

PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- .2 Refer to Section 01 33 00 for submittal requirements.
- 1.2 Reference Standards .1 ASTM C127-88(2001) 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 Submissions .1 Product Data/Samples:
.1 Provide samples of materials proposed for the work.
- .2 Methodology:
.1 Provide methodologies for carrying out the work.
- 1.4 Source Sampling .1 Inform the Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.
- .2 Provide test results from the quarry supporting specified requirements.
- 1.5 Existing Conditions .1 It is important that Contractors intending to bid on work visit the site and ascertain the conditions of the site. Bidder to advise the Departmental Representative and Harbour Authority prior to going to site and to submit a SSSP to cover the visit. The bidder must ascertain what preparatory work will be

required for the following:

.1 Condition and load carrying ability of existing harbour structures over which material must be hauled. Many of the existing structures are not posted.

.2 Preparation, maintenance and removal of temporary roadways to and on the breakwater for the use of trucks, excavators, draglines, etc.

.3 As noted on the drawings, Structures 406 and 411 (bridge) are not to be used for construction loads. Both are posted for passenger cars only.

.2 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.

1.6 Haul Roads

.1 The contractor shall be solely responsible for construction and maintenance of temporary 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.

.2 If the contractor intends to haul material over the existing harbour structures, then the contractor shall submit a report authored by a Professional Engineer licensed in the province of Prince Edward Island stating what wheel, axle, and total loads can be imposed on existing structures.

1.7 Measurement for Payment

.1 Core stone, Filter stone and Armour stone will be measured in accordance with Section 01 10 10.

.2 Excavation below low normal tide will be measured in accordance with Section 01 10 10. PWGSC will perform a pre-excavation survey of

the area to be used for calculating excavated quantities in combination with the contractor's cross section survey as they apply.

- .3 Incidental to the work will be the haul and placement of the excavated material below LNT. Material to be placed in the cell as indicated on the drawings.
- .4 Incidental to the work will be any rework and/or maintenance of the berm walls of the cell to assure the excavated material is contained.
- .3 Prices will include the entire cost of supplying and placing the material in the work, rough grading as necessary, the leveling and finish grading of the listed materials, taking soundings, producing cross sections, diving inspections all as shown on the drawings, and as specified.
- .4 Transportation of material and any excavation and preparation of existing material will not be measured for payment but will be considered incidental to the work as bid items for supply armour (transport) and excavated material.
- .5 No payment will be made for working surfaces or haul roads however there is an allowance in the core stone quantity to build a working surface (approximately 300mm thick) on top of the filter stone to provide access for construction.
- .6 Making good to the satisfaction of the Departmental Representative, any damage to existing structures, roads, or work surfaces 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, the 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.

- .8 Incidental to the work will be weight receipts from a certified scale provided by the contractor for each load of material delivered to the site. The weight receipts are to be in triplicate, one copy for the contractor, one copy for the quarry(s) and one copy for the Departmental Representative. Receipts from the quarry and the site are to be matched prior to request for payment.
- .9 Salvage, sorting and reuse of existing armour materials within the rebuilt breakwater limits will constitute a lump sum for measurement purposes. Estimated volumes of material to be salvaged are as follows:
 - .1 Existing Armour Stone: ±275 tonne.
- .10 Layout and survey control, including cross sections during placement, will constitute a lump sum for measurement purposes.
- .11 Supply of all traffic control devices and personnel shall not be measured for payment.

PART 2 - PRODUCTS

2.1 Materials

- .1 Inform departmental representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing the work. Provide test results from quarry supporting the specified requirements.
- .2 Hard durable crushed quarried rock, free from excessive fines, silt, clay, organic matter and other foreign substances and free from splits, seams or defects likely to impair its soundness during handling or under action of water.

- .3 Specific gravity of not less than 2.65 when tested to ASTM C127 or AASHTO T85. Max absorption shall be 3.5% for corestone, and 2.0% for armour stone and filter stone. Actual specific gravity and absorption will be determined by testing selected samples of material being incorporated into the work. Materials with a specific gravity less than the specified minimum or an absorption rate in excess of the specified maximum will be rejected.
- .4 Core stone shall be imported, well graded and free from fines. Gradation as per Table 1. The following materials will not be considered acceptable for use as corestone: slate, siltstone, sandstone, shale, conglomerate, and mudstone. The material is to be blended to ensure a homogeneous mix of smaller and larger stone sizes will be obtained. Material to be screened, if required to ensure no more than 1 to 3% fines or stones less than 0.1 kilograms are placed in the work.

SIEVE SIZE	% PASSING
600mm	100
200mm	45-70
100mm	25-40
50mm	0

- .5 Armour Stone: Dimension of each rock shall not exceed two times the least dimension. Armour stone shall consist of 2.5 - 4.5 tonne stones (mean weight of 3.5 tonnes).
- .6 Filter stone: Dimension of each rock shall not exceed two times the least dimension. Filter stone shall consist of 250-350 kg stones.
- .7 Actual specific gravity and absorption will be determined by testing selected samples of material being incorporated into the work.

Materials with a specific gravity less than the specified minimum or an absorption rate in excess of the specified maximum will be rejected.

PART 3 - EXECUTION

- 3.1 Preparation
- .1 Remove and relocate existing armour stone as indicated on the drawing.
 - .2 For the construction of the toe cross section, sound area and record elevation of material on which new material will be placed before placement.
 - .3 Take soundings of the area in advance of the operation to assure elevation -1.0m is maintained for construction stability purposes.
 - .4 It is expected that upon placement of the core stone and filter stone layers, the existing marine deposits (approximately 0.7m in depth on average) in the extents of the breakwater will either fully or partially displace outwards under the weight of the core and filter stone (Note: contract drawing cross sections show the material fully displaced). Settlement, if the material is not fully displaced is estimated to be 50mm±.
 - .1 Assure the core and filter stone is placed in such a way that the marine deposits can displace outwards away from the stone placement as the breakwater is constructed.
 - .2 Maintain the elevation in front of the core and filter stone placement operation at a maximum elevation of -1.0m (chart datum) at all times during construction to assure the stability of the new breakwater.
 - .3 Placement/removal of any excavated material as per the direction of the PWGSC

representative.

- .5 Assure throughout the stone placement that the new breakwater structure is stable and safe for equipment, workers and material loads. The construction design loads considered were a maximum excavator track pressure of 83 kPa and a total excavator operating weight of 31 tonnes.
- .6 Take no risks and be aware that close to 0.7m of marine sediment under the new work may displace or may settle in a non-uniform manner. Settlement is estimated to be 50mm±.
- .7 Excavation for breakwater toe key must be excavated to lines and grades shown on the drawings.
- .8 All excavated material shall be hauled to a disposal site within the property boundary of the harbour authority.

3.2 Placement

- .1 Submit proposed access to construct, methods of material placement, and construction sequence for review and consideration prior to starting work.
- .2 Sort salvaged armour and incorporate in work as indicated on the drawings. Also, blend new armour into existing armour at the start of the new work.
- .3 The contractor may build a working surface (out of core stone material only) on top of the filter stone layer to provide access for construction equipment. Any core stone material required to build the working surface must be removed to the top of filter stone to the satisfaction of the departmental representative.
- .4 Core stone material shall be placed according to the following:

- .1 Place material to lines, grades and dimensions indicated on the plan. Harbour bottom should be free from kelp, debris, snow, ice, etc.
 - .2 Execute work in such a manner to protect 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.
 - .3 Do not extend material for breakwater more than 10 metres beyond Filter stone protection.
 - .4 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 material will be necessary to produce the slopes and shapes required.
 - .5 Grades, lines, dimensions, slope and quantity, to be captured by a licensed surveyor and digitally presented for review and approval by the Departmental Representative before proceeding with overlaying filter layer.
- .5 Filter Stone and Armour Stone layers shall be placed according to the following:
- .1 Place each Filter / Armour stone layer to lines, grades and dimensions indicated on the plans.
 - .2 Place each Filter stone / Armour stone individually using mechanical means to the lines, grades and dimensions shown on the plans. Do not dump units into place. Commence placement at toe of slope and proceed up the slope towards the crest. Place each stone so that it is stable, secure on slope and supported by units below. Control placement of stone so as to produce a uniform and continuous cover over the underlying layer.
 - .3 Handle Filter stone / Armour stone with care. Do not damage units during placement. Replace damaged or broken units at no additional cost to the contract.
 - .4 For all materials, grades, lines, dimensions, slopes and quantity of stones to be reviewed and approved by the Departmental

Representative before proceeding with the overlying layer.

.5 Replacement or resetting of Filter / Armour material lost or displaced due to storm will be the responsibility of the contractor with no additional cost to the contract.

.6 Choose stones and place them in such a way that the whole structure will be bonded and consolidated to as great an extent as nature of rock will allow. Rocks should vary in size so they don't create steep slopes when placing the grade lines as indicated on the drawings.

.7 Armour stone is to be mechanically placed so as to knit together with adjacent stones.

3.3 Tolerances

- .1 Armour stone and Filter stone layers to be within 150mm of lines and grades shown.
- .2 Core stone layer to be within 100mm of lines shown.

3.4 Protection

- .1 Take into account anticipated weather conditions and degree of exposure of site in setting requirements for protection.
- .2 Schedule and carry out construction so that the core and filter layers are never built any longer than 10.0m out before they are protected by armour up to the top of filter stone elevation.
- .3 The Contractor should note that the work site is subject to water level variations due to tidal action and that the top of Filter stone may be submerged by times during the construction season depending on the tide cycle.
- .4 The Contractor will be responsible to replace any materials lost due to storms, tidal erosion or by their own activities.

- 3.5 Cross Sections
- .1 During construction the Contractor shall submit digital cross-sections compiled by a licenced surveyor to the Departmental Representative showing the following:
 - .1 Cross-sections as-built at stations every 10 metres along the breakwater slope.
 - .2 The design cross-section layers showing proposed core, filter, armour stone and existing till (including toe excavation and removal to elevation -1.0m in advance of the work) in solid lines.
 - .3 Superimposed in dashed lines, elevations taken at 2 metre intervals perpendicular to the centerline and at top and toe of slopes, showing the core, filter, armour stone and existing material (including toe excavation) 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 the Departmental Representative has reviewed and approved the as-built elevations for underlying layer.
 - .2 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. Provide an electronic file of the cross sections and two sets or prints. Divers will be required to assist with the survey for elevations required below chart datum. The following minimum requirements to be met:
 - .1 Elevations every 10 meters along the centerline of the breakwater and every 6 meters perpendicular to the centerline, on the end cone, top and bottom of slopes.
 - .2 All survey work to be in meters with elevations relative to chart datum (LNT) and coordinates referenced to NAD83 CSRS (Zone 20) PEI Double Stereographic Datum.

3.7 Temporary
Navigational Buoys

- .1 The Contractor is to maintain temporary buoys to mark the position of the outer end of the breakwater toe, temporary structures and silt fencing as construction proceeds. Refer to section 01 10 10 for type and location of buoys.
- .2 The Contractor shall coordinate the buoy 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 buoys.
- .4 The contractor shall place temporary buoys such that the clear navigable width into the harbour is maximized however is never less than 20 meters wide.