

PART 1 - GENERAL

1.1 DESCRIPTION

1. This section specifies requirements for construction of a rubblemound breakwater consisting of component layers to dimensions indicated.

1.2 REFERENCE STANDARDS

1. ASTM C127-88(1993)el (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 three weeks prior to commencing work. Forward, prepaid, a sample rock to be used to a testing consultant to be determined by the Departmental Representative for approval. Sample(s) to be between 1 and 3 kg, representative of quarry and submitted minimum three weeks prior to starting work.

1.5 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 breakwater and wharf 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. 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.

1.6 MEASUREMENT FOR PAYMENT

1. Corestone 0.1-400 kilogram will be measured in accordance with Section 01 29 00.
2. Filterstone 600-800 kilogram will be measured in accordance with Section 01 29 00.
3. Armourstone 6-8 tonne will be measured in accordance with Section 01 29 00. Toe-in of armourstone where shown will be incidental to work.
4. Mobilization and demobilization will be measured in accordance with Section 01 29 00.
5. 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.
6. 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.
7. Clearing, grubbing and stripping of quarries to be incidental to the work.
8. 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:
 1. Specific Gravity minimum 2.65 and absorption maximum 2.0%. Slate, sandstone, shale and stone containing mica not acceptable for filterstone or armourstone.
 4. Corestone to have a minimum Specific Gravity of 2.65.
 5. Actual Specific Gravity 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. 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

4. Material to be screened, if required, to ensure no fines or stones less than 0.1 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 600 and 800 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 6 and 8 tonnes as shown on the plans.

PART 3 - EXECUTION

3.1 TOE PROTECTION

1. Provide toe protection by toeing-in filterstone and armourstone.
2. Harbour bottom material dredged for breakwater to be pushed out as required, new armourstone installed to elevation 1 m below harbour bottom, then material pulled in and placed on bottom courses of armourstone.

3.2 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.
5. Corestone material may be placed by end dumping. However, Contractor shall note that due to the side slopes of the breakwater, 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.

3.3 FILTERSTONE

1. Place filter layer material to lines, grades and dimensions indicated on the plans.
2. Place filter layer material in two layers as shown on plans.
3. Do not extend filter material for breakwater more than 10 metres beyond armourstone protection.
4. 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.
5. Replace filterstone units broken or damaged during placement. Damaged units to be removed from the work and will not be paid for.
6. Grades, lines, dimensions, slopes and quantity of filterstone to be reviewed and approved by Departmental Representative before proceeding with the overlying armour layer.

3.4 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.

3.5 EXISTING ARMOUR REMOVAL, SORTING STOCKPILING AND REINSTALLATION

1. Remove existing armourstone where shown. Sort into various size categories, stockpile and reinstall in new work where shown.

3.6 TOLERANCES

1. Completed component layers to be within following tolerances of line and grades indicated:
 1. Core: +50 mm
 2. Filter: +100 mm
 3. Armourstone: +150 mm
 4. Armour crest: minimum design elevation

3.7 CROSS SECTIONS

1. During construction the Contractor shall submit cross-section sheets to the Departmental Representative showing the following on the breakwater:
 1. Cross-sections at stations every 10 metres along the centreline of the breakwater.
 2. The design cross-section showing proposed core, filter, and armourstone in solid lines.
 3. Superimposed in dashed lines as-constructed elevations on top of core, filter, and armourstone layers at:
 1. centreline
 2. top of slopes
 3. 6 metre intervals perpendicular to the centreline on the sidelopes
 4. toe of slopes

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.
6. After construction is complete and before the Final Certificate of Completion will be paid, Contractor to submit detailed as-built survey plan to Departmental Representative to show that contract grades and elevations have been achieved on the breakwater. Provide an electronic file and two sets of prints. Divers will be required to assist with survey for elevations required below chart datum. The following minimum requirements to be met:
 1. Elevations every 10 meters at centreline, top of slopes, every 6 meters perpendicular to the centreline on the slopes, and toe of slopes.

3.8 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 progress and to be considered incidental to the work.

3.9 ROADWAYS

1. Construction, maintenance and removal of working roadway layers to be the responsibility of the Contractor and is to be considered incidental to the work.
2. Construction, maintenance and removal of causeways, fills, etc. as required, to be the responsibility of the Contractor and is to be considered incidental to the work.

3.10 TEMPORARY NAVIGATIONAL BUOYS

1. The Contractor is to maintain temporary bouy's to mark the position of the outer end of the structure as construction proceeds. All bouy's are to meet the requirements of Canadian Coast Guard Standard TP968 and be equipped with flashing hazard lights and radar reflectors.

2. The Contractor shall coordinate the bouy installation with the local harbour authority.
3. The Contractor is responsible for all costs associated with the supply, installation and removal of all temporary navigational bouys.

3.11 CONSTRUCTION EQUIPMENT AND PLANT

1. On request, prove to the satisfaction of Departmental Representative that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.
2. Maintain construction equipment and plant in good operating order.

3.12 FINAL CLEANING

1. In preparation for certificate of completion of the project perform final cleaning.
2. Maintain the work, at least on a daily basis, free from accumulations of waste material and debris.
3. Remove waste materials, and debris from site.

END