

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 61 00 – Common Product Requirements
- .2 Section 32 11 16.01 – Granular Sub-base
- .3 Section 32 11 23 – Aggregate Base Course

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D 4791-19, Standard Test Method for Flat Particles, Elongated Particles or Flat and Elongated Particles in Coarse Aggregate.
- .2 Nova Scotia Environment
 - .1 NS Department of Environment and Labour (DEL) Pit & Quarry Guidelines (Revised May 1999)

1.3 SOURCE APPROVAL

- .1 Provide copy of permit for operation of pit/quarry in conformance with Guidelines.
- .2 Inform Departmental Representative of proposed source of aggregates and provide access for sampling.
- .3 If, in opinion of Departmental Representative, aggregate from the proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that aggregate from source in question can be processed to meet specified requirements.
- .4 Should a change of aggregate source be proposed during work, advise Departmental Representative 1 week in advance of proposed change to allow sampling and testing.
- .5 Acceptance of an aggregate at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

1.4 SAMPLING

- .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Allow continual sampling by Departmental Representative during production.
- .3 Provide Departmental Representative with access to source and processed material for sampling.
- .4 Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when requested by Departmental Representative to permit full cross section sampling.

- .5 Provide front end loader or other suitable equipment including trained operator for stockpile sampling as necessary. Move samples to storage place as directed by Departmental Representative.
- .6 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
- .7 Provide water, electric power and propane to Departmental Representative laboratory trailer at production site.

Part 2 Products

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable aggregate free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in a deleterious manner for the use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed three times least dimension.
- .3 Fine aggregate satisfying requirements of applicable section to be one, or a blend of following:
 - .1 Natural sand.
 - .2 Manufactured sand.
 - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.

Part 3 Execution

3.1 DEVELOPMENT OF AGGREGATE SOURCE

- .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by Departmental Representative.
- .2 Where clearing is required, leave a screen of trees between cleared area and roadways as per the Guidelines.
- .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
- .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
- .5 Trim off and dress slopes of waste material piles and leave site in neat condition.

3.2 STRIPPING OF TOPSOIL

- .1 Commence topsoil stripping of areas as indicated by the Guidelines and as directed by the Departmental Representative.
- .2 Avoid mixing topsoil with subsoil.
- .3 Stockpile in locations as indicated by the Guidelines. Stockpile height not to exceed 2 m.

3.3 PROCESSING

- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Departmental Representative.
- .3 Wash aggregates, if required to meet specifications. Use only equipment approved by Departmental Representative.
- .4 When operating in stratified deposits use excavation equipment and methods that will product uniform, homogeneous aggregate.

3.4 HANDLING

- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

3.5 STOCKPILING

- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
- .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 as directed by Departmental Representative within 48 hours of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Maximum 1.5 m for coarse aggregates and base coarse aggregate.
 - .2 Maximum 1.5 m for fine aggregate and sub-base aggregate.
 - .3 Maximum 1.5 m for other aggregate.
- .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.

3.6 SOURCE ABANDONMENT

- .1 For temporary or permanent abandonment of aggregate source, rehabilitate source to condition meeting requirements of the Guidelines.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 31 09 17 – Pile Tests
- .3 Section 31 61 13 – Pile Foundations, General Requirements
- .4 Section 31 62 16.16 – Steel H Piles

1.2 REFERENCES

- .1 All reference standards in this section shall be current issue or latest revision at the first date of project tender advertisement.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A252-98 (2018), Standard Specification for Welded and Seamless Steel Pipe Piles.
 - .2 ASTM A307-21, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile.
 - .3 ASTM F3125/F1325M-21, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Head Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20-13/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
 - .2 CAN/CSA-S16-14(R2019), Design of Steel Structures.
 - .3 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel Structures.
 - .4 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
 - .5 CSA W59-18, Welded Steel Construction (Metal Arc Welding) (metric version).
 - .6 CAN/CSA S6-19, Canadian Highway Bridge Design Code (CHBDC).
- .4 The Master Painters Institute (MPI)/Architectural Painting Specification Manual, (ASM-[February 2004]).
 - .1 MPI #19, Inorganic Zinc Rich Primer.
- .5 The Society of Protective Coatings (SSPC)
 - .1 SSPC-SP 5/NACE No.1-2000, White Metal Blast Cleaning Joint Surface Preparation Standard.

1.3 SYSTEM DESCRIPTION

- .1 Design Requirements: design templates to safely withstand following loads:
 - .1 Gravity loads to which template are subjected.

- .2 Lateral loads to firmly hold pile in position when driving.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
 - .1 Include product characteristics, performance criteria, and limitations.
- .3 Submit shop drawings and indicate following items:
 - .1 Material.
 - .2 Anchorage, field control and alignment methods.
 - .3 Design parameters.
 - .4 Tolerance for driving pile.
 - .5 Removable method.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for disposal in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21- Type 350W.
- .2 Welding materials: to CSA W48 and CSA W59.
- .3 Bolts, nuts and washers: to ASTM A325.

2.2 FABRICATION

- .1 Fabricate structural steel for templates: to CAN/CSA-S16.
- .2 Welding: to CSA W59.
- .3 Use welding companies qualified under CSA W47.1.

Part 3 Execution

- .1 The design of pile templates are the responsibility of the Contractor. All pile template designs shall be stamped by a Professional Engineer Licensed to Practice in the Province of Nova Scotia, Canada.

3.2 POSITIONING

- .1 Position and hold template in location to receive piles.
 - .1 Ensure pile positions are within tolerances specified.
- .2 Secure templates to piles in accordance with shop drawings

3.3 REMOVAL OF TEMPLATES

- .1 Avoid damage to piling when removing templates.
- .2 When instructed by Departmental Representative, remove templates from Project site.

3.4 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.5 PROTECTION

- .1 Protect templates from damage.
- .2 Repair damage to templates, formwork or concrete arising from operations as reviewed by Departmental Representative at no extra cost.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 31 09 16 – Pile Driving Templates
- .3 Section 31 61 13 – Pile Foundations – General Requirements
- .4 Section 31 62 16.16 – Steel H Piles

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D4945-17, Standard Test Method for High-Strain Dynamic Testing of Piles.
- .2 Harbourside Geotechnical Consultants Report, File No 193135, December 2, 2019.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Quality assurance submittals:
 - .1 Test reports: submit 3 copies of dynamic test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

Part 2 Products

Not Used.

Part 3 Execution

3.1 GENERAL

- .1 Contractor to notify Departmental Representative of pile driving operations at least seven (7) days in advance of work.
- .2 If a pile is suspect of meeting refusal on a boulder, Pile Driving Analyser (PDA) testing should be conducted to confirm capacity.
- .3 Supply and erect equipment and temporary structures necessary for making tests.
- .4 Departmental Representative to select piles for testing during performance of work.
- .5 Test to be performed in presence of Departmental Representative.
- .6 Provide shelter, enclosures and lighting for observation, testing and recording of data.

- .7 PDA testing shall be carried out on the initial pile installations to verify that overstressing does not occur, that the hammer is operating with normal efficiencies and that the estimated resistance provide for design is achieved at the embedment criteria.
- .8 PDA tests shall be performed on at least two (2) HP360x152 pile per abutment to ensure pile resistance noted on the Drawings are achieved.
- .9 PDA testing shall be completed at the end of initial driving of piles installed and on the same piles during pile restrikes. Restrike shall be undertaken at 24 and 72 hours after initial drive to assess potential softening and soil setup effects.
- .10 If PDA testing indicates that the design capacity is not obtained piles shall be driven to additional depth as per the direction of the Departmental Representative.

3.2 TESTING

- .1 Do PDA testing in accordance with ASTM D4945-17.

3.3 TEST EVALUATION

- .1 Qualified geotechnical engineer to interpret results for predicting pile performance and resistance.
- .2 Carry out additional PDA tests as directed by Departmental Representative if pile fails to sustain required resistance.
- .3 Test validity determined by Engineer.

3.4 CLEANING

- .1 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 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 35 43 - Environmental Procedures
- .3 Section 01 74 21 – Construction / Demolition Waste Management and Disposal
- .4 Section 32 91 21 – Finish Grading & Soil Placement
- .5 Section 32 93 10 – Planting of Trees, Shrubs & Groundcover

1.2 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of all stumps, roots, embedded logs, humus, root mat and topsoil from areas of excavations and embankments to not less than specified depth below existing ground surface.
- .6 Organic stripping consists of existing soil and organic material that has been grubbed from the site during grading operations. The intent for this project is to reuse the organic stripping as material for final landscaping treatments.

1.3 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, utility lines, water courses, root systems of trees and existing site fixtures which are to remain.
 - .1 Repair damaged items to approval of Departmental Representative.
 - .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

Part 2 Products

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 Contractor's sediment and erosion control.
- .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 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
 - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
 - .2 When utility lines which are to be removed are encountered within area of operations, notify utility in ample time to minimize interruption of service. The Departmental Representative is to be provided copies on all correspondence.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

3.3 CLEARING

- .1 Clearing is not permitted during nesting season which is anticipated to be between May 15 and June 30. Approval from the Departmental Representative must be given prior to commencement of clearing operation.
- .2 Clear areas as indicated and approved by the Departmental Representative. Generally, the areas to be cleared shall extend to a width of 3 m outside of excavation and embankment slope lines.
- .3 Clearing includes felling and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, rubbish and brush occurring within cleared areas.
- .4 Clear as indicated and as directed by Departmental Representative, by cutting at height of not more than 300 mm above ground.
- .5 Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.

- .6 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.4 GRUBBING

- .1 Grub areas as indicated. Generally, the areas to be grubbed shall extend to a width of 1.5 m outside of excavation and embankment slope lines.
- .2 Remove all rootmat, stumps, embedded logs, humus, root mat and topsoil from areas of excavations and embankments to not less than 300 mm below existing ground surface.
- .3 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.5 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site as indicated by Departmental Representative.
- .2 Stockpile organic stripping material on site as indicated by Departmental Representative for reuse in final treatment.
- .3 Protect stockpiled organic stripping material with erosion and sedimentation controls.

3.6 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations to approval of Departmental Representative.

3.7 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 RELATED SECTIONS

- .1 Section 31 11 00 – Clearing and Grubbing
- .2 Section 32 15 60 – Roadway Dust Control

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 EXISTING CONDITIONS

- .1 Obtain clearance report from utilities regarding all underground services in the area.

Part 2 Execution

2.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate are acceptable for rough grading.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Examine existing conditions for any public or private service lines and report such to the Departmental Representative prior to starting work
 - .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

2.2 WATER DISTRIBUTORS

- .1 Apply water with equipment capable of uniform distribution.

2.3 ROUGH GRADING

- .1 Rough grading shall consist of the excavation of the existing roadbed to a maximum depth of 500 mm for the purpose of reshaping the excavated material to re-contour the area of the existing roadbed and surrounding area.
- .2 Excavated material shall be reshaped to the lines and grades as shown on the plans or as directed by the Departmental Representative.
- .3 Material shall be shaped and trimmed to eliminate ponding water with uniform surface and no soft spots.
- .4 Compact filled and disturbed areas to eliminate soft spots and eliminate erosion of material.

2.4 PROTECTION

- .1 Maintain finished surfaces in condition conforming to this section until acceptance by Departmental Representative.
- .2 Provide silt fences and erosion protection as required to mitigate and prevent impacts to adjacent properties and watercourses.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 43 – Environmental Procedures
- .3 Section 01 55 26 – Traffic Regulation
- .4 Section 31 05 16 –Aggregate Materials
- .5 Section 32 11 23 – Aggregate Base Courses

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 0.3 m³. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation. Common excavation shall include removal of existing pipe with no reduction in material for the void

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Traffic Control Plan for any lane reductions for review and approval by the Departmental Representative.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse / recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.5 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site, if applicable.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

Part 2 Products

2.1 MATERIALS

- .1 Backfill material around structures shall be in accordance with Section 32 11 23 - Aggregate Base Courses.

Part 3 Execution

3.1 SITE PREPARATION

- .1 Cut pavement, if applicable, neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.2 STOCKPILING

- .1 Stockpile granular materials in manner to prevent segregation and for ready access in completing backfilling operation.
- .2 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.3 DEWATERING

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative review and approval details of proposed dewatering methods.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.4 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations.
- .2 Excavate to lines, grades, elevations and dimensions as indicated or as directed by Departmental Representative.
- .3 For trench excavation, one lane of travel must remain open at all times during the day and reinstate two lanes of traffic prior to completion of day's work.
- .4 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .5 Restrict vehicle operations directly adjacent to open trenches.
- .6 Dispose of surplus and unsuitable excavated material off site.
- .7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .8 Notify Departmental Representative when bottom of excavation is reached.
- .9 Obtain Departmental Representative approval of completed excavation.
- .10 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

3.5 BACKFILLING AND COMPACTION

- .1 Backfill around and over culverts as indicated or as directed by Departmental Representative.
- .2 Place granular backfill material, approved in writing by Departmental Representative, in 150 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.

- .3 Compact each layer to 95% corrected maximum dry density taking special care to obtain required density under haunches.
 - .1 The top 300 mm below subgrade elevation shall be compacted to a minimum 98% of the corrected maximum dry density.
 - .2 Backfill above subgrade elevation shall be compacted to a minimum 100% of the corrected maximum dry density.
- .4 Protect installed culvert with minimum 600 mm cover of compacted fill before heavy equipment is permitted to cross.
- .5 Place backfill in unfrozen condition.

3.6 RESTORATION

- .1 Reinstatement pavements disturbed by excavation to thickness, structure and elevation which existed before excavation as directed by the Departmental Representative.
 - .1 In areas for which there will be a delay in reinstating the pavement, upon approval of the Departmental Representative regarding the delay, a smooth riding granular surface is to be continually maintained free of depressions, pot holes and dust.
- .2 Upon completion of Work, remove waste materials and debris and correct defects as directed by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 35 29.06 – Health and Safety.
- .3 Section 01 35 43 – Environmental Procedures
- .4 Section 02 41 16 – Structure Demolition
- .5 Section 31 05 16 –Aggregate Materials
- .6 Section 31 24 14 – Fill against Structure
- .7 Section 31 32 19.01 – Geotextiles.
- .8 Section 31 37 00 – Armour Rip Rap
- .9 Section 31 62 16.13 – Steel Sheet Piles Temporary Retaining Walls

1.2 SUMITTALS

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of work.

Part 2 Products

Not Used

Part 3 Execution

3.1 Examination

- .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovering.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Install temporary barrier to separate and protect work zone from roadway traffic.

- .3 One lane of traffic shall be maintained on the existing bridge and approaches throughout construction / until traffic is diverted onto the new structure and realigned roadway.

3.3 TEMPORARY DAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 – Health and Safety and Health and Safety Act for the Province of Nova Scotia, Canada.
- .2 Construct temporary Works to depths, heights and locations as required. Shoring will be required adjacent to existing detour bridge to maintain bridge foundation and roadway stability to allow for construction on new bridge foundations and wingwalls. Design of such required shoring is the responsibility of the contractor.

3.4 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 Dispose of water by pumping into vegetated areas in approved collection runoff areas and in 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.
 - .2 Do not allow sediment laden water to reach adjacent watercourses.

3.5 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 indicated on the drawings or as directed by Design Departmental Representative.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .5 Restrict vehicle operations directly adjacent to open trenches.
- .6 Dispose of surplus and unsuitable excavated material in approved location on site as directed by the Departmental Representative.
- .7 Do not obstruct flow of surface drainage or natural watercourses.
- .8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .9 Notify Departmental Representative when bottom of excavation is reached.
- .10 Obtain Departmental Representative approval of completed excavation.
- .11 Remove unsuitable material from excavation bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .12 Correct unauthorized over-excavation as follows:

- .1 Fill with Fill Against Structure gravel compacted to not less than 98% of corrected Standard Proctor maximum dry density.
- .13 Install geotextiles in accordance with Section 31 32 19.02 - Geotextiles.
- .14 Protect environment from erosion and sediment, transport as per requirements of Environment Protection Plan.
- .15 The use of explosive or other means, which in the opinion of the Departmental Representative might disturb the existing structure, etc. shall not be permitted.
- .16 Boulders removed shall be satisfactorily utilized or disposed of as directed by the Departmental Representative.
- .17 After removal of forms and the required concrete strength has been achieved as noted on the Contract Drawings, the excavations around the structure shall be backfilled up to the level shown on the Contract Drawings, utilizing the backfill materials noted in the Contract Documents. Materials obtained from the foundation excavation shall not be used as backfill unless written approval to do so is provided by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 11 00 – Clearing and Grubbing
- .2 Section 31 23 33.02 - Foundation Excavation Bridge
- .3 Section 32 15 60 – Roadway Dust Control

1.2 REFERENCES

- .1 Definitions:
 - .1 Rock Excavation: excavation of:
 - .1 Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort with a Caterpillar D9 crawler bulldozer or equivalent to be considered integral with parent mass.
 - .2 Boulder or rock fragments measuring in volume 1cubic metre or more.
 - .2 Common Excavation: excavation of materials that are not Rock Excavation.
 - .3 Unclassified Excavation: excavation of materials regardless of type.
 - .4 Free Haul: distance that excavated material is hauled without compensation.
 - .5 Over Haul: authorized hauling in excess of free haul distance that excavated material is moved. Over Haul does not apply to this Contract.
 - .6 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
 - .7 Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.
 - .8 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.
 - .1 Parks is supplying the borrow material for this project. It is located in stockpile at Fish Cove Pond Trail.
- .2 Reference Standards:
 - .1 ASTM International
 - .1 ASTM D698-12(2021), Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft³) (600 kN-m/m³).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Adhere to regulations of authority having jurisdiction when blasting is required

Part 2 Products

2.1 MATERIALS

- .1 Embankment materials require approval by Departmental Representative.
- .2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or other unsuitable material.
- .3 Borrow material:
 - .1 Obtain from sources such as quarry, or borrow pit as approved by Departmental Representative.
 - .1 Earth Embankment materials to consist of acceptable earth material and processed rock material free from objectionable quantities of organic matter, frozen soil, stumps, trees, moss, and other unsuitable materials.
 - .2 Rock Embankment material to consist of fragmented rock produced by drilling and blasting operations, and boulders which cannot be placed in layers as specified for Earth Embankments.
 - .1 Rock Embankment to conform to gradation as follows:

Sieve Designation	Percent Passing by Weight
150 mm	100
100 mm	85 - 100
75 mm	10 - 50
No. 200	* 0 - 3

- .2 * Gradation is determined by that portion passing 75 mm screen.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:
 - .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 COMPACTION EQUIPMENT

- .1 Compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.
 - .1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.
 - .2 Replace or supplement equipment that does not achieve specified densities.
- .2 Operate compaction equipment continuously in each embankment when placing material.

3.3 WATER DISTRIBUTORS

- .1 Apply water with equipment capable of uniform distribution.

3.4 EXCAVATING

- .1 General:
 - .1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.
 - .2 Sub-excavate rock 300 mm below subgrade in cut sections unless otherwise directed by Departmental Representative.
 - .1 Replace with approved embankment material and compact to specified embankment density.
 - .3 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points as directed by Departmental Representative.
- .2 Drainage:
 - .1 Maintain profiles, crowns and cross slopes to provide good surface drainage.
 - .2 Provide ditches as work progresses to provide drainage.
 - .3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.
- .3 Rock excavation:
 - .1 Notify Departmental Representative, when material appearing to conform to classification for rock is encountered, to enable measurements to be made to determine volume of rock. Provide 12 hour notification.
 - .2 Submit blasting program to Departmental Representative, for approval 14 days minimum before start of Work.
 - .1 Do not proceed without written approval of blasting program and receipt of Parks Canada permit from Departmental Representative.
 - .3 Reduce overbreak and increase stability of rock faces by using smooth blasting techniques.
 - .4 Use smooth blast and excavate short sections in rock cuts to determine optimum spacing of holes when requested by Departmental Representative.
 - .5 Stem holes as necessary to contain blast.
 - .6 Do not use prilled type ammonium nitrate and fuel oil (ANFO) explosives within 4 m of final cut line.
 - .7 Scale rock backslopes to achieve smooth, stable face, free of loose rock and overhangs to design backslope.
 - .8 Control blasting to minimize flying particles.
 - .9 No undrained pockets shall be left in the rock surface.
- .4 Borrow Excavation:
 - .1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.
 - .2 Trim and leave borrow pits in condition to permit accurate measurement of material removed.

3.5 EMBANKMENTS

- .1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.
 - .1 Method used to be pre-approved in writing by Departmental Representative.
- .2 Break up or scarify existing road surface prior to placing embankment material.
- .3 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized by Departmental Representative.
- .4 Maintain crowned surface during construction to ensure ready run-off of surface water.
- .5 Drain low areas before placing materials.
 - .1 Place and compact to full width in layers not exceeding 200 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.
- .6 Where material consists of rock:
 - .1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.
 - .2 Distribute rock material to fill voids with smaller fragments such that the interstices around rock are filled with fine material to form compact mass.
 - .3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.
 - .4 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 500 mm of subgrade elevation.
- .7 Deductions from excavation will be made for overbuild of embankments.

3.6 COMPACTION

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
- .2 Deposit, spread, and blade smooth in successive uniform layers embankment material in layers 200 mm maximum thickness to the full width of the cross section.
 - .1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.
 - .2 Ensure required compaction for each layer before placing any material for next layer.
- .3 Compact top 300 mm of subgrade in areas of excavation.
- .4 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.
- .5 Obtain written approval from Departmental Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results.
- .6 Compact each layer to minimum 95% of the Standard Proctor dry density or the acceptable Control Strip Density except top 300 mm of subgrade.

- .1 Compact top 300 mm in 150 mm layers to a minimum 98% of the Standard Proctor dry density or the acceptable Control Strip Density.
- .7 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.
- .8 For material containing less than 30% oversize (retained on 20 mm sieve) the test method shall be Standard Proctor Test – ASTM D698.
- .9 For maximum dry density for material containing more than 30% oversized shall be determined using method prescribed herein as Control Strip.
- .10 Control Strip Method:
 - .1 A Control Strip is a lift of material constructed on a 200 m section, minimum 3 m wide, of prepared surface selected by the Departmental Representative.
 - .2 A maximum dry density “Control Density” shall be established on a lift of material using the equipment and method of compaction as prescribed herein for construction of a Control Strip.
 - .3 A Control Strip shall be constructed at the beginning of work. One or more Control Strips shall be constructed whenever a change is made in the type or source of material or any change in the compaction equipment used. Each Control Strip shall remain in place and become a portion of the completed base course.
 - .4 To determine the Control Density, a minimum of six moisture and density tests shall be taken at random locations by the Departmental Representative, using nuclear equipment. Test results shall be averaged to determine the in-place maximum dry density.
 - .5 The maximum compacted thickness of each layer shall not exceed 200 mm except when it can be demonstrated, in construction of the Control Strip, that adequate compaction of thicker lifts is possible.
 - .6 No additional lift shall be placed until the control density is determined and the compacted lift is approved by the Departmental Representative.
 - .7 The Control Strip moisture content shall be adjusted to produce necessary compaction as directed by the Departmental Representative. If the Control Strip compaction is being adversely affected by the moisture content of the soil, being either excessive or deficient, the Control Strip construction shall not continue until the moisture content is reduced or increased, to produce necessary compaction.
 - .8 The type and mass of the compaction equipment used shall be such that uniform density is obtained throughout the depth of the layer being compacted.
- .11 Minimum compaction equipment shall be a vibratory steel roller(s) weighing not less than 6 t, having a vibratory capacity of at least 1500 VPM with a minimum dynamic or centrifugal force of 8000 kg, operated in a vibratory mode, at a speed not exceeding 8 km/h.
- .12 Control Density Determination.
 - .1 A lift of material shall be spread over the entire Control Strip section. Once the Control Strip lift has been completely spread, the measurements of the Control

Density shall commence and continue during repeated passes of the compaction equipment until a maximum dry density is achieved.

- .2 A pass shall be one complete coverage of the Control Strip layer with the compaction equipment.
 - .3 Testing of the Control Strip shall be discontinued when the average dry density between each series of passes increases by less than 10 kg/m^3 , continually decreases, or remains constant.
- .13 The maximum dry density shall be the Control Density used to determine the percent compaction in other areas of the project for the same lift and thickness in other areas of the project for the same lift and thickness and same class of gravel as that used in the Control Section.

3.7 FINISHING

- .1 Shape entire roadbed to within 25 mm of design elevations.
- .2 Finish slopes, ditch bottoms and borrow pits true to lines, grades and drawings where applicable. Scale slope by removing loose fragments, for cut slopes in bedrock steeper than 1:1.
- .3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.
- .4 Hand finish slopes that cannot be finished satisfactorily by machine.
- .5 Round top of backslope 1.5 m both sides of top of slope.
- .6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.
- .7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

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.

3.9 PROTECTION

- .1 Maintain finished surfaces in condition conforming to this section until acceptance by Departmental Representative.
- .2 Provide silt fences and erosion protection as required to mitigate and prevent impacts to adjacent properties.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 31 23 33.02 – Foundation Excavation Bridge
- .3 Section 31 37 00 – Armour Rip-Rap

1.2 REFERENCES

- .1 ASTM C117, Test Method for Material Finer Than 75 m Sieve in Mineral Aggregate by Washing.
- .2 ASTM C131, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136, Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

Part 2 Products

2.1 MATERIALS

- .1 Crushed and screened gravel or rock approved by the Departmental Representative prior to placement.
- .2 Material shall be tested in accordance with ASTM C117 and ASTM C136 and shall conform to the following gradation:

<u>Sieve Size µm</u>	<u>Percent Passing</u>
112 000	100
40 000	60 – 85
5 000	25 – 50
315	5 – 15
80	2 – 7

- .3 Fill Against Structure shall conform to the physical properties requirements listed in the following:

<u>Property</u>	<u>Test Method</u>	<u>FAS</u>
LA Abrasion (Grading A)	ASTM C131	45
Plasticity Index (Sand Portion)	ASTM D4318	< 6

Part 3 Execution

3.1 PLACING

- .1 The embankment underlying the Fill Against Structures shall be compacted as indicated on the drawings or as directed by the Departmental Representative.
- .2 Prior to placing structural fill, inspect subgrade and concrete abutment structures to assure stability. Do not proceed with filling operations until these areas are approved by the Departmental Representative.
- .3 Fill material shall be placed in layers not exceeding 300 mm in thickness and each layer compacted as specified herein by means of a vibratory compactor. Refer to Contract Drawings for allowable compaction equipment adjacent to bridge structure. Backfilling and compaction of the Fill Against Structure material at the bridge structure shall be carried out simultaneously in equal lifts to equalize longitudinal loads applied and follow rigid frame manufacturer instructions.
- .4 Fill Against Structure shall be compacted using special equipment, suitable for work in confined spaces and as outlined on the Contract Documents.
- .5 Compaction of Fill Against Structure shall compacted as indicated on the Drawings.
- .6 Extents of Fill Against Structure adjacent and surrounding each abutment on both approaches shall be as indicated on the Drawings or as determined by the Departmental Representative.
- .7 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .8 Do not use Fill Against Structure material which is frozen or contains ice, snow or debris.

3.2 SITE TOLERANCES

- .1 The extent of Fill Against Structure shall be as indicated on the plans or as determined by the Departmental Representative.

3.3 PROTECTION

- .1 Upon completion of Work, remove waste materials and debris and correct defects as directed by Departmental Representative.
- .2 Maintain finished slopes and lines until subsequent material is placed covering the Fill Against Structure.
- .3 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .4 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 24 13 – Roadway Embankments

1.2 REFERENCES

- .1 All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:
- .1 ASTM C 127, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
- .2 ASTM C 131, Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

Part 2 Products

2.1 MATERIALS

- .1 The stone may be field or quarry stone and of such sizes as may be approved or specified. All pieces of stone shall be sound and subject to approval.

2.2 GRADATION REQUIREMENTS

- .1 The rock fill shall be angular quarried or crushed, 300 mm minus stone, free of fines and having at least one crushed face. Material shall be well graded to fill voids and meet compaction.

2.3 PHYSICAL PROPERTIES

- .1 Rock fill shall conform to the physical properties listed in the table below:

<u>Property</u>	<u>Test Method</u>	<u>Rock Fill</u>
Absorption % max.	ASTM C 127	2.00
LA Abrasion % max.	ASTM C 131	40

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Rock Fill shall be placed and compacted in accordance with Section 31 24 13 or as directed by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 31 23 33.02 – Foundation Excavation Bridge
- .3 Section 31 24 14 – Fill Against Structure
- .4 Section 31 37 00 – Armour Rip-Rap
- .5 Section 31 37 20 – Clear Stone

1.2 REFERENCES

- .1 All current standards at the time of initial advertisement of tender apply
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permeability.
 - .2 ASTM D4595, Standard Test Method for Tensile Properties of Geotextile by Wide-Width Strip Method.
 - .3 ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2-2004, Textile Test Methods – Bursting Strength – Ball Burst Test (Extension of September 1989)
 - .2 CAN/CGSB-148.1-2003, Methods of Testing Geotextiles and Geomembranes.
 - .1 No. 2, Methods of Testing Geotextiles and Geomembranes – Mass per Unit Area.
 - .2 No. 3, Methods of Testing Geotextiles and Geomembranes – Thickness of Geotextiles.
 - .3 No. 6.1, Methods of Testing Geotextiles and Geomembranes – Bursting Strength of Geotextiles Under No Compressive Load.
 - .4 No. 7.3, Methods of Testing Geotextiles and Geomembranes – Grab Tensile Test for Geotextiles.
 - .5 No. 10, Methods of Testing Geotextiles and Geomembranes – Filtration Opening Size.

1.3 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 geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Test and Evaluation Reports:
 - .1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

Part 2 Products

2.1 MATERIAL

- .1 Geotextile: woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: 3.81 m minimum.
 - .2 Composed of: UV protected material.
- .2 Physical properties:
 - .1 Grab tensile strength and elongation: to CAN/CGSB-148.1, No. 7.3.
 - .1 Breaking force: minimum 1100 N, wet condition.
 - .2 Elongation at break: maximum 15%.
 - .2 Mullen burst strength: to CAN/CGSB-4.2, No. 11.2, minimum 3.0 MPa, wet condition.
 - .3 Bursting strength: use values specified in CAN/CGSB-148.1, No. 6.1, wet condition.
- .3 Hydraulic properties:
 - .1 Apparent opening size (AOS): to ASTM D4751, 50 µm (minimum) 150 µm (maximum).
 - .2 Hydraulic Conductivity, 0.01 cm/sec.
 - .3 Permeability: to CAN/CGSB-4.2 No. 11.1-9.

Part 3 Execution

3.1 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with security pins.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases. Stop geotextile 100 mm below finished surface.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

- .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .6 After installation, cover with overlying layer within 4 hours of placement.
- .7 Replace damaged or deteriorated geotextile to approval of Design Departmental Representative.

3.2 CLEANING

- .1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner. Recycle material if at all possible.

3.3 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

3.4 QUALITY CONTROL

- .1 The Contractor shall supply documentation from the manufacturer that the supplied material meets all specified as follows:

<u>Test Type</u>	<u>Standard</u>
Opening	ASTM D4751
Bursting Strength	CAN/CGSB-4.2, No. 11.2
Mass/Unit Area	CAN/CGSB-148.1, No. 2
Thickness	CAN/CGSB-148.1, No. 3
Burst	CAN/CGSB-148.1, No. 6.1
Tensile	CAN/CGSB-148.1, No. 7.3
Filtration Opening	CAN/CGSB-148.1, No. 10
Grab Tensile Strength and Elongation	CAN/CGSB-148.1, ASTM D4595
Permeability and Water Flow Rate	ASTM D4491

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 02 41 16 – Structure Demolition
- .2 Section 31 23 33.02 – Foundation Excavation Bridge
- .3 Section 31 24 14 - Fill Against Structure
- .4 Section 31 32 19.01 – Geotextiles

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C127-15, Test Method for Material Finer Than 75 µm Sieve in Mineral Aggregate by Washing.
 - .2 ASTM C131-20, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 ARMOUR STONE

- .1 Armour stone shall be hard, durable, field or quarry stone, free from splits, seams or defects likely to impair its soundness during handling or by the actions of water and ice. Shale, slate or rocks with thin foliations shall not be acceptable. The greatest dimension of each stone shall not exceed two times the least dimension. The minimum density of the stone shall be 2 650 kg/m³. Physical properties shall be as defined as:

Property	Test Method	Armour Rock
Absorption % maximum	ASTM C 127	1.5
Los Angeles Abrasion, % maximum	ASTM C 131	35

Sizes of Armour Rip Rap shall be defined as:

Approximate Maximum Dimension, mm	Percent Smaller Than
850	100
550	0 – 50
230	0 - 15

2.2 GEOTEXTILE FILTER

- .1 Geotextile: in accordance with Section 31 32 19.01 - Geotextile.

Part 3 Execution

3.1 PLACING

- .1 Where armour rip rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.
- .2 Fine grade area to be armoured to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
- .3 Place geotextile on prepared surface in accordance with Section 31 32 19.01 - Geotextile and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
- .4 Place armour rip rap to thickness and details as indicated.
- .5 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
- .6 The Armour Rip Rap shall be placed to the lines and grades shown on the drawings or as directed by the Departmental Representative. Placement shall be by machine in order to avoid waste and to ensure that the stone is in a stable position.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 05 16 – Aggregate Materials
- .2 Section 31 24 13 – Roadway Embankments
- .3 Section 31 32 19.01 - Geotextile
- .4 Section 31 62 16.16 – Steel H Piles

1.2 REFERENCES

- .1 All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:
 - .1 ASTM C117-04, Standard Test Methods for Material Finer Than 75µm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C127-15, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D 4318 Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
 - .5 DOT&PW TM-1, Test Method for the Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.

Part 2 Products

2.1 MATERIALS

- .1 Clear stone material: shall consist of hard, durable stone particles and free from elongated or objectionable pieces. Material shall be tested in accordance with ASTM C117 and ASTM C136 and shall conform to the following gradation table:

<u>Sieve Size, mm</u>	<u>Percent Passing</u>				
	C1	C2	C3	C4	C5
250	100				
200		100	100		
150	20-35	90-100	90-100		
112		0-10	20-35	100	
80			0-20	90-100	
56	0-10				
28				0-10	100

- | | | | |
|--|----|------|--------|
| | 20 | 0-10 | 90-100 |
| | 10 | | 0-40 |
| | 5 | | 0-10 |
- .2 Clear stone (pea gravel) material: to be rounded in shape, uniform in size and shall consist of hard and durable stone particles. Gradation shall not be well-graded and meet the following:

<u>Sieve Size</u>	<u>Percent Passing</u>
19 000	100
4 760	0 - 10

- .3 Material shall conform to the physical properties listed in the table below:

<u>Property</u>	<u>Test Method</u>	<u>Clear Stone</u>
Absorption % max.	ASTM C 127	1.75
Plasticity Index	ASTM D 4318	0
Micro-Deval % max.	DOT&PW TM-1	25

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Where clear stone is to be placed on slopes, abutment drainage pipe ends, culvert ends, gutter ends, ditches or elsewhere shown on the drawings or directed by the Departmental Representative, excavate or prepare surface as directed.
- .2 Place geotextile on prepared surface in accordance with Section 31 32 19.01 - Geotextile and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
- .3 Place clear stone to thickness and details as indicated or directed by Departmental Representative.
- .4 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass.
- .5 The clear stone shall be placed to the lines and grades shown on the drawings or as directed by the Departmental Representative. Placement and compaction shall be by machine in order to avoid waste and to ensure that the stone is in a stable position.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 31 09 16 – Pile Driving Templates
- .3 Section 31 09 17 – Pile Tests
- .4 Section 31 23 16.26 – Rock Excavation for Bridge
- .5 Section 31 62 16.13 – Steel Sheet Piles – Temporary Retaining Wall
- .6 Section 31 62 16 .16 – Steel H Piles

1.2 REFERENCES

- .1 Harbourside Geotechnical Consultants Report No. 193135, Dated December 2, 2019.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to Departmental Representative and await further instructions.
- .4 Submit schedule of planned sequence of driving to Departmental Representative for review, as specified.
- .5 Spliced piles: when authorized, submit design details of splice complete with signature and stamp of qualified professional engineer registered or licensed in Province of Nova Scotia, Canada. All splices of piles shall be designed and constructed as full-strength splices. Welds shall be tested as per W59 Section 11, Statically Loaded Structures.
- .6 Equipment:
 - .1 Submit prior to pile installation for review by Departmental Representative, list and details of equipment for use in installation of piles. Only impact hammers are to be used for driving piles
 - .2 Impact hammers: submit manufacturer's written data as specified.
 - .3 Non-impact methods: submit characteristics to evaluate performance.
- .7 Quality assurance submittals:
 - .1 Test reports: submit 3 copies of certified test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions.
- .2 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .3 Replace damaged piles as directed by Departmental Representative.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for disposal in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Recycle cut-off or damage portions of H piles.

1.6 EXISTING CONDITIONS

- .1 Harbourside Geotechnical Consultants Report No 193135, dated December 2, 2019 is provided with the Contract Documents for reference purposes. PSPC assumes no responsibility for the contents of this report and the Contractor shall conduct their own investigations as required, but without impacting traffic, the existing bridge or the surrounding environment, to determine actual sub-surface conditions.
- .2 Notify Departmental Representative in writing if subsurface conditions at site differ from those indicated and await further instructions from Departmental Representative.

1.7 SCHEDULING

- .1 Provide schedule of planned sequence of driving to Departmental Representative for review, not less than two weeks prior to commencement of pile driving.

Part 2 Products

2.1 MATERIALS

- .1 Material requirements for piles are specified in Section 31 62 16.16 – Steel H Piles.
- .2 Full strength pile splices shall only be permitted with written approval of Departmental Representative.
 - .1 When permitted, only a single splice per pile shall be permitted. Provide details for Departmental Representative review.
 - .2 Design details of full strength welded pile splice to bear dated signature stamp of professional engineer registered or licensed in Province of Nova Scotia, Canada.

2.2 EQUIPMENT

- .1 Impact hammers: provide manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer, mass of driving cap and type and elastic properties of hammer and pile cushions.
- .2 Non-impact methods of installation such as augering, jacking, vibratory hammers or other means are not acceptable.
- .3 Hammer:

- .1 Hammers shall be capable of delivering a minimum rated energy of 450 Joules/cm² of pile steel cross sectional area.
- .2 When required criteria cannot be achieved with the proposed hammer, use larger hammer and take other measures as required.

Part 3 Execution

3.1 PREPARATION

- .1 Protection:
 - .1 Protect adjacent structures, services and work of other sections from hazards due to pile driving operations.
 - .2 Arrange sequencing of pile driving operations and methods to avoid damages to adjacent existing structures. Exiting water and sewer lines must be rerouted prior to driving piles.
 - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
 - .4 Ensure that pile driving operations has no impact on open traffic on the roadway and existing bridge adjacent to the work site.
- .2 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation.
 - .1 Make provision for access and support of piling equipment during performance of Work.
- .3 Drive piles only when temporary shoring is installed and excavation to the underside of abutment pile caps has been completed.

3.2 INSTALLATION

- .1 Leads: construct pile driver leads to provide free movement of hammer.
 - .1 Hold leads in position at top and bottom, with guides, stiff braces, or other means reviewed by Departmental Representative to ensure support to pile while being driven.
 - .2 Length: provide sufficient length of leads to ensure that use of follower is unnecessary.
 - .3 Swing leads:
 - .1 Not permitted.
- .2 Followers:
 - .1 Provide followers of such size, shape, length and mass to permit driving pile in desired location to required depth and resistance.
 - .2 Provide followers with socket or hood carefully fitted to top of pile to minimize loss of energy and prevent damage to pile.
 - .3 Drive applicable load test piles using similar follower.
- .3 Design load capacity of pile as follows:

- .1 Assumed design pile capacity at ultimate limit states = 785 kN(C) for HP360x152 plumb abutment piles.
- .4 Installation of each pile will be subject to review of Departmental Representative.
 - .1 Departmental Representative will be sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration, tolerance or other criteria used to determine load capacity and pile final position / elevations.
 - .2 Departmental Representative to review final driving of all piles prior to removal of pile driving rig from site.
- .5 Contractor to determine initial pile set/refusal by PDA testing.
- .6 Dynamic pile monitoring (PDA) shall be carried out on the initial pile installations to verify that overstressing does not occur, that the hammer is operating within normal efficiencies and that the estimated resistance is achieved at the noted embedded depth.
- .7 Drive each pile to tip elevation noted on drawings. Dynamic Pile Monitoring (PDA) shall be carried out on the initial pile installations at the end of initial drive and at the beginning of restrike and on at least 2 piles per abutment. Restrike testing shall be completed 24 and 72 hours after initial drive. Final pile tip elevation to meet required pile resistance shall be approved by the Departmental Representative.

3.3 APPLICATION / DRIVING

- .1 Use driving caps and cushions to protect piles.
 - .1 Reinforce pile heads as required by Departmental Representative.
 - .2 Piles with damaged heads as determined by Departmental Representative will be rejected.
- .2 Hold piles securely and accurately in position while driving.
- .3 Deliver hammer blows along axis of pile.
- .4 Restrike already driven piles lifted during driving of adjacent piles to confirm set.
- .5 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.
- .6 Cut off piles neatly and squarely at elevations as indicated to tolerance of plus or minus 5 mm.
 - .1 Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
- .7 Remove and recycle cut-off lengths from site upon completion of work.

3.4 DRIVING TOLERANCES

- .1 Piles to be driven within ± 75 mm of theoretical position.
- .2 Piles not to be more than 1.0% of length out of vertical alignment.

3.5 OBSTRUCTIONS

- .1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, notify Departmental Representative.

- .2 The presence of cobbles in underlying till may require removal and redrive of piles should obstructions be encountered.

3.6 REPAIR AND RESTORATION

- .1 Pull out rejected piles and replace with new piles.
- .2 Remove rejected pile and replace with new, and if necessary, longer pile.
- .3 Remove rejected pile and fill hole as directed by Departmental Representative.
- .4 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

3.7 FIELD QUALITY CONTROL

- .1 Pile Driving Analyzer:
 - .1 Use Pile Driving Analyzer and Wave Equation Analysis to determine and confirm driving criteria such as hammer size and variation in impact, suitability of driving cap and cushions and penetration resistance relative to set on at least two (2) piles per abutment during start of pile placement.
 - .1 Confirm criteria during pile installation by using Pile Driving Analyzer and Wave Equation Analysis on one (1) additional piles when requested by Departmental Representative.
 - .2 Departmental Representative to select piles.
 - .3 Work to be performed by geotechnical engineer registered or licensed in Province of Nova Scotia, Canada.
- .2 Testing agency appointed by Departmental Representative will use Pile Driving Analyzer and Wave Equation Analysis to confirm driving criteria. Included are: hammer size and variation in impact, suitability of driving cap and cushions, and penetration resistance relative to set for initial driving and re-striking.
 - .1 Departmental Representative to select piles for testing.
- .3 Prepare piles to be instrumented by drilling and tapping holes for installation of strain transducers and accelerometers, as directed by Departmental Representative.
- .4 Provide assistance, as required, in instrumentation process during initial set-up and during test.
- .5 Make allowance for probable interruption in driving for:
 - .1 Changing/modifying hammer, cap, cushions, or other equipment;
 - .2 Replacing/adjusting of transducers and accelerometers;
 - .3 Assessing of monitored results.
- .6 Replace/adjust hammer and modify cap, cushions, and other equipment, as directed by Departmental Representative.
- .7 Confirm that final set has been achieved, when instructed by re-striking instrumented piles as directed 24 hours and 72 hours after determination of penetration resistance for initial set.
- .8 Measurement:

- .1 Maintain accurate records of driving for each pile, including:
 - .1 Type and make of hammer, stroke or related energy.
 - .2 Other driving equipment including water jet, driving cap, cushion.
 - .3 Pile size and length, location of pile in pile group, location or designation of pile group.
 - .4 Sequence of driving piles in group.
 - .5 Number of blows per metre for entire length of pile and number of blows per 25 mm for last 300 mm.
 - .6 Final tip and cut-off elevations.
 - .7 Other pertinent information such as interruption of continuous driving, pile damage.
 - .8 Record elevation taken on adjacent piles during, before and after driving of each pile.
- .2 All measurements, observations and calculations associated with pile driving analyzer and wave equation analysis.
- .3 Provide Departmental Representative with three copies of records.

3.8 CLEANING

- .1 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 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 31 23 33.02 – Excavation for Bridge
- .4 Section 31 61 13 – Pile Foundations, General Requirements

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A563-21a¹ Standard Specification for Carbon and Alloy Steel Nuts
 - .2 ASTM A29/A29M-20 Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
 - .3 ASTM F436-11 Standard Specification for Hardened Steel Washers
 - .4 ASTM A328/A328M-07 Standard Specification for Steel Sheet Piling
 - .5 ASTM F3125/F3125M-21 Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength
- .2 CSA International
 - .1 CSA G40.20/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel Structures.
 - .3 CSA W59-2018, Welded Steel Construction (Metal Arc Welding).
 - .4 CAN/CSA S6-19 Canadian Highway Bridge Design Code (CHBDC).

1.3 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, specifications and datasheets for steel piles.
 - .2 Submit manufacturer's printed product literature, specifications and datasheets for timber, miscellaneous steel, and all other material required to complete work.
- .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of work.

- .4 Temporary shoring/retaining wall system shall be designed by a Professional Engineer Licensed to Practice in Nova Scotia, Canada; stamped drawings and calculations shall be provided for review at least four (2) weeks prior to the start of construction. This review is for general conformance only and in no way limits the responsibility of the Contractor who shall remain fully responsible for the design of any temporary shoring/retaining system.
- .5 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Shop drawing review by the Designer is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Designer approves the detailed design inherent in the shop drawings, responsibility for which shall remain with the Fabricator submitting the shop drawings, and such review shall not relieve the Fabricator of the responsibility for meeting all requirements of the contract documents. The Contractor shall be responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or construction and for the installation of work.
 - .3 Each drawing submitted to bear signature and stamp of qualified Professional Engineer registered or licensed in the Province of Nova Scotia, Canada.
 - .4 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, shims, threaded fasteners and welds. Indicate welds by CSA W59 welding symbols.
 - .5 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.
 - .6 Submit description of methods, temporary bracing and strengthening, sequence of erection and type of equipment proposed for use in erecting temporary shoring/retaining walls.
 - .7 The contractor shall schedule 2 weeks (10 business days) for the detailed single review of the temporary shoring shop drawings. This review time will start the following business day after the contractor has submitted the shop drawings to the Departmental Representative. If additional reviews of shop drawings are required, then additional time beyond that scheduled for the initial review will be required and the time required for subsequent shop drawing reviews shall not be constituted in any way by the Contractor as a delay.
- .6 Certificates:
 - .1 Submit 2 weeks prior to fabrication, 2 copies of steel producer and mill test reports in accordance with CSA G40.20/G40.21.
 - .2 Submit copy of certification for fusion welding in accordance with CSA W47.1.
 - .3 Submit 2 weeks prior to installation, all material data sheets for any timber lagging.

1.4 QUALITY ASSURANCE

- .1 Materials inspected or tested by Departmental Representative which fail to meet contract requirements will be rejected.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, Contractor to pay costs for additional tests or inspections. Departmental Representative to approve corrected work.

1.5 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.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations.
 - .2 Store and protect all materials from damage.
 - .3 Replace defective or damaged materials with new.
- .4 Use slings for lifting piling. Make sure mass is evenly distributed and piling is not subjected to excessive bending stresses.
- .5 Store piling on level ground or provide supports so that piling is level when stored.
 - .1 Provide blocking at spacing not exceeding 5 m so that there is no excessive sagging in piling.
 - .2 Overhang at ends not to exceed 0.5 m.
 - .3 Block between lifts directly above blocking in lower lift.
- .6 If material is stock-piled on or near structure, ensure structure is not overloaded.

Part 2 Products

2.1 MATERIALS

- .1 Steel sheet piles: to CSA G40.21, and ASTM A328-07 grade 350W
- .2 Mark each piece of sheet piling legibly by stencilling or die-and-stamping with information as follows:
 - .1 Heat number.
 - .2 Manufacturer's name.
 - .3 Length and section number.
- .3 Do not precut lifting or slinging holes in sheet piles.
- .4 Structural steel for H-Piles, walers, bearing plates, waler splice plates, angle connections and miscellaneous steel: to CSA G40.21, Grade 350 W.
- .5 Backfill material: to Section 31 23 33.02 – Excavating for Bridge

- .6 Steel reinforcement to be deformed bars and conform to CSA-G30.18M and CSA A23.1/A23.2, Grade 400W (Weldable)

Part 3 Execution

3.1 EXAMINATION

- .1 As-built drawings of temporary detour structure and foundations are not available. Exact configuration of temporary detour foundations is unknown to PSPC. Contract is to determine configuration and loading of temporary detour and ensure that temporary shoring/retaining walls are designed to maintain stability of this structure and detour roadway throughout construction. Contractor is fully responsible for design of temporary shoring/retaining wall system and shall complete any and all investigations/design necessary to complete required design and construction.

3.2 INSTALLATION

- .1 Do pile installation Work in accordance with Section 31 61 13 - Pile Foundations, General Requirements and procedure outlined in Contract Drawings except where otherwise specified.
- .2 Do welding in accordance with CSA W59.
- .3 Submit full details of method and sequence of installation of piling to Departmental Representative for approval prior to start of pile installation work. Details must include templates, bracing, driving shoes, setting and driving sequence and number of piles in panels for driving.
- .4 Single lane of traffic shall be maintained during temporary shoring/retaining wall installation.
- .5 Following construction of new bridge, any temporary shoring/retaining walls shall be removed to 1 m below finished grade or as approved otherwise by the Departmental Representative.

3.3 OBSTRUCTIONS

- .1 If obstruction is encountered during driving leave obstructed pile and proceed to drive remaining piles. Return and attempt to complete driving of obstructed pile later.
- .2 Advise Departmental Representative immediately if impossible to drive pile to full penetration, and obtain direction from the engineer of record for the shoring/retaining wall design. Submit recommendations to the Departmental Representative for review and approval.

3.4 HOLES

- .1 Drill any required holes in piling. Do not use flame cutting without permission of Departmental Representative.

3.5 CUTTING

- .1 When flame cutting tops of piles, and flame cutting holes in piles approved by Departmental Representative, use following procedure:
 - .1 When air temperature is above 0 degrees C, no pre-heat is necessary.
 - .2 When air temperature is below 0 degrees C, pre-heat until steel 25 mm on each side of line of cut has reached a temperature very warm to hand (approximately 35 degrees C).
 - .3 Use torch guiding device to ensure smooth round holes or straight edges.
 - .4 Make cut smooth and free from notches throughout thickness. If grinding is employed to remove notch or crack, finished radius to be minimum 5 mm.

3.6 SPLICING

- .1 Use full length piles unless splicing is approved on site by Departmental Representative.

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.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 30 00 – Cast in Place Concrete
- .4 Section 31 09 16 – Pile Driving Templates
- .5 Section 31 09 17 – Pile Tests
- .6 Section 31 61 13 – Pile Foundations, General Requirements

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel Structures.
 - .3 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
 - .4 CSA W186-21, Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - .5 CAN/CSA S6-19, Canadian Highway Bridge Design Code (CHBDC).
 - .6 CAN/CSA S16-14(R2019), Design of Steel Structures.
 - .7 CSA W59-18, Welded Steel Construction, (Metal Arc Welding).

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Submit shop drawings and indicate: splice detail, pile cap details.
 - .1 Each drawing stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
- .4 Quality Assurance: Test Reports:
 - .1 Prior to fabrication, and, if requested, provide Departmental Representative with two copies of steel producer's certificates in accordance with CSA-G40.20/G40.21.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Submit details of pile stock material to be used, as described in Section 2 - Products, for review by Departmental Representative.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle to prevent damage to products.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Deliver new, undamaged materials to site, accompanied by certified test reports, with manufacturer's logo and mill identification mark provided on H piling.
- .4 Storage and Protection:
 - .1 Store and handle H piling in accordance with manufacturer's written instructions to prevent permanent deflection, distortion or damage to piles.
 - .2 Support H piling on level blocks or racks spaced not more than 3 m apart and not more than 0.60 m from ends.
 - .3 Store H piling to facilitate required inspection activities and prevent corrosion prior to installation.
- .5 Waste Management and Disposal:
 - .1 Separate waste materials for disposal in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
 - .2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Steel HP360x152 vertical (plumb) piles as indicated to CSA G40.20/G40.21 – 350W.
- .2 Pile cap plate to CSA-G40.20/G40.21, Grade 350W.
- .3 Splices: to CSA-G40.21/G40.21, Grade 350W
- .4 Welding electrodes: to CSA W48.
- .5 Welding and weld testing to CSA W59.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- .2 Connect approved H pile driving shoe to H pile as per manufacturer's recommendations.

3.2 FABRICATION

- .1 Limit of one (1) full strength welded splice per pile unless otherwise approved in writing by Departmental Representative.

- .1 Use complete joint penetration groove welds. Test weld soundness to W59 Section 11, Statically Loaded Structures.
- .2 Submit details of planned use of pile material stock to Departmental Representative for approval prior to start of fabrication. Re-use cut-off lengths as directed by Departmental Representative.
- .3 Allowable tolerance on axial alignment to be 0.25% as measured by 3 m straight edge.
- .4 Allowable deviation from straight line over total length of fabricated pile to be 50 mm.
- .5 Repair defective welds as directed by Departmental Representative.
 - .1 Repairs: to CSA W59.
 - .2 Unauthorized weld repairs may be rejected.

3.3 INSTALLATION

- .1 Install piling in accordance with Section 31 61 13 – Pile Foundations, General Requirements.
- .2 If approved by Departmental Representative, splice piles in place during installation by welding. Hold members in alignment during splicing operation. Make splice by complete joint penetration groove welds as indicated on approved shop drawings. Limit of one (1) splice per pile unless otherwise approved by the Departmental Representative.
- .3 Perform internal visual inspection of steel H piles, joints and cap prior to placing of concrete. Ensure enough pile cut-off length is provided such that the remaining pile has not been damaged during pile driving operations.
- .4 Piles to be driven within ± 75 mm of theoretical position.

3.4 WELDING

- .1 Weld to CSA W59.
- .2 Welding certification of companies: to CSA W47.1.
- .3 Welding certification of companies welding steel reinforcing bars placed in reinforced concrete: in accordance with CSA W186.

END OF SECTION

Part 1 General

1.1 WORK INCLUDED

- .1 This section specifies requirements for providing materials, labor, tools and equipment, and performing operations necessary to complete the trenchless installation of watermain and sanitary pressure sewer, where shown on the drawings.
- .2 The method i.e., pipe jacking, pipe ramming, boring, Horizontal Directional Drilling (HDD), etc. will be subject to approval by the Engineer.

1.2 RELATED WORK

- .1 Watermain: Section 33 14 16
- .2 Pressure Sewer: Section 33 31 23

1.3 REFERENCE MATERIAL

- .1 Guidelines for Pipe Ramming TTC Technical Report #2001-04, US Corp of Army Engineers.
- .2 ASTM F1962-2011, Standard Guide for use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles.

1.4 SUBMISSIONS AND SHOP DRAWINGS

- .1 Provide a detailed description of the proposed method of trenchless installation.
- .2 Provide two examples of similar projects successfully completed in the last five (5) years in Atlantic Canada, complete with contact information for reference for review by the Engineer.
- .3 Provide shop drawings showing dimensions including open cut entry and exit pits, details of pipes including material for (carrier pipe and casing pipe if used complete with straps, skids, blocks or manufactured casing spacers and end seals, pumped unshrinkable fill if required), jointing method, joint location and type, and additional supplement to 1.4.1 as may be requested by the Engineer.
- .4 Alternate pipe and jointing may be considered. Submit alternates for review and approval by the Engineer.

1.5 QUALIFICATIONS

- .1 Perform work with skilled tradesmen able to complete it expeditiously and who have been engaged in work of similar scope and nature which has been successfully completed.

1.6 SCHEDULING & COORDINATION OF TRENCHLESS INSTALLATION

- .1 Submit plan, details, shoring details, and schedule for the Trenchless installation to the Engineer for approval prior to the start of the construction.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Watermain: to Section 33 11 00.
- .2 Sanitary sewer: to Section 33 31 00.
- .3 Annular space material: unshrinkable fill (Rheocell 30).
- .4 Pipe/Casing spacers, if required: corrosion and rot-proof.
- .5 Acceptable product: RACI HDPE, spacing interval to suit but not less than 1.0 m.
- .6 Temporary Wood Skids, if required: pressure treated hardwood timber skids, size as required.

Part 3 EXECUTION

3.1 TRENCHLESS PIPE INSTALLATION

- .1 Perform Work at such times and in such manner as the Engineer may direct.
- .2 Prior to any work commencing on the trenchless installation, view a video inspection of the adjacent sanitary sewer system and carry out a visual inspection of the sanitary sewer and the adjacent storm sewer system to confirm horizontal location and approximate depths of service laterals and main lines.
- .3 The trenchless carrier pipe and casing pipe if used, is to be installed as shown on drawings, avoiding conflict with utility poles. The exact horizontal location and depth of installation can be adjusted depending on site conditions. Any change in location is to be agreed by the Engineer prior to commencement of the trenchless installation.
- .4 The soil formation at the depth through which the trenchless installation is to be performed is representative of material commonly found throughout much of the area.
- .5 Use of a casing pipe is optional, where a casing pipe is used, place carrier pipe inside casing pipe using approved blocking methods to guide carrier pipe in true alignment and fill the annular space with unshrinkable fill.
- .6 Free boring for main line pipe installation is acceptable, fill the annular space around the carrier pipe with unshrinkable fill.
- .7 The limit of the installation is shown on the drawings and construction activity for the trenchless installation shall be confined to either end of the installation.
- .8 The installation method used shall not cause heave, future settlement, or in any way disturb existing structures and services. The direction of installation will be agreed with the Engineer.
- .9 Carry out work in accordance with health and safety regulations, including stabilization of entry and exit pits, de-watering, and fencing. Cuttings from the trenchless installation will be removed from site daily and the site will be cleaned and made safe during off hours.

END OF SECTION