matamata piako district council





Standard Technical Specifications
Part 3: Roading

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. Subbase

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

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 moisture content in the range 4-8%.

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.

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.

In some places, the blue/brown rock material needs to be tapered to thicknesses less than the materials maximum size. Therefore an AP40 material may be used in the finishing of this subbase layer to ensure that this can be achieved.

The construction shall comply with NZTA B/2:2005, however the Contractor shall carry out the compaction testing (may need to break up larger particles to perform the compaction curve and CBR test to replicate field conditions). The Contractor shall confirm that the target density will consistently satisfy the minimum CBR requirement.

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

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 or 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.

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

Tests to check compliance with this specification shall be carried out on representative samples of the aggregate. These will be selected from the stockpile, truck or insitu on site and will be required for approval by the Engineer, prior to its use.

1.5. GAP Aggregate – Pavement Courses

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

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".

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)".

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".

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".

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.

	% of Weight Passing		
Test Sieve Aperture	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

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	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

1.6. NZTA M/4:2006 AP40 & AP20 Aggregate– Pavement Course

All aggregate shall comply with NZTA specification M/4:2006 and 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 3122:2009

1.9. Sealing Chips

Sealing chips shall conform to NZTA Specification M/6:2011 for all applications in the works

1.10. Asphaltic Bitumen

Bitumen’s for use in pavement and footpath tack coats and sealing shall conform to NZTA Specification M/1:2011 and shall generally be 180/200 penetration grade.

1.11. Asphaltic Concrete

Asphaltic concrete shall conform to NZTA Specification M/10:2010 “Specification for Asphaltic Concrete”.

1.12. Friction Course

Friction course shall conform to NZTA Specification P/11:2007 "Specification for Friction Course Material".

1.13. Concrete

Cement, aggregates and water shall be of the qualities specified in NZS 3109:1997 - Concrete Construction and NZS 3121:1986 – Water and Aggregate for Concrete

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

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

NZS 3104:2003 Ready 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

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, Concrete Segmental and Flagstone Paving.

1.18. Reinforcement

Reinforcing bars shall conform to AS/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, of this document.

2. Testing

2.1. Scale Penetrometer

2.1.1. General

The Scala Penetrometer shall only be employed where a significant part of the subgrade particles pass a 9.5mm sieve and no aggregate is greater than 10mm.

The cone is bedded into the soil with one (or more) blows. The zero point for depth and the number of blows is taken neglecting the bedding blows.

There are 2 methods of recording the results and all test sites must comply.

CBR	Max m/blow	Min blows/100mm
7	32	3
10	23	4
15	17	6

The CBR vs Penetration graph for sand silt materials is shown on Drawing TS 345

2.1.2. On Carriageways

Scala tests are to be taken at the following locations and frequency.

a) Carriageway 4.0 m wide and less	Along centreline
b) Carriageway between 4.0 m and 8.0 m	At the kerbside wheel tracks
c) Carriageway 8.0 m and wider	At centreline and kerbside wheel tracks

As a means of compliance for an acceptable CBR in carriageways in the insitu subgrade, the scala readings are averaged for the top 600 mm. At the imported subgrade or lower sub-base subgrade, the scala readings are averaged for the full depth of the pavement layer being tested.

The test sites are to be at a maximum of 15 m centres for each line or where 2 or 3 lines are required these may be staggered at 10 m intervals, giving a space of 20 and 30 m for each line.

2.1.3. Footpaths

The Engineer may require tests to be carried out on the subgrade along the line of the intended footpath before works are commenced.

Scala readings are to be taken at a maximum of 30 m centres and to a depth of 300 mm below the final upgrade level to ensure that the appropriate CBR's are achieved at the appropriate depth.

2.1.4. Vehicle Crossings

A minimum of three scala penetrometer tests randomly spread shall be taken to a depth of 300 mm below the final subgrade level per crossing.

One test per 5 m2 on crossings greater than 15 m2 (kerb to boundary).

2.2. Subbase and basecourse compaction

2.2.1. General

All CBR values specified on the drawings and documents refer to the ten percentile of soaked CBR value.

Testing on the day on site cannot provide the soaked CBR value.

To ensure compliance with specified CBR values, all readings with the Nuclear Densometer testing regime shall exceed the specified CBR values.

To ensure compliance with specified CBR values all readings with the Clegg Hammer testing regime shall exceed:

1.15 x the specified value for stabilised pavements
1.20 x the specified value for non-stabilised pavements

2.2.2. Nuclear Densometer

2.2.2.1. Testing Regimes

These are two testing regimes allowable for use of a nuclear densometer.

In conjunction with CBR testing the degree of compaction in the subbase and basecourse layer will first be tested using a CBR test rig. Nuclear densometer readings shall be taken adjacent to the insitu CBR test sites. Insitu CBR tests shall be undertaken at intervals and positions directed by the Engineer. Nuclear densometer readings shall be taken to achieve a correlation between the insitu test results and recorded dry density of the tested basecourse layer.

Nuclear densometer tests shall then be carried out at the rate of 1 test for 100 sq.m. to ensure that the basecourse layer has been compacted uniformly and sufficiently to reach the required dry density equivalent to a CBR of at least the specified value.

If a densometer test gives a sub-standard result, five further tests will be taken within the test area, all of which must satisfy the specified compaction to obtain a pass.

2.2.2.2. Percentage Dry Density

The Contractor shall be responsible for carrying out laboratory tests according to NZS 4402:1988 Test 4.1.3 to determine the maximum laboratory dry density (MDD) at optimum moisture content (OMC) of the aggregate used.

Nuclear densometer tests shall be carried out at the rate of 1 test per 100 sq.m. The compaction requirements shall be met if the mean and minimum compaction values of the tests taken comply with the values in:

Figure TS 3.2.1.

Values	Sub-basecourse Pavement layer	Basecourse Pavement Layer
Mean Value	> 95	> 98
Minimum Value	> 92	> 95

Figure TS 3.2.1: Mean & Minimum Value of Pavement Layer Compaction as Percentage of Maximum Laboratory Dry Density

2.2.3. Clegg Hammer

Where the Clegg Hammer is to be used then it shall be the Standard Australian Digital model with a 4.5 kg compaction hammer, using a drop height of 450 mm.

Testing is carried out on a surface that has no loose material (removed by scuffing with stiff hand-brooming). The device is held in place by foot and steadied in a vertical position with the knees.

The maximum Clegg Impact Value (CIV) at the end of the 4th blow is the recorded value. The on-site CBR value shall be taken as 0.07 (CIV) 2

If a Clegg Hammer test gives a sub-standard result, five further tests will be taken close-by. If any further tests fail to reach the compacted limit required, the area will be reworked at the Contractor's expense until a satisfactory test result is achieved.

2.3. Benkelman Beam Test

2.3.1. Sealed Surface

The Contractor shall test the sealed surface with a standard Benkelman Beam test apparatus.

The beam test shall be as per NZTA Specification T/1:1977 except that the recordings for bowl deflection shall not be recorded or used in the deflection calculation.

2.3.2. Test Procedure

The test axle shall be a dual tyred single axle of 8.2 tonne. Readings shall be taken at the kerbside wheel track in both sides of the carriageway at a maximum interval of 15 m on each side. Where the carriageway is 8.0m or wider, tests at 15 m maximum intervals shall also be taken at the centre line.

Deflections should not exceed the following target figures:

On carriageways where asphalt is to be placed (with the exception of where asphalt is to be placed at cul-de-sac heads only):

	Average (mm)	90 Percentile (mm)	Maximum (mm)
A1 - Residential: Cul-de-sacs and private way ≤ 40 household units	1.3	1.6	2.1
A2 - all other carriageways up to 103	1.10	1.35	1.80
A3 - All carriageways	1.00	1.20	1.60

between 105 and 106 EDA

On other carriageways surfacing situations (factored by 1.5 for block paving):

	Average (mm)	90th Percentile (mm)	Maximum (mm)
B1. Residential cul-de-sacs and private ways < 40 household units	1.5	1.8	2.4
B2. All other carriageways up to 105 EDA	1.25	1.50	2.60
B3. All carriageways between 105 and 106 EDA	1.00	1.20	1.60

No more than 10% of the test results shall exceed the 90th Percentile and no single result shall exceed the maximum.

The developer shall provide the results from the Benkelman Beam tests (specified above) to show that the pavement complies with the requirements detailed. The organisation carrying out the tests shall have an IANZ accreditation.

Acceptance of pavements with deflections exceeding the target figures will be at the discretion of the Asset Manager Strategy and Policy.

2.4. Surface Texture

The method for determining surface texture shall be equivalent to or will follow NZTA Specification T/3:1981 Sand Circle Surface Texture measurements.

2.5. Sealed Surface Roughness

2.5.1. Method of Testing for Surface Roughness

Roughness measurements shall normally, but not exclusively be taken only on surfacing applied to areas of new or reworked basecourse, or as directed by the Engineer.

The Contractor shall use a NAASRA roughness meter in accordance with the "Standard Operating Instructions for the NAASRA Roughness Meter".

For projects where the total carriageway is less than 200 metres the use of an approved 2 metre profile beam will be acceptable.

A minimum of three runs for roughness measurement shall be taken in each direction. Roughness measurements taken through rotary intersections shall not be considered as part of the average roughness.

The roughness count shall include the junction between the contract works and the existing pavement by including no less than 20 metres of old pavement at the beginning and end of each lane. Roughness values are to be recorded for every 100 metre length of pavement continuously along all travelling lanes.

The Contractor shall provide the Engineer with all the Certified Test results. The Certification shall include that the testing has been carried out in accordance with this clause.

The Contractor shall be responsible for all costs in arranging and carrying out of the testing and informing the Engineer of the results.

The average roughness value shall be taken to be the arithmetic mean of all recorded readings excluding readings taken through rotary intersections.

For the purposes of comparing with the specified Average Construction Roughness, the average roughness obtained shall be rounded to the nearest whole number.

3. Pavement construction

3.1. General

This section covers areas of new or completely reconstructed road pavement and includes all pavement layers between the finished natural subgrade level up to and including the finished basecourse.

3.2. Imported Subgrade Layer

The imported subgrade material for the pavement shall be "run of pit" sand, unless otherwise specified or approved by the Engineer. The suitability of alternatives will need to be demonstrated.

The material shall be placed in layers not exceeding 150mm (compacted thickness) and at optimum moisture content.

The material shall be compacted to the specified California Bearing Ratio (CBR) as measured with a standard scala penetrometer. Except that the standard of compaction shall not be less than 95% of the optimum dry density of the material as specified in Test 4.1.1 of NZS 4402:1988 “New Zealand Standard Compaction Test”, or Test 4.1.3 “New Zealand Vibrating Hammer Compaction Test”.

Scala Penetrometer tests shall be carried out as detailed in Section 2 "Testing".

The entire surface of the completed subgrade shall be made smooth, firm and uniform, by blading, grading and rolling, approximating the crossfall required on the final surface.

The surface shall be finished so that all points are within 15mm from a 3m straight edge laid at any point on the surface.

The reduced level of any point shall be within the limits 0mm above to 30mm below the designed or nominated level.

Compaction shall not continue if the material shows signs of excessive weaving or heaving, until the problem has been resolved.

The completed subgrade shall be tested to ensure the required CBR has been achieved. If the compaction of the imported subgrade layer does not meet the required criteria then the following options are available for consideration:

The Contractor may choose to carry out further compactive effort to achieve the required level of compaction.

The Contractor may choose to place not more than 100mm compacted depth of the sub-base layer on the condition that the imported subgrade compaction criteria can be met following the subsequent compaction of the sub-base. If the compaction specified for the imported subgrade layer cannot be achieved by this method then the Contractor at their expense shall re-work both pavement layers until the problem has been resolved.

3.3. Lower Sub-base layer

The material in this layer shall be "run of pit" sand unless otherwise specified or approved by the Engineer. The suitability of alternatives will need to be demonstrated.

No lower sub-base layer shall be placed until the subgrade has been approved by the Engineer.

The material shall be placed in layers not exceeding 150mm (compacted thickness) and at optimum moisture content.

The material shall be compacted to the specified CBR as tested by a standard scala penetrometer. Except that the standard of compaction shall not be less than 95% of the optimum dry density of the material as specified in Test 4.1.1 of NZS 4402:1988.

Scala penetrometer tests shall be carried out as detailed in Section 2: Testing.

The entire surface of the completed lower sub-base shall be made smooth, firm and uniform, by blading, grading and rolling.

The surface shall be finished so that all points are within 15mm from a 3m straight edge laid at any point on the surface.

The reduced level of any point shall be within the limits 0mm above to 30mm below the designed or nominated level.

Compaction shall not continue if the material shows signs of excessive weaving or heaving, until the problem has been resolved.

The completed lower sub-base shall be tested for compaction to ensure the required CBR has been achieved. If the compaction of the imported lower sub-base layer does not meet the required criteria then the following options are available for consideration:

i) The Contractor may choose to carry out further compactive effort to achieve the required level of compaction.

i) The Contractor may choose to place half the sub-base layer (100mm compacted depth GAP40) on the condition that the imported subgrade compaction criteria can be met following the subsequent compaction of the sub-base. If the compaction specified for the imported subgrade layer cannot be achieved by this method then the Contractor at their expense shall re-work both pavement layers until the problem has been resolved.

3.4. Recovered Material

Recovered material may be specified for use in either the lower sub-base layer or as the sub-base layer in the construction of the new pavement.

Where recovered material is to be used and there is a shortfall, this material shall be placed first and the imported material specified to make up the shortfall, placed on

top, subject to suitable layer depths of each being achievable for effective compaction.

Recovered road pavement for reuse shall not contain any transition material, finer than sand-silt in particle size.

The amount of transition material included in the total recovered road pavement material, shall be limited to minor overcutting in recovery, where the particle size of the transition material is greater than sand-silt.

The least dimension shall not exceed 75mm and the maximum dimension shall not exceed 200mm for any surfacing recovered along with the road pavement for reuse, and before placing in the pavement layer.

Other than the recovered materials consequential characteristics, the pavement layer shall be prepared as specified.

3.5. Sub-Base Layer (GAP 40 or GAP 65)

Material contained in this layer shall be GAP 40 or GAP 65 unless otherwise specified.

No sub-base layer material shall be placed until the subgrade has been satisfactorily completed and approved by the Engineer.

The NZTA Specification B/2:2005 shall be deemed to be part of this specification except as modified hereafter.

Compaction of the sub-base shall be tested according to the Section 2 - Testing and shall comply with the specified criteria.

NAASRA roughness measurements will not be required.

3.6. Basecourse Layer

Material contained in this layer will typically consist of crushed metal for GAP40, or NZTA M/4:2006 AP40 or AP20.

No basecourse layer material shall be placed until all previous pavement layers have been satisfactorily completed and approved by the Engineer.

The NZTA Specification B/2:2005 shall be deemed to be part of this specification except Clause 14.0 and as modified hereafter.

If required, the degree of compaction in the basecourse shall be tested according to Section 2 - Testing and shall comply with the requirements of the Project Specification. No NAASRA roughness measurements on the unsealed surface will be required.

In addition to the requirements of NZTA B/2:2005 and any preceding requirements of this specification, approval of the basecourse and pavement as a whole shall be subject to testing with a Benkelman beam apparatus. The required deflection criteria shall be as noted in section 2: Testing unless specified otherwise.

3.7. Construction Layer Profiles

Each layer required to be constructed shall relate to the final shape as shown on the Drawings TS300 and TS304 or on the construction drawings.

In all cases the crown shall be confined to a quarter width of the lip to lip dimension, with a uniform grade to the channel lip or to other point as shown on the drawings.

Where the crown is required to be off-centre or the crossfall is not to be 3%, then the crown above the lip of channel, if not specified, shall be calculated from:

Crown = (10 Z x CF %) - (2 X x CF %)

Crown = actual crown height above lip of channel (in mm)
Z = distance from lip of channel to crown (in metres)
CF% = specified crossfall (in percent)
X = lip to lip of channel dimension (in metres)

The crossfall on the travelling lanes shall be between 2% and 6%. The desirable crossfall is 3%.

4. Ripping and cement stabilisation

4.1. Scope

This Specification applies to the treatment of those areas of pavement which are to be cement stabilised.

4.2. Ripping

The existing sealed surface and pavement shall be ripped and pulverised to the specified depth to allow shaping and, where required, overlaying of a nominal depth of basecourse as shown on the drawings.

If in the course of the work it becomes apparent that the nominal depth of ripping is not practicable or appropriate the Contractor shall inform the Engineer as soon as possible and shall not proceed without the Engineer's consent to a variation. Likewise the Engineer may order a variation in the nominal depth or extent of ripping.

There shall be no claim for a variation in the rate that this work is included under as a result of a variation in the depth or nature of ripped material unless in the opinion of the Engineer this renders the Contractor's declared plant and methods to be impractical and the use of alternatives is consequently required.

Unless otherwise agreed by the Engineer, overbreak and any consequent backfilling or repair shall be the Contractor's responsibility.

4.3. Use of ripped material

All material to be re-used shall be broken down by the ripping and pulverising processes such that it has a particle size no greater than 75mm and a grading that makes its shaping and compaction to a dense stable condition practicable.

The Engineer may reject any material for re-use which in the Engineer's opinion is unsuitable because of its nature, condition, particle size, or grading.

4.4. Placing, shaping and compacting of re-used material and imported basecourse overlay

Where the re-used material is to be subsequently overlaid with basecourse it shall be shaped and compacted such that it meets the profile on the drawings to a tolerance of plus 0mm to minus 20mm. Where the re-used material is to form the top of the pavement construction, the tolerances of NZTA Specification B/2:2005 shall apply.

Where imported basecourse is to be overlaid it shall be the Contractor's decision whether or not to compact the re-used material prior to this, except that no layer of uncompacted material shall have a thickness of less than 80mm or more than 200mm.

The basecourse construction, whether imported or re-used material, shall conform to the specification for basecourse construction given in Section 3 - Pavement Construction.

4.5. Cement Stabilisation of basecourse

4.5.1. Preparation

The rolling and compaction of the pre-stabilised basecourse shall be such that the pavement shape and density approximates that required of the post-stabilised pavement in its final shape.

The standard of finish required of the pre-stabilised pavement shall be such that pot-holing, ravelling and/or rutting does not occur under normal traffic loads.

4.5.2. Supply, Spread and Mix Cement into Pavement

A cement spreader which has no visible dust during operation or filling, apart from that produced from the product falling to the ground shall be used. The spreader shall be self-propelled and have the capability to electronically regulate the spread rate.

The cement shall be evenly spread over the prepared pavement at the specified rate. The application rate shall be checked before cement is applied to the pavement and must not differ by more than one half of one per cent by mass from the cement percentage calculated from the given spread rate. The pavement shall be stabilised to a depth of 200mm, unless specified otherwise.

The material to be treated shall not have cement spread or mixed in rain or if rain threatens. Material to be stabilised shall be within 2% of optimum moisture content.

Mixing shall follow immediately behind the spreader and in no case should there be a delay of more than one hour. After spreading the cement, no traffic shall be allowed to pass over the spread cement until the mixing has been completed.

Mixing shall be carried out, using either single or multi rotor machines, until the maximum particle size is no greater than 40mm. Mixing or remixing operations, regardless of equipment used, shall continue until the mixture is uniform and is free of streaks or pockets of cement.

4.5.3. Compaction

The compaction of the stabilized mix shall be completed within two hours of mixing.

The compaction shall be achieved by the minimum necessary number of passes of compaction plant.

Areas inaccessible to rollers shall be compacted to the required density by other suitable means.

4.5.4. Shaping

After compaction, the treated pavement shall be trimmed to the required shape. This process shall be one of cutting to waste and all surplus material shall be removed from site and disposed of.

Shaping to final levels must be completed for all stabilised pavement on the day of stabilising

4.5.5. Joints

(a) Longitudinal Joints

Care shall be taken to knit materials at all longitudinal joints and overlaps shall be provided during the mixing operation.

Where the works adjoin the existing road surface joints are to be sawcut to give a vertical face.

(b)Transverse Joints

All transverse and construction joints shall be either made in thoroughly compacted material, normal to the centreline of the road, with a vertical face or made by overlapping with the next mixing operation. Where the works adjoin the existing road surface joints are to be sawcut to give a vertical face. All loose material will be removed from the joint before the next mix is compacted in place.

4.5.6. Curing

Upon completion of the mixing, pulverisation, compaction and shaping of the cement stabilisation, the Contractor may, with the Engineer's consent, supply and spread uniformly over the entire pavement surface, GAP20 running course aggregate at the specified rate.

Pending the construction of the seal coat the uniform spread of the running course aggregate shall be maintained at all times by drag-brooming. The traffic shall be controlled by temporary speed restrictions and during working hours, it shall be channelled by suitably defined traffic lanes, with frequent transverse shift of the defined lanes to obtain an even spread of traffic over the entire surface. The Contractor shall provide a programme for this traffic management.

The Contractor shall maintain the pavement surface and running course in a damp condition for a minimum of three days.

4.5.7. Defects to be remedied

Any defects or damage of any nature caused by or resulting from the operations of the construction or maintenance of the pavement course shall be made good immediately.

4.5.8. Cement Contamination

All practicable means shall be used to prevent cement contamination where it is likely to cause harm, nuisance or annoyance to persons or damage to property in any street, public place or in private property in the vicinity of the site.

4.5.9. Signs

The Contractor shall ensure the appropriate signs are placed at the extents of the work to inform the public of the cement stabilisation process, e.g. "Cement Splashes - Wash Car Today" being NZTA rule W7-5.

4.5.10. Sealing, Surface Shape and Roughness

The requirements of Section 3 - Pavement Construction, Section 10 - Road Surfacing and Section 2 Testing, shall apply to areas subject to "Ripping and Cement Stabilization".

5. Rip and Relays

5.1. Scope

This Specification applies to the treatment of those areas of pavement which are to be ripped and relaid, or ripped, have basecourse added and then relaid.

5.2. Ripping for relay

The existing sealed surface shall be ripped (and pulverised) so that the surfacing material can become integrated with the existing basecourse. Any surfacing material which is unable to be integrated following the ripping shall be removed off site.

5.3. Ripping to allow placement of additional basecourse

Where an additional basecourse overlay is to be placed on top of the existing sealed surface and pavement, the sealed surface is to be ripped sufficient to allow for the overlay to become integrated into the existing pavement and to break up the sealed surface to allow moisture movement.

5.4. Replacement of basecourse after ripping

Material contained in this layer shall consist of crushed metal to WHAP40, or NZTA M/4:2006 AP40 or AP20, as specified or directed in the drawings.

The basecourse overlay is to be placed to the depths and profiles indicated in the drawings such that minimal reshaping is required.

6. Pavement rehabilitation

6.1. Scope

This Specification applies to the treatment of those areas of pavement which are to be rehabilitated by digouts, asphalt smoothing and crack sealing. These treatments either singly or with others will by their nature be used only on parts of the carriageway.

The areas of excavation, crack sealing and smoothing are to be marked on site and approved prior to the work commencing.

6.2. Digouts

6.2.1. Shallow Excavation

Excavation shall be to a depth (minimum of 200mm) which removes all unsuitable weak, distressed and loose material to expose a firm level base which, with or without compaction, achieves the required CBR as follows:

i) CBR value greater than 20 down to 300mm below base of excavation.

ii) CBR value greater than 15 at a depth of 300mm or greater.

The excavated material is to be removed and disposed of unless directed otherwise. The Contractor shall be liable for the repair of any undermining or overbreak.

6.2.2. Existing Subgrade Layer

Scala penetrometer tests shall be carried out as detailed in Section 2 - Testing or as dictated by the size of the digout. Should the test not meet the requirements specified, the area shall be reworked until such time as these requirements are met.

Compaction shall not continue if the material shows signs of excessive weaving or heaving, until the problem has been resolved.

The existing subgrade shall be tested to ensure the required CBR has been achieved. If the strength of the existing subgrade does not meet the required criteria then it shall be undercut and replaced with imported subgrade material.

The entire surface of the existing subgrade shall be made smooth, firm and uniform. The reduced level of any point shall be within the limits 0mm above to 50mm below the designated or nominated level.

6.2.3. Imported subgrade (run of pit sand) layer

The imported subgrade material shall be "pit sand" as specified in Section 1 - Materials, and shall comply with the requirements of Section 3 - Pavement Construction.

6.2.4. Basecourse in areas of dig out

No basecourse layers shall be placed without the Engineer's approval of the surface of the subgrade. The basecourse layer shall consist of WHAP 40 or NZTA M4 AP40 placed in layers not exceeding 200mm in depth. The basecourse shall be compacted to the CBR specified.

The finished basecourse surface shall have a tight stone mosaic surface, with no loose metal, and be a suitable level for the application of a tack coat and an asphalt layer. A compacted integral skin of WHAP 20 may be required to ensure the surface requirements are achieved.

6.3. Pre-emergent Weed spray

In areas where kerb and channel exist, the pavement course from the channel to 600mm from the channel shall be treated with a pre-emergent chemical approved by the Engineer and used at the strength and rate of application as recommended by the manufacturer.

All safety precautions, in particular the use of protective clothing, face masks, gloves etc, shall be rigidly adhered to during mixing and spraying as required by the manufacturer's labels and literature accompanying the chemicals used.

Consideration of the public over and above their protection in the safety aspects shall be maintained at all times. Spraying near schools shall not be carried out when children are likely to come into close proximity of the spraying.

Care shall be taken when applying weedkillers to ensure that no harm is done to any vegetation on adjoining private property or to the area of berm to be grassed, and those applying it shall be held responsible for any claims for damage to gardens and/or lawns etc caused by this operation.

6.3.1. Asphalt Patch Surfacing

After the basecourse surface has been approved by the Engineer, a tack coat of 180/200 cationic emulsion shall be applied at a rate of 0.3 litres per square metre residual at 15°C.

The surfacing shall consist of a Mix 10 Asphalt nominally 30mm deep (compacted) and laid in accordance with NZTA Specification P/9 1975 Construction of Asphaltic Concrete Paving.

The asphalt surface shall be flush with and neatly abut the surrounding undisturbed chip seal surface. No depression or irregularities that would cause water to pond will be permitted in the finished surface.

6.4. Asphalt Pre-Levelling and Levelling Coat

The areas that require pre-levelling and/or levelling prior to the work commencing shall be marked out.

The areas concerned shall be swept until all debris and loose chip have been removed. A tack coat of 180/200 penetration cationic emulsion shall be applied to the surface at a rate of 0.3 litres per square metre.

The following mixes shall be used unless otherwise specified.

0-40mm depressions - Mix 10
40-65mm depressions – 2 layers of Mix 10
65mm depressions and above - Mix 20 to -30mm+ Mix 10

The asphalt layers shall be placed in one continuous run after the application of the tack coat and compacted by mechanical means. The edges shall be feathered so that there is no appreciable edge above or below the existing sealed surface.

The surface shall be smooth and conform to the cross-falls dictated by the existing surrounding sealed surface. Under no circumstances will surface irregularities that may hold water be permitted.

6.4.1. Measurement of Asphalt

Where Mix 10 and Mix 20 Asphaltic Concrete Pre-levelling and/or levelling Course are to be measured in tonnes, the following requirements shall be met.

Prior to delivery on site the Mix 10 and Mix 20 asphaltic concrete regulating course delivery truck must be weighed at a weighbridge with a current certificate of accuracy from an A.P. accredited agency. The Certificate of Compliance shall be in accordance with regulation 15F of "Weights and Measures Act - 1987".

If there is excess asphaltic concrete from any delivery then the truck shall return to the same weighbridge utilised prior to delivery for the nett weight of asphaltic concrete used on site to be calculated.

All dockets are to indicate:

i) time and date of dispatch of asphaltic concrete delivery truck
ii) time and date of weighing of delivery vehicle upon return to weigh bridge
iii) weight of vehicle upon departure from weighbridge
iv) weight of vehicle upon return to weighbridge
v) net weight of asphaltic concrete delivered to site

Dockets shall be forwarded to the Engineer as soon as practicable after the delivery of the asphaltic concrete to site.

Prior to the work, the Contractor shall submit for approval a conversion table showing the equivalent tonnage per cubic metre of each type of material to be used.

6.5. Crack Sealing

6.5.1. Preparation and Cleaning

All cracks shall be pressure cleaned, with raised and protruding edges trimmed off and loose material removed. The larger cracks (greater than 5mm) shall be gouged, where necessary, to remove wedged in or non-compressible debris or, when instructed by the Engineer, cracks shall be saw cut. Old filler material in cracks previously treated shall be removed as directed by the Engineer.

The joint cavity shall then be dried thoroughly either by a combination of forced air and heat or by drying naturally.

6.5.2. Inspection

All prepared cracks shall be inspected by the Engineer immediately prior to the sealing work commencing. Any sealant applied without the Engineer's prior approval shall be removed, and the crack again prepared for sealing as set out above.

6.5.3. Crack Treatment

The bonding surfaces shall be primed with a primer compatible with both the existing material and he crack filler. The primer may be sprayed or brushed on and shall be completely dry before the filling material is poured.

The filler material shall be poured or jetted into the crack so that the final level is approximately flush with the road surface. Excess material shall be struck off using a stripper to form a "bandage" which extends 30mm each side of the joint. The primer shall extend 15mm wider than the bandage.

Traffic shall be kept off the treated cracks for a period of time sufficient to allow the sealant to cure.

The finished surface shall be dusted with fine sand, limestone dust, crusher dust or cement to prevent "pick up" by vehicles.

The depth of the filler shall be not less than the width of the crack nor greater than three times the crack width.

6.5.4. Sealant

The filler material shall be Techniflex PMB4, Samifilla, or material with similar specifications and shall be heated on site to the temperature recommended by the manufacturer in a suitable container fitted with a thermometer and a means of mechanical agitation and temperature control.

The temperature shall be strictly controlled to avoid damage caused by overheating and to avoid unsatisfactory behaviour of the sealant due to pouring at temperatures lower than those specified by the manufacturer.

Once the sealant has reached the pouring temperature it shall be discharged into the cracks as soon as possible and in any case before a period of two hours at the pouring temperature, has elapsed.

Sealant which has been heated and allowed to cool, or has been heated for more than two hours at pouring temperature, shall not be reheated but shall be rejected and removed from the site.

7. Grader laid asphalt pre-levelling

7.1. Scope

This Specification describes the work required to lay Mix 10 and Mix 20 asphaltic concrete by grader as a pre-levelling treatment prior to a resurfacing.

7.2. Grader Type

The grader shall be of a type and size that can cope with the requirements of the work. The grader shall be fitted with smooth (i.e. treadless) tyres to ensure that no imprints are left in the asphalt surface.

7.3. Limits of Asphalt Pre-Levelling

The limits of the areas to be pre-levelled and the type of mix to use shall be determined with regard to depth and size of area and the specified requirements, and shall require the approval of the Engineer.

7.4. Preparation

The carriageway surface shall be swept clean to ensure all loose chips and debris has been removed.

7.5. Use of Mix Types

The following mixes shall be used unless otherwise stated in the Project Specification:

0-40mm depressions	Mix 10
40-65mm	Mix 10 in 2 layers
65mm & above "	Mix 20 to -30mm plus 30mm Mix 10

7.6. Laying of Asphalt

7.6.1. Tack Coat

A tack coat of 180/200 penetration cationic emulsion shall be applied to the surface at the rate specified.

7.6.2. Application of Pre-levelling Course

All pre-levelling coats shall be laid in layers not exceeding 40mm in depth.

The edges shall be feathered out to the minimum depth of asphalt possible, without segregation taking place. Where two or more layers are required, the next layer shall be laid immediately after compaction of the lower layer has been completed.

Where a paver-laid final levelling layer is specified the surface of the final compacted grader laid layer shall not be less than 30mm below the final surface level.

Compaction of each layer shall take place immediately after laying using the appropriate compaction equipment.

7.6.3. Final Levelling Surface Requirement

The surface of the final pre-levelling coat shall be homogenous, smooth and have no signs of areas of possible water ponding. The overall surface shall correspond in level and shape to the existing surrounding surface. The interface between the final levelling coat and surrounding surface shall be as smooth as practical and shall not be a hindrance to water run-off.

7.6.4. Tolerance

The acceptable tolerance for the final surface of the levelling coat, however placed, shall be plus zero minus 6mm when measured by a 5m straight edge placed at any position on the final levelled surface.

7.6.5. Measurement Requirements for Tonnage

Where the asphalt is specified, it shall be paid for on a per tonne basis. Clause 6.4.1 shall apply.

8. Concrete works

8.1. General

This specification covers all concrete work for paths, vehicle crossings, various kerbs, kerb & channel and cut downs for vehicle and pram crossings. These shall all be formed to the dimensions shown in the Standard Cross Sections and Details.

The New Zealand and Australian Standards that form part of this specification are:

- NZS 3104:2003 Specification for Concrete Production
- NZS 3109:1997 Concrete Construction
- NZS 3114:1987 Specification for Concrete Surface Finishes
- NZS 3121:1986 Specification for Water and Aggregate for Concrete
- NZS 3122:2009 Portland and Blended Cements
- AS/NZS 4671:2001 Steel Reinforcing Materials
- AS 3582 Supplementary materials for use with Portland and Blended Cement
    - Part 1:98 Fly Ash
    - Part 2:01 Slag

The strength of concrete as defined in NZS 3109:1997 shall be 20 MPa at 28 days.

8.2. Framework

Formwork shall generally comply with the requirements of NZS 3109:1997 as amplified below.
Formwork shall be used wherever necessary to support and confine the concrete and shape it to the required dimensions. Joints and linings shall be sufficiently tight to prevent loss of water from the concrete.

All timber for formwork shall be of an approved quality and kind, and for kerbs and channels shall be ex 40mm material, provided that 15mm timber or other suitable material may be used on short radius curves. Formwork shall be of sufficient depth to fully support all vertical faces and where supporting exposed surfaces, shall be long lengths, thicknessed and dressed smooth on one face and both edges.

Timber strips for chamfers shall be machined all round to be true to shape and form and they shall be kept in perfect order. Alternatively the chamfer or bull-nose may be formed with a specific floating tool.

Steel forms, where used, shall be of approved design and shall be maintained in perfect condition. The joints between lengths shall be secured accurately during concreting to maintain a good line in the finished work.

Formwork shall generally comply with the requirements of NZS 3109:1997 as amplified below.

Formwork shall be used wherever necessary to support and confine the concrete and shape it to the required dimensions. Joints and linings shall be sufficiently tight to prevent loss of water from the concrete.

All timber for formwork shall be of an approved quality and kind, and for kerbs and channels shall be ex 40mm material, provided that 15mm timber or other suitable material may be used on short radius curves. Formwork shall be of sufficient depth to fully support all vertical faces and where supporting exposed surfaces, shall be long lengths, thicknessed and dressed smooth on one face and both edges.

Timber strips for chamfers shall be machined all round to be true to shape and form and they shall be kept in perfect order. Alternatively the chamfer or bull-nose may be formed with a specific floating tool.

Steel forms, where used, shall be of approved design and shall be maintained in perfect condition. The joints between lengths shall be secured accurately during concreting to maintain a good line in the finished work.

8.3. Concrete Mix and proportions

Concrete mixes shall be proportioned to be workable and capable of being thoroughly consolidated by the means of compaction available and produced to provide the specified strength of concrete. The concrete may be either ordinary grade, high grade or special grade as defined in NZS 3109:1997.

The concrete used shall be either made on the site, or supplied ready mixed. In each case, the concrete production shall be in accordance with NZS 3104:2003.

8.4. Placing Concrete

The Contractor shall give due notice to the Engineer of the time it is intended to place any concrete and no concrete shall be placed until consent has been obtained from the Engineer.

Concrete shall not be placed on frozen ground nor shall it be placed in unfavourable conditions which may be detrimental to the quality and finish of the concrete. Unfavourable conditions shall be deemed to include low temperatures (below 5°C with temperatures descending, or below 2°C with temperature ascending), excessively hot, dry conditions, excessively wet conditions, or any conditions making it impractical to work and finish the concrete adequately.

Immediately prior to placing the concrete, the foundations shall be lightly damped, and formwork shall be cleaned out. In all cases surplus water shall be removed before concrete is placed.

The concrete shall be placed so that the coarse aggregate will not be separated from the rest of the material, and it shall be thoroughly worked and consolidated into all parts of the formwork, so that no voids or cavities are left. All concrete shall be handled from the mixer, or from the agitator or truck mixer, to the place of final deposit as rapidly as is practicable by methods which shall prevent segregation.

Unless otherwise approved, in no case shall more than 30 minutes elapse between discharge of concrete from the mixer or agitator truck and final placement. Under no circumstances shall partially hardened concrete be placed in the work.

Where a channel is finished with a sand/cement mortar coat, the mortar shall be placed within two hours of placing the concrete, provided that when hot dry conditions are prevailing, the allowable time shall be reduced to one hour.

If for any reason, a delay of more than two hours occurs, an approved PVA bonding agent shall be used to ensure that the mortar is adequately bonded to the concrete.

Before fresh concrete is placed upon or against any concrete which has already hardened the surface of the hardened concrete shall be thoroughly roughened and cleaned and cleared of all laitance, loose or foreign matter.

8.5. Reinforcement

All reinforcement other than ties and stirrups shall be deformed unless otherwise detailed.

The length of lapped splices (without hooks) shall be 40 bar diameter in length.

Steel reinforcement, at the time concrete is placed, shall be free from loose flaky rust, mud, oil or other coatings that will destroy or reduce the bond.

Reinforcement shall be accurately placed, adequately supported and secured against displacement prior to or during concrete placement.

The minimum cover to all main reinforcing steel shall be 50 mm (in all three dimensions) unless otherwise specified. Reinforcing in slab-on-ground (eg vehicle crossings) shall be supported on 'chairs' so as to maintain the location of the steel design.

8.6. Curing of concrete

Strict attention shall be paid to adequate curing, which is an important factor in attaining the required strength for the concrete.

From immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures and mechanical injury, and shall be maintained with minimal moisture loss for the period necessary for hydration of the cement and hardening of the concrete.

In cold or wet weather, concrete shall be protected from the elements during the curing period by covering with sacks or other approved material.

8.7. Machine Laid Kerb and Channel

Contractors who intend to construct the kerbs and channels by using an extrusion machine will be required to use an approved ready mixed concrete. The concrete provided shall be designed so that after placement it will accurately retain its shape and present a good surface. No subsequent cement washing will be permitted. The machine shall be capable of providing well compacted concrete with the absence of entrapped air.

The machine shall not be used to pour curves with radii less than 5 m. For these curves the Contractor shall use formwork as specified.

A properly shaped screed or profile shall be used in forming cut-downs at vehicle and pram crossings.

8.8. Finished work

Methods shall be used that will provide a smooth, clean and even surface on the exposed faces of all concrete work, and will obtain the required finish directly on the

structural concrete without the use of mortar renderings, provided that, if specific prior approval of the Engineer is obtained, the channel may be finished with a layer of mortar separately applied to its surface. In such case, the mortar shall consist of not more than two parts of approved sand to one of cement. It shall be nominally 6mm in thickness and shall be placed before the initial set of the concrete, and in any case within two hours of placing the concrete.

Alternatively a mortar layer to the above consistency may be applied in conjunction with the laying of the kerb and channel when the kerb and channel is laid by machine and the machine is designed for such use.

The top and face of the kerb and the channel surface shall be floated over with a steel tool before the concrete has finally set. No depressions which may hold water will be permitted. Only workers expert in this particular type of work are to carry out the finishing.

The surface finishes of all kerb and channel, whether machine laid or hand laid, shall be uniform in colour, texture and shape.

8.9. Backfilling against concrete work

Backfilling against the kerb and channel or any other concrete structure shall take place as soon as practicable after the concrete has reached sufficient strength with particular emphasis at curves, corners, intersections and pedestrian kerb crossings.

Care shall be taken to ensure that no damage is done to the path, crossing, kerb and channel or other concrete structure when placing and compacting the backfill.

8.10. Final surfaces – for footpath and vehicle crossing areas

All final path and vehicle crossing surfaces shall be true to the lines, levels and grades specified. Design considerations excepted, the final surface shall not vary by more than 5mm when checked with a 3m straight edge. No finished surface shall hold water.

9. Kerb and channel, Catchpits and Subgrade drainage

9.1. Kerb & Channel within Existing Pavement

Attention is drawn to the Standard Cross Section details and to Section 8 - Concrete Works.

9.1.1. Kerb and Channel Removal

Prior to the work commencing, the lengths of kerb and channel that are to be removed shall be marked on site and agreed with the Engineer.

9.1.2. Saw Cutting

Prior to removal, the kerb & channel shall be sawcut vertically to ensure a clean break. The existing sealed surface shall be cut by saw parallel to and at a distance of 500mm, or greater if required, from the existing channel lip. The seal shall also be cut perpendicular to the kerb from the point of kerb removal to the parallel seal cut line.

If the kerb & channel to be removed abuts against any berm seal (e.g. sealed footpath) the sealed surface shall be saw cut at a distance behind the kerb face suitable for reinstatement.

9.1.3. Excavation to Pavement Depth

Refer to Standard Details for excavation dimensions.

After saw cutting, the kerb and channel and pavement shall be excavated to the proposed pavement depth or deeper if required. The sides of the excavated area shall be trimmed to be as near as possible to vertical.

Care shall be taken to ensure that undermining and/or overbreak does not occur during excavation.

All waste material including the old kerb and channel shall be removed from the site and disposed of.

9.1.4. Subgrade Preparation

The exposed subgrade (at the required depth), shall be tested using a standard scala penetrometer. The prepared subgrade shall be compacted to the CBR specified. If the material fails this initial test it shall either be:

- further compacted, if the material is suitable, to improve the CBR value, or
- excavated and removed from site, then backfilled with pit sand and compacted to the subgrade level.

All pit sand backfill shall be compacted in lifts of not more than 100mm.

The subgrade area either insitu or imported shall be trimmed and shaped to accommodate the specified lines and levels given and compacted to provide uniform support for the pavement course.

All tree roots found in the subgrade or pavement area during excavation shall be removed. They shall be severed 0.5m behind the back or front of the kerb and be removed off site. Any root greater than 50mm in diameter shall be cleanly saw cut. No such roots shall be cut without the prior approval of the Engineer if they are within the drip line of the tree.

9.1.5. Kerb and Channel Foundation

After the subgrade has been satisfactorily completed to line and level a compacted layer of GAP 40 75mm deep shall be placed. Compaction shall be to refusal.

The surface of the GAP 40 shall be smooth and uniform, suitable for the placing of the kerb and channel concrete.

9.1.6. Kerb and Channel Placing

Refer to Clause 8 - Concrete Works for the placement of kerb and channel.

9.1.7. Carriageway Reinstatement

After the kerb & channel concrete has hardened the carriageway shall be reinstated to marry into the existing carriageway and new kerb & channel lip.

If not already achieved during the kerb base construction, the carriageway shall be excavated to a minimum depth of 225mm at the channel face. The excavation base shall be flat and level up to the edge of the saw cut seal. All excavated faces shall be vertical.

The subgrade shall be compacted to a CBR of at least 10.

The specified basecourse metal (either GAP40 or NZTA M4 AP40) shall be placed on the prepared subgrade in layers not exceeding 150mm and compacted to refusal. The depth of basecourse is dependent on the surfacing, either asphalt or chip seal, but in no circumstances will it be less than 175mm (i.e. 50mm of asphalt surfacing). In areas where kerb and channel exist, the pavement course from the channel to 600mm from the channel shall be treated with a pre-emergent chemical approved by the Engineer and used at the strength and rate of application as recommended by the manufacturer.

9.2. Kerb & Channel in new pavement

9.2.1. Refer 8.1

As per 8.1 except all references to carriageway protection and reinstatement (i.e. sawcutting of carriageway, vertical face of excavation in carriageway, etc) shall not be required for this activity.

9.3. Catchpits

9.3.1. General

Refer Drawings No. TS 347, 348, 349, 350 and 351.

The precast components shall comprise either:

675 x 450 x 1650 Catchpit Flat Top	Hynds/Humes
675 x 450 x 1650 Catchpit Top (Back Entry)	Hynds/Humes
600 dia x 1800mm Circular Sump Barrel	Humes
750 dia x 1800mm Circular Catchpit Barrel	Humes
225 dia x 1200mm Socketed Culvert Pipe Class X	Hynds/Humes
675 x 450 x 1650mm Rectangular Catchpit Barrel	Humes
675 x 450 Cast Iron Grate and Frame	Humes/Surecast
300 dia Cast Iron Grate to suit socket of 225 dia culvert pipe	
610 x 310 Galvanised Web Grate and Frame	Hygrade/Humes
Fish Symbol	Surecast/Castech

The 'fish' symbol shown on drawing TS350 shall be used when the drainage system under construction discharges to fresh water.

The construction specification as described in Part 4 – Stormwater and Wastewater Sewers, shall apply.

Catchpits shall be accurately positioned so that the grate and kerb block fit neatly into the kerb. Rectangular pits shall be oriented with the longer side parallel to the kerb.

Catchpit leads shall be of the size and material detailed on the plans or specification and shall discharge where detailed.

The connection of the lead into the catchpit shall be constructed as detailed in Part 4.

Alternative oil trap details may be permitted providing they achieve a similar result. Details of any alternatives proposed must be submitted for approval prior to construction.

9.4. Subgrade drainage

9.4.1. General

Refer Drawing No. TS 321.

Where subsoil drains are required as shown on the Drawings or directed by the Engineer, they shall be placed behind the kerb unless shown or directed to be in front of the kerb. The subsoil drains shall consist of an approved filter drainpipe 100mm to 150mm diameter or equivalent in a trench backfilled with an approved filter material around the conduit. The conduit shall have a grade not less than 1 in 200 to discharge into the catchpit.

Related Standard: Pipe Subsoil Drain Construction NZTA F/2:2000

9.4.2. Additional Subsoil Drainage

Where directed, any permanent wet spot in the subgrade shall be drained to the below the kerb drainage system. Where the wet area is below the level of the subsoil drain, it shall be drained using approved filter drainpipes connected to the nearest stormwater system.

9.4.3. Other Requirements

NZTA F/2:2000 filter material shall not be used as a filter material in close proximity to HDPE slotted pipe. Unless directed elsewhere in these documents, pea metal shall be for backfilling around HDPE slotted pipe. Where backfilling a subsoil drain with filter material to all sides of the pipe, the minimum cover shall be 100mm. Where strip drain is approved backfill with permeable sand.

The invert of subsoil conduits at the catchpit shall not be less than 100mm above invert of catchpit outlet (catchpit outlet invert is 1.0m below top of kerb).

10. Road Surfacing

10.1. General

The following NZTA specification shall be deemed to be part of this Specification

- P/3:1995 "Specification for First Coat Sealing"
- P/4:1995 "Specification for Resealing"
- M/6:2011 "Specification for Sealing Chips"

i) except that all references to the basis of payment contained within these NZTA Specifications are deleted.

ii) Reference to the Contractor's obligation with respect to the foreshortening of the maintenance requirements of the seal coat (NZTA P/3:1995, P/4:1995 - relevant Clause "Protection and Repairs of the Seal Coat") is deleted.

In all cases the spraying and chipping rates specified are for tendering purposes only. Actual application rates, cutback percentage and the percentage of adhesion agent will be specified by the Contractor and forwarded to the Engineer for consent at least 24 hours prior to application.

10.2. Two Coat Seal (first coat with wet locking coat)

A two coat chip seal shall be applied to the prepared basecourse surface.

The first layer shall consist of the supply and spraying of NZTA P/3:1995 180/200 penetration grade bitumen cut back to suit, plus 1 parts per hundred (p.p.h) adhesion agent, at a rate of 1.2 litres/m2 residual (measured at 15oC) and the supply, spreading and rolling of NZTA M/6:2011 Grade 3 chip at a spread rate of 75 m2/m3.

The second layer shall consist of the supply and spraying of NZTA P/3:1995 180/200 penetration grade bitumen cut back to suit, plus 1 p.p.h. adhesion agent, at a rate of 0.8 litres/m2 residual (measured at 15oC) and the supply, spreading and rolling of NZTA M/6:2011 Grade 5 chip at a spread rate of 150 m2/m3.

10.3. Two Coat Seal and open graded porous asphalt overlay

10.3.1. Two Coat Seal (First Coat With Wet Locking Coat)

A two coat chip seal as described in Clause 10.2 of this Specification shall be applied to the prepared basecourse surface.

10.3.2. Open Graded Porous Asphalt Overlay

The friction mix overlay shall be placed no sooner than 14 days after the application of the two coat chipseal.

The friction mix overlay shall be laid in accordance with clauses relevant in NZTA P/11:2007 "Specification for Open Graded Porous Asphalt".

The friction mix sealing shall consist of the supply and spraying of NZTA M/1:2011 tack coat with a quick breaking cationic bituminous emulsion at an application rate of 0.3 litres/m2 residual (measured at 15°C) and the supply, spreading and rolling of NZTA M/1:2011 friction course material. The thickness of the friction course shall be 30mm except at the lip of kerb and channel where it shall be 15mm thick, tapered from a point 600mm from the channel lip.

Prior to laying the open graded porous asphalt the new first coat chip seal shall be brought up to a suitable standard.

10.4. Two Coat Seal and asphalt concrete

10.4.1. Two Coat Seal (First Coat With Wet Locking Coat)

A two coat chip seal as described in Clause 10.2 shall be applied to the prepared basecourse surface.

10.4.2. Asphalt Concrete

The asphalt concrete shall be placed no sooner than 14 days after the application of the two coat chip seal .Asphaltic concrete shall be laid in accordance with clauses relevant to Mix 10 Asphaltic contained within NZTA P/9:1975 "Specification for the Construction of Asphaltic Concrete Paving".

Asphaltic concrete sealing shall consist of the supply and spraying of NZTA M/1:2011 Tack Coat with a quick breaking bituminous emulsion at an application rate of 0.3 litres/m2 and the supply, spreading and rolling of NZTA M/10:2010 Asphaltic Concrete.

10.5. Reseal (Chipseal and Dry Locking coat)

10.5.1. Application

This treatment shall be applied on carriageways to produce a uniform texture on surfaces that have an existing (old) seal coat or a combination of an existing (old) seal coat with asphalt patches or levelling (which have been texturised) or basecourse repairs (which have been two coat sealed).

The resealing shall not be applied until 14 days after the asphalt patching or levelling has been texturised or the basecourse repairs have been two coats sealed.

The asphalt repairs shall not be texturised until 14 days after being completed.

10.5.2. Chipseal and Dry Locking Coat. – Rural and Urban

This shall be grade 3 seal with a grade 5 lock in rural areas (greater than 70 kmh) and grade 4 seal with a grade 6 lock in areas of 70 kmh and under.

The reseal shall consist of supply and spraying of NZTA M/1:2011 180/200 penetration grade bitumen cut back to suit, plus 1 p.p.h Adhesion agent, at the rate to suit the chip size and the supply, spreading and rolling of NZTA M/6:2011 chip at a spread rate to cover the surface.

A dry locking coat of M/6:2011 chip shall then be supplied and applied in accordance with NZTA Specification P/4:1995, and spread at a rate to lock the reseal chip.

10.6. Requirements after chip sealing

10.6.1. Traffic Control

Unless otherwise authorised a temporary speed restriction of 30 km/h shall be used for 48 hours after the completion of rolling or until after the first sweep, whichever is the later.

10.6.2. Removal of Surplus Chip

All surplus chips shall be removed within 48 hours of the completion of rolling when the sealed surface is open to traffic. In specific cases, loose chip may be left for a longer period, particularly in turning areas at intersections where the excess chip shall be swept and removed at a later date as instructed by the Engineer. This is to help protect the new seal from the turning action of vehicles.

All surplus chips shall be removed from grass berms, driveways, parking areas and footpaths.

10.6.3. Protection and Repairs of the Sealcoat

Any bald areas exceeding 0.5 m2 shall be repaired within 5 days from the day of occurrence or reporting.

10.6.4. Road marking

If any road markings have been covered by the reseal, then temporary warning signs are to be maintained on site until the markings have been reinstated. These signs ‘W2-1.8’ (Land Transport Rule W2-1.8) and read “NO ROAD MARKING.

10.7. High friction or coloured aggregate surfacing

10.7.1. Overall Requirements

High friction or coloured aggregate surfacing shall be applied at locations specified by the Engineer. Both surfacing types generally use a specialised aggregate bonded to the road surface in an epoxy or polyurethane resin so are included in the same specification.

Proprietary surfacing systems shall be applied in accordance with the manufacturer's specification and by the manufacturer's approved applicators.

Documents that relate to this section are NZTA – M/6:2011 Specification for Sealing Chip

All technical documentation regarding the proprietary product or system to be used shall be submitted at the time of tender.

10.7.2. Binder

The binder shall be a suitable epoxy, polyurethane or other approved proprietary product compound. When used in conjunction with coloured aggregates the binder shall be pigmented to the same colour as the aggregate. Thermo plastic binders shall not be used. The cured binder shall be flexible so that it does not crack or delaminate under traffic loadings on non-rigid pavements.

The binder shall be capable of holding the aggregates so they do not become embedded or dislodged under heavy braking.

10.7.3. High Friction Aggregate

The aggregate shall be calcined bauxite or equivalent, which has a PSV greater than 70 when tested in accordance with BS 812: Part 114.

The grading of the aggregate shall be as follows:

less than 5% retained on 4.75mm BS sieve
less than 5% passing 1.18mm BS sieve

The aggregate shall be clean and free of foreign matter. The aggregate shall comply with NZTA M/6:2011 strength, shape and weathering resistance requirements.

10.7.4. Coloured Aggregate

The aggregate shall be a chemically inert, semi translucent, synthetic aggregate that complies with shape, strength and weathering requirements of NZTA M/6:2011 specification and is coated with colouring compound(s) to produce the specified colour. A suitable product is Synthite® manufactured by Omnicrete Pty Ltd. however alternative materials or methods that achieve similar results may be proposed.

The grading of the aggregate shall be as follows:

less than 5% retained on 4.75mm BS sieve
less than 5% passing 1.18mm BS sieve

The aggregate and binder system shall be designed to achieve a high level of colour retention and resistance to both traffic abrasion and weather such that colour is substantially intact and effective for at least 5 years from initial installation. The aggregate shall have a minimum PSV value of 50 when tested in accordance with BS 812: Part 114. The surfacing must be capable of being cleaned by high pressure water jet to remove dirt grime and debris in order to restore the colour.

10.7.5. Surface Preparation

The surface shall be clean of any dust, detritus or loose matter. Any oil visible on the surface shall be removed by washing with a detergent solution, followed by flushing with clean water or other suitable cleaning system.

The surface is to be completely dry before application of the binder.

All existing roadmarking, pavement markers, catchpits and kerbing shall be suitably masked so that only the road surfacing is coated.

The suitability of application to the pavement at the sites specified shall be discussed with the Engineer using the manufacturer's guidelines.

10.7.6. Mixing, Batching and Application

The Contractor shall follow the manufacturer's guidelines for the mixing, batching and application rates of product unless otherwise directed by the Engineer.

10.7.7. Curing & Aftercare

All masking shall be removed together with the binder adhering to it. During the curing period, no disturbances or trafficking of the treated surface will be permitted.

The cure time shall be to the manufacturer's recommendations as required due to the particular site conditions that exist at the time.

Before traffic is allowed on the area, all excess chip shall be removed. The Contractor will be required to remove any subsequent chip which may have eroded off the treatment.

10.7.8. Performance

The minimum performance requirements are:

SCRIM Value – shall be at least 0.7 ESC or as specified.

Aggregate Retention – a visual assessment of the surfacing shall be performed to assess the level of coverage and retention. Aggregate retention shall be assessed by determining coverage on any 300mm x 300mm area. The surface shall be rejected if any 3 locations have less than 95% chip coverage.

Texture Depth – the surfacing shall be rejected if any 3 locations have a mean profile depth of 1.0 mm or less (105mm sand circle if determined in accordance with NZTA T/3:1981 specification).

Cracking/Delaminating/Sliding – the surfacing shall be rejected if there are any of the above conditions present at the end of the 3 month defect liability period.

10.7.9. Cleaning

When cleaning of existing high friction or coloured surfacing is required a high pressure water jet or other suitable means shall be used to remove all dirt, grime, debris etc from the surface. Care must be taken to avoid damage to the surfacing.

11. Berm features

11.1. Scope

This Specification describes the work required to construct, reinstate or repair footpaths, vehicle and pram crossings, grass berms and planted areas, and traffic island infills.

11.2. Alignments, Lines, and Levels

The edge lines of kerbs, footpaths, vehicle crossings shall be perfectly straight between tangent points, and on curves shall sweep round without kinks, flats or angles in a smooth, true arc to the radius shown or directed. Design levels and alignments shall be strictly adhered to and the grade from level peg to level peg shall be even, provided always that at changes of grade the angle between the grades shall be eased so as to form a vertical curve or other form of smooth transition.

The entire berm area shall fall, at an even grade where possible, from the property boundaries to the kerb and channel.

11.3. Break out, removal and disposal

All existing berm features which are to be removed shall be broken up and lifted out so as to cause minimum damage to the surrounding features.

The outer limits of these marked areas shall be saw cut, except in the case of paving blocks or grass verges, before the damaged features are removed to provide a tidy interface between existing and replacement work.

Where salvaging of materials is specified, care shall be taken to ensure that as little damage as possible is done to units which are to be recovered, e.g. catchpits, gratings, frames, stormwater piping etc., and such units shall be neatly stacked on the site so as not to obstruct any footpath, vehicle crossing or roadway until they are reused or taken off site.

All spoil, broken path, concrete, etc, not for reuse, shall be removed from site and disposed of.

11.4. Excavation to pavement depth

Initial excavation shall be to the pavement depth as shown in the Standard Cross Sections and shall expose the subgrade.

The width of all excavation shall be no wider than necessary to construct or reinstate the various berm features. Specific restrictions on excavations are shown in the Standard Cross Sections and Details.

Where excavation adjoins existing berm features, or carriageways, care shall be taken so as not to undermine the existing surfacing while material is being removed. The sides of the excavated area shall be trimmed to slopes that are as steep as possible without being unstable or causing undermining

11.5. Subgrade Preparation

11.5.1. Testing

The exposed subgrade (excavated to trial subgrade level or pavement depth) shall be tested by using a scala penetrometer for compliance with the following CBR values:

i) In footpath and traffic island infill - CBR value >7 (3 blows per 100mm)

ii) In vehicle crossing and kerb and channel areas - CBR value >10 (4 blows per 100mm)

If the material fails this initial test then either:

i) the existing subgrade shall be further compacted if the material is suitable, to improve the CBR value, or if this is not applicable.

ii) the unsuitable material shall be excavated and removed from site, and replaced with pitsand compacted up to the trial subgrade level.

When treatment II) is required the excavation shall extend 100mm past either side of the edgeboards, or the outer limits of the construction area.

The depth and extent of this subgrade excavation shall be as instructed by the Engineer.

Note
Small pockets of material may require treatment rather than the entire subgrade area.

All pitsand backfill shall be compacted in lifts of not more than 100mm.

The subgrade area either existing or reinstated shall be trimmed and shaped to accommodate the specified lines and levels given and compacted to provide uniform support for the pavement course.

All tree roots found in the subgrade or pavement area during excavation shall be removed. They will be severed 200mm outside of the final edge alignments, removed from site and disposed of. Any root greater than 50mm in diameter is to be cleanly saw cut. No such roots shall be cut without the prior approval of the Engineer if they are within the drip line of the tree.

11.6. Timber Edging for Seal, Asphalt and Paving Block Paths and Vehicle Crossings

All footpaths and vehicle crossing edges shall be contained by either a concrete kerb or edging, or by timber edge boards which shall form part of the finished work.

Edge boards shall be held firmly in place with wooden pegs (50 x 25mm) or battens nailed to the outer edge at 1.0m centres and at every joining board. The pegs shall be in minimum lengths of 225mm or longer so as to be driven down into solid unyielding ground. Batter stakes may be used as pegs, driven down into firm ground and trimmed to correct lengths.

All pegs shall sit 15 to 25mm below the top level of the edge boards.

Edge boards shall be joined with 400mm long boards (either edge board offcuts or 75 x 25mm timbers) which will span the joint evenly and are nailed firmly in place. The top of the joining boards shall sit 15 to 25mm below the top level of the edge board

The spacing of wooden pegs shall be adjusted so that a peg is positioned alongside every joining board.

All timber edging shall be backfilled outside the construction area as necessary to protect the timbers from being damaged, or distorted from alignment and level, during the preparation and compaction of the pavement course.

All edge boards shall be set out using string lines and shall be true and straight at the completion of the work.

If directed by the Engineer, existing timber edging in good condition shall be adjusted for level, repegged and incorporated in the new footpath or vehicle crossing.

At all times excavation for timber edging replacement, installation or adjustment, shall be the minimum required to provide an adequate work space.

Note
Where the path edge adjoins existing kerb, the top of the kerb will be treated as the top of an edge board.

11.7. Pavement Course for all Berm features

The pavement course shall be constructed of bedding sand and/or GAP metal (NZTA-AP metal on occasions) and shall form a compacted pavement depth conforming to the Standard Cross Sections.

Where existing metal paths or vehicle crossing areas are to be upgraded on the same alignment and basically require to be "built up", less added metal may be required to achieve the specified pavement depth provided that the existing metal is considered suitable, complies with clause 11.5.1 above and is approved by the Engineer.

For chip seal and asphalt paths the final pavement surface shall have a tight stone mosaic surface, with no loose metal, suitable for the application of either a tack coat and an asphalt layer or a chip seal surfacing as appropriate. A skin of GAP 20 may need to be added to GAP 40 areas and compacted into place to achieve this.

All pavement courses shall be compacted to refusal in lifts of not more than 100mm.

11.8. Pre-emergent Weed spray

The whole of the footpath and vehicle crossing pavement course shall be treated with a pre-emergent chemical approved by the Engineer and used at the strength and rate of application as recommended by the manufacturer.

All safety precautions, in particular the use of protective clothing, face masks, gloves etc, shall be rigidly adhered to during mixing and spraying as required by the manufacturer's labels and literature accompanying the chemicals used.

Consideration of the public over and above their protection in the safety aspects shall be maintained at all times. Spraying near schools shall not be carried out when children are likely to come into close proximity of the spraying.

Care shall be taken when applying weedkillers to ensure that no harm is done to any vegetation on adjoining private property or to the area of berm to be grassed, and those applying it shall be held responsible for any claims for damage to gardens and/or lawns etc caused by this operation.

11.9. Chip Seal Surfacing – Vehicle Crossings

Note: Chip sealed footpaths are not permitted.
The section of the vehicle crossing that is contiguous with the footpath shall be formed with the same material as the footpath which not only allows a safe and continuous walkway but also indicates to drivers of vehicles using the vehicle crossing that pedestrians have the right-of-way.

Chip seal surfacing shall be carried out in accordance with the relevant clauses of Section 10 – Road Surfacing.

The prepared pavement shall be swept to remove all loose metal and debris before sealing takes place.

180/200 penetration grade cut back bitumen shall be sprayed at an application rate submitted by the Contractor and consented to by the Engineer. An adhesion agent shall be added to all bitumen brews.

Grade 5 Sealing Chip complying with NZTA Specification M/6:2011 - Specification for Sealing Chip, shall be used and spread at a rate directed by the Engineer.

Attention to rolling is required to ensure good chip adhesion.

The Contractor will be required to monitor the site and organise the pick up of excess chip once the seal coat has "settled down". All excess chip shall be removed from adjoining grass berm areas and from the kerb and channel.

11.10. Concrete footpaths and vehicle crossings

Concrete surfacing shall be carried out in accordance with the relevant clauses of the Section 8 - Concrete Works.

Where concrete paths are to be constructed steeper than 1 in 10, a permanent non-skid surface should be provided (broom finish or similar).

For cross section details refer Standard Drawings TS 308 and TS310

11.10.1. Crack Control

In concrete paths, crack control lines shall be formed or cut at vehicular crossing/footpath edges and along the path at a maximum spacing of 5.0m. All crack control lines shall be a minimum of 25mm deep.

11.11. Asphalt Surfacing

The prepared pavement shall be swept to remove all loose metal and debris prior to the application of a tack coat. The tack coat shall be applied to all surfaces against which the asphalt material will be placed generally at an application rate of 0.25 litres/m^2

Asphalt Mix shall be laid to the compacted depths shown in Drawing No. TS 310. The final surface shall be flush with the top of the edge boards and graded uniformly between them.

No depressions or irregularities that would cause water to pond will be permitted in the finished surface.

All asphalt shall be laid in accordance with NZTA Specification P/9:1975 - Construction of Asphaltic Concrete Paving, except that plant appropriate to the size of the area being surfaced shall be used.

11.12. Asphalt Overlay

Where asphalt smoothing or overlay is required the existing chip seal/asphalt surface shall be swept to remove all loose metal and debris prior to the application of the tack coat. Mix 5 shall be used to smooth irregularities up to a compacted depth of 20mm. For depths greater than 20mm, the following shall apply.

For 20-40mm, Mix 10 shall be used, 40-65mm, Mix 10 in 2 layers. For 65mm +, Mix 20 shall be used to -30mm, Mix 10 to -10mm and Mix 5 for the final 10mm..

12. Block Paving

12.1. Bedding Course For Block Paving

All bedding course will be laid in accordance with NZS 3116:2002 – Concrete Segmental and Flagstone Paving, as specified.

12.2. Laying of Paving Blocks

All paving blocks shall be laid in accordance with NZS 3116:2002 as specified and shall comply with Drawings No. TS 310, 312, 318A and 318B which take preference over the Standards.

12.3. Edge Restraints

Refer to Drawings No. TS 312 & 314.

Edge restraints shall be one of the following:

i) kerb & channel
ii) traffic island kerb
iii) concrete separating strip
iv) paving blocks on edge cast in concrete
v) timber edging

The drawings will specify paving block, the laying pattern and the type of edge restraint.

All pavers must be cut using a power saw unless otherwise specified.

13. Road openings and reinstatement

For all excavation and trenching work undertaken on a road that is administered by Matamata Piako District Council, a Corridor Access Request (CAR) is required.

Clauses with numbers in brackets refer to the National Code of Practice for Utility Operators' Access to Transport Corridors. Nov 2011 (NCoP)

13.1. General

All reinstatement shall be undertaken in accordance with the above Code of Practice.

A charge shall apply where a Principal Provider's Contractor does not submit a CAR for approval before commencing any excavation work, other than emergency work that is notified within one day of the start of emergency work

13.2. Temporary Traffic Management (Clause 5.3.3)

All temporary traffic management shall be as specifically accepted by the Kaimai Consultants in accordance with NZTA CoPTTM Level 1, except where the work is adjacent to a State Highway where Level 2 Temporary Traffic Management is required on the environs of the State Highway.

Where the work is in the environs of the State Highway, approval from the New Zealand Transport Agency is required.
If at any time it is proposed to carry out work which will necessitate a reduction in the number of lanes available to traffic on a State Highway or Regional Arterial Road – as defined in the MPDC District Plan, section 9.1.1 - a site specific sign layout shall be submitted for approval 5 working days prior to the work commencing.

Under no circumstances will a reduction in the number of lanes available for traffic on State Highways or Regional Arterial routes be permitted during the hours of 7.30 am to 9.15 am and 4.30 pm to 6.00 pm Monday to Friday, or during major public events.

For work on regional arterial roads, in addition to the requirement of NZTA CoPTTM Level 1, the first sign on the approach to the work site shall be a Level 2 sign and all signs shall have repeater signs erected on any central median.

13.3. Quality Assurance (Refer Clause 2.4)

All Principal Providers are required to comply with the MPDC Council In Code of Practice 2010 and the Transit Quality Standard (TQS2) being NZTA manual SP/M/034.

13.4. Health and Safety (Refer Clause 2.5)

Principal Providers shall provide a copy of their Health and Safety Policy.

13.5. Corridor Access Request (CAR)

Where a contractor applies for a CAR on behalf of a Principal Provider, evidence of this delegation shall be provided in writing to the Council.

13.6. Maintenance Notice (Refer Clause 4.7)

The works are to have a warranty period of two years.
All agreed maintance needs are to be completed at the end of the warranty period prior to applying for a Notice of Completion.

13.7. Normal Hours of Work

Work shall only be undertaken on site between the hours of 30 minutes before sunrise and 30 minutes after sunset, Monday to Saturday inclusive and then only if the visibility is sufficient to clearly see a person or vehicle 100m away. The only exemption is for works necessary to make the site safe due to inclement weather. No work shall be undertaken within 200m of any school between 8.30 am and 9.15 am and 2.45 pm and 3.15 pm.

No work on Sundays or Public Holidays shall be carried out without the prior approval of Matamata Piako District Council.

All works, excluding emergency works, undertaken in the CBDs of Te Aroha, Matamata, Morrinsville, and Waharoa shall be undertaken outside of normal working hours (i.e. 6.30 pm to 6.00 am) except where consultation has been undertaken and agreed by all adjacent business operators. Limits of the CBD areas are available from Kaimai Consultants.

13.8. Public Liability Insurance (Refer Clause 5.1.6)

Each Principal Provider shall provide a copy of each of their Contractors Public Liability Insurance certificates to Kaimai Consultants, Team Leader – Projects, demonstrating that a local authority extension clause is included, and the minimum value of the cover is $2,000,000.00 (two million dollars)

13.9. Warranty (Refer Clause 4.7)

Each Principal Provider is required to maintain sites for a two year period from the notice of completion.

All utility covers and above ground structures shall be maintained in a safe, sound and tidy condition similar to when they were installed.
Where a defect is identified during the two year maintenance period then the period between identification and rectification will be added to the period of maintenance liabilities (effectively “stopping-the-clock”).

Where a defect is evident at the end of the two year maintenance period, Council reserve the right to extend the maintenance period for a further twelve months after completion of defect rectification.

13.10. “One Metre Rule” (Refer Clause 5.6.2)

Where a Principal Provider believes that the 1 metre rule is not appropriate, they are required to contact Kaimai Consultants to arrange a joint site inspection at which the required limits of reinstatement will be confirmed. This inspection must be carried out at least 48 hours prior to the commencement of the work (excluding emergency work).

13.11. Trench Reinstatement (Refer Clause 5.5)

Trench reinstatement shall be in accordance with clause 5.5 of NCoP.
Excavated material may be reused for bulk backfill provided it is capable of being compacted to the required strength.

The contractor's Quality Plan shall include a testing regime to ensure that required compaction standards are met.

The following is an example testing regime that sets the minimum level of testing to be used. The contractor is responsible for carrying out all tests and making the results available to the Engineer.

Before placing any pavement layers, compaction testing of bulk backfill is required. The following are minimum test frequencies:

Trenches > 20.0 m long and < 1.0 m wide: 1 test in each 50 m length or part thereof.

Other excavations > 20 m2 in plan area or greater than 900mm deep: 1 test for each 50m2 plan areas or part thereof. Test sites are to be evenly distributed over the full area of the excavation.

Further tests may be required where there is visual evidence of inadequate compaction such as "weaving" or settlement.

Compaction testing of bulk backfill in cohesion less soils may be carried out using a Scala penetrometer (See clause 2.1). It is expected that this will be appropriate for the majority of backfill materials. Testing shall extend for the full depth of the backfill to within 300mm of the top of the buried service. Test results shall be reported as the number of blows required for each 300mm of penetration. Other test methods will be needed for cohesive soils. Compaction shall continue until all results meet the specified value.

Prior to resurfacing of openings in the carriageway, the compacted pavement surface shall be tested with a Clegg Hammer (Refer to clause 2.2.3)

At least 2 tests are required for all carriageway openings greater than 5 m2 but less than 20m2 in plan area. For areas > 20m2 1 test is required in each 20 m2 of area, evenly distributed. If a test at a point fails, 2 further readings shall be taken within 2.0m of the original test point. If both these readings pass the test shall be recorded as a Pass. Otherwise compaction and working of the pavement layer shall continue until all tests pass. The minimum acceptable value is 38 for sites within the traffic lanes of arterial or collector roads and 30 for other carriageways.

13.12. Surface Reinstatement (Refer Clause 5.6)

In the CBDs of Te Aroha, Matamata, Morrinsville and Waharoa, and on MPDC arterial roads, all works undertaken in the carriageway shall be reinstated immediately. Upon completion of the site works where permanent reinstatement cannot be undertaken immediately, temporary (e.g. cold mix) material shall be placed, with permanent reinstatement completed within 48 hours.

For work undertaken in the footpaths of the CBDs of Te Aroha, Matamata, Morrinsville, and Waharoa, all reinstatement shall be completed immediately upon completion of the site works.

Where works are undertaken on low volume roads (roads carrying less than 1000vpd, i.e. short cul-de-sac roads), compacted metal surfaces shall be permanently reinstated within 7 days providing a Traffic Management Plan is in place, and the metal surface is adequately maintained.

13.13. Steel Plates

Steel plates shall not be used on Matamata Piako District's roads or footpaths except where expressly approved by Kaimai Consultations', Team Leader – Projects.

13.14. Surface Reinstatement (Refer Clause 5.6)

The deviation in surface level shall not exceed +0mm and –10mm over a 3m straight edge, with no lip exceeding 2mm.

13.15. Stone Mastic Asphalt (SMA) Surfacing in Carriageway

Where an excavation is to be undertaken in a carriageway surfaced with SMA, the principal provider shall contact Kaimai Consultations', Team Leader – Projects to determine the appropriate asphalt reinstatement product.

13.16. Trenches in Chipseal Carriageways (refer Clause 5.)

Where excavation work is undertaken in a chipseal carriageway, the reinstatement required shall be as per an asphaltic concrete carriageway.

13.17. Slurry Footpaths

All slurry footpaths shall be reinstated as per asphalt footpaths.

13.18. Special Paving, Amenity Areas and Decorative Areas

All works shall be accordance with this CoP clause 12.
Consideration shall be given to thrusting of ducts, cables and pipes in these areas as these areas have a high-value surface and a high level of public activity.

14. Road signs and street furniture

14.1. General

For the selection of the name(s) of all new roads and streets, public and/or private, the Developer shall supply three names to Council in order of preference with the application for engineering approval. A brief explanation of the reasons for the selection shall also be submitted.

In general, road names that currently exist within Council's roading network will not be permitted
Council will arrange any necessary authority for regulatory signage and marking.

All costs associated with the gazetting and implementation of the traffic services shall be paid by the consent holder.

14.2. Sign design and construction

All signs are to be constructed and installed in accordance with:

i) The latest version of the appropriate NZTA Specifications covering sign formats, in particular:
   a) NZTA C/20 "Standard for Manufacture & Maintenance of Traffic Signs, Posts and Fittings"
   b) NZS 5414:1977 "Specification for the Construction of Traffic Signs"
   c) NZTA Manual for Signs & Markings Part 1: Traffic Signs (MoTSaM)

ii) Road Sign Manufacturers Association (RSMA) Compliance Standard for Traffic Signs

iii) Land Transport Rule: Traffic Control Devices 2004 and subsequent amendments.

MPDC specification or individual requirements will supersede standards set out in the above documents.

			Reflective Class					
Land Transport Rule - traffic control device	Sign	Road Category	Class 1W Prismatic	Class 1W Fluoro Red/Orange Prismatic	Class 1W Fluoro Yellow/ Green Prismatic	Class 1W Fluoro Yellow Prismatic	Class 1 High Intensity Prismatic	Class 2 Engineering Grade
A11, A12, A13	Advance direction	Specific						
A14	Street Name	All						
R1	Speed limit	All						
R2	Stop & Give Way	All						
R2-4	School Patrol	All						
R3	Direction & Placement	All						
R4	Lane Use	All						
R5	Road User	All						
R6	Parking	All						
	Ped Xing pole bands	All						
W1	Warning Temporary	All						
W2	Temporary Hazard Warning	All						
W3	Specific Temporary Warning	All						
W4	Temporary Lane Management	All						
W5	Closed / Detour	All						
W7	Other Temp. Warning	All						
W10,W11 & W12	Warning Permanent	All						
W10	PW Yellow VRU cat	Specific						
W10	PW Yellow	Specific						
W13	Road Width							
W15	Rail Xing	Specific						
W16	Pedstrian School etc	Specific						
W16-3	Belisha Disc	All						
W18	Misc.							
W20	Chevron & hazard	Specific						

All backs of signs are to be coloured “aircraft grey” No 693 as referred to in BS381C, or similar with a semi gloss finish, unless otherwise stated. Slate grey (as per the specs in 15.2 above is an approved alternative. Any uncertainty should be checked with the Engineer.

All signs shall have an aluminium substrate with radiused corners.

Mounting – unless specified otherwise, all signs shall be mounted to posts using 10mm galvanised bolts. A nylon washer is to be used on the front side of the sign to deduce the risk of damage to the reflective sheeting. Likewise the bolts are to be tightened in a manner that will not damage the sheeting.

14.3. Typical sign installation and location

14.3.1. Regulatory and Parking Signs

Regulatory signs are to be located in accordance with the specifications in 15.2 above. The following guidelines are additional to the above documents:

Height of Sign (except Keep Left, Bus Stop, Parking) in berm areas	a) 3.0m to top of sign (behind kerb line) b) 2.0m to top of sign (in traffic island)
Height of sign (Keep Left) in islands	250mm between bottom of sign and top of adjacent kerb. 1.5m from traffic island nose.
Height of sign (Bus Stop & Parking)	2.7m to top of sign
Longitudinal Offset (except Keep Left)	a) 5m (± 1m)* from tangent to intersecting road kerb line (behind kerb line) b) 3m from island nose (in traffic island) c) Keep Left: 1.5m from traffic island nose. Mobility: 1m back from front of park. Note: * Tolerance to accommodate possible site constraints
Lateral offset	a) Poles shall not be closer than 500mm from kerb line. Sign shall not be closer than 350mm from kerb face. b) In the centre of traffic islands with a maximum offset of 1m from island kerb face
Pole diameter shall be NB50 for Parking Signs and NB65 for all other regulatory signage.	

14.3.2. Parking Signs

With the exception of signs in the CBD parking areas, as shown on TS 367, parking signs shall be as detailed in accordance with the specifications in 15.2 above. (RP-4 or RP-4.1). Signs in the CBD shall be as detailed on TS 366.

14.3.3. Warning Signs

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Warning signs are to be located in accordance with the specifications in 15.2 above. The following guidelines are additional to this document:

Height of Sign (Except Diverge Signs and Chevron Boards)	3m to top of sign
Height of Sign (Chevron Board)	750mm to top of sign. Consideration should be given to road vertical alignment when determining sign height.
Height of Sign (Diverge Sign)	250mm between bottom of sign and top of adjacent kerb
Offset (Diverge Sign)	1.5m from traffic island nose.
Lateral offset (except chevrons in roundabouts)	a) sign to be 500mm from kerb line b) in centre of traffic island
Lateral offset (chevrons in roundabouts)	1m from kerb face and perpendicular to sight line of approaching vehicles approximately 50m from intersection

14.3.4. Information Signs

Information signs are to be located in accordance with the specifications in 15.2 above and the following guidelines are additional to this document:

Height of Sign (No Exit)	3m to top of sign
Height of Sign (Free Turn)	250mm between bottom of sign and top of adjacent kerb.
Height of Sign (Route Sign) (in place of chevrons sign in roundabouts)	750mm to top of sign or minimum of 250mm between bottom of sign and top of adjacent kerb; 100mm if the area is not planted.
Offset (Free Turn)	1.5m from traffic island nose
Lateral offset (Except Route sign)	a) sign to be 500mm from kerb line b) in centre of traffic island
Lateral offset (Route sign)	Sign to be 500mm from kerb face. If no kerb sign to be > 1.5m from the edge of seal

14.3.5. Signs on Cycleways or Shared Walkway/Cycleways

All signs installed adjacent to cycleways shall have a minimum clearance to the bottom of the sign of 2.2 metres. Mounting heights specified elsewhere shall be increased as needed to achieve this clearance.

14.4. Street Name Signs

14.4.1. Design

Street name signs are to be designed in accordance with the following specification:

Letter Height (except abbreviations see 14.4.2)	125mm for all road name signs with a single line of legend plus 60mm for any second line of legend
Letter Styles	NZTA Transport' Medium. Signs to include both upper & lower case letters, such as 'a', 'c', 'e', to be central on the blade.
Letter Spacing	Standard spacing up to 12 letters, over 12 letters to be condensed to 70% unless directed otherwise by the Asset Manager. All lettering to have minimum 60mm clearance to the end of the sign
Blade Depth	200mm for all road name signs or 225mm where 2

	lines of legend are required. The depth of the "I" extrusion shall be the measurement of the flat surface available for the application of the sign background surface. This measurement is referred to as the "target/reflective depth".
Blade Profile	A purpose designed, one piece, "I" section aluminium extrusion manufactured from allor 6106 – T6 or equivalent as referred to in the Aluminium Development Council of Australia Standard, with 90deg cut at each end.
Colours	White refectorised lettering on blue refectorised background, except for 'Rapid' number plates which shall be 60mm reflective red numerals on white reflective background. All reflectorisation to be High Intensity Prismatic.
"No Exit" and "Rapid" numbering	Separate plate mounted below the road name plate by means of a female extrusion which slide onto the base of the main sign and is crimped in place. Signs shall be either T5 or T6 Tempered aluminium "I" extrusion 135mm target/reflective depth and attached to the underside of the road name plate. Letter to be 60mm upper and 40mm lower case transport medium to the same specification as the road name sign. Rapid numbering numerals to be 60mm.
Arrows	White refectorised triangular arrow at the end of name plates as per TS327,328 & 329.
Attachment to Pole	As detailed in TS 358 and 359
Poles to be NB50	

14.4.2. Legend

The following are the abbreviations to be used on all street name plates:

i) Avenue – Ave
ii) Close – Cl
iii) Court – Ct
iv) Crescent – Cres
v) Drive – Dr
vi) Parade - Pde
vii) Way – Way
viii) Place – Pl
ix) Rise – Rise
x) Road – Rd
xi) Street – St
xii) Terrace – Tce

The Legend 'Lane' shall only used for private roads.

These abbreviations are to have a letter height of 50mm and 75mm for secondary and primary streets respectively.

14.4.3. Location of Street Name Signs

Street name signs are to be located in accordance with the following specification. If there is a utility pole in the proposed location, then the signs may be attached to it. (See Note 4 TS 358). Refer to TS 327, TS 328 and TS 329 for layout at intersections

Height of Name Sign	3.0m between footpath & top of upper blade
Lateral Offset	Minimum 500mm, maximum 1500mm between closest part of name sign and kerb or seal edge. (Refer also a) below).
Number of Signs	To be in accordance with TS 327, 328 and 329
Double-sided Signs	All signs to be double-sided (except those on medians or at the head of "T" intersections).
Repeater signs on Primary Roads	Repeater plates are to be erected at every side road intersecting a primary road.
Median Island Low Level Street Name Signs	75mm to top of sign or minimum of 250mm between bottom of sign and top of adjacent kerb; 100mm if the area is not planted.

The following is in addition to this location specification:

a) Part of the sign blade should be located within 1500mm of the kerb face but provide at least 500mm clearance to the kerb face or seal edge.

b) Where it is not possible to locate the pole such that the sign complies with the table above and the footpath is not obstructed, the sign may be reverse mounted.

Poles shall be either NB50 or NB65 steel poles, as appropriate to the type of sign required. All poles shall be galvanised, powder coated white, and capped with powder coated top caps. Installation shall be as 4.2.6 above.

14.5. Amenity Signs for Public Amenities

14.5.1. Design

Directional signs are to be in accordance with the following specification:

Letter Height	125mm
Letter Styles	as for Street Name signs
Letter Spacing	as for Street Name signs
Background depth	175mm
Blade profile	90° cuts at both ends
Colours	Blue refectorised lettering on a white refectorised background – all reflectorisation to be Engineering Grade
Arrows	Blue refectorised triangular arrow at the end of sign plates. Refer to TS 327, 328 and 329.

14.5.2. Location

Directional signs are to be located in accordance with the following specification:

Height of sign blade	3.0m between footpath and top of blade
Lateral offset	As for Street Name signs
Number of signs	Maximum of two directional signs per facility

Note: In addition to standard mounting requirements (TS 358), when amenity signs are to be attached to the same pole as a street name sign, they shall be located below the street name sign.

15. Roadmarking

15.1. General

This section covers all aspects of roadmarking, as well as the supply and fixing of reflective and/or non-reflective road studs and delineators, and the removal of roadmarking as required.

The latest version of New Zealand Transport Agency Specifications shall be deemed to form part of the Technical Specifications, except as modified or qualified hereafter.

- NZTA M/6:2011 - Specification for Sealing Chip
- NZTA M/7:2009 - Specification for Roadmarking Paint – White & Yellow
- NZTA M/7:2009 - Notes to Specification for Roadmarking Paint
- NZTA M/1:2011 - Specification for Raised Pavement Markers
- NZTA M/20:2003 - Specification for Long Life Roadmarking Materials
- NZTA M/20:2003 - Notes to Specification for Long Life Roadmarking materials
- NZTA M/24:2006 - Specification for Audio Tactile Profiled Road Markings
- NZTA P/12:2000 - Specification for Pavement Marking
- NZTA P/12:2000 - Notes to Pavement Marking
- NZTA P/14:1995 - Specification for Installation of Raised Pavement Markers
- NZTA P/22:2006 - Specification for Refectorised Pavement Marking
- NZTA T/8:2008 - Specification for Roadmarking Applicator Testing
- NZTA T/1:1977: - Specification for Long-Life Pavement Marking Material Applicator Testing

The latest versions of the following publications are also to be read as part of this specification

- TCD Rule New Zealand Transport Agency - Traffic Control Devices Rule 2004
- Guide to Urban Roadmarking NZTA
- MoTSaM Manual of Traffic Signs and Roadmarking – Part II - NZTA
- RTS 4:1991 Guidelines for Flush Medians NZTA
- CoPTTM Code of Practice for Temporary Traffic Management - NZTA
- NZRF Manuals Industry ‘Best Practice

15.2. Setting Out and Timing

The Contractor is to set out the proposed roadmarking in accordance with the approved drawings, and any location marking out provided by the Engineer, with modifications as necessary to make the "lines" pleasing to the eye. Roadmarking layout on plans shall take priority where they differ from the NZTA "Manual of Traffic Signs and Markings"

The Engineer’s approval of the set out is required prior to marking. In order to achieve this with least delay the contractor shall liaise with the Engineer and give at least 48 hours notice of when the setting out will be ready for Council to approve or amend.

Roadmarking which has been applied without approval of the set out and needs amending (in Council's opinion), shall be removed, at no cost to Council.

On new surfaces, marking of centreline, limit lines and other intersection markings such as Give Ways shall be completed within 48 hours of completion of surfacing. For roads that are not open to traffic, such as new subdivisions, these markings are to be completed before the road is opened to the public. Other markings on new surfaces shall be completed within 7 days of surfacing. For other works such as line removals or maintenance remarking, timing will be specified by the Engineer.

15.3. Paint Types

15.3.1. Paint Types

Unless specified otherwise by the Engineer, all roadmarking shall be carried out with Long Life or Waterborne paint. All paint shall have type approval to NZTA M/7:2009 Class A. All technical data pertaining to the paint and reflective beads shall be supplied as part of the tender documentation including information on product life cycle, including verification of NZTA M/7:2009 type approval.

15.3.2. Waterborne Paint

Waterborne paint shall be applied in accordance with NZTA P/12:2000 and NZTA M/7:2009, with the following amendments:
Clause 13.1 (a) NZTA P/12:2000 – replace with: The finished dry film thickness shall be 220 microns or greater for remarking and 300 microns or greater for new work as defined by the equation in NZTA P/12:2000."

15.3.3. Reflectorisation

a) Reflectorisation
All markings used for the control of moving traffic shall be refectorised. This shall be done by the use of Intermix Beads applied at a rate of 280g/m2.

b) Non reflectorisation markings
Shall be used only on lines used for guidance of parking.

15.3.4. Long Life

Where long life or thermoplastic materials are specified they shall be supplied and applied in accordance with NZTA M/20:2003 specification. The type of long life material proposed to be used and details of type approval to NZTA M/20:2003 specification shall be submitted with any tender or proposal.

15.3.5. New Markings

New markings shall be painted with waterborne and not acrylic paint

15.4. T/8 & T/12 Certificates and staff competence

All roadmarking equipment used for applying paint and glass beads shall have current NZTA T/8:2008 certification.

All roadmarking equipment used for applying long life or thermoplastic shall be certified as complying with NZTA T/1:1977 certification.

The senior operator of each roadmarking crew must have at least a minimum qualification approved by the Industry Training Organisation (ITO). At least one person in each roadmarking crews shall be a qualified Traffic Controller (TC) in accordance with Code of Practice for Temporary Traffic Management.

15.5. Raised pavement markers (Rpm)

All refectorised pavement markers are to be glass faced (long life) or equivalent with NZTA M/12:2007 type approval. Alternative products will be considered by the Engineer but must be supported with the appropriate technical data.

All pavement markers are to comply with NZTA M/12:2007 (and NZTA M/12:2007 notes). Installation of raised pavement markers shall comply with NZTA P/14:1995, the MoTSaM (latest edition), and any subsequent NZTA document (e.g. RTS 4:1991 "Guidelines for Flush Medians"). Further to this, the Engineer may require specific RPM layouts in certain locations.

Where ‘Active’ RPMs are specified these shall incorporate solar panels and LED lights so that they do not rely on reflected light. A suitable device is the Solarlite S Series marketed by Integrated Traffic Solutions. Other devices that deliver similar results may be acceptable but prior approval for their use must be sought from the Engineer, accompanied by full technical data.

15.6. Removal of Roadmarking

When redundant roadmarkings require erasure the Engineer will specify the method to be used.

15.6.1. Removal

When ‘removal’ is specified the roadmarking material (paint or thermoplastic) shall be removed from the road surface. Typical methods include grinding, sandblasting (wet or dry) and ultra high pressure water cutting but other methods will be considered. Care shall be taken so that damage is not caused to the underlying road surface and that ‘ghosting’ of the marking does not occur. Once complete, the surrounding area shall be swept clean of all sand, paint chips or other debris. This material shall be suitably disposed of by the Contractor. The Contractor is to ensure that no solid matter can enter any waterway or stormwater system as a result of the removal operation. This could require the placement of filters or similar on catchpits etc.

Details of methodology, including materials to be used, equipment, staff skills and qualifications and quality assurance shall be supplied with tenders or proposals.

15.6.2. Paint Blackout

When short term or semi permanent erasure is adequate the redundant markings may be specified to be over painted with black paint. The paint material shall be one of the paint types specified in Clause 15.3 and should ideally be the same type as the underlying marking. The colour of the paint should be a near match with the colour of the adjacent road pavement. The 'Blackout' shall overlap the edges of the redundant marking. The edge of the overlap should be irregular to minimise the amount of 'ghosting' of the old marking – particularly in wet conditions.

15.6.3. Cold Applied Plastic Blackout

Permanent erasure of markings may be specified to be carried out with cold applied plastic (CAP) material. Existing long life markings or multilayered paint markings should be ground off before applying CAP Blackout. The base coat shall be a 2 component cold plastic designed and formulated for use as a roadmarking material and generally complying with NZTA M/20:2003 specification. The CAP shall be pigmented to a grey or charcoal colour that is close to the colour of the existing road surface. The product shall be mixed and applied in accordance with manufacturer's instructions. Where the area to be blacked out abuts markings that are to remain

The edge of the blackout shall be masked off, otherwise an irregular edge to the blackout is desirable to minimise any ghosting effect.

While the plastic material is still wet crushed stone or grit shall be evenly broadcast onto the base.

The grit shall be a sound crushed mineral or synthetic aggregate with 95% passing a 6.7mm BS sieve and no more than 15% passing a 2.36mm BS sieve. The CAP material thickness and grit size shall be matched so that approximately 60% of the grit depth is embedded into the plastic material.
The aggregate shall have a maximum of 2% weak materials when tested using the Australian Weak Particles Test (AS 1141.32:1995).

15.7. Coloured Markings

When specified some markings may be required in colours other than white or yellow. Typical applications are green cycle way markings. Actual colours will be specified at the time. Such markings shall use one of the paint types specified in clause 15.3 coloured to the specified colour. Paint application shall be in accordance with the relevant clauses of this specification.

15.8. Temporary Markings

When specified temporary markings may be required that can easily be removed when no longer needed. Such markings shall be capable of withstanding normal road traffic and weather conditions for a period of at least 3 months, or longer if specified. When no longer required the markings shall be removed without causing damage to the underlying road surface.

Full details of materials proposed for temporary markings, their method of application and removal and typical properties shall be supplied with any tender or proposal for use. All materials shall be handled and applied in strict accordance with manufacturer's specifications and datasheets. In particular all environmental precautions must be adhered to.

Typical methods of temporary marking include 'removable paint' and self adhesive road marking tape.

15.9. Non Standard Markings

15.9.1. Cycle Symbols

The cycle symbol shall be set out as per Traffic Control Devices Rule diagram M2-3 scaled to be 1200mm or 800mm high as required.

15.9.2. Cycleway 'End'

Cycleway 'End' shall be painted at the end of cycle lanes along with a cycleway symbol, where directed. 'End' shall be 600mm high x 900mm long.

15.9.3. Speed Cushions

The approach faces of speed cushions shall be painted with refectorised white triangles approximately 600mm high x 600mm base width. If necessary the width of the triangles shall be varied so that there are at least 3 triangles on each speed cushion and the depth varied to be the full depth of the tapered approach face of the speed cushion

15.9.4. Pedestrian Platforms

The faces of raised pedestrian crossing platforms and full width speed control devices shall be marked with white refectorised cross hatching as dimensioned in Traffic Control Devices Rule, Diagram M4-2.

16. Lighting

16.1. Scope

This section sets out the requirements for the installation of:

a) Carriageway lighting including underground cabling, LV pillars, columns, consumer services and earthing.
b) Pedestrian facility lighting including footpath lighting, belisha beacons, flood lights and warning globes.
c) Installation of lighting cabling, including control methods in accordance the requirements and specifications of the lines company.

16.2. Specifications, regulations and codes of practice

The work shall be undertaken in compliance with all statutory requirements including and not limited to the following: -

- Relevant Statutory Acts, Regulations and Bylaws
- Health and Safety in Employment Act 1992 and associated regulations
- Electricity Regulations 1997, handbook to the electricity regulations
- The Electricity Act 1992
- Electrical Code of Practices
- New Zealand Radio Interference Regulations and Interference Notices
- Ministry of Health code of Practice for the Safe Management of PCB's

The following specifications related to the work involved with road lighting and under veranda lighting: -

- NZTA M/19:1994 Tubular Steel Lighting Columns
- NZTA M/19:1994 Notes Tubular Steel Lighting Columns
- NZTA C/24: 1991 Maintenance of Highway Lighting
- NZTA C/24: 1991 Notes Maintenance of Highway Lighting
- AS/NZS 1158: 2010 Road Lighting
- NZS 6705: 1986 Luminaries for Road and Street Light
- NZS 3000: 2007 Electrical Installations – Buildings, structures and premises
- AS/NZS 4676: 2000 Structural Design requirements for Services Utility Poles
- AS/NZS 4677: 2000 Steel Service Utility Poles
- AS/NZS 2312: 2002 Guide to Protection of Structural Steel against atmospheric corrosion by protective coatings

The lighting design must maximise safety and efficiency while minimising the life cycle cost and impact on the environment.

It is important to design the lighting to blend in with adjacent road lighting, complement the neighbourhood character and - as far as is reasonably practicable -

minimise the impact on the neighbouring properties and environment with regard to aesthetics, glare and spill light. The principles of the Ministry for the Environment's Urban Design Protocol should be considered.
The design must comply with all appropriate New Zealand standards, in particular the requirements of AS/NZS 1158 series. Anything not specified to a greater degree within this specification shall be that specified in those standards. Where a conflict exists between any Standard and the specific requirements outlined in this Infrastructure Code of Practice (CoP), the Designer shall seek clarification from MPDC.

16.2.1. General Requirements

The lighting design must maximise safety and efficiency while minimising the life cycle cost and impact on the environment.

It is important to design the lighting to blend in with adjacent road lighting, complement the neighbourhood character and - as far as is reasonably practicable - minimise the impact on the neighbouring properties and environment with regard to aesthetics, glare and spill light. The principles of the Ministry for the Environment's Urban Design Protocol should be considered.

16.2.2. Reticulate all 'green fields' developments underground.

In areas where the existing overhead network is for road lighting only, or where the Electricity Network Operator's network is underground, lay underground cable to supply power to the new lighting. The overhead network must not be extended.

The Electricity Network Operator's network usually determines whether the lighting will have an overhead or underground power supply. When lighting is being upgraded in an area where the Electricity Network Operator's network is overhead and is not part of an "underground conversion" project, use of the Electricity Network Operator's poles to support the lights may be permitted, subject to the prior approval of both MPDC and the pole owner. This solution is intended to minimise the number of poles in that area.

This IDS defines the minimum standards but it is important not to over-design and provide a standard of lighting higher than that required.

16.2.3. Electrical Standards and Requirements

Ensure that all parts of the lighting scheme conform to the following:
The Electricity Act, Electricity Regulations, NZS 3000:2007 and approved Codes of Practice issued by the Minister.

The Electricity Network Operator's requirements for connection, supply and installation of cables, and attachment of lighting equipment to their poles.
The Electricity Network Operator's conditions for connecting equipment to a lighting network.

16.2.4. Safety and Environmental Management

All work shall comply with MPDC's safety and environmental management requirements.

16.2.5. Benefit Cost and life cycle costing

Where required by MPDC, carry out a benefit cost and/or life cycle costing for the scheme. The "ROAD LIGHTING CALCULATOR" included as part of the online road lighting resource (see www.rightlight.govt.nz/roadlighting) can be used for life-cycle cost analysis.

Life cycle costing may be used to consider options within a scheme or a scheme as a whole. In undertaking life cycle costing, consider the initial costs borne by the developer or MPDC and the maintenance and replacement costs borne by the future owners and/or the RCA.

NOTE
All category V & P luminaires must meet the requirements for type 4 luminaires detailed in AS/NZS 1158.3.1, Table 2.10. and demonstrate compliance with AS/NZS 1158.3.1, Appendix E and Appendix VII of this document.

Set back to be clearly illustrated on drawings and documentation submitted.

16.2.6. Signs

Identify any existing signs that need to be relocated onto lighting columns or onto their own posts. Ensure the column will support the added load of the sign. Obtain MPDC requirements regarding location of signs.

16.3. Lighting Equipment

Table 1 - Expected Useful Life of Equipment

Component	Design life
Columns[1] (concrete and steel)	40 years[2]
Outreach arms[1]	40 years[2]
Luminaires[1]	20 years[2]
Lamps HPS MH Fluorescent	16,000 hours[3] 12,000 hours[3] 12,000 hours
Painted/powder coated surfaces	10 years

1 Includes all bolts and fixings associated with the component.
2 The NAMS "NZ Infrastructure Asset Valuation and Depreciation Guidelines" lists 25 to 50 years for lighting columns and outreach arms and 10 to 25 years for luminaires.
3 Expected service life based on manufacturers data and expected 5% failure rate. Note: lamp manufacturers may publish average rated life at 50% failure rate; this is too long if a periodic lamp replacement programme is implemented. Typical operating hours of road lighting networks within New Zealand is approximately 4,200 hours per annum.

Luminaires, columns and outreach arms that are used in new schemes should be compatible with adjacent lighting and, where practicable, visually match the existing road lighting.

For efficient maintenance, the types of lighting equipment used are usually limited to those already in the lighting network. Introduction of new equipment requires approval from MPDC prior to use.

Provide detailed information on the design drawings about the columns, outreach arms, luminaires and lamps proposed to be used in the scheme.

16.4. The Designer

16.4.1. The Designer must:

be conversant with Australian/New Zealand Standards and Practices concerning lighting design for public outdoor areas;
be suitably qualified and experienced in the respective field;
have an excellent track record in road lighting design;
have an appropriate level of professional indemnity insurance;
undertake the complete lighting design, including preparing estimates, tender documents and drawings, and assisting with tender evaluation;
provide a Design Report, and Producer Statement – see Appendix II, and III;
notify all adjacent residents of the proposed lighting work and light locations before the start of the physical work;
ensure the lighting scheme meets the requirements of the IDS and the construction specification;
manage the lighting construction works to a successful conclusion, including regular site supervision;
check and approve payment of all progress and final invoices;
resolve any complaints to the satisfaction of the RCA, prior to final acceptance by the RCA; and
sign off the project at completion.

16.4.2. Project brief

MPDC rep must provide or agree to the lighting requirements for a project before any detailed design is undertaken. These lighting requirements will be specified in a project brief or for developer-funded projects, in the Council's consent conditions.

Any resource consent requirements are considered to be part of the project brief, which will also include details about the:

- scope and location of the project;
- purpose and objective of the lighting scheme;
- the RCA Project Manager, for RCA funded projects;
- lighting subcategory that applies to the project;
- specific requirements (if any), such as: a particular type of column (e.g. frangible) or luminaire, restrictions on light locations, special features of the proposed road layout or landscaping that may influence the lighting design, traffic management devices that require supplementary lighting;
- designation of the road or area (e.g. major/minor arterial, collector, local road, pedestrian area, access way); and
- maintenance period to enable the use of appropriate lamp lumen depreciation figures.

16.4.3. Design Review

The peer reviewer shall be as competent as the Designer

Safety audits shall be carried out by a qualified safety auditor.

16.4.4. Design records

Provide the following information as a minimum to support the engineering drawings, Design Report and Producer Statement, for MPDC acceptance before tendering. Supply this information along with a programme for implementing the physical works. Records of any non-compliant design elements and any departures from the design spacing that have been used in the design process;

- A completed Lighting Specification;
- Complete computer analysis information required by AS/NZS 1158;
- Luminaire intensity distribution tables if required (in North American IES or CIE format as requested);
- The name and source of the computer programme used, and a statement of its compliance or otherwise with the requirements of AS/NZS 1158;
- Details of the design method used and the values of the light technical parameters obtained, for each of the road elements involved, compared to the limiting values given in AS/NZS 1158;
- The origin of the photometric data for the luminaires and lamps;
- Details of the road surface reflection characteristics assumed in luminance-based design calculations;
- Justification for the maintenance factor used in the calculations and the associated schedule of maintenance to be adopted, e.g. the luminaire cleaning and lamp replacement intervals; and
- A cross-section drawing showing the proposed type of column, arm and luminaire.

16.4.5. Control of non-conforming work

The Designer must have a procedure to ensure that design work not conforming to the specified requirements is either:

- redesigned to meet the specified requirements; or
- accepted by written concession from MPDC.

Record all non-conforming work on the relevant design records and the Design Report and Producer Statement. (See appendix II and III).

16.4.6. Engineering drawings

as dwgs, dxfs, pdfs or tifs.

16.5. Acceptance of design

16.5.1. Documents to be submitted for MPDC acceptance

Submit the design records, engineering drawings, and any other requested information with the Design Report and Producer Statement. This information should enable the process to be followed easily and should allow for replication of the results.

16.5.2. Design Report

A Design Report see below shall be submitted for engineering acceptance.

The Design Report will provide MPDC with specific details relating to the design including any non-compliant design elements. The Design Report shall identify how construction of the project will be managed to ensure the design will be successfully implemented. It shall also describe how communication with stakeholders and other parties to the design has been or will be managed.

16.5.3. Producer Statement – Design

The Producer Statement – Design shall be submitted for engineering acceptance.

The Producer Statement – Design confirms that the design meets all specifications relating to the project.

16.5.4. MPDC Acceptance

All quality aspects of the investigation, design and construction must comply with the requirements of this document.

When it is satisfied that the design and design report meets the requirements of this IDS and the design brief, MPDC shall notify the Designer that the design has been accepted. In considering the design and giving its acceptance, MPDC shall act without undue delay.

Work must not commence on site unless and until:

- A resource consent for the work has been granted, except when no such consent is required;
- The RCA has given engineering acceptance;
- Any other consent/approval required has been granted; and
- A Traffic Management Plan, if required, has been prepared by the Developer or installation Contractor and approved by MPDC.

16.5.5. Control and Inspection of the Work

Undertake the work in a planned and controlled manner to ensure that the quality requirements are realised. Demonstrate that the following has been undertaken:

- Identify MPDC's key achievement criteria;
- Plan how these will be realised;
- Control the work in conformance with the project quality system;
- Check, inspect or test the work and verify that it conforms to the specified requirements; and
- Record the results as documentary evidence of compliance.
- This clause relates to both design and construction works and requires that all processes involved are properly managed.

16.5.6. Checking, inspection, testing and recording

Check, inspect or test against all key achievement criteria to verify compliance during design and construction and on final completion.

Clearly indicate any "hold' or "witness points" in the Design Report, Engineer's Report or Contract Quality Plan, where the project requires checking, an inspection and/or approval to proceed (i.e. internally and/or from MPDC).

Where there is a requirement to use third party accredited agencies, include the details of compliance methods in the Completion Certificate.

16.5.7. Completion Certificate

The installation Contractor will be required to send a Completion Certificate to the Designer (or project manager) at practical completion. The Designer after inspecting the work shall provide certification of practical completion by submitting a Completion Certificate (see appendix V) to MPDC. All other paperwork including audit records, "As Built Drawings" etc will be submitted with the Completion Certificate to the RCA.

16.6. Installation and Commissioning

16.6.1. Installation

Carry out installation and commissioning in accordance with the MPDC's construction specifications.

The Contractor/Designer must have a procedure to ensure that construction work that does not conform to the specified requirements is either:

- reworked to meet the specified requirements;
- accepted with or without repair by concession from MPDC; or
- rejected and replaced.

Record all non-conforming work on the relevant construction check sheet.

If the construction non-conformance is significant in that it either:

- results in the need for written concession;
- results in delay or interference to the work or to other parties;
- indicates that the fault has occurred due to the use of incorrect work practices and/or failure of materials and could have been prevented;
- occurs sufficiently frequently as to indicate a problem in training or procedures; or
- is a safety issue;
- then the Contractor shall produce a Non-Conformance Report and send it to the Designer. The report and supporting documentation must clearly indicate the action to be taken to rectify the fault, the timeframe and responsibilities. It must be authorised by the Designer and forwarded to MPDC.

In cases involving concessions, the Designer and MPDC must accept the proposed rectification (the corrective action) of the non-conforming work in writing and prior to implementation.

16.6.2. Testing

Any work required to be tested by the contractor in the presence of MPDC must be pre-tested and proved satisfactory before test witnessing by MPDC is requested.

16.6.3. Completion Procedures and Certification

At the completion of the physical works, check and then certify that:
the project has met all the requirements of the project brief, the standards and specifications; and all the documentation detailed below has been completed, is correct and has been forwarded to MPDC.

At the end of the defects liability period, carry out an audit and certify that lighting columns are vertical and lights have been installed and operate correctly and are at the correct mounting height and at the correct tilt.

- Provide the following documentation:
- Test Certificates for each lighting column;
- Electrical Certificate of Compliance for the complete scheme;
- As-built information in a format suitable to be loaded into MPDC's Road Lighting Asset System (see Appendix VI);
- Completion Certificate (see Appendix V);
- Contractor documentation required by the construction specifications, e.g. construction Completion Certificate; and
- Any special maintenance requirements e.g. shear base columns.

Producer Statement - Design

Issued by: _____(Designer's name)

To: _____(MPDC Rep)

In respect of:_____(Description of design)

at:_____(Location)

_____(Address)

Lot: _____DP: _____

in respect of the project requirements described above for:
☐ All
☐ Part only as specified

The design has been prepared in accordance with AS/NZS 1158 (category) and the work is described on _____drawing titled _____ and numbered sheet _____ of _____ and the specification plus other documents according to which the construction is proposed to be constructed.

I _____ (name) have the necessary qualifications and experience as an independent design professional covered by a current policy of Professional Indemnity Insurance to a minimum value of $ _____ and I believe on reasonable grounds that subject to:

(i) The verification of the following design assumptions, and

(ii) all proprietary products meeting the performance specification requirements, the drawings, specifications, and other documents according to which the development is proposed to be constructed will result in a compliant design.

Date: _____

_____
(Signature suitably qualified Design Professional)

_____
Qualifications and experience

Drawing Layout and Format Requirements

Provide drawings to a minimum standard that complies with AS/NZS 1100.

Where road lighting will be altered, label all affected poles/columns and lights as detailed in table below:
Label poles to be removed with "R".

Number each affected road luminaire with the related number from the lighting schedule on the drawing. For example L1, L2 L3 etc.
Label existing poles / columns / luminaires that won't be affected as "E". Show the lighting wattage of all proposed and remaining lights.

Symbols

Symbol	Use	Numbering system
Pxxx	Every pole/column upon which work is to be carried out shall be identified. Existing poles/columns shall have construction material and manufacturer's pole code shown on the drawing	Prefix to be followed with unique identifier either Electricity Network Operator's pole number or sequential column number for the project.
Lxxx	Any alteration to the existing lighting or proposed new installation. Provide separate codes for replacement, new and differing luminaire, lamp, column or outreach arm details	Prefix to be followed with unique identifier.
Rxxx	Any lighting equipment to be removed that is not covered by a "L" reference	Prefix to be followed with unique identifier.
E	Existing luminaire to remain	Not applicable

Locality Diagram

Show the road boundaries and street names where considered necessary. Show the limit of the development. Draw the locality diagram true to the map orientation or at the same orientation as the engineering drawing.

Completion Certificate

To:

From:

Lighting installation works at: (Location)

The above project has been completed by (Contractor's Name)

All work has been carried out in accordance with AS/NZS 1158, the Matamata Piako District Councils' "Development Manual", scheme design, construction specifications and approved variations plus any additional requirements specific to this project that were indicated within the project brief.

All the tests were successfully completed and commissioning was completed (i.e. the lights were livened) on (Date)_____and the maintenance period can commence from this date.

All the tests were successfully completed and commissioning was completed (i.e. the lights were livened) on:
and the maintenance period can commence from this date. _____

The following documentation is enclosed:

- ☐ Test Certificate for each Lighting Standard
- ☐ Electrical Certificate of Compliance
- ☐ As Built Information
- ☐ Removed Lighting Equipment List
- ☐ Cable recording information

(Signature)

(Print Name)

(Date)

17. Stock Underpass

17.1. General

17.1.1. Contact details

The name, address and phone numbers of all personnel relevant and involved in the design and construction of the Stock Underpass must be listed. This includes, but is not limited to the following:

- Chartered Engineer who will sign off on the design, construction works and the finished Stock Underpass.
- The Engineer will need to be on our 'Approved Engineer' list. A list has been compiled throughout the Waikato Region with all 'Approved Engineers'.
- Suitably Qualified Contractor who will construct the Stock Underpass.
- The Contractor will need to be on our 'Approved Contractor' list. A list has been compiled with contractors that have relevant health and safety procedures in place and that have undertaken similar work in the past.
- Notification shall be provided in writing identifying the appointed representative experienced in construction work with whom all discussions and correspondence relating to engineering matters will be undertaken with Council staff.

17.1.2. Approvals

The applicant shall obtain a Building Consent for the underpass structure in accordance with the Building Act 2004.
The applicant shall obtain Resource Consent from Council as Council is the Road Controlling Authority.

17.1.3. Encumbrance

Stock Underpasses are structures the Roading Controlling Authority allows to be erected in the road reserve at its pleasure. Council, as owner of the road reserve will enter into an agreement with the farm owner for the right to cross the road reserve. An agreement is required to define the roles of the parties to the agreement and to spell out their relationship. The agreement identifies the purpose as well as defining the interaction of the parties and their obligations to each other. The agreement that is used is in the form of an encumbrance on the title of the land. A site specific agreement will be drawn up for signatures by both parties. The agreement also defines the maintenance obligations that the property owner shall fulfill. Council's Legal Officer will need to be contacted to arrange and draft the agreement.

Before any work commences within the road reserve a completed, signed and registered Memorandum of Encumbrance (refer attachment). The Encumbrance is a legal instrument which will be registered against the titles of all serviced by the underpass. We recommend that you contact your solicitor to obtain independent legal advise on the effect of an encumbrance on your property.

17.2. Preliminary design process

17.2.1. Considerations for design length

The minimum length of an underpass shall be seven metres either side of the centre of the road but the final length of the underpass will be determined by a Council Roading Engineer conducting a site visit where they will take the following site specific factors into consideration;

- Roading hierarchy and traffic volume
- Seal and shoulder width
- In-situ soil conditions
- Depth and angle of underpass
- Construction of wing walls
- Roadside drainage requirements
- Traffic safety / risk assessment
- Any other site specific factors

Please contact Council on (07) 884-0060 to arrange a free site visit for a Roading Engineer to confirm the minimum underpass length required by Council.

17.3. Design for underpass

17.3.1. Site Investigation

The applicant shall engage a suitably qualified and experienced Engineer to undertake all site investigations (including the interpretation of the results) required for the complete design of the underpass. The Engineer shall ensure that the bearing capacity of the ground is greater than the minimum specified by the manufacturers of the underpass units. Council requires a written undertaking from the Engineer that they (the Engineer) will certify the works upon completion.

17.3.2. Location of Services

The applicant shall be responsible for making contact with all service authorities and obtaining location plans for water services, gas, telephone, electricity and all other above and below ground services and overhead plants to ensure all conflicts with the works are identified.

During the course of all works within the road reserve the applicant is responsible for all damage and costs of subsequent reinstatement of services.

17.3.3. Underpass Design

The underpass shall be designed in accordance with Transit New Zealand's Bridge Design Manual to HN-HO-72 loading. It shall have a minimum cover (as specified by the manufacturer) and allow for drainage of the underpass floor and surrounding ground. Retaining/wing walls shall be designed to retain the embankment fill. Any cut slopes shall be laid back to a safe slope or retained with a properly designed retaining wall. A producer statement from the designer of the proposed underpass structure[1] shall be included.

[1] All manufacturers of underpasses will supply this information for a building consent application. It is the responsibility of the applicant to obtain this information.

Important Note:
Please note that the Waikato Regional Council (WRC) has stringent rules that apply to Farm Effluent Discharges. Matamata-Piako District Council will not be responsible for any WRC non-compliance issues related to stock effluent from any underpass. Compliance with WRC's rules is the sole responsibility of the user of the underpass and we strongly recommend that the design engineer considers compliance to these rules for all extreme events eg. high stock usage, inclement weather, high water table etc. For further information we recommend that you either visit their website (**www.wrc.govt.nz**) or contact an WRC representative.

17.3.4. Barriers, Roadside Stock Control and Fencing

The Applicant shall, at the time of construction, install barrier rails sufficient to warn approaching traffic of the hazard. They shall also identify the position of the underpass to reduce the possibility of vehicles leaving the road and dropping into the openings adjacent to the road. The ends of the barriers shall also be marked with bridge end hazard markers approved by the Council. A white painted post and rail fence (minimum two coats white acrylic paint) shall be erected from the property boundary fence around the top of the batter of the underpass and back to the boundary fence. The fence shall consist of a minimum of three rails made with timber posts with a diameter of 150 mm and rails of 150mm by 50mm. The ends of the underpass shall be sufficiently retained to prevent the loss of fill material and stormwater into the underpass openings.

17.3.5. Pavement

The pavement shall be reinstated to the same line and levels that existed prior to the construction of the underpass. The pavement material shall be in accordance with Section 2 of these specifications.

17.3.6. Drawings

The drawings shall show how the embankments are to be retained, the roadside drainage is to be handled, and how the road pavement is to be reinstated and by whom. The following information is required as a minimum:

- All drawings shall be a minimum size of A3, be clear and legible and show a North point[2].
- A locality plan (to scale) showing the location of the underpass on the road in relation to other properties/roads/features etc.
- A drawing in plan view (to scale) showing the location of the underpass, road boundaries, fence lines, the location of any drains, poles, overhead lines, signs, services (Power Co Telecom, water, sewer, Clear Communications etc). Dimensions and levels on the underpass, distance from boundaries, length of approach slopes etc. The location of new fencing. The method and location of drainage lines to dispose of stormwater from inside the underpass. Any other information such as vehicle entrances, valves, bridges, trees, retaining walls etc. that could have a bearing on the works also needs to be shown on the drawings.
- A cross-section drawing (to scale) on the centreline of the underpass showing dimensions and levels of the underpass at regular intervals, approach slopes

[2] North point shall be shown on locality plan and plan view drawings.

in relation to existing ground levels and the road. The plan shall show any existing services and stormwater drains in the immediate vicinity of the works.
- Specifications showing the type and quality of materials being used. This shall include the bedding of the concrete units, the general backfill, the subbase, basecourse and then the seal.
- Structural drawings of the units/pipes.

Once submitted, the drawings are passed on to one of Council's Roading Engineers to consider for approval.

17.4. Construction of underpass

17.4.1. Scope

This section details the minimum requirements for construction of the underpass.

17.4.2. Construction methodology

The applicant shall develop, implement and manage a construction methodology. The methodology shall outline the general steps that the Contractor shall take to complete the construction works. Issues that shall be considered are:

- Traffic management
- Compliance with any resource consents
- Supply of materials
- Identification of all affected services
- Excavation
- Preparation of the foundation including acceptance testing
- Supply and complete construction of the underpass including backfilling of the underpass structure
- Pavement construction, surfacing and berm areas
- Quality Assurance on all of the above aspects

17.4.3. Traffic management

17.4.3.1. Traffic control

A Traffic Management Plan shall be prepared and submitted to Council for approval, prior to the lodgement of a building consent. All temporary traffic measures shall be designed and carried out in accordance with the Code of Practice for Temporary Traffic Management (CoPTTM).

The site shall be signed and barricaded as described in the approved Traffic Management Plan The Contractor shall keep one suitably defined lane of the road open to traffic at all times. Council reserves the right to suspend work if traffic flow is delayed for more than five minutes.

The Contractor shall ensure that all personnel including subcontractors are wearing safety footwear and an approved type of high visibility clothing (Fluorescent Red Orange, as to AS/NZS 1906.4:1997 standards). Vehicles employed on the job shall be equipped with a flashing, rotating amber light.

17.4.3.2. Temporary road closure

In very exceptional circumstances Council may consider temporary closure of the road for one day to allow the Contractor to install the underpass. For the road to be temporarily closed, Council need to advertise the proposed temporary road closure in the local newspapers at least six weeks (42 days) prior to the closure date in order to process any objections and then advertise the actual closure dates. The Contractor shall draw a plan indicating the proposed detour route and submit it to Council for approval. Detour signage needs to be erected around the closed road to Councils satisfaction. The Contractor shall also carry out a letter drop to all those properties affected by the road closure. All costs associated with temporary road closure, advertising signage, and costs associated with Council staff advising emergency services etc. will be the applicant's responsibility.

17.4.4. Site Safety

The Contractor shall take all practicable steps to ensure the safety of the public and persons working in the vicinity of the place of work and shall comply in all respects with the Health and Safety in Employment Act 1992, 1995 Regulatory and 2002 amendment. In particular shall take all practicable steps to prevent accidents while undertaking the works by erecting approved barriers, signs devices to control traffic speed or fences around any specific hazard.

The following is a list of known hazards that may be encountered while installing an underpass:

- Traffic passing through the site
- All machinery and plant used on the site
- Deep roadside drains
- Overhead and underground services
- Open trenches and the stability of the trench walls
- Lifting of underpass units
- Adverse weather conditions
- The list is not comprehensive but it shall be up to the Contractor to ensure that all hazards on a work site are identified and isolated, minimized or eliminated.

17.4.5. Materials

All materials shall comply with the relevant standard specifications. All materials not covered by these specifications shall be the best of their kind available.

Testing/Quality Assurance
The Contractor and Engineer shall be responsible for all Quality control on site. The Quality Control for the compaction and Material Specifications shall be in accordance with this Code of Practice.

17.4.6. Construction

17.4.6.1. General

The underpass shall be constructed

According to the methodology and approved drawings
To the line and levels shown on the drawings
According to the following minimum requirements detailed in 4.6

17.4.6.2. Earthworks

All earthworks shall be constructed according to NZTA F/1:1997

The extent of excavation shall be limited so that the excavation is the minimum possible to allow the safe construction of the underpass. The base of the excavation shall be thoroughly compacted and contain no areas which could pond water.

17.4.6.3. Backfilling

Backfill shall be imported material comprising well-graded aggregate free of organic material and generally with a maximum particle size of 65mm. In no case shall excavated material be used as backfill except with express written permission from Council's Roading Engineer.

Backfill shall only be placed in level layers no greater than 300mm of uncompacted thickness. Compaction shall be applied evenly to each layer before process to the next layer.

17.4.6.4. Pavement Construction

The pavement shall be constructed of NZTA M/4:2006 AP40 Basecourse according to specification NZTA B/2 2005. Basecourse shall be placed in layers of uniform thickness and compacted. The depth of the basecourse layer shall be 300mm and shall be compacted and shaped to the same dimensions as the existing road. There shall be no depressions in the finished surface that will allow water to pond.

17.4.6.5. Pavement Surfacing

Council staff shall inspect the constructed basecourse surface prior surfacing the road and will either accept a two coat seal (Grade 3 and 5) or hot mix surfacing.
Two coat seal – Sealing to be in accordance with NZTA P/3:1995.
Hot mix - The basecourse shall be treated with either a single coat Grade 5 seal coat or a tack coat prior to applying the hotmix. The pavement shall be hot mixed to a minimum depth of 30mm in accordance with NZTA M/1:2011.

17.4.6.6. Traffic Services

All traffic services (signs, edge marker posts, pavement markings and raised pavement markers) shall be reinstated in the same positions as that existed prior to the commencement of the works.

17.4.6.7. Removal of surplus material and clean up

All material surplus to requirements shall be removed to approved spoil dumps. No spoil dumps will be permitted on Council road reserve without Council approval.

All reinstated areas shall be left clean and tidy on completion of the work including the removal of any loose material on the surface or shoulders and any spoil from water channels.

17.4.6.8. Completion of works

Once Council has issued you with a code of compliance, an initial maintenance period of 12 months shall be required. Subsequently the applicant will retain the responsibility for repairs and reinstatement of structural defects detected by the Council staff in periodic inspections of the underpass.

17.5. New Zealand Transport Agency specifications

17.5.1. General

This section details the New Zealand Transport Agency specifications that shall be used;

B/2	Construction of unbound granular pavement courses	2005
F/1	Earthworks Construction	1997
M/4	Crushed Basecourse Aggregates	2006
M/10	Asphaltic Concrete	2010

18. Vehicle Crossings

All vehicle crossings are to be constructed in accordance with the Development and Sections 1 and 2 of this document.

For rural vehicle crossings the Development Manual requires large vehicle entrances to provide widening on the opposite side of the road where the carriageway width is less than 6metres. The widening requires to provide a total carriageway width of 6metres for a length of 15metres. 5:1 tapering shall then be used to terminate back to the existing edge of seal.

A .5m unsealed shoulder is also required for the entire widening and splay. The shoulder shall have a grade of 5:1/6:1.

19. As built plans and asset details

19.1. Scope

This section sets out details of the completed works that are to be supplied by contractors or Developers to Council on completion of the work.

19.2. As built plans

Upon completion of construction work, copies of "As-Built" plans and data recording information about the completed works shall be provided to the Matamata Piako District Council. Responsibility for providing the plans and associated data shall lie with:

19.2.1. The Developer

In the case of land development (urban, rural-residential and industrial sub-division).

19.2.2. The Contractor

In the case of works constructed for the Council under contract to Council.

Plans presented in fulfilment of this requirement shall be shown as "As-Built" in the amendments part of the drawing title block and signed off as 'approved for issue' by a person having responsibility for the quality assurance aspect of the as-built information.

The plans are required in one of two formats:

19.2.2.1. Copy of construction drawings

These may be a copy of the construction drawings hand annotated with as-built details, clearly marked as "AS-BUILT" and certified. Significant variations from the original design should have an amended plan issued, and therefore only minor variations and items such as sub-soil drains may be hand annotated. These plans must be in good condition suitable for scanning for archive purposes.

19.2.2.2. Computer aided design software

Where as-built plans are prepared using computer aided design software, DXF or DWG format export files of the hard copy plans should be supplied.

The GST/Asset Register in Part 1 shall be completed for all Assets.

All "As built" plans and associated data shall be sent to the following:

In the case of all consents:

Planning Administrator
Planning Department
Matamata-Piako District Council
PO Box 266
Te Aroha 3320

Electronic copies of plans shall be emailed to planningadmin@mpdc.govt.nz.

In the case of Council contracts:

Send to the Principals Representative where it will be forwarded to the Asset Manager - Strategy and Policy.

19.2.3. As-built details

The plans shall show the following details:

i) A plan view of the site showing the location of kerb and channel, catch pits, footpaths, berm features, trees, lighting columns, culverts and drainage, subsoil drainage, other drainage structures e.g. soakage devices, locations of MPDC ducts and other below-ground features.

ii) For MPDC ducts a location diagram with measurements from reference points to the ends of the ducts and to any angles in the alignment.

iii) Details of any structures.

19.2.4. Co-ordination Information must be supplied in terms of:

i) NZGD2000 (New Zealand Geodetic Datum 2000) for all spatial information
ii) NZTM (New Zealand Transverse Mercator) for all co-ordinates
iii) Moturiki Datum for all levels

19.3. Data Sheets

Contractors and Developers shall complete data sheets for the following classes of assets:

i) Pavement
ii) Surfacing
iii) Street Lights

The information required is shown in the checklists of this section.

19.4. Quality Assurance forms

Contractors and Developers shall complete check sheets 3.9 and 3.10 with regards to the design compliance and also the testing regime.

19.5. Asset Values

The Council is legally required to maintain an asset valuation register for all infrastructure assets. Asset values are recorded at what is termed the 'component' level and each asset is depreciated according to rules applicable to particular component types. Assets are entered into the asset register at 'purchase cost'. Asset values are regularly revised taking into account asset condition and assessed remaining life. The asset value information required in the lists of asset data provides the 'purchase cost' for this asset accounting requirement.

The spreadsheets are designed to facilitate data entry of asset values at the component level'.

Generally each asset will have a direct cost as well as some indirect costs. Direct costs include Materials and Installation/construction cost.

Indirect costs include such items as Professional fees for design and construction supervision, Resource consents, Insurance and Traffic control.

To determine asset values, indirect costs need to be apportioned pro rata to direct costs using a methodology represented by this formula: -

$$\text{Asset Value} = \left[\text{Asset Direct Cost} + \frac{\Sigma \text{ Indirect Costs} \times \text{Asset Direct Cost}}{\Sigma \text{ Asset Direct Costs}} \right]$$

The component level direct cost will often align with items on a measure-and-value type construction contract. Care is needed to ensure the values of contract variations are attributed to relevant assets rather than being loaded as a general overhead to all assets.

The information required is shown on the checklists.

All values shall be exclusive of GST.

CHECKLIST 3.1
SCALA PENETROMETER TEST

Subdivision: _____ Stage: _____

Road Name/No._____ Ch. From ____ To _____

Test Location: _____ Date _____

Ch	Centreline	Kerb Side Wheel Tracks	
		Left	Right

Analysis of Results

- ❑ Pass
- ❑ Fail From_____ To _____
  From_____ To _____
  From_____ To _____

Suggested remedial work to be considered by Roading Project Manager

_____
_____
_____
_____
_____
_____
_____

_____ _____
Signature of Developer's Representative Signature of MPDC Representative

CHECKLIST 3.2
SUBGRADE

Subdivision: _____ Stage: _____

Road Name/No._____ Ch. From ____ To _____

Ch	Centreline	Kerb Side Wheel Tracks	
		Left	Right

Analysis of Results

- ❑ Subgrade Completed
- ❑ Subgrade requires remedial work

Suggested remedial work to be considered by Roading Project Manager

_____
_____
_____
_____
_____
_____

_____ _____
Signature of Developer's Representative Signature of MPDC Representative

CHECKLIST 3.3
SUB-BASE COMPACTION/SHAPE

Clegg Hammer Compliance CIV 25 (equivalent to CBR40)

Subdivision: _____ Stage: _____

Road Name/No._____ Ch. From ____ To _____

Date _____

Ch	300mm from Ch (L)	Centreline of lane	Centreline of lane	300mm from Ch (R)

Analysis of Results

- ❑ Sub-base Completed
- ❑ Sub-base requires remedial work

Suggested remedial work to be considered by Roading Project Manager

_____
_____
_____
_____
_____
_____

_____ _____
Signature of Developer's Representative Signature of MPDC Representative

CHECKLIST 3.4
BASECOURSE COMPACTION

Compliance CIV 35 (equivalent to CBR80)

Subdivision …… Stage ……

Road Name/No. …… Ch. From ……. To ……

Date ……

Ch	300mm from Ch (L)	Centreline of lane	Centreline of lane	300mm from Ch (R)

Analysis of Results

- ❑ Basecourse Completed
- ❑ Basecourse requires remedial work

Suggested remedial work to be considered by Roading Project Manager

_____
_____
_____
_____
_____
_____

_____ _____
Signature of Developer's Representative Signature of MPDC Representative

CHECKLIST 3.5
BASECOURSE SHAPE AND RELATIVE HEIGHT (final layer)

Subdivision ……. Stage ……

Road Name/No. …… Ch. From …… To ……

Date …….

Ch	1.0m from K&C (L)	Centreline	1.0m from K&C (R)

Analysis of Results

- ❑ Basecourse shape completed
- ❑ Remedial work required
  From_____ To _____
  From_____ To _____
  From_____ To _____

Suggested remedial work to be considered by Roading Project Manager

_____
_____
_____
_____
_____
_____

_____ _____
Signature of Developer's Representative Signature of MPDC Representative

CHECKLIST 3.6
Site Field Meeting - In Attendance:

Contractor: _____
MPDC Rep: _____
Developers Rep: _____

Action Required			Yes	N/A
1)	Check all items which failed previous inspections		☐	☐
	a)	Earthworks	☐	☐
	b)	Drainage	☐	☐
		Wastewater	☐	☐
		Stormwater	☐	☐
	c)	Water Reticulation	☐	☐
	d)	Roading	☐	☐
	e)	Reserves	☐	☐
	f)	Environmental Mitigation	☐	☐
2)	General			
	a)	Surplus material removed	☐	☐
	b)	Drainage reticulation topsoiled and grassed	☐	☐
	c)	Manhole lids level with surrounding area/clear of boundaries	☐	☐
	d)	Carriageway and berms clear of rubbish	☐	☐
	e)	Grass take on topsoiled areas	☐	☐
	f)	Water reticulation, boxes and kerb markings in place	☐	☐
	g)	Check concrete paths vehicle crossings & drives for cracks	☐	☐
	h)	Channel swept and cesspits empty of debris	☐	☐
	i)	Road surface acceptable	☐	☐
	j)	Fences erected where required	☐	☐
	k)	Warning sign at end of stage roads	☐	☐
	l)	Restoration after telecommunication, electricity, gas, etc	☐	☐
	m)	Right of entry releases	☐	☐
	n)	Uncompleted items to be bonded for	☐	☐
	o)	See details of Bond Schedule in Appendix	☐	☐
	p)	See Consent details	☐	☐

Items to be Provided/Corrected

No.	Action Required	Party to Action	Party to Accept	Acceptance Approved	Date

MPDC Rep _____ Developer's Rep _____ Date _____

CHECKLIST 3.7
CERTIFICATION UPON COMPLETION OF ROADS, PIPELINES AND OTHER SERVICES

ISSUED BY:

_____
(suitably qualified professional)

TO: _____
(Development Owner)

TO BE SUPPLIED TO:

_____
(MPDC)

IN RESPECT OF:

_____
(Description of Development Project)

AT:

_____

_____
(Address)

_____has been engaged by _____
(Survey Firm) (Development Owner)

to provide construction observation, review and certification services in respect of the above development which is described in the specification and shown on the drawings numbered _____approved by:

_____
(MPDC)

I have sighted the _____ consent and conditions of consent to the _____
(MPDC Rep.)

Development and the approved specification and drawings.
As an independent professional, I or personnel under my control, have carried out periodic reviews of the works appropriate to the engagement and based upon these reviews, information supplied by the contractor during the course of the works and the contractor's certification upon completion of the works (copy attached) I BELIEVE ON REASONABLE GROUNDS that the works, other than those outstanding works listed below, have been completed in accordance with the above consent and sound engineering practice.

Date_____ Signature_____
(suitably qualified Professional)

_____
(Professional Qualifications)

Member	CSNZ	☐	NZIS	☐
	ACENZ	☐	IPENZ	☐
	CPEng	☐		

Outstanding Works

_____

_____

_____

CHECKLIST 3.8

RAMM DATA – TO BE COMPLETED FOR EACH ROAD
(one set of forms to be completed for each road section)

Road …….

Subdivision …….

Start …… End ……

Width ……

BASECOURSE LAYER (LAYER 1)

Date Completed ……

Depth …… Width……

Layer Strength ……

Pavement Material ……

Pavement Source (Quarry) ……

SUB-BASE LAYER (LAYER 2)

Date Completed ……

Depth …… Width……

Layer Strength ……

Pavement Material ……

Pavement Source (Quarry) ……

SUB-GRADE (LAYER 3)

Test Date ……

CBR …… Type ……

Stabilised Yes / No

Method (Agent) …… Depth ……

UNDERCUT (LAYER 4)

Location ……

Length ……

Width ……

Depth ……

Backfill Material ……

CHECKLIST 3.9
ROADING QUALITY ASSURANCE

Subdivision ……

Subdivision Location ……

Drawing numbers ……

Designer …… Date ……

Items	Comments with regards to conformance
Road Widths -- comply with Table 3.1 of DM	
Speed Environment -- Speed environment implement _____km/hr	
-- Element Design speeds: ___km/hr with e_{max} = ___ and f_{max} = ___ ___km/hr with e_{max} = ___ and f_{max} = ___ ___km/hr with e_{max} = ___ and f_{max} = ___ ___km/hr with e_{max} = ___ and f_{max} = ___ ___km/hr with e_{max} = ___ and f_{max} = ___ *(e_{max} = maximum superelevation, f_{max} = maximum friction)* -- Design speed must not alter by > 10km/hr on adjacent elements.	
-- Maximum friction must not be exceeded and be consistent.	
Horizontal Alignment -- Urban Roads (where speed is 50km/hr or less) Minimum Radius - 80m for arterial & industrial roads. - 15m for local roads. Apply curve widening where required. Swept path of 11m truck at 12.5m design radius.	
-- Rural Roads (where speed is > 50km/hr) (use AUSTROADS Rural design guide) Minimum Radius in accordance with Section 3 of DM. Apply curve widening where required. Swept path of 11m truck at 12.5m design radius.	
Vertical Alignment -- Vertical curves comply with AUSTROADS Min crest K value = ____ Min crest curve length = _____ Min sag K value = _____	
-- Longitudinal Grades comply with AUSTROADS Min Grade = _____ Max Grade = _____ Grade at intersection = _____ Cul-de-sac turning head grade between 4% and 6%	
Intersections -- Extraordinary vehicle entrance required if development generating more than 40vpd in Rural areas.	
-- Edge of seal radius - >6m for residential roads - > 15 for rural roads	
-- Sight distance to be in accordance with Development Manual.	
-- Separation distance/location in accordance with Development Manual.	
-- Tracking curve, B-Train swept path with 15m design Radius.	
Cul-de-sac -- Minimum turning head radius (in accordance with Development Manual) – 9m for residential – 13m for industrial	
-- Minimum kerb gradient 0.5% (if applicable)	

-- Surfacing to be asphaltic concrete	
Superelevation and crossfall -- Normal camber to be – 3-4% for sealed surfaces – 5-6% for unsealed surfaces -- Maximum and design superelevation in accordance with design speed. -- Superelevation profile in accordance with AUSTROADS - Rate of rotation _____ % - Relative grade _____ %	
Pavement Design -- Design life to be no less than 25 years. -- Traffic loading and pavement design calculations are Attached -- Unsealed pavements -- Subgrade CBR ___ -- All Laboratory and field test results are attached. -- Comply with Development Manual for sealed pavements. - Basecourse: material _____ thickness: ____mm - Sub-base: material_____ thickness: ____mm	

300mm	Well graded granular material	Min. soakage CBR 20
50mm	WHAP 20	

Sealing -- As per Table 3.1 in Development Manual	
Parking -- On street Requirements in accordance with Table 3.1.	
Berms and Side Slopes -- Urban Berms - Crossfall between 1 in 25 and 1 in 6 to allow for mowers. - 75mm topsoiling and grassing to be included. -- Batter Slopes - Crossfall between 1 in 5 and 1 in 7.	
Kerb and channelling -- Concrete to be 20MPa -- Type to be barrier kerb in accordance with Development Manual (only use mountable kerb on central islands) -- Scour protection required if kerb and channel is discharging into earthen drain.	
Footpath -- Widths in Accordance with Table 3.1 Requirements. -- Minimum of 100mm concrete (in accordance with Development Manual) -- Subgrade of ____ (subgrade should have minimum CBR of 7) -- Concrete to have a minimum 28 day strength of 20MPa -- 25 mm compacted depth of fine granular material base. -- Crossfall of 2% falling towards kerb and channel.	
Sumps -- Spacing and location at low spots and no more than 90m apart. -- Standard details from Development Manual. -- All leads used are >= 225mm diameter. -- sumps are all connected up to stormwater system.	
Drainage -- Minimum Culvert details Class X RCRRJ > 300mm dia. -- TNZ F/3 pipe culvert construction details.	
Subgrade Drainage -- Min of 100mm perforated pipe under kerb and channel. -- Outlets appropriate. -- Material and construction in accordance with TNZ standard specifications.	
Crossings -- Sight visibility and separation distance are to be in accordance with Development requirement. -- Construction to be in accordance with Development Manual.	

Signage and Markings -- All Markings are to be in accordance with Transit New Zealand's Manual of Traffic Signs and Markings Part 2. -- All Signage is to be in accordance with Transit New Zealand's Manual of Traffic Signs and Markings Part 1. -- Any new private or public Road names are to be submitted to Council for approval.	
Lighting -- Residential and industrial subdivisions required lighting - manufacturing details, design calculations and isolux drawings to be submitted for approval. -- Any new roads created, require lighting at intersections. - manufacturing details, design calculations and isolux drawings to be submitted for approval.	
Other -- All road boundaries in the rural area shall be fenced.	

Date_____ Signature_____
(Designer)

Date_____ Signature_____
(MPDC representative)

CHECKLIST 3.10
PHYSICAL WORKS QUALITY ASSURANCE CHECKLIST

Subdivision ……

Subdivision Location …… Date ……

Construction Item (only tick box if applicable)		Test	Frequency	Compliance		
				Dev. Rep/Engineer (Signature)	Date	Council (Signature)
❑ Vehicle crossing	Level and dimension	Measurement				
	Subgrade suitability	Scala Penetrometer or Clegg Hammer	*Tests at 2 random locations*			
	Concrete depth and strength	Verification of concrete strength	*Depth measured at 20m intervals*			
❑ Footpath	Alignment	Measurement				
	Subgrade suitability	Scala Penetrometer or Clegg Hammer	*At 50m intervals*			
	Concrete depth and strength	Verification of concrete strength	*Depth measured at 20m intervals*			
	Surface finish	Visual inspection				
❑ Pavement						
Subgrade	Compaction	Scala Penetrometer or Clegg Hammer	*At edge of seal and at wheel tracks staggered at 20m intervals*			
	Shape	String line measurement	*At 20m intervals*			
Subbase	Material Quality	Grading, sand equivalent	*One test prior to commencement, then: 1 per < 600m^3 | 2 per 600–2000m^3 | 3per > 2000m^3*			
		Weathering/Crushing Resistance	*1 per 2000m^3*			
	Layer depth	String line measurement	*At 20m intervals*			
	Strength	Density and water content (field)	*One test every 500m^3 (Minimum of 3 tests)*			
	Shape	String line measurement	*At 20m intervals*			
Basecourse	Material Quality	Grading, sand equivalent	*One test prior to commencement, then: 2 per < 400m^3 | 3 per 400–1500m^3 | 4 per > 1500m^3*			
		Weathering/Crushing Resistance	*1 per 2000m^3*			
		CBR (laboratory)	*Minimum 2 tests per lot*			
	Layer depth	String line measurement	*At 20m interval*			

	Compaction	Maximum Dry density (laboratory)	*One per material type at commencement of construction from different samples*			
	Strength	Density (field)	*One test every 500m^3 (Minimum of 3 tests)*			
	Final Shape	String line measurement	*At 20m intervals*			
❑ Sealing	Final Basecourse surface	Visual Assessment	*Walk through site*			
Chip seal	Material Quality	Size, shape, grading, cleanness	*One test prior to commencement, then: 2 per < 100m^3 | 3 per 100–400m^3 | 4 per > 400m^3*			
		Weathering/Crushing resistance	*One per 1000m^3*			
Asphalt	Bitumen	Viscosity softening point	*2 samples per bitumen distribution load*			
		Adhesion Agent, penetration	*2 samples per bitumen distribution load*			
❑ Kerb and Channel	Levels and Alignment	String line measurement	*At 20m intervals*			
	Subgrade suitability	Scala Penetrometer or Clegg Hammer	*Tests at 3 random locations*			
	Metal base	Visual inspection – smooth and compacted				
	Concrete strength	Verification of concrete strength				
	Kerb profile	Measurement	*At 100m intervals*			
❑ Road Markings	Location and Dimension	Measurement	*At 100m intervals*			
	Paint and Bead application	Dry film thickness, weights of beads	*Three random locations near start, middle and end of project*			
❑ Road Signage	Location	Measurement	*Each sign*			
	Installation	In accordance with DM and design	*Each sign*			
❑ Services	Alignment	Measurement				
	Depth	Verification of installation depth				
❑ Streetlighting	Location as per design	Measurement				
	Installation	In accordance with DM and design				