

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 23 Granular Base
- 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.

END OF SECTION

PART 1 - GENERAL

<u>1.1</u>	<u>Related Sections</u>	.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
		.6	Section 31 37 10 Dense Stone Fill
		.7	Section 32 11 23 Granular Base
<u>1.2</u>	<u>Description</u>	.1	Work under this section consists of all operations and materials related to excavation and backfilling for Work.
<u>1.3</u>	<u>Measurement Procedures</u>	.1	Include cost for excavation, stockpiling and reinstatement of excavated material as 'compacted granular backfill' in Construction/Demolition/Mob/Demob pay item of Section 02 41 13 Site Work, Preparation and Removal.
		.2	Include all other backfilling costs in the respective material sections.
<u>1.4</u>	<u>References</u>	.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

.6 Using Modified Effort (2,700 kN-m/m³).
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.

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 or where existing cribwork/ structures have been demolished and removed are to be inspected by a geotechnical engineer to ensure suitable conditions for support of new granular 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.

- .2 Compacted Granular Backfill: Suitable excavated material.
 - .1 All excavated materials judged unsuitable or not reinstalled in the work shall be disposed off-site at an approved disposal site.

.3 Random Rip-Rap (R-5): As specified under Section 31 37 10 Dense Stone Fill.

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

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 If requested by the Departmental Representative, 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 Excavated material shall be separated into two stockpiles. Unsuitable and submerged material shall be stockpiled separately from suitable and dryer material.
- .2 Material stockpiling space on site is limited. Coordinate

delivery to minimize storage period on site before being needed for incorporation into work. Place material where directed by Departmental Representative.

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 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 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 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .5 Restrict vehicle operations directly adjacent to open trenches.
- .6 Dispose of surplus and unsuitable excavated material at an approved land based disposal site.
- .7 Do not obstruct flow of surface drainage or natural watercourses.

- .8 Notify Departmental Representative when bottom of excavation is reached.
 - .9 Obtain Departmental Representative's approval of completed excavation.
 - .10 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
 - .11 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.
 - .12 Install filter fabric in accordance with Section 31 32 21 Geotextiles.
- 3.7 Fill Types and Compaction
- .1 Compact reused granular backfill to a density not less than 95% in accordance with ASTM D698 (Standard Proctor).
 - .2 Placement and compaction of crushed rock to be in accordance with their respective section or drawings.
- 3.8 Backfilling
- .1 Do not proceed with backfilling operations until 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 Place granular backfill material to full width in uniform layers not exceeding 300 mm compacted thickness.
 - .5 Refer to related sections or drawings for additional backfilling and compaction requirements.
 - .6 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.
- 3.9 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.
- 3.10 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

<u>1.1</u>	<u>Related Sections</u>	.1	Section 31 23 10 Excavation and Backfill
<u>1.2</u>	<u>Description</u>	.1	This section specifies requirements for the supply and installation of synthetic non-woven filter fabric to be used in backfilling operations as indicated on drawings.
<u>1.3</u>	<u>Measurement Procedures</u>	.1	<u>Filter Fabric</u> : The supply and installation of filter fabric will be measured as a lump sum item.
		.2	Damaged material shall be replaced at no cost to the owner.
<u>1.4</u>	<u>References</u>	.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 Permittivity.
		.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.
		.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.
<u>1.5</u>	<u>Submittals</u>	.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 proposed to be used.

1.6 Delivery, Storage and Handling .1

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

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 & 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 to have the 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.
- .2 Contractor shall note that the material may become buoyant.
- .3 Seams: to be 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 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.

3.2 Protection .1 Vehicular traffic is not permitted directly on geotextile.

END OF SECTION

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

Mass	Size	R-A	R-5
(kg)	(mm)	(Note 2)	
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 Geotextile: in accordance with Section 31 32 21 Geotextiles.

PART 3 - EXECUTION

3.1 Placing

- .1 Grade areas to be backfilled with stone to uniform, even surfaces. Compact to provide firm bed.
- .2 If indicated, 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. 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.

END OF SECTION

- .3 Swing leads:
 - .1 Obtain approval from the Departmental Representative prior to using swing leads.
 - .2 Firmly guy top and bottom to hold pile in position during driving operation.

PART 3 - EXECUTION

- 3.1 Preparation
 - .1 Obtain Departmental Representative's approval before start of pile driving.
 - .1 Provide 24 hours notice prior to start of pile driving.
 - .2 Protection:
 - .1 Protect adjacent structures, services and work of other sections from hazards due to pile installation 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.
 - .3 Ensure that existing wharf structure and ground conditions at pile locations are adequate to support pile installation 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 Installation of the piles is to be by driving.
 - .2 Pile driving points:
 - .1 Pile driving points are not required if the piles can be properly installed without them.
 - .2 Contractor to make his own determination of the use of pile driving points.
 - .3 Use driving caps and cushions to protect piles.
 - .1 Reinforce pile heads as required.
 - .2 Piles with damaged heads, as determined by the

- Departmental Representative, will be rejected.
- .4 Hold piles securely and accurately in position while driving.
 - .5 Deliver hammer blows along axis of pile.
 - .6 Install each pile to depth indicated.
 - .7 Restrike already driven piles lifted during driving of adjacent piles to assure set.
 - .8 Installation of each pile will be subject to review by the Departmental Representative.
 - .1 Departmental Representative will be sole judge of acceptability of each pile with respect to final alignment, orientation and installation capacity, 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.
 - .9 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.
 - .10 Remove cut-off lengths from site on completion of work.
- 3.3 Pile Driving Criteria
- .1 Contractor is responsible to make his own determination of existing geotechnical conditions.
 - .2 Piles to be driven to the depth indicated on plans.
- 3.4 Installation Approval
- .1 Installation of each pile will be subject to review by the Departmental Representative.
 - .1 Departmental Representative will be sole judge of acceptability of each pile with respect to final alignment, orientation and installation capacity, depth of penetration or other criteria used to determine load capacity.

yield and chemical analysis of steel piles to the Engineer.

- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.6 Waste Management and Disposal

- .1 Separate waste materials for reuse and recycling in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.
- .2 Divert unused metal materials from landfill to metal recycling facility as approved by the Engineer.

PART 2 - PRODUCTS

2.1 Materials

- .1 Steel H-piles: to CSA-G40.20/G40.21, Grade 350W or ASTM A572, grade 50.
 - .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 or better, and to supplied and installed in accordance with Item: 311 of the NBDTI Standard Specifications dated January 2015.

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 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.

END OF SECTION
