

PART 1 - GENERAL

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| <u>1.1 Related Sections</u>       | .1 | Section 01 74 21 - Construction/Demolition Waste Management And Disposal.   |
|                                   | .2 | Section 01 35 44 - Environmental Protection.  |
| <u>1.2 Measurement Procedures</u> | .1 | Excavation: All excavation work and disposal of material will be included in the item for payment under Section 01 74 21 - Construction/Demolition Waste Management and Disposal.   |
|                                   | .2 | R5 Backfill/Core Stone: New granular backfill material, R5 random rip-rap and core stone (10-60kg) for the breakwater as shown will be measured by the metric tonnes of material supplied and acceptably placed in the works to the lines and grades specified. Payment will also include handling, stockpiling, mixing, compacting, trucking and all related work. Both size of rocks will be paid one pay item. |
|                                   | .3 | Granular Base Material: will be measured by the metric tonnes of material supplied and acceptably placed in the works to the lines and grades as shown on drawings. Payment will also include handling, stockpiling, mixing, compacting, trucking and all related work.   |
|                                   | .4 | Granular Sub-Base Material: will be measured by the metric tonnes of material supplied and acceptably placed in the works to the lines and grades as shown on drawings. Payment will also include handling, stockpiling, mixing, compacting, trucking and all related work.   |
| <u>1.3 References</u>             | .1 | Canadian General Standards Board (CGSB)<br>.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.  |
|                                   | .2 | American Society for Testing and Materials (ASTM)   |

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| <u>1.3 References</u><br>(Cont'd) | .2 | (Cont'd)<br>.1 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate. |
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| <u>1.4 Submittals</u> | .1 | Samples:<br>.1 Submit samples in accordance with Section 01 33 00.<br>.2 Inform Departmental Representative at least 4 weeks prior to commencing Work, of proposed source of fill materials and provide access for sampling. |
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| <u>1.5 Protection of Existing Features</u> | .1 | Existing buried utilities and structures:<br>.1 Maintain and protect from damage, water, electric, and other utilities and structures encountered.<br>.2 Where utility lines or structures exist in area of excavation, obtain direction of the Departmental Representative before removing or re-routing. Costs for such Work to be paid by the Departmental Representative.<br>.3 Record location of maintained, re-routed and abandoned underground lines. |
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## PART 2 - PRODUCTS

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| <u>2.1 Materials</u> | .1 | Granular Backfill: to consist of hard, durable, quarry or pit run material of an approved quality. The material will be free from frost, snow stumps, weeds, sod, roots, logs, silt, organic material, garbage, or any other waste materials and must be capable of being compacted to degree as specified herein and meeting approval of the Departmental Representative. Material to be uniformly graded having a stone size between 75 to 200 mm (R5 random rip-rap) on any dimension. Slate, sandstone or shale rock will not be accepted. Specific gravity not less than 2.65 when tested to ASTM C127-12 (AASHTO T85-14). |
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2.1 Materials  
(Cont'd)

.1 (Cont'd)

.1 Gradation to meet NBDOT 'R5' Random  
Rip-Rap limits as follows:

| ASTM Sieve size | % passing |
|-----------------|-----------|
| 220 mm          | 100       |
| 190 mm          | 70 - 90   |
| 150 mm          | 40 - 55   |
| 70 mm           | 0 - 15    |

.2 Gradation - Core 10-60kg:

| ASTM Sieve Size | % Passing |
|-----------------|-----------|
| 380 mm          | 100       |
| 330 mm          | 70 - 90   |
| 260 mm          | 40 - 55   |
| 120 mm          | 0 - 15    |

.2 Granular Base and Sub-Base:

.1 Granular Base rock, clear, hard durable, angular, crushed quarried rock aggregate free from silt, clay lumps, organic matter, foreign substances and free from splits, seams or defects. Specific gravity not less than 2.6 when tested to ASTM C127-12 (AASHTO T85-14).

.2 Gradation to be within following limits when tested to ASTM C136-06 and ASTM C117-13 and giving a smooth curve without sharp breaks when plotted on a semi-log grading chart.

.3 Gradation - Granular Base:

| ASTM Sieve Size | % Passing |
|-----------------|-----------|
| 31.5 mm         | 95-100    |
| 25.0 mm         | 81-100    |
| 19.0 mm         | 66-90     |
| 12.5 mm         | 50-77     |
| 9.5 mm          | 41-70     |
| 4.75 mm         | 27-54     |
| 2.36 mm         | 17-43     |
| 1.18 mm         | 11-32     |
| 300 µm          | 4-19      |
| 75 µm           | 0-8       |

2.1 Materials .1 (Cont'd)

.4 Gradation - Granular sub-base material:

| ASTM Sieve Size | % Passing |
|-----------------|-----------|
| 75.0 mm         | 100       |
| 63.0 mm         | 95-100    |
| 50.0 mm         | 85-100    |
| 37.5 mm         | 73-95     |
| 19.0 mm         | 35-69     |
| 9.50 mm         | 25-54     |
| 4.75 mm         | 17-43     |
| 2.36 mm         | 12-35     |
| 1.18 mm         | 8-28      |
| 0.30 mm         | 4-16      |
| 0.075 mm        | 0-9       |

PART 3 - EXECUTION

3.1 EXCAVATION .1 Site excavation to consist of the removal of all material and substrate bottom material to the excavation limits as indicated on the drawing and as directed by the Departmental Representative.

.2 Contractor to submit excavation method adjacent to existing wharf structures. Method to define protection of existing structures and foundations.

3.2 Backfilling .1 Do not proceed with backfilling operations until the Departmental Representative has inspected and approved areas to be backfilled.

.2 Install filter fabric on back side of panels and on top of existing fill material as shown.

.3 Place R5 random rip-rap backfill material into the bottom of the backfilled areas. Backfilling below LNT and up to 400 mm above LNT may be end dumped.

.4 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

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| <u>3.2 Backfilling</u><br>(Cont'd) | .5 | Do not use backfill material which is frozen or contains ice, snow or debris.  |
|                                    | .6 | Place backfill material in uniform layers not exceeding 300 mm compacted thickness. Compact each layer to create a firm, dense and rigid base before placing succeeding layer.                 |
|                                    | .7 | When using hand operated tamping devices, place backfill material in layers not exceeding 100 mm in thickness.   |
|                                    | .8 | Backfilling around installations.<br>.1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.   |
|                                    | .9 | Place backfill material in uniform layers simultaneously on sides of the tie-back anchor blocks so that loading is equivalent.   |
| <u>3.3 Granular Base</u>           | .1 | Do not place granular base until sub-base surface is compacted, inspected and approved.  |
|                                    | .2 | Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.   |
|                                    | .3 | Place materials to the lines, grades, and depths as indicated on Plan or as directed by the the Departmental Representative.   |
|                                    | .4 | Remove and replace portion of work in which material becomes segregated during spreading.  |
|                                    | .5 | Compact to a density not less than 98% of maximum dry density ASTM D698-12, (AASHTO T99-10, Method D).   |
|                                    | .6 | Shape and roll alternately to obtain a smooth, even and uniformly compacted base.  |
|                                    | .7 | Apply water as is necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected. |
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| 3.3 Granular Base<br>(Cont'd) | .8 | In areas not accessible to rolling equipment, compact to required density with approved mechanical tampers. |
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| 3.4 Granular<br>Sub-Base | .1  | Do not place granular sub-base until finished sub-grade is inspected and approved by the Departmental Representative.  |
|                          | .2  | Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.   |
|                          | .3  | Begin spreading sub-base material on a crown line or high side of a one way slope.   |
|                          | .4  | Place material in uniform layers not exceeding 150mm when compacted or to such other depth as approved by the Departmental Representative.   |
|                          | .5  | Shape each layer to a smooth contour and compact to specified density before a succeeding layer is placed.   |
|                          | .6  | Remove and replace portion of a layer in which material has becomes segregated during spreading.   |
|                          | .7  | Compact to 95% maximum density, AASHTO T99-10, Method D except last 150mm up to subgrade elevation. Compact last 150mm to 100% maximum density, AASHTO T99-10, Method D.                       |
|                          | .8  | Shape and roll alternately to obtain a smooth, even and uniformly compacted sub-base.  |
|                          | .9  | Apply water as is necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected. |
|                          | .10 | In areas not accessible to rolling equipment, compact to required density with approved mechanical tampers.  |
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- 3.5 Restoration
- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21.
  - .2 Remove surplus materials and debris and correct defects noted by the Departmental Representative.

PART 1 - GENERAL

1.1 Description .1 This section specifies requirements for the supply and installation of synthetic non-woven filter fabric, floating silt curtain and geogrid to be used as shown no drawings.

1.2 RELATED SECTIONS .1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

1.3 MEASUREMENT PROCEDURES .1 Geotextiles: Supply and installation of filter fabric and geogrid of surface covered as shown on drawings will be measured as a fixed price item. Filter fabric for sediment and debris containment curtain surrounding the work area will not be paid separately but be part of the 'Site Work' fixed price item in section 01 74 21.

.2 Damaged material shall be replaced at no cost to the owner.

.3 No extra payment will be made for overlapping of fabric i.e. overlaps are measured as a single layer of fabric.

1.4 REFERENCES .1 American Society for Testing and Materials International, (ASTM)

.1 ASTM D 4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permitivity.

.2 ASTM D 4595-11, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

.3 ASTM D 4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

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| <u>1.4 REFERENCES<br/>(Cont'd)</u> | .2 | Canadian General Standards Board (CGSB)<br>.1 CAN/CGSB-4.2 No. 11.2-M89(April 1997),<br>Textile Test Methods - Bursting Strength -<br>Ball Burst Test (Extension of September 1989).<br>.2 CAN/CGSB-148.1, Methods of Testing<br>Geotextiles and Complete Geomembranes. |
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| <u>1.5 SUBMITTALS</u> | .1 | Submit samples in accordance with Section<br>01 33 00 - Submittal Procedures.   |
|                       | .2 | Submit to the Departmental Representative the<br>following at least 2 weeks prior to beginning<br>Work.<br>.1 manufactures specifications on the<br>proposed materials to be used.<br>.2 samples of proposed materials. |

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| <u>1.6 DELIVERY,<br/>STORAGE AND<br/>HANDLING</u> | .1 | During delivery and storage, protect<br>geotextiles from direct sunlight, ultraviolet<br>rays, excessive heat, mud, dirt, dust, debris<br>and rodents. |
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| <u>1.7 WASTE<br/>MANAGEMENT AND<br/>Disposal.</u> | .1 | Separate waste materials for reuse and<br>recycling in accordance with Section 01 74 21.                         |
|   | .2 | Collect and separate for disposal paper,<br>plastic, polystyrene and corrugated cardboard<br>packaging material. |
|   | .3 | Fold up metal banding, flatten and place in<br>designated area for recycling.                                    |

## PART 2 - PRODUCTS

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| <u>2.1 Filter Fabric,<br/>floating silt<br/>curtain</u> | .1 | Non-woven synthetic fibre fabric, rot proof,<br>unaffected by action of oil or salt water and<br>not subject to attack by marine life, insects<br>or rodents to be supplied in rolls. |
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- 2.1 Filter Fabric, floating silt curtain  
(Cont'd)
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- .2 Fabric to be of non woven construction supplied in rolls of minimum 3.0 metres width, minimum thickness of 4.0 mm and to the following properties or equivalent:
    - .1 Mass(g/m<sup>2</sup>) 250 to 270
    - .2 Tear (N) 500
    - .3 Tensile Strength (N) 950
    - .4 Elongation at Break(%) 70-100
    - .5 Mullen Burst Strength (kPa) 2500
    - .6 Opening Size (um) 50 to 150
    - .7 Permeability (K cm s<sup>-1</sup>) 2.7x10<sup>-1</sup>.
  - .3 Factory seams: sewn in accordance with manufacturer's recommendations.
  - .4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.
- 2.2 Geogrid
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- .1 Geogrid: open grid polymer having biaxial orientation, free of striations, roughness, pinholes, blisters, undispersed raw materials or any sign of contamination by foreign matter.
    - .1 Roll width: 4 m minimum.
    - .2 Roll length: 5 m minimum.
    - .3 Rib thickness: 2.2 mm minimum.
    - .4 Junction thickness: 5 mm minimum.
    - .5 Aperture size:
      - .1 Machine direction: 39 mm.
      - .2 Cross machine direction: 39 mm.
    - .6 Polymer: polypropylene: to ASTM D 4101-02b with inhibitors added to resist deterioration by ultra-violet and heat exposure.
  - .2 Geogrid physical properties:
    - .1 Peak tensile strength: to GRI GG1. (Geosynthetic Research Institute).
      - .1 Machine direction: minimum 30 kN/m.
      - .2 Tensile secant modulus at 2% elongation: to GRI GG1, minimum 10.5 kN/m.
      - .3 Carbon black content: to ASTM D 4218-96(2001), minimum 2 %.
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PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Place geotextile material by unrolling in orientation, manner and locations indicated and retain in position with securing pins and washers or weights.
  - .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
  - .3 Overlap each successive strip of geotextile 600 mm over previously laid strip.
  - .4 Pin successive strips of geotextile with securing pins as recommended by manufacturer.
  - .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material.
  - .6 Replace damaged or deteriorated geotextile to approval of Departmental Representative .

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 31 62 16.16 - Steel H-Piles.

1.2 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 Spliced piles are not permitted.
- .4 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.

1.3 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 Piles damaged by the contractor will be replaced as directed by the Departmental Representative at contractor's cost.
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- 1.4 EXISTING CONDITIONS
- .1 Sub-surface investigation report is available for viewing at PWGSC office 4th floor Unit 100, 1045 Main Street, Moncton, N.B., during the following business hours: 8:30 to 12:00 noon and from 13:00 to 16:00, Monday to Friday. Contact the Department Representative.
  - .2 Any information pertaining to soils and all borehole logs are furnished by the Departmental Representative as a matter of general information only. Borehole descriptions shown on the logs are only descriptive of conditions at locations described by the boreholes themselves.
  - .3 The Contractor must make his own evaluation of soil conditions.

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

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Supply full length steel H-piles as per section 31 62 16.16 and provide equipment to handle full length piles without cutting and splicing.

- 2.2 EQUIPMENT
- .1 Prior to pile installation, submit to Departmental Representative for review, details of equipment and method for installation of piles.
    - .1 Contractor will set H-piles into sandstone bedrock by pre-drilling 600mm diameter holes filled with concrete.
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### 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 installation operations and methods to avoid damages to adjacent existing structures.
  - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
- .2 Ensure that structures and ground conditions at pile locations are adequate to support pile installation operation.
  - .1 Make provision for access and support of piling installation equipment during performance of Work.
  - .2 Contractor to assess state of access structure(s) for load carrying capability.

#### 3.2 INSTALLATION

- .1 The steel H-piles are to be installed true and plumb along the baseline as shown on drawings. H-piles will be set by pre-drilling into bedrock.
    - .1 **Pre-Drilling;**
      - .1 Pre- drilling a 600 mm diameter (minimum) sockets by the full embedment length of the piles into bedrock, to achieve satisfactory plumpness and the depth shown on plan.
  - .2 All piles for the Berlin Wharf are to be installed a minimum of 2.0 meters into the bedrock and piles for the floating docks to be 3.0 meters into the bedrock unless noted otherwise as shown on the drawings. The bottom elevations may vary depending on the exact location of the bedrock.
  - .3 Hold piles securely and accurately in position while installation.
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- 3.2 INSTALLATION  
(Cont'd)
- .4 Cut off piles neatly and squarely at elevations indicated.
  - .5 Installation of each pile will be subject to review of Departmental Representative.
  - .6 Remove cut-off lengths from site on completion of work.

- 3.3 Field  
Measurements
- .1 Maintain accurate and daily records of each pile, including:
    - .1 Pile size and length, location of pile in pile group, and location or designation of pile group.
    - .2 Toe elevation upon termination of installation of pile and cutoff elevations upon completion of pile group.
    - .3 Other pertinent information, such as interruption, observed pile damage, etc.

- 3.4 OBSTRUCTIONS
- .1 Where obstruction is encountered that causes sudden unexpected change in specified tolerances, proceed as directed by Departmental Representative.

- 3.5 REPAIR AND  
RESTORATION
- .1 Pull out rejected piles and replace with new piles.
  - .2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Submittal Procedures: Section 01 33 00
- .2 Underwater Placed Concrete: Section 03 37 26
- .3 Miscellaneous Metals: Section 05 50 00
- .4 Pile Foundation, General Requirements: Section 31 61 13

1.2 Delivery and  
Handling

- .1 Protect piles from damage due to excessive handling during delivery, storage and bending stress, impact, abrasion or other causes handling.

1.3 MEASUREMENT  
PROCEDURES

- .1 Steel H-Piles: The supply and installation of steel H-piles needed for the wharf and floating docks as shown will be paid by the linear meter of piling acceptably incorporated in the work, following trimming and cutting of the piles. Measurement will be taken from final pile tip to top of pile elevation remaining in the work. The additional pile at corners will also be measured for payment. Welding will be considered incidental.
  - .1 H-piles will be set into subsoils by pre-drilling 600mm diameter holes filled with concrete.
    - .1 Pre-drilling; will include all equipment, labour and material for pre-drilling 600 mm diameter holes by the full embedment length of the piles into subsoils strata as shown, the supply and installation of underwater concreting and any additional excavation material required to carry out the work. Material excavated will be disposed/stockpiled as described in section 01 74 21.



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| 1.3 MEASUREMENT PROCEDURES<br>(Cont'd) | .1 | (Cont'd)  |
|  | .1 | (Cont'd)  |
|  | .2 | The supply and installation of all miscellaneous steel, cover plates, welding of corner piles, clip steel angles for concrete panels support and anchoring system of tie-rod to H-Pile will be considered incidental to this section. |

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| 1.4 REFERENCES | .1 | Canadian Standards Association (CSA International)  |
|                | .1 | CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.                                      |
|                | .2 | CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel. |

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| 1.5 SUBMITTALS | .1 | Submittals in accordance with Section 01 33 00 - Submittal Procedures.  |
|                | .2 | Quality Assurance:  |
|                | .1 | Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties. |

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| 1.6 WASTE MANAGEMENT AND DISPOSAL | .1 | Separate waste materials for reuse and recycling in accordance with Section 01 74 21 Construction/Demolition Waste Management and Disposal. |
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## PART 2 - PRODUCTS

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| 2.1 MATERIALS | .1 | Steel H piles: to CSA-G40.20/G40.21, Grade 350.  |
|               | .1 | Size and weight as indicated.  |
|               | .2 | Minimum lengths: Contractor is responsible to order required pile lengths to complete the work as shown. |

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| <u>2.1 MATERIALS</u><br>(Cont'd) | .2 | Welding materials: to CSA W48. |
|                                  | .3 | Do not splice piles.           |

### PART 3 - EXECUTION

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| <u>3.1 INSTALLATION</u> | .1 | The steel H-piles are to be installed true and plumb along the baseline as shown on drawings.   |
|                         | .2 | Hold piles securely and accurately in position while installation.  |
|                         | .3 | Prior to commencement of pile installation operation, submit to the Departmental Representative for approval, details of equipment and method to be used for the installation of piles. |
|                         | .4 | Cut off piles squarely at required elevation.   |

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| <u>3.2 Tolerances</u> | .1 | H-piles are to be install as shown on the plans and specified herein.  |
|                       | .2 | Deviations from the vertical in any direction shall not exceed 1 to 50 for all piles.  |
|                       | .3 | Piles must be install in such a manner so the face of the wharf is straight. Maximum rotation tolerance about axis of pile layout to be $\pm 1$ degree.  |
|                       | .4 | The piles at the mud line to be within $\pm 30$ mm of the location indicated on the drawing for the direction parallel to the wharf, with no two adjacent piles having a centerline spacing less than 2500 mm unless otherwise indicated. Tolerance at the top of the wharf will be $\pm 15$ mm. |
|                       | .5 | Pile heads to be within 20 mm of the location indicated on the drawing.  |
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- 3.3 WELDING
- .1 Weld to CSA W59.
  - .2 Welding certification of companies: to CSA W47.1.
- 3.4 RECORDS
- .1 Keep complete and accurate record of each pile driven/installation.
  - .2 Indicate:
    - .1 Pile location.
    - .2 Deviations from design location.
    - .3 Cross section shape and dimensions.
    - .4 Original length.
    - .5 Ground elevation.
    - .6 Bedrock elevation.
    - .6 Tip elevation.
    - .7 Cutoff elevation.
- 3.5 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.