

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 31 23 10 - Excavating, Trenching and Backfilling
- .3 Section 31 23 13 - Roadway Embankment

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D 4791-2010, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Allow continual sampling by Departmental Representative during production.
- .3 Provide Departmental Representative with access to source and processed material for sampling.
- .4 Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when requested by Departmental Representative to permit full cross section sampling.
- .5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.4 WASTE  
MANAGEMENT AND  
DISPOSAL

- .1 Divert unused granular materials from landfill to local facility as approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
  - .1 Greatest dimension to exceed five 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 Screenings produced in crushing of quarried rock, boulders or gravel.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.

2.2 SOURCE QUALITY CONTROL

- .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, materials 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 Advise Departmental Representative two (2) weeks in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 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 methods and equipment approved by Departmental Representative.
  - .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.
- .2 Handling
  - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Stockpiling
  - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
  - .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 h of rejection.
  - .7 Stockpile materials in uniform layers of thickness as follows:
    - .1 Max 1.5 m for coarse aggregate and base course materials.
    - .2 Max 1.5 m for fine aggregate and sub-base materials.
    - .3 Max 1.5 m for other materials.

3.1 PREPARATION  
(Cont'd)

- .3 (Cont'd)
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
- .3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 31 25 00 - Erosion and Sediment Control

1.2 REFERENCES

- .1 Applicable environmental protection reference documents as issued by Nova Scotia Environment and Department of Fisheries and Oceans.

1.3 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of 0.25m<sup>3</sup> to not less than specified depth below existing ground surface.

1.4 STORAGE AND  
PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, and existing site fixtures which are to remain.
  - .1 Repair damaged items to approval of Departmental Representative.
  - .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.5 WASTE  
MANAGEMENT AND  
DISPOSAL

- .1 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

PART 3 - EXECUTION

3.1 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 waterways, according to NSEL sediment and erosion control.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
  - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
  - .2 When utility lines which are to be removed are encountered within area of operations, notify utility in ample time to minimize interruption of service. The Departmental Representative is to be provided copies on all correspondence.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

3.3 CLEARING

- .1 Clearing includes felling and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags and brush occurring within cleared areas.

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| <u>3.3 CLEARING<br/>(Cont'd)</u>    | .2 | Clear as indicated and as directed by Departmental Representative, by cutting at height of not more than 300mm above ground.             |
|                                     | .3 | Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.                                 |
|                                     | .4 | Cut off unsound branches on trees designated to remain as directed by Departmental Representative.                                       |
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| <u>3.4 GRUBBING</u>                 | .1 | Grub areas as indicated.   |
|                                     | .2 | Remove and dispose of all rootmat and stumps.  |
|                                     | .3 | Grub out stumps and roots to not less than 300mm below ground surface.   |
|                                     | .4 | Grub out visible rock fragments and boulders, greater than 300mm in greatest dimension, but less than 0.25m <sup>3</sup> .               |
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| <u>3.5 REMOVAL AND<br/>DISPOSAL</u> | .1 | Remove cleared and grubbed materials off site.   |
|                                     | .2 | Cut marketable timber to lengths suitable for transport and use intended.  |
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| <u>3.6 FINISHED<br/>SURFACE</u>     | .1 | Leave ground surface in condition suitable for immediate grading operations to approval of Departmental Representative.                  |
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| <u>3.7 CLEANING</u>                 | .1 | On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment. |

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 30 - Health and Safety.
- .3 Section 01 35 43 - Environmental Procedures.
- .4 Section 31 05 16 - Aggregate Materials.
- .5 Section 31 25 00 - Erosion and Sediment Control.
- .6 Section 32 11 16 - Granular Sub-base.
- .7 Section 32 11 23 - Aggregate Base Courses.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C117-04, Standard Test Method for Materials Finer than 75- $\mu$ m 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 D 698-2012, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600 kN-m/m<sup>3</sup>.
  - .5 ASTM D4318-2010, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Nova Scotia Transportation and Infrastructure Renewal.
  - .1 Highway Construction and Maintenance Standard Specification.

1.3 DEFINITIONS

- .1 Unclassified excavation: excavation of whatever character other than stripping topsoil encountered.
- .2 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.



1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
- .3 Samples:
  - .1 Submit samples in accordance with Section 01 33 00.
  - .2 Inform Departmental Representative at least four (4) weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

1.5 DELIVERY,  
HANDLING

- .1 Storage and Protection:
  - .1 Protect existing features.
  - .2 Existing buried utilities and structures:
    - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
    - .2 Prior to beginning excavation Work, notify applicable authorities having jurisdiction establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
    - .3 Confirm locations of buried utilities by careful test excavations at no additional cost to Contract.
    - .4 Maintain and protect from damage, water, sewer, electric, telephone and other utilities and structures encountered as indicated.
    - .5 Where utility lines or structures exist in area of excavation, coordinate work with utilities.
    - .6 Record location of maintained, re-routed and abandoned underground lines.
    - .7 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 buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

- 1.5 DELIVERY, .1 (Cont'd)  
HANDLING .3 (Cont'd)  
(Cont'd) .2 Construction/Demolition Waste Management and Disposal:  
.1 Crush demolished concrete from the existing structure to a size suitable for transportation to off-site disposal.

## PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Common Fill: well-graded material from Contractor's own sources. Common fill which is free from stumps, trees, roots, sod, organics, rocks, boulders larger than 200 mm in any dimension and other deleterious materials, and with a moisture content sufficient to allow it to be compacted to the specified densities.
- .2 Rock Fill: well graded, sound, durable material free from flat, elongated pieces as accepted by the Departmental Representative prior to placement. 300mm maximum size in any dimension.
- .3 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work providing borrow meets the requirements of common fill.
- .4 Gravel: crushed and screened pit gravel crushed and screened rock or slag. Gradation shall be dense, well graded and as follows:  
.1 Type 1: as per NSDTIR standard specification, except with gradation adjusted as noted in aggregate specifications.  
.2 Type 2: as per NSDTIR standard specification except with gradation adjusted as noted in aggregate specifications.
- .5 Clear stone: crushed and screened, hard, durable stone or slag, free from clay and organic matter and graded as follows:  
.1 Type C4: as per NSDTIR standard specification.

## PART 3 - EXECUTION

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

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| <u>3.1 SITE PREPARATION<br/>(Cont'd)</u> | .2 | Cut pavement neatly along limits of proposed excavation in order that surface may break evenly and cleanly. |
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| <u>3.2 STRIPPING OF TOPSOIL</u> | .1 | Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of brush weeds and grasses and disposed of.   |
|                                 | .2 | Strip topsoil to depths as directed by Departmental Representative. Do not mix topsoil with subsoil.  |
|                                 | .3 | Stockpile above brook floodplain in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m and shall be protected from erosion by covering with tarpaulins. |
|                                 | .4 | Dispose of unused topsoil to location as directed by Design Departmental Representative.  |
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| <u>3.3 STOCKPILING</u> | .1 | Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation.        |
|                        | .2 | Protect fill materials from contamination.   |
|                        | .3 | Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into approved water bodies. |
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| <u>3.4 TEMPORARY DAMS, SHORING, BRACING AND UNDERPINNING</u> | .1 | Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 30 and the Occupational Health and Safety Act for the Province of Nova Scotia.  |
|  | .2 | Construct temporary Works to depths, heights and locations as indicated or directed by Departmental Representative.  |
|  | .3 | During backfill operation:<br>.1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.<br>.2 Do not remove bracing until backfilling has reached respective levels of such bracing.<br>.3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting. |
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3.4 TEMPORARY DAMS,  
SHORING, BRACING  
AND UNDERPINNING  
(Cont'd)

- .4 Upon completion of construction:  
.1 Remove cofferdams, shoring and bracing.  
.2 Remove excess materials from site and restore watercourses as indicated and as directed by Departmental Representative.

3.5 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 Dispose of water by pumping into vegetated areas in approved collection runoff areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.  
.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.  
.2 Do not allow sediment laden water to reach adjacent watercourses.

3.6 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated on the drawings or as directed by Design Departmental Representative.  
.2 Excavation must not interfere with bearing capacity of adjacent foundations.  
.3 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.  
.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 in approved location on site as directed by the Departmental Representative.  
.7 Do not obstruct flow of surface drainage or natural watercourses.  
.8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

3.6 EXCAVATION  
(Cont'd)

- .9 Notify Departmental Representative when bottom of excavation is reached.
- .10 Obtain Departmental Representative 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 Correct unauthorized over-excavation as follows:
  - .1 Fill with Type 2 gravel compacted to not less than 98% of corrected Standard Proctor maximum dry density.
- .13 Protect environment from erosion and sediment, transport as per requirements of Environment Protection Plan.

3.7 FILL TYPES AND  
COMPACTION

- .1 Use types of fill as indicated. Compaction densities are percentages of maximum densities obtained from ASTM D 698. All fills to be compacted to 98% of corrected maximum dry density.

3.8 BEDDING AND  
SURROUND OF  
UNDERGROUND  
SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in Section 33 42 16.
- .2 Place bedding and surround material in unfrozen condition.

3.9 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
  - .2 Departmental Representative has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
  - .4 Backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

3.9 BACKFILLING  
(Cont'd)

- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations.
  - .1 Place bedding and surround material as specified elsewhere.
  - .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 1 metre.
  - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
    - .1 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

3.10 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as directed by the Departmental Representative. Protect topsoil from erosion until vegetation is established.
- .3 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .4 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 01 56 00 - Temporary Barriers and Enclosures
- .2 Section 31 05 16 - Aggregate Materials
- .3 Section 31 11 00 - Clearing and Grubbing
- .4 Section 31 23 10 - Excavating, Trenching and Backfilling
- .5 Section 31 25 00 - Erosion and Sediment Control
- .6 Section 32 11 23 - Aggregate Base Courses
- .7 Section 32 11 16 - Granular Sub-base

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM D698-12, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).

1.3 DEFINITIONS

- .1 Unclassified Excavation: excavation of whatever character, other than stripping topsoil, encountered in the Work.
- .2 Stripping: excavation of organic material covering original ground.
- .3 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
- .4 Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.
- .5 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work and as specified in Section 31 23 10.
- .6 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

1.4 QUALITY  
ASSURANCE

- .1 Regulatory Requirements:
  - .1 Adhere to regulations of authority having jurisdiction when blasting is permitted.
  - .2 Adhere to Provincial and National Environmental requirements when potentially toxic materials are involved.
- .2 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Common Fill: as specified in Section 31 23 10.
- .2 Borrow material: as specified in Section 31 23 10.

PART 3 - EXECUTION

3.1 COMPACTION  
EQUIPMENT

- .1 Compaction equipment must be capable of obtaining specified densities in materials on project. Equipment that does not achieve specified densities must be replaced or supplemented.
- .2 Operate suitable compaction equipment continuously in each embankment when placing material.

3.2 WATER  
DISTRIBUTORS

- .1 Apply water with equipment capable of uniform distribution.

3.3 EXCAVATING

- .1 General:
  - .1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.
  - .2 Subcut 300mm below subgrade in cut sections unless otherwise directed. Compact top 150 mm below subcut to minimum 95% maximum dry density, ASTM D 698 (AASHTO T99). Replace with approved embankment material and compact.
- .2 Drainage:
  - .1 Maintain profiles, crowns and cross slopes to provide good surface drainage.



3.3 EXCAVATING  
(Cont'd)

- .2 (Cont'd)
  - .2 Provide ditches as Work progresses to provide drainage.
  - .3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.
- .3 Borrow Excavation:
  - .1 Completely use in embankments, suitable materials removed from site excavations before obtaining material from borrow areas.
  - .2 Obtain embankment materials, in excess of what is available from cut areas, from designated borrow areas.

3.4 EMBANKMENTS

- .1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces. Method used to be subject to prior approval of Departmental Representative.
- .2 Break up or scarify existing road surface prior to placing embankment material.
- .3 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized.
- .4 Maintain crowned surface during construction to ensure ready run-off of surface water.
- .5 Drain low areas before placing materials.
  - .1 Place and compact to full width using layer thicknesses suitable for type of compaction equipment used, but not to exceed 300mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.
- .6 Where material consists of rock:
  - .1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1.0m.
  - .2 Distribute rock material to fill voids with smaller fragments to form compact mass.
  - .3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.
  - .4 Do not place boulders and rock fragments with dimensions exceeding 150mm within 300mm of subgrade elevation.

3.4 EMBANKMENTS  
(Cont'd)

- .7 Deductions from excavation will be made for overbuild of embankments.

3.5 SUBGRADE  
COMPACTION

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
- .2 Compact each layer to minimum 95% maximum dry density, ASTM D 698 (AASHTO T99) except top 300 mm of subgrade. Compact top 300 mm to 98% maximum dry density.
- .3 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

3.6 FINISHING

- .1 Shape entire roadbed to within 25mm of design elevations.
- .2 Finish slopes, ditch bottoms true to lines, grades and drawings where applicable. Scale slope by removing loose fragments, for cut slopes in bedrock steeper than 1:1.
- .3 Remove stones over 150 mm in dimension from slopes and ditch bottoms.
- .4 Hand finish slopes that cannot be finished satisfactorily by machine.
- .5 Round top of backslope 1.5 m both sides of top of slope.
- .6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.
- .7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.
- .8 Protect slopes from erosion until vegetation is established.

3.7 PROTECTION

- .1 Maintain finished surfaces in condition conforming to this section until acceptance by Departmental Representative.

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 43 - Environmental Procedures
- .3 Section 31 23 10 - Excavating, Trenching and Backfilling

1.2 REFERENCES

- .1 Nova Scotia Department of Transportation and Infrastructure Renewal, Highway Construction and Maintenance Standard Specifications.
- .2 Nova Scotia Watercourse Alteration Specifications.

1.3 ENVIRONMENTAL  
PROTECTION PLAN

- .1 Provide Environmental Protection Plan in accordance with Section 01 35 43.

1.4 SUBMITTALS

- .1 Provide shop drawings, in accordance with Section 01 33 00.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Use sediment barriers to keep sediment on site. Consider sediment barriers as temporary perimeter controls to intercept sediment laden sheet flow runoff before it enters the watercourse or as it leaves the construction site.
  - .2 Construct flow checks across roadside drainage ditches throughout cut sections and adjacent to inlets and outlets of culverts, and as directed by the Departmental Representative. Place flow checks to reduce the channel velocity, promote the deposition of suspended sediment, and to provide a trap for sediment material.
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## 2.2 MATERIALS

- .1 Straw barriers: straw bales to be dry, firm, tightly tied in at least two places, show no evidence of straw or tie decay and be free of sediment. They are to be of standard agriculture dimensions, approximately 600mm x 600mm x 1200mm.
  - .1 Stakes: of sufficient strength to satisfy control measure performance and maintenance requirements. Stakes to be 1.2m in length.
- .2 Silt fence barriers: construct silt fence barriers of silt fence geotextile supported on stakes. Geotextile used for silt fence shall be woven Class 1 geotextile, having a minimum width of 900mm. The maximum filtration opening size (FOS) shall be 840µm.
  - .1 Stakes: of sufficient strength to satisfy control measure performance and maintenance requirements. Stakes to be 1.5m in length.

## PART 3 - EXECUTION

### 3.1 GENERAL

- .1 Supply, install and maintain temporary erosion and sedimentation control features where required and in accordance with Environmental Protection Plan. Do not remove control features until authorized by Departmental Representative.
- .2 Fires and burning of rubbish on site is not permitted.

### 3.2 SEDIMENT CONTROL BERMS

- .1 Construct sediment control items to the cross sections shown, using materials indicated on the Drawings. Locate where indicated unless otherwise directed by Departmental Representative.

### 3.3 SILT FENCE

- .1 Install silt fence in the locations directed.
- .2 Install extra 50 x 75 x 1200 mm long posts midpoints between supplied posts. Attach fence with roofing nails and roofing tins. Provide wood strapping along top of fence as shown.
- .3 Excavate 150 x 150 mm trench along length of fence as indicated. Lay fabric bottom in trench and backfill with selected backfill material.

### 3.4 STRAW BARRIERS

- .1 Where straw bale barriers are to be installed on earth surfaces, place the bale in a trench measuring 750mm wide by 150mm deep at the location specified for the barrier. The bales will then be staked and the remaining trench space backfilled and compacted to existing grade.
- .2 Where straw bale barriers are to be installed on sod, erosion control blanket or existing turf, place so that there are no gaps between the bales and the underlying cover.
- .3 Do not place straw bale ties in contact with the ground. The ends of adjacent bales are to be placed tightly against one another to prevent gaps.
- .4 Firmly secure in place each bale by two (2) stakes spaced 150mm from the end of each bale. Drive stakes flush with the top of bale.
- .5 Main straw barriers such that bales remain firm intact and without decay.
- .6 Include at each end of the barrier a 2m to 3m section, angled upstream to direct runoff to the main section of the barrier.
- .7 Replace bales when they are no longer functioning or as directed by the Departmental Representative.

### 3.5 MAINTENANCE

- .1 Maintain erosion and sediment control features throughout the construction period. Repair damage to original condition.
- .2 Remove accumulated sediment from behind sediment control items when and as directed by the Departmental Representative.
- .3 Maintain vertical alignment of silt fence such that it is always plumb and straight.
- .4 Remove sedimentation control features when directed by the Departmental Representative. Take care to avoid causing turbidity, and excessive re-suspension of particles when removing sediment control features.

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 31 05 16 - Aggregate Materials
- .2 Section 31 23 10 - Excavating, Trenching and Backfilling

1.2 REFERENCES

- .1 ASTM C88-05, Test Methods for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- .2 ASTM C127-15, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
- .3 ASTM C136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.
- .4 ASTM C535-12, Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .5 ASTM D5312-2012, Test Method for Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions.
- .6 ASTM D5313-2012, Test Method for Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions.

1.3 SOURCE APPROVAL

- .1 Source(s) of all stone materials to be incorporated into the work requires the approval of the Departmental Representative.
- .2 Inform the Departmental Representative of proposed source(s) of materials and submit stone quality test results at least one (1) week prior to shipping material to site.
- .3 Rip-Rap shall be individually selected at the source and marked for delivery to the site by the Contractor.
- .4 Acceptance of material at the source does not preclude future rejection at the site if it fails to conform to the requirements specified.

1.4 WASTE  
MANAGEMENT AND  
DISPOSAL

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- .1 Separate and recycle waste materials.

PART 2 - PRODUCTS

2.1 RIP RAP AND  
ARMOUR STONE

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- .1 Hard, dense, durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended:

.1 Stone sizes in accordance with the following dimensions:

SIZE	% FINER BY MASS (%)	
mm	R-5	R-100
600		100
530		70-90
420		40-55
220	100	
190	70-90	0-15
150	40-55	
70	0-15	

- .2 Supply rock spalls or cobbles to fill open joints.

- .3 General:

.1 All stone shall be dense, hard, sound, close-grained, durable rock, free of overburden material, and highly resistant to weathering and disintegration under freezing/thawing and wetting/drying conditions and shall be of a quality to ensure permanence of the structure in the climate in which it is to be used.

.2 All stone shall be free from detrimental cracks, seams and other defects that tend to increase deterioration from natural causes or cause breakage in handling and/or placing. Stone with high argillaceous or shale content is more susceptible to weathering, abrasion, thin bedding, close fracturing and other undesirable rock properties and will not be accepted.

2.1 RIP RAP AND  
ARMOUR STONE  
(Cont'd)

.3 (Cont'd)

.3 The stone shall be free from damage as a result of blasting during production. Blast damage is a significant cause of rejection of stone. Blast cracks that have the potential of causing more than 20% loss of weight of an individual stone, if the crack opens in service, are not acceptable. Stones with minor cracking may be reworked at the Contractor's option, with cracked portions being removed by jacking or other suitable method. The remaining stone, if within the gradation limits, may be re-evaluated for acceptance.

.4 Miscellaneous stone materials excavated from the site may be suitable for reuse in the new structures if they meet the requirements for gradation, quality and shape specified herein. Reuse of excavated stone materials requires the approval of the Departmental Representative.

.4 Stone Quality/Durability Tests:

.1 Stone materials to be used in Work shall be tested for quality/durability during quarry start-up and production operations at the Contractor's expense.

.2 The following rock durability test specifications must be met or exceeded by all stone materials:

<u>Description</u>	<u>Test Method</u>	<u>Acceptance Criteria</u>
Specific Gravity	ASTM C127	minimum 2.6
Absorption	ASTM C127	maximum 2%
LA Abrasion	ASTM C131	maximum 20% loss after 500 revolutions
MgSO4 Soundness	ASTM C88	maximum 10% loss after 5 cycles

.5 If these test results suggests borderline or questionable material, the following additional tests shall be conducted:

<u>Description</u>	<u>Test Method</u>	<u>Acceptance Criteria</u>
Freeze-Thaw	ASTM D5312	max. 0.5% loss after 40 cycles



2.1 RIP RAP AND  
ARMOUR STONE  
(Cont'd)

.4 (Cont'd)

Wet-Dry

ASTM D5313

max. 0.5% loss  
after 80 cycles

- .6 Test samples of the proposed stone shall be obtained by the Contractor at his own expense. Samples selected for testing shall be representative of material formations in the quarry to be used for this project. The Engineer must be present for and agree upon the selection of all test samples prior to shipment. The Engineer may personally select all samples if he so elects.
- .7 The samples shall be shipped or delivered by the Contractor, at his expense, to a suitable testing facility.
- .8 The Contractor is responsible for allowing sufficient time for the testing to be completed such that there are no delays in the start of construction.
- .9 Previous test results for stone materials quarried from the same area (ie. the same working face and rock unit) of the quarry may be accepted at the discretion of the Engineer.
- .10 Submit stone quality test results at least one (1) week prior to shipment of stone to site.

PART 3 - EXECUTION

3.1 RIP RAP AND  
ARMOUR STONE PLACING

- .1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.
- .2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
- .3 Place rip-rap and armour stone to thickness and details as indicated.
- .4 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
- .5 Hand placing:

3.1 RIP RAP AND .5  
ARMOUR STONE PLACING  
(Cont'd)

(Cont'd)

.1 Use larger stones for lower courses and as headers for subsequent courses.

.2 Stagger vertical joints and fill voids with rock spalls or cobbles.

.3 Finish surface evenly, free of large openings and neat in appearance.