

SPECIFICATIONS

DIVISION 31 Earthwork

Section 31 37 01	Granular Materials and Riprap
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PART 1 GENERAL

1.1 WORK INCLUDED

- .1 Work of this Section includes the supply of granular materials.

1.2 DEFINITIONS

- .1 “Effective Particle Size (D_e)” of rock particles is calculated as follows:

$$D_e = \sqrt[3]{\frac{M}{523.6 \times G_s}}$$

Where D_e = Effective particle size measured in metres.
 M = Particle mass measured in kilograms.
 G_s = Specific gravity of particle = 2.60 unless otherwise measured.

- .2 “Percent Passing by Mass” means the cumulative mass of particles that are finer than a specified size expressed as a percentage of the total mass of the sample.
- .3 “Durability Absorption Ratio” of rock particles is determined as follows:

$$DAR = \frac{\text{Durability Index}}{\text{Absorption} + 1}$$

Where: DAR = Durability Absorption Ratio of rock particles.

Durability Index of the rock particles is determined by CAL.229.

Absorption of the rock particles is determined by CAL.206 and is expressed as a percentage.

1.3 REFERENCES

- .1 Provide granular materials in accordance with the following standards (latest revision) except where specified otherwise.
- .2 American Society for Testing and Materials (ASTM)
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| .1 | ASTM D422 | Standard Method for Particle Size Analysis of Soils. |
| .2 | ASTM D1140 | Standard Test Method for Amount of Material in Soils Finer than the No. 200 (75µm) Sieve. |
| .3 | ASTM D2487 | Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). |
| .4 | ASTM C33/C33M-13 | Standard Specification for Concrete Aggregates |
- .3 California Division of Highways
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| .1 | CAL. 206 | Test Method for Specific Gravity and Absorption of Coarse Aggregate. |
| .2 | CAL. 229 | Test Method for Durability Index. |

- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M Sieves, Testing, Woven Wire, Metric.
- .5 Canadian Standards Association (CSA)
 - .1 CAN/CSA–A23.1/A23.2 Concrete Materials and Methods of Concrete Construction.

1.4 SUBMITTALS

- .1 Submit source quality control test results 15 days prior to delivery of materials to site. Present results as log scale gradation curve with specified gradation curves included.

1.5 QUALITY ASSURANCE

- .1 Conduct quality control tests at the source to confirm that materials meet the specified gradation and durability requirements
- .3 The Departmental Representative may take samples of granular material for quality assurance testing. Cooperate with the Departmental Representative during testing.
- .5 The Departmental Representative may reject granular material at the source, in the transport vehicle, in the stockpile, or in place.

PART 2 PRODUCTS

2.1 MATERIALS

Provide materials in accordance with the following.

- 1. Granular:
 - 1. Reasonably well graded sand with the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Mass</u>
25.4 mm	100%
19.05 mm	90% - 100%
4.75 mm	70% - 100%
2.00 mm	55% - 100%
0.840 mm	30% - 75%
0.250 mm	0% - 40%
0.105 mm	0% - 15%
0.075 mm	0% - 5%

- 2. Less than 12% loss of weight after 5 cycles in accordance with the requirements of CAN/CSA A23.2–9A.

PART 3 EXECUTION

3.1 GRANULAR MATERIAL PROCUREMENT

- .1 Deliver the total required volume of granular material to the site.
- .2 Stockpile the materials at locations indicated on Drawings or otherwise designed by the Departmental Representative.
- .3 Complete the works prior to March 31, 2015

3.2 STOCKPILING OF SAND AND GRAVEL MATERIALS AT THE SITE:

- .1 Temporarily stockpile all granular materials that have been processed by washing methods for a minimum of 48 hours to permit drainage of excess water. Do not place recently washed materials on top of or with drier stockpiled materials.
- .2 Use equipment and methods that minimizes the amount of material handling, and that do not cause segregation or material breakdown.
- .3 Do not stockpile materials in areas where contamination with the underlying soils can occur.
- .4 For granular materials, construct temporary stockpiles by first distributing material over the entire base and then by building upwards in successive layers which do not exceed a thickness of 2 metres per layer. Construct each layer working from the outer edges toward the centre of the stockpile. Complete each layer over the entire area before starting the subsequent layer. Keep traffic on the materials to a minimum during stockpiling. Do not push or dump granular material over the edges or down the faces of the stockpile.
- .5 Keep stockpiles neat and regular in form.
- .6 Do not construct stockpiles that are more than 6 metres in height.
- .7 Maintain a minimum clearance of 5 m between stockpiles of each material.
- .8 Replace stockpiled material that becomes contaminated, damaged or lost at no cost the Departmental Representative.

3.3 STOCKPILING OF GRANULAR MATERIALS ON SITE

- .1 Obtain prior authorization from the Departmental Representative for stockpile locations on Site. Do not stockpile granular materials in areas where contamination with the underlying soils can occur. Prepare stockpile areas by grading the area level, and diverting drainage from adjacent areas away from the stockpile locations. Do not stockpile on completed pavement surfaces.
- .2 Stockpile granular materials in a manner that minimizes segregation.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of granular. Stockpile granular on ground but do not incorporate bottom 300 mm of pile into Work.
- .5 Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
- .6 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.4 CLEANING

- .1 Leave granular stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused granular in neat compact stockpiles as directed by Departmental Representative.
- .3 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION