

PART 1 - GENERAL

<u>1.1 Related Sections</u>	.1	Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
	.2	Section 01 35 43 - Environmental Procedures.
	.3	Section 31 32 21 - Geotextiles.
	.4	Section 35 31 24 - Rock Breakwater.
<u>1.2 Measurement Procedures</u>	.1	Excavation: Payment for 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	Granular Backfill: The existing rock ballast stones will be recycled as granular backfill and core stones material as shown on drawings. The cost for this work will be included in the item for payment under Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
	.3	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.
<u>1.3 References</u>	.1	Canadian General Standards Board (CGSB) .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
	.2	American Society for Testing and Materials (ASTM) .1 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.4 Submittals .1 Samples:
.1 Submit samples in accordance with Section 01 33 00.
.2 Inform Departmental Representative at least 4 weeks prior to commencing Work, of proposed source of fill materials and provide access for sampling.

1.5 Protection of Existing Features .1 Existing buried utilities and structures:
.1 Maintain and protect from damage, water, electric, and other utilities and structures encountered.
.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.
.3 Record location of maintained, re-routed and abandoned underground lines.

PART 2 - PRODUCTS

2.1 Materials .1 Granular Sub-Base:
.1 Granular 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 sub-base material:
ASTM Sieve Size % Passing
75.0 mm 100
0.425 mm 30 max
0.075 mm 8 max

PART 3 - EXECUTION

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| <u>3.1 EXCAVATION</u> | .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 structure and method of protection of existing structures and foundations. |
| <u>3.2 Backfilling</u> | .1 | Do not proceed with backfilling operations until the Departmental Representative has inspected and approved areas to be backfilled. |
| | .2 | Install filter fabric on top of existing fill material as shown. |
| | .3 | Place backfill material into the bottom of the backfilled areas to limits as shown. |
| | .4 | Areas to be backfilled to be free from debris, snow, ice, water and frozen ground. |
| | .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 before placing succeeding layer. |
| | .7 | Backfilling around installations.
.1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete. |
| <u>3.3 Granular Sub-Base</u> | .1 | Do not place granular sub-base until finished sub-grade is inspected and approved by the Departmental Representative. |
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- .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.

3.4 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 to be used in locations 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 Supply and installation of filter fabric of surface covered as shown on drawings will be measured as a fixed price item.
.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 Permittivity.
.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.
.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-4.2 No. 11.2-M89(April 1997), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).

.2 CAN/CGSB-148.1, Methods of Testing
Geotextiles and Complete Geomembranes.

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| <u>1.5 SUBMITTALS</u> | .1 | Submit samples in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Submit to the Departmental Representative the following at least 2 weeks prior to beginning Work.
.1 manufactures specifications on the proposed materials to be used.
.2 samples of proposed materials. |
| <u>1.6 DELIVERY, STORAGE AND HANDLING</u> | .1 | During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents. |
| <u>1.7 WASTE MANAGEMENT AND Disposal.</u> | .1 | Separate waste materials for reuse and recycling in accordance with Section 01 74 21. |
| | .2 | Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material. |
| | .3 | Fold up metal banding, flatten and place in designated area for recycling. |

PART 2 - PRODUCTS

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| <u>2.1 Filter Fabric</u> | .1 | Non-woven synthetic fibre fabric, rot proof, unaffected by action of oil or salt water and not subject to attack by marine life, insects or rodents to be supplied in rolls. |
| | .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: |
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- .1 Mass(g/m2) 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-1)2.7x10-1.

- .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.

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, including 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 Various Sub-surface investigation reports are 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 driving to Departmental Representative for review, not less than two (2) weeks prior to commencement of pile driving.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Supply full length steel H-piles as indicated in accordance with sections 31 62 16.16.
- .2 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 for installation of piles.
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.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: provide full details of characteristics necessary to evaluate performance.

.2 Hammer:

.1 When required criteria can not 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.

.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 driving operation.

.1 Make provision for access and support of piling equipment during performance of Work.

.2 Contractor to assess state of access structure(s) for load carrying capability.

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 guys, stiff braces, or other means to ensure support to pile while being driven.

.2 Length: except for piles driven through water, provide sufficient length of leads to ensure that use of follower is unnecessary.

.3 Swing leads:

.1 Obtain approval from Departmental Representative prior to using swing leads.

.2 Firmly guy top and bottom to hold pile in position during driving operation.

.2 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 or other criteria used to determine load capacity.

.2 Departmental Representative to review final driving of all piles prior to cutting and removal of pile driving rig from site.

.3 All piles will be driven to a refusal criteria to achieve an axial factored capacity of 500 KN as determine by a pile driving analyser (PDA).

.3 Steel piles to be set a minimum 2.0 metres into mudstone bedrock as shown on drawings or as determined by the PDA testing.

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 assure set.

- .5 Cut off piles neatly and squarely at elevations as indicated on drawings.
 - .1 Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
- .6 Remove cut-off lengths from site on completion of work.

3.4 Field Measurements

- .1 Maintain accurate and daily records of driving for each pile, including:
 - .1 Type and make of hammer, rated energy, observed stroke, and observed number of blows per minute.
 - .2 Other installation equipment including details on use of pile cushion, follower, etc.
 - .3 Pile size and length, location of pile in pile group, and location or designation of pile group.
 - .4 Time for start and finish of driving pile and sequence of pile driving for piles in group.
 - .5 Penetration for own weight and weight of hammer, number of blows per meter of penetration from start of driving and numbers of blows per 100 mm for the last meter and numbers of blows per 25mm for the last 100mm.
 - .6 Toe elevation upon termination of driving pile and final toe and cutoff elevations upon completion of pile group.
 - .7 Records of restriking.
 - .8 Other pertinent information, such as interruption of continuous driving, observed pile damage, etc.
 - .9 Records of elevations of adjacent piles before and after driving of pile.
 - .10 Record all information on forms provided by Departmental Representative.
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| <u>3.5 Final Penetration Resistance</u> | <ul style="list-style-type: none">.1 Installation of each pile will be subject to approval of Departmental Representative, who will be sole judge of acceptability of pile with respect to final penetration resistance, depth of penetration, or other criteria. Departmental Representative to approve final penetration resistance of all piles prior to removal of pile driving equipment from site..2 Each pile shall be installed as shown and as determine by Pile Driving Analyzer. Do not overdrive to cause damage to piles..3 Departmental Representative will determine refusal criteria for piles.<ul style="list-style-type: none">.1 Steel H-Piles: Drive each pile a minimum of 2.0 metres into mudstone bedrock as indicated. Provide a hammer of sufficient size (developing an energy at least 75000 joules) in order to install the piles.<ul style="list-style-type: none">.1 Or, 10 blows per 25mm increments for four consecutive increments..2 Piles to be re-tapped 24 hours after driving with same driving criteria. |
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| <u>3.6 OBSTRUCTIONS</u> | <ul style="list-style-type: none">.1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, proceed as directed by Departmental Representative. |
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| <u>3.7 REPAIR AND RESTORATION</u> | <ul style="list-style-type: none">.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. |
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PART 1 - GENERAL

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| <u>1.1 RELATED SECTIONS</u> | .1 | Submittal Procedures: Section 01 33 00. |
| | .2 | Miscellaneous Metals: Section 05 50 00 |
| <u>1.2 Delivery and Handling</u> | .1 | Protect piles from damage due to excessive handling during delivery, storage and bending stress, impact, abrasion or other causes handling. |
| <u>1.3 Existing Sub-Surface Conditions</u> | .1 | Sub-surface investigation report is available for inspection 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. |
| <u>1.4 MEASUREMENT PROCEDURES</u> | .1 | Steel H-piles: The supply and installation of steel H-piles as shown for this work will be paid by the linear meter of piling acceptably incorporated in the work, following trimming and cutting of the piles. Cap steel plates, pile points, mob and demob of equipment, templates and/or guides will be considered incidental to the work. Measurement will be taken from final pile tip to top of pile elevation remaining in the work. |
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.1 The tip elevation may vary depending on the exact location of the mudstone bedrock elevation and pile acceptance criteria established by the Pile Driving Analyzer test results.

- .2 Contractor is advise that at least four (4) piles will be tested by PDA (Pile Driving Analyzer) by an independent consultant and will be paid by the client. The contractor, at his own expense, will provide a work platform for the consultant and access to piles during tests.

1.5 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.

1.6 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.

1.7 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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| <u>2.1 MATERIALS</u> | .1 | Steel H piles: to CSA-G40.20/G40.21, Grade 350. |
| | .1 | Size and weight as indicated. |
| | .2 | Minimum length 12.20 meters. |
| | .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. |
| <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 ± 10 . |
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- .4 The piles at the mud line to be within ± 30 mm of the location indicated on the drawing, with no two adjacent piles having a centreline spacing other than indicated. Tolerance at the top of the wharf will be ± 15 mm.
- .5 Pile heads to be within 20 mm of the location indicated on the drawing.

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.
- .2 Indicate:
 - .1 Pile location.
 - .2 Deviations from design location.
 - .3 Cross section shape and dimensions.
 - .4 Original length.
 - .5 Ground 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.