
    - e. Rotate pages that must be viewed in landscape to the appropriate position for easy reading.
    - f. Images only shall be scanned at a resolution of 300 dpi or greater.
      - 1) Perform Optical Character Recognition (OCR) capture on all images.
      - 2) Achieve OCR with the "original image with hidden text" option.
      - 3) Word searches of the PDF document must operate successfully to demonstrate OCR compliance.
    - g. Create bookmarks in the navigation frame, for each entry in the Table of Contents/Index.
      - 1) Normally three levels deep (i.e., "Chapter," "Section," "Sub-section").
    - h. Thumbnails must be generated for each PDF file.
    - i. Set the opening view for PDF files as follows:
      - 1) Initial view: Bookmarks and Page.2) Magnification: Fit in Window.
      - 3) Page layout: Single page.
      - 4) Set the file to open to the cover page of the manual with bookmarks to the left, and the first bookmark linked to the cover page.



- j. All PDF documents shall be set with the option "Fast Web View" to open the first pages of the document for the viewer while the rest of the document continues to load.
- k. File naming conventions:
  - 1) File names shall use a "ten dot three" convention (XXXXXX-YY-Z.PDF) where XXXXXX is the Specification Section number, YY is the Shop Drawing Root number and Z is an ID number used to designate the associated volume.
    - a) Example 1:
      - (1) Two (2) pumps submitted as separate Shop Drawings under the same Specification Section:
        - (a) Pump 1 = 11061-01-1.pdf.
        - (b) Pump 2 = 11061-02-1.pdf.
      - b) Example 2:
        - (1) Control system submitted as one (1) Shop Drawing but separated into two (2) O&M volumes:
          - (a) Volume 1 = 13440-01-1.pdf.
          - (b) Volume 2 = 13440-01-2.pdf.
  - l. Labeling:
    - 1) As a minimum, include the following labeling on all CD-ROM discs and jewel cases:
      - a) Project Name.
      - b) Equipment Name and Project Tag Number.
      - c) Project Specification Section.
      - d) Manufacturer Name.
      - e) Vendor Name.
  - m. Binding:
    - 1) Include labeled CD(s) in labeled jewel case(s).
      - a) Bind jewel cases in standard three-ring binder Jewel Case Page(s), inserted at the front of the Final paper copy submittal.
      - b) Jewel Case Page(s) to have means for securing Jewel Case(s) to prevent loss (e.g., flap and strap).

6. Operation and Maintenance Manuals for Materials and Finishes:

  - a. Building Products, Applied Materials and Finishes:
    - 1) Include product data, with catalog number, size, composition and color and texture designations.
    - 2) Provide information for re-ordering custom manufactured products
  - b. Instructions for Care and Maintenance:
    - 1) Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods and recommended schedule for cleaning and maintenance.
  - c. Moisture Protection and Weather Exposed Products:
    - 1) Include product data listing, applicable reference standards, chemical composition, and details of installation.
    - 2) Provide recommendations for inspections, maintenance and repair.
  - d. Additional requirements as specified in individual product specifications.

7. Operation and Maintenance Manuals for Equipment and Systems:

  - a. Submission of Operation and Maintenance Manuals for equipment and systems is applicable but not necessarily limited to:
    - 1) Major equipment.
    - 2) Equipment powered by electrical, pneumatic or hydraulic systems.
    - 3) Specialized equipment and systems including instrumentation and control systems and system components for HVAC process system control.
    - 4) Valves and water control gates.

- b. Equipment and Systems Operation and Maintenance Manuals shall include, but not necessarily be limited to, the following completed forms and detailed information, as applicable:
  - 1) Fully completed type-written copies of the associated Equipment Record(s), Exhibits B1, B2 and B3, shall be included under the first tab following the Table of Contents of each Operation and Maintenance Manual.
    - a) Each section of the Equipment Record must be completed in detail.
      - (1) Simply referencing the related manual for nameplate, maintenance, spare parts or lubricant information is not acceptable.
    - b) For equipment items involving components or subunits, a fully completed Equipment Record Form is required for each operating component or subunit.
    - c) Submittals that do not include the associated Equipment Record(s) will be rejected without further content review.
    - d) Electronic copies of the Exhibits may be obtained by contacting the Project Manager.
  - 2) Equipment function, normal operating characteristics, limiting operations.
  - 3) Assembly, disassembly, installation, alignment, adjustment, and checking instructions.
  - 4) Operating instructions for start-up, normal operation, control, shutdown, and emergency conditions.
  - 5) Lubrication and maintenance instructions.
  - 6) Troubleshooting guide.
  - 7) Parts lists:
    - a) Comprehensive parts and parts price lists.
    - b) A list of recommended spare parts.
    - c) List of spare parts provided as specified in the associated Specification Section.
  - 8) Outline, cross-section, and assembly Drawings; engineering data; and electrical diagrams, including elementary diagrams, wiring diagrams, connection diagrams, word description of wiring diagrams and interconnection diagrams.
  - 9) Test data and performance curves.
  - 10) As-constructed fabrication or layout Drawings and wiring diagrams.
  - 11) Instrumentation or tag numbers assigned to the equipment by the Contract Documents are to be used to identify equipment and system components.
  - 12) Additional information as specified in the associated equipment or system Specification Section.

## **1.5 TRANSMITTAL OF SUBMITTALS**

- A. Operation and Maintenance Manuals:
  - 1. Submit to Contract Administrator. Submit with reasonable promptness and in an orderly sequence as to not cause delay of work:
  - 2. All submittals must be from Contractor.
    - a. Submittals will not be received from or returned to subcontractors.
    - b. Operation and Maintenance Manual submittal stamp may be Contractor's standard approval stamp.
  - 4. Provide submittal information defining specific equipment or materials utilized on the Project.
    - a. Generalized product information, not clearly defining specific equipment or materials to be provided, will be rejected.
- B. Expedited Return Delivery:
  - 1. Include prepaid express envelope or airbill in submittal transmittal package for any submittals Contractor expects or requires express return mail.

2. Inclusion of prepaid express envelope or airbill does not obligate Engineer to conduct expedited review of submittal.
- C. Electronic submittals will not be accepted except for approved Operation and Maintenance Manuals as required by this Specification.
- D. Fax Transmittals:
  1. Permitted on a case-by-case basis to expedite review when approved by Departmental Representative.
  2. Requires hard copy transmittal to immediately follow.
    - a. Departmental Representative will proceed with review of fax transmittal.
    - b. Departmental Representative's approval or rejection comments will be recorded and returned on hard copy transmittal.
3. Provisions apply to both:
  - a. Initial transmittal contents.
  - b. Supplemental information required to make initial transmittal contents complete.

#### **1.6 DEPARTMENTAL REPRESENTATIVE'S REVIEW ACTION**

- A. Operation and Maintenance Manuals:
  1. Departmental Representative will review and indicate one of the following review actions:
    - a. A - ACCEPTABLE.
    - b. B - REVISE AND RESUBMIT.
  2. Acceptable paper copy submittals will be retained with the transmittal form returned with a request for one (1) additional paper copy and two (2) electronic copies on CD-ROM.
  3. Deficient submittals (paper copy and/or electronic copy) will be returned along with the transmittal form which will be marked to indicate deficient areas.

#### **2 - PRODUCTS – (Not Applicable to this Section)**

#### **3 - EXECUTION – (Not Applicable to this Section)**

**END OF SECTION**

**Part 1            General**

**1.1                MEASUREMENT PROCEDURES**

- .1            Cost of traffic control will not be paid for directly, but shall be considered incidental to contract unit prices tendered

**1.2                REFERENCES**

- .1            Alberta Infrastructure and Transportation
  - .1            Traffic Accommodation in Work Zones - 2008.

**1.3                PROTECTION OF PUBLIC TRAFFIC**

- .1            Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .2            When working on travelled way:
  - .1            Place equipment in position to minimize interference and hazard to travelling public.
  - .2            Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
  - .3            Do not leave equipment on travelled way overnight.
- .3            Close lanes of road only after receipt of written approval from Departmental Representative
  - .1            Before re-routing traffic erect suitable signs and devices in accordance to Manual of Uniform Traffic Control Devices for Streets and Highways
- .4            Keep travelled way graded, free from pot holes and of sufficient width for required number of lanes of traffic.
  - .1            Provide 7m wide minimum temporary roadway for traffic in two-way sections through Work and on detours.
  - .2            Provide 5m wide minimum temporary roadway for traffic in one-way sections through Work and on detours.
- .5            Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, except where other means of road access exist that meet approval of Departmental Representative.

**1.4                INFORMATIONAL AND WARNING DEVICES**

- .1            Contractor shall submit a Traffic Accommodation Strategy (TAS) prior to commencement of work.
- .2            Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.

- .3 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in Manual of Uniform Traffic Control Devices for Streets and Highways.
- .4 Place signs and other devices in locations recommended in Manual of Uniform Traffic Control Devices for Streets and Highways.
- .5 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list to approval of Departmental Representative.
- .6 Continually maintain traffic control devices in use:
  - .1 Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
  - .2 Remove or cover signs which do not apply to conditions existing from day to day.

## **1.5 CONTROL OF PUBLIC TRAFFIC**

- .1 Provide competent flag personnel, trained in accordance with, and properly equipped as specified in Manual of Uniform Traffic Control Devices for Streets and Highways for situations as follows:
  - .1 When public traffic is required to pass working vehicles or equipment that block all or part of travelled roadway.
  - .2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
  - .3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
  - .4 Where temporary protection is required while other traffic control devices are being erected or taken down.
  - .5 For emergency protection when other traffic control devices are not readily available.
  - .6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

## **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 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Alberta
  - .1 Occupational Health and Safety Act, R.S.A. - Updated 2013.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation.
- .3 Submit 1 copy of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly, including minutes of safety toolbox meetings.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets to Departmental Representative.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 3 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 3 days after receipt of comments from Departmental Representative.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
  - .1 Emergencies: In the event of emergency call (403) 859-2636.
  - .2 All other inquiries: Parks Canada Switch Board (403) 859-2224.

**1.3 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

**1.4 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

**1.5 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

**1.6 REGULATORY REQUIREMENTS**

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

**1.7 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

**1.8 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

**1.9 COMPLIANCE REQUIREMENTS**

- .1 Comply with Occupational Health and Safety Act, General Safety Regulation, Alberta Reg.
- .2 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.
- .3 Comply with Occupational Health and Safety Regulations, 1996.
- .4 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

**1.10 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

**1.11 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.



**1.12 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

**1.13 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**1.1 NATIONAL PARKS ACT**

- .1 Perform work in accordance with the ordinances and laws set out in the National Parks Act and Regulations.

**1.2 CANADIAN ENVIRONMENTAL ASSESSMENT ACT**

- .1 Execution of work is subject to provisions within the Canadian Environmental Assessment Act, 2012.
- .2 Failure to comply with or observe environmental protection measures, as identified in these specifications, may result in work being suspended pending rectification of problem(s).

**1.3 RELICS AND ANTIQUITIES**

- .1 Give immediate notice to the Departmental Representative if evidence archaeological finds are encountered during construction, and await Departmental Representative's written instructions before proceeding with work in this area.
- .2 Relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found on site shall remain Department's property. Protect such articles and request directives from Departmental Representative.
- .3 Provide 48 hours notice to Departmental Representative prior to commencing any work that may interfere with or affect an identified historical or archaeological site. Commence work only upon written instructions from Departmental Representative.

**1.4 WILDLIFE**

- .1 Avoid or terminate activities on site that attract or harass wildlife.
- .2 Immediately notify Departmental Representative who will notify Park Warden Service of bear activity or encounters on or around site. Other wildlife encounters should be reported within 24 hours.

**1.5 FIRES**

- .1 Fires and burning of rubbish on site not permitted.

**1.6 DISPOSAL OF WASTE**

- .1 All garbage must be stored and handled in conformance with National Parks Garbage Regulations.
- .2 All domestic garbage should be stored over the short term in wildlife-proof dumpsters. Domestic recycling should be put in appropriate facilities. Contaminated materials are to be taken out of the Park.
- .3 Do not bury rubbish and waste materials on site.
- .4 Maintain the site in a tidy condition, free of waste material, debris and litter.

## **1.7 DRAINAGE**

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Dewatering of a construction site will require a special permit.
- .3 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Parks Canada requirements and in conformance with the Environmental Contaminants Act and applicable provincial regulations while observing the Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Establishments.

## **1.8 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties where indicated.
- .2 Where absolutely necessary to work adjacent to existing trees and shrubs, Contractor shall exercise all possible care to avoid injury to vegetation. Where roots or limbs over 25 mm in diameter and bark are damaged during operations, trim damaged portion and immediately inform Departmental Representative for inspection and approval.
- .3 Permits are required from Park Warden Service if a tree is to be removed. Contact Warden Office at (403) 859-5140. Municipal Officer may also give permission for a dead tree to be removed without the consent of Park Warden Service. Three young trees, from Waterton's native species or approved introduced species list, must be planted for each tree removed.
- .4 Park Warden Service (and the Municipal Officer) has a list of native grasses, shrubs, flowers and trees for appropriate revegetating.

## **1.9 WORK ADJACENT TO WATERWAYS**

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or within 100 m of indicated spawning beds.
- .8 Fueling operations and fuel storage shall be at least 200 m away from watercourses, in consultation with Park Warden Service.

## **1.10 CONTRACTOR'S OPERATIONS**

- .1 Confine all operations to work limits as staked or designated by Departmental Representative. No activities of any kind may be carried out beyond those work limits without Departmental Representative's written permission.

- .2 Do not store or stockpile construction materials in trees bordering, or being preserved on site. Do not unreasonably encumber site with products.
- .3 Equipment maintenance shall only be carried out in designated areas or as approved by Departmental Representative and Park Warden Service. Use of turnouts, campgrounds, picnic areas, work camps, etc., for equipment oil changes and other servicing will not be permitted.
- .4 Used oil, filter and grease cartridges, lubrication containers and other products of equipment maintenance shall be collected and disposed of at nearest industrial waste facility.
- .5 Provide sufficient sanitary facilities and maintain in a clean condition.
- .6 Obtain permit from Park Warden Service for storage of fuel or other inflammable liquids. Observe all restrictions and conditions imposed by permit regarding special protection and berming to control spills and tank damage; fire protection considerations; provisions for disposal of fouled material and used petroleum products
- .7 Conduct operations at all times in such a manner as to preserve natural features and vegetation in area. Cut and fill slopes shall be blended with adjoining topography. Material from fill slopes will not be permitted to slough or roll into surrounding tree cover or to bury any plant material designated to be retained.
- .8 When, in opinion of Departmental Representative, negligence on part of Contractor results in damage or destruction of vegetation, or other environmental or aesthetic features beyond staked or designated work areas, Contractor shall be responsible, at his expense, for complete restoration of trees including replacement of trees, shrubs, topsoil, grass, etc. to Departmental Representative's satisfaction.
- .9 As no non-native vegetation is allowed in Park, all construction equipment shall be thoroughly washed before entering Waterton National Park.

#### **1.11 CONTRACTOR'S EMPLOYEE BRIEFING**

- .1 Conduct briefing sessions for all employees and sub-contractor employees highlighting requirements of this section, including operation of equipment strictly.
- .2 Initial site meeting with Contractor, Departmental Representative, Park Project Manager and Park Warden Service will occur prior to construction commencing.
- .3 Contract documents have been developed in accordance with Canadian Environmental Assessment Act screening requirements. Construction methods which are directly affected by CEAA screening will be reviewed at initial site meeting. Contractor will be expected to comply with and ensure construction practices meet the CEAA Standards. Failure to comply may lead to cessation of work.

#### **1.12 COMPLIANCE WITH PARKS CANADA DEVELOPMENT PERMIT**

- .1 Read, understand and comply with Parks Canada Development Permit and all stipulations provided therein.

#### **1.13 MEASUREMENT AND PAYMENT**

- .1 Cost of environmental and aesthetic protection will not be paid for directly, but shall be considered incidental to contract unit prices tendered.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES AND CODES**

- .1      Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2      Meet or exceed requirements of:
  - .1          Contract documents.
  - .2          Specified standards, codes and referenced documents.

**1.2                WHMIS**

- .1      Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Labour Canada and Health and Welfare Canada.

**1.3                BUILDING SMOKING ENVIRONMENT**

- .1      Comply with smoking restrictions and municipal by-laws.

**1.4                NATIONAL PARKS ACT**

- .1      Perform Work in accordance with National Parks Act when projects are located within boundaries of National Park.

**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 The Contractor is totally responsible for quality of Material and Product which he provides for the Work.
- .2 The Contractor is responsible for quality control and shall perform such inspections and tests as are necessary to ensure that the Work conforms to the requirements of the Contract Documents.
- .3 During the progress of the Work, a sufficient number of tests shall be performed by the Contractor to determine that Material, Product and installation meet the specified requirements.
- .4 Minimum requirements regarding quality control are specified in various sections of the specifications, however, the Contractor shall perform as many inspections and tests as are necessary to ensure that the Work conforms to the requirements of the Contract Documents.
- .5 Testing shall be in accordance with pertinent codes and regulations and with selected standards of the American Society for Testing Materials (ASTM) and Canadian Standards Association (CSA).
- .6 Product testing, mill test and laboratory reports to demonstrate that Product and Material supplied by the Contractor meet the specifications are specified under various sections of the Contract Documents.

**1.2 QUALITY CONTROL TESTING BY THE CONTRACTOR**

- .1 The Contractor shall retain the services of an independent testing agency under supervision of a registered professional Engineer, and pay for the cost of testing services for quality control including, but not limited to, the following:
  - .1 Sieve analysis of sands and aggregates to be supplied to the Work.
  - .2 Concrete Testing
  - .3 Backfill, subgrade, base course and asphalt concrete paving
  - .4 Any product testing that is required and is specified under various sections of the specifications
- .2 The Contractor shall promptly process and distribute all required copies of test reports and test information and related instructions to all of his Subcontractors and Suppliers to ensure that all necessary retesting and replacement of construction can proceed without delay.

**1.3 QUALITY ASSURANCE TESTING BY THE OWNER**

- .1 The Owner shall retain and pay for the services of an independent testing agency for testing for quality assurance, for the Owner's purposes.
- .2 The Owner's testing agency and the Departmental Representative shall inspect and test Materials, Products and the Work for conformance with the test requirements of the Contract Documents; however, they do not undertake to check the quality of the Work on behalf of the Contractor nor to provide quality control.

- .3 Inspections and test by the Owner's testing agency and by the Departmental Representative do not relieve the Contractor of his responsibility to supply Materials and Products and to perform the Work in accordance with the requirements of the Contract Documents.
- .4 The Departmental Representative, at his discretion, may order or perform any additional inspections and test for purposes of his own or for purposes of the Owner.
- .5 The Contractor shall coordinate with the Departmental Representative the scheduling of testing and inspection by the Owner's testing agencies or by the Departmental Representative, to enable testing to be done as necessary, without delay, and the Contractor shall notify the Departmental Representative sufficiently in advance of operations to allow for such inspection and test by the Departmental Representative's or the Owner's testing agency.

#### **1.4 INSPECTION**

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

#### **1.5 ACCESS TO WORK**

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

#### **1.6 PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.



**1.7 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

**1.8 REPORTS**

- .1 Submit 1 copy of inspection and test reports to Departmental 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                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.2                INSTALLATION AND REMOVAL**

- .1        Provide temporary utilities controls in order to execute work expeditiously.
- .2        Remove from site all such work after use.

**1.3                DEWATERING**

- .1        Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

**1.4                WATER SUPPLY**

- .1        Contractor will provide continuous supply of potable water to all homes, businesses and facilities disrupted by construction activities.
- .2        Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.
- .3        Costs for temporary water services and considered incidental to the work and no separate or additional payment will be made.

**1.5                SANITARY SEWER**

- .1        Contractor will provide continuous sanitary sewer to all homes, businesses and facilities disrupted by construction activities.
- .2        Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.
- .3        Costs for temporary sanitary sewer services and considered incidental to the work and no separate or additional payment will be made.

**Part 2            Products**

**2.1                NOT USED**

- .1        Not Used.

**Part 3            Execution**

**3.1                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.

- .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.

**END OF SECTION**

**Part 1            General**

**1.1                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.2                INSTALLATION AND REMOVAL**

- .1        Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2        Identify areas which have to be gravelled to prevent tracking of mud.
- .3        Indicate use of supplemental or other staging area.
- .4        Provide construction facilities in order to execute work expeditiously.
- .5        Remove from site all such work after use.

**1.3                SITE STORAGE/LOADING**

- .1        Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2        Do not load or permit to load any part of Work with weight or force that will endanger Work.

**1.4                CONSTRUCTION PARKING**

- .1        Parking will be permitted on site provided it does not disrupt performance of Work or normal operations of the National Park. Parking areas must be approved by Departmental Representative.
- .2        Provide and maintain adequate access to project site.

**1.5                SECURITY**

- .1        Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

**1.6                OFFICES**

- .1        If required by Contractor, provide office of sufficient size to accommodate required work activities of Contractor and all Sub-Contractors. Departmental Representative to approve location of trailer.
- .2        Contractor is responsible to deal directly with utility companies for any utility hook ups required for site office.
- .3        Provide marked and fully stocked first-aid case in a readily available location.

**1.7                EQUIPMENT, TOOL AND MATERIALS STORAGE**

- .1        Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

## **1.8 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

## **1.9 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .8 Dust control: adequate to ensure safe operation at all times.
- .9 Provide snow removal during period of Work.

## **1.10 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not Used.

**Part 3            Execution**

**3.1                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.
- .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.

**END OF SECTION**

**Part 1 General**

**1.1 INSTALLATION AND REMOVAL**

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

**1.2 GUARD RAILS AND BARRICADES**

- .1 Provide secure, rigid guard rails and barricades around deep excavations.

**1.3 ACCESS TO SITE**

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

**1.4 PUBLIC TRAFFIC FLOW**

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

**1.5 FIRE ROUTES**

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.6 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

Approved: 2006-03-31

## **Part 1            General**

### **1.1                REFERENCES**

- .1        If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .2        Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

### **1.2                QUALITY**

- .1        Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2        Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3        Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4        Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5        Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6        Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

### **1.3                AVAILABILITY**

- .1        Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2        In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.



**1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

**1.5 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.

**1.6 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

**1.7 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

**1.8 CO-ORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

**1.9 SETTING OUT OF WORK**

- .1 Departmental Representative will supply horizontal reference control points benchmark elevations only for this project.
- .2 Contractor will set grades and layout work in detail from control points established by Departmental Representative.

- .3 Contractor shall employ competent survey staff for complete detailed layout of work.
- .4 Survey supervisor shall have experience in urban field survey work, including obtaining horizontal and vertical measurements, record keeping and calculation of quantities, generally associated with 3 to 5 years related experience.
- .5 Contractor will be responsible for correction of any error associated with his layout.
- .6 Contractor shall supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.
- .7 Contractor shall supply stakes and other survey markers required for laying out the work.
- .8 Cost of setting out of work will not be paid for directly but shall be considered incidental to contract unit prices tendered.

**1.10 REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

**1.11 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**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                PROJECT CLEANLINESS**

- .1      Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2      Remove waste materials from site at daily regularly scheduled times or dispose of. Do not burn waste materials on site.
- .3      Clear snow and ice as required. Pile snow in designated areas only.
- .4      Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5      Provide on-site containers for collection of waste materials and debris.
- .6      Dispose of waste materials and debris outside of Waterton Lakes National Park.

**1.2                FINAL CLEANING**

- .1      When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2      Remove waste products and debris, and leave Work clean and suitable for occupancy.
- .3      Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4      Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .5      Remove dirt and other disfiguration from exterior surfaces.
- .6      Sweep and wash clean paved areas.

**1.3                WASTE MANAGEMENT AND DISPOSAL**

- .1      Separate waste materials for reuse and recycling.

**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            ADMINISTRATIVE REQUIREMENTS**

- .1    Acceptance of Work Procedures:
  - .1    Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1    Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2    Request Departmental Representative's inspection.
  - .2    Departmental Representative's Inspection:
    - .1    Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
    - .2    Contractor to correct Work as directed.
  - .3    Completion Tasks: submit written certificates that tasks have been performed as follows:
    - .1    Work: completed and inspected for compliance with Contract Documents.
    - .2    Defects: corrected and deficiencies completed.
    - .3    Equipment and systems: tested, adjusted and fully operational.
    - .4    Certificates required by Utility companies: submitted.
    - .5    Operation of systems: demonstrated to Owner's personnel.
    - .6    Work: complete and ready for final inspection.
  - .4    Final Inspection:
    - .1    When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
    - .2    When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
  - .5    Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
  - .6    Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
  - .7    Final Payment:
    - .1    When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

**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            ADMINISTRATIVE REQUIREMENTS**

- .1    Pre-warranty Meeting:
  - .1    Convene meeting one week prior to contract completion with Departmental Representative, to:
    - .1    Verify Project requirements.
    - .2    Review warranty requirements.
  - .2    Departmental Representative to establish communication procedures for:
    - .1    Notifying construction warranty defects.
    - .2    Determine priorities for type of defects.
    - .3    Determine reasonable response time.
  - .3    Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4    Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    One week prior to Substantial Performance of the Work, submit to the Departmental Representative, two final copies of operating and maintenance manuals in English.
- .3    Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4    Provide evidence, if requested, for type, source and quality of products supplied.

**1.3            FORMAT**

- .1    Organize data as instructional manual.
- .2    Binders: vinyl, hard covered, 3 'D' ring, loose leaf [219 x 279] mm with spine and face pockets.
- .3    When multiple binders are used correlate data into related consistent groupings.
  - .1    Identify contents of each binder on spine.
- .4    Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5    Arrange content under Section numbers and sequence of Table of Contents.
- .6    Text: manufacturer's printed data, or typewritten data.
- .7    Drawings: provide with reinforced punched binder tab.

#### **1.4 AS -BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, at site for Departmental Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

#### **1.5 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information on set of drawings, provided by Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .2 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .3 Field changes of dimension and detail.
  - .4 Changes made by change orders.
  - .5 Details not on original Contract Drawings.
  - .6 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:

- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
- .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

**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 Not Used**

**1.1 NOT USED**

**Part 2 Products**

**2.1 EQUIPMENT**

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.
- .4 Disconnect Services.
  - .1 Sewer and Water Lines.
  - .2 Other Underground Services

**3.2 REMOVAL OF HAZARDOUS WASTES**

- .1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

**3.3 REMOVAL OPERATIONS**

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Removal of pavements, curbs and gutters:
  - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
  - .2 Protect adjacent joints and load transfer devices.
  - .3 Protect underlying and adjacent granular materials.
- .4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving,
- .5 Excavate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.

- .6 Demolish and dispose of existing sanitary lift station shown on the drawings.
- .7 Remove designated trees during demolition.
  - .1 Obtain written approval of Departmental Representative prior to removal of trees not designated.
- .8 Stockpile topsoil for final grading and landscaping:
  - .1 Stockpile location at Upper Compound approximately 3.5kms from site
  - .2 Provide erosion control and seeding if not immediately used.
- .9 Disposal of Material:
  - .1 Dispose of materials not designated for salvage to approved disposal facility outside of Waterton Park or reuse on site as instructed by Departmental Representative.
- .10 Backfill:
  - .1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **3.4 STOCKPILING**

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

### **3.5 RESTORATION**

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

### **3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
  - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.7 PROTECTION**

- .1 Repair damage to adjacent materials or property caused by selective site demolition.

**END OF SECTION**

**Part 1            General**

- .1       Not Used

**Part 2            Products**

**2.1               EQUIPMENT**

- .1       Use cold milling, planning or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.

**Part 3            Execution**

**3.1               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.
  - .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.
- .2       Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.
- .3       Protection: protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

**3.2               REMOVAL**

- .1       Remove existing asphalt pavement to lines and grades as indicated.
- .2       Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.
- .3       Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.
- .4       Suppress dust generated by removal process.
- .5       Asphalt cores completed in 2001 reveal the following average asphalt thicknesses:
  - .1       Evergreen Avenue South
    - .1       Range: 65 mm to 93 mm
    - .2       Average: 78 mm

- .2 Columbine Avenue
  - .1 69 mm
- .3 Waterton Avenue
  - .1 67 mm
- .4 Evergreen Avenue North
  - .1 Range: 65 mm to 180 mm
  - .2 Average: 125 mm
- .5 Fern Street
  - .1 109 mm
- .6 Firgrove Street
  - .1 Range: 30 mm to 50 mm
  - .2 Average: 40 mm
- .7 All removed asphalt shall be stockpiled at Upper Compound (approx. 3.5km from site)

### **3.3 FINISH TOLERANCES**

- .1 Finished surfaces in areas where asphalt pavement has been removed to be within +/-5 mm of grade specified but not uniformly high or low.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

**END OF SECTION**

**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
- .3 Provide testing results for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

**1.2 QUALITY ASSURANCE**

- .1 Provide to Departmental Representative, 2 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
  - .1 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review by the Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

**Part 2 Products**

**2.1 PERFORMANCE CRITERIA**

- .1 Quality Control Plan: ensure concrete supplier meets specifications performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

**2.2 MATERIALS**

- .1 Cement: to CSA A3001, Type 10.

- .2 Water: to CSA A23.1/A23.2.
- .3 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
- .4 Welded steel wire fabric: to ASTM A185.
- .5 Premoulded joint filler:
  - .1 Bituminous impregnated fibreboard: to ASTM D1751.
- .6 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
- .7 Sealer: boiled linseed oil to ASTM D260, mixed with mineral spirits 1:1.
- .8 Other concrete materials: to CSA A23.1/A23.2.

## **2.3 MIXES**

- .1 Proportion concrete in accordance with CAN/CSA-A23.1.
- .2 Minimum 28 day compressive strengths and exposure classifications:
  - .1 Pavements, walks, curbs and exposed site concrete: 32 MPa; C-2.
  - .2 All other concrete: 25 MPa; C-4.
- .3 Nominal size of coarse aggregate: Clause 14 of CAN/CSA-A23.1.
- .4 Slump: to Table 6 of CAN/CSA-A23.1.
- .5 Air content: all concrete to contain purposely entrained air in accordance with Table 10 of CAN/CSA-A23.1.
- .6 Admixtures: to Clause 6 of CAN/CSA-A23.1.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Provide Departmental Representative 24 hours notice before each concrete pour.
- .2 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .3 Protect previous Work from staining.
- .4 Clean and remove stains prior to application of concrete finishes.

### **3.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Sleeves and inserts:
  - .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.
  - .2 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.

### **3.3 FINISHES**

- .1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA A23.1/A23.2.
- .2 Pavements, walks, curbs and exposed site concrete:
  - .1 Screed to plane surfaces and use wood floats.
  - .2 Provide round edges and joint spacings using standard tools.
  - .3 Trowel smooth to provide lightly brushed non-slip finish.

### **3.4 CONTROL JOINTS**

- .1 Cut control joints in slabs on grade at locations indicated, to CSA A23.1/A23.2 and install specified joint sealer/filler.

### **3.5 EXPANSION AND ISOLATION JOINTS**

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

### **3.6 CURING**

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

### **3.7 SEALING APPLICATION**

- .1 After curing is complete, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m<sup>2</sup>/L. Allow first coat to dry before applying second coat. Apply poly-siloxane resin blend sealer at 4 m<sup>2</sup>/L.

### **3.8 SITE TOLERANCES**

- .1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.

### **3.9 FIELD QUALITY CONTROL**

- .1 Concrete testing: to CSA A23.1/A23.2 by designated testing laboratory.

### **3.10 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Use trigger operated spray nozzles for water hoses.
- .3 Designate cleaning area for tools to limit water use and runoff.
- .4 Cleaning of concrete equipment to be done in accordance with Section 01 35 43 Environmental Procedures.

**END OF SECTION**



**Part 1 General**

**1.1 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 aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations
- .3 Samples:
  - .1 Submit 1 sample.
  - .2 Allow continual sampling by Departmental Representative during production.
  - .3 Provide Departmental Representative with access to source and processed material for sampling.
  - .4 Supply new or clean sample bags or containers according appropriate to aggregate materials.
  - .5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
  - .1 Greatest dimension to exceed 5 times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
  - .2 Reclaimed asphalt pavement.
  - .3 Reclaimed concrete material.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock.
  - .2 Crushed gravel composed of naturally formed particles of stone.
  - .3 Reclaimed asphalt pavement.
- .5 All utility pipe bedding to be 25 mm minus washed drain rock.

Sieve Size	Percent Passing by Weight
25 000	100
16 000	90-100
10 000	45-75
5 000	0-15
1 250	0-5

- .6 Base Course Aggregate shall meet the following sizes:

Sieve Size	Percent Passing by Weight
25 000	100
20 000	82-97
16 000	70-94
10 000	52-79
5 000	35-64
1 250	18-43
630	12-34
315	8-26
160	5-18
80	2-10

## 2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 2 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative 2 weeks minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

## Part 3 Execution

### 3.1 PREPARATION

- .1 Processing:
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

- .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.
  - .1 Use methods and equipment approved in writing by Departmental Representative.
- .2 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.
- .3 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
  - .1 Use only equipment approved in writing by Departmental Representative.
- .4 Stockpiling:
  - .1 Stockpile aggregates on site at Upper Compound (approx. 3.5 kms from site)
  - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials within 48 hours of rejection.
  - .7 Stockpile materials in uniform layers of thickness as follows:
    - .1 Maximum 1.5 m for coarse aggregate and base course materials.
    - .2 Maximum 1.5 m for fine aggregate and sub-base materials.
    - .3 Maximum 1.5 m for other materials.
  - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
  - .9 Do not cone piles or spill material over edges of piles.
  - .10 Do not use conveying stackers.
  - .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

### **3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .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 11 - Cleaning.
- .3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

- .4      Leave any unused aggregates in neat compact stockpiles

**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT PROCEDURES**

- .1 Work performed under this section will be incidental to work involved in other sections.
- .2 Shoring, bracing, cofferdams, underpinning and de-watering of excavation will not be measured separately for payment.

**1.2 DEFINITIONS**

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock : solid material in excess of 1.00 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.2 Table:

<u>Sieve Designation</u>	<u>% Passing</u>
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

- .3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.4 EXISTING CONDITIONS**

- .1 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .4 Prior to beginning excavation Work, notify applicable Departmental Representative, establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
  - .5 Confirm locations of buried utilities by careful soil hydrovac methods.
  - .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such Work to be incidental.
  - .8 Record location of maintained, re-routed and abandoned underground lines.
  - .9 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	%Passing	
	<u>Type1</u>	<u>Type2</u>
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
<u>0.075 mm</u>	<u>3-8</u>	<u>0-10</u>

- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 200mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 All utility pipe bedding to be 25 mm minus washed drain rock.

Sieve Size	Percent Passing by Weight
25 000	100
16 000	90-100
10 000	45-75
5 000	0-15
1 250	0-5

### Part 3 Execution

#### 3.1 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.
- .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.

### **3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Saw cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly in accordance with Section 02 41 13 - Selective Site Demolition.

### **3.3 PREPARATION/ PROTECTION**

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

### **3.4 STOCKPILING**

- .1 Stockpile fill materials in areas designated by Departmental Representative.
  - .1 Stockpile granular materials in manner to prevent segregation.
  - .2 Protect fill materials from contamination.
  - .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

### **3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING**

- .1 Designs of these temporary works need to be completed by and approved by a Professional Engineer.
- .2 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  - .1 Where conditions are unstable, Departmental Representative to verify and advise methods.
- .3 Construct temporary Works to depths, heights and locations as approved by Departmental Representative.
- .4 During backfill operation:
  - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.



- .5 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .6 Upon completion of substructure construction:
  - .1 Remove cofferdams, shoring and bracing.
  - .2 Remove excess materials from site and restore watercourses as indicated by Departmental Representative.

### **3.6 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative's approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved areas and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

### **3.7 EXCAVATION**

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as shown on drawings.
- .3 Remove concrete, asphalt, walks and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material outside of Waterton Lakes National Park.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify Departmental Representative when bottom of excavation is reached.
- .12 Obtain Departmental Representative approval of completed excavation.

- .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth.
- .14 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .15 Rocks 0.6m<sup>3</sup> up to 1m<sup>3</sup> to be salvaged and stockpiled at Upper Compound (approx.. 3.5km from site.

### **3.8 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below.
  - .1 Under road pavement, parking areas, sidewalk and other graveled areas, use Type 3 fill material for backfill, compact to 98% of maximum dry density to ASTM D698.
  - .2 Under grass and other areas not subject to vehicular traffic, use Type 3 fill for backfill. Compact to 98% of maximum dry density to ASTM D698.

### **3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in Section 33 11 16 - Site Water Utility Distribution Piping and Section 33 31 13 - Public Sanitary Utility Sewerage Piping.
- .2 Place bedding and surround material in unfrozen condition.

### **3.10 BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading.
  - .4 Backfill trenches with Type 3 material.

### **3.11 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects.
- .2 Reinstate lawns to elevation which existed before excavation.

- .3 Reinstall pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .4 Clean and reinstall areas affected by Work.
- .5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

**Part 1            General**

**1.1                ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2            Products**

**2.1                NOT USED**

**Part 3            Execution**

**3.1                RESERVATION OF MATERIAL**

- .1            Whenever gravel, sand topsoil, or any other material suitable for special use is encountered, it shall be deemed to be the property of the Waterton National Park and shall be stockpiled at Upper Compound (approx. 3.5km from site)
- .2            Where layers of gravel or gravelly mixtures are encountered, suitable materials shall be excavated separately from other excavation and shall be stockpiled at Upper Compound (approx. 3.5km from site) or incorporated into the work as base material.

**3.2                DISPOSAL OF MATERIAL**

- .1            Excavated materials shall be utilized as fill if required on any portion of the work being carried out under this Contract. Where excavated material is specifically directed to be used as fill or for any other purpose, the Contractor will be required to haul the material as part of his excavations for the work to an approved disposal site outside of Waterton Park. There is no separate payment for this work and is considered included in the subgrade preparation unit payment.
- .2            Sufficient material will be kept on site for backfill of curbs and boulevard areas. Overhaul will not be paid to haul back to an area which contained a surplus of excavated soil suitable for this purpose.
- .3            The excavated material shall be hauled and dumped at the fill area as part of the unit of excavation. Any materials required to be used in boulevard areas or for rounding at the base of cuts or fills shall be placed, spread in lifts not exceeding 150 mm, and fine graded as part of the unit of excavation. No special compaction will be required.
- .4            All materials deemed to be in excess of requirements or unsuitable shall be disposed of appropriately by the Contractor outside of Waterton National Park.

**3.3                FINISHING AND COMPACTING SUBGRADE**

- .1            The excavated sections shall be ploughed to a depth of at least 150 mm below the surface of the subgrade and replaced and compacted to a minimum of ninety eight percent (98%) of Standard Proctor Density. The cut shall be left sufficiently high so that the surface after compaction can be trimmed to the final grade, and any loose material resulting from

this operation removed. All depressions caused by the finishing rollers shall be removed during the final blading operation.

### 3.4 EXCAVATION BELOW GRADE

- .1 Unsuitable Materials: When topsoil, muskeg, or other soft areas are encountered below the finished subgrade, which in the opinion of the Departmental Representative require removal, the area shall be undercut and the unsuitable material excavated, loaded and disposed of outside of Waterton National Park. These materials shall be replaced with suitable common excavation.
- .2 Placing Fill: Fill material shall be placed in successive horizontal layers not exceeding 150 mm. Suitable spreading and leveling equipment shall be kept in continuous operation at all times.
- .3 Compaction: The compaction will be sufficient to obtain a minimum density of 98% of maximum dry density in accordance with ASTM D698 (Method C or D), unless otherwise stated in the specifications. Where it is necessary to add or remove moisture from the soil to obtain the compaction, it shall be done as part of the requirements of this section.
- .4 Finishing: The fill section shall be compacted to a level slightly above the finished grade, and cut back to the final elevation. All loose material shall be removed from the surface of the subgrade.

### 3.5 THE FOLLOWING TESTS SHAL BE EMPLOYED TO ESTABLISH COMPACTION PROCEDURES:

- .1 The maximum dry density of the soil shall be determined by ASTM procedure D-698 (Moisture Density Relationships of soils), to be determined for each soil type. The optimum moisture content of the soil shall be determined from the laboratory compaction curve established.
- .2 The field density of soils shall be determined by ASTM D-2922 – Determining density of soil and soil aggregate in place by nuclear methods (shallow depth).

### 3.6 NORMAL COMPACTED THICKNESSES OF LIFTS

Equipment Type	Cohesive Soils	Non-Cohesive Soils
Vibratory Sheepsfoot Packer	300 mm	300 mm
Sheepsfoot Packer	200 mm	--
Pneumatic Tire	200 mm	200 mm
Vibratory Roller	150 mm	300 mm
Pneumatic Tamper	100 mm	100 mm
(contact area < 130 sq cm)		
Pneumatic Tamper	100 mm	100 mm
(contact area > 130 sq cm)	100 mm	100 mm
Mechanical Tamper		
(diesel or gas – jumping jack)	100 mm	200 mm

- .1 Thickness of lifts for other equipment shall be determined by laboratory testing procedures during the construction process. The Departmental Representative may grant approval in writing to alter lift thicknesses upon evidence of satisfactory compaction at other lift thicknesses.

**END OF SECTION**

**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2 Products**

**2.1 SAMPLES**

- .1 At least two (2) weeks prior to commencing work, provide the Departmental Representative of proposed source of aggregates and provide materials certification of properties below.

**2.2 MATERIALS CERTIFICATION**

- .1 Aggregates: At least two (2) weeks prior to commencing work provide:
- .1 Test data reports representing granular base and/or granular sub-base processed into stockpile. Submit one (1) complete aggregate gradation analysis report for every 1,000 tonnes of each material required for the project or one complete analysis for each production day when production is less than 1,000 tonnes. Include percentage of crushed coarse aggregate particles in granular base reports.
  - .2 Certification that the physical properties of the aggregates meet the requirements of this section.
  - .3 Reports and certification shall be provided by an independent testing consultant under the signature and professional seal of a qualified materials engineer.
- .2 At least two (2) weeks prior to contemplated change in source of aggregates, provide written notification to the Departmental Representative and provide new materials certification in accordance with the requirements of this section.

**2.3 GRANULAR BASE**

- .1 Crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .2 Physical properties of Aggregates:
- |   |         |
|---|---------|
| % Fracture, by weight (2 faces)                               | 60 min. |
| Los Angeles Abrasion, loss, %                                 | 45 max. |
| Liquid Limit, %   | 25 max. |
| Plasticity Index, %   | 6 max.  |
| Lightweight Particles, %                                      | 5 max.  |
| California Bearing Ratio, when compacted to 100% of ASTM D698 | 80 min. |
- .3 Gradation to be within the following limits when tested to ASTM C-117 with sieve sizes to CAN/CGSBD 8-GP-2M rather than ASTM E11, and to have a smooth curve without sharp breaks when plotted on a semi-log grading chart.

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
25 000	100
20 000	85-97
16 000	70-94
10 000	52-79
5 000	35-64
1 250	18-43
630	12-34
315	8-26
160	5-18
80	2-10

### **Part 3      Execution**

#### **3.1      PREPARATION**

- .1      The Contractor shall maintain the subgrade to the specified section, free from ruts, waves and undulations until granular sub-base material is placed. The subgrade shall be in a firm dry condition and must be approved by the Departmental Representative before gravel is placed. The depositing of granular base or sub-base on a soft, muddy or rutted subgrade will not be permitted.

#### **3.2      PLACING**

- .1      Place material on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.
- .2      Place using methods which do not lead to segregation or degradation of aggregate. Use approved methods to create uniform windrow of material along a crown line or high side of a one-way slope.
- .3      Place material to full width in layers not exceeding 150 mm in compacted thickness.
- .4      Shape each layer to a smooth contour and compact to the specified density before succeeding layer is placed.
- .5      Remove and replace any portion of a layer in which material becomes segregated during compaction.

#### **3.3      COMPACTING**

- .1      Moisture condition of granular sub-base and base course materials to be within plus or minus 3 percent of the optimum moisture content of the material.
- .2      Compact to density not less than 98% of maximum dry density in accordance with ASTM D698 (Method C or D).
- .3      Shape and compact alternately to obtain a smooth, even and uniformly compacted base.
- .4      In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.



**3.4 FINISH TOLERANCES**

- .1 Finished sub-base and base surfaces shall be within plus or minus 10 mm of established grade, but not uniformly high or low.
- .2 Correct surface irregularities by loosening and adding or removing materials until surface is within the specified tolerances.

**3.5 MAINTENANCE**

- .1 Maintain finished base in a condition conforming to this section until succeeding material is applied or until acceptance.

**3.6 TESTING**

- .1 The Departmental Representative shall perform all quality assurance tests for acceptance in accordance with the requirements of this section. Test data provided shall be final and binding on both the Department and the Contractor.

**END OF SECTION**

**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.2 DEFINITIONS**

- .1 End Product Specification (EPS) – A specification whereby the methods of construction are not defined. Under EPS the Departmental Representative will monitor the Contractor's control of the process that produces the items of construction and will accept or reject the end product according to a specified acceptance plan. The Contractor is responsible for quality control. End product acceptance, including quality acceptance is responsibility of the Departmental Representative.
- .2 Project Category – For the purposes of this specification, projects are to be identified as Category A or Category B. Generally, Category A projects have asphalt concrete quantities greater than 2,000 tonnes of any one mix type; and Category B projects have quantities of any one mix type less than 2,000 tonnes.
- .3 Lot – A lot is a portion of the Work being considered for acceptance, and is defined as the following:
- .1 Category A projects – One day of plant production, per mix type, when the day's quantity is greater than 1,000 tonnes. When a day's production is less than 1,000 tonnes, the material may be added to the previous or subsequent day(s) of production, at the Departmental Representative's discretion. The maximum Category A lot size shall be 2,000 tonnes.
- .2 Category B projects – The entire project quantity for each mix type.
- .3 At the Departmental Representative's discretion, any portion of the Work may be deemed a lot.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Asphalt Cement
- .1 Asphalt Cement shall be prepared by the refining of petroleum and shall not foam when heated to 177 C.
- .2 The tolerance allowed by ASTM for testing precision will be applied from acceptance of asphalt cement.
- .2 Asphalt cement shall meet the following requirements:

REQUIREMENTS	ASTM TEST METHOD	VALUES
Kinematic Viscosity at 135 C, mm /sec	D2170	200-300

Absolute Viscosity at 60 C, 300 mm, hg Vacuum, Pa.S	D2170	60-100
Penetration at 0 C, 200g,. 60 sec; dmm	D5	30 min
Flash Point (Cleveland Open Cup) , C	D92	201 min.
Thin Film Oven Test. Penetration after test at 25 C, 100g, 5sec.; % of Original	D5	50 min
Ductility at 25 C and. 5 cm/min.; cm	D113	100 min
Solubility in Trichlorethylene, % by Mass	D2042	99.5 min.

.3 Aggregates:

- .1 Coarse aggregate is aggregate retained of the 5 000 µm sieve; fine aggregate is aggregate passing the 5 000 µm sieve.
- .2 Aggregate material shall be crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .3 Gradation to be within limits specified, when tested to ASTM C-136 and ASTM C-117 with sieve sizes to CAN/CGSB 8-GP-2M rather than ASTM E11.
- .4 Aggregate shall be processed to meet the following requirements:
  - .1 Natural fines shall be pre-screened and stockpiled with not more than 10% of material retained in the 5 000 µm sieve and 100% passing the 10 000 µm sieve.
  - .2 Fine fraction or manufactured sand to contain not more than 20% of material retained on the 5 000 µm sieve.
- .5 Physical properties of aggregates to meet the requirements in Table 2.1.1.5

Table 2.1.1.5  
Aggregate Physical Property Requirements

REQUIREMENT	TEST STANDARD	MIX TYPES I, II AND III
Los Angeles Abrasion, Grading B (% loss)	C131	32.0 max.
Magnesium Sulphate Soundness (% loss) Coarse Aggregate:	C88	12.0 max.

Fine Aggregate:		12.0 max.
Lightweight Particles (%)	C123	1.5 max.

- .6 Blend sand:
  - .1 To consist of natural or manufactured sand passing the 5 000 µm sieve.
  - .2 Stockpile volumes shall be maintained to ensure a minimum of 5 000 tonne of plant mix production at all times.
- .7 Blended Aggregate Requirements:
  - .1 Aggregate Gradation Requirements, including RAP, to meet the requirements of Table 2.1.1.7.1.

Table 2.1.1.7.1  
Blended Aggregate Gradation Requirements

SIEVE SIZE (µm)	Percent Passing					
	Type I		Type II		Type III	
	Max.	Min.	Max.	Min.	Max.	Min.
25 000	-	-	100	100	-	-
20 000	-	100	95	85	-	-
16 000	100	97	88	77	-	100
12 500	95	85	80	65	100	90
10 000	85	70	72	57	90	75
5 000	65	50	55	40	75	60
2 500	50	40	42	30	60	45
1 250	40	30	33	23	45	30
630	30	20	27	17	36	22
315	23	15	22	12	27	15
160	16	6	15	6	18	6
80	8.0	4.0	8.0	4.0	10.0	4.0

- .2 Coarse Aggregate Fracture: Of coarse fraction (retained on 5 000 µm sieve size) the percentage of particles with two (2) or more fractured faces shall be by mass:
  - .1 Mix Type I – 80% minimum
  - .2 Mix Type II – 60% minimum
  - .3 Mix Type III – 80% minimum
- .3 Flat and Elongated Particles: Of coarse fraction (retained on the 5 000 µm sieve size) the percentage of flat and elongated particles greater than a 5:1 ratio shall be by mass less than 10%.
- .4 Manufactured Sand: Of total fine fraction (passing 5 000 µm sieve size), manufactured sand shall be by mass:
  - .1 Mix Type I – 70% minimum

- .2 Mix Type II – 50% minimum
- .3 Mix Type III – 50 % minimum
- .5 For mixes incorporating RAP, 50% of the RAP sand portion shall be considered manufactured sand.
- .6 The sand equivalent value (ASTM D2419, mechanical method) determined for the fine aggregate portion shall be:
  - .1 Mix Types I and III – 45% minimum
  - .2 Mix Type II – 40% minimum
- .7 Of total aggregate, the maximum RAP portion shall be by mass:
  - .1 Mix Type I – 15% maximum
  - .2 Mix Type II – 15% maximum
  - .3 Mix Type III – 20% maximum
- .8 Delivery and Storage
  - .1 Aggregates: Stockpile minimum of 50% of total amount of aggregate required before commencing trial mix designs.
  - .2 Reclaimed Asphalt Pavement (RAP): Stockpile minimum of 100% of total amount of RAP required before commencing trial mix designs.

## 2.2 MIX DESIGN

- .1 An asphalt mix design must be prepared and submitted to the Departmental Representative for review and approval at least one week prior to the work. The Contractor shall use qualified engineering and testing services licensed to practice in the Province of Alberta.
- .2 The mix design shall follow the Marshall method of mix design as outlined in the latest edition of the Asphalt Institute Manual Series No. 2 (MS-2), and shall include five separate trial values of asphalt content.
- .3 Design of mix:
  - .1 Mix Types I and II – 75 blows on each face of test specimens.
  - .2 Mix Type III – 50 blows on each face of test specimens.
- .4 Include the following data with mix design submission:
  - .1 Aggregate specific gravity and asphalt absorption.
  - .2 Sand equivalent, coarse aggregate fracture, flat and elongated particles, and percent manufactured sand values.
  - .3 Asphalt cement supplier/refinery, specific gravity and mixing and compaction temperatures, based on temperature-viscosity properties of asphalt cement.
  - .4 Job mix formula including aggregate gradation and blending proportions, and design asphalt content.
  - .5 Maximum relative density at each trial asphalt content.
  - .6 Where reclaimed asphalt pavement (RAP) is to be incorporated into the mix supply, RAP gradation, RAP asphalt cement content and design recycle percentage.

.7 Data to satisfy the requirements of the following:

Table 2.2.4.7  
Mixture Physical Property Requirements

PROPERTY	REQUIREMENTS		
	Mix Type		
	I	II	III
Marshall Stability (kN)	10.0 min.	10.0 min.	5.4 min.
Marshall Flow (0.25 mm units)	8 - 14	8 - 15	8 - 14
Air Voids (%)	3.8 - 4.2	4.3 - 4.7	2.8 - 3.2
Voids in Mineral Aggregate (VMA) (%)	13.5 - 15.0	12.5 - 14.0	14.0 - 16.0
Voids Filled With Asphalt (VFA) (%)	65 - 75	60 - 70	70 - 80
Film Thickness (µm)	7.0 - 8.5	6.0 - 8.0	7.0 min.

## 2.3 JOB MIX FORMULA

- .1 Subject to approval by the Departmental Representative, the aggregate proportioning (including RAP), target gradation, asphalt content and air void content from the Mix Design will become the Job Mix Formula for the supply of hot mix asphalt.
- .2 Once established, no alterations to the Job Mix Formula will be permitted unless the Contractor submits a new Job Mix Formula and approved by the Departmental Representative.
- .3 If the sum of any alterations to the Job Mix Formula is in excess of any one of the following limits, a new Mix Design is required.
  - ± 5% passing the 5 000 µm sieve size
  - ± 1% passing the 80µm sieve size
  - ± 0.30% asphalt content
- .4 Any alteration to the Job Mix Formula shall not result in properties which do not meet the requirements of this Specification.

## 2.4 PRODUCTION TOLERANCES

- .1 All mixtures shall be supplied to the Job Mix Formula within the range of tolerances specified.
- .2 Asphalt cement content: ± 0.30% of JMF value.
- .3 Temperature: Mix temperature at point of plant discharge shall not vary from that specified in the JMF by more than ± 10°C.
- .4 Aggregate Gradation:

AGGREGATE PASSING SIEVE SIZE (µm)	TOLERANCE (% BY MASS)
-----------------------------------	-----------------------

Max. Size to 5 000	± 5.0
2 500 & 1 250	± 4.0
630 & 315	± 3.0
160	± 2.0
80	± 1.0

- .5 Air Voids: ± 1.0 % of the JMF value.
- .6 Mixture Properties: Marshall Stability, Marshall Flow, Voids Filled with Asphalt, Voids in Mineral Aggregate, and Film Thickness as per requirements identified in Table 2.2.4.7.
- .7 Moisture in Mix: Maximum permissible moisture, at point of plant discharge, is 0.2% by mass of mix.
- .8 Asphalt cement recovered from freshly produced hot mix by the Abson Method, ASTM D1856 and subsequently tested in accordance with ASTM D5, shall retain a minimum value of 50% of its original penetration value.

### Part 3 Sampling and Testing

#### 3.1 GENERAL

- .1 The Departmental Representative shall have access to all production processes and materials used for the work to monitor material quantity as often as deemed necessary. Such inspection and testing shall not relieve the Contractor of the responsibility for meeting the requirements of this specification.
- .2 At least three (3) weeks prior to commencing work, inform the Departmental Representative of the proposed source of aggregates and provide access for sampling, and provide samples of asphalt cement.

#### 3.2 QUALITY CONTROL

- .1 Quality control is the responsibility of the Contractor throughout every stage of the work from aggregate processing to the final accepted product. Tests performed by the Departmental Representative will not be considered as quality control tests.
- .2 The Contractor shall be totally responsible for production of materials and construction that meets all specified requirements.
- .3 All quality control shall be conducted by qualified personnel. The Contractor shall bear the cost of all quality control testing and consulting services.
- .4 Pre-Production testing and sampling and minimum frequencies are described in Table 3.2.4, Pre-Production Quality Control Requirements.

Table 3.2.4  
Pre-Production Quality Control Requirements

Quality Control Requirement	Test Standard	Minimum Frequency
Asphalt Cement Certification	-	Once per year or for change in

		supplier.
Aggregate Physical Properties Table 2.1.1.5	Table 2.1.1.5	Once per year, or for change in source.
Crushed Coarse Aggregate Gradation Analysis and Fracture Content	ASTM C 136 ASTM D 5821	One for every 1,000 tonnes of each class of material processed into stockpile, or one analysis for each material, every production day when production rate is less than 1,000 tonnes.
Manufactured Sand Aggregate Gradation	ASTM C 117 ASTM C 126	
Natural Fine Aggregate Gradation	ASTM C 117 ASTM C 126	
Blend Sand Aggregate Gradation	ASTM C 117 ASTM C 126	
Reclaimed Asphalt Pavement (RAP) Asphalt Content and Extracted Aggregate Gradation	ASTM D 2172 ASTM C117 ASTM C 136	One for each 500 tonnes delivered to stockpile, or one for each location when delivery rate is less than 500 tonnes.
Penetration of Asphalt Cement Recovered from RAP by Abson Method	ASTM D 1856 ASTM D 5	One for each 2,000 tonnes delivered to stockpile.
Trial Mix Design by Marshall Method Section 2.2	Asphalt Institute MS-2	One per mix type every 3 years, or as required for a change in asphalt cement supply, aggregate gradation or aggregate source. See Note 1.
Plant Calibration	-	As required.

Note 1: A laboratory/plant JMF verification is required each year when a trial mix design is not conducted.

- .5 Post-Production testing and sampling an minimum frequencies are described in Table 3.2.5, Recommended Post-Production Quality Control Requirements.

Table 3.2.5  
Recommended Post-Production Quality Control Requirements

Quality Control Requirement	Test Standard	Minimum Frequency
Hot Mix Asphalt Analysis (including Asphalt Content, Aggregate Gradation, Marshall Density and Void Properties)	ASTM D 6307 ASTM C117 ASTM C 136 ASTM D 3203	One for every 500 tonnes of each mix type supplied under this specification. See note 1.
Quality Control Charts (including 3 test running average for Binder Content, Aggregate Gradation,	-	For each hot mix analysis. Test results and updated 3 test running average to be submitted to the



Marshall Density and Void Properties)		Departmental Representative as they become available.
Hot Mix Asphalt Temperature	-	Minimum frequency not specified.
Cold Feed Aggregate Analysis	ASTM C 117 ASTM C 1236	Minimum frequency not specified.
Maximum Relative Density of Hot Mix Asphalt	ASTM D 2041	Minimum frequency not specified.
Compaction Monitoring (Core or Nuclear Density)	ASTM D 2726 ASTM D 2950	Minimum frequency not specified. See note 2.

Note 1: Where an individual test indicates non-compliance, another test shall be initiated immediately.

Note 2: Coring is subject to approval by the Departmental Representative.

- .6 Pre-Production Quality Control test data as specified in Table 3.2.4 shall be reported to the Departmental Representative one week prior to commencing the project, or as requested.
- .7 Post-Production Quality Control test data as specified in Table 3.2.5 shall be reported to the Departmental Representative daily as the work proceeds.

### 3.3 QUALITY CONTROL COMPLIANCE WITH SPECIFIED TOLERANCES

- .1 Asphalt Content, Aggregate Gradation and Mixture Properties
  - .1 The test data derived by Post-Production Quality Control mix testing, described in Section 3.2, shall be compared to the tolerances set forth in Section 2.4 of this specification. The Contractor shall document, and make available to the Departmental Representative, any adjustments made to correct non-compliance with the specified tolerances.
  - .2 The Contractor shall suspend mix production when the 3 test running average for any property is outside of the specified tolerance limits for three consecutive tests. Supply shall not commence again until it is demonstrated that corrective action has been taken.
- .2 Hot Mix Asphalt Temperature
  - .1 Plant mix that does not meet temperature requirements of Section 2.4.3, at the point of plant discharge shall be subject to rejection at the discretion of the Departmental Representative.

### 3.4 ACCEPTANCE SAMPLING AND TESTING

- .1 Within this specification, certain requirements, limits and tolerances are specified regarding supplied materials and workmanship. Compliance with these requirements shall be determined from acceptance testing as described in this section.
- .2 Acceptance testing is the responsibility of the Departmental Representative.
- .3 Initial acceptance testing will be undertaken free of cost to the Contractor.

- .4 Sampling and acceptance testing is described in Table 3.4.4, Acceptance Testing Requirements – Category A & B Projects.

Table 3.4.4  
Acceptance Testing Requirements – Category A & B Projects

Acceptance Testing	Test Standard	Minimum Frequency
Hot Mix Asphalt Analysis (including Binder Content, Aggregate Gradation, Marshall Density, Maximum Relative Density, Void Properties, Marshall Stability and Flow)	ASTM D 6307 ASTM C 117 ASTM C 136 ASTM D 2041 ASTM D 3203	For each mix type, one test for each 3,500 sq.m. of placement, or three tests per lot, whichever is greater. See note 1.
Compaction Testing (Core Density) and Thickness Determination	ASTM D 2726 ASTM D 3549	For each mix type, one test for each 2,000 sq.m. of placement, or three tests per lot, whichever is greater.
Hot Mix Asphalt Temperature	-	No minimum frequency.

Note 1: For Category B projects, the Departmental Representative may, at their discretion, acquire the minimum number of mix samples, but reduce the number of tests to a minimum of one (1). Should non-compliance be indicated by the sample(s) tested, the Departmental Representative reserves the option to test the remaining samples.

- .5 Acceptance Sampling Procedures:
- .1 Loose mix samples shall be acquired from the Work site in accordance with Albert Transportation Test (ATT) procedure ATT-37. Auger samples may be used if approved by both the Departmental Representative and the Contractor.
  - .2 The timing of mix sampling shall be stratified, with each sample representing a similar production quantity.
  - .3 Core locations will be selected using stratified random sampling procedures. The lot will be divided into segments meeting or exceeding the minimum frequency in Table 3.4.4 and of approximately equal area. In each segment a test site will be located using random numbers to determine the longitudinal and transverse coordinates.
  - .4 Areas within 3 metres of transverse joints or 0.3 metres of a mat edge are excluded from compaction acceptance sampling and testing.
- .6 Reporting Protocols
- .1 Test reporting accuracy shall be as stipulated in the referenced test procedures, including:
    - .1 Gradation to the nearest whole number, except the percent passing the 80  $\mu$ m sieve, which shall be reported to the nearest 0.1%.
    - .2 Binder content to the nearest 0.01%.
    - .3 Air voids and compaction to the nearest 0.1%.
    - .4 Thickness to the nearest whole millimeter (mm).

- .2 Lot averages shall be reported to the same accuracy as test results.

### **3.5 APPEAL OF ACCEPTANCE TESTING RESULTS**

#### **.1 General**

- .1 The Contractor may appeal the results of acceptance testing for Compaction Standard, Asphalt Content or Air Voids for any lot subject to rejection or unit price reduction. The notice of appeal shall be in writing and submitted to the Departmental Representative within 48 hours of receipt of the acceptance testing results.
- .2 Appeals will only be considered if cause can be shown and the requirements of Table 3.2.5 have been satisfied.
- .3 Quality Control tests initiated after the Contractor's receipt of the acceptance testing results will not be considered when evaluating cause for appeal.
- .4 For Category A projects, only Quality Control testing during production for the subject project will be considered when evaluating cause for appeal. For Category B projects, Quality Control test results from production prior to the subject project may be considered when evaluating cause for appeal.

#### **.2 Asphalt Content Appeal**

- .1 A stratified random sampling plan shall be developed by the Departmental Representative with the same number of segments as the original number of samples for the subject lot. Sufficient core samples will be acquired from each segment to enable asphalt content determinations.
- .2 For asphalt content appeal testing, the Contractor will have the option for the testing to be done by the Departmental Representative or an independent testing laboratory selected by the Departmental Representative.
- .3 The average of the appeal test results will be used for acceptance and unit price adjustment, and shall be binding on both the Departmental Representative and the Contractor.
- .4 If the average appeal test result verifies that any unit price reduction of rejection applies for that Lot, the costs of the appeal sampling and testing will be borne by the Contractor. If the results show that a penalty or rejection no longer applies, the sampling and appeal costs will be the responsibility of the Departmental Representative.

#### **.3 Compaction Standard or Air Void Appeals**

- .1 The testing laboratory conducting the project acceptance sampling and testing will routinely retain companion samples sufficient for the determination of maximum relative density and/or Marshall density.
- .2 For compaction standard or air void (Marshall density) appeal testing, the Contractor will have the option for the testing to be done by the Departmental Representative or an independent testing laboratory selected by the Departmental Representative.
- .3 The average of the appeal test results will be used for acceptance and unit price adjustment, and shall be binding on both the Departmental Representative and the Contractor.

- .4 If the new compaction standard verifies that any unit price reduction of rejection applies for that Lot, the costs of the appeal sampling and testing will be borne by the Contractor. If the results show that a penalty or rejection no longer applies, the appeal costs will be the responsibility of the Departmental Representative.

## **Part 4**

### **4.1 CONTINUITY OF PRODUCTION**

- .1 During the time period that work is in progress on any project for which this specification is in effect, and at the Departmental Representative's discretion, the plant may be limited to producing only the mix type required for that project.

### **4.2 MIX PRODUCTION**

- .1 Preparation of Mineral Aggregate
  - .1 The Mineral aggregates shall be at as low a temperature as is consistent with proper mixing and lay down and in no case to exceed 165°C.
- .2 Composition of Mixture
  - .1 The mineral aggregate, reclaimed asphalt pavement (where applicable) and asphalt cement shall be mixed in a manner to produce a homogeneous mixture in which all particles of the mineral aggregate are uniformly coated.
  - .2 Incorporate RAP such that it does not come in direct contact with the burner flame.
  - .3 Plant emissions shall not exceed the limits set by Alberta Environment.

### **4.3 PREPARATION FOR PAVING**

- .1 The Contractor shall provide the Departmental Representative a minimum of six hours notice of the intention to commence paving over any previously approved primed or tacked surface.
- .2 The hot asphalt mixture shall be laid upon a dry firm surface, true to grade and cross-section and free from all loose or foreign material. No hot mix shall be placed when the surface is wet or when other conditions prevent proper spreading, finishing or compaction.
- .3 If undercutting, and subsequent backfill with asphalt concrete is done, the backfill operation shall be performed sufficiently far ahead of the paving operation to allow the asphalt concrete time to cool down enough to support equipment.

### **4.4 HOT MIX ASPHALT PLACING TEMPERATURE**

- .1 No hot mix asphalt shall be dispatched to the field unless the temperature, as issued by Environment Canada, is rising and meets the following minimum temperature requirements.
  - .1 Thickness less than 50 mm: 7°C
  - .2 Thickness greater than 50 mm: 2°C
- .2 A tolerance will be permitted for plant start-up.

- .3 No surface lift asphalt shall be placed regardless of temperature until the road surface is 5°C or higher.

#### **4.5 HOURS OF OPERATION**

- .1 No loads of hot mix asphalt shall be dispatched from the plant after sunset or during hours of darkness unless loads can be placed and compacted in accordance with these specifications, and suitable artificial illumination is provided, all subject to the Departmental Representative's approval.

#### **4.6 TRANSPORTATION OF HOT MIX ASPHALT**

- .1 Trucks shall be equipped with tarpaulins of sufficient weights and size to cover the entire open area of the truck box. Regardless of weather conditions, tarpaulins shall be used.
- .2 Vehicles used for the transportation of hot mix asphalt from the plant to the site of work shall have tight metal boxes previously cleaned of all foreign matter. The inside surface may be lightly lubricated with a soap solution just before loading. Excess lubrication will not be permitted.
- .3 For purposes of checking asphalt mixture temperatures, trucks shall have an accessible 13 mm diameter hole drilled into the driver's side of the truck box, at a distance of 0.3 metres from the bottom of the box and 150 mm clear of the reinforcing ribs.
- .4 The speed and weight of hauling trucks shall be regulated so that, in the opinion of the Departmental Representative, no damage will occur to any portion of the work underway. The Contractor at their own expense shall repair any damage to the tack coat, prime coat or the existing surface caused by the Contractor's equipment.

#### **4.7 HOT MIX ASPHALT SPREADERS**

- .1 The spreading machine shall be self-propelled and capable of placing a uniform layer of asphalt mix to the depth and grades as shown on the plans or as indicated by the Departmental Representative.
- .2 The screed shall include a tamping bar or vibratory strike-off device for use when required. The screed shall strike-off the mix to the depth and cross-section specified and produces a finished surface of uniform texture.
- .3 Control of the screed shall be by automatic sensing devices. Longitudinal control shall be accomplished by a sensor, which follows a string line, ski, or other reference. The grade sensor shall be movable and mounts provided so that grade control can be established on either side of the paver. A slope control sensor shall also be provided to maintain the proper transverse slope of the screed. Use automatic grade control for paving operations.

#### **4.8 HAND TOOLS**

- .1 Only lutes shall be used during the spreading operation and when the asphalt is worked by hand in areas in which the paver cannot reach.
- .2 Tamping irons may be used to consolidate the material along structures inaccessible to the rollers. Mechanical compaction equipment, satisfactory to the Departmental Representative, may be used instead of tamping irons.

- .3 For purposes of checking the finished surface, the Contractor must provide and carry on each paving machine a 3 metre straight edge and slope measuring level.

#### **4.9 PRE-LEVELLING FOR ASPHALT CONCRETE**

- .1 Pre-levelling of uneven surfaces over which asphalt concrete is to be placed shall be accomplished by the use of asphalt concrete placed with a grader, paver, hand or by a combination of these methods.
- .2 After placement, the asphalt concrete used for pre-levelling shall be compacted thoroughly with pneumatic tired rollers.

#### **4.10 PAVING OPERATIONS**

- .1 The asphalt concrete shall be placed to the design thickness as shown on the contract drawings. On new construction where an established reference is lacking, a string-line reference will be required. Adjacent mats on the same lift are to be controlled by use of the grade sensor. No relaxation of the above procedure will be permitted without written approval of the Departmental Representative.
- .2 The spreader shall be operated in such a manner as to distribute the asphalt concrete mix to proper cross section, width and thickness without causing segregation of the mix. Segregated areas, which may occur, shall be corrected immediately. The forward motion of the spreader shall be controlled so that no irregularities in the pavement surface are caused by excessive speed. The rate of placement of the mixture shall be uniform, and shall be co-ordinated with the production rate of the asphalt plant without intermittent operation of the spreader.
- .3 Any failure of the machine or operation to produce a smooth, uniformly dense mat, free from irregularities, shall be corrected immediately to the satisfaction of the Departmental Representative.

#### **4.11 AREAS INACCESSIBLE TO THE PAVING MACHINE**

- .1 Areas that are inaccessible to the paving machine may be paved by other methods, as approved by the Departmental Representative.
- .2 In small areas or where the use of mechanical equipment is not practical, the mix may be spread and finished by hand. The asphalt mixture shall be dumped on the area and immediately thereafter distributed into place by shovels and spread with lutes in a loose uniform layer uniform density and correct depth. Material must be handled so as to avoid segregation.

#### **4.12 COMPACTION**

- .1 The Contractor shall supply sufficient compaction equipment to:
  - .1 Provide a compaction rate that will equal or exceed the placing rate of the spreader.
  - .2 Ensure the specified compaction is attained before the temperature of the mat falls below 80°C.

#### **4.13 LONGITUDINAL AND TRANSVERSE JOINTS**

- .1 Longitudinal and transverse joints shall be made in a manner consistent with industry standards. Coarse aggregate removed from the hot mix during joint preparation shall not be broadcast onto the mat.
- .2 Paving joints shall not be placed in the same vertical plane. Longitudinal joints shall be offset at least 150 mm and transverse joints shall be offset at least 2 metres.
- .3 Longitudinal joints shall not be located within travel lanes, unless approved by the Departmental Representative.
- .4 Edges where additional pavement is to be placed shall be vertically formed to true line. A lute shall be used immediately behind the paver when required to obtain a true line and vertical edge.
- .5 The exposed edges of all cold asphalt joints and the face of concrete curb and gutter shall be cleaned and painted with a thin coat of asphalt tack.
- .6 At the end of each day's paving of the surface course and upper lift of the base course mix, the uncompleted paving mats shall be provided with vertically cut transverse joints. Joints between old and new pavements or between successive days' work shall be carefully made in such a manner as to ensure a thorough and continuous bond between the old and new surfaces.

#### **4.14 OPENING TO TRAFFIC**

- .1 Prior to any application of traffic, paving mats shall be sufficiently cool to resist and deformation or surface scuffing.
- .2 The Departmental Representative may, at their discretion, require means of cooling (e.g. application of water) completed pavements prior to opening to traffic.
- .3 At their discretion, the Departmental Representative may prohibit traffic from travelling on newly paved surfaces for any length of time deemed necessary.

### **Part 5**

#### **5.1 GENERAL**

- .1 The Contractor shall provide an end product conforming to the quantity and tolerance requirements of this specification. Where no tolerances are specified, the standard of workmanship shall be in accordance with accepted industry standards.
- .2 Acceptance of any Lot at full or increased payment will occur if there are no obvious defects and the Lot mean results for asphalt content, pavement density, air voids and thickness meet or exceed the specified tolerances.
- .3 Unit price reductions will only be applied on the basis of full acceptance testing in accordance with Table 3.4.4.

#### **5.2 ASPHALT CONTENT**

- .1 For full payment, the Lot Mean Asphalt Content must be within  $\pm 0.30\%$  of the approved JMF value, as specified in Section 2.4.

- .2 Payment adjustment for asphalt content is as follows:

Asphalt Content Deviation from JMF Value (%)	Payment Adjustment Factor
$\pm 0.30$ or less	1.00
$\pm 0.31$ to $\pm 0.50$	As per Chart A
Greater than $\pm 0.50$	Reject (Note 1)

Note 1: Subject to removal and replacement at the discretion of the Departmental Representative.

### 5.3 PAVEMENT COMPACTION

- .1 For full or increased payment, the Lot Mean Pavement Compaction must be equal to or greater than 93% of the Lot Mean Maximum Relative Density.
- .2 Payment adjustment for pavement compaction is as follows:

Pavement Compaction % of Maximum Relative Density	Payment Adjustment Factor
94.6 to 95.5 (Note 1)	1.03
93.5 to 94.5 (Note 1)	1.02
93.0 to 93.4	1.00
90.0 to 92.9	As per Chart B
Less than 90.0	Reject (Note 2)

Note 1: Where no individual test result is less than 93% otherwise the payment adjustment factor 1.00.

Note 2: Subject to removal and replacement at the discretion of the Departmental Representative.

### 5.4 AIR VOID CONTENT

- .1 For full payment, the Lot Mean Air Voids must be within  $\pm 1.0\%$  of the JMF value, as specified in Section 2.4.
- .2 Payment adjustment for air void content is as follows:

Air Void Content % Deviation from JMF Value	Payment Adjustment Factor
Less than 1.0	1.00
1.0 to 2.0	As per Chart C



Greater than 2.0 (Lower Lifts)	0.80
Greater than 2.0 (Upper Lifts)	0.60

## 5.5 THICKNESS (NEW CONSTRUCTION AND TOP LIFT ONLY)

- .1 Pavement of any type found to be deficient in thickness by more than 13.0 mm shall be removed and replaced by pavement of specified thickness, at the Contractor's expense.
- .2 The Lot Mean Thickness for any Lot will be determined on the basis of the acceptance cores described in Table 3.4.4. Core thickness shall be determined in accordance with ASTM D 3549.
- .3 If the deficiency of any individual core exceeds 13 mm, additional cores may be extracted in the proximity to the location of the core of excessive deficiency, to identify the extremities of the pavement area subject to be removed and replaced. The Contractor shall pay for such additional coring.
- .4 For full payment, the Lot Mean Thickness must be equal to, or greater than, the specified thickness.
- .5 Payment adjustment for the thickness is as follows:

Average Thickness Compared to Specified Thickness	Payment Adjustment Factor (Note 1)	
	Total Thickness (Single or Multiple Lifts)	Top Lift Thickness (Multiple Lifts)
Compliant or Greater	1.00	1.00
1 mm to 13 mm Deficient	As Per Chart D	As Per Chart D
More than 13 mm Deficient	Reject (Note 2)	Reject (Note 2)

Note 1: As single Thickness Payment Adjustment Factor shall be applied. Total Thickness of Top Lift Thickness, whichever results in the greatest adjustment.

Note 2: Subject to removal and replacement at the discretion of the Departmental Representative.

## 5.6 SMOOTHNESS

- .1 The completed asphalt concrete surface shall be true to the dimensional and tolerance requirements of the specifications and drawings. Unless detailed otherwise in the contract documents, the tolerances in both profile and crown are:
  - .1 Base course: 10 mm in 3 m
  - .2 Surface Course: 5 mm in 3 m
- .2 When deviations in excess of the above tolerances are found, the pavement surface shall be corrected by methods satisfactory to the Departmental Representative. Correction of defects shall be carried out until there are no deviations anywhere greater than the allowable tolerances.

## **5.7 SEGREGATION**

- .1 The finished surface shall have a uniform texture and be free of segregated areas. A segregated area is defined as an area of the pavement where the texture differs visually from the texture of the surrounding pavement.
- .2 All segregation will be evaluated by the Departmental Representative to determine repair requirements.
- .3 The severity of segregation will be rated as follows:
  - .1 Slight: The matrix of asphalt cement and fine aggregates is in place between the coarse aggregate particles, however there is more stone in comparison to the surrounding acceptable mix.
  - .2 Moderate: Significantly more stone than the surrounding mix, and exhibit a lack of surrounding matrix.
  - .3 Severe: Appears as an area of very stony mix, stone against stone, with very little or no matrix.
- .4 Segregated areas shall be repaired by the Contractor. The following methods of repair are identified.
  - .1 Slight: Squeegee asphalt to completely fill the surface voids.
  - .2 Moderate: Slurry seal for full mat width.
  - .3 Severe: Removal and replacement or overlay.
- .5 All repairs shall be regular in shape and finished using good workmanship practices to provide an appearance suitable to the Departmental Representative.
- .6 Any other methods of repair proposed by the Contractor will be subject to the approval of the Departmental Representative.
- .7 Repairs will be carried out by the Contractor at their expense.

## **Part 6**

### **6.1 PAYMENT ADJUSTMENTS**

- .1 The Unit Price applicable to each Lot quantity as asphalt concrete will be calculated as follows:

$$\text{LOT UNIT PRICE} = \text{CONTRACT UNIT PRICE} \times \text{PA}_{\text{AC}} \times \text{PA}_{\text{COM}} \times \text{PA}_{\text{AV}} \times \text{PA}_{\text{T}}$$

Where:

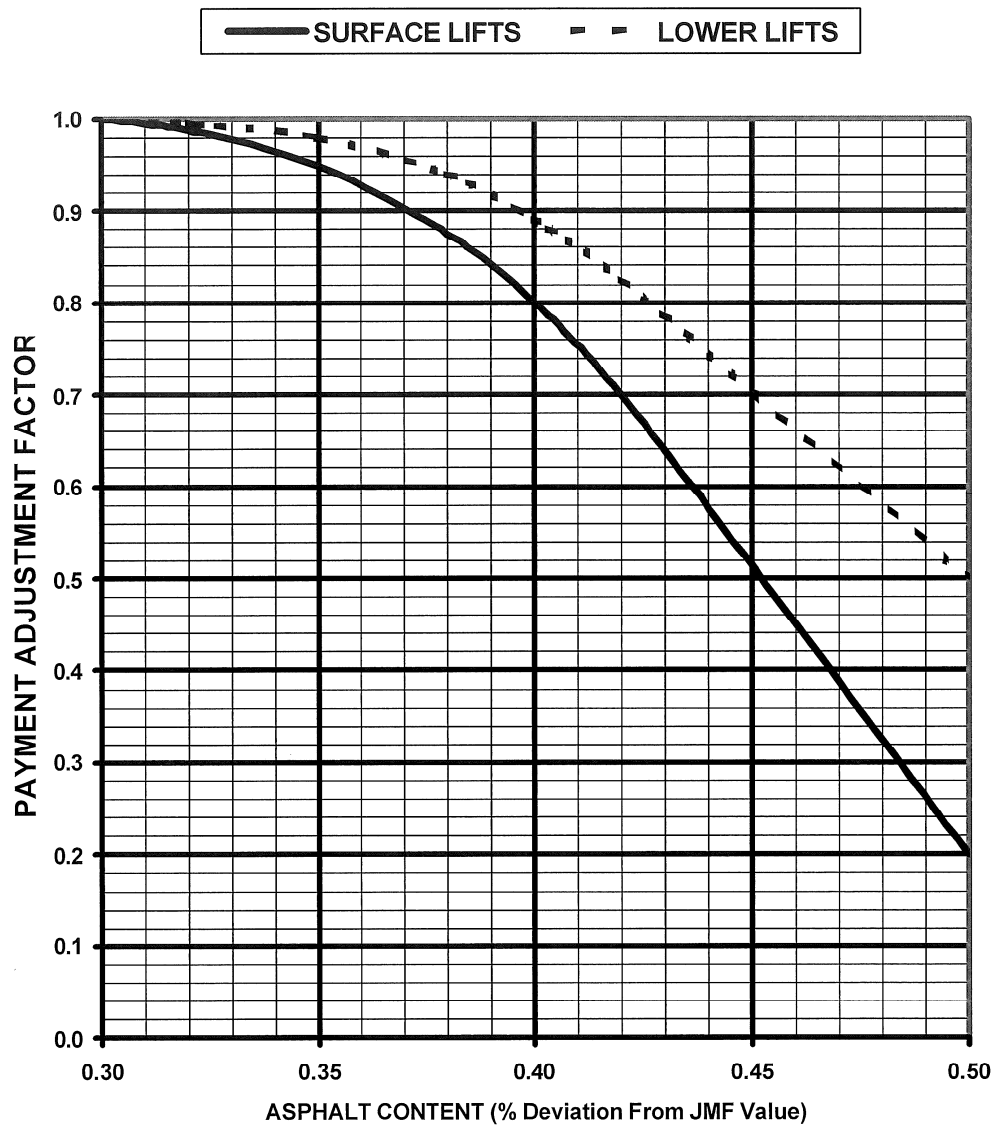
$\text{PA}_{\text{AC}}$  = Asphalt Content Payment Adjustment

$\text{PA}_{\text{COM}}$  = Compaction Payment Adjustment

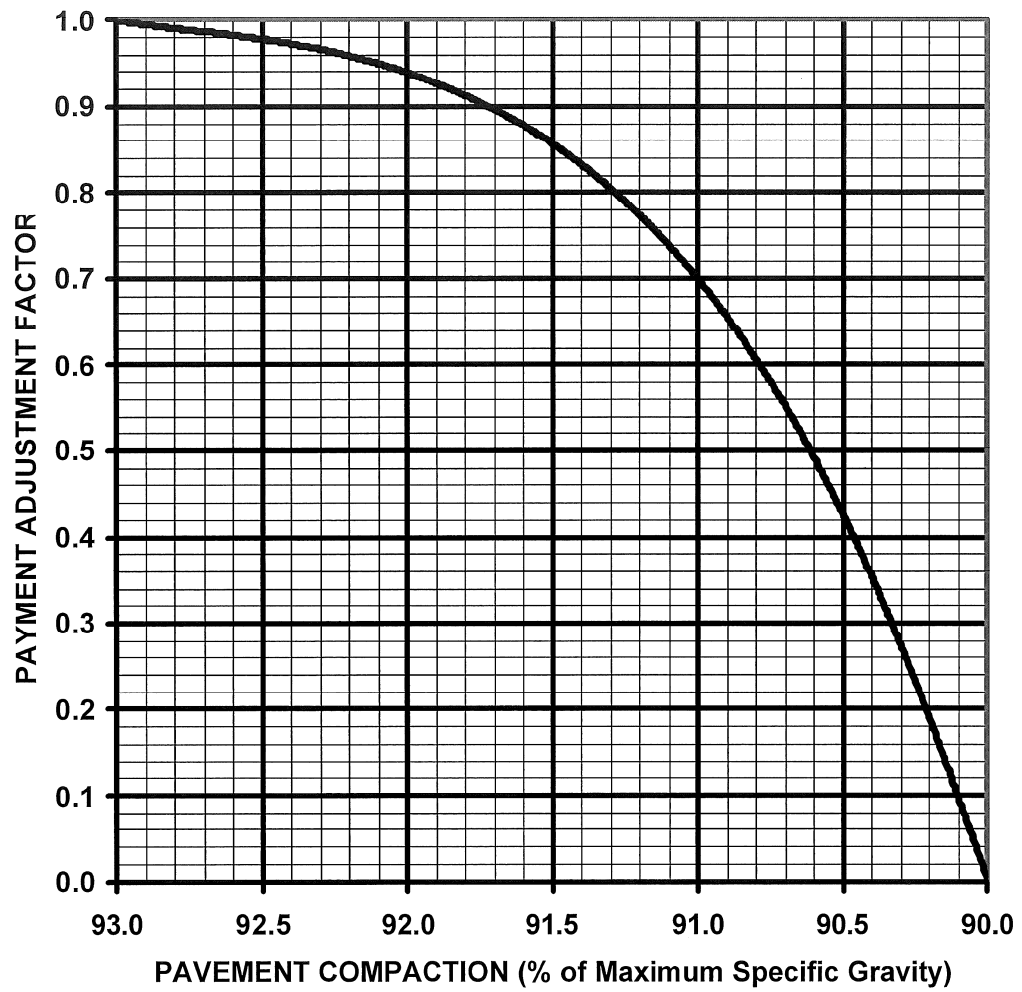
$\text{PA}_{\text{AV}}$  = Air Void Payment Adjustment

$\text{PA}_{\text{T}}$  = Thickness Payment Adjustment

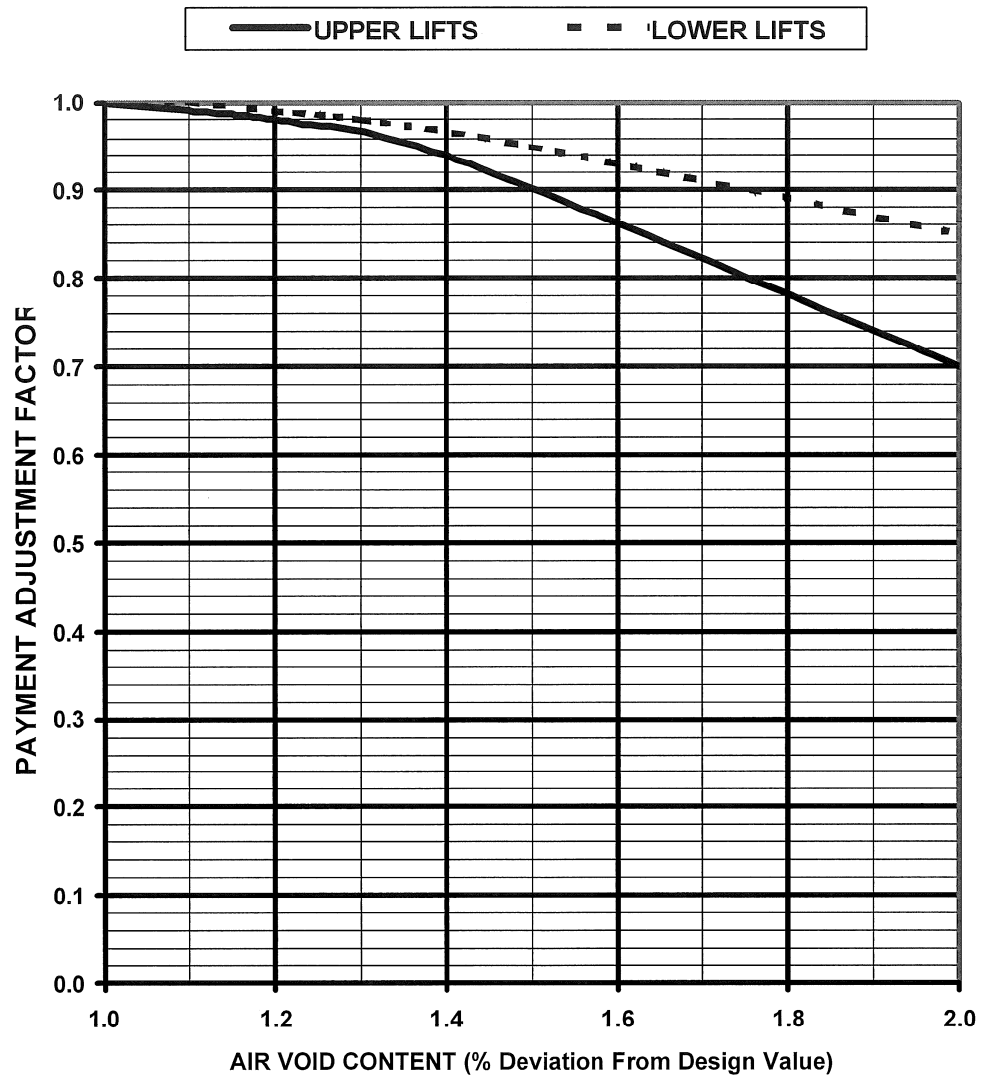
**CHART A**  
**ASPHALT CONTENT**  
**PAYMENT ADJUSTMENT FACTOR**



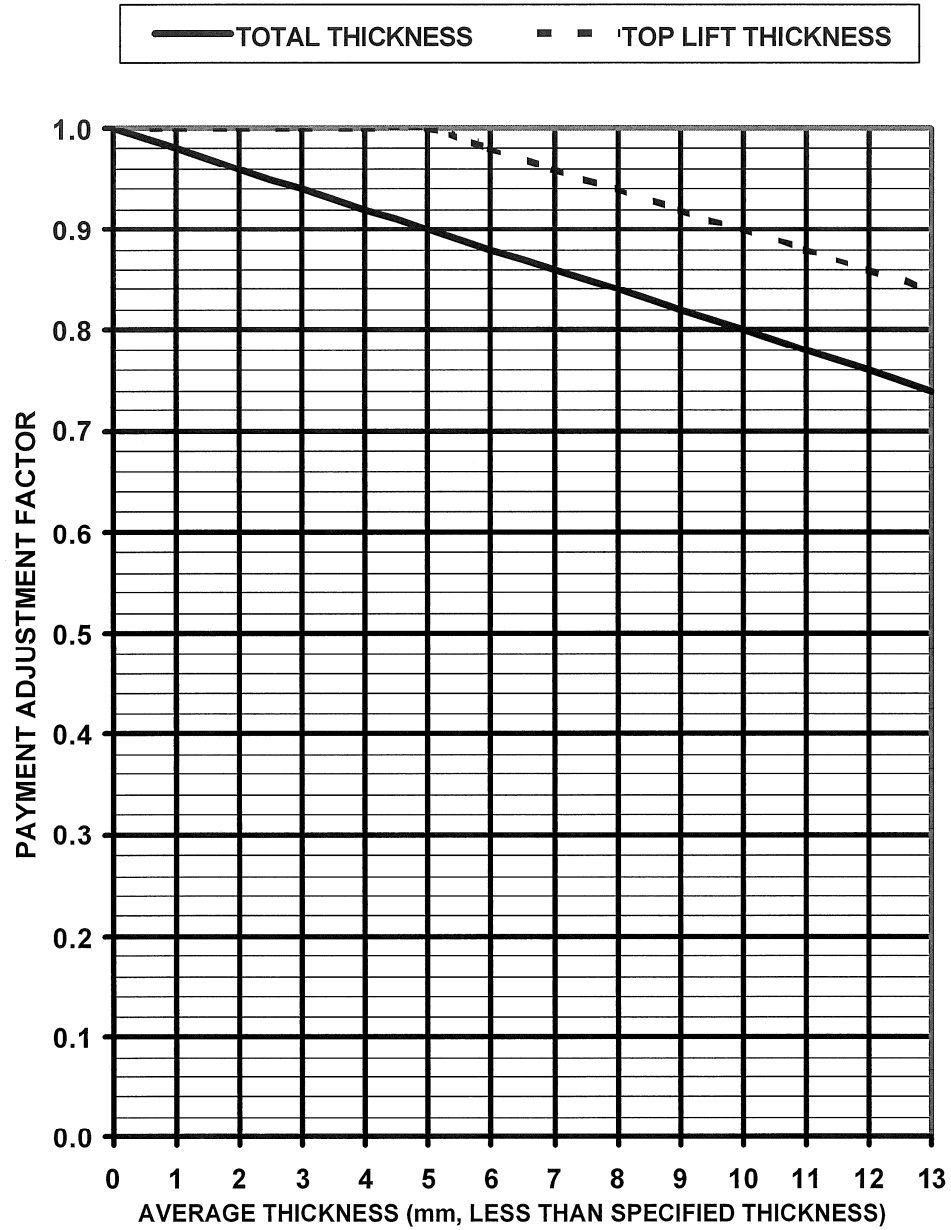
**CHART B**  
**COMPACTION**  
**PAYMENT ADJUSTMENT FACTOR**



**CHART C**  
**AIR VOID CONTENT**  
**PAYMENT ADJUSTMENT FACTOR**



**CHART D**  
**AVERAGE THICKNESS**  
**PAYMENT ADJUSTMENT FACTOR**



**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT PROCEDURES**

- .1 Asphalt tack coat will be considered incidental to asphalt costs. No additional payment will be made for asphalt tack.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples:
  - .1 Submit two - 1 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed, wide mouth jars or bottles made with plastic to Departmental Representative, at least 2 weeks prior to beginning Work.
  - .2 Sample asphalt tack coat material to: ASTM D 140.
  - .3 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work to ASTM D 140.

**1.3 QUALITY ASSURANCE**

- .1 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect asphalt tack coats from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Deliver, store and handle materials in accordance with ASTM D 140.
- .5 Provide, maintain and restore asphalt storage area.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Asphalt tack: Anionic emulsified asphalt, slow setting SS-1h
- .2 Cut-back asphalt; to AASHTO M081-92-UL, grade RC-70 or RC-250.
- .3 Water: clean, potable, free from foreign matter.



## **2.2 EQUIPMENT**

- .1 Equipment required for Work of this Section to be in satisfactory working condition and maintained for duration of Work.
- .2 Pressure distributor:
  - .1 Designed, equipped, maintained and operated so that asphalt material can be:
    - .1 Maintained at even temperature.
    - .2 Applied uniformly on variable widths of surface up to 5 m
    - .3 Applied at readily determined and controlled rates from 0.2 to 5.4 L/m<sup>2</sup> with uniform pressure, and with allowable variation from any specified rate not exceeding 0.1 L/m<sup>2</sup>.
    - .4 Distribute in uniform spray without atomization at temperature required.
  - .2 Equipped with meter, registering travel in metres per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
  - .3 Equipped with pump having flow meter graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
  - .4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
    - .1 Measure temperature to closest whole number.
  - .5 Equipped with accurate volume measuring device or calibrated tank.
  - .6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
  - .7 Equipped with nozzle spray bar, with operational height adjustment in increments of 0.6 metres and capable of being raised or lowered.
  - .8 Cleaned if previously used with incompatible asphalt material.

## **Part 3 Execution**

### **3.1 APPLICATION**

- .1 Apply asphalt tack coat only on clean and dry surface.
- .2 Dilute asphalt emulsion with water at 1:1 ratio for application.
  - .1 Mix thoroughly by pumping or other method approved by Departmental Representative.
- .3 Apply asphalt tack coat evenly to pavement surface at rate of 0.5L/sq. m.
- .4 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.
- .5 Apply asphalt tack coat only when air temperature greater than 10 degrees C and when rain is not forecast within 2 hours minimum of application.
- .6 Apply asphalt tack coat only on unfrozen surface.
- .7 Evenly distribute localized excessive deposits of tack coat by brooming.

- .8 Where traffic is to be maintained, treat no more than one half of width of surface in one application.
  - .1 Control traffic in accordance with Section 01 35 00 - Special procedures for Traffic control.
- .9 Keep traffic off tacked areas until asphalt tack coat has set.
- .10 Re-tack contaminated or disturbed areas.
- .11 Permit asphalt tack coat to set before placing asphalt pavement.
- .12 Submit summary report within 7 days minimum of date of application and include information as follows:
  - .1 Total area tack coated.
  - .2 Quantity of tack coat used.
  - .3 Mean application rate.
  - .4 Actual product quantity used when using equipment on pressure distributors.
  - .5 Dipstick measurements or electronic printouts are acceptable.
- .13 Carry out measurements in presence of Departmental Representative upon request.
- .14 Inspect tack coat application to ensure uniformity.
  - .1 Re-spray areas of insufficient or non-uniform tack coat coverage.
  - .2 Ensure tack coating performed using hand held devices is consistent in appearance with adjacent areas of machine applied material.

### **3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .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 11 – Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT PROCEDURES**

- .1 Asphalt prime will be considered incidental to asphalt costs. No additional payment will be made for asphalt prime.

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

- .1 Samples:
  - .1 Submit two 1 L samples of asphalt prime proposed for use in new, clean, air tight sealed, wide mouth, jars or bottles made with plastic, to Departmental Representative, 2 weeks prior to commencing Work.
  - .2 Sample asphalt prime coat materials in accordance with ASTM D 140.
  - .3 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work, in accordance with ASTM D 140.

**1.3 QUALITY ASSURANCE**

- .1 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Storage and Handling Requirements:
  - .1 Deliver, store and handle materials to ASTM D 140.
  - .2 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .3 Store and protect asphalt prime coats from nicks, scratches, and blemishes.
  - .4 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 MATERIAL**

- .1 Asphalt tack: Anionic emulsified asphalt, slow setting SS-1h
- .2 Sand blotter: clean granular material passing 4.75 mm sieve and free from organic matter or other deleterious materials.
- .3 Water: clean, potable, free from foreign matter.

**2.2 EQUIPMENT**

- .1 Pressure distributor:
  - .1 Designed, equipped, maintained and operated so that asphalt material can be:
    - .1 Maintained at even temperature.
    - .2 Applied uniformly on variable widths of surface up to 5 m.

- .3 Applied at controlled rates from 0.2 to 5.4 L/m<sup>2</sup> with uniform pressure, and allowable variation from any specified rate not exceeding 0.1 L/m<sup>2</sup>.
- .4 Distributed in uniform spray without atomization at temperature required.
- .2 Equipped with meter registering travel distance in metres per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
- .3 Equipped with pump having flow meter graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator.
  - .1 Pump power unit to be independent of truck power unit.
- .4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
  - .1 Temperature to be measured to nearest whole number.
- .5 Equipped with accurate volume measuring device or calibrated tank.
- .6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
- .7 Equipped with nozzle spray bar, with operational height adjustment in increments of 0.6 metres and capable of being raised or lowered.
- .8 Cleaned if previously used with incompatible asphalt material.
- .2 Aggregate Spreader:
  - .1 Apply blotter sand to primed surfaces using roll type spreader, or rotating disc sander capable of applying aggregate at variable widths and at variable rates.

### **Part 3 Execution**

#### **3.1 APPLICATION**

- .1 Proceed with application of tack coat only after receipt of written approval of granular base surface from Departmental Representative.
- .2 Cutback asphalt:
  - .1 Heat asphalt prime for pumping and spraying.
  - .2 Apply on dry surface.
- .3 Anionic emulsified asphalt:
  - .1 Dilute asphalt emulsion with clean water at 1:1 ratio for application.
  - .2 Mix thoroughly by pumping or other method approved by Departmental Representative.
  - .3 Apply asphalt tack coat evenly to pavement surface at rate of 0.5L/sq. m.
  - .4 Apply diluted asphalt emulsion on damp surface unless otherwise directed by Departmental Representative.
- .4 Apply asphalt prime only on unfrozen surface.
- .5 Apply asphalt tack coat only when air temperature is greater than 10 degrees C and when rain is not forecast within 2 hours minimum of application.

- .6 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt prime material.
- .7 Where traffic is to be maintained, treat no more than one-half width of surface in one application.
- .8 Prevent overlap at junction of applications.
- .9 Do not prime surfaces that will be visible when paving is complete.
- .10 Apply additional material to areas not sufficiently covered
- .11 Keep traffic off primed areas until asphalt prime has cured.
  - .1 Control traffic in accordance with Section 01 35 00.06 - Special Procedures for Traffic Control.
- .12 Permit prime to cure before placing asphalt paving.

### **3.2 USE OF SAND BLOTTER**

- .1 If asphalt prime fails to penetrate within 24 hours, spread sand blotter material in amounts required to absorb excess material.
- .2 Allow sufficient time for excess prime to be absorbed
- .3 Apply second application of sand blotter as required.
- .4 Do not roll blotter sand.
- .5 Sweep and remove excess blotter material.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .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 11 – Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 2 weeks prior to commencing work.
- .3 If materials have been tested by accredited testing within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Granular base: material to Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Type 1, 2 or 3 fill.
  - .2 Crushed stone or gravel.
  - .3 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.
- .3 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.
- .4 Fill material: to Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Type 1, 2 or 3 fill.
  - .2 Crushed stone or gravel.
  - .3 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

**Part 3 Execution**

**3.1 GRADE PREPARATION**

- .1 Do grade preparation work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Construct embankments using excavated material free from organic matter or other objectionable materials.
  - .1 Dispose of surplus and unsuitable excavated material outside of Waterton Lakes National Park.

- .3 Place fill in maximum 150 mm layers and compact to at least 98% of maximum dry density to ASTM D 698.

### **3.2 GRANULAR BASE**

- .1 Obtain Departmental Representative's approval of subgrade before placing granular base.
- .2 Place granular base material to lines, widths, and depths as indicated.
- .3 Compact granular base in maximum 150 mm layers to at least 98% of maximum density to ASTM D 698.

### **3.3 CONCRETE**

- .1 Obtain Departmental Representative's approval of granular base prior to placing concrete.
- .2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.
- .4 Provide edging as indicated with 10 mm radius edging tool.
- .5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Departmental Representative can be demonstrated. Hand finish surfaces when directed by Departmental Representative.

### **3.4 TOLERANCES**

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

### **3.5 EXPANSION AND CONTRACTION JOINTS**

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals shown on the drawings.
- .2 Install expansion joints.
- .3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

### **3.6 ISOLATION JOINTS**

- .1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.
- .2 Install joint filler in isolation joints in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Seal isolation joints with sealant.

### **3.7 CURING**

- .1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound.

- .2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
- .3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

### **3.8 BACKFILL**

- .1 Allow concrete to cure for 7 days prior to backfilling.
- .2 Backfill to designated elevations with material as shown on the drawings
  - .1 Compact and shape to required contours.

### **3.9 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**



**Part 1            General**

**1.1            ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Product Data:
  - .1          Submit manufacturer's printed product literature and data sheets for pavement markings and include product characteristics, performance criteria, physical size, finish and limitations.
- .3      Samples:
  - .1          Submit to Departmental Representative following material sample quantities at least 2 weeks prior to commencing work.
    - .1              Two 1 L samples of each type of paint.
    - .2              One 1 kg sample of glass beads.
  - .2          Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, specification number and formulation number and batch number.

**1.2            DELIVERY, STORAGE AND HANDLING**

- .1      Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2      Storage and Handling Requirements:
  - .1          Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2          Replace defective or damaged materials with new.

**Part 2           Products**

**2.1            MATERIALS**

- .1      Paint and Markings:
  - .1          To CGSB 1-GP-74M-79, Paint, Traffic, Alkyd.
  - .2          Colour: to CGSB 1-GP-12C-68, yellow 505-308, white 513-301.
- .2      Thinner: to CAN/CGSB-1.5.
- .3      Glass reflective beads: type suitable for application to wet paint surface for light reflectance.

**Part 3            Execution**

**3.1                EXAMINATION**

- .1        Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings previously installed under other Sections or Contracts are acceptable for product installation in accordance with MPI instructions prior to pavement markings installation.
  - .1            Visually inspect substrate in presence of Departmental Representative.
- .2        Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
- .3        Proceed with Work only after unacceptable conditions have been rectified.

**3.2                EQUIPMENT REQUIREMENTS**

- .1        Paint applicator: approved pressure type mobile with positive shut-off distributor capable of applying paint in single, double and dashed lines and capable of applying marking components uniformly, at rates specified, and to dimensions as indicated.
- .2        Distributor: capable of applying reflective glass beads as overlay on freshly applied paint.

**3.3                APPLICATION**

- .1        Pavement markings: laid out by Contractor.
- .2        Unless otherwise approved by Departmental Representative, apply paint only when air temperature is above 10 degrees C, wind speed is less than 60 km/h and no rain is forecast within next 4 hours.
- .3        Apply traffic paint evenly at rate of 3 m<sup>2</sup>/L.
- .4        Do not thin paint unless approved by Departmental Representative.
- .5        Symbols and letters to dimensions indicated.
- .6        Paint lines of uniform colour and density with sharp edges.
- .7        Thoroughly clean distributor tank before refilling with paint of different colour.
- .8        Apply glass beads at rate of 200 g/m<sup>2</sup> of painted area immediately after application of paint.

**3.4                TOLERANCE**

- .1        Paint markings: within plus or minus 12 mm of dimensions indicated.
- .2        Remove incorrect markings to the satisfaction of the Departmental Representative.

**3.5                CLEANING**

- .1        Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .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 11 – Cleaning.

**3.6**

**PROTECTION**

- .1 Protect pavement markings until dry.
- .2 Repair damage to adjacent materials caused by pavement marking application.

**END OF SECTION**

**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2 Not Used**

**2.1 NOT USED**

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for fence and gate installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 PREPARATION**

- .1 Grading:
  - .1 Level ground along fence line prior to reinstallation.

**3.3 ERECTION OF FENCE**

- .1 Erect fence along lines as directed by Departmental Representative.
- .2 Installation of posts:
  - .1 Space posts to match current fence as directed by Departmental Representative.
  - .2 Install posts true to line and plumb.
- .3 Fencing with wood posts:
  - .1 Backfill around posts and compact to same density as surrounding ground. Dispose of surplus material as directed by Departmental Representative.
  - .2 Erect wires and stretch to have uniform tension.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .1 Leave Work area clean at end of each day.

- .2 Clean and trim areas disturbed by operations. Dispose of surplus material and replace damaged turf with sod as directed by Departmental Representative.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT PROCEDURES**

- .1 Preparation of sub-grade for placing of topsoil will not be measured for payment.
- .2 Topsoil stripping is incidental to contract unit prices.
- .3 Topsoil Placement and grading will be measured in square metres.
- .4 Imported Topsoil will be measured in cubic metres.

**Part 2 Not Used**

**2.1 NOT USED**

**Part 3 Execution**

**3.1 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.
- .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.

**3.2 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as indicated and remove to stockpile location within Waterton Lakes National Park at Upper Compound (approx.3.5 km from Site).
- .2 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .3 Stockpile height not to exceed 2 m.
- .4 Protect stockpiles from contamination and compaction.
- .5 Stripped sod shall be broken into 2 in or smaller pieces and mixed with the topsoil.
- .6 The contractor shall import topsoil to mix with stockpiled salvaged topsoil at the Upper Compound at a ratio of 1:2. The supplier source of the imported topsoil must be approved by the Departmental Representative prior to import into Waterton Park.

**3.3 PREPARATION OF EXISTING GRADE**

- .1 Verify that grades are correct.
  - .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
  - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
  - .2 Remove debris which protrudes more than 75 mm above surface..
  - .3 Dispose of removed material off site.

### **3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 100 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement.
  - .1 100 mm for seeded areas.
  - .2 100 mm for sodded areas.
  - .3 300 mm for flower beds.
  - .4 500 mm for shrub beds.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

### **3.5 FINISH GRADING**

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
  - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
  - .1 Leave surfaces smooth, uniform and firm against deep footprinting.

### **3.6 ACCEPTANCE**

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

### **3.7 SURPLUS MATERIAL**

- .1 Dispose of materials except topsoil not required outside of Waterton Lakes National Park at an approved dumping facility.

### **3.8 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

**Part 1 General**

**1.1 GENERAL**

- .1 This specification covers preparation of the area to be seeded, the supply and application of seed and fertilizer, and the finishing of seeded areas.
- .2 Areas to be seeded shall include any disturbed or exposed earth surfaces within the limits if construction shown on the drawings. Any disturbed areas outside of these limits will be seeded at the Contractor's expense.

**Part 2 Products**

**2.1 SUPPLY OF MATERIALS**

- .1 Materials for seeding, including grass seed mix, fertilizer, mulch and water shall be supplied by the Contractor.
- .2 Seed and fertilizer materials shall be stored dry and protected from direct sunlight and other detrimental conditions. Materials that have been subjected to detrimental conditions, as determined by Departmental Representative, will not be accepted for use on the project.

**2.2 GRASS SEED**

- .1 Grass seed shall meet the minimum requirements for Common No. 1 Seed as defined by the Grade Tables under the Canada Seeds Act & Regulations, and shall be of the following composition:

Native Seed Mix		Percentage by Dry Weight
Common Name	Latin Name	
Slender Wheat Grass	Agropyron trachycaulum	30%
Smooth Wildrye	Elymus glaucus	20%
Northern Wheat Grass	Agropyron dasystachyum	10%
Tickle Grass	Agrostis scabra	10%
Fringed Brome <sup>(1)</sup>	Bromus ciliatus	10%
Tufted Hairgrass	Deschampsia cespitosa	10%
Foothills Rough Fescue	Festuca campestris	10%

Note (1): Fringed Brome seed shall be coated.



- .2 The seed shall be mixed by a conditioner and bulk storage facility approved by the Authority responsible for Canada Seeds Act & Regulations. All seed shall be tested by a Registered Seed Lab, and each bag shall be clearly marked with the name of the supplier and the mixture composition.
- .3 Prior to the use on the project, the Contractor shall provide the Departmental Representative with a Certificate of Analysis for each lot of seed supplied. Test results from the Certificate of Seed Analysis shall specify the germination, or for native seeds that are not a part of the seed tables the Tetrazolium, and purity for each seed species of the mix as well as the seed mix composition expressed as a percentage of each seed species by dry mass for each seed mix specified.

### **2.3 HYDRO-MULCH**

- .1 Mulch material shall be cellulose fibre unless otherwise specified in the Special Provisions. Mulch shall be clean and free of weeds and other foreign matter. Mulch shall be 100% biodegradable, compatible with the environment, and shall contain no germination-inhibiting components.

### **2.4 TACKIFIER**

- .1 The binder must be capable of joining together the mulch particles to secure the mulch to the ground. The binder shall not form an impervious seal that will prevent the penetration of moisture to underlying soil.

### **2.5 WATER**

- .1 Water supplied by the Contractor shall be free of any impurities that might inhibit germination of the seed.

### **2.6 APPLICATION RATE**

- .1 The minimum application for Hydro-Seeding is 75-100 kg/ha

## **Part 3 Execution**

### **3.1 NOTIFICATION OF COMMENCEMENT OF WORK**

- .1 The Contractor shall notify the Departmental Representative a minimum of 48 hours prior to any seeding work. Seeding operations shall not commence until all areas designated for seeding have been prepared to the satisfaction of the Departmental Representative.
- .2 Seeding operations shall not commence until the Departmental Representative has reviewed the Certificate of Seed Analysis and verified the specified seed mixture supplied.

### **3.2 SURFACE PREPARATION**

- .1 Grading or topsoil placement shall be completed to the satisfaction of the Departmental Representative prior to any surface preparation.

- .2 All eroded areas shall be corrected prior to surface preparation, as determined by the Departmental Representative, using imported material or material adjacent to the area being filled.
- .3 Areas to be seeded shall be finished to a smooth and uniform surface, which is loosened to a depth of not less than 25 mm at the time of seeding. Where necessary, the surface shall be scarified and the Contractor shall dispose of stones and other debris as determined by the Departmental Representative.
- .4 Seeding will not be permitted on hardened, crusted or rutted soil.

### **3.3 WEATHER CONDITIONS**

- .1 The Contractor shall not proceed with the Work when, in the opinion of the Departmental Representative, weather conditions are unsuitable. The Departmental Representative will not allow work to proceed when wind conditions are such that material is being carried beyond the designated work areas or that the material is not being uniformly applied.

### **3.4 PROTECTION**

- .1 The Contractor shall take reasonable care to prevent the contamination of structures, signs, guardrails, fences, utilities and other installations by his operations. Where such contamination occurs, the Contractor shall remove the offending material using methods acceptable to the Departmental Representative.
- .2 The Contractor shall ensure that hydro-seeding does not dislodge soil or cause erosion.
- .3 The Contractor shall be responsible for the protection of the Work and shall, at his own expense, repair all areas damaged by any cause, until the Work has been accepted by the Departmental Representative.

### **3.5 RESEEDING**

- .1 At locations that fail to show a uniform stand of grass for any reason during the calendar year following the year of initial seeding, the Contractor shall repair the defective locations as determined by the Departmental Representative. A uniform stand of grass will be considered growth that shows no deterioration or bare spots greater than 1 square metre in size, and provides a minimum of 80 percent ground cover as determined by the Departmental Representative.
- .2 The initial inspection of seeding will occur during the month of May of the calendar year following the year of initial seeding. The Contractor shall complete any required reseeding work prior to June 15 of that year. This date will be extended if, in the opinion of the Departmental Representative, the weather conditions prior to June 15 are not suitable for reseeding work.
- .3 Contractor will not be required to reseed any area more than once during the warranty period.
- .4 The Contractor shall supply all materials necessary for reseeding work and complete all reseeding work entirely at his own expense.

**END OF SECTION**

**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 For every one tree removed, three 3 tree plantings in kind will be planted.

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
  - .2 Protect plant material from damage during transportation:
    - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
    - .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
    - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
  - .3 Storage and Handling Requirements:
    - .1 Immediately store and protect plant material which will not be installed within 1 hour in accordance with supplier's written recommendations and after arrival at site in storage location approved by Departmental Representative.
    - .2 Protect stored plant material from frost, wind and sun and as follows:
      - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in topsoil and watering to full depth of root zone.
      - .2 For pots and containers, maintain moisture level in containers.
      - .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
    - .3 Store and manage hazardous materials in accordance with manufacturer's written instructions.

**1.3 WARRANTY**

- .1 Contractor hereby warrants that plant material will remain free of defects in accordance with General Conditions CCDC GC 12.3, but for 1 full growing season.
- .2 End-of-warranty inspection will be conducted by Departmental Representative.

- .3 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

## **Part 2 Products**

### **2.1 PLANT MATERIAL**

- .1 Plantings to be selected from the attached document entitled: TREES AND SHRUBS RECOMMENDED FOR WATERTON PARK TOWNSITE (Pages 6 -8 of this Section).
- .2 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
- .3 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .4 Trees: with straight trunks, well and characteristically branched for species.
- .5 Trees larger than 200 mm in caliper: half root pruned during each of two successive growing seasons, the latter at least one growing season before arrival on site.
- .6 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.
- .7 Collected stock: maximum 40 mm in caliper, with well developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.
  - .1 During collection, ensure 10% maximum seed crop (or plants) are collected from healthy population of many individuals, and from several plants of same species.
  - .2 Leave remainder for natural dispersal and as food for dependent organisms.

### **2.2 WATER**

- .1 Free of impurities that would inhibit plant growth.

### **2.3 STAKES**

- .1 Wood, pointed one end, 38 x 38 x 2300 mm.

### **2.4 GUYING COLLAR**

- .1 Tube: plastic, 13 mm diameter, nylon reinforced.

### **2.5 TRUNK PROTECTION**

- .1 Wire mesh: galvanized, electrically welded 1.4 mm wire with 25 x 25 mm mesh and fastener.
- .2 Plastic: perforated spiralled strip.

### **2.6 FERTILIZER**

- .1 Synthetic commercial type as recommended by manufacturer.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for planting installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 PRE-PLANTING PREPARATION**

- .1 Proceed only after receipt of written acceptability of plant material from Departmental Representative.
- .2 Remove damaged roots and branches from plant material.
- .3 Locate and protect utility lines.

**3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS**

- .1 For individual planting holes:
  - .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
  - .2 Excavate to depth and width as indicated.
  - .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
  - .4 Scarify sides of planting hole.
  - .5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

**3.4 PLANTING**

- .1 For bare root stock, place 50 mm backfill soil in bottom of hole.
  - .1 Plant trees and shrubs with roots placed straight out in hole.
- .2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.
  - .1 Do not pull burlap or rope from under root ball.
- .3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4 Plant vertically in locations as indicated.
  - .1 Orient plant material to give best appearance in relation to structure, roads and walks.
- .5 For trees and shrubs:

- .1 Backfill soil in 150 mm lifts.
  - .1 Tamp each lift to eliminate air pockets.
  - .2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
  - .3 After water has penetrated into soil, backfill to finish grade.
- .2 Form watering saucer as indicated.
- .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
- .7 Water plant material thoroughly.
- .8 After soil settlement has occurred, fill with soil to finish grade.

### **3.5 TRUNK PROTECTION**

- .1 Install trunk protection on deciduous trees as indicated.
- .2 Install trunk protection before installation of tree supports.

### **3.6 TREE SUPPORTS**

- .1 Install tree supports as indicated.
- .2 Use single stake tree support for deciduous trees less than 3 m in height and evergreens less than 2 m in height.
  - .1 Place stake on prevailing wind side and 150 mm minimum from trunk.
  - .2 Drive stake 150 mm minimum into undisturbed soil beneath roots.
    - .1 Ensure stake is secure, vertical and unsplit.
  - .3 Install 150 mm long guying collar 1500 mm above grade.
  - .4 Thread Type 1 guying wire through guying collar tube.
    - .1 Twist wire to form collar and secure firmly to stake. Cut off excess wire.
- .3 After tree supports have been installed, remove broken branches with clean, sharp tools.

### **3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.
  - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
    - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
    - .2 Keep trunk protection and guy wires in proper repair and adjustment.
    - .3 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

### **3.8 MAINTENANCE DURING WARRANTY PERIOD**

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.

- .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
- .2 Apply fertilizer in early spring as indicated by soil test.
- .3 Remove dead, broken or hazardous branches from plant material.
- .4 Keep trunk protection and tree supports in proper repair and adjustment.
- .5 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
- .6 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
- .7 Submit monthly written reports to Departmental Representative identifying:
  - .1 Maintenance work carried out.
  - .2 Development and condition of plant material.
  - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

### **3.9 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .1 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 11 – Cleaning.

### **3.10 CLOSEOUT ACTIVITIES**

- .1 Submit maintenance reports for trees, shrubs, and other plantings.

## **TREES AND SHRUBS RECOMMENDED FOR WATERTON PARK TOWNSITE**

The following is a condensed list of native tree and shrub species which are recommended for planting in the Waterton Townsite area. Species of trees and shrubs native to the Waterton area are the preferred species to be used when planting and should be sourced locally to prevent the introduction of non-native varieties. Where possible species have been selected to minimize the attraction to wildlife (bears, deer, elk) and have reduced fire risk potential. Species not found on this list must be approved by the Park Ecologist (Vegetation) or representative prior to planting.

### **TREES:**

#### **Coniferous:**

##### **Douglas fir (*Pseudotsuga menziesii*) – medium browse; medium fire**

- Growing to 10 metres or more with a massive trunk and dense, spreading branches. Occurs at low elevations on dry exposed slopes and ridges.
- A primary species on disturbed sites, it occupies a variety of habitats from moist to very dry soils
- Adaptable to most sites; therefore good survival rate
- Good windthrow resistance; good shade tree
- Plant well away from eaves troughs (high needle cast)

##### **White Spruce (*Picea glauca*) – Low browse; high fire**

- Often somewhat bluish-green with a dense crown, up to 15 metres in height.
- Best on a moist site; needs a great deal of water, especially after transplanting
- Good shade tree; wind and shade tolerant.
- Colorado Spruce is not a desirable alternative; it's non-native

##### **Lodgepole Pine (*Pinus contorta*) – low browse; high fire**

- Occurs on a wide variety of soils, at low to middle elevations
- Young trees are intolerant of shade and grow best on dry exposed sites

##### **Limber Pine (*Pinus flexilis*) – low browse; high fire**

- Long-lived and slow growing
- A SARA listed species but plantings in town site can be used as educational material

#### **Deciduous:**

##### **Trembling aspen (*Populus tremuloides*) – high browse; very low fire**

- Rather small and more or less rounded leaves
- Mature trees form groves from root suckers.
- Require a moderately moist site
- NOTE – lots of hybrid and cultivar species available – these must not be used.

##### **Balsam Poplar (*Populus balsamifera*) – high browse; very low fire**

- Tall tree growing best along creek-beds and lakeshores (requires a moist site)
- Long, wide leaf-blades
- Sticky seed scales can be a nuisance; roots can surface

##### **Paper Birch (*Betula papyrifera*) – low browse; very low fire**

- A slender, long-branched tree – 10-25 m tall, mature bark mostly white; peeling
- Moist upland sites; shade intolerant
- Can withstand moderate drought once established

##### **Water Birch (*Betula occidentalis*) – low browse; very low fire**

- Smaller tree - <10m; dark-reddish brown bark that does not peel.
- Good early successional species in moist areas

#### **SHRUBS:**

##### **Mountain Maple (*Acer glabrum*) – medium browse; very-low fire**

- A red-stemmed shrub growing to a few metres tall. Typical "maple leaf" shaped leaf blades
- Will grow on rocky sites

##### **Shrubby Cinquefoil (*Potentilla fruticosa*) – low browse; low fire**



- A coarse shrub of grasslands and open places, decorated June to September with numerous small, yellow, rose-like flowers.
- NOTE – lots of hybrid and cultivar species available – these must not be used.

**Red Osier Dogwood (*Cornus stolonifera*) - high browse; low fire**

- Willow-like shrub with distinct red bark and small greenish-white flowers; 1 to 3 metres tall
- grows best in damp, somewhat sheltered places

**Wolf Willow (*Elaeagnus commutata*) – medium browse; low fire**

- Leaves silvery in colour; exhibits small yellow aromatic flowers in June/July
- Forms small groves in seepage areas
- NOTE – lots of hybrid and cultivar species available – these must not be used.

**Snowberry (*Symphoricarpos albus*) – medium browse; low fire**

- Common in a variety of habitats
- Small bell-shaped flowers June to August

**Buffalo-berry (*Shepherdia canadensis*) – medium browse; low fire**

- PLANT MALE BUSHES ONLY
- Spreading shrub to 3m tall

**Common Wild Rose (*Rosa woodsii*) – medium browse; low fire**

- Exhibits bright pink flowers in June and July
- Open woods and thickets, some tolerance to sandy areas

**Prickly Rose (*Rosa acicularis*) – high browse; low fire**

- Branching shrub, up to 1.5 metres high
- Open woods and moist thickets

**Tree Standards:**

- In cases of tree replacement, the three replacement trees should be as large as available, with a 15 gallon root size and at least ¾” trunk size. If 15 gallon native trees are not available, on approval of the SO, four 10 gallon trees may be planted instead.
- All trees must be guaranteed for one year (one growing season).
- Trees shall be inspected immediately after initial planting and during the growing season by a designated Parks Canada Surveillance Officer (SO). After the growing season, the SO will determine final acceptance of the tree.
- Any planted tree that is dead or, in the opinion of the SO, is in an unhealthy or unsightly condition, and/or has lost its natural shape due to dead branches, excessive pruning, inadequate or improper maintenance, or other causes prior to final acceptance, shall be replaced in the next planting season. There shall be a growing season guarantee on trees commencing after the final inspection of the permitted planting.
- Where dead trees are identified, the dead material shall be removed within four (4) weeks of notification. When necessary, approved soil and grass seed shall be added to the pit to reclaim the site and eliminate potential tripping hazards at the time of removal.

**General Tips:**

- Select the right tree for the site. It is important to match your planting site and its conditions with a tree species' shade, moisture, and soil preferences.
- Plants should be put in the ground in autumn or spring and fenced immediately to prevent animal damage.
- Frequent watering is necessary for the weeks following transplantation or first growing season, and if possible up to the first frost.
- It is advisable to screen young plants from wind over the winter.
- Avoid planting dense clusters of shrubs; this helps limit cover for large animals such as cougars and reduces fire hazards.
- Even “fire resistant” vegetation will burn if the plant’s moisture content is low.
- To prevent the spread of non-native species and reduce the appeal of the townsite for animals such as deer and bear, please avoid planting the following:
  - Saskatoon (*Amelanchier alnifolia*) - berries attract bears

- Chokecherry (*Prunus virginiana*) - cherries can attract bears
- Pincherry (*Prunus pennsylvanica*) – cherries can attract bears
- Common Caragana (*Caragana arborescens*) - it's non-native and can crowd out other plants.
- Junipers – (*Juniperus communis & horizontalis*) – can be highly volatile in case of fire.
- Provide good pre-planting care. Keep trees shaded, cool, and moist before planting. Be gentle when handling the root mass.
- Remove burlap, pots, wire baskets, rope, plastic, etc. from the roots and all labels, wires etc. from the stem. Removing these materials with the root ball in the hole minimizes root system disturbance. If you can't remove burlap because the ball is loose, at least slit and peel it back below the soil surface.

**For further information please contact the Park Ecologist (Vegetation) at 859-5137.**

**In cases of tree replacement, for further information please contact the Park Surveillance Officer at 859-5185.**

**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT PROCEDURES**

- .1 Measure excavation and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.
- .2 Measure maintenance holes and catch basins in vertical meters installed, measured from top of cover (rim) or grating to lowest pipe invert of maintenance hole and catch basin as shown on the drawings

**1.2 SCHEDULING OF WORK**

- .1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit Schedule of interruptions for approval and adhere to approved schedule.

**1.3 SUBMITTALS**

- .1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Precast maintenance hole units: to ASTM C 478M, circular or oval.
  - .1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.
  - .2 Monolithic bases to be approved by Departmental Representative and set on concrete slabs cast in place].
- .2 Precast catch basin sections: to ASTM C478M.
- .3 Joints: made watertight using rubber rings, bituminous compound, epoxy resin cement or cement mortar.
- .4 Mortar:
  - .1 Aggregate: CSA A82.56.
  - .2 Masonry Cement: to CAN/CSA-A3002.
- .5 Ladder rungs: to CSA G30.18, No.25M billet steel deformed bars, hot dipped galvanized to ASTM A 123/A 123M.
- .6 Rungs to be safety pattern (drop step type).
- .7 Adjusting rings: to ASTM C 478M.
- .8 Concrete Brick: to CAN/CSA-A165 Series.
- .9 Drop maintenance hole pipe: same as sewer pipe.

- .10 Galvanized iron sheet: approximately 2 mm thick.
- .11 Steel gratings, I-beams and fasteners: as indicated.
- .12 Frames, gratings, covers to dimensions as indicated and following requirements:
  - .1 Metal gratings and covers to bear evenly on frames.
    - .1 Frame with grating or cover to constitute one unit.
    - .2 Assemble and mark unit components before shipment.
  - .2 Gray iron castings: to ASTM A 48/A 48M, strength class[30B].
  - .3 Castings: coated with two applications of asphalt varnish, sand blasted or cleaned and ground to eliminate surface imperfections.
  - .4 Maintenance hole frames and covers: cover cast with perforations and complete with two 25 mm square lifting holes
  - .5 Catch basin frames and covers to City of Lethbridge standards.
  - .6 Maintenance holes frames and covers to City of Lethbridge standards.
- .13 Granular bedding and backfill: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 25mm washed drain rock
  - .2 Gradations to be within limits specified:
  - .3 Table:
 

Sieve Designation	% Passing
25mm	100
16mm	90-100
10mm	45-75
5mm	0-15
1.25mm	0-5
  - .4 Concrete mixes and materials: in accordance with Section 03 30 00.01 - Cast-in-Place Concrete.
- .14 Unshrinkable fill: in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **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 maintenance holes and catch basin structures installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative]

### **3.2 EXCAVATION AND BACKFILL**

- .1 Excavate and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and as indicated.
- .2 Obtain approval of Departmental Representative before installing outfall structures, maintenance holes or catch basins.

### **3.3 CONCRETE WORK**

- .1 Use 25 MPa concrete in accordance with Section 03 30 00 - Cast-in-Place Concrete.

### **3.4 INSTALLATION**

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses.
  - .1 Maximum of 3 units behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.
- .4 Cast bottom slabs directly on undisturbed ground.
- .5 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% corrected maximum dry density; maximum density to ASTM D 698.
- .6 Precast units:
  - .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base.
  - .2 Make each successive joint watertight with Departmental Representative's approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination of these materials.
  - .3 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
  - .4 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
- .7 For sewers:
  - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
  - .2 Bench to provide smooth U-shaped channel.
  - .3 Side height of channel to be 0.75 times full diameter of sewer.
  - .4 Slope adjacent floor at 1 in 20.
  - .5 Curve channels smoothly.
  - .6 Slope invert to establish sewer grade.

- .8 Compact granular backfill to 98% corrected maximum dry density; maximum density to ASTM D 698.
- .9 Place frame and cover on top section to elevation as indicated.
  - .1 If adjustment required use concrete ring.
- .10 Clean units of debris and foreign materials.
  - .1 Remove fins and sharp projections.
  - .2 Prevent debris from entering system.

### **3.5 LEAKAGE TEST**

- .1 Install watertight plugs or seals on inlets and outlets of each new sanitary sewer maintenance hole and fill maintenance hole with water.
- .2 Leakage not to exceed 0.3% per hour of volume of maintenance hole.
- .3 If permissible leakage is exceeded, correct defects.
- .4 Repeat until approved by Departmental Representative.
- .5 Departmental Representative will issue Test Certificate for each maintenance hole passing test.

**END OF SECTION**

**Part 1            General**

**1.1            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Inform Departmental Representative of proposed source of bedding materials and provide access for sampling at least 2 weeks prior to commencing work.
- .3        Submit manufacturer's test data and certification that pipe materials meet requirements of this section 2 weeks minimum prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .4        Pipe certification to be on pipe.

**1.2            CLOSEOUT SUBMITTALS**

- .1        Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2        Submit data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details.
  - .1        Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.
- .3        Operation and Maintenance Data: submit operation and maintenance data for pipe, valves, valve boxes, valve chambers and hydrants for incorporation into manual.

**1.3            DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

**1.4            SCHEDULING OF WORK**

- .1        Schedule Work to minimize interruptions to existing services.
- .2        Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.
- .3        Notify Departmental Representative minimum of 24 hours in advance of interruption in service.
- .4        Do not interrupt water service for more than 2 hours and confine this period between 10:00 and 16:00 hours local time unless otherwise authorized.
- .5        Notify fire department of planned or accidental interruption of water supply to hydrants.
- .6        Provide and post "Out of Service" sign on hydrant not in use.
- .7        Advise local police department of anticipated interference with movement of traffic.

## **Part 2            Products**

### **2.1            PIPE, JOINTS AND FITTINGS**

- .1 Polyvinyl Chloride (PVC) Pressure Pipe
  - .1 For pipe sizes 150 mm to 300 mm in diameter, all pipes and joints shall be to the latest revision AWWA C900, CSA certified as meeting latest revision CSA 3-B137.3-M86, SDR 18, working pressure rating 235 psi.
  - .2 For pipe sizes 350 mm to 900 mm in diameter, all pipe and joints shall be to the latest revision AWWA C905, CSA certified as meeting latest revision CSA 3-B137.3-M86, SDR 25, working pressure rating 165 psi.
  - .3 All PVC pipe to be cast iron outside diameter, bell end, c/w SBR or NBR gaskets of a pressure actuated seal design.
  - .4 All PVC pipe to be capable of deflecting at a joint.
  - .5 All pipe shall be supplied with integral wall thickened bell ends and continuous gaskets.
- .2 Polyvinyl Chloride (PVC) Fittings
  - .1 For main sizes 300 mm and smaller, PVC Fittings to the latest revision AWWA C-907, CSA certified as meeting latest revisions CSA 3-B137.2, SDR 18, pressure class 150, bell ends, c/w 1MPa elastomeric gasket push –on joint.
  - .2 For main sizes larger than 300mm, PVC Fittings to be latest revisions AWWA & CSA.
- .3 Cast Iron Fittings
  - .1 Cast Iron Fittings to the latest revision AWWA C110-87 / ANSI A21.10, pressure class 150 minimum. Long body only. Exterior of fittings to be bituminous coated at factory.
  - .2 Joints for cast iron fittings to latest revision AWWA C111 / ANSI A21.11, pressure class 150 minimum, “Tyton Joint” or approved equal.

### **2.2            VALVES AND VALVE BOXES**

- .1 Gate Valves
  - .1 Valves sized 150 to 300 mm diameter shall be resilient wedge gate valves, conforming to latest revision AWWA C509, and c/w fully rubber encapsulated solid wedge, non-rising stem, suitable for direct bury.
  - .2 Valves to open counter clockwise (Turn left to open).
  - .3 Valve body to be constructed of cast iron, in accordance with ASTM A126, Class “B”. All nuts, bolts and washers to be stainless steel.
  - .4 Interior and exterior of valve to be epoxy coated, as per latest revision AWWA C550.
  - .5 Bronze valve stem to be operated by a 50 x 50 mm square operating nut. The valve stem (stuffing box) shall contain a double “O” ring seal.
  - .6 Valve ends to be push-on “Tyton Joint” conforming to latest revision of AWWA C111-85/ANSI A21.11.



## **2.3 SERVICE CONNECTIONS**

### **.1 General**

- .1 For service connection sizes 20 mm to 50 mm diameter, pipe to be Copper Tubing, Municipex or IPEX Blue 904 Pex.
- .2 For service connection sizes 100 mm to 300 mm diameter, pipe to be Polyvinyl Chloride (PVC) Pressure Pipe as specified in this Section.
- .3 Fittings for service connection sizes 100 mm to 300 mm diameter to be as specified in this Section.
- .4 Valves for service connection sizes 100 mm to 300 mm diameter to be as specified in this Section.

### **.2 Water Service Pipe**

- .1 For services 20 mm to 50 mm diameter, copper tubing conforming to latest revision ASTM B88M, type K, annealed.
- .2 For services 20 mm to 50 mm diameter, cross-linked polyethylene pipe shall be manufactured in accordance with CSA B137.5 and ASTM F876 and shall comply with NSF 14. The pipe and resin (compound) shall be manufactured in an ISO 9001 certified production facility. The degree of cross linking for Municipex pipe shall not be less than 80% when tested in accordance to ASTM D2765 Method B. Municipex pipe shall have CSA / NSF approved pressure rating of:

160 psi @ 23 degree C / 73.4 degree F

100 psi @ 82 degree C / 180 degree F

80 psi @ 93 degree C / 200 degree F

The outside diameter of the pipe shall be copper tube size (CTS) and shall have a standard dimension ratio (SDR) 9.

The pipe shall carry the following marks every 5 feet minimum: manufacturers name, nominal size, ASTM, CSA 7 NSF designations, SDR, pressure/temperature rating, potable tubing, manufacturing date & Machine number and footage mark. The pipe shall have consecutive footage marks every 5 feet (minimum starting with 0 at the beginning of each coil). The pipe shall be shipped in protective cardboard boxes marked with the product name and size.

When connecting Municipex or Blue 904 to main cocks and service valves, stainless steel inserts shall be used.

## **2.4 HYDRANTS**

- .1 Hydrants to be dry barrel, compression type, conforming to latest revision AWWA C502 designed for working pressure of 1,035 kPa (150 psi). Hydrants to close with pressure.
- .2 The pumper and hoze nozzles shall be located a minimum of 460 mm above the ground flange. Nozzle threads to conform to the Alberta Mutual Aid Standard. No chains are required to secure the hydrant caps to the hydrant body. Nozzle sizes to be:
  - .1 Pumper Nozzle: 1-100 mm diameter
  - .2 Hose Nozzles: 2-65 mm diameter (at 90 degrees to pumper nozzle).

- .3 Hydrant valve opening to be 133 mm. Both the valve seat and the valve body to be of bronze construction.
- .4 Hydrant inlet to be 150 mm diameter push-on "Tyton Joint" c/w elastomeric gasket conforming to latest revision of AWWA C111 / ANSI A21.11.
- .5 Hydrants shall be opened by turning the hydrant operating nut left (counter clockwise). The operating nut and nozzle caps to be three-sided, 38 mm on each side.
- .6 Depth of bury to be 2.44 m (8').
- .7 Hydrant branch to be 150 mm diameter PVC pipe conforming to this Section c/w 150 mm connection at main.
- .8 Hydrant bodies and bonnets to be painted with exterior enamel. After installation, paint pumper and hose nozzle caps using exterior enamel in accordance with the following colour code:
  - .1 100 mm diameter - Red
  - .2 150 mm diameter - Yellow
  - .3 200 mm diameter and larger – Black
- .9 Hydrants to be constructed with Break-a-way Flange, complete with a safety stem (spindle). Coupling is to be located at ground level.
- .10 All nuts, bolts and washers to be stainless steel.

## 2.5 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material to: Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 25 mm minus washed drain rock.

Sieve Size	Percent Passing by Weight
25 000	100
16 000	90-100
10 000	45-75
5 000	0-15
1 250	0-5

- .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.
- .2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 - Cast-in-Place Concrete.

## 2.6 BACKFILL MATERIAL

- .1 As indicated. Type 3, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

## **2.7 PIPE DISINFECTION**

- .1 All new water mains shall be disinfected and flushed before being put into services in accordance with the latest edition of AWWA Standard C651 for Disinfecting Water Mains.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
  - .1 Inspect materials for defects to approval of Departmental Representative.
  - .2 Remove defective materials from site .

### **3.2 TRENCHING**

- .1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Ensure trench depth allows coverage over pipe of 3 m minimum from finished grade or as indicated.
- .3 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

### **3.3 CONCRETE BEDDING AND ENCASEMENT**

- .1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
  - .1 Place concrete to details as indicated.
  - .2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
  - .3 Do not backfill over concrete within 24 hours after placing.

### **3.4 GRANULAR BEDDING**

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to 98% minimum of corrected maximum dry density.
- .6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **3.5 PIPE INSTALLATION**

- .1 Lay pipes to ANSI/AWWA C600 ANSI/AWWA M-9 M-11 and manufacturer's standard instructions and specifications.
  - .1 Do not use blocks except as specified.
- .2 Join pipes in accordance with ANSI/AWWA C600 ANSI/AWWA C602 ANSI/AWWA C206 AWWA M-9 M-11 and manufacturer's recommendations.
- .3 Bevel or taper ends of PVC pipe to match fittings.
- .4 Handle pipe by methods approved by Departmental Representative and recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .5 Lay pipes on prepared bed, true to line and grade.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
  - .2 Take up and replace defective pipe.
  - .3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
- .6 Face socket ends of pipe in direction of laying. For mains on grade of 2% or greater, face socket ends up-grade
- .7 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- .8 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
  - .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .9 Position and join pipes with equipment and methods approved by Departmental Representative.
- .10 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .11 Align pipes before jointing.
- .12 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .13 Avoid displacing gasket or contaminating with dirt or other foreign material.
  - .1 Remove disturbed or contaminated gaskets.
  - .2 Clean, lubricate and replace before jointing is attempted again.
- .14 Complete each joint before laying next length of pipe.
- .15 Minimize deflection after joint has been made.
- .16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

- .17 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Departmental Representative.
- .18 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .19 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .20 Do not lay pipe on frozen bedding.
- .21 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.
- .22 Backfill remainder of trench.

### 3.6 VALVE INSTALLATION

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Valves not to be supported by pipe.
- .3 Install underground post-type indicator valves as indicated.

### 3.7 SERVICE CONNECTIONS

- .1 Do not install service connections until satisfactory completion of hydrostatic and leakage tests of water main.
- .2 Construct service connections at right angles to water main unless otherwise directed. Locate curb stops 300 mm inside roadway allowance.
- .3 Tappings on PVC-C900 pipe, may be threaded without service clamps.

- .1 Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used.

- .2 Tappings for PVC-C900 pipe to conform to following:

Pipe Diameter (mm)	Maximum Tap Without Clamp (mm)	Maximum Tap With Clamp (mm)
100	20	25
150	20	25
200	20	25

- .4 Tappings on PVC pipe to be either PVC valve tees or bronze type service clamps, strap type with "O" ring seal cemented in place.
- .5 Tappings for PE pipe: PE tapping tees or multi-saddle tees.
- .6 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.
- .7 Install single and multiple tap service connections on top half of main, between 45 degrees and 90 degrees measured from apex of pipe.
- .8 Install multiple corporation stops, 30 degrees apart around circumference of pipe and minimum of 300 mm apart along pipe.

- .9 Tap main at 2:00 o'clock or 10:00 o'clock position only; not closer to joint nor closer to adjacent service connections than recommended by manufacturer, or 1 m minimum, whichever is greater.
- .10 Leave corporation stop valves fully open.
- .11 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.
- .12 Install rigid stainless steel liners in small diameter plastic pipes with compression fittings.
- .13 Install curb stop with corporation box on services NPS 2 or less in diameter.
  - .1 Equip larger services with gate valve and cast iron box.
  - .2 Set box plumb over stop and adjust top flush with final grade elevation.
  - .3 Leave curb stop valves fully closed.

### 3.8 HYDRANTS

- .1 Hydrants to be dry barrel, compression type, conforming to latest revision AWWA C502 designed for working pressure of 1,035 kPa (150 psi). Hydrants to close with pressure..
- .2 Pumper and hose nozzles shall be located a minimum of 460 mm above ground flange. Nozzle threads to conform to Alberta Mutual Aid Standard.
- .3 Hydrant valve opening to be 133 mm. Valve seat and valve body to be of bronze construction.
- .4 Hydrant inlet to be 150 mm diameter push-on "Tyton Joint" c/a elastomeric gasket conforming to latest revision of AWWA C111 / ANSI A21.11.
- .5 Hydrants shall be opened by turning hydrant operating nut left (counter clockwise). Operating nut and nozzle caps to be three-sided, 38 mm on each side.
- .6 Depth of bury to be 2.44 m (8').
- .7 Hydrant branch to be 150 mm diameter PVC pipe conforming to this Section, c/w 150 mm connection at main.
- .8 Hydrant bodies and bonnets to be painted with exterior enamel. After installation, paint pumper and hose nozzle caps using exterior enamel in accordance with following colour code:

<u>Watermain Diameter</u>	<u>Colour</u>
100 mm	Red
150 mm	Yellow
200 mm and larger	Black

- .9 Hydrants to be constructed with break-a-way flange, c/w safety stem (spindle). Coupling is to be located at ground level.
- .10 All nuts, bolts and washers to be stainless steel.

### 3.9 THRUST BLOCKS AND RESTRAINED JOINTS

- .1 For thrust blocks: do concrete work in accordance with Section 03 30 00 – Cast-in-Place Concrete.

- .2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground.
- .3 Keep joints and couplings free of concrete.
- .4 Do not backfill over concrete within 24 hours after placing.
- .5 For restrained joints: only use restrained joints approved by Departmental Representative.

### **3.10 HYDROSTATIC AND LEAKAGE TESTING**

- .1 Do tests in accordance with ANSI/AWWA C600.
- .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .3 Notify Departmental Representative at least 24 hours in advance of proposed tests.
  - .1 Perform tests in presence of Departmental Representative.
- .4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- .5 Test pipeline in sections not exceeding 100 m in length, unless otherwise authorized by Departmental Representative.
- .6 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed.
- .7 Leave hydrants, valves, joints and fittings exposed.
- .8 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.
- .9 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- .10 Open Valves.
- .11 Expel air from main by slowly filling main with potable water.
  - .1 Install corporation stops at high points in main where no air-vacuum release valves are installed.
  - .2 Remove stops after satisfactory completion of test and seal holes with plugs.
- .12 Thoroughly examine exposed parts and correct for leakage as necessary.
- .13 Apply hydrostatic test pressure based on elevation of lowest point in main and corrected to elevation of test gauge, for period of 1 hour.
- .14 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.
- .15 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .16 Repeat hydrostatic test until defects have been corrected.
- .17 Apply leakage test pressure after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 2 hours.

- .18 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2 hours.
- .19 Do not exceed allowable leakage of 0.03 L/mm of pipe, including lateral connections.
- .20 Locate and repair defects if leakage is greater than amount specified.
- .21 Repeat test until leakage is within specified allowance for full length of water main.

### **3.11 PIPE SURROUND**

- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
  - .1 Do not dump material within 0.6 m of pipe.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 98% of corrected maximum dry density.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 98% of corrected maximum dry density.

### **3.12 BACKFILL**

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Under Paving and walks, compact backfill to at least 98% corrected maximum dry density.
  - .1 In other areas, compact to at least 98% corrected maximum dry density.

### **3.13 HYDRANT FLOW TESTS**

- .1 Conduct flow tests on every hydrant to determine fire flows prior to painting hydrant caps and ports.

### **3.14 FLUSHING AND DISINFECTING**

- .1 Flushing and disinfecting operations: witnessed by Departmental Representative.
  - .1 Notify Departmental Representative at least 4 days in advance of proposed date when disinfecting operations will begin.
- .2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.
- .3 Flushing flows as follows:

<u>Pipe Size NPS</u>	<u>Flow (L/s) Minimum</u>
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6 and bleow	38
8	75
10	115
12	150

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- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, hydrants and service connections to ensure thorough flushing.
- .6 When flushing has been completed to Departmental Representative approval, [introduce strong solution of chlorine as approved by Departmental Representative into water main and ensure that it is distributed throughout entire system.
- .7 Disinfect water mains.
- .8 Rate of chlorine application to be proportional to rate of water entering pipe.
- .9 Chlorine application to be close to point of filling water main and to occur at same time.
- .10 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- .11 Flush line to remove chlorine solution after 24 hours.
- .12 Measure chlorine residuals at extreme end of pipe-line being tested.
- .13 Perform bacteriological tests on water main, after chlorine solution has been flushed out.
  - .1 Take samples daily for minimum of 2 days.
  - .2 Should contamination remain or recur during this period, repeat disinfecting procedure.
- .14 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.
- .15 After adequate chlorine residual not less than 50 ppm has been obtained leave system charged with chlorine solution for 24 hours.
  - .1 After 24 hours, take further samples to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

### **3.15 SURFACE RESTORATION**

- .1 After installing and backfilling over water mains, restore surface to original condition.

### **3.16 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .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 11 - Cleaning.

**END OF SECTION**

**Part 1            General**

**1.1                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Indicate on drawings proposed method for installing carrier pipe for undercrossings.
- .3        Inform Departmental Representative at least 2 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .4        Certification to be marked on pipe.
- .5        Submit manufacturer's test data and certification 2 weeks minimum before beginning Work.

**1.2                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

**1.3                SCHEDULING OF WORK**

- .1        Schedule Work to minimize interruptions to existing services and maintain sewage flows during construction.
- .2        Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.
- .3        Notify Departmental Representative minimum of 24 hours in advance of interruption in service.

**Part 2            Products**

**2.1                SMOOTH WALL POLYVINYL CHLORIDE (PVC) PIPE**

- .1        For pipe sizing 150 mm to 375 mm diameter, all pipe to be PVC gravity sewer pipe to latest revision ASTM D3034, SDR 35, CSA certified as meeting latest revision CSA B182.2-M, integral locked-in gasket bell and spigot system.
- .2        For pipe sizing 450 mm to 900 mm diameter, all pipe to be PVC gravity sewer pipe to latest revision STM F679, SDR 35, CSA certified as meeting latest revision CSA B182.2-M, integral locked-in gasket bell and spigot systems.
- .3        Polyethylene Pipe:
  - .1 Conform to CSA-B.137.1 and CGSB 41-GP-25M, PE 3408.
  - .2 Joint pipe using thermal butt fusion to AWWA C207.
  - .3 Fittings: 1) To be flanged to AWWA C207; 2) Fittings shall match the pipe supplied and shall be supplied by the manufacturer of the pipe or by suppliers approved by the pipe manufacturer; 3) All fittings to be compatible in materials and dimensions with the pipe.

- .4 Tracer Wire to be an electric #14 AWG Solid SBC (1/64") polyethylene insulated wire or metal tape detectable to 3 m bury.

## **2.2 SERVICE CONNECTIONS**

- .1 Smooth Wall PolyVinyl Chloride (PVC) Pipe
  - .1 For PVC service connections 100 mm to 150 mm diameter, all pipe to be to latest revision ASTM D3034, CSA certified as meeting latest revision CSA B182.1-M, SDR 28, integral locked-in gasket bell and spigot joints.
- .2 PolyVinyl Chloride (PVC) Fittings
  - .1 For PVC service connections 100 mm to 150 mm in diameter, all fittings to be to latest revision ASTM D3034, CSA certified as meeting latest revision CSA B182.2-M, SDR 28, integral locked-in gasket bell and spigot joints.
  - .2 Connecting to Mains:
    - .1 PVC Tee Saddle c/w Rubber Gasket Joint: Saddles to be manufactured with integral centering ring of teeth to align saddle opening with hole in pipe. Saddle to be fastened to main by adjustable stainless steel straps. Screw mechanism on straps to be completely stainless steel.
    - .2 PVC Insert Type Fittings: Insert type fitting ("Inserta-Tee") to be PVC PSM gasket joint stubs, c/w moulded rubber sleeve and adjustable stainless steel strap. Screw mechanism on straps to be completely stainless steel.

## **2.3 PIPE BEDDING AND SURROUND**

- .1 Granular material to Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 25 mm minus washed drain rock.
  - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117.
    - .1 Sieve sizes to CAN/CGSB-8.1.
- .2 Concrete mixes and materials for cradles, encasement, supports: to Section 03 30 00 - Cast-in-Place Concrete.

## **2.4 BACKFILL MATERIAL**

- .1 As indicated.
- .2 Type 3, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.
- .2 Clean and dry pipes and fittings before installation.
- .3 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

### **3.2 TRENCHING**

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Protect trench from contents of sewer or sewer connection.
- .3 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.

### **3.3 GRANULAR BEDDING**

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
  - .1 Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 98% corrected maximum dry density.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with common backfill.

### **3.4 INSTALLATION**

- .1 Lay and join pipes to: ASTM C 12.
- .2 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .3 Handle pipe using methods approved by Departmental Representative.
  - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .4 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .6 Joint deflection permitted within limits recommended by pipe manufacturer.
- .7 Water not to flow through pipe during construction, unless permitted by Departmental Representative.
- .8 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .9 Install plastic pipe and fittings in accordance with CSA B182.11.
- .10 Pipe jointing:
  - .1 Install gaskets in accordance with manufacturer's written recommendations.

- .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .3 Align pipes before joining.
- .4 Maintain pipe joints free from mud, silt, gravel and foreign material.
- .5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
- .7 Minimize joint deflection after joint has been made to avoid joint damage.
- .8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
- .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .11 When stoppage of Work occurs, block pipes to prevent creep during down time.
- .12 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .13 Make watertight connections to manholes.
  - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .14 Use prefabricated saddles or field connections approved by Departmental Representative, for connecting pipes to existing sewer pipes.
  - .1 Joints to be structurally sound and watertight.

### **3.5 CONCRETE THRUST BLOCKING**

- .1 All plugs, caps, tees, crosses, reducers, hydrants, valves, and bends (deflecting 11¼ degrees or more) shall be anchored to prevent movement. Suitable reaction blocking shall be used for this purpose.
- .2 Blocking shall be placed between solid ground and the fitting to be anchored. The area of bearing on the pipe and on the ground in each instance shall be as determined by the Consultant. The blocking shall be so placed that the pipe and fitting joints will be accessible for repair. Typical thrust block locations are shown on the standard drawing.

### **3.6 PIPE SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
  - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
  - .1 Do not dump material within 10 m of pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.

- .5 Compact each layer from pipe invert to mid height of pipe to at least 98% corrected maximum dry density.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90% corrected maximum dry density.
- .7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

### **3.7 BACKFILL**

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 98% corrected maximum dry density.

### **3.8 SERVICE CONNECTIONS**

- .1 Install pipe to CSA B182.11 and manufacturer's instructions and specifications.
- .2 Service connections to main sewer: Departmental Representative approved saddles.
  - .1 Do not use break-in and mortar patch-type joints.
- .3 Service connection pipe: not to extend into interior of main sewer.
- .4 Make up required horizontal and vertical bends from 45 degrees bends or less, separated by straight section of pipe with minimum length of 4 pipe diameters.
  - .1 Use long sweep bends where applicable.
- .5 Plug service laterals with water tight caps or plugs as approved by Departmental Representative.

### **3.9 TRACE WIRE**

- .1 Tracer wire shall be installed simultaneously with the pipe on all mains and services. Splicing of the tracer wire can be done by soldering only. The connection shall be sealed with mastic and electrical tape. The Contractor shall be responsible for ensuring electrical continuity of the completed system.
- .2 The tracer wire shall be brought above ground at every valve box riser, at every road crossing, at every facility location and at each end of every pipe section. It shall be brought above ground inside a rigid PVC conduit and looped inside a PVC junction box. The junction box shall be mounted to a marker post and be complete with a blank weatherproof cover. The wire shall be coiled inside these junction boxes. Rigid PVC conduit need only extend 1 m below grade at valve boxes and shall extend down to the waterline at all other locations.
- .3 The tracer wire shall be installed on the top centreline of the pipe. Allowable tolerances will be a maximum of 25 mm clearance between the tracer wire and the pipe and 100 mm either side of the top of pipe. Tracer wire shall be attached to pipe in a manner acceptable to the Consultant.

**3.10 MARKER POSTS**

- .1 Marker posts shall be installed at all valves and specials. Markers shall be 50 mm diameter steel posts painted blue.

**3.11 WARNING SIGNS**

- .1 Warning signs and painted fence posts shall be installed at the edge of the road allowance where pipelines cross roadways and at the fence of every  $\frac{1}{4}$  section line. The Contractor shall install warning signs as per detail drawings.
- .2 Pipeline signs shall be 406 mm x 305 mm warning signs printed on 3M 3650 or 3690 Scotchlcl in black ink. Mounted on 12 gauge high tensile aluminum (0.61) sign sheet. Sign holes to be drilled 11 m (7/16") on 35 mm (14") centres.
- .3 Pipeline warning posts shall be 2.7 metres in length, hat section, galvanized sign post punched and complete with hardware recommended for pipeline crossing signs.

**3.12 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - a) 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 11 – Cleaning.

**Part 4 Field Testing**

**4.1 GRAVITY SEWERS**

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Remove foreign material from sewers and related appurtenances by flushing with water.
- .3 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
- .4 Do infiltration and exfiltration test to ASTM C 828.
- .5 Do infiltration and exfiltration testing as specified herein.
  - .1 Perform tests in presence of Departmental Representative.
  - .2 Notify Departmental Representative 24 hours minimum in advance of proposed tests.
- .6 Carry out tests on each section of sewer between successive manholes including service connections.
- .7 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.
- .8 Exfiltration test:
  - .1 Fill test section with water to displace air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are begun.

- .2 Immediately prior to test period add water to pipeline until there is head of 1 m over interior crown of pipe measured at highest point of test section or water in manhole is 1 m above static ground water level, whichever is greater.
- .3 Duration of exfiltration test: 2 hours.
- .4 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.
- .9 Infiltration test:
  - .1 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.
  - .2 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.
  - .3 Install watertight plug at upstream end of pipeline test section.
  - .4 Discontinue pumping operations for at least 3 days before test measurements are to begin and during this time, keep thoroughly wet at least one third of pipe invert perimeter.
  - .5 Prevent damage to pipe and bedding material due to flotation and erosion.
  - .6 Place 90 degrees V-notch weir, or other measuring device approved by Departmental Representative in invert of sewer at each manhole.
  - .7 Measure rate of flow over minimum of 1 hour, with recorded flows for each 5 min interval.
- .10 Infiltration and exfiltration: not to exceed following limits in L per hour per 100 m of pipe, including service connections.

Nominal Pipe Diameter in mm	Asbestos-Cement or Plastic Pipe	Concrete or Vitrified Clay Pipe
100	3.88	25.5
125	4.62	30.0
150	5.51	34.0
200	7.45	41.5
250	9.39	49.5
300	11.33	56.5
350	13.27	63.5
400	14.91	70.0
450	16.84	76.0
500	18.78	81.5
550	20.72	87.0
600	22.80	92.5
700	26.53	102.0
800	30.11	110.5
900	33.69	118.0
1000	37.56	124.5
1100	41.29	130.0
1200	45.01	135.0

- .11 Leakage: not to exceed following limits in litres per hour per mm of diameter per 100 m of sewer including service connections:



- .1      Exfiltration, based on 600 mm head: 0.175 L.
- .2      Infiltration: 0.150 L.
- .12     Repair and retest sewer line as required, until test results are within limits specified.
- .13     Repair visible leaks regardless of test results.
- .14     Television and photographic inspections:
  - .1      Carry out inspection of installed sewers by video camera, digital camera or by other related means.

#### **4.2            HDPE FORCE MAINS**

- .1      Before acceptance of the work, the entire system shall be subjected to a hydrostatic pressure test in the presence of the Consultant. Notify Consultant at least 48 hours in advance of all proposed tests. The Contractor shall provide all necessary labour, materials and equipment for the test including a suitable pump, measuring tank, pressure hoses, connections, plugs, caps, gauges and all other apparatus necessary for filling the main, pumping to the required test pressure and recording the pressure and leakage losses. The Contractor shall provide evidence that the gauges used are accurate.
- .2      When the line has been filled and most of the air expelled, time should be allowed for the remaining air and water to reach a constant temperature.
- .3      No test shall be applied until at least 7 days after the concrete thrust reaction block has been cast and plugged ends securely braced. In the case of high early strength concrete, allow a minimum of 3 days.
- .4      The test section may be pressured through a hydrant or a tap may be installed in the line. After testing the pipe, the tap shall be plugged at the Contractor's expense.
- .5      Fill the force main at a velocity of less than 0.6 m/s.
- .6      Each section between valves shall be brought to test pressure with the valves closed, to test the valves under pressure. Test pressure shall be held without loss for two (2) minutes before opening the valve and releasing the pressure into the next section.
- .7      Mark the gauge and the level of water in the storage barrel at the beginning of the test.
- .8      Maintain the test pressure within + 20 kPa of the specified test pressure for the duration of the test. Pump the test section back to the test pressure at the end of the first 30 minutes. If the allowable leakage is exceeded, air may be trapped. Remove trapped air and repeat the test.
- .9      The test procedure consists of two steps. The initial expansion phase and the test period. In order to accommodate the initial expansion of the main under test, the following shall be done:
  - a) Fill the line with water and pressurize to 1.5 times the Standard Pressure Rating of the main. All air shall be expelled from the line during filling of the test section.
  - b) Add sufficient make-up water to the main at hourly intervals to return the main to the test pressure. The initial expansion shall be done for a 3 hour period so the main shall be repressurized 3 times during this phase.

c) After the third repressurization, the test period shall begin. No make-up water shall be added to the main until the end of the test period which shall be 1 to 3 hours long. At the end of the 3 hours, a measured quantity of make-up water shall be added to the main to repressurize it to the test pressure. The amount of make-up water shall not exceed the volume allowance for expansion given below

d) Allowance for expansion under test pressure in litres for each 100 metre of pipe at 23°C.

Nominal Pipe Diameter in mm	1 Hour Test	2 Hour Test	3 Hour Test
75	1.2	1.9	3.1
100	1.6	3.1	5.0
150	3.7	7.5	11.2
200	6.2	12.5	18.7
250	8.7	16.2	26.2
300	13.7	28.7	42.4
350	17.4	33.7	52.4

e) The amount of make-up water shown in the table above should be multiplied by the appropriate correction factor taken from below for the pipe temperature at the time of testing:

Temperature (°C)	Correction Factor
0	0.22
2	0.24
4	0.28
6	0.32
8	0.36
10	0.42
12	0.47
14	0.53
16	0.59
18	0.66
20	0.74
22	0.87
23	1.00
24	1.20

Under no circumstances should the total time under test exceed eight (8) hours at 1.5 times the pressure rating. If the test is not completed due to leakage, equipment failure or any other reason within this time period, the test section shall be permitted to “relax” for an additional eight hour period prior to starting the next testing sequence.

- .10 If the test fails any section of the water main, the Contractor shall locate and repair the leaks at no extra cost. After such repairs, retesting of the repaired sections shall be conducted.
- .11 Where connections are made to existing water mains, the pressure used to test sections of new mains which cannot be isolated from the existing mains shall be specified by the Consultant, or the leakage test may be waived by the Consultant. This shall not relieve the Contractor from his obligation to repair leaks or replace defective material.
- .12 It is the responsibility of the Contractor to ensure that normal safety precautions are observed for hydrostatic pressure tests.

- .13 Flush and clean out pipes after pressure tests.
  - a) Remove stops after satisfactory completion of test and seal holes with plugs, make repairs to insulation and external protective jacket as required.
  - b) Dispose of flushing water in a manner acceptable to the Consultant.
- .14 Maintenance: If leaks develop in the work before the expiry of the maintenance period, the Contractor shall make the necessary repairs. The leaks shall be deemed repaired when the leakage is less than the allowable amount specified.
- .15 Damages: Water introduced into the force mains by the Contractor shall be at his own risk. All damage to the pipe from freezing or other causes shall be repairs by the Contractor at his own expense

**END OF SECTION**

**PART 1      GENERAL**

1.1      Related sections but not necessarily limited to

- .1      Division 03 – Concrete  
         Division 31 – Earthwork  
         Division 33 – Utilities
- .2      Refer to the soil test pits report (TP15-06) for soil and water table information to design a concrete base for the lift station.
- .3      Supply, deliver, install, test and adjust ready for operation of a new submersible sewage lift station, as specified herein, including pump motors, pump accessories, pump monitoring equipment, blower heater, level switches, level controller, control panel and instrumentation. All electrical equipment shall meet hazardous area classification requirements, if applicable.

1.2      References

- .1      Alberta Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems
- .2      Aluminum work in compliance with CSA CAN3-S157
- .3      Company Certification to CSA W 47.2
- .4      Canadian Electrical Code

1.3      Fabrication Standards

- .1      Amec 4S-10.01 Manufacture and Installation for FRP structures
- .2      Amec 4S-10.02 FRP pressure pipe, fittings and flanges
- .3      Flygt specification GE-1008-04 (Latest version) or equivalent

1.4      Submittals

- .1      Product Data: Provide manufacturer's technical data including operating characteristics. Include product data for covers, fiberglass cell, guide rail assembly, piping, valves, control panel, and accessories. Include product data for pumps. Include product data for control panel and panel wiring schematic.
- .2      Pump Performance Curves: Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include net positive section head (NPSH) curve and total dynamic head calculations. Include performance chart for motor showing curves for torque, current, power, factor, input/output KW and efficiency. Include data on starting and no-load characteristics.
- .3      Shop Drawings: Show fabrication and installation details for the station. Indicate dimensions of New Lift Station cell. Detail equipment assemblies and indicate dimensions; loads; required clearances; method of field assembly; components; electrical characteristics; and location and size of each field connection.

Pumps: Indicated pump type, capacity, and power requirements.  
Wiring Diagrams: Power, signal, and control wiring.  
Indicate requirements for guide rail and bracket fabrication based upon selected pump.

- .4 Submit the following additional information:
  - .1 Dimensional drawings of each pump, including mass of major components.
  - .2 Dimensional drawings of specified pump equipment and accessories.
  - .3 Minimum submergence and impeller size.
  - .4 Pump cross-section with replacement parts list.
  - .5 List of recommended spare parts list.
  - .6 Proof of Pump/Motor CSA approval.
  - .7 Certificate signed by manufacture verifying lift station performance testing.
  - .8 Field testing report documenting lift station operational performance.
  - .9 Singed copy of manufacturer's warranty.
  - .10 Uplift calculations sealed by a P.Eng. registered with APEGA

#### 1.5 Operations and Maintenance Data

- .1 Submit Operation and Maintenance Data in accordance with Section 01 77 01 - Operations and Maintenance Manual.
- .2 For sewage lift station equipment including control panel and ventilation unit provide:
  - .1 General overall layouts
  - .2 Detailed wiring schematics
  - .3 Provide single line diagram for each station identifying all electrical loads.
  - .4 Parts list complete with list of recommended spare parts
  - .5 Control narrative describing overall operation of station components
  - .6 Detailed instructions for adjustment of start-stop levels.
  - .7 Detailed maintenance and lubrication schedule, including daily, weekly, monthly, semi-annual and annual checks.
  - .8 Detail for each pump

## **PART 2      PRODUCTS**

### 2.1 Fiberglass Reinforced Plastic (FRP) Lift Station

- .1 Diameter (inside): 2.438 m (8 ft)
- .2 Height: approximately 4.0 m (13.2 ft)
- .3 The shell will have a sanitary white gelcoat finish on the interior, backed up with a standard corrosion liner which includes a surfacing veil and two layers of 1.5 oz. chopped strand mat. These reinforcements are wetted out with a premium grade isophthalic resin. The glass content of the corrosion liner shall be 20-30% with an overall thickness of .11". Shell structure shall be filament wound in a helical pattern with a winding angle of 60 -70 degrees from the horizontal axis, to a total thickness of .55". Glass content of this filament wound structure shall be between 60% and 70% by weight. External

reinforcing ribs shall also be installed using the filament winding process. These ribs are trapezoidal in shape with a 2" height with approximately 1/4" of thickness. Rib spacing shall be shown on shop drawings.

- .4 The FRP base design and fabrication is critical in handling the uplift forces present and to provide adequate mounting for the discharge connections. The standard design for these bases incorporate the same corrosion liner as the shell, but uses a combination FRP/foam core composite for the structure. This base will have a total thickness of 95mm (3.75") to withstand a full hydrostatic head outside of station with no fluid inside. A minimum 16" x 16" square solid FRP pad will be provided in the base for bolting of each discharge connection. The 3/4" stainless steel base bolts are installed into these solid pads and glassed over from the back side to prevent any leakage. The base is to have a smooth radiused corner on the inside in order to eliminate benching. It should also be noted that this base gets installed to the corrosion liner before the filament winding process in order to wind past the knuckle radius of the base. This provides an integral base to shell joint and adds thickness to the radiused corner.
- .5 An aluminium checker-plate cover with lip will be installed onto the top of the station, with Flygt hatches bolted into it for station access. All bolting hardware will be 304 stainless steel.
- .6 A center mount sleeve for the safety davit shall be installed on the top of the Lift Station.
- .7 A working floor or intermediate platform consists of aluminium angle or channel frame with wall clips made in aluminium with floor grating made of Safe-T-Grate fiberglass 1.5"x1.5"x1.5" deep. This particular station has a full platform. Hinged door sections are installed to accommodate removal of pumps.
- .8 Station will include a full length ladder to the station floor. This is a marine grade aluminium industrial ladder with non-slip treads. Aluminium wall brackets are attached to this ladder approximately every 6' in length.
- .9 Threaded PVC couplers are laminated to the station wall to provide sealed connections for electrical cables. 2" diameter couplers be installed at elevation and orientation required to connect to control and power panels.
- .10 For handling and anchoring purposes a total of 2 lifting and 8 hold down lugs will be installed. These lugs are 4" wide by 1/2" thick mild steel coated with coal tar epoxy. Lugs are installed during the filament winding of the reinforcing ribs and are placed under the very bottom and top ribs.

## 2.2 Manufacturer

- .1 The pump manufacturer shall have several units of similar type pumps installed and operating for no less than five years in Canada.
- .2 The motor and pump shall be designed and assembled by the same manufacturer.

## 2.3 Performance Requirements

- .1 Supply and install two submersible non-clog wastewater pumps each rated at 5 L/s at a TDH of 4.2 m. Pumps shall be Flygt or approved equal.
- .2 Each pump shall be equipped with a 2.25 kW (3.0 hp), submersible electric motor connected for operation to 208 Volts, three (3) phases, 60 hertz, with sufficient length of submersible, SOW cable for removal and servicing of each pump.
- .3 The neoprene or CPE jacketed cable shall be sized according to CSA standards and carry a CSA approval.
- .4 The pumps shall be supplied with pump stands with 100 mm mating cast iron flange.
- .5 Fit one of the pumping units with a Flygt hydraulic mix flush valve .
- .6 Each pump shall be supplied with sufficient length of steel lifting chain for removal and servicing of each pump. The safe working load of the lifting chain shall be at least 40% greater than the pump weight. Sufficient chain shall be supplied to enable the chain to be threaded into the chain hoist with the pump removal hatch in an open position.

#### 2.4 Pump Design

- .1 The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well.
- .2 Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal, watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor.

#### 2.5 Impeller Design

- .1 The impeller shall be of semi-open, multi-vane, backswept, non-clog design. The impeller vanes shall be self-cleaned upon each rotation as they pass across a relief groove(s) located in the pump housing (or in an insert ring in the pump housing) and shall keep the vane clear of debris, maintaining an unobstructed pumping.
- .2 The impeller(s) shall have heavily back swept leading edges with a specific angle distribution enabling the capability of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Impellers shall be locked to the shaft. The clearance between the pump housing/insert ring and the impeller shall be adjustable. The impeller shall be of grey cast iron (ASTM A48 Class 35B) with hardened edges.

#### 2.6 Pump Construction

- .1 Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blowholes or other irregularities.

- .2 All exposed nuts or bolts shall be of AISI type 304 stainless steel. An approved, sewage resistant coating shall protect all metal surfaces coming into contact with the pumpage, other than stainless steel or brass.
- .3 Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings.
- .4 Fittings shall be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
- .5 Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

## 2.7 Mechanical Seals

- .1 Each pump shall be provided with a tandem mechanical shaft seal system consisting of two, totally independent seal assemblies.
- .2 The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate.
- .3 The lower, primary seal unit, located between the pumped liquid and the lubricant chamber, shall contain one stationary and one positively driven rotating tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary tungsten-carbide seal ring and one positively driven rotating carbon seal ring.
- .4 Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing.
- .5 Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load. The seal lubricant shall be non-toxic and FDA approved for potable water applications.

## 2.8 Bearings

- .1 The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces.

## 2.9 Electric Motors



- .1 The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, EEMAC B type. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (355°F). The stator shall be trickle impregnated using Class H resin and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable.
- .2 The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel.
- .3 The motor and pump shall be designed and assembled by the same manufacturer.
- .4 The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C (176°F).
- .5 The power cable shall be sized according to the CEC and CSA standards and shall be of sufficient length to reach the junction box without the need of any splices. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 20 metres.
- .6 The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

#### 2.10 Protection

- .1 All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F) the thermal switches shall open, stop the motor and activate an alarm.
- .2 A leakage sensor shall be included to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote.
- .3 The thermal switches and FLS shall be connected to a Flygt MiniCAS II (Control & Status) monitoring unit to be supplied and mounted in the control panel.

#### 2.11 Painting

- .1 The exterior of the pump, including all metal surfaces coming into contact with the pumpage shall be protected by a factory-applied spray coating of acrylic dispersion zinc phosphate primer and finished with a polyester, epoxidized resin paint. Prior to the final paint finish being applied, the pump components shall be primed and washed. The components shall then be assembled and washed

a second time before the final topcoat is applied. The finish paint or topcoat shall be Flygt Duasolid, applied externally to a minimum dry film thickness of not less than 100 microns. The film thickness shall be consistent with ISO 2808, Method No. 6.

2.12 Station Equipment

- .1 Supply and install guide bars for each pump including upper, lower and intermediate guide bar holders. Guide bars shall extend from the pump discharge assembly to the top of the station.
- .2 Supply and install pump stands (anchor frame) for each pump. The pump stand shall be c/w 100 mm discharge flange.
- .3 Supply and install external blower heater unit. Unit shall be DEXON Model MDH3 or approved equal. Unit shall be able to provide at 6 air changes per hour and shall be suitable to install within a Class 1, Division 2 location. Unit shall have a maximum heating capacity of 3 kW and shall operate with 208 volt, three phase power. Unit to be complete with alarm module to generate alarms for "No Air", "Low Temperature", or "Overheat" condition or any combination of the three.
- .4 Supply lifting davit wall mounted support to suit Davit as specified in 2.10.3.
- .5 Supply and install Davit Arm mounting plate as specified in Section 10.45.00.

2.13 Pump Lifting Davit

- .1 Supply one lifting davit with a lifting capacity suitable for lifting the heaviest pumps, complete with chain hoist sized to allow removal of pumping units at each lift station.

2.14 Piping, Valves and Fittings

- .1 All discharge piping will be 316SS SCH10 and all inlet stubs will be FRP 200 psi rated. Vent piping will consist of FRP ducting. Spools from the discharge connection and the valves on header shall use full face flanges. This discharge header shall be made removable by a set of flanges to the force main pipe. All inlet and outlet nozzles are to be FRP laminated inside and out to the tank wall with external gussets where required. Nozzles are machined to a precise O.D. as per your field requirements. Bolting for all flanges are to be 304 Stainless Steel. All interior piping is coated with a bright white gelcoat
- .2 Supply and install 100 mm diameter flanged check valves (Flygt) for each pump.
- .3 Supply and install 100 mm diameter flanged Non-Lubricated eccentric plug valves c/w manual gear operator for each pump, cast iron body, cast iron resilient coated plug, seat compatible with raw sewage.
- .4 Supply and install 50 mm NPT air release valve.
- .5 All submerged bolts and nuts shall be stainless steel.

- .6 Couplings within the station shall be Victaulic Zero-Flex Style 07. Couplings shall be epoxy coated and shall be supplied with stainless steel bolting materials.
- .7 Couplings for buried service shall be Dresser as shown on the drawings. Dresser couplings shall be Denso Paste and Denso tape wrapped. Bolting materials shall be stainless steel. Supply and install Dresser Style 440 joint harnesses as shown on the Drawings. Bolting materials for joint harnesses shall be stainless steel. Joint harness bolts shall be Denso paste and tape wrapped. Provide anodes for each coupling as shown on the Drawings.

#### 2.15 Epoxy Pipe Coatings

- .1 Piping shall be externally epoxy coated with Devco Bar-Rust 235 or approved equal. Surface Preparation shall be commercial sandblast to SSPC SP10. Provide a prime coat of 150 micron (dry) and top coat of 150 micron (dry) for a total dry film thickness of 300 micron (12 mils).
- .2 Pipes for buried service shall be epoxy coated and externally protected with yellow jacket.

#### 2.16 Control Panels

- .1 Supply and install PLC based control panels for each station complete with pump motor starters, ultrasonic level control system, float bulbs suitable for installation within a Class 1, Zone 2 environment, and other components to provide a complete operating station. The operational control system shall be as described below and in this section. The controller shall be Flygt Multi-Smart. Control panels shall be signed to accommodate the flow meters remote mounted electronics.
- .2 Supply, install necessary communication hardware to facilitate telemetering of alarms via future wireless network. Controller must be capable of communicating with the central SCADA system via wireless internet connection.

The following alarms are to be programmed into the alarm dialer:

- .1 Low Level Alarm
  - .2 High Level Alarm
  - .3 Pump 1 Fail
  - .4 Pump 2 Fail
  - .5 Pump 1 and Pump 2 Fail
  - .6 Common Station Alarm
- .3 Supply and install breaker and starter in control panel to facilitate connection of Blower Heater.
- 4 Control/Power panel to be NEMA 4 lockable with handle and double doors. The inner door to be used to mount control devices and indicators. The outer door to be used to lock the panel.
- .5 Power supply to the control panel will be 208 volt, 60 Hz, 3-phase.

- .6 Panel shall provide for all loads as shown on the single line diagrams.
- .7 Panels shall be provided with a thermostatically controlled interior heater.
- .8 Each control panel shall be sized to provide a clear space of 300 mm x 300 mm for future communication devices.

#### 2.17 Ultrasonic Level Sensor

- .1 An ultrasonic level sensor shall be installed in the new wet well cell and can be submersible.
- .1 Measuring range: min. 0.3m, max. 15 m
- .1 Mounting thread and facing: 1" NPT ((Taper), ANSI/ASME B1.20.1)
- .1 Cable length: 30 m (98.43 ft)
- .1 Approvals: CSA Class 1 Div 1 (available only with Mounting Options)
- .1 Echomax XPS-15 Transducer High-frequency ultrasonic transducer or approved equal.

#### 2.18 Control and Instrumentation

- .1 Provide one complete control package to integrate all aspects of the sewage pumping stations.
- .2 Controls based on the manufacturer's standard PLC based control system. Controller must be capable of communicating with the central SCADA system via wireless internet connection. User program shall be provided on an optical disc.
- .3 Systems to provide the control sequence for two pumps based on float switches. Level set points to be confirmed during shop drawing review stage.
- .4 Level alarms for each station will be based on level detected by high level and low level float bulbs.

Control Level	Level Position	Control Point Function	Rising or Falling Condition
LAH	LS-5	Initiate high level alarm, start lead pump, delay 15 seconds and start lag pump	Rising
P2 Start	LS-4	Lag pump starts	Rising
P1 Start	LS-3	Lead pump starts	Rising
Stop	LS-2	Stop both pumps and switches the lead and lag roles for next cycle.	Falling
LAL	LS-1	Stop both pumps and initiate low level alarm, adjustable delay between 15 seconds to 120 seconds	Falling

- .5 Pumping Control Philosophy
  - .1 Level bulbs and ultrasonic level transmitter provide input to controls for pump operation. Level bulbs installation shall utilize Xylem Vertical level Regulator Hanger Installation. Provide two

single hangers connected via galvanized chain. Unit shall be suitable for two level bulbs.

- .2 Controls starts and stops pumps on rising and falling levels determined during shop drawing review stage. LS-1 and LS-5 (level bulbs) to be hard wired directly to pump motor starters.
- .3 LS-2, LS-3 and LS-4 are from the ultrasonic level transmitter.
- .4 The Control Panel to have red indicators for the following alarms:
  - .1 Stator Leakage Pump 1, Pump 2.
  - .2 Stator High Temperature Pump 1, Pump 2
  - .3 Pump 1, Trip
  - .4 Pump 2, Trip
  - .5 LAL
  - .6 LAH
- .5 Alarm from stator leakage or high temperature will stop lead pump, start lag pump, and generate an alarm.
- .6 Any alarm condition will cause the appropriate alarm indicator to flash. At the same time the alarm beacon will operate.
- .7 The Alarm Acknowledge button will cause the flashing indicators to switch to steadily-lit and will shut off the beacon.
- .8 The Alarm Reset button will clear the alarm condition in the controls and extinguish the indicator.
- .9 If the alarm condition still exists the indicator will begin flashing again.
- .10 The Lamp Test button will test all indicators and operate the beacon.
- .11 The Control Panel to have red indicators for the following:
  - .1 Pump 1 Running
  - .2 Pump 2 Running
- .12 Three hour meters, one for each pump, and one for when both pumps are operating together, record elapsed operating time.
- .13 Alarm beacon to be Edwards 49CR N5, 120 VAC or approved alternative.
- .14 Motor Starters:
  - .1 Submit shop drawings to show:
    - .1 Mounting method and dimensions.
    - .2 Starter size & type
    - .3 Layout of identified internal & front panel components.
    - .4 Enclosure types
    - .5 Wiring diagram for each starter.
    - .6 Interconnection diagrams.
    - .7 Overload relay trip settings.
  - .2 Provide operation and maintenance data for motor starters.

- .3 Include operation and maintenance data for each type and style of starter.
- .4 Provide one spare set of load contacts and one spare set of auxiliary contacts for each starter.
- .5 Provide two spare fuses of each type.
- .6 Half-size starters not acceptable.
- .7 Each starter to consist of:
  - .1 Control transformer with size and voltages as required.
  - .2 Solenoid-operated contacts, as indicated on single-line diagram by vendor.
  - .3 Overload relay sized as required for motor connected, manual reset via push-button.
  - .4 Power and control terminals.

2.19 Lighting

- .1 Provide one explosion proof light, Cooper Crouse-hinds Hazguard Exacta, wall mount.

**PART 3** **EXECUTION**

3.1 Installation

- .1 Install pumping equipment in the locations shown on the Drawings and in accordance with the recommendations of the manufacturer.
- .2 Align equipment and pipe connections to avoid the transmission of piping weight or reactions to the equipment at pipe connections.
- .3 Grout pump steel support base using non-shrink grout Sika 212SR or equivalent.
- .4 Provide the services of the manufacturer's representative to inspect and make final adjustments to the equipment.
- .5 Provide all pumping units properly mounted, aligned and balanced so that vibrations do not exceed the limits recommended by the Hydraulic Institute Standards for Centrifugal Pumps.
- .6 Acceptance of equipment shall be subject to the final inspection of the Departmental Representative based on running tests after installation.
- .7 Check for correct direction of rotation.

3.3 Lubrication

- .1 The Contractor shall ensure that the pump and drive are correctly lubricated in accordance with the manufacturer's instructions.

3.4 Field Testing

- .1 Force Main: Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 1035 kPa (150 psi).
- .2 Field test all pumps in the presence of the Departmental Representative to demonstrate the installation is correctly completed and all pumps are operating satisfactorily over the entire speed range specified without vibration or cavitation.
- .3 If vibration or cavitation should occur during the test procedure, correct any deficiencies as required and retest the pump until all vibration or cavitation is removed.
- .4 During the initial test of a pump unit, Contractor is to arrange to have the Departmental Representative, the manufacturer's representative and a representative of the Departmental Representative on site.
- .5 All costs for the presence of the pump manufacturer's representative for inspections, adjustments and performance tests shall be borne by the Contractor.
- .6 After construction debris and foreign material has been removed from the wet well, Contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment; test manual control devices and automatic control systems. Be alert to undue noise, vibration, or other operational problems.
- .7 Prior to acceptance by Owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to specified operating characteristics.

3.5 Painting

- .71 Thoroughly clean and touch up paint in the field.

3.6 Manufacturer's Start-up Services

- .1 Provide 8 man-hours of on-site service by manufacturer's technical service representative. The representative or factory service technician shall inspect the completed installation. He shall calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

**END OF SECTION**

**Part 1            General**

**1.1            DESCRIPTION**

- .1        This section addresses the procedures to be employed for replacing existing water and sanitary force mains crossing Cameron Creek by pipe bursting as identified on the drawings, and replacing with new high density polyethylene pipe (HDPE) pipe.

**1.2            RELATED SECTIONS**

- .1        Section 331116 – Site Water Utility Distribution Piping
- .2        Section 333113 – Public Sanitary Utility Sewage Piping

**1.3            REFERENCES**

- .1        International Pipe Bursting Association – Guideline Specification for the replacement of Mainline Sewer Pipes by Pipe Bursting
- .2        International Pipe Bursting Association – Guideline for Pipe Bursting
- .3        USPEA - State of Technology for Rehabilitation of Water Distribution Systems
- .4        USEPA – Quality Assurance and Quality Control Practices for Rehabilitation of Sewer and Water Mains

**1.4            QUALIFICATIONS**

- .1        The contractor shall be trained to operate pipe bursting equipment and systems. The contractor shall provide proof of training and proficiency in the use of the equipment. Only the contractor's trained employees shall operate the equipment.
- .2        The contractor shall be trained by the respective manufacturer of the pipe bursting equipment in the use of that machinery. The contractor shall provide certification from the manufacturer that the contractor has been trained and is proficient in the use of the equipment. Only the contractor's employees trained and certified by the manufacturer shall be allowed to operate the equipment during the project.
- .3        The contractor must have successfully completed 1,000m of pipe bursting which includes one successful static pipe bursting project. Contractor shall submit a list of these projects including the owner, engineer, addresses, phone numbers and dates that said projects were completed with their proposal. Or, the contractor shall submit with bid documents proof that they will use manufactures equipment and technical support for project start up.

**1.5            EQUIPMENT**

- .1        Pipe bursting tool shall be static and hydraulically operated. The bursting action of the tool shall increase the external dimensions sufficiently, causing pitting and breakage of the pipe at the same time expanding the surrounding ground. This action shall not only break the pipe, but also create the temporary void into which the burster can be statically pulled which enables forward progress to be made. Simultaneously, the new polyethylene pipe, directly attached to the expander, shall also move forward.



- .2 The static pulling frame shall be telescopic in design to allow the cutting head to release at the termination of the pull. This also provides minimal trench length by telescopic adjustment.
- .3 Quick lock bursting rods are required to guarantee snap lock connections. Quick Lock rods also stabilize cutting wheels at a 90° plane to invert pipe. Threaded bursting rods are not allowed. This insures the same cutting location eliminating threaded rod failures and turning of rods which effect cutting ability of blades.
- .4 The unit must maintain automatic thrust and pull back.
- .5 The static unit is capable of pipe bursting in two directions from the same excavation.

## **1.6 SUBMITTALS**

- .1 Submit manufacturer's specific technical data with complete information on physical properties of pipe and pipe dimensions pertinent to this job. A certificate of "Compliance with Specification" or suitable alternative shall be furnished for all materials to be supplied.
- .2 Complete calculations including lists of parameters, all formulas and all other data showing the design of the new pipe.
- .3 Detail drawings and written descriptions of the entire construction procedure to install pipe, bypass sewage flow, pit sizes, pit construction and shoring, dewatering and sewer service reconnections.

## **Part 2 Products**

### **2.1 Products Specifications**

- .1 High Density Polyethylene Pipe shall be AWWA C906 (HDPE).
- .2 Pipe must conform to ASTM F714 and NSF 61.
- .3 HDPE resin shall be PE3408 characterized by ASTM D3350.
- .4 All pipes shall be made of virgin material, not reworked except that obtained from manufacturer's own production.
- .5 Dimension Ratios: The minimum wall thickness of the polyethylene pipe (PE) shall meet Minimum 11 SDR of Pipe.
- .6 Cuts or gouges, per ASTM F585 are acceptable up to 10% of wall thickness. Beyond 10% of wall, damage must be removed by cutting the damaged section from the pipe string and butt fusing the ends.
- .7 Stripe along the length of the pipe shall be blue in color to identify the pipe as potable water.
- .8 Pipe connection fittings shall meet AWWA C906 and meet or exceed the pressure requirements of the HDPE pipe.

### **2.2 Product Handling**

- .1 Pipe transport and handling shall be per manufacturer's recommendation.

- .2 Product other than pipe must be stored and handled per manufacturer's recommendations.

### **2.3 Documentation and Planning**

- .1 Contractor shall submit a plan to the city or town on a marked-up copy of the project drawings showing the contractor's construction phasing and plans at the pre-construction meeting. Plan details should include:
  - a. Pit locations for pipe insertion and burst machine location;
  - b. Pit locations for service reconnects;
  - c. Schedule of when various sections are to be rehabilitated;
  - d. Distances of each pull;
  - e. Isolating points used to seal the system during the pipe burst;

## **Part 3 Execution**

### **3.1 SAFETY**

- .1 Submit manufacturer's specific technical data with complete information on physical properties of pipe and pipe dimensions pertinent to this job. A certificate of "Compliance with Specification" or suitable alternative shall be furnished for all materials to be supplied.
- .2 The contractor shall carry out operations in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving work entry into confined spaces. It shall be the contractor's responsibility to familiarize and its employees with OSHA Standards and regulations pertaining to all aspects of the work.

### **3.2 INSERTION AND RECEIVING EXCAVATIONS**

- .1 The location and number of insertion and receiving excavations shall be planned by the contractor and submitted in writing for approval by the Departmental Representative 10 days (or as determined by the Engineer) prior to excavation.
- .2 Burst pit and insertion pit locations shall be placed such that excavations are minimized. This may be accomplished by placing either or both of these pits at the point of a service connection.
- .3 Before excavation is begun, it will be the responsibility of the contractor to check with the various utility companies and determine the location of existing utilities in the vicinity of the work area. The contractor at no cost to the City, if required, will arrange temporary construction easement and/or right-of-way areas.
- .4 Damage to utilities and the resulting repair, temporary service cost, etc., shall be borne by the contractor. Access pits shall be backfilled in accordance with the appropriate specifications.
- .5 All excavations shall be properly sheeted/shored in accordance with relevant specifications for trench safety systems. Any damage resulting from improperly shored excavations shall be corrected to the satisfaction of the Departmental Representative with no compensation due to the contractor.

- .6 All open excavations shall be kept secure at all times by the use of barricades with appropriate lights and signs, construction tape, covering with steel plates, etc.
- .7 One or more receiving pits shall be excavated at the end(s) of the sewer pipe to be replaced or at appropriate points within the length of the existing pipe. Pit shall be centered over the existing pipe.
- .8 The number of pits for machine and pipe insertion shall be the minimum necessary to most efficiently accomplish the work. The contractor shall give consideration to the use of excavation required for other purposes such as for sanitary sewer service reconnections and manhole replacement.
- .9 Where manholes are used as machine or new pipe insertion pits, the contractor shall identify such manholes and replace them at no additional cost to the City if damaged. Any manhole modification or replacement required shall be considered incidental to the installation of the new pipe.
- .10 The cost of diversion pumping around a manhole or insertion pit, if required, from a manhole upstream to a manhole downstream, shall be incidental to the installation of the new pipe.

### **3.3 Joining of Pipe**

- .1 Fusing per butt fusion methods in strict conformance to the pipe and/or fusing equipment manufacturer's recommendations shall be used to join sections of HDPE pipe.
- .2 Fusing of 'sticks' of pipe shall be performed in the general vicinity of the pipe insertion pit or laydown yard (staging area).
- .3 Pipe supplied by the pipe manufacturer in a coil may be fused remote from the pipe insertion pit.

### **3.4 Hydrostatic Testing**

- .1 See Section 331116 – Site Water Utility Distribution Piping.

### **3.5 Disinfection**

- .1 See Section 331116 – Site Water Utility Distribution Piping.

**END OF SECTION**

**Part 1 General**

**1.1 SCHEDULING**

- .1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect pipes from damage.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 SMOOTH WALL POLYVINYL CHLORIDE (PVC) PIPE**

- .1 For pipe sizing 200 to 375 mm diameter, all pipe to be PVC gravity sewer pipe to latest revision ASTM D3034, SDR 35, CSA certified as meeting latest revision CSA B182.2-M, c/w integral locked-in gasket bell and spigot systems.
- .2 For pipe sizing 450 to 1050 mm diameter, all pipe to be PVC gravity sewer pipe to latest revision ASTM F679, SDR 35, CSA certified as meeting latest revision CSA B182.2-M, c/w integral locked-in gasket bell and spigot systems .

**2.2 PIPE BEDDING AND SURROUND MATERIAL**

- .1 Granular material in accordance with Section 31 05 16 - Aggregate Materials and following requirements.
  - .1 25 mm minus washed drain rock.
  - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.
- .2 Concrete mixes and materials for bedding, cradles, encasement, supports: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

**2.3 BACKFILL MATERIAL**

- .1 As indicated.
- .2 Type 3 in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**Part 3            Execution**

**3.1                PREPARATION**

- .1        Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

**3.2                TRENCHING**

- .1        Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2        Protect trench from contents of sewer.
- .3        Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

**3.3                GRANULAR BEDDING**

- .1        Place bedding in unfrozen condition.
- .2        Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .3        Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
  - .1        Do not use blocks when bedding pipes.
- .4        Shape transverse depressions as required to suit joints.
- .5        Compact each layer full width of bed to at least 98% corrected maximum dry density.
- .6        Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted common backfill.

**3.4                INSTALLATION**

- .1        Lay and join pipes to: ASTM C 12.
- .2        Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .3        Handle pipe using methods approved by Departmental Representative.
  - .1        Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .4        Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.
  - .1        Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .5        Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .6        Joint deflection not to exceed limits recommended by pipe manufacturer.
- .7        Water not to flow through pipes during construction unless permitted by Departmental Representative.

- .8 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .9 Install plastic pipe and fittings in accordance with CAN/CSA-B1800.
- .10 When any stoppage of Work occurs, restrain pipes, to prevent "creep" during down time.
- .11 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .12 Make watertight connections to manholes and catch basins.
  - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .13 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.
  - .1 Joint to be structurally sound and watertight.
- .14 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

### **3.5 PIPE SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
  - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
  - .1 Do not dump material within 10 m of pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 98% corrected maximum dry density.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 98 % corrected maximum dry density.
- .7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

### **3.6 BACKFILL**

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 100 % corrected maximum dry density. In other areas, compact backfill to at least 98 % corrected maximum dry density.

### **3.7 FIELD TESTS AND INSPECTIONS**

- .1 Repair or replace pipe, pipe joint or bedding found defective.

- .2 Remove foreign material from sewers and related appurtenances by flushing with water.
- .3 Television and photographic inspections:
  - .1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.

**3.8 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .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 11 – Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect conduits from damage.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 SMOOTH WALL POLYVINYL CHLORIDE (PVC) CONDUIT**

- .1 The following suppliers:
  - .1 Polytubes - High density polyethylene 4" IPS SDR 11.0 Polytubes HDPE conduit PE-3408 12.2M conduit, M.O.P = 160 PSI for conduit. Conduit colouring should be black.
  - .2 Carlon trenchless raceway, 4" PVC

**2.2 BACKFILL MATERIAL**

- .1 As indicated.
- .2 Type 3 in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Clean conduits and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

**3.2 TRENCHING**

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and conduit. Trench depth to be minimum 0.75m to top of conduit.

**3.3 INSTALLATION**

- .1 Handle, lay and join conduit to manufacturer's specifications.



- .2 Lay conduits on prepared bed, true to line and grade with conduit inverts smooth and free of sags or high points.
  - .1 Ensure barrel of each conduit is in contact with shaped bed throughout its full length.
- .3 Joint deflection not to exceed limits recommended by conduit manufacturer.
- .4 Whenever Work is suspended, install removable watertight bulkhead at open end of last conduit laid to prevent entry of foreign materials.
- .5 Red warning tape shall be placed at least 0.300m above buried conduit.

### **3.4 CONDUIT SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of conduit laying, and after Departmental Representative has inspected conduit joints, surround and cover conduits as indicated.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .4 Compact each layer from conduit invert to mid height of conduit to at least 98% corrected maximum dry density.

### **3.5 BACKFILL**

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above conduit surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 100 % corrected maximum dry density. In other areas, compact backfill to at least 98 % corrected maximum dry density.

### **3.6 FIELD TESTS AND INSPECTIONS**

- .1 Repair or replace conduit, conduit joint or bedding found defective.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .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 11 – Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect conduits from damage.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 Sidewalk Trench Drains to convey surface drainage from gutter through sidewalk**

- .1 The following suppliers:
  - .1 Polycast 600 Series Trench Drain complete with grate or equivalent.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Install trench drain in locations as shown on the plan drawings and standard drawings
- .2 Installation to manufacturers installation procedures

**3.2 CONDUIT SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of conduit laying, and after Departmental Representative has inspected conduit joints, surround and cover conduits as indicated.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .4 Compact each layer from conduit invert to mid height of conduit to at least 98% corrected maximum dry density.

**3.3 BEDDING AND BACKFILL**

- .1 Concrete bedding and a surrounding concrete fill to be completed in accordance with Spec 033000 Cast in Place Concrete
- .2 Place backfill material, above conduit surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

- .3 Under drain, prior to trench installation, compact backfill to at least 100 % corrected maximum dry density.

### **3.4 FIELD TESTS AND INSPECTIONS**

- .1 Repair or replace trench drain assembly, concrete and bedding if found defective.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .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 11 – Cleaning.

**END OF SECTION**