

## **SECTION 815Q - CEMENT TREATED CRUSHED ROCK FOR SUBBASE PAVEMENT**

### **815.01 DESCRIPTION**

This section covers the requirements for cement treated Class 3 crushed rock subbase of 20 mm and 40 mm nominal size produced from source rock of any type. The requirements relate to quality of source rock, and properties of the product.

The nominal sizes shall be as specified in the Special Conditions and/or the drawings and/or the schedule.

### **815.02 DEFINITIONS**

#### **Cement Treated Crushed Rock**

Cement treated crushed rock is a mixture of crushed rock fragments, cement and water or crushed rock fragments, sand, cement and water produced at a controlled mixing plant to close tolerances of grading, moisture content and cement content.

#### **Unsound Rock**

Unsound rock is that material, whether in the source or as spalls or as crushed particles, which:

- (a) is soft, friable, or composed of clay or weathered rock, or which contains matter which breaks up when alternately wetted and dried; or
- (b) in the case of igneous and metamorphic source rock, has a Degradation Factor - Source Rock less than the minimum value for marginal rock specified in Clause 815.03; or
- (c) in addition in the case of basic igneous rock, has a Secondary Mineral Content greater than the maximum value for marginal rock specified in Clause 815.03; or
- (d) in the case of sedimentary rock has a Texas Ball Mill value greater than the maximum value for marginal rock specified in Clause 815.03.

#### **Assigned Los Angeles Abrasion Loss**

The assigned Los Angeles Abrasion Loss is a hardness rating derived from Los Angeles Abrasion Loss test results and is assigned to each source by VIC ROADS on the basis of past test data.

### **815.03 SOURCE ROCK**

**HP** Prior to the commencement of work, the Contractor shall confirm the source from which the material will be obtained.

The Wyndham City Council will investigate the quarry in accordance with Code of Practice 500.00

Source rock shall be considered sound or marginal in accordance with the provisions of Table 815.031.

Table 815.031

Rock Type	Test Value					
	Sound Rock			Marginal Rock		
	Degradation Factor Source Rock  (min)	Secondary Mineral Content % (max)	Texas Ball Mill Value (max)	Degradation Factor Source Rock  (range)	Secondary Mineral Content % (range)	Texas Ball Mill Value (range)
<b>ACID IGNEOUS</b>						
Granitic Rocks (includes Granite, Adamellite, Granodiorite)	50	-	-	35-49	-	-
Granophyre	45	-	-	35-44	-	-
Rhyolite	45	-	-	35-44	-	-
Rhyodacite	45	-	-	35-44	-	-
<b>INTERMEDIATE IGNEOUS</b>						
Diorite	45	-	-	35-44	-	-
Porphyry	45	-	-	35-44	-	-
Trachyte	50	-	-	30-49	-	-
<b>BASIC IGNEOUS</b>						
Basaltic Rocks (includes Basalt, Dolerite, Limburgite)	50	25	-	30-49	26-30	-
<b>METAMORPHIC</b>						
Hornfels	40	-	-	20-39	-	-
Quartzite	45	-	-	30-44	-	-
Schist	45	-	-	30-44	-	-
Phyllite	45	-	-	30-44	-	-
Gneiss	45	-	-	30-44	-	-
Greenstone	45	-	-	30-44	-	-
<b>SEDIMENTARY</b>						
Argillaceous (includes Mudstone, Calcareous Mudstone, Shale, Siltstone, Claystone, Tillite)	-	-	30	-	-	31-35
Arenaceous (includes Sandstone, Arkose, Greywacke, Quartzite, Calcarenite)	-	-	45	-	-	46-55

The hardness of the source rock shall be measured by a Los Angeles Abrasion Loss test on the product and shall comply with the test values in Table 815.032.

**Table 815.032**

Rock Type	Los Angeles Abrasion Loss (max)			
	Base		Subbase	
	Class 1	Class 2	Class 3	Class 4
<b>ACID IGNEOUS</b>				
Granitic Rocks (includes Granite, Adamellite, Granodiorite)	40	40	45	-
Granophyre	25	25	30	-
Rhyolite	25	25	30	-
Rhyodacite	25	25	30	-
<b>INTERMEDIATE IGNEOUS</b>				
Diorite	25	25	30	-
Porphyry	25	25	30	-
Trachyte	30	30	35	-
<b>BASIC IGNEOUS</b>				
Basaltic Rocks (includes Basalt, Dolerite, Limburgite)	30	30	35	-
<b>METAMORPHIC</b>				
Hornfels	25	25	25	-
Quartzite	30	30	35	-
Schist	30	30	35	-
Phyllite	30	30	35	-
Gneiss	30	30	35	-
Greenstone	30	30	35	-
<b>SEDIMENTARY</b>				
Argillaceous (includes Mudstone, Calcareous Mudstone, Shale, Siltstone, Claystone, Tillite)	-	-	25	-
Arenaceous (includes Sandstone, Arkose, Greywacke, Quartzite, Calcarene)	-	-	45	-

If at any time the Contractor proposes to obtain material from a source other than the confirmed source, the Superintendent shall be notified in sufficient time to allow such investigation as may be required.

**HP The Superintendent's approval shall be obtained prior to changing the source of material.**

**HP If the Contractor proposes to use a source rock type other than those listed in Table 815.031 the Superintendent will determine whether the rock type is acceptable and will set appropriate test values.**

**HP Source rock which does not comply with specified requirements but from which cement treated crushed rock of proven satisfactory performance has been produced may be accepted for use subject to the written approval of the Superintendent.**

**815.04 COMPONENTS**

- (a) Crushed rock fragments shall consist of clean, hard, durable, angular fragments of rock.

**The use of crusher fines produced from a quarry, or a location within a quarry, different from that used for production of that fraction of the crushed rock retained on a 4.75 mm AS sieve shall be subject to approval in writing by the Superintendent to the proposed source and nature of these materials and the proposed amounts to be added.**

Crusher fines produced from any igneous or metamorphic rock shall have a Degradation Factor - Crusher Fines not less than 60.

- (b) **The use of sands and/or filler shall be subject to approval in writing by the Superintendent to the proposed source and nature of such materials, the proposed amounts to be added and the proposed method of incorporating such materials in the product.**

**815.05 PRODUCT**

- (a) The cement treated crushed rock shall be free from vegetable matter and lumps or balls of clay and shall comply with the relevant requirements of Table 815.051.

**Table 815.051**

Total of Marginal and Unsound Rock % (max)	Unsound Rock % (max)
20	10

The Superintendent will supply the reference specimens necessary for use with Test Method RC 372.01.

- (b) The mixture before the addition of cement shall comply with the requirements of Table 815.052.

**Table 815.052**

Test	Test Value
Liquid Limit % (max)	35
Plasticity Index (max)	10

**815.06 CEMENT**

Cement shall comply with the requirements of AS 3972-1991 - Portland and Blended Cements. It shall be stored in weatherproof structures, and any cement which is damaged by moisture shall not be used.

**815.07 WATER**

Water shall be clear and substantially free from detrimental impurities such as oils, salts, acids, alkalis and vegetable substances.

**815.08 MIXING**

The crushed rock, sand (if any), cement and water shall be mixed by continuous or batch mixing.

The mixing period and the time of addition of water shall be such as to produce a uniform mixture of the components.

**815.09 GRADING OF CRUSHED ROCK WITHOUT CEMENT**

The crushed rock, just prior to the addition of cement, shall comply with the relevant grading requirements of Tables 815.091 to 815.094 corresponding to the Los Angeles Abrasion Loss and the nominal size of the material.

The mixture shall not be graded from near the coarse limit in one sieve to near the fine limit on the following sieve or vice versa.

**Grading Requirements for Class 3, 20 mm Crushed Rock Prior to the Addition of Cement (by mass)**

**Table 815.091**

Assigned Los Angeles Abrasion Loss 25 or less, igneous and metamorphic source rock.

Sieve Size AS (mm)	Target Grading (% Passing)	Test Value before Compaction Limits of Grading (% Passing)
26.5	100	100
19.0	100	95 - 100
13.2	85	75 - 95
9.5	75	60 - 90
4.75	59	42 - 76
2.36	44	28 - 60
0.425	21	14 - 28
0.075	10	6 - 13

**Table 815.092**

Assigned Los Angeles Abrasion Loss 26 or greater, igneous and metamorphic source rock - all sedimentary source rock

Sieve Size AS (mm)	Target Grading (% Passing)	Test Value before Compaction Limits of Grading (% Passing)
26.5	100	100
19.0	100	95 - 100
13.2	85	75 - 95
9.5	75	60 - 90
4.75	59	42 - 76
2.36	44	28 - 60
0.425	19	10 - 28
0.075	6	2 - 10

**Grading Requirements for Class 3, 40 mm Crushed Rock Prior to the Addition of Cement (by mass)****Table 815.093**

Assigned Los Angeles Abrasion Loss 25 or less, igneous and metamorphic source rock

Sieve Size AS (mm)	Target Grading (% Passing)	Test Value before Compaction Limits of Grading (% Passing)
53.0	100	100
37.5	100	95 - 100
26.5	85	75 - 95
19.0	77	64 - 90
9.5	60	42 - 78
4.75	46	27 - 64
2.36	35	20 - 50
0.425	17	10 - 23
0.075	9	6 - 12

**Table 815.094**

Assigned Los Angeles Loss 26 or greater, igneous and metamorphic source rock and all sedimentary source rock.

Sieve Size AS (mm)	Target Grading (% Passing)	Test Value before Compaction Limits of Grading (% Passing)
53.0	100	100
37.5	100	95 - 100
26.5	85	75 - 95
19.0	77	64 - 90
9.5	60	42 - 78
4.75	46	28 - 64
2.36	35	20 - 50
0.425	15	7 - 23
0.075	6	2 - 9

The Superintendent may change the target grading requirements pertaining to the 2.36 mm, 0.425 mm and 0.075 mm sieves specified in Tables 815.091 to 815.094. Notwithstanding any change made to the target grading, the magnitude of the range of the limits of grading will remain unchanged and the range will remain centred on the target grading. No additional payment will be made unless the change from the specified requirements exceeds two percentage units for the 2.36 mm and 0.425 mm sieves or one percentage unit for the 0.075 mm sieve.

**815.10 CEMENT CONTENT**

Cement shall be added and mixed into the crushed rock in such a manner as to produce a uniform cement content. After mixing, the cement content of the mixture, expressed as a percentage by mass of the dry crushed rock, shall be within 0.3 of the value specified below:

The cement content shall be as shown on the drawings.

**815.11 MOISTURE CONTENT**

Where the work of the Contract includes supply and delivery only, the moisture content of the mixture at the point of delivery, expressed as a percentage by mass, shall be within plus 0.5 to minus 1.0 of the target nominated from time to time by the Superintendent.

**815.12 STOCKPILING OF MIXTURE**

Cement treated crushed rock shall not be stockpiled.

**815.13 HANDLING OF MIXTURE AND DELIVERY**

Handling of the mixture, including discharging from mixing plant and loading of trucks shall be effected in such a manner as to minimise segregation.

Cement treated crushed rock shall be delivered within 75 minutes after the time of completion of mixing at the plant.

**815.14 MINIMUM TESTING REQUIREMENTS**

The Contractor shall test the cement treated crushed rock at a frequency which is sufficient to ensure that all material supplied under the Contract complies with the specified requirements. The frequency shall not be less than that shown in Table 815.141, except that the Superintendent may agree to a lower frequency where the Contractor has implemented a system of statistical process control and can demonstrate that such lower frequency is adequate to assure the quality of the product.

**Table 815.141 - Minimum Frequency of Testing**

Test	Minimum Frequency of Testing
Grading	On each day - one per 300 tonne or part thereof
Unsound Rock	On each day - one per 300 tonne or part thereof
Cement Content	On each day - one per 100 tonne or part thereof
Moisture Content	On each day - one per 100 tonne or part thereof
Plasticity Index	In each month - one per 20,000 tonne or part thereof
Degradation Factor - Crushed Fines (imported)	One per day