

Table 3602/1

## CRUSHED STONE BASE AND SUBBASE: MATERIAL REQUIREMENTS

Material Characteristic		TYPE OF MATERIAL			
		G1	G2	G3	
Parent Material		Sound rock from an approved quarry, or clean, sound mine rock from mine dumps, or clean sound boulders	Sound rock, boulders or coarse gravel	Sound rock, boulders or coarse gravel	
ADDITIONAL FINES		Only fines crushed from the same sound parent rock may be added for grading correction provided that added fines shall have a LL. Not exceeding 25 and PI not exceeding 4	May contain UP to 10% by mass of approved natural fines not necessarily obtained from parent rock. Added fines shall have a LL. not exceeding 25 and PI not exceeding 6	May contain UP to 15% by mass of approved natural fines not obtained from parent rock. Added fines shall have a LL. not exceeding 25 and a PI not exceeding 6.	
STRENGTH		10% Fines Aggregate Crushing Value (10% fact), determined in accordance with TMH1 method B2, shall be not less than the appropriate value in table 3602/2, column 3. The Aggregate crushed value(ACV), determined in accordance with TMH1 method B1, shall not exceed the appropriate value in the 3602/3.			
DURABILITY		The material shall comply with the requirements in columns 3,4 and 5 of table 3602/2.			
FLAKINESS INDEX		Flakiness Index, determined in accordance with TMH1 method B3, shall not exceed 35 on each of the -26,5 + 19mm fraction and the -19 + 13,2mm fraction.			
FRACTURED FACES		All faces shall be fractured faces	For crushed materials at least 50% by mass of the fractions retained on each standard sieve 4.75mm and larger shall have at least one fractured face		
Atterberg Limits	Fraction (mm)	LL. Shall not exceed 25. PI shall not exceed 5 LS shall not exceed 2%	LL. shall not exc.25 PI shall not exc.6 In addition the arithmetic mean of the PI's for a lot (min 6 tests) shall not exceed 4,5. LS shall not exc.3%.	LL. Shall not exceed 25 PI shall not exceed 6 LS shall not exceed 3% In the case of calcrete the PI shall not exceed 8 (% passing 0.425mm sieve) LS	
	-0,425	In addition the arithmetic mean of the PI's for a lot (min 6 tests) shall not exceed 4.			
	-0,075	The PI shall not exceed 12. If the PI exceeds 12 the material shall be chemically modified. After chemical modification the PI of the minus 0.075mm fraction shall not exceed 8		If chemical modification is required, the PI of the -0,075mm fraction after modification shall not exceed 10.	
SOLUBLE SALTS		See additional requirements			
NOMINAL MAXIMUM SIZE		37,5mm	37,5mm	37,5mm	26,5mm
	Nominal aperture size of sieve(mm)	Percentage passing sieve, by mass	Percentage passing sieve, by mass	Percentage passing sieve, by mass	

GRADING	37,5	100	100	100	
	26,5	84 -94	84 94	84 94	100
	19,0	71 - 84	71 - 84	71 - 84	85 - 95
	13,2	59 - 75	59 - 75	59 - 75	71 - 84
	4,75	36 - 53	36 - 53	36 - 53	42 - 60
	2,00	23 - 40	23 - 40	23 - 40	27 - 45
	0,425	11 - 24	11 - 24	11 - 24	13 - 27
	0,075	4 - 12	4 -12	4 -12	5 - 12
COARSE SAND RATIO (see definition in SUBSUBCLAUSE 3602(c)(i)(5))	Shall not be less than 35% and shall not exceed 50% in respect of the target grading	Shall not be less than 35% and shall not exceed 50% in respect of the target grading	Shall not be less than 35% and shall not exceed 50% in respect of the target grading.		
COMPACTION REQUIREMENTS	Minimum of 88% of apparent relative density.	Minimum of 85% of bulk relative density.	98% or 100% of modified AASHTO density (as specified)		

**TABLE 3402/1 REQUIREMENTS FOR TYPES G4 TO G6 MATERIALS**

PROPERTY	TYPES OF MATERIAL		
	G4	G5	G6
DESCRIPTION OF MATERIAL	Natural gravel, or natural gravel and boulders which may require crushing	Natural gravel, or natural gravel and boulders which may require crushing, or crushed rock	Natural gravel, or natural gravel and boulders which may require crushing, or crushed rock.
ADDITIONAL FINES	May contain approved additional fines not obtained from parent rock. Added fines shall have a liquid limit (LL.) not exceeding 25 and a plasticity(PI) not	May contain approved natural fines not obtained from parent rock.	May contain approved natural fines not obtained from parent rock.
NOMINAL MAXIMUM SIZE	(i) Uncrushed material:53mm  (ii) Crushed material:37,5mm or (unless otherwise specified in the project specifications)	(i) Uncrushed material: 63mm  (ii) Crushed material: 53mm before compaction(unless otherwise specified in the project specifications)	(i) Uncrushed material:  Two thirds of the compacted layer thickness(unless otherwise specified in the the project specifications)  (ii) Crushed material:  63mm before compaction (unless otherwise specified in the project specifications)
FLAKINESS INDEX	Flakiness index, determined in accordance with the TMH1 method B3, shall not exceed 35 on each of the -26,5 + 19mm fraction and the -19 + 13,2mm		

		fraction.					
FRACTURED FACES		Alluvial and colluvial gravels shall be crushed so that at least 50% by mass of the fractions retained on each standard sieve 4,75mm and any larger shall have at least one fractured face.			Alluvial and colluvial gravels shall be crushed so that at least 50% but. Mass of the fractions retained on each standard sieve 4,75m and any larger shall have at least one fractured face.		
GRADING	Nominal aperture size of sieve(mm)	Percentage passing through sieve by mass			The percentage by mass passing the 2,00mm sieve shall not be less than 20% nor more than 70%.		
		Crushed material					Uncrushed material
		Nominal maximum size 37,5mm	Nominal maximum size 26,5 mm				
		53,0					100
		37,5	100				85-100
		26,5	84-94	100			-
		19,0	71-84	85-95			60-90
		13,2	59-75	71-84			-
		4,75	36-53	42-60			30-65
		2,00	23-40	27-45			20-50
0,425	11-24	13-27	10-30				
0,075	4-12	5-12	5-15				
GRADING MODULE (GM)				2.5smaller & equal GM smaller & equal 1.5	2.6 smaller & equal GM smaller & equal 1.2		
ATTERBERG LIMITS FOR NATURAL MATERIAL (-0,425 FRACTION)		<b>(a) All materials except calcrete:</b> LL. Shall not exceed 25 PI shall not exceed 6 LS shall not exceed 3%.  <b>(b) Calcrete:</b> LL. Greater than 25 PI greater than 8 (%) passing 0,425mm sieve LS greater than 170			<b>(a) All materials except calcrete:</b> LL. Shall not exceed 30, PI shall not exceed 10. LS shall not exceed 5%.  <b>(b) Calcrete:</b> LL. greater than 30 PI greater than 15 LS greater than 6 (%) passing 0,425mm sieve) LS greater 320	PI shall not exceed 12 or a value equal to 2 times the GM plus 10, whichever is the higher value.LS shall not exceed 5%. In the case of calcrete the PI shall not exceed 15 provided the LS does not exceed 6% and (% passing 0,425mm sieve) LS greater than 320.	
DURABILITY		The material shall comply with the requirements in table 3402/3			Mudrock shall have a wet 10% FACT value of not less than	Mudrock shall have a wet 10% FACT value of not less than 80kN, and a wet/dry Venter test	

		90kN, and a wet/dry Venter test class of I or II	class of I or II.
SOLUBLE SALTS	The materials shall comply with the requirements of clause 3602.		
STRENGTH (CBR)	CBR at 98% of modified AASHTO density shall not be less than 80%	CBR AT 95% of modified AASHTO density shall not be less than 45%	CBR at 95% of modified AASHTO density shall not be less than 25%.
SWELL (Maximum)	Swell at 100% of modified AASHTO density shall not exceed 0,2% for all materials except calcrete for which the swell shall not exceed 0,5%.	Swell at 100% of modified AASHTO density shall not exceed 0,5%.	Swell at 100% of modified AASHTO density shall not exceed 1,0%.
COMPACTION REQUIREMENTS	98% or 100% (as specified) of modified AASHTO density for natural materials.	The density requirements of the layer in which the material is used, shall be applicable. (See subclause 3402(b).) In restricted areas the in situ dry density of gravel material shall comply with the requirements in the project specifications.	

**REQUIREMENTS FOR TYPES G7 TO G9 MATERIALS**

PROPERTY	TYPE OF MATERIAL		
	G7	G8	G9
DESCRIPTION OF MATERIAL	Natural material (soil, sand or gravel)	Natural material (soil, sand or gravel)	Natural material (soil, sand or gravel)
ADDITIONAL FINES	Not applicable	Not applicable	Not applicable
NOMINAL MAXIMUM SIZE	(i) Uncrushed material: two thirds of the compacted layer thickness. (ii) Uncrushed material: 75mm	Two thirds of the compacted layer thickness.	Two thirds of the compacted layer thickness.
GRADING MODULUS (GM)	2.7 smaller equal GM smaller equal 0.75		2.7 smaller equal GM smaller equal 0.75
ATTERBERG LIMITS FOR NATURAL MATERIAL (0,425mm FRACTION)	The PI shall not exceed 12 or a value equal to 3 times the GM plus 10, whichever is the higher value. In the case of the calcrete the PI shall not exceed 17 provided that the LS does not exceed 7% and (% passing 0,425mm sieve) LS greater than 320.	The PI shall not exceed 12 or a value equal to 3 times the GM plus 10, whichever is the higher value. In the case of calcrete the PI shall not exceed 17 provided that the LS does not exceed 7%	The PI shall not exceed 12 or a value equal to 3 times the GM plus 10, whichever is the higher value. In the case of the calcrete the PI shall not exceed 17 provided that the LS does not exceed 7%

DURABILITY	Mudrock shall have a wet 10% FACT value of not less than 60kN, and a wet.dry Venter test class of I, II or III.	Mudrock shall have a wet FACT value of not less than 60kN, and a wet/dry Venter	Mudrock shall have a wet 10% FACT value of not less than 60kN, and a wet.dry Venter test class of I, II or III.
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		test class of I, II or III.	
SOLUBLE SALTS	The materials shall comply with the requirements of clause 3602.		
STRENGTH (CBR)	CBR at 93% of modified AASHTO density shall be at least 15%	CBR at 93% of modified AASHTO density shall be at least 10%	CBR at 93% of modified AASHTO density shall be at least 7%
SWELL (MAXIMUM)	Swell at 100% of modified AASHTO density shall not exceed 1,5%	Swell of 100% of modified AASHTO density shall not exceed 1,5%	Swell at 100% of modified AASHTO density shall not exceed 1,5%
COMPACTION REQUIREMENTS	The density requirements of the layer in which the material is used, shall be applicable. (See subclause 3402(b).) In restricted areas the in situ dry density of gravel material shall comply with the requirements in the project specifications.		

**Table 3402 / 3  
DURABILITY REQUIREMENTS FOR G4  
MATERIAL**



GROUP	MEMBERS OF THE GROUP	DURABILITY MILL INDEX (MAXIMUM)	%PASSING 0,425mm SIEVE AFTER THE DURABILITY MILL TEST (MAXIMUM)
Basic crystalline rock	Basalt Dolerite Gabbro	125	35
	Gneiss Granite	420	35
High silica rock	Chert Hornfels Quartzite	420 (clay mineral kaolin)	35
Sandstone	Arkose Conglomerate Sandstone Siltstone	125	35 (increase from original not more than 15%)
Mudrock	Mudrock Phylite Shale etc.	125	35
Carbonater rock	Dolomite Limestone Marble	not applicable	not applicable
	Greywacke Tillite	125	35
Pedogenic material	Calcrete Ferricrete Silcrete	480	40

**Table 3402/4**

**REQUIREMENTS FOR GRAVEL WEARING COURSE**

PARAMETER	LIMIT	
	TYPE 1	TYPE 2
Maximum size, mm	37,5	37,5
Oversize Index (I <sub>o</sub> ) (maximum), %	Greater and equal to 5	0
Shrinkage product (S <sub>p</sub> )	100-365 (maximum of 240 preferable)	100-240
Grading coefficient (G <sub>c</sub> )	16-34	16-34
CBR at smaller & equal to 95% modified AASHTO Compaction(soaked value) (minimum), %	smaller and equal to 15	smaller and equal to 15
<p>I<sub>o</sub> = Oversize Index (per cent retained on 37,5 mm sieve)</p> <p>S<sub>p</sub> = Linear shrinkage x (per cent passing 0,425mm sieve)</p> <p>G<sub>c</sub> = (Per cent passing 26,5mm - per cent passing 2,0mm) x per cent passing 4,75 mm /100</p>		
Note: All the parameters in table 3402/4 are defined in TRH 20		

**Table 3402/5**

**REQUIREMENTS FOR CHEMICALLY STABILIZED PAVEMENT LAYERS**

CRITERIA	C1	C2	C3	C4
Material before treatment	At least G2 quality	At least G4 quality	At least G6 quality	
Atterberg limits after treatment	Slightly plastic	Slightly plastic	PI shall not exceed 6	
Design strength (Mpa) (Laboratory unconfined strength)				
(a) at 100% of modified AASHTO density	minimum : 6 maximum : 12	minimum : 3 maximum : 6	minimum:1,5 maximum:3	minimum: 0,75 maximum: 1,5
(b) at 97% of modified AASHTO density	minimum : 4 maximum : 6	minimum : 2 maximum : 4	minimum:1 maximum:2	minimum: 0,5 maximum: 1
Indirect tensile strength at 100% modified AASHTO density(kPa)			Minimum:250	Minimum :200
Durability: Fines lost Wet - dry Freeze - thaw	All characteristics, including amongst others the carbonated values with regard to durability, shall comply with the requirements in the project specifications.			