

PART 1 - GENERAL

- 1.1 Description .1 This section specifies the requirements for supplying and placing filter stone and armour stone at the locations and to the dimensions indicated on the plans.
- 1.2 Related Work .1 Refer to other Specification Sections for related information.
- 1.3 Source of Material .1 Inform *Departmental Representative* at least [two] weeks prior to commencing work of the location of the source of materials.
- 1.4 Measurement for Payment .1 Armourstone and Filterstone:
- .1 Armour stone and filter stone will be measured in accordance with **Section 01 29 00.**
 - .2 Transportation of material to the site and any excavation and preparation of the foundation base will not be measured for payment but will be considered incidental to the work.

PART 2 - MATERIALS

- 2.1 Stone .1 Filterstone:
- .1 Filterstone will be hard, dense, durable, angular stone, free from cracks, or other structural defects.
 - .2 Filterstone to consist of stones weighing 500 to 700 kg.
 - .3 Fifty percent (50%) by weight of the Filter stone shall be individual stones greater than, or equal to 600 kg.
- .2 Armourstone:
- .1 Armourstone will be hard, dense, durable, angular stone, free from cracks, or other structural defects.
 - .2 Minimum individual weight of armour stones will be 4 tonnes, maximum weight will be 6 tonnes, based on a specific gravity of 2.75 tonnes per cubic meter.

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Filterstone and Armourstone

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.3 Greatest dimension of each stone will not exceed two times the least dimension.

.4 Fifty percent (50%) by weight of the armourstone will be individual stones greater than, or equal to 5 tonnes.

.3 Field Stone

All field stone supplied by the contractor must be accepted before it is used in the work.

PART 3 - EXECUTION

3.1 Placing

.1 Filterstone :

.1 Place filterstone on slope as shown on the drawings or as directed by the *Departmental Representative*.

.2 Completed filterstone in place shall consist of two layers 1300 mm thick.

.3 Tolerances:+100mm

.2 Armourstone :

.1 Place armourstone as shown on the drawings or as directed by the *Departmental Representative*.

.2 Completed armour stone in place shall consist of one layer, a total of 1500 mm thick.

.3 Place armour stone in an approved manner to produce regular surface and a stable mass.

.4 Tolerances:+150mm

.3 End dumping of armour and filterstone on prepared slopes will not be permitted.

PART 1 - GENERAL

- 1.1 Description .1 This section specifies requirements for construction of a rubblemound breakwater consisting of component layers and dimensions indicated.
- 1.2 Reference Standards .1 ASTM C127-88(1993)e1 (or latest edition) Specific Gravity and Absorption of Coarse Aggregate
- .2 AASHTO T85-88 (or latest edition) Specific Gravity and Absorption of Coarse Aggregate
- 1.3 Related Work .1 Refer to other Specification Sections for related information.
- 1.4 Source Sampling .1 Inform *Departmental Representative* of proposed source of materials and provide access for sampling at least [2] weeks prior to commencing work. Forward, prepaid, a sample rock to be used to Public Works and Government Services Canada, P.O. Box 2247, Halifax, N.S., B3J 3C9 for approval. Sample to be between 5 and 10 kg, representative of quarry and submitted minimum [2] weeks prior to starting work.
- 1.4 Existing Conditions and Haul Road .1 It is important that Contractors intending to bid on work visit the site and ascertain what preparatory work will be required for the following:
- .1 Condition of existing structures over which material must be hauled.
- .2 Preparation, maintenance and removal of temporary roadways to and on the existing armourstone protection for the use of trucks, cranes, excavators, draglines, etc.
- .3 Preparation, maintenance and removal of all temporary causeways and/or fills as required for trucks, loaders, excavators, cranes, draglines, etc.
- .4 The land surrounding the site is the property of Her Majesty the Queen in the Right of Canada and the Contractor will

exercise extreme care to prevent damage to the land.

- .5 Contractor shall be solely responsible for construction and maintenance of haul roads which shall be considered incidental to the work. All temporary roads shall be removed at the completion of the project and the land restored to its original condition.

1.5 Measurement for Payment

- .1 Filterstone (500-700 kg) will be measured in accordance with **Section 01 29 00**.
- .2 Armourstone (4-6 tonne) will be measured in accordance with **Section 01 29 00**.
- .3 Transportation of material to the site and any excavation and preparation of the foundation base will not be measured for payment but will be considered incidental to the work.
- .4 No payment will be made for material used to construct and/or maintain haul roads, causeways, fills or working roadways on top of filter and armour layers.
- .5 Clearing, grubbing and stripping of quarries to be incidental to the work.
- .6 Making good to the satisfaction of the *Departmental Representative*, any damage to the existing structures will be considered incidental to the work.
- .7 Do not mix different categories of material in the same truckload. Only one class of material will be weighed for payment at any given time. If rocks of markedly different sizes are present, *Departmental Representative* reserves the right to weigh such rocks separately for payment. There will be no additional payment for weighing individual stone units which do not meet the category of material listed for the truckload.

PART 2 - PRODUCTS

2.1 Materials

- .1 Rock Material
 - .1 All rock materials to be tested and approved by the *Departmental*

Representative prior to installation in the work.

- .2 All rock materials to be free from cracks, seams and other defects which may impair durability.
- .3 **Armourstone and Filterstone to meet the following requirements:**
Relative density minimum 2.65 and absorption maximum 2.0%. Slate, sandstone, shale and stone containing mica not acceptable for filterstone or armourstone.
- .4 Actual relative density and absorption will be determined by testing selected samples of material being incorporated into the works. Materials with a specific gravity less than 2.65 or an absorption rate in excess of 2% will be rejected.

.2 Corestone:

- .1 To be quarried material rough and angular in shape requiring approval by the *Departmental Representative* prior to being used in the work.
- .2 Material not to contain organic matter, frozen lumps, sod, roots, logs, stumps or any other objectionable matter.
- .3 Corestone gradation shall be within the following limits:

IMPERIAL SIZE	METRIC SIZE	% PASSING BY MASS
18"	450 mm	100
8"	200 mm	44 - 75
4"	100 mm	25 - 50
2"	50 mm	7 - 14

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Rubblemound Breakwater

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- .4 Material to be screened, if required, to ensure no fines or stones less than 0.2 kilograms are placed in the work.
 - .5 Material to be blended so that a homogeneous mix of smaller and larger sizes within the approved range is attained.
 - .3 Filterstone:
 - .1 Greatest dimension of each stone not to exceed two times least dimension.
 - .2 Filterstone shall be quarried or field stone, rough and angular in shape.
 - .3 Filterstone shall vary in size between 500 kg and 700 kg where shown on the drawings.
 - .4 Armourstone:
 - .1 Greatest dimensions of each stone not to exceed two times least dimension.
 - .2 Armourstone to be quarried or field stone, rough and angular in shape.
 - .3. Armourstone shall vary in size between 2 and 7 tonnes as shown on the plans.

PART 3 - EXECUTION**3.1 Corestone**

- .1 Place core material to lines, grades and dimensions indicated on the plan.
- .2 Place material on clean harbour bottom to specified grades, and after the removal of kelp, debris, snow, ice, etc.
- .3 Execute work in such a manner to protect core material from storm wave action or tidal erosion damage. Replacement of material lost due to storm or erosion damage will be the responsibility of the Contractor.
- .4 Do not extend corestone material for breakwater more than 10 metres beyond filterstone protection.

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- .5 Corestone material may be placed by end dumping. However, Contractor shall note that due to the side slopes of the breakwater that mechanical placing of the core will be necessary to produce the slopes and shapes required.
- .6 Grades, lines, dimensions, slope and quantity of core, to be reviewed and approved by the *Departmental Representative* before proceeding with overlaying filter layer.
- 3.2 Filterstone
- .1 Place filter layer material to lines, grades and dimensions indicated on the plans.
- .2 Do not extend filter material for breakwater more than 10 metres beyond armourstone protection.
- .3 Place each filterstone individually using mechanical means to the lines, grades and dimensions shown on the plans. Do not dump filter units into place. Commence placement at toe of slope and proceed up the slope towards the crest. Place each filterstone so that it is stable, secure on slope and supported by units below. Control placement of filterstone so as to produce a uniform and continuous cover over the underlying layer.
- .4 Replace filterstone units broken or damaged during placement. Damaged units to be removed from the work and will not be paid for.
- .5 Grades, lines, dimensions, slopes and quantity of filterstone to be reviewed and approved by *Departmental Representative* before proceeding with the overlying armour layer.
- .6 Install filterstone in voids in the existing breakwaters to provide a surface consistent with the original lines and grades over which to place armourstone units.
- .7 Install filterstone on slopes such that it fills the space between the existing

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breakwater outer surface and the new layers of armourstone.

.8 In some locations, new armour maybe added directly to the existing armour slope to provide the finished lines and grades.

.9 In the case that core material is exposed in the existing slopes, filter must be placed over core material prior to adding armourstone.

3.3 Armourstone

.1 Place armourstone in layers as shown on the plan to the lines, grades and dimensions shown on the plan.

.2 Place each armourstone individually using mechanical means to the lines, grades and dimensions shown on the plans. Do not dump armour units into place. Commence placement at toe of slope and proceed up the slope towards the crest elevation. Place each unit so that it is stable and secure on slope and supported by units below. Control placement of armour units so as to produce a uniform and continuous cover.

.3 Replace armourstone units broken or damaged during placement. Damaged units to be removed from the work and will not be paid for.

3.4 Existing Armour, Filter and Core Stone Removal, Salvage and Installation

.1 Existing armour, filter and corestone are to be salvaged and incorporated into the new respective stone limits.

3.5 Tolerances

.1 Completed component layers to be within following tolerances of line and grades indicated:

- .1 Core: +50 mm
- .2 Filter: +100 mm

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- .3 Armourstone: +150 mm
- .4 Armourcrest: Minimum design elevation
- 3.8 Cross Sections .1 During construction the Contractor shall submit cross-section sheets to the *Departmental Representative* showing the following:
- .1 Cross-sections at stations every 10 metres along the breakwater slope.
- .2 The design cross-section showing proposed core, filter, and armourstone in solid lines.
- .3 Superimposed in dashed lines elevations taken at 2 metre intervals perpendicular to the centreline and at top and toe of slopes showing core, filter, and armourstone as constructed surfaces.
- .4 Cross-sections to be referenced to the plan view of the breakwater with stations shown for reference.
- .5 Cross-sections to be submitted as work at each station is completed for each class of stone. Next layer not to be placed until *Departmental Representative* or his representative has reviewed and approved the as-built elevations for underlying layer.
- 3.9 Protection .1 Take into account anticipated weather conditions and degree of exposure of site and tidal conditions in setting requirements for protection.
- .2 Schedule and carry out construction so that each phase of work is not left exposed longer than necessary.
- .3 Progress of placement of core and stone to be recorded daily by *Departmental Representative's* inspector with Contractor's concurrence. Replacement of material lost due to storm wave action or tidal erosion damage to be based on daily journal of work