

PART 1 - GENERAL

- 1.1 Scope of Work .1 Pressure, (consolidation) grouting shall consist of the supply of all grouting equipment and materials, drilling of grout holes, mixing and injection of grout mixtures within the bedrock to depths as shown on the drawings, under controlled pressures and all surface preparation necessary to contain the grout within the bedrock.
- 1.2 Measurement For Payment .1 No separate measurement for payment to be made for items under this Section. Include all costs incidental to the unit price items for which pressure grouting is required under Section 03 30 00 Cast-In-Place Concrete.
- 1.3 Records .1 The Contractor shall maintain and make available to the Departmental Representative full and complete records (including drill logs of holes) for all work carried out under this section of the specifications.

PART 2 - PRODUCTS

- 2.1 Grout Materials .1 The grout mix shall be designed and submitted under seal of a professional engineer licensed to practice in Newfoundland and Labrador. The grout shall be suitable for applying under pressure as per the methods described herein. The design shall include the following:
- .1 Grout material to be in accordance with CAN3-A32.1 portland cement to CAN3-A5.
  - .2 Minimum 28 day strength of grout: 40 Mpa.
  - .3 Sand shall be used if rock conditions so warrant. Sand shall be graded and proportioned for suitable use under pressure applications.
  - .4 Water cement ratio to be suitable for pressure application and produce a consistency without segregation.
  - .5 Including in submission all establish proportions, certificates for materials, cements, aggregates and admixtures.
- .2 Pre-manufactured grout may be accepted at the discretion of the Departmental Representative. Standard of acceptance: Sika Grout 300PT, or approved equal.
- .3 Each drilled grout hole and grout connection shall have forced into it, under a predetermined pressure.

PART 3 - EXECUTION

- 3.1 Preparation For Grouting .1 The overburden will be removed from the area of grouting prior to drilling of grout holes. The surface of the bedrock will be prepared by cleaning out any cracks or openings in the rock surface and sealing surfaces at the direction of the Departmental Representative. During pressure grouting operations, every effort will be made to contain the injected grout within the voids in the rock by application of oakum, wooden wedges or other means necessary to seal the rock surface.
- 3.2 Equipment .1 The grout shall be mixed in a high speed mechanical or electric mechanical mixer. The mixer shall be capable of intimate and thorough mixing of cement and water. A separate agitator shall be provided to maintain the cement in suspension until the injection of the grout under pressure is complete.
- .2 The grout shall be fed into holes under closely controlled pressure by means of properly equipped duplex grout pump and hoses, pipes, fittings, etc. of a type or types designated to withstand the erosive action of grout flowing under pressure and capable of maintaining a grout pressure of 690 Kpa or as otherwise approved by the Departmental Representative for the given bedrock conditions. A header assembly shall be provided at the holes which shall consist of an accurate, sensitive pressure gauge, cutoff valves, and a throttling valve to which a return line to the pump is connected so that the amount of grout being injected into the hole and the pressure in the system can be closely controlled.
- .3 The gauges shall be protected from direct contact with the grout. They shall be of 150 mm minimum register and accurate from 0 to 690 KPa and calibrated in 6.9 KPa increments. A pipe assembly equipped with a suitable rubber expansion plug shall lead from the header into the hole so that grouting can be carried out at any depth.
- 3.3 Drilling of Holes .1 No rod grease, drilling mud or other insoluble lubricants shall be used in this holes. Upon completion of drilling, the holes shall be cleaned by use of air and water under pressure and capped to prevent the entry of foreign material.
- 3.4 Grouting Procedure .1 Holes for consolidation grouting shall be drilled and grouted at intervals as shown on the drawings, or as otherwise directed by the Departmental Representative.

- .2 Grouting of each section of a hole shall be commenced by injection of a grout mixture of the highest water-cement ratio as designed for the application, and reduction in water-cement ratio shall only be made as recommended in the mix design and approved by the Departmental Representative.
- .3 All grouting shall be done at pressures that are suitable for the conditions encountered.
- .4 When grouting in freezing weather, the temperature of all grout shall be above 4°C, up to the time of the injection. Surface cracks shall be cleaned out and sealed as approved by the Departmental Representative.
- .5 The grouting pressure on any section of hole will be maintained for a minimum of 20 minutes during the grouting period, unless otherwise approved by the Departmental Representative given the rock conditions.
- .6 As far as possible, the grouting pressure shall be maintained constantly during grout injections. After the grouting of holes is completed, the pressure shall be maintained by means of stopcocks or other suitable valve device, until the grout has set sufficiently so that it will be retained in the hole being grouted.