

PWGSC Wharf Reconstruction 406 & 409 Pointe Sapin, NB R.074536.001	Excavating, Trenching and Backfilling	Section 31 23 10 Page 1 2015-04-30
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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.
<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	New Granular Backfill New granular backfill material, R5 and R25 random rip-rap, will be measured by the metric tonnes of material supplied and acceptably placed in the works to the lines and grades specified. Payment will include supply, handling, stockpiling, mixing, placing, compacting, trucking and all related work. No separate payment will be made for R5 and R25 random rip-rap backfill. These materials will be measured as one unit under this 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.
	.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.
	.5	Sandstone Backfill: New Sandstone backfill for the dredger pad as shown will be measured for payment by the cubic meter truck measure (CMTM). Payment will include supply, handling, stockpiling, placing, compacting, trucking and all related work.

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- 1.3 References
- .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 New 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 100 and 350 mm (R25 random rip-rap) and 75 to 200 mm (R5

2.1 Materials
(Cont'd)

- .1 (Cont'd)
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).

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

<u>ASTM Sieve size</u>	<u>% passing</u>
220 mm	100
190 mm	70 - 90
150 mm	40 - 55
70 mm	0 - 15

.2 Gradation to meet NBDOT 'R25' Random Rip-Rap limits as follows:

<u>ASTM Sieve size</u>	<u>% passing</u>
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:

<u>ASTM Sieve Size</u>	<u>% Passing</u>
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

.4 Gradation - Granular sub-base material:

2.1 Materials (Cont'd)

.2 Granular Base and Sub-Base:(Cont'd) .4 (Cont'd)

ASTM Sieve Size	% Passing
75.0 mm	100
0.425 mm	30 max
0.075 mm	8 max

- .3 Sandstone Backfill: Clean, durable broken sandstone free from mud, dirt, organic and other deleterious materials. The sandstone will be well graded and have a maximum size of 300 mm. Percent by mass passing No. 12.5 mm sieve not to exceed 40%. Percent by mass passing No. 0.075 mm sieve not to exceed 10%.

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 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 R25 random rip-rap backfill material into the bottom of the backfilled areas. Backfill 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.
- .5 Do not use backfill material which is frozen or contains ice, snow or debris.

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| <u>3.2 Backfilling
(Cont'd)</u> | .6 | Place backfill material in uniform layers not exceeding 300 mm compacted thickness. Compact each layer to 95% of Standard Proctor dry density 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.
.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 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. |
| | .8 | In areas not accessible to rolling equipment, compact to required density with approved mechanical tampers. |
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| <u>3.4 Granular
Sub-Base</u> | .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. |
| <u>3.5 Restoration</u> | .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. |
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Part 1 General

1.1 SCOPE OF WORK

- .1 Work under this Section includes all plant, materials and labour required to excavate, backfill, stockpile, and dispose of materials as indicated on the drawings, specified herein or as directed by the Engineer-Architect, for the installation of buried watermain.

1.2 EXISTING CONDITIONS

- .1 Contractors are to visit the site and examine the existing conditions.

1.3 MEASUREMENT PROCEDURES

- .1 Work performed under this Section shall form part of the lump sum contract. No additional compensation will be made.

1.4 RELATED WORK

- .1 Section 33 11 16 Site Water Utility Distribution Piping

1.5 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C 117-95, Standard Test Method for Material Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing Woven Wire, Inch Series.
 - .2 Topographic survey, boundary and utilities provided by Daigle Surveys Ltd.
 - .3 New Brunswick Department of Transportation and Infrastructure Standard Specifications (January 2015).
 - .4 New Brunswick Department of Transportation Acid Rock Protocol (October 2000).
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1.6 DEFINITIONS

- .1 Excavation classes: one class of excavation will be recognized; common excavation.
 - .1 Common excavation: excavation of materials of whatever nature, which includes solid rock.
- .2 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 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 C 136. Sieve sizes to CAN/CGSB-8.1.
 - .2 Table:

Sieve Size, mm	% Passing
2.00	100
0.10	45 - 100
0.02	10 - 80
0.005	0 - 45
 - .3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
 - .4 Any material deemed unsuitable by the Engineer-Architect.

1.7 INSPECTION AND TESTING

- .1 Testing of materials and compaction will be carried out by the testing laboratory designated by the Engineer-Architect.
- .2 The Owner will pay for inspection and testing.
- .3 Compaction densities are percentages of Standard Proctor as determined by ASTM D-698-00a.

1.8 PROTECTION OF EXISTING FEATURES

- .1 Protect existing features and services in accordance with applicable local regulations.
- .2 Conduct, with Engineer, condition survey of trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.
- .3 Take all necessary precautions to protect existing or newly constructed works, but if undermining should occur, it shall be corrected by breaking out and repairing the existing structure and/or replacing the disturbed foundation material with fill concrete, grout, sand, etc., as may be directed by the Engineer. All of the protective and corrective work is to be at the expense of the Contractor.
- .4 The above shall also apply to all electrical cables, poles, sewers, water mains, gas lines and other appurtenances already constructed in the area whether above ground or underground or which appear within the trench. Should damage of any kind, including settlement or lateral movement of adjacent structures, utilities or surface features occur as a result of the work, such conditions and any resultant damage shall be immediately rectified at the Contractor's expense and to the satisfaction of the Engineer.

Part 2 Products

2.1 MATERIALS

- .1 Engineered Fill: Properties to the following requirements:
 - .1 Crushed quarried rock.
 - .2 Gradations to be within limits specified when tested to ASTM C-136 and ASTM C-117. Sieve sizes to CAN/CGSB-8.1.
 - .3 Maximum abrasion loss of 30% when tested to MTO LS 618.
 - .4 Maximum Freeze Thaw loss of 20% when tested to MTO LS 614.
 - .5 Plasticity Index to a maximum of three (3) when tested to D4318-05.

.6 Table:

Sieve Size, mm	% Passing
75	95 - 100
50	73 - 95
37.5	58 - 87
25	--
19	35 - 69
12.5	--
9.5	25 - 54
4.75	17 - 43
2.36	12 - 35
1.18	8 - 28
0.30	4 - 16
0.075	0 - 7

.2 Granular Base:

.1 See Section 32 11 23.

.3 Granular Subbase:

.1 See Section 32 11 16.01

.4 Bedding and Backfill:

.1 Aggregate shall be composed of clean, hard, sound, durable, uncoated particles that do not contain friable, soluble or reactive minerals or other deleterious materials or conditions that would make the aggregate prone to decomposition or disintegration when exposed to the natural elements after placement in the Work.

.2 Gradations to be within limits specified when tested to ASTM C-136 and ASTM C-117. Sieve sizes to CAN/CGSB-8.1.

.3 Maximum abrasion loss of 30% when tested to MTO LS 619.

.4 Maximum Freeze Thaw loss of 20% when tested to MTO LS 614.

.5 Plasticity Index to a maximum of three (3) when tested to D4318-05.

.6 Table: Type 1 (Sand Bedding)

Sieve Size, mm	% Passing
40	100
25	95 - 100
19	90 - 100
9.5	60 - 100
4.75	35 - 80
2.36	15 - 60
0.30	0 - 30
0.075	0 - 10

.7 Table: Type 2 (Clean Stone Bedding)

Sieve Size, mm	% Passing
28	100
20	90 - 100
10	25 - 60
5	0 - 10
2.5	0 - 5

.5 Pit Run Gravel :

- .1 Aggregate shall be composed of clean, hard, sound, durable, uncoated particles that do not contain friable, soluble or reactive minerals or other deleterious materials or conditions that would make the aggregate prone to decomposition or disintegration when exposed to the natural elements after placement in the Work.
- .2 Gradations to be within limits specified when tested to ASTM C-136 and ASTM C-117. Sieve sizes to CAN/CGSB-8.1.
- .3 Maximum abrasion loss of 30% when tested to MTO LS 619.
- .4 Maximum Freeze Thaw loss of 20% when tested to MTO LS 614.
- .5 Plasticity Index to a maximum of five (5) when tested to D4318-05.

.6 Table:

Sieve Size, mm	% Passing
125	100
100	95-100
75	82-100
50	62-100
37.5	52-100
19	30-90
9.5	22-79
4.75	16-66
2.36	12-55
1.18	9-44
.300	4-25
.075	0-7

Part 3 Execution

3.1 GENERAL

- .1 The Contractor will be required to excavate through existing granular materials and native materials through the execution of this contract. Suitable excavated granular materials so meeting the appropriate gradations and physical requirements may be re-incorporated into the Work. Unsuitable excavated materials will comprise frozen, saturated, or deleterious materials whatever their origin and shall also include excavated bedrock. All unsuitable excavated materials shall become the property of the Contractor and shall be disposed of off site. All exposed subgrade surfaces shall be inspected by the Engineer prior to the placement of fill or concrete. Existing or constructed engineered fill may be proof rolled at the discretion of the Engineer. Groundwater may be encountered at or near the bedrock surface or in the vicinity of existing services. Appropriate de-watering measures will be required by the Contractor.
- .2 The Contractor shall advise the Engineer two weeks in advance of his intended use of any materials to allow sufficient time for sampling and testing. The Contractor shall submit samples of granular materials to be used in the Works if so requested by the Engineer. Approval of a sample does not mean acceptance of the whole source. Each load of material received at the job site shall be subject to all the requirements of that material.
- .3 The costs of any additional testing of backfill, as deemed necessary by the Engineer, to determine the acceptability or degree of compaction shall be paid by the Contractor.
- .4 Operations on earthwork shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing weather or other conditions of the field. At all times, the Contractor shall drag, blade or slope the fill to provide proper surface drainage.
- .5 Materials which shall be compacted shall be placed in layers no thicker than 300 mm, loose depth, and of the proper moisture content before compacting to facilitate obtaining the prescribed compaction shown on the drawings or specified herein.

- .6 Final grades shall be within 12 mm of the levels shown on the drawings. All areas shall be sloped to avoid puddles.
- .7 It shall be the responsibility of the Contractor to repair all damage and correct all deficiencies which may result from the settlement of backfill areas.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.3 STOCKPILING AND DISPOSAL

- .1 Protect fill materials from contamination.
- .2 Excess material unsuitable for backfill shall become the property of the Contractor and be disposed of off site. It will be the Contractor's responsibility to acquire permission and all permits for the disposal site. A copy of all obtained permits are to be submitted to the Engineer.
- .3 In case of a dispute, the Engineer shall be the sole judge as to which material is unsuitable and shall be hauled away.

3.4 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 All excavations and trenches shall be kept free from water. Dams, dykes or other work necessary for dewatering including duplicate pumps of sufficient capacity for the purpose, shall be placed at the Contractor's expense.
- .4 The discharge of water from any dewatering operation shall be in accordance with all applicable municipal, provincial, and federal regulations.

3.5 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
 - .2 Excavation shall include the removal of all water, ice, snow and material of any nature which interferes with construction work.
 - .3 Where the bearing value of the sub-grade is determined by the Engineer to be unsuitable, or where unknown interfering objects are encountered the Contractor shall sub-excavate to the depth directed by the Engineer.
 - .4 Excavation must not interfere with bearing capacity of adjacent foundations.
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- .5 For trench excavation, unless otherwise authorized by Engineer in writing, do not excavate more than 30 metres of trench in advance of installation operations.
- .6 All earth banks created by excavating shall be sloped at sufficient angle to prevent sliding or caving in and if they are not adequately sloped, then shoring and/or trench boxes must be used.
- .7 Earth bottoms of excavations to be undisturbed soil or rock, level, free from loose, soft or organic matter.
- .8 Notify Engineer when bottom of excavation is reached.
- .9 Obtain Engineer approval of completed excavation.
- .10 Remove unsuitable material from trench bottom to extent and depth as directed by Engineer.
- .11 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .12 Make all excavations in such a manner and to such a width as will give adequate clearance for structures connections thereto, for bracing and supporting, pumping, draining and for removing from the excavation any material which the Engineer may deem unsuitable for foundations, including any material which may slough off the sides of the excavation.
- .13 Where excavation carried out by the Contractor exceeds the limits authorized by the Engineer, the costs of such unauthorized excavation shall be borne by the Contractor as shall all necessary fill required to fill the void.

3.6 FILL TYPES AND COMPACTION

- .1 Under foundations: Use 300 mm of engineered fill compacted to 97%.
- .2 Exterior of perimeter walls: Use subbase material compacted to 95%.
- .3 Interior of perimeter walls: Use approved engineered fill or pit run gravel compacted to 97%.
- .4 Under slabs: Use materials as indicated on drawings or as specified by Engineer-Architect compacted to 95%.
- .5 Under roadways, walkways, curbs and gutters use subbase and base materials as specified in the drawings compacted to 95%.
- .6 Under landscaped areas compacted to 95%.
- .7 Pit run gravel or suitable excavated material to be used below subbase material

compacted to 95%.

3.7 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place bedding and surround of underground services as indicated on the drawings or as directed by the Engineer.
- .2 Place bedding and surround material in unfrozen and unsaturated condition.

3.8 BACKFILLING

- .1 Do not proceed with backfilling operations until Engineer has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 300 mm loose depth and compacted up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
 - .1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

3.9 RESTORATION

- .1 Upon completion of work, remove waste material and debris, trim slopes, and correct defects as directed by Engineer.
- .2 Replace topsoil as directed by Engineer.
- .3 Clean and reinstate areas affected by Work as directed by Engineer.

3.10 REPAIRS DURING WARRANTY PERIOD

- .1 During the specified guarantee period, make good, any damage to walks, roads, etc., due to settlement of backfilled areas. All such repairs shall be made at the Contractor's expense upon notification by the Engineer.
- .2 Should the Contractor fail to carry out the necessary maintenance within 5 days after receiving written instruction from the Department of Supply and Services Representative, the Owner will carry out the work and deduct the cost incurred from the money owing the Contractor.

END OF SECTION

PART 1 - GENERAL

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| <u>1.1 Description</u> | .1 | This section specifies requirements for the supply and installation of synthetic non-woven filter fabric to be used between the concrete panel wall and backfill material as shown on drawings. |
| <u>1.2 RELATED SECTIONS</u> | .1 | Section 01 33 00 - Submittal Procedures. |
| | .2 | Section 01 74 21 - Construction/Demolition Waste Management And Disposal. |
| <u>1.3 MEASUREMENT PROCEDURES</u> | .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. |
| <u>1.4 REFERENCES</u> | .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. |
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<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: |
| | .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. |

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| <u>2.1 Filter Fabric
(Cont'd)</u> | .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

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| <u>3.1 INSTALLATION</u> | .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 . |

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PART 1 - GENERAL

<u>1.1 Related Sections</u>	.1	Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
	.2	Section 31 32 21 - Geotextiles.
<u>1.2 Measurement Procedures</u>	.1	Measure Rip-Rap stones (300-500KG) in tonnes of material placed to the dimensions indicated on drawings or authorized in writing by the Departmental Representative.
	.2	Mobilization and demobilization of equipment to be included in the above pay items.
	.3	Construction and maintenance of haul roads will not be measured for payment.
	.4	Weighing will not be measured for payment but shall be considered as incidental to the work.
<u>1.3 Waste Management and Disposal</u>	.1	Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

PART 2 - PRODUCTS

<u>1.1 Material</u>	.1	Rip-Rap Stone (300-500 KG): granitic or 2.65 when tested to ASTM C 127-12 (AASHTO T85-15). Larger stone to be placed as directed by the Departmental Representative. .1 Greatest dimension of each stone not to exceed two times least dimension. .2 The average size of the armour rocks being placed will be in the mid range of accepted gradation which will ensure that there is a uniform gradation of stone across the size range. The contractor will arrange the placement of stone to ensure that he has a proper gradation not being high or low.
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PART 3 - EXECUTION

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| <u>2.1 Placing</u> | .1 | Place stone material to lines, grades and dimensions indicated or as directed. |
| | .2 | Place stones in manner approved by the Departmental Representative to secure surface and create a stable mass. |
| | .3 | Material may be placed with the aid of mechanical means or other approved method subject to the Departmental Representative review and approval. End dumping onto sloped areas will not be permitted. |
| | .4 | Contractor will choose his stones and place them in such a way that the whole structure will be bonded and consolidated to as great an extent as nature or rock will allow. |

PART 1 - GENERAL

<u>1.1 RELATED SECTIONS</u>	.1	Section 31 62 16.16 - Steel H-Piles.
<u>1.2 SUBMITTALS</u>	.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.
<u>1.3 DELIVERY, STORAGE AND HANDLING</u>	.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.
<u>1.4 EXISTING CONDITIONS</u>	.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.

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| <u>1.4 EXISTING
CONDITIONS
(Cont'd)</u> | .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. |

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| <u>1.5 SCHEDULING</u> | .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. |
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PART 2 - PRODUCTS

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| <u>2.1 MATERIALS</u> | .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. |
| <u>2.2 EQUIPMENT</u> | .1 | Prior to pile installation, submit to Departmental Representative for review, details of equipment for installation of piles. |

PART 3 - EXECUTION

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| <u>3.1 PREPARATION</u> | .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. |
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| <u>3.1 PREPARATION
(Cont'd)</u> | .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. |
| <u>3.2 INSTALLATION</u> | .1 | Steel H-piles are to be installed in a straight line to provide full bearing surface for the concrete as indicated on the drawing. |
| | .2 | The steel H-piles are to be installed true and plumb along the baseline as shown on drawings. 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. |
| | .3 | All piles are to be installed a minimum of 2.0 meters into the bedrock as shown on the drawings. The bottom elevations may vary depending on the exact location of the bedrock. |
| | .4 | Hold piles securely and accurately in position while installation. |
| | .5 | Cut off piles neatly and squarely at elevations indicated. |
| | .6 | Remove cut-off lengths from site on completion of work. |
| <u>3.3 Field Measurements</u> | .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. |
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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

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| <u>1.1 RELATED
SECTIONS</u> | .1 | Submittal Procedures: Section 01 33 00. |
| | .2 | Miscellaneous Metals: Section 05 50 00 |
| | .3 | New Berlin Wall: Section 31 63 26.16 |
| <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 needed for this work (including piles along new ramp) 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 steel H-Piles are to be installed vertically by pre-drilling into the bedrock strata and stabilized with underwater concreting. Pre-drilling and |
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1.4 MEASUREMENT PROCEDURES (Cont'd)	.1	Steel H-Piles:(Cont'd) underwater concreting will be considered incidental to this item. .1 The additional pile for at corner no. 52 will also be measured for payment. Welding will be considered incidental.
	.2	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 bedrock strata as shown, the supply and installation of underwater concreting and any additional excavation material required to carry out the work. Material excavate will have be disposed as described in section 01 74 21.
	.3	The supply and installation of top steel cover plates will be considered incidental to this section.
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.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Steel H piles: to CSA-G40.20/G40.21, Grade 350.
 - .1 Size and weight as indicated.
 - .2 Minimum length 6.86 meters.
 - .2 Welding materials: to CSA W48.
 - .3 Do not splice piles.

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .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.
- 3.2 Tolerances
- .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 .
 - .4 The piles at the mud line to be within ± 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
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3.2 Tolerances .4 (Cont'd)
(Cont'd) 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.

PART 1 - GENERAL

<u>1.1 Definition</u>	.1	This section specifies the requirements for supply and installation of the Berlin Wall Construction.	
<u>1.2 Related Work</u>	.1	Submittal Procedures	Section 01 33 00
	.2	Environmental Protection	Section 01 35 44
	.3	Excavating, Trenching and Backfilling	Section 31 23 10
	.4	Steel H-Piles	Section 31 62 16.16
	.5	Concrete Reinforcement	Section 03 20 00
	.6	Cast in place Concrete	Section 03 30 00
	.7	Miscellaneous Metals:	Section 05 50 00
<u>1.3 Measurement for Payment</u>	.1	<p>New Berlin Wall: The supply and installation of the new Berlin Wall Construction as shown including all material, equipment and labour to complete the work under this section will be a Lump Sum price item. This will include:</p> <p>.1 Concrete Panels and anchor blocks: The supply and installation of the reinforced concrete panels including ladder panels and anchor blocks, all labour, equipment and materials for the completion of the work. Curing will be considered incidental to this work. Price will also include the supply and placement of "Lifting Anchors". Concrete used in the casting of concrete cylinders for testing will not be measured for payment but will be considered incidental to the work. There will be no additional payment for enclosures or heating of enclosures to complete cast in place concrete or precast concrete work.</p> <p>.2 Ladders: The supply and installation of all the steel components and inserts as shown to complete the ladders units, and modifications to reinforcing bars and formwork</p>	

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1.3 Measurement for .1
Payment
(Cont'd)

(Cont'd)

.2 Ladders:(Cont'd)

of concrete panels to accommodate ladders will be considered incidental to this section. One (1) ladder holdfasts as shown will be included under this section. Galvanizing of ladder components after fabrication is considered incidental to the cost of the Berlin Wall.

.3 Steel Angles or clips: The supply and installation of all the steel angles or clips, and miscellaneous steel required to complete the work for the Berlin Wall will be considered incidental to this section. The welding, cutting, drilling and other work necessary to complete the project will also be considered incidental to this Section. There will not be any separate measurement of payment for the supply and installation of the steel angles and bent plates to the H-piles or adjustment necessary in the field to complete the work.

.4 Steel tie rod, Washers and nuts: The supply and installation of all the tie-rods, washers, nuts, bearing plates and miscellaneous steel for connections to H-piles required to complete the work for the Berlin Wall will be considered incidental to this section. The welding, cutting, drilling and other work necessary to complete the project will also be considered incidental to this Section.

.5 Other Miscellaneous steel: The supply and installation of all other miscellaneous steel such as corner brace and any other associated hardware to complete the work for the Berlin Wall as indicated.

PART 2 - PRODUCTS

- 2.1 Steel H-piles .1 The supply of steel H-piles for the construction of Berlin Wall must meet the requirements of Section 31 62 16.16.
- 2.2 Steel Angles, Tie-Rods, and Miscellaneous Steel .1 The supply of steel angles, as shown on plan, must meet the requirements of Section 05 50 00.
- 2.3 Concrete Panels And Anchor Blocks .1 The supply of concrete panels and anchor wall, as shown on plan, must meet the requirements of Section 03 30 00.
- 2.4 Lifting Anchors .1 'Swift Lift' anchors (recessed) as per Manufacturer's recommendation; Dayton Superior or equivalent.
.1 Supply shop drawings for review.

PART 3 - EXECUTION

- 3.1 Installation .1 The installation of the steel H-piles, steel angles, tie-rods, concrete panels and anchor blocks for the construction of the Berlin Wall must be carried out in accordance with their applicable Sections.
- 3.2 Lifting Anchors .1 Submit to the Departmental Representative the method for lifting the Pre-Cast Concrete panels and anchor blocks for review.