

**Marshalling Yard Improvements****Saint John Ferry Terminal****Saint John, New Brunswick****Project No. R.090690.001**

Rubble Mound Breakwater

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**PART 1 - GENERAL**

- 1.1 Related Work
- .1 Refer to other Specification Section for related information
  - .2 Refer to Section 01 33 00 for submittal requirements
- 1.2 Measurement and Payment
- .1 Corestone will be measured in accordance with Section 01 29 00.
  - .2 Filterstone (10-400 kg) will be measured in accordance with Section 01 29 00.
  - .3 Armourstone (1-2 tonne) will be measured in accordance with Section 01 29 00.
  - .4 Mobilization/demobilization of equipment to be included in lump sum.
  - .5 Construction and maintenance of haul roads will not be measured for payment, and must be reinstated to pre-construction condition.
- 1.3 References
- .1 All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications
    - .1 ASTM C88, Test Methods for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
    - .2 ASTM C127, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
    - .3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
    - .4 ASTM C535, Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
    - .5 ASTM D5312, Test Method for Evaluation of Durability of Fill for Erosion Control Under Freezing and Thawing Conditions
    - .6 ASTM D5313, Test Method for Evaluation of Durability of Fill for Erosion Control Under Wetting and Drying Conditions
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- 1.4 Submissions .1 Methodology  
.1 Provide methodologies for carrying out the work
- 1.5 Source Sampling .1 Inform the Departmental Representative of proposed source of materials and provide access for sampling at least 2 weeks prior to commencing work.  
.2 Provide test results for the quarry supporting specified requirements.
- 1.6 Measurement for Payment .1 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.  
.2 Making good to the satisfaction of the Departmental Representative, any damage to existing structures, road, or work surfaces will be considered incidental to the work.  
.3 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 fills of markedly different sizes are present, the Departmental Representative reserves the right to weigh such fills 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.  
.4 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
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Representative. Receipts from the quarry and the site are to be matched prior to request for payment.

- .5 No separate payment will be made for geotextile.

PART 2 - PRODUCTS2.1 Armour Stone

- .1 General
- .1 All stone shall be dense, hard, sound, close-grained, durable quarried fill, 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 fill properties and will not be accepted.
- .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 10% 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 Engineer.

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**.2 Stone Quality / Durability Tests**

- .1 Stone materials to be used in Work shall be tested for quality/durability during expense.
- .2 The following fill durability test specifications must be met or exceeded by all stone materials:

| <u>Description</u> | <u>Test Method</u> | <u>Acceptance Criteria</u>                   |
|--------------------|--------------------|--|
| Freeze-Thaw        | ASTM C127          | Minimum 2.65                                 |
| Absorption         | ASTM C127          | Maximum 2%                                   |
| LA Abrasion        | ASTM C131          | Maximum 20% loss<br>after 500<br>revolutions |
| MgSO4 Soundness    | ASTM C88           | Maximum 10% loss<br>After 5 cycles           |

- .3 If these test results suggest 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<br>after 40 cycles |
| Wet-Dry            | ASTM D5313         | max. 0.5% loss<br>after 80 cycles |

- .4 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.
- .5 The samples shall be shipped or delivered by the Contractor, at his expense, to a suitable testing facility.
- .6 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.

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- .7 Previous test results for stone materials quarried from the same area (ie. the same working face and fill unit) of the quarry may be accepted at the discretion of the Engineer.
- .8 Submit stone quality test results at least one week prior to shipment of stone to site.

**.3 Gradation and Shape Requirements**

- .1 Material meeting the gradation and shape requirements listed below shall be placed in the work at the locations as shown on the Contract Drawings. Gradation limits are in-place requirements. Adjustments in production, transportation and placement methods shall be made as necessary to assure final placed materials are within specified ranges. Stone shall be well graded, and shall not exhibit gap grading or scalping from individual size ranges.
- .2 **Armour Stone**
- 1 All armour stone shall be angular in shape, with the ratio of maximum to minimum dimensions (aspect ratio) not exceeding 2.5.
  - 2 **Armour stone shall range in weight from 1.0 to 2.0 tonnes, with a median stone weight (W50) of 1.5 tonnes.**

**2.2 Filterstone**

- .1 The source of filterstone shall be a high quality blasted material from an approved quarry meeting the physical requirement of Armour Stone.
- .2 **Filterstone**
- .1 All filterstone shall be angular in shape, with the ratio of maximum to minimum dimensions (aspect ratio) not exceeding 2.
  - .2 Filterstone shall be well graded and fall within the following gradation limits:

| Stone Weight (kg) | Percent (%) Less Than by Weight |                      |
|-------------------|---------------------------------|----------------------|
|                   | Fine (Upper) Limit              | Coarse (Lower) Limit |
| 10                | 5                               | -                    |
| 50                | 35                              | 0                    |
| 75                | 50                              | 15                   |
| 200               | 100                             | 60                   |
| 400               | -                               | 100                  |

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- 2.3 Corestone
- .1 The source of corestone shall be a high quality blasted material from an approved quarry meeting the physical requirement of Armour Stone.
- .2 Corestone
- .1 All corestone shall be angular in shape, with the ratio of maximum to minimum dimensions (aspect ratio) not exceeding 3.
- .2 Corestone stone, nominally 1 to 75 kg, shall be well graded and fall within the following gradation limits

| Metric Size (mm) | Percent (%) Passing Less Than by Weight |
|------------------|---|
| 50               | 7 - 14                                  |
| 100              | 25 - 50                                 |
| 200              | 44 - 50                                 |
| 450              | 100                                     |

- .3 Corestone material shall consist of clean hard, sound durable stone, free of organic or other deleterious materials, having a density of not less than 2.65 t/m<sup>3</sup>.
- .1 Corestone material when tested by the Micro- Deval Test Method in accordance with MTO LS-618, shall have a Micro-Deval loss not greater than 35%.
- .2 When tested by the Freeze-Thaw Test Method in accordance with MTO LS-614 shall have a Freeze-Thaw loss not greater than 15%
- .3 Absorption, 2% maximum as determined by ASTM C127 test procedure
- .4 Sulphate Soundness Determination, maximum 12% by ASTM C88-73.

PART 3 - PLACEMENT

- 3.1 Preparation
- .1 Excavation for Storm Outlet must be excavated to lines and grades shown on the drawing.
- .2 Any excavated material shall become property of the contractor if deemed not necessary for reconstruction

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**3.2 Placement**

- .1 The contractor may build a working surface(out of corestone material only)to provide access for construction equipment. Any additional stone material required to build the working surface must be removed to the satisfaction of the Departmental Representative.
  - .2 Filterstone material shall be placed according to the following:
    - .1 Place material to lines, grades and dimension indicated on the plans. 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 filterstone more than 10 metres beyond armour protection.
    - .4 Material may be placed by end dumping. However, Contractor shall note that due to the side slopes of the groynes that mechanical placing of the material will be necessary to produce the slopes and shapes required.
  - .3 Armour Stone layers shall be placed according to the following:
    - .1 Place each Armour stone layer to lines, grades and dimensions indicated on the plans.
    - .2 Place each 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
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- to produce a uniform and continuous cover over the underlying layer.
- .3 Handle 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 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 fill will allow. Fills 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 layers to be within 150mm of lines and grades shown.
  - .2 Filterstone layer to be within 100mm of lines shown
- 3.4 Protection
- .1 Take into account anticipated weather conditions and degree of exposure of the site in setting requirements for protection
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Preservation of Water Course

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PART 1 - GENERAL

- 1.1 Related Work .1 Section 01 35 44 - Environmental Protection Procedures.
- 1.2 Environmental Requirements
- .1 Operation of construction equipment in water is prohibited.
- .2 Use borrow material from watercourse beds when approved by Department Representative.
- .3 Design and construct temporary crossings to minimize environmental impact to watercourse.
- .4 Constructing temporary crossings of watercourses when spawning beds are indicated is prohibited.
- .5 Dumping excavated fill, waste material, or debris in watercourse is prohibited.
- 1.3 Preparation .1 Obtain work permits from governing Federal, Provincial and/or Municipal Conservation authority.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

- 3.1 Existing Conditions .1 Maintain existing flow pattern in natural watercourse systems.
- .2 In natural systems maintain existing riffle/pool and step/pool patterns.
- 3.2 Drainage .1 Pumping water containing suspended materials into watercourse is prohibited.
- .2 Establish rock chute spillways to accommodate safe surface water entry to watercourse as instructed by the Department Representative.

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- .3 Install drop pipe inlet system as instructed by Department Representative.

3.3 Site Restoration

- .1 Establish vegetated buffer zones with topsoil and seeding to minimum 3 m along edge of watercourse banks as determined by Department Representative.
  - .2 Plant vegetation natural to area, suitable for application without requirement for fertilizers, pesticides and other chemicals.
  - .3 Control streambank erosion in lower section of watercourse with irregular shaped rip rap underlain with non-toxic filter cloth of size specified by Department Representative.
  - .4 Control streambank erosion in upper section of watercourse by planting suitable vegetation as directed by Department Representative. Planting to occur within 30
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