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SECTION 1 : MATERIALS

1.1 GENERAL

The following specifications apply to materials to be incorporated in the Works.

Other materials shall comply with details in the Project Specification or the appropriate New Zealand Standard.

1.2 SAND

1.2.1 Imported sand for use in the formation of lower sub-base of pavement, imported subgrade, footpaths and paved areas and as foundation to concrete works shall be "run of pit" sand which is free of organic matter and well graded. It shall be made up of clean particles of silica or hard stone containing minimal silts, clays, and pumices.

1.2.2 Bedding sand for use with concrete block paving shall comply with NZS 3116:2002 Grading Curve for Bedding Sand. Single sized, gap graded, or other sands containing an excessive amount of fines shall not be used. The sand shall be free of deleterious materials, soluble salts and other contaminants. The particles shall preferably be sharp. The sand shall have a moisture content in the range 4-8%.

1.2.3 Joint filling sand shall be such that 90% passes a 1.18 mm BS410 sieve and no more than 10% passes a 75 micron sieve, and shall be free of deleterious materials, soluble salts and other contaminants. It shall be dry enough to be free running and shall be non-plastic.

1.2.4 Trench sand shall comprise "run of pit" sand as above and may have up to 6% by weight of clean loam.

1.3 BROWN ROCK

This material is a non-specific rock aggregate intended for use as a subgrade improvement layer.

The Blue/Brown sub base material shall have minimum soaked CBR of 20 and a nominal maximum size.

The Blue/Brown material shall be suitably graded, moderate to highly weathered quarry rock with sufficient fines to aid compaction. A minimum of 10% by dry mass shall be unweathered (blue) material to ensure a level of durability.

The source of supply of all materials shall be nominated and the material shall be tested to ensure the CBR requirement can be achieved, and test results shall be provided.

The suitability of the material will be assessed on its grading, crushing and weathering resistance, and clay content relative to its use.

Evidence of these properties will be required for approval by the Engineer prior to its use.

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1.4 WHAP AGGREGATE

1.4.1 Scope

This Specification sets out requirements for crushed general aggregate (WHAP) intended for use as sub-base material or shaping material for stabilisation purposes.

1.4.2 Proportion Of Broken Rock

In each of the aggregate fractions between the 63.0mm and 4.75 mm sieves not less than 50% by weight shall have two or more broken faces. It shall be free of organic matter.

1.4.3 Crushing Resistance

The crushing resistance shall not be less than 130 kN when the aggregate is tested according to NZS 4407:1991 Test 3.10 "The Crushing Resistance Test".

1.4.4 Weathering Resistance

The aggregate shall have a quality index of AA, AB, AC, BA, BB or CA when tested according to NZS 4407:1991 Test 3.11 "Weathering Quality Index Test".

1.4.5 Sand Equivalent

The sand equivalent shall not be less than 25 when the aggregate is tested according to NZS 4407:1991 Test 3.6 "Sand Equivalent Test". The sand equivalent test may be omitted if the grading test shows less than 4% passing the 75 micron sieve.

1.4.6 Grading Limits

When tested according to NZS 4407: 1991 Test 3.8.1 "Preferred Method by Wet Sieving" or Test 3.8.2 "Subsidiary Method by Dry Sieving" the grading of the aggregate shall fall within their respective envelopes defined below.

Test Sieve Aperture (mm)	% of Weight Passing		
	WHAP 65	WHAP 40	WHAP 20
63	100	-	-
37.5	55-80	100	-
19	35-65	60-80	100
9.5	20-50	35-65	45-75
4.75	10-35	20-45	25-55
1.18	2-20	2-25	2-30
0.075	6 max	7 max	8 max

1.5 GAP AGGREGATE - PAVEMENT COURSES

1.5.1 The GAP aggregate shall comprise crushed aggregate and must be free of all non-mineral matter.

1.5.2 The crushing resistance shall be not less than 100 kN when the aggregate is tested according to NZS 4407:1991 Test 3.10 "The Crushing Resistance Test".

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An aggregate shall be considered to have met the requirement if the sample produces less than 10 percent fines when loaded so that the specified peak load is reached in 10 minutes. In this case the test shall follow the standard method in all other respects. If the aggregate passes the test it shall be reported as having a crushing resistance "greater than (the load specified)".

1.5.3 Weathering Resistance - The aggregate shall have a quality index of AA, AB, AC, BA, BB, CA or CB when tested according to NZS 4407:1991 Test 3.11 "Weathering Quality Index test".

1.5.4 Sand Equivalent - The sand equivalent shall not be less than 25 for carriageway pavement metal when the aggregate is tested according to NZS 4407:1991 Test 3.6 "Sand Equivalent Test".

Where the GAP20 is to be used on the footpath the sand equivalent shall not be less than 25 when tested according to NZS 4407:1991 Test 3.6 "Sand Equivalent Test".

1.5.5 Grading Limits - When tested according to NZS 4407:1991 Test 3.8.2 "Subsidiary Method by Dry Sieving", or Test 3.8.1 "Standard Method by Wet Sieving" where aggregates contain clay or other fine material causing aggregation of the particles, the grading of the aggregate shall fall within the respective envelope defined below.

Test Sieve Aperture	Percentage Passing		
	GAP 65	GAP 40	GAP 20
63.0 mm	100		
37.5 mm		100	
19.0 mm	40-65	63-81	100
9.5 mm		40-60	52-76
4.75 mm		25-45	33-57
2.36mm		16-35	20-44
1.18 mm		9-27	12-35
600 micron		5-20	7-25
300 micron	10 max	1-15	4-20
150 micron		10 max	12 max
75 micron		7 max	8 max

1.5.6 Grading Shape Control - The weight in each fraction shall lie within the limits defined in the following table:

Fractions	Percentage of Material Within the Given Fraction	
	GAP 40	GAP 20
19.00 - 4.75 mm	25-49	-
9.50 - 2.36 mm	14-36	19-45
4.75 - 1.18 mm	7-27	11-35
2.36 - 600 micron	5-22	6-26
1.18 - 300 micron	3-18	3-21
600 - 150 micron	1-13	2-18

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1.6 NZTA M/4 AP40 & AP20 AGGREGATE - Pavement Course

All aggregate shall comply with NZTA specification M/4 2006 and or subsequent issues.

1.7 WEARING COURSE MAP 20 AGGREGATE

1.7.1 Scope

This Specification sets out requirements for crushed general aggregate (MAP) intended for use as wearing course on unsealed roads. The specification relies on the control of the plasticity index and grading co-efficient to manufacture a product that will form a well bound upper pavement maintenance layer. A general requirement on shape seeks to ensure that material which would cause undue wear and punctures to vehicle tyres is excluded.

1.7.2 Proportion Of Broken Rock

In each of the aggregate fractions between the 19.0mm and 4.75 mm sieves not less than 50% by weight shall have two or more broken faces. It shall be free of organic matter.

1.7.3 Material Properties

When tested according to the appropriate tests in NZS 4407:1991 the aggregate shall meet the following requirements:

Crushing Resistance	100kN minimum
Liquid Limit	25 to 35
Plasticity Index	6 to 12
Clay Index	4.5 max
Grading Coefficient	16 to 34

(where Grading Coefficient = (% passing 26.5mm sieve- % passing 2.36mm sieve) x % passing 4.75mm sieve/ 100)

1.7.4 Grading Limits

When tested according to NZS 4407: 1991 Test 3.8.1 "Preferred Method by Wet Sieving" or Test 3.8.2 "Subsidiary Method by Dry Sieving" the grading of the aggregate shall fall within the envelope defined below.

Test Sieve Aperture	% of Weight Passing
26.5 mm	100
19 mm	100
6.7mm	60 - 80
2.36 mm	40 - 60
300 micron	15 - 35
75 micron	10 - 20

1.8 CEMENT (FOR STABILISATION)

Cement shall comply with NZS 3122:1995

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1.9 SEALING CHIPS

Sealing chips shall conform to NZTA Specification M/6 for all applications in the works.

1.10 ASPHALTIC BITUMENS

Bitumens for use in pavement and footpath tack coats and sealing shall conform to NZTA Specification M/1 and shall generally be 180/200 penetration grade.

1.11 ASPHALTIC CONCRETE

Asphaltic concrete shall conform to NZTA Specification M/10 - Specification for Asphaltic Concrete.

1.12 FRICTION COURSE

Friction course shall conform to NZTA Specification P/11 "Specification for Friction Course Material".

1.13 CONCRETE

Cement, aggregates and water shall be of the qualities specified in NZS 3109:1997 - Concrete Construction.

If requested, samples shall be supplied to the Engineer for testing.

The following specifications shall apply for the production of the concrete:

- NZS 3104 Ready Mixed Concrete Production
- NZS 3108 Site Mixed Concrete Production.

Curing compounds shall conform to ASIM C309 "Specification for Liquid Membrane Forming Compounds for Curing Concrete".

1.14 TOPSOIL

Refer to Part 7 : Landscape Works.

1.15 GRASS SEED

Refer to Part 7 : Landscape Works

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1.16 TIMBER

Timber for edging and pegs shall be H:4 treated timber. Timber for fencing shall be H4 treated for posts or other members in contact with the ground, and H3 treated for all other components.

1.17 CONCRETE BLOCK PAVING

Concrete blocks shall comply with NZS 3116:2002, Interlocking Concrete Block Paving.

1.18 REINFORCEMENT

Reinforcing bars shall conform to NZS 4671 : 2001 — Steel Reinforcing Materials.

1.19 ROAD MARKING PAINT

Refer Section 15 — Roadmarking, of this document.

1.20 SIGNS

Refer to Section 14 — Road Signs and Street Furniture.