PART 1 - GENERAL

1.1 Related Sections	.1	Section 31 23 10 Excavation and Backfill
	.2	Section 31 37 10 Dense Stone Fill
	.3	Section 32 11 16 Granular Sub-Base
	.4	Section 32 11 23 Granular Base
	.5	Section 35 31 24 Rock Protection
1.2 Measurement Procedures	.1	No measurement will be made under this section. Include costs in items of work that require aggregate.
1.3 Source Approval	.1	Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least four (4) weeks prior to commencing production.
	.2	If, in opinion of Departmental Representative, material from proposed source do not meet, or cannot reasonably be processed to meet specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
	.3	Should a change of material source be proposed during work, advise Departmental Representative four (4) weeks in advance of proposed change to allow sampling and testing.
	.4	Acceptance of a material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.
1.4 Production Sampling	.1	Aggregate will be subject to continual sampling by Department Representative during production.
	.2	Provide Departmental Representative with ready access to source and processed material for purpose of sampling

and testing.

.3 Install adequate sampling facilities at discharge end of production conveyor to allow Departmental Representative to safely obtain representative samples of materials being produced. Stop conveyor belt when requested by Departmental Representative to permit full cross-section sampling.

.4 Bear the cost of sampling and testing of aggregates which fail to meet specified requirements.

PART 2 - PRODUCTS

2.1 Materials

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material or other deleterious substances.

.2 Flat and elongated particles are those whose greatest dimension exceeds four times least dimension.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
- .1 Natural sand.
- .2 Manufactured sand.
- .3 Screening produced in crushing of quarried rock, boulders or gravel.

.4 Coarse aggregates satisfying requirements of applicable section shall be one, or a blend of following:
- .1 Crushed rock.
- .2 Gravel and crushed gravel composed of naturally formed particles of stone.

.5 Particles having at least one fractured face are considered to be crushed particles.

PART 3 - EXECUTION

3.1 Aggregate Source

.1 Sources to be supplied by Contractor.

3.2 Processing

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use approved methods and equipment.

.3 Wash aggregates, if required to meet specifications. Use only equipment approved by Departmental Representative.

.4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

3.3 Handling

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

3.4 Stockpiling

.1 Stockpile aggregates off site. Do not unload delivered aggregate on completed concrete surfaces where damage to concrete may result.

.2 Stockpile aggregates in sufficient quantities to meet project schedule.

PART 1 - GENERAL

1.1 Description	.1	Work under this section consists of all operations and materials related to excavation and backfilling for Work.
1.2 Related Sections	.1	Section 01 35 44 Environmental Protection Procedures for Marine Work
	.2	Section 01 74 21 Construction/Demolition Waste Management & Disposal
	.3	Section 02 41 13 Site Work, Preparation and Removal
	.4	Section 31 05 16 Aggregates - General
	.5	Section 31 32 21 Geotextiles and Geogrids
	.6	Section 31 37 10 Dense Stone Fill
	.7	Section 32 11 16 Granular Sub-base
	.8	Section 32 11 23 Granular Base
	.9	Section 35 31 24 Rock Protection
	.10	Division 26 - Electrical
	.11	Division 33 - Utilities
1.3 Measurement Procedures	.1	Include excavation costs in Construction/ Demolition item of Section 02 41 13 Site Work, Preparation and Removal.
	.2	Granular Fill: Granular Fill to be measured in metric tonnes, (Tonnes), of material supplied and acceptably placed in the work to the lines and grades specified.
	.3	Include all other backfilling costs in respective material sections.
	.4	Include excavation and backfill costs for trenching in the cost items requiring trenching.
1.4 References	.1	American Society for Testing and Materials

International (ASTM)

.1 ASTM C117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.5 ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m^3).

.6 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.5 Definitions

.1 Unclassified excavation: excavation of deposits of whatever character encountered in Work. This includes concrete foundations, rubble, wood debris and other obstructions encountered during excavation.

.2 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.3 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136:

.2 Sieve sizes to CAN/CGSB-8.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

1.6 Existing conditions

.1 Existing surface features:

.1 Conduct, with Departmental Representative, condition survey of existing plants, service poles, wires, site features, asphalt pavement, concrete slab, survey bench marks and monuments which may be affected by work.

.2 Protect existing surface features from damage while work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.2 Buried services:

.1 Before commencing work establish location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.5 Prior to beginning excavation Work, notify Departmental Representative and Authorities having jurisdiction. Establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during Work.

.6 Confirm locations of buried utilities by careful test excavations.

.7 Maintain and protect from damage, water, electric, telephone and other utilities and structures encountered.

.8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental

Representative before removing or re-routing.

.9 Record location of maintained, re-routed and abandoned underground lines.

.10 Confirm locations of recent excavations adjacent to area of excavation.

.3 Existing buildings and surface features:

.1 Conduct, with Departmental Representative, condition survey of existing structures, catch basins, drains, service poles, wires, survey bench marks and monuments which may be affected by Work.

.2 Protect existing surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

1.7 Submittals

.1 Make submittals in accordance with Section 01 33 00 Submittal Procedures.

.2 Quality Control: in accordance with Section 01 45 00 Testing and Quality Control:

.1 Submit condition survey of existing conditions as described in article 1.6 Existing Conditions, of this Section.

.2 Submit for review by Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this Section.

.3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.

.4 Submit to Departmental Representative a written notice when bottom of excavation is reached.

.5 Submit to Departmental Representative testing inspection results and report as described in PART 3 of this Section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

.2 Submit records of underground utility locates, indicating: location plan of existing utilities as

found in field, clearance record from utility authority, and location plan of relocated and abandoned services, as required.

.4 Samples:
- .1 Submit samples in accordance with Section 01 33 00 Submittal Procedures.
- .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
- .3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
- .4 Ship samples prepaid to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.

1.8 Quality Assurance

.1 Do not use backfill materials until written report of soil test results are reviewed by Departmental Representative.

.2 Health and Safety Requirements:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29 Health and Safety Requirements.

1.9 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.

.2 Divert excess materials from landfill to local quarry for reuse as directed by Departmental Representative.

1.10 Special Inspection

.1 The bottoms of all excavated areas where existing cribwork/pile structures have been demolished and removed are to be inspected by a geotechnical engineer to ensure suitable conditions for support of new granular fill and stone fill.

.2 do not proceed with backfilling until bottom of excavation has been inspected and approved.

PART 2 - PRODUCTS

2.1 Materials

.1 Filter fabric: As specified under Section 31 32 21 Geotextiles and Geogrids.

.2 Dense Stone Fill (R5): As specified under Section 31 37 10 Dense Stone Fill.

.3 Granular Fill: Granular Fill for use as backfilling or for the reconstruction of the wharf structures to top of subgrade above the stone fill or in-situ materials up to the underside of the granular sub-base layer is to be material meeting all the requirements as specified for granular sub-base as specified under Section 32 11 16 Granular Sub-Base.

.4 Granular Sub-base: As specified under Section 32 11 16 Granular Sub-Base.

.5 Granular Base: As specified under Section 32 11 23 Granular Base.

.6 Filter Stone: As specified under Section 35 31 24 Rock Protection.

.7 Armour Stone: As specified under Section 35 31 24 Rock Protection.

.8 Barrier Stone: As specified under Section 35 31 24 Rock Protection.

.9 Trenching Materials:

.1 Bedding material for normal dry trench conditions: Crushed stone as specified under Section 32 11 23 Granular Base.

.2 Bedding material in wet trench (“drainage stone”): gradation as follows:

ASTM Sieve size	% passing
20.0 mm	100
14.0 mm	40 – 80
10.0 mm	20 – 62
5.0 mm	0 – 20
2.5 mm	0 – 10
0.08 mm	0 – 3

.3 Common backfill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 - EXECUTION

3.1 Site Preparation

.1 Set out pertinent lines, grades and levels required for excavation and backfill work. Maintain accuracy of line and grade stakes during Work.

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

.3 Strip and dispose of excavated materials as indicated on plans and as required to complete the Work.

3.2 Temporary Erosion and Sedimentation Control

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 Preparation/Protection

.1 Protect existing features in accordance with Section 01 10 10 General Instructions, and applicable local regulations.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.

.4 Protect natural and man-made features required to remain undisturbed.

.5 Protect buried services that are required to remain undisturbed.

3.4 Stockpiling

.1 Due to limited space, no materials are to be stockpiled on the site unless otherwise approved by Departmental Representative.

.2 All new materials to be brought to the site immediately prior to placement.

3.5 Sheathing, Shoring, Bracing and Underpinning

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29 Health and Safety Requirements and the Health and Safety Act for the Province of New Brunswick.

.2 During backfill operation:

.1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 600 mm above toe of sheeting.

.3 Upon completion of substructure construction:

.1 Remove shoring and bracing.

.2 Remove excess materials from site.

3.6 Dewatering and Heave Prevention – New Building and Approach area

.1 Keep excavations free of water while work is in progress.

.2 Provide details of proposed dewatering or heave prevention methods, including dikes and well points, for Departmental Representative's review.

.3 Protect open excavations against flooding and damage due to surface run-off.

.4 Dispose of water in runoff areas and in manner not detrimental to property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage and other diversions outside of excavation limits.

3.7 Excavation

.1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as directed by Departmental Representative.

.3 Remove concrete foundations, rubble and other obstructions encountered during excavation.

.4 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.5 Keep excavated and stockpiled materials safe distance away from edge of trench.

.6 Restrict vehicle operations directly adjacent to open trenches.

.7 Dispose of surplus and unsuitable excavated material at an approved land based disposal site.

.8 Do not obstruct flow of surface drainage or natural watercourses.

.9 Notify Departmental Representative when bottom of excavation is reached.

.10 Obtain Departmental Representative's approval of completed excavation.

.11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.12 Hand trim, make firm and remove loose material and debris from excavations.
- .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.13 Install filter fabric and geogrid in accordance with Section 31 32 21 Geotextiles and Geogrids.

3.8 Fill Types and Compaction

.1 Use types of fill as indicated or specified in related sections. Compaction densities are percentages of maximum densities obtained from ASTMD 698.

.2 Placement and compaction of crushed rock to be in accordance with their respective section or drawings.

3.9 Bedding and Surround of Underground Services

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.10 Backfilling

.1 Do not proceed with backfilling operations until completion of following:
- .1 Departmental Representative has inspected and approved of construction below finish grade.

.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 Refer to related sections or drawings for additional backfilling and compaction requirements.

.5 Backfilling around installations:
- .1 Place bedding and surround material as specified in related sections.
- .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
- .3 Place layers simultaneously on both sides of

installed work to equalize loading. Difference not to exceed 600 mm.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval is obtained from Departmental representative.

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

3.11 Restoration

.1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

.2 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.3 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

3.12 Quality Assurance Inspection and Testing

.1 Testing of materials and compaction will be carried out by Testing Agency designated by Departmental Representative. Frequency of tests will be determined by Departmental Representative.

.2 Departmental Representative will pay for services of testing laboratory.

.3 Inspection and testing by the Soil Testing Agency and/or Departmental Representative will not augment or replace Contractor quality control nor relieve the Contractor of contractual responsibilities.

PART 1 - GENERAL

1.1 Description

.1 This section specifies requirements for:

.1 The fabrication and installation of a debris and sediment containment curtain including its maintenance for the duration of work and removal.

.2 The supply and installation of synthetic non-woven filter fabric and geogrid to be used in backfill operations as indicated on the drawings and as specified herein.

1.2 Measurement Procedures

.1 Debris and Sediment Containment Curtain (Debris Sediment/Curtain): The fabrication, installation and maintenance of the debris and sediment containment curtain for the duration of the work will be paid for as a lump sum, including the cost for the removal and disposal of the floating containment curtain upon completion of the work.

.2 Filter Fabric: The supply and installation of filter fabric will be measured as a lump sum item.

.3 Geogrid: The supply and installation of geogrid will be measured in square metres, (M^2), calculated from theoretical neat dimensions indicated on plans or as authorized in writing by the Departmental Representative.

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

1.3 References

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

.1 ASTM D 4101-10, Standard Specification for Polypropylene Injection and Extrusion Materials.

.2 ASTM D 4491-99a(2009)e1, Standard Test Methods for Water Permeability of Geotextiles by Permitivity.

.3 ASTM D 4595-09, Standard Test Method for Tensile Properties of Geotextiles by the

Wide-Width Strip Method.

.4 ASTM D 4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.5 ASTM D 6637-10, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-4.2 No. 11.2-M89 (November 2004), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).

.2 CAN/CGSB-148.1, Methods of Testing. Geosynthetics.

1.4 Submittals

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

.2 Submit to the Departmental Representative the following samples at least 2 weeks prior to commencing work: manufacturer's specifications on the filter fabric, geogrid and debris/sediment containment curtain proposed to be used.

1.5 Delivery, Storage and Handling

.1 During delivery and storage, protect geotextiles and geogrids from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

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 & Disposal.

PART 2 - PRODUCTS

2.1 Materials

.1 Filter Fabric to be synthetic fiber and be rot proof, unaffected by action of oil or salt water and not subject to attack by marine life, insects, or rodents. Filter fabric to be of non-woven construction supplied in rolls of minimum 3.0 metres width.

.1 Filter fabric for the Floating Debris Containment Curtain to following properties:

.1 Mass(g/m^2) 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.

.2 Filter fabric for the reconstruction of the wharf structures to following properties:
.1 Mass(g/m²) 380
.2 Tear (N) 500
.3 Tensile Strength (N) 1,200
.4 Elongation at Break(%) 50
.5 Opening Size (um) 50 to 250
.6 Permeability (K cm s-1) 1.0 to 2.5x10-1.

.3 Contractor shall note that the material may become buoyant.

.4 Seams: to be in accordance with manufacturer's recommendations.

.5 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

.2 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: 3 m minimum.
.2 Rib thickness: 0.76 mm minimum.
.3 Aperture size:
.1 Machine direction (MD): 25 mm.
.2 Cross machine direction (XMD): 33 mm.
.4 Polymer: Polypropylene to ASTM D 4101.
.5 Ultimate tensile strength: To ASTM D 6637.
.1 Machine direction (MD): minimum 12.4 N/mm.
.2 Cross machine direction (XMD): minimum 19.0 N/mm.
.6 Tensile strength at 2% strain for machine direction: to ASTM D 6637, minimum 4.0 N/mm.

PART 3 - EXECUTION

3.1 Debris and Sediment Containment Curtain Installation

.1 The debris and sediment containment curtain will be installed before the wharf demolition work begins and it will remain in place for the duration of the work.

.2 Remove and replace fabric damaged or deteriorated as directed by Departmental Representative.

.3 Any fabric damaged to be replaced at no additional cost.

.4 The floating debris containment curtain will not be removed until approved by the Departmental Representative.

3.2 Filter Fabric Installation

.1 Place geotextile material by unrolling in orientation, manner and locations indicated and retain in position with securing pins and washers, weights or other method as approved by Departmental representative.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Overlap each successive strip of geotextile minimum of 600 mm over previously laid strip.

.4 Pin successive strips of geotextile with securing pins or fasteners as recommended by manufacturer.

.5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material.

.6 After installation, cover with overlying layer within 4 hrs of placement.

.7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

3.3 Geogrid Installation

.1 Place geogrid material by unrolling in orientation, manner and locations indicated and retain in position in accordance with manufacturer’s written recommendations.

.2 Overlap each successive strip of geogrid minimum of 600 mm over previously laid strip.

.3 Join successive strips of geogrid by tying or pinning as recommended by manufacturer.

.4 Protect installed geogrid material from displacement, damage or deterioration before, during and after placement of material.

.5 After installation, cover with overlying layer within 10 days of placement.

.6 Replace damaged or deteriorated geogrid to approval of Departmental Representative.

3.4 Protection

.1 Vehicular traffic is not permitted directly on geotextiles & geogrids.

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 45 01 Weigh Scales

.2 Section 31 23 10 Excavation and Backfill

.3 Section 31 32 21 Geotextiles and Geogrids

1.2 Measurement Procedures

.1 Dense Stone Fill (R5): Dense Stone Fill to be measured in metric tonnes, (Tonnes), of material supplied and acceptably placed in the work to the lines and grades specified.

.2 Mobilization/demobilization of equipment will not be measured for payment.

.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.

1.3 References

.1 New Brunswick Department of Transportation 2011 standard Specifications.

PART 2 - PRODUCTS

2.1 Materials

.1 Dense Stone Fill (R5): Clean, hard, dense durable quarry stone.

.1 To consist of R5 material and to be in strict accordance with the material requirements as per the January 2011 Edition of the NBDOT Standard Specifications, Item: 608, Random Rip Rap. Gradation to be to R5 grading limits as per Table 608-1 of NBDOT Specifications.

Table 608 – 1 (Partial Table)
Random Rip Rap Grading Limits

Mass	Size (Note 1)	R-A (Note 2)	R-5
(kg)	(mm)		
15	220	100	100
10	190		70 - 90
5	150		40 - 55
2.5	120	0	
0.5	70		0 - 15
Thickness (mm) (Note 3)		300	300

2.2 Filter Fabric

.1 Geotextile: in accordance with Section 31 32 21 Geotextiles and Geogrids.

PART 3 - EXECUTION

3.1 Placing

.1 Fine grade areas to be backfilled with stone to uniform, even surfaces. Compact to provide firm bed.

.2 Line bottom and sides of areas to be filled with stone with filter fabric on prepared surfaces in accordance with Section 31 32 21 Geotextiles and Geogrids and as indicated. Place rip-rap on filter fabric so as to avoid puncturing filter fabric. Do not drive vehicles directly on filter fabric.

.3 Place stone to thickness and details as indicated.

.4 Place stone in manner approved by Departmental Representative to create a firm compacted, very dense stable mass. Place larger stones at bottom. Top of stone fill to be of finer gradation suitable to receive filter fabric and granular fill.

.5 Finish surface evenly, free of loose areas and neat in appearance.

.6 Mechanically place the stone. No end dumping will be permitted.

PART 1 - GENERAL

1.1 Related Sections	.1	Section 31 62 16 Steel H Piles.
1.2 Measurement Procedures	.1	There will be no measurement for payment under this section. Work included in this section will be included in pay item for Section 31 62 16 Steel H Piles.
1.3 Submittals	.1	Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
	.2	Product Data: submit manufacturer's printed product literature, specifications and datasheet.
	.3	Spliced piles are not permitted.
1.4 Delivery, Storage and Handling	.1	Deliver, store and handle materials in accordance with manufacturer's instructions.
	.2	Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
	.3	Replace damaged piles as directed by Departmental Representative.
1.5 Existing Conditions	.1	The Contractor must make his own evaluation of soil conditions.
1.6 Scheduling	.1	Provide schedule of planned sequence of driving to Departmental Representative for review, not less than two weeks prior to commencement of pile driving.

PART 2 - PRODUCTS

2.1 Materials	.1	Material requirements for piles are specified in Section 31 62 16 Steel H Piles.
	.2	Supply full length piles as indicated 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 for installation of piles.

.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 Hammer:

.1 When required criteria cannot be achieved with the proposed hammer, use larger hammer and take other measures as required.

PART 3 - EXECUTION

3.1 Preparation

.1 Protection:

.1 Protect adjacent structures, services and work of other sections from hazards due to pile driving operations.

.2 Arrange sequencing of pile driving operations and methods to avoid damages to adjacent existing structures.

.3 When damages occur, remedy damaged items to restore to original or better condition at own expense.

.2 Ensure that existing wharf structure 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 by Departmental Representative.
.1 Department 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 Install each pile to practical elevations indicated.

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, etc.
.3 Pile size and length, location of pile.
.4 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.
.5 Toe elevation upon termination of driving pile and final toe and cutoff elevations upon completion.
.6 Records of restriking.
.7 Other pertinent information, such as interruption of continuous driving, observed pile damage, etc.
.8 Records of elevations of adjacent piles before and after driving of pile.
.9 Record all information on forms provided by Departmental representative.

3.5 Final Penetration Resistance

.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 installation of all piles prior to removal of pile driving equipment from site.

3.6 Obstructions

.1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, proceed as directed by Departmental Representative.

3.7 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 Section 05 50 00 Metal Fabrications.

.2 Section 31 61 13 Pile Foundations, General Requirements.

1.2 Measurement Procedures

.1 Steel H Piles: will be measured by unit (Unit), of pile supplied, driven and acceptably incorporated into the work. Length to be defined by top and toe elevations indicated on plans.

.1 Pile shoes will not be measured separately for payment but will be considered as incidental to the work included in the above item.

1.3 References

.1 Canadian Standards Association (CSA International)

.1 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel.

.2 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.

.3 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).

.4 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

1.4 Pile Driving Criteria

.1 Contractor is responsible to make his own determination of existing geotechnical conditions.

.2 Installation of the piles is to be by driving.

.3 Piles to be driven to the depth indicated on plans, or to refusal provided a minimum depth of 2 metres is achieved into sound bedrock.

.4 Refusal criteria to be >10 blows per 25 mm, using a hammer with a minimum rated energy of 200 ft*lbs/in^2 of steel cross-sectional area.

.5 Refusal above pile toe elevation shown on plan to be subject to confirmation by the geotechnical engineer.

1.5 Submittals

.1 Submittals in accordance with Section 01 33 00 Submittal Procedures.

.2 Submit shop drawings and indicate: pile shoes, and tip reinforcement, if applicable.
- .1 Each drawing to be signed by qualified professional engineer registered or licensed in Province of New Brunswick.

.3 Quality Assurance:
- .1 Test Reports: submit 3 copies of mill test reports indicating yield and chemical analysis of steel piles to Departmental Representative.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Submit pile driving records, as described in PART 3 - 3.3 RECORDS, for review by Departmental Representative.

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.

.2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 Materials

.1 Steel H piles: to CSA-G40.20/G40.21, Grade 350W.
- .1 Size and weight as indicated.

.2 Welding materials: to CSA W48.

.3 Steel plates: to CSA-G40.20/G40.21, Grade 300W.

.4 Pile driving shoes: to CSA-G40.20/G40.21, Grade 300W, and to supplied and installed in accordance with Item: 311 of the NBDOT Standard Specifications dated January, 2011.

PART 3 - EXECUTION

3.1 Installation

.1 Install piling in accordance with Section 31 61 13 Pile Foundations, General Requirements.

.2 Cut off piles squarely at required elevation.

3.2 Welding

.1 Weld to CSA W59.

.2 Welding certification of companies: to CSA W47.1.

3.3 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.
.8 Penetration in blows per meter for entire length of penetration.
.9 Hammer data including: rate of operation, make and size.
.10 Unusual pile behavior or circumstances experienced during driving such as redriving, heaving, weaving, obstructions, jetting, and unanticipated interruptions.

3.4 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.