

PART 1 - GENERAL

- 1.1 Related Work
  - .1 Section 31 61 13 - Pile Foundations General
  - .2 Section 31 62 16 - Steel Sheet Piles
  - .3 Section 31 62 26 - Steel Pipe Piles
- 1.2 References
  - .1 ASTM F3125/F3125M-19e2, 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 ASTM F436/F436M-19, Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
  - .3 CSA G40.20/G40.21-18, General Requirements for Rolled or Welded Quality Steel/Structural Quality Steel.
  - .4 CSA S16-19, Design of Steel Structures.
  - .5 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel.
  - .6 CSA W59-20, Welded Steel Construction.
- 1.3 Shop Drawings
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submissions/Shop Drawings, stamped by professional engineer registered to practice in Nova Scotia.
  - .2 Indicate the following items:
    - .1 Material.
    - .2 Anchorage, field control and alignment methods.
    - .3 Design parameters.
    - .4 Pile location tolerances.
    - .5 Removable members.
    - .6 Alternatives.
- 1.4 Design Criteria
  - .1 Design templates to safely withstand following loads:
    - .1 All gravity loads to which template will be

subjected.

- .2 Lateral loads to firmly hold pile in position during installation.

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| 1.5 <u>Protection</u>              | .1 | Protect templates from damage. Repair damage to templates, formwork, or concrete arising from operations to satisfaction of the Departmental Representative at no additional cost to the Contract. |
| 1.6 <u>Measurement for Payment</u> | .1 | This item will not be measured separately but will be considered incidental to the Work in accordance with Section 01 29 00 - Project Particulars and Measurement.                                 |

## PART 2 - PRODUCTS

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|----------------------|----|--|
| 2.1 <u>Materials</u> | .1 | Steel sections and plates: to CSA G40.20 and CSA G40.21, Type 300W, minimum.                           |
|                      | .2 | Welding Materials: to CSA W59.   |
|                      | .3 | Bolts: to ASTM F3125/F3125M, Grade A325/A325M. Matching nuts to ASTM A563, washers to ASTM F436/F436M. |

## PART 3 - EXECUTION

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|---------------------------------|----|---|
| 3.1 <u>Fabrication</u>          | .1 | Fabricate structural steel for templates in accordance with CSA S16 and reviewed shop drawings.                                 |
|                                 | .2 | Do welding in accordance with CSA W59.  |
|                                 | .3 | Welding companies must be qualified under provisions of CSA W47.1.  |
| 3.2 <u>Positioning</u>          | .1 | Position and hold template in location to receive piles with an accuracy which will bring piles to within tolerances specified. |
| 3.3 <u>Removal of Templates</u> | .1 | Avoid any damage to piling when removing templates.   |

- .2 When instructed by the Departmental Representative, move templates from project site.

**END OF SECTION**

PART 1 - GENERAL

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|------------------------------------|----|--|
| 1.1 <u>Description of Work</u>     | .1 | This Section includes but is not limited to the following:<br>.1    All normal removals as required to complete the work. All items to be verified by a site visit prior to submission of a tender. All available plans of the existing structure are available, upon request. |
| 1.2 <u>Related Work</u>            | .1 | Refer to other specification sections for related information.   |
|                                    | .2 | Refer to Section 01 33 00 for Shop Drawing/ Submissions requirements.  |
| 1.3 <u>Submissions</u>             | .1 | Methodology:<br>.1    When requested provide methodology for carrying out the work   |
|                                    | .2 | Provide submission in accordance with Section 01 33 00.  |
| 1.4 <u>Protection</u>              | .1 | Prevent movement, settlement, or damage of adjacent structures. Provided bracing and shoring as required. In event of damage, immediately replace such items or make repairs to approval of the Departmental Representative and at no additional cost to the Contract.         |
|                                    | .2 | Prevent debris from going adrift and becoming a menace to navigation.  |
|                                    | .3 | All damage to existing structures, roadways, pipelines, electrical systems not specified for removal to be repaired at the Contractor's cost to the satisfaction of the Departmental Representative.   |
| 1.5 <u>Measurement for Payment</u> | .1 | Sitework, demolition and removals will be measured in accordance with Section 01 29 00.  |

PART 2 - PRODUCTS

2.1 Not Used .1 Not applicable.

PART 3 - EXECUTION

3.1 Preparation

- .1 Inspect site and verify with the Departmental Representative items designated for removal and items to be preserved.
- .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.
- .3 Provide temporary power and lighting as shown on the plan or as required by the Departmental Representative.
- .4 Repair damages as a result of operations at no additional cost and to the satisfaction of the Departmental Representative.

3.2 Removal

- .1 Remove items indicated and as directed by the Departmental Representative. The Departmental Representative will be the sole judge of the extent of removal required.
- .2 If concrete is to be removed by jackhammer, the maximum hammer mass permitted is 13 kg. All tools used in concrete removal must be pointed. If any concrete is removed around reinforcing steel, then maximum hammer size permitted is 7 kg.
- .3 Sawcut perimeter of concrete removals to a minimum depth of 25mm to prevent feathered edges. No overcutting is permitted at corners of removal areas.
- .4 Remove by mechanical means any and all concrete indicated on Drawings to sound concrete. A clear distance of 25mm must be exposed around all reinforcement uncovered during demolition. Take care not to damage existing reinforcing steel.
- .5 Remove all loose, delaminated and weak concrete, oil, greases, laitance and other contaminates to the approval of the Departmental Representative.

Prepare existing concrete surfaces for bonding with new concrete using acceptable mechanical means and concrete cleaners as necessary to obtain clean, sound and roughened surfaces (to +/- 5mm amplitude). Coarse aggregate to be exposed.

- .6 Do not disturb adjacent structures designated to remain in place.
- .7 At end of each day's work, leave work in safe condition so no part is in danger of toppling or falling.
- .8 Turn over items designated for salvage by the Departmental Representative.

### 3.3 Disposal of Material

- .1 Dispose of materials not designated for salvage or re-use in work off-site.
- .2 Transport and dispose of material in an environmentally acceptable manner to the satisfaction of the Departmental Representative, and in accordance with any local, Municipal, Provincial and Federal restrictions and regulations.

### 3.4 Restoration

- .1 Upon completion of work, remove debris, trim surfaces, and leave work site clean.
- .2 Reinstate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work. Match condition of adjacent, undisturbed areas.

**END OF SECTION**

## PART 1 - GENERAL

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|-----|----------------|----|---|
| 1.1 | <u>General</u> | .1 | Provide and maintain silt boom, oil boom and sediment control devices where required or as directed, prior to and during construction. Coordinate locations with the Departmental Representative. Do not remove control features until authorized by the Departmental Representative. |
|     |                | .2 | Do erosion control in accordance with approved Environmental Protection Plan.   |

## PART 2 - PRODUCTS

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|-----|-------------------------------|----|--|
| 2.1 | <u>Sediment Control Fence</u> | .1 | Sediment Control fence: preassembled sediment control fence with industrial woven geotextile fabric pre-stapled to wood posts. |
| 2.2 | <u>Silt Curtain</u>           | .1 | High strength woven geotextile, UV protected, floating boom.   |
| 2.3 | <u>Oil Boom</u>               | .1 | UV resistant, vinyl coated polyester or nylon, ballasted minimum 300mm submerged.  |

## PART 3 - EXECUTION

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|-----|-------------------------------|----|---|
| 3.1 | <u>Temporary Soil Covers</u>  | .1 | If blown straw or hay is to be used as temporary soil cover for sediment and erosion control of exposed soils, a 100% cover should be required to ensure soil erosion is minimized. |
| 3.2 | <u>Sediment Control Fence</u> | .1 | Attach fence with roofing nails and roofing tins. Provide wood strapping along top of fence.  |
|     |                               | .2 | Excavate 150mm x 150mm trench along length of fence. Lay fabric bottom in trench and backfill with selected excavated material.   |
| 3.3 | <u>Oil Boom Installation</u>  | .1 | Install oil boom in segments as the Work progresses while maintaining complete containment. Do not impede the marine traffic on Site.   |

- |     |  |    |   |
|-----|--|----|---|
| 3.4 | <u>Silt Curtain Installation</u>                         | .1 | Install silt curtain in segments as the Work progresses while maintaining complete containment. Do not impede the marine traffic on Site. |
|     |  | .2 | Anchor the silt curtain to the seafloor.  |
|     |  | .3 | Minimum depth of silt curtain to be 5m.   |
| 3.5 | <u>Maintenance of Silt and Sediment Control Features</u> | .1 | Maintain siltation control features throughout the construction period. Repair damage to original condition.                              |
|     |  | .2 | Remove accumulated sediment from behind silt fence.   |
|     |  | .3 | Maintain vertical alignment of silt fence and boom such that it is always plumb and straight.   |
| 3.6 | <u>Removal of Silt and Sediment Control Features</u>     | .1 | Remove sediment control features at upon Completion of the Work.  |

**END OF SECTION**



## PART 1 - GENERAL

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|-----|---------------------|----|---|
| 1.1 | <u>Related Work</u> | .1 | Section 31 32 21 - Filter Fabric.   |
| 1.2 | <u>References</u>   | .1 | American Society for Testing and Materials International (ASTM)   |
|     |                     | .1 | ASTM C117-17, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.  |
|     |                     | .2 | ASTM C136/C136M-19, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.  |
|     |                     | .3 | ASTM D422-72e2, Standard Test Method for Particle-Size Analysis of Soils.   |
|     |                     | .4 | ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m <sup>3</sup> ).   |
|     |                     | .5 | ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m <sup>3</sup> ).  |
|     |                     | .6 | ASTM D4318-17E1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.  |
|     |                     | .2 | Canadian General Standards Board (CGSB)   |
|     |                     | .1 | CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.  |
|     |                     | .3 | Canadian Standards Association (CSA International)  |
|     |                     | .1 | CAN/CSA-A3000-18, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).   |
|     |                     | .2 | CSA-A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.  |
| 1.3 | <u>Definitions</u>  | .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 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.
- .5 Recycled fill material: material, considered inert, obtained from alternate sources, and engineered to meet requirements of fill areas.
- .6 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.
- .7 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.

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| 1.4 | Action and<br>Informational<br><u>Submittals</u> | .1 | Make submittals in accordance with Section 01 33 00.   |
|     |  | .2 | Quality Control:   |
|     |  | .1 | Submit condition survey of existing conditions as described in Existing Conditions article of this Section.  |
|     |  | .2 | Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.   |
|     |  | .3 | Submit to the Departmental Representative written notice when bottom of excavation is reached.   |
|     |  | .3 | Preconstruction Submittals:  |
|     |  | .1 | Submit construction equipment list for major equipment to be used in this section prior to start of Work.  |
|     |  | .2 | Submit records of underground utility locates, indicating: location plan of existing utilities as found in field clearance record from utility authority and location plan of relocated and abandoned services, as required.                   |
|     |  | .4 | Samples:   |
|     |  | .1 | Inform Departmental Representative at least four (4) weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.  |
| 1.5 | <u>Quality Assurance</u>                         | .1 | Qualification Statement: submit proof of insurance coverage for professional liability.  |
|     |  | .2 | Keep design and supporting data on site.   |
|     |  | .3 | Engage services of qualified professional engineer who is registered or licensed in Province of Nova Scotia, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing, and underpinning required for Work. |
|     |  | .4 | Do not use soil material until written report of soil test results are reviewed by the Departmental Representative.  |

- 1.6 Existing  
Conditions
- .1 Soil sampling has not been carried out at the Site.
  - .2 Buried services:
    - .1 Before commencing Work verify location of buried services on and adjacent to site.
    - .2 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
    - .3 Prior to beginning excavation Work, notify Departmental Representative or authorities having jurisdiction establish location and state of use of buried utilities and structures. The Departmental Representative or authorities having jurisdiction will clearly mark such locations to prevent disturbance during Work.
    - .4 Confirm locations of buried utilities by careful test excavations.
    - .5 Maintain and protect from damage, water, sewer, electric, telephone and other utilities and structures encountered.
    - .6 Where utility lines or structures exist in area of excavation, obtain direction of the Departmental Representative before removing or re-routing.
    - .7 Record location of maintained, re-routed and abandoned underground lines.
    - .8 Confirm locations of recent excavations adjacent to area of excavation.
  - .3 Existing buildings and surface features:
    - .1 Conduct condition survey of existing buildings, service poles, wires, pavement, survey benchmarks 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 as directed by the Departmental Representative at no additional cost.
  - .4 Carefully carryout excavation and backfilling operations in vicinity of existing tie rods and anchor systems to avoid damage. Provide protection as required.

PART 2 - PRODUCTS2.1 Materials

- .1 Clear stone: crushed and screened, hard, durable stone, free from clay and organic matter. And graded as follows:

## .1 Type C4:

<u>Sieve Size, mm</u>	<u>Percent Passing</u>
100	100
75	85-100
31.5	10-20
25	0-8

- .2 Gravels: crushed and screened pit gravel or crushed and screened rock. Material shall consist of hard and durable stone particle. Gradation to be dense, well graded and as follows:

## .1 Type 1:

<u>Sieve Size, <math>\mu</math>m</u>	<u>Percent Passing</u>
25 000	100
19 000	90-100
12 500**	48-82
4 750	20-50
150	5-12
75*	3-8

## .2 Type 2:

<u>Sieve Size, <math>\mu</math>m</u>	<u>Percent Passing</u>
75 000	100
50 000	65-98
25 000	48-78
12 500	35-65
4 750	30-60
150	5-12
75*	3-8

\* For gravel sources not classified as quarries, the allowable percentage passing the 75  $\mu$ m sieve shall be 3 to 5%.

\*\* For gravel sources classified as quarries the allowable percentage passing the 12,500  $\mu$ m sieve to be 50-90%.

PART 3 - EXECUTION

- 3.1 Temporary Erosion and Sedimentation Control
- .1 Provide temporary erosion and control sedimentation 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.
  - .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 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
- 3.3 Preparation/Protection
- .1 Protect existing features from drainage and in accordance with 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 the Departmental Representative's approval.
  - .4 Protect natural and man-made features required to remain undisturbed.
  - .5 Protect buried services that are required to remain undisturbed.
- 3.4 Stockpiling
- .1 Stockpile fill materials in areas designated by the 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 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Health and Safety Act for the Province of Nova Scotia.
  - .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
  - .3 Construct temporary Works to depths, heights and locations as approved by Departmental Representative.
  - .4 Upon completion of substructure construction:
    - .1 Remove cofferdams, shoring and bracing.
    - .2 Remove excess materials from site.
- 3.6 Dewatering
  - .1 Keep excavations free of water while Work is in progress.
  - .2 Provide for the Departmental Representative's review details of proposed dewatering methods.
  - .3 Avoid excavation below groundwater table if quick condition is likely to occur.
  - .4 Protect open excavations against flooding and damage due to surface run-off.
  - .5 Dispose of water 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.
- 3.7 Excavation
  - .1 Excavate to lines, grades, elevations, and dimensions as indicated.
  - .2 Remove concrete, rubble and other obstructions encountered during excavation off site. All existing tie rod anchorages for existing wharf to

be maintained. Install temporary shoring as required to ensure stability of existing wharf structure at all times.

- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by the Departmental Representative.
- .5 Restrict vehicle operations directly adjacent to open trenches.
- .6 Dispose of surplus and unsuitable excavated material off site.
  - .1 Prior to hauling surplus excavated soils from site, provide copy of disposal permit to the Departmental Representative.
  - .2 Temporary stockpiling of excavated material will be considered incidental to the contract.
- .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 the Departmental Representative when bottom of excavation is reached.
- .10 Obtain the Departmental Representative approval of completed excavation.
- .11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Departmental Representative.
- .12 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 When exposing existing tie rods and anchor systems.
  - .2 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.



- .3 Clean out rock seams and fill with concrete mortar or grout to approval of the Departmental Representative.

### 3.8 Backfilling

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
  - .2 Departmental Representative has inspected and approved of construction below finish grade.
  - .3 Removal of concrete formwork.
  - .4 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water, and frozen ground.
- .3 Backfill with materials indicated.
- .4 Do not use backfill material which is frozen or contains ice, snow, or debris.
- .5 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Carefully carryout backfilling operations in vicinity of existing tie rods and anchor systems to avoid damage. Do not operate rollers over ties rods until buried with at least 300mm of backfill material.
- .7 Backfilling around installations:
  - .1 Do not backfill around or overcast-in-place concrete within 24 hours after placing of concrete.
  - .2 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 600mm.
  - .3 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
    - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and

compaction pressure and approval  
obtained from Departmental  
Representative or:

- .2 If approved by Departmental  
Representative, erect bracing or  
shoring to counteract unbalance, and  
leave in place until removal is  
approved by Departmental  
Representative.

- .8 Consolidate and level unshrinkable fill with  
internal vibrators.

### 3.9 Restoration

- .1 Upon completion of Work, remove waste materials  
and debris, trim slopes, and correct defects as  
directed by Departmental Representative.
- .2 Reinstate walkway disturbed by excavation to  
thickness, structure and elevation which existed  
before excavation.
- .3 Clean and reinstate areas affected by Work as  
directed by the Departmental Representative.
- .4 Use temporary plating to support traffic loads  
over unshrinkable fill for initial 24 hours.
- .5 Protect newly graded areas from traffic and  
erosion and maintain free of trash or debris.

**END OF SECTION**

PART 1 - GENERAL

- |     |                                |    |   |
|-----|--------------------------------|----|---|
| 1.1 | <u>Related Work</u>            | .1 | Section 31 23 33 - Excavating and Backfilling.  |
| 1.2 | <u>References</u>              | .1 | ASTM D4595-17, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.   |
|     |                                | .2 | ASTM D4751-21, Standard Test Methods for Determining Apparent Opening Size of a Geotextile.   |
|     |                                | .3 | CAN/CGSB-148.1-03, Complete Set - Methods of Testing Geotextiles and Geomembranes.  |
| 1.3 | <u>Mill Certificates</u>       | .1 | At least two (2) weeks prior to start of work, furnish the Departmental Representative with copies of mill test data and certificate that filter fabric delivered to job site meets requirements of this section. |
| 1.4 | <u>Approval</u>                | .1 | Obtain written approval of the Departmental Representative for filter fabric before installation of material in work.   |
| 1.5 | <u>Measurement for Payment</u> | .1 | Filter fabric will not be measured but will be considered incidental to the work.   |

PART 2 - PRODUCTS

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|-----|-------------------------|----|---|----|-------------------------|----|---------------------|
| 2.1 | <u>Materials</u>        | .1 | Synthetic fiber: rot proof, unaffected by action of oil or salt water and not subject to attack by insects or rodents.  |    |                         |    |                     |
|     |                         | .2 | Fabric: nonwoven polyester and/or polypropylene fabric.   |    |                         |    |                     |
|     |                         | .3 | Seams: sewn in accordance with manufacturer's recommendations.  |    |                         |    |                     |
|     |                         | .4 | Physical properties: to ASTM D4595, CAN/CGSB-148.1 and ASTM D4751: <table border="0" style="margin-left: 20px;"> <tr> <td style="vertical-align: top;">.1</td> <td>Tensile Strength: 900 N</td> </tr> <tr> <td style="vertical-align: top;">.2</td> <td>Tear Strength 360 N</td> </tr> </table> | .1 | Tensile Strength: 900 N | .2 | Tear Strength 360 N |
| .1  | Tensile Strength: 900 N |    |   |    |                         |    |                     |
| .2  | Tear Strength 360 N     |    |   |    |                         |    |                     |

- .3 Elongation at break 50%
- .4 Filtration Opening Size = 100 - 80um.
- .5 Permeability =  $2 \times 10^{-1}$  cm sec.

### PART 3 - EXECUTION

- 3.1 Preparation of Base
  - .1 Fine grade area to be covered with filter fabric to a uniform surface area. Fill depressions with suitable material.
- 3.2 Placing Filter Fabric
  - .1 Place filter fabric on prepared surface loosely from top of the slope to the bottom allowing fabric to conform easily to contours of the slope.
  - .2 Allow one (1) metre of fabric for overlapping and anchoring purposes, 700 mm at the top and 300 mm at the bottom of the slope.
  - .3 Longitudinal seems will have a minimum of 450 mm overlap and will be pinned every 600 mm with 100 mm nails.
  - .4 Anchor top of fabric at 1 metre intervals with 15mm diameter steel rods 600 mm in length. Anchor bottom of fabric by folding fabric and placing fill on top.

**END OF SECTION**

PART 1 - GENERAL

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|-----|--|----|---|
| 1.1 | <u>Related Work</u>                    | .1 | Section 31 09 19 - Piling Installation Templates.   |
|     |  | .2 | Section 31 62 26 - Steel Pipe Piles.  |
| 1.2 | <u>Submissions</u>                     | .1 | Methodology: provide methodology statement including type of pile installation equipment to carry out the Work.   |
|     |  | .2 | Provide submissions in accordance with Section 01 33 00 - Submissions/Shop Drawing.   |
| 1.3 | <u>Existing Sub-Surface Conditions</u> | .1 | Notify the Departmental Representative immediately if subsurface conditions at site differ from those indicated.  |
|     |  | .2 | Design is based on subsurface information inferred from the surrounding site records. Pile installation details are based on this information. Coordinate all work to facilitate the Departmental Representative's observations and review. |
| 1.4 | <u>Protection</u>                      | .1 | Protect public and construction personnel, adjacent structures, and work of other sections from hazards due to pile installation operations.  |
| 1.5 | <u>Scheduling of Work</u>              | .1 | Submit schedule of planned sequence of pile installation to the Departmental Representative for review, not less than two (2) weeks prior to commencement of pile installation for structure.   |
| 1.6 | <u>Delivery, Storage And Handling</u>  | .1 | Protect piles from damage due to excessive bending stresses, impact, abrasion or other damages during storage and handling.   |
|     |  | .2 | Replace damaged piles to the satisfaction of the Departmental Representative.   |
| 1.7 | <u>Inspection of Work</u>              | .1 | Coordinate pile installation procedures with the Departmental Representative a minimum of two (2) weeks prior to commencement of pile installation. The method of advancing the pile to the depth   |

indicated into bedrock must be approved by the Departmental Representative prior to starting work.

- .2 Arrange and pay for full-time inspection by qualified Geotechnical Engineer during pipe pile installation.
- .3 Have the Geotechnical Engineer determine elevation to top of sound bedrock and confirm that pile depth into bedrock indicated has been achieved.
- .4 After drilling is completed, clean out pile and inspect with downhole camera.
- .5 Pile installation must be approved by the Departmental Representative prior to concreting and pile cut-off.

## PART 2 - PRODUCTS

### 2.1 Materials

- .1 For material requirements refer to Section 31 62 26 - Steel Pipe Piles.
- .2 Provide equipment of sufficient capacity to handle full length piles without cutting and splicing.
- .3 Splicing of piles will not be permitted unless specifically agreed to by the Departmental Representative. When permitted, provide details for Departmental Representatives review. Design details of splice to bear dated signature stamp of a Professional engineer registered or licensed in the Province of Nova Scotia.

## PART 3 - EXECUTION

### 3.1 Equipment Requirements

- .1 Equipment information: prior to commencement of pile installation operation, submit to the Departmental Representative for review, details of equipment for installation of piles.

### 3.2 Preparation

- .1 Verify conditions at pile locations are adequate to support pile installation operation. Make

provision for access and support of piling equipment during performance of work.

- .2 Provide at least 72 hours notice of readiness to the Departmental Representative when the Work is ready to take place. Provide assistance as required and access to the Work so the Departmental Representative can conduct review.

3.3 Field Quality Control .1  
And Field Measurement

Measurement:

- .1 Maintain accurate records of installation for each pile, including:
  - .1 Type and make of equipment.
  - .2 Pile size and length, location of pile in pile group, location or designation of pile group.
  - .3 Sequence of pile installation in group.
  - .4 Final tip and cut-off elevations.
  - .5 Other pertinent information such as drilling interruptions, pile damage.
- .2 Provide the Departmental Representative with an electronic copy of records in PDF file format.
- .2 Provide method and equipment for inspection of each pile to ensure that pile is properly cleaned out.
- .3 Co-operate with and assist Departmental Representative to inspect each pile.

3.4 Drilling

- .1 Reinforce pile heads if necessary. Piles with damaged heads, as determined by Departmental Representative, will be rejected.
- .2 Hold piles securely and accurately in position while drilling.
- .3 Cut off piles neatly and squarely at elevations indicated. Provide sufficient length above cut-off elevation so that the part damaged during installation is cut off.
- .4 Remove cut-off lengths from site on completion of work.
- .5 Installation of each pile will be subject to acceptance by the Departmental Representative.

Departmental Representative will be sole judge of acceptability of each pile. Departmental Representative to accept final installation of all piles prior to removal of pile drilling rig from site.

- .6 Advance piles to achieve minimum penetration into bedrock indicated while maintaining the pile shape without damaging. Contractor is solely responsible for any damage, and must remedy any such damage to Departmental Representative's approval at no additional cost to project.

### 3.5 Tolerances

- .1 Pile heads to be within 75mm of locations as indicated.
- .2 Piles not to be more than 1% of length out of vertical alignment.

### 3.6 Obstructions

- .1 Remove all obstructions from the surface prior to installing piles and install piles to the specified depth in competent bedrock.
- .2 Where an obstruction is encountered that causes sudden and unexpected change in penetration resistance or deviation from specified tolerances, advise the Departmental Representative and submit for their review the Contractor's proposed method(s) for achieving specified penetrations and tolerances. Incorporate review comments in the proposed method(s) and proceed with the Work.
- .3 Consideration will be made for additional compensation for non-native material and or situations that are encountered under the surface, over and above what could be reasonably anticipated from soils information available and causes delays/additional costs in piling. Each case will be reviewed and approved by the Departmental Representative by means of the RFI process.

### 3.7 Damaged Or Defective Piles

- .1 Remove rejected pile and replace with a new and if necessary, a longer pile.



- .2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of a defective pile.

### 3.8 Penetration

- .1 Protect adjacent structures, services, and work of other section from hazards due to pile installation operations.
- .2 Arrange sequencing of pile installation operations and methods such that no damage occurs to adjacent existing structures. If damaged, remedy damaged items to restore to original or better condition at no additional cost to the Contract.

**END OF SECTION**

PART 1 - GENERAL

- |     |                                       |    |   |
|-----|---------------------------------------|----|---|
| 1.1 | <u>Related Work</u>                   | .1 | Section 31 09 19 - Piling Installation Templates.   |
| 1.2 | <u>References</u>                     | .1 | ASTM A572/A572M-21e1, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.   |
|     |                                       | .2 | CSA W59-18, Welded Steel Construction.  |
|     |                                       | .3 | CSA W47.1-19, Certification of Companies for Fusion Welding of Steel.   |
| 1.3 | <u>Submittals</u>                     | .1 | Submit shop drawings for the following items:   |
|     |                                       | .1 | Splice details.   |
|     |                                       | .2 | All connectors and hardware.  |
| 1.4 | <u>Protection</u>                     | .1 | Protect public and construction personnel, adjacent structures, and work of other sections from hazards due to pile installation operations.  |
| 1.5 | <u>Quality Assurance</u>              | .1 | Inspection and testing of piling material may be carried out by testing laboratory designated by the Departmental Representative at any time during course of Work.   |
|     |                                       | .2 | Materials inspected or tested by the Departmental Representative which fail to meet specified requirements will be rejected.  |
|     |                                       | .3 | 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. |
|     |                                       | .4 | Conduct all shop welding in accordance with CSA W59, or other equivalent international standard. Use welders certified to CSA W47.1 or other equivalent international standard.   |
| 1.6 | <u>Delivery, Storage and Handling</u> | .1 | Use slings for lifting piling so that mass is evenly distributed and piling is not subjected to excessive bending stresses.   |

- .2 Store sheet piling on level ground or provide supports so that sheet 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.
    - .4 Do not allow stored piling sections to be in contact with the ground.
  - .3 If material is stockpiled on structure, do not overload structure.
- 1.7 Waste Management and Disposal
- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
  - .2 Collect and separate for disposal packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

## PART 2 - PRODUCT

- 2.1 Steel Sheet Piles
- .1 Steel sheet piles: to ASTM A572, Grade 60 ( $F_y = 415 \text{ MPa}$ ) and as specified below.
  - .2 Continuous interlocking Z section consisting of the following minimum section properties:
    - .1 Minimum effective elastic section modulus of  $3995 \text{ cm}^3$  per metre of wall.
    - .2 Minimum flange thickness of Z section of 17.0mm.
    - .3 Minimum web thickness of Z section of 13.2mm
    - .4 System width of 1400mm per steel sheet pile pair.
  - .3 Mark each piece of sheet piling legibly by stenciling or die-and-stamping with the following information:
    - .1 Heat number.
    - .2 Manufacturer's name.
    - .3 Length and section number.
  - .4 Do not precut lifting or slinging holes in sheet piles.

- .5 Special corners: provide fabricated special corners as specified by pile manufacturer for specific pile being installed.
- 2.2 Fabrication Steel Sheet Piles
  - .1 Fabricate full length piles to eliminate splicing during installation.
  - .2 Full length piles may be fabricated from piling material by splicing lengths together where approved by the Departmental Representative. Use complete joint penetration groove welds. Conform to requirements of piling system manufacturer.
  - .3 Submit details of planned use of pile material stock to the Departmental Representative for approval prior to start of fabrication. Re-use cut-off lengths as directed by the Departmental Representative.
  - .4 Repair defective welds as approved by the Departmental Representative. Repairs to CSA W59. Unauthorized weld repairs may be rejected.

### PART 3 - EXECUTION

- 3.1 Installation of Steel Sheet Piles
  - .1 If approved by the Departmental Representative, accomplish pile splices via welding. To prevent distortion of steel sheet piles, hold members in alignment during splicing operation. Make splice by complete joint penetration groove welds as indicated on shop drawings.
  - .2 Do welding in accordance with CSA W59.
  - .3 Submit details of method and sequence of installation of piling to the Departmental Representative for review prior to start of pile installation work.
  - .4 Install sheet piles as indicated.
- 3.2 Holes
  - .1 Patch holes in sheet piles, except where permanent holes are indicated.
  - .2 Use material equal to that of piling to patch holes and overlap not less than hole diameter.

- .3 Weld to develop full strength of plate.
- .4 Drill any required holes in piling. Do not use flame cutting without permission of the Departmental Representative.

### 3.3 Welding

- .1 Weld in accordance with CSA W59.
- .2 Welding certification of companies must be in accordance with CSA W47.1.

### 3.4 Cutting

- .1 When flame cutting tops of piles, and flame cutting holes in piles approved by the Departmental Representative, use the 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). Temperature indicating crayon marks may be used to measure temperature.
  - .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 5mm.

**END OF SECTION**

PART 1 - GENERAL

- |     |                                    |    |  |
|-----|------------------------------------|----|--|
| 1.1 | <u>Related Work</u>                | .1 | Section 03 30 00 - Cast-in-Place Concrete.   |
|     |                                    | .2 | Section 31 09 19 - Piling Installation Templates.  |
| 1.2 | <u>References</u>                  | .1 | API SPEC 5L-2018, Line Pipe.   |
|     |                                    | .2 | ASTM A252/A252M-19, Standard Specification for Welded and Seamless Steel Pipe Piles.   |
|     |                                    | .3 | ASTM A53/A53M-20, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.  |
|     |                                    | .4 | CSA W47.1-19, Certification of Companies for Fusion Welding of Steel.  |
|     |                                    | .5 | CSA W59-18, Welded Steel Construction.   |
|     |                                    | .6 | CSA Z245.1-18, Steel Pipe.   |
| 1.3 | <u>Transportation and Delivery</u> | .1 | Upon arrival at the site promptly inspect pipe piles and give written report to the Departmental Representative on condition of all piles received. Mark pipe piles in accordance with Clause 2.1.2.3 of this section.   |
| 1.4 | <u>Quality Assurance</u>           | .1 | Inspection and testing of steel piling material may be carried out by a testing laboratory designated by the Departmental Representative at any time during course of work. When undertaken by the Departmental Representative, inspection and testing of pipe pile materials will in accordance with ASTM A252. |
|     |                                    | .2 | Materials inspected or tested by the Departmental Representative which fail to meet contract requirements will be rejected.  |
|     |                                    | .3 | Materials failing to meet contract requirements may be rejected at any time in course of work.   |
|     |                                    | .4 | Where tests or inspections by designated testing laboratory reveal that the pipe pile material fails to meet the specified requirements, cover all costs associated with this inspection and/or testing. Pay costs for any additional tests or inspections as the Departmental Representative                    |

may require to verify acceptability of corrected work.

1.5 Shop Drawings

- .1 At least two (2) weeks prior to finalizing pile order, submit a schedule of material properties and pile lengths to the Departmental Representative for review.
- .2 Submit shop drawings for the following items in accordance with Section 01 33 00 - Submissions/Shop Drawings. Shop drawings for pile splices are to be stamped by professional engineer licensed in the Province of Nova Scotia.
  - .1 Ring Bit details.
  - .2 Pile Splice details.
- .3 Equipment lists: submit to Departmental Representative, list of equipment for installation before beginning work.
  - .1 Provide details sufficient to evaluate performance of equipment.
  - .2 Include details of equipment for excavating, drilling, cleaning out and concreting of piles.

1.6 Waste Management and Disposal

- .1 Separate waste materials for reuse and recycling.
- .2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .3 Divert unused concrete materials from landfill to local facility as approved by Departmental Representative.

1.7 Measurement for Payment

- .1 Supply of steel pipe piles will be measured in accordance with Section 01 29 00 and will include all incidental costs for handling, testing, marking and transportation of pipe piles from supplier to site.
- .2 Installation of steel pipe piles will be measured in accordance with Section 01 29 00.

PART 2 - PRODUCTS2.1 Materials

- .1 Steel pipe: butt-straight longitudinal seam or spiral butt, plain cut ends to API 5L and ASTM A252, grade 3 (MOD).
- .2 Pipe material to have following minimum properties:
  - .1 Yield strength: 345 MPa.
  - .2 Tensile strength: 455 MPa.
  - .3 Each length of pile will be marked at the supplier either by stencilling or other means to show manufacturer's name, heat number, kind of pipe, size, weight, length, wall thickness, specification number and grade. Pipe pile material not marked in this way will be rejected.
- .3 Pipe allowable tolerances:
  - .1 Deviation from straight line, specified diameter, wall thickness and out-of-roundness on body of pipe and at pipe ends to conform to API 5L. Pipe to be checked for deviations before leaving supplier.
- .4 Piles conforming to ASTM A252 specifications must also meet the following provisions:
  - .1 Conduct flattening tests for ductility according to the procedure and frequency stipulated in CSA Z245.1.
  - .2 Unless spiral or longitudinal welds are certified as conforming to the requirements of ASTM A53, CSA Z245.1 or API 5L to the satisfaction of the Departmental Representative, at no additional expense to the Contract, have welds 100 percent inspected by an independent third party inspection firm according to CSA W59, Clause 11, with the exception that the outside weld will be 100% visually inspected and the inside weld will be visually inspected as far into the end of the pile as is physically possible. Provide electronic copy (PDF format) of reports to the Departmental Representative.
  - .3 At no additional expense to the Contract, have radiographic inspection performed by an independent third-party inspection firm according to CSA W59, Clause 11, and provide certification to the Departmental Representative with a minimum of two (2) shots per pile. Each radiographic shot must



be a minimum length of 100mm with one (1) shot at or near each end of each length of pile.

- .5 Ring Bits: to the approval of the Departmental Representative.
- .6 Welding electrodes: to CSA W48 series.
- .7 Concrete: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

### PART 3 - EXECUTION

#### 3.1 Fabrication

- .1 Fabricate full length piles to eliminate splicing during installation wherever possible. Splicing during installation shall not be done without written permission of Departmental Representative.
- .2 If permitted, only one splice per pile will be considered. All welds to be full penetration butt welds with backing plate, to the Departmental Representative's approval.
- .3 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.
- .4 Allowable tolerance on axial alignment to be 0.25% as measured by a 3m straight edge.
- .5 Allowable deviation from straight line over total length of fabricated pile to conform to the applicable CSA standard.
- .6 Install pile shoes in accordance with the manufacturer's details, as required and as reviewed on shop drawings.
- .7 Repair defective welds only on authority of Departmental Representative. Welds which show evidence of having been repaired without authorization may be rejected. Make repairs in accordance with CSA W59.
- .8 All pipe pile splices, if permitted, to be full penetration butt welds.

- 
- 3.2 Welding
- .1 Weld in accordance with CSA W59.
  - .2 Welding certification of companies to be in accordance with CSA W47.1.
- 3.3 Installation
- .1 Install piling in accordance with Section 31 61 13 - Pile Foundations General
  - .2 Ring bits may be installed during shop fabrication or as part of field work.
  - .3 Secure equipment in position during drilling.
  - .4 Advance piles to achieve minimum penetration into bedrock indicated while maintaining the pile shape without damaging. Geotechnical Engineer to determine elevation to top of sound bedrock and confirm that pile depth into bedrock indicated has been achieved.
  - .4 If approved by Departmental Representative, splice piles in place by welding. To prevent distortion, tack opposite points first and then weld opposite sections, weld against a backup ring. Hold member in alignment during splicing operation. Make splice by complete penetration groove welds only and to details of reviewed shop drawings stamped by a Professional Engineer registered to practice in the province of Nova Scotia.
  - .5 Submit full details of method and sequence of installation of piling to the Departmental Representative for review prior to start of pile installation work. Details must include templates, bracing, handling, setting, and installation sequence.
- 3.3 Obstructions
- .1 If obstruction is encountered during installation, advise the Departmental Representative immediately and submit proposed remedial measures for review. Incorporate review comments into proposed work, but do not complete associated work until authorized by Departmental Representative in writing.
- 3.4 Preparation/Pile Clean-Out
- .1 After pile is seated in competent bedrock, remove overburden inside pile down to tip of pile.

- .2 Clean out material adhering to inside surface of pile by high pressure water jets and airlifts.
- .3 Protect open piles from intrusion of foreign materials.
- .4 Provide method and equipment for inspection of each pile to ensure that pile is properly cleaned out.
- .5 Co-operate with and assist Departmental Representative to inspect each pile.

### 3.5 Concreting

- .1 Concrete in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Use concrete mix that has been demonstrated to produce required strength at temperature prevailing in pile in specified time.
  - .1 Concrete mix and concreting pressure to approval of Departmental Representative.
- .3 Hold pile securely in position so that it does not move during concreting and until concrete has attained specified strength.
- .4 Place concrete in one continuous operation to fill socket up to specified level.

### 3.6 Cutting

- .1 When flame cutting tops of piles, and flame cutting holes approved by the Departmental Representative, use the following procedure:
  - .1 When air temperature is above 0 degrees C, no pre-heat is necessary.
  - .2 When air temperature is below zero degrees C, pre-heat until steel 25mm on each side of line of cut has reached a temperature of 35 degrees C. Temperature indicating crayon marks may be used to measure temperature.
  - .3 Use a torch guiding device to ensure smooth round holes and 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 5mm.

**END OF SECTION**