CS4 – Transportation

Contents

CS4 Transportation

4.1 Scope

This construction standard sets out the requirements for the construction or upgrade and maintenance of district roads. It covers the specifications for constructing, testing and maintaining roads and related ancillary items such as footpaths and drainage.

Road works shall be maintained throughout the maintenance period. Maintenance shall include but not be limited to sound engineering practices.

Evidence of a regular maintenance contract, including contact details shall be submitted for Council approval prior to the consideration by Council of the release of either the s224 certificate or certificate of practical completion.

4.2 Definitions

Definitions are set out in Section 1 of the Development Code: Design, unless otherwise described.

4.3 Related Documents

The following Drawings and other documents form part of this construction standard as listed:

Design Standard DS4:	Transportation
Drawings as shown in the Development Code:	Construction

4.4 Materials

Materials shall be as listed in the appropriate section of the Development Code: Construction, or as defined in this document.

Materials shall be as specified within this document, unless otherwise specifically agreed with Council.

A Pavement Construction

A4.1 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.

A4.2 Subgrade Layer

Subgrade layer shall be constructed to meet the requirements of the pavement designer and TNZ F/1.

For imported subgrade material, the pavement shall be "run of the 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 CBR as measured with a standard scala penetrometer, used in accordance with this code. 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 NZS4402:1986 "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 accordance with this Code.

The entire surface of the compacted 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 that 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:

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

ii. 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 shall re-work both pavement layers until the problem has been resolved, all at the Contractor's expense.

A4.3 Lower Sub-Base Layer

The material in this layer shall be "run of the 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 NZS4402:1986.

Scala penetrometer tests or appropriate acceptance testing shall be carried out as detailed in accordance with this Code.

The entire surface of the completed lower sub-base shall be made smooth, firm and uniform, by blinding, 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 that 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 compaction effort to achieve the required level of compaction.
II. The Contractor may choose to place half the sub-base layer (100mm compacted depth GAP40) on the condition that the lower sub-base compaction criteria can be met following the subsequent compaction of the sub-base. If the compaction specified for the lower sub-base layer cannot be achieved by this method then the Contractor shall rework both pavement layers until the problem has been resolved, all at the Contractor's expense.

A4.4 Recovered Material

Recovered material may be specified for use in the lower sub-base layer for 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 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 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.

A.4.5 Sub-Base Layer

Material contained in this layer shall be GAP40 or GAP 65 unless otherwise specified.

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

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

Compaction of the sub-base shall be tested in accordance with this Code and shall comply with the specified criteria.

NAASRA roughness measurements will not be required.

A4.6 Basecourse Layer

The only material acceptable for use to construct the basecourse layer is TNZ M/4 basecourse.

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

The TNZ Specification B/2 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 in accordance with this Code 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 TNZ B/2 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 on the Design Component – Roading unless specified otherwise.

A4.7 Construction Layer Profiles

Each layer required to be constructed shall relate to the final shape as shown 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% - 2/3 x CF%

Where

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%.

B Testing

B4.1 Scala Penetronometer

B4.1.1 General

The Scala Penetrometer shall only be employed where a significant part of the subgrade particles pass a 9.5mm sieve.

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 two methods of recording the results and all test sites must comply.

CBR	Max mm per 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 the Drawings.

B4.1.2 On Carriageways

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

i. Carriageway 4.0m wide and less - Along centreline
ii. Carriageway between 4.0m and 8.0m - At the kerbside wheel tracks
iii. Carriageway 8.0m and wider - At the centreline and kerbside wheel tracks

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

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

B4.1.3 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 30m centres and to a depth of 300mm below the final subgrade level to ensure that the appropriate CBRs are achieved at the appropriate depth.

B4.1.4 Vehicle Crossings

A minimum of three scala penetrometer tests randomly spread shall be taken to a depth of 300mm below the final subgrade level per crossing. One test per $5m^2$ on crossings greater than $15m2^2$ (kerb to boundary).

B.4.2 Subbase and Basecourse Compactions

B4.2.1 General

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

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

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

- 1.15 times the specified value for stabilised pavements
- 1.20 times the specified value for non-stabilised pavements.

B4.2.2 Nuclear Densometer

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

In conjunction with CBR testing the degree of compaction in the sub-base 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 shall be taken within the test area, all of which must satisfy the specified compaction to obtain a pass.

ii. Percentage Dry Density

The Contractor shall be responsible for carrying out laboratory tests according to NZS4402:1986 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 100m^2. The compaction requirements shall be met if the mean and minimum compaction values of the tests taken comply with the values in the following table:

Values	Sub-basecourse Pavement Layer % MDD	Basecourse Pavement Layer % MDD
Mean Value	≥ 95	≥ 98
Minimum Value	≥ 92	≥ 95

B4.2.3 Clegg Hammer

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

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.

B4.3 Benkelman Beam Test

Standard Beam Tests

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

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

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 15m on each side. Where the carriageway is 8.0m or wider, tests at 15m maximum intervals shall also be taken at the centre line.

Deflections should not exceed the following target figures:

a. 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)	Maximum (mm)
A1 Residential cul-de-sacs and privateways ≤ 40 household units	1.30	1.60
A2 All other carriageways up to EDA = 10^5	1.10	1.35
A3 All carriageways EDA between 10^5 and 10^6	1.00	1.20

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

	Average (mm)	Maximum (mm)
B1 Residential cul-de-sacs and privateways ≤ 40 household units	1.50	1.80
B2 All other carriageways up to EDA = 10^5	1.25	1.50
B3 All carriageways EDA between 10^5 and 10^6	1.00	1.20

No more than 10% of the test results shall exceed the maximum and no single result shall exceed the maximum by a third or more.

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 the tests shall have IANZ accreditation.

Acceptance of pavements with deflections exceeding the target figures will be at the discretion of the Authorising Officer.

Bowl Ratio Tests

Bowl shape deflection testing on the surface of the basecourse layer is required for all roads with an asphalt surface, and lengths greater than 100m in length.

Testing will be undertaken at 20m intervals on the centreline and on the wheel track adjoining the edge of seal. Those tests shall be staggered. It is intended to determine that the surfacing can tolerate the measured deflection ratio characteristics without fracturing and fatiguing.

The bowl deflection is to be based on a D250/D0 ratio using a Standard Benkleman Beam Test method to measure pavement deflections.

For all streets which are to have an asphaltic concrete surface the parameters of surface stiffness are of paramount importance. The bowl ratio result will not be assessed where the maximum deflection is less than 1.0mm. The table below is to be utilised for this purpose:

95 Percentile Bowl Ratio D250/D0

25mm	0.54	0.54	-	-	-
40mm	-	-	0.65	0.65	By Specific Design
50mm	-	-	0.70	0.70	

A deflection of 3mm is the maximum permitted for asphaltic surfaces and no one deflection shall be greater than 1.5 times the mean value for the series.

Designers are permitted to:

- Include modifiers to the asphalt mix design to provide more tolerance to lower bowl ratio characteristics. Modified mix designs shall be submitted to WBOPDC for acceptance.
- Increase the unbound pavement thicknesses to achieve the Bowl Ratio characteristics required.
- Modify the pavement construction by stabilisation and/or reinforcement to achieve the Bowl Ratio characteristics required.

Where modification to the characteristics of the pavement construction are made by designers, compliance testing shall be provided to WBOPDC supporting the certification of adequacy.

Designers are permitted to delay the asphalt surfacing of roadways constructed on ash soils to allow subgrade soils to regain strength and stiffness before re-testing. A 224 certificate will not be issued until complying tests results are achieved.

B4.4 Surface Texture

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

B4.5 Sealed Surface Roughness

Method of Testing for Surface Roughness

The target maximum values for roughness of sealed surfaces shall be 60 NASSRA counts for asphalt, and 70 NASSRA counts for chipseal.

Roughness measurements shall normally, but not exclusively, be taken only on surfacings applied to areas on 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 under 200 square metres the use of an approved 2 metre profile beam will be acceptable.

A minimum of three runs for roughness measurements 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 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.

C In-situ Stabilisation of Modified Pavement Layers

C4.1 Scope

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

All work shall be in accordance with TNZ B/05 Specification for in-situ stabilisation of modified pavement layers.

D Rip and Relay

D4.1 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.

D4.2 Ripping

The existing sealed surface shall be ripped (or 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 from the site.

D4.3 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.

D4.4 Placement of Basecourse After Ripping

Material contained in this layer shall consist of crushed metal to GAP40, or TNZ M/4 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.

E Pavement Rehabilitation

E4.1 Scope

This Specification applies to the treatment of those areas of pavement which are to be rehabilitated by digouts, asphalt smoothing and cracksealing. 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.

E4.2 Digouts

E4.2.1 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.

E4.2.2 Existing Subgrade Layer

Scala penetrometer tests shall be carried out as detailed in this Code 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.

E4.2.3 Imported Subgrade (Run of Pit Sand) Layer

The imported subgrade material shall be “Pit sand” as specified in this Code, and shall comply with the requirements of this Code.

E4.2.4 Basecourse in Areas of Digout

No basecourse layers shall be placed without the Engineer's approval of the surface of the subgrade. The basecourse layer shall be 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 GAP 20 may be required to ensure the surface requirements are achieved.

E4.2.5 Asphalt Patch Surface

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 TNZ Specification P/9 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.

E4.3 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
65mm depressions and above	Mix 20 + Mix 10

Where the depth of asphaltic concrete exceeds 40mm but is less than 65mm, the asphaltic concrete shall be laid in two layers of Mix 10. Where the depth of asphaltic concrete exceeds 65mm the Contractor shall lay a Mix 20 regulating course to within 30mm of proposed finished surface level and then finish with a layer of 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 crossfalls dictated by the existing surrounding sealed surface. Under no circumstances will surface irregularities that may hold water be permitted.

E4.3.1 Measurement of Asphalt

Where Mix 10 and Mix 20 asphaltic concrete pre-levelling and/or levelling course is 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 accredited agency. The Certificate of Compliance shall be in accordance with regulation 15F of "Weights and Measures - 1987".

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

All dockets are to indicate:

- time and date of dispatch of asphaltic concrete delivery truck
- time and date of weighing of delivery vehicle upon return to weigh bridge
- weight of vehicle upon departure from weighbridge
- weight of vehicle upon return to weighbridge
- 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.

E4.4 Crack Sealing

E4.4.1 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.

E4.4.2 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.

E4.4.3 Crack Treatment

The bonding surfaces shall be primed with a primer compatible with both the existing material and the 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.

E4.4.4 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.

F Concrete Work

F4.1 General

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

The strength of concrete as defined in NZS 3109 shall be as follows:

- 28 day in place minimum strength of 20 MPa for all the above works.

F4.2 Formwork

Formwork shall generally comply with the requirements of NZS 3109 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 bullnose 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.

Forms shall be designed to be easily removable without jarring the green concrete, and shall be kept thoroughly clean and treated to prevent adhesion of concrete. Forms for curved kerbs shall be brought to a true curve by springing the timber evenly around.

The shape, strength, rigidity, mortar tightness and surface smoothness of re-used forms shall be maintained at all times. Warped or bulged timber is not permitted. Timber which has been used

shall have the surfaces which are to be in contact with the concrete thoroughly cleaned and treated before being used again.

F4.3 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.

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 the relevant standards as follows:

- NZS 3104 Specification for Concrete Production - High Grade and Special Grade
- NZS 3108 Specification for Concrete Production - Ordinary Grade

F4.4 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.

F4.5 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 diameters 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 unless otherwise specified.

F4.6 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.

All concrete surfaces not in contact with formwork shall be cured by the application of a curing compound conforming to ASTM C3109 "Specification for liquid membrane - forming compounds for curing 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.

F4.7 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 shall be used in forming cutdowns.

F4.8 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 finish of all kerb and channel, whether machine laid or hand laid, shall be uniform in colour, texture and shape.

F4.9 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.

F4.10 Final Surfaces – For footpath and Vehicle Crossing Areas

All final path and vehicle crossing surfaces shall be true to the lines and levels 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.

G Kerb and Channel, Sumps and Subgrade Drainage

G4.1 Kerb and Channel Within Existing Pavement

Attention is drawn to the Standard Cross-section details and in accordance with this Code.

G4.1.1 Kerb & 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.

G4.1.2 Saw Cutting

Prior to removal, the kerb and channel shall be sawcut vertically to ensure a clean break. The existing sealed surface shall be sawcut 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 and 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.

G4.1.3 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.

G4.1.4 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:

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

All pits and backfill shall be compacted in lifts of not more than 150mm.

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 will 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.

G4.1.5 Kerb & Channel Foundation

After the subgrade has been satisfactorily completed to line and level a compacted layer of aggregate shall be placed. Compaction shall be to refusal.

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

G4.1.6 Kerb & Channel Placing

Refer to Section H: Concrete Works for the placement of kerb & channel.

G4.1.7 Carriageway Reinstatement

Where the carriageway is widened by up to 0.5m 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 except as specified by the Engineer.

The specified basecourse metal (TNZ 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).

G4.2 Kerb and Channel in New Pavement

As for kerb & channel above except that 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.

G4.3 Sumps

G4.3.1 General

Refer to the Drawings in this Code.

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

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

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

G4.4 Subgrade Drainage

G4.4.1 General

Refer to the Drawings in this Code.

Where subsoil drains are required they shall be placed as shown on the drawings. 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.

G4.4.2 Additional Subsoil Drainage

Where directed by the Engineer, 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.

G4.4.3 Other Requirements

TNZ F/2 filter material shall not be used as a filter material in close proximity to HDPE slotted pipe. Unless directed elsewhere in these specifications, peametal shall be used 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).

H Road Surfacing

H4.1 General

The TNZ Specification P/3 "Specification for First Coat Sealing", TNZ Specification P/4 "Specification for Resealing", and the TNZ Specification M/6 "Specification for Sealing Chips" shall be deemed to be part of this Code except that:

i. All references to the basis of payment contained within these TNZ Specifications are irrelevant.

ii. Reference to the Contractor's obligation with respect to the foreshortening of the maintenance requirements of the seal coat (TNZ P/3, P/4 - 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.

Note: The use of emulsions in a chip sealing operation is an acceptable alternative surfacing treatment method.

H4.2 Double 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 TNZ P/3 180/200 penetration grade bitumen cut back to suit, plus 1 parts per hundred (p.p.h) adhesion agent, at a rate of 1.2 litres/m^2 residual (measured at 15oC) and the supply, spreading and rolling of TNZ M/6 Grade 3 chip at a spread rate of 75m^2/m^3.

The second layer shall preferably consist of the supply and spraying of TNZ P/3 135/150 penetration grade bitumen cut back to suit, plus 1 p.p.h. adhesion agent, at a rate of 0.8 litres/m^2 residual (measured at 15oC) and the supply, spreading and rolling of TNZ M/6 Grade 5 chip at a spread rate of 150m^2/m^3. All materials and application rates shall be confirmed by the Designer at the time of application.

H4.3 Two Coat Seal and Open Graded Porous Asphalt Overlay

H4.3.1 Two Coat Seal (First Coat with Wet Locking Coat)

A two coat chip seal as described in clause 2.0 above shall be applied to the prepared basecourse surface.

H4.3.2 Open Graded Porous Asphalt Overlay

The friction mix overlay shall be placed no sooner than 12 months after the application of the two coat chipseal.

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

The friction mix sealing shall consist of the supply and spraying of TNZ M/1 tack coat with a quick breaking cationic bituminous emulsion at an application rate of 0.3 litres/m^2 residual (measured at 15°C) and the supply, spreading and rolling of TNZ M/11 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.

H4.4 Two Coat Seal and Asphaltic Concrete

H4.4.1 Two Coat Seal (First Coat with Wet Locking Coat)

A two coat chip seal as described in clause 2.0 above shall be applied to the prepared basecourse surface.

H4.4.2 Asphaltic Concrete

The asphaltic concrete shall be placed in accordance with best practice after the application of the two coat chip seal, or after the application of a specifically designed water proofing seal. Asphaltic concrete shall be laid in accordance with clauses relevant to Mix 10 Asphaltic Concrete contained within TNZ P/9 "Specification for the Construction of Asphaltic Concrete Paving".

Asphaltic concrete sealing shall consist of the supply and spraying of TNZ M/1 Tack Coat with a quick breaking bituminous emulsion at an application rate of 0.3 litres/m^2 and the supply, spreading and rolling of TNZ M/10 Asphaltic Concrete.

H4.5 Requirements After Chip Sealing

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

H4.5.1 Removal of Surplus Chip

All surplus chip 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 area from the turning action of vehicles.

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

H4.5.2 Protection and Repairs of the Sealcoat

Any bald areas exceeding 0.5 m^2 shall be repaired within 5 days from the day of occurrence or reporting.

I Berm Features

I4.1 Scope

This specification describes the work required to construct, reinstate or repair footpaths, vehicle and pram crossings, grass berms, planted areas and bus shelter installation.

I4.2 Alignments, Lines and Levels

The edge lines of kerbs, footpaths and 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.

I4.3 Break-Out, Removal and Disposal of Existing Berm Features

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 sawcut, 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 taken off site.

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

I4.4 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.

I4.5 Subgrade Preparation

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, or
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 pits and 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 sawcut. No such roots shall be cut without the prior approval of the Engineer if they are within the drip line of the tree.

I4.6 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.

I4.7 Pavement Course for All Berm Features

The pavement course shall be constructed of bedding sand and/or GAP metal (TNZ-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 by the Engineer.

For 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 GAP20 may need to be added to GAP40 areas and compacted into place to achieve this.

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

I4.8 Concrete Footpaths and Vehicle Crossings

Concrete surfacing shall be carried out in accordance with the relevant clauses of Concrete Works

The footpath shall be generally of concrete, 1.5m wide with a minimum 28 day strength of 20MPa and with a minimum thickness of 100mm on a compacted subgrade. The construction boxing shall be 100mm thick. Additional width is required where angle parking is anticipated.

Footpaths shall be constructed as a continuous concrete pathway up to but not including private driveways and formed vehicle crossings. Vehicle crossings shall be continuous from kerb to boundary.

When required, off street footpath/cycleways (width 2.5m) shall be provided both sides on all roads except cul-de-sacs <50.

Alternative surfacing materials may be used for footpaths only where approved by the Authorising Officer.

Alternative materials may include concrete pavers and asphaltic concrete to a minimum thickness of 25mm. Any alternative surfacing material must be demonstrated to be appropriate to the surrounding environment.

Where concrete paths are proposed for construction steeper than 1 in 10, steps shall be constructed.

For cross-section details refer to the Drawings in this Code.

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 25mm deep.

I4.9 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 the Drawings in this Code. 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 TNZ Specification P/9 - Construction of Asphaltic Concrete Paving, except that plant appropriate to the size of the area being surfaced shall be used.

I4.10 Asphalt Overlay

Where asphalt smoothing or overlay is required the existing chip seal or 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.

Mix 10 shall be used for compacted depths of 20-50mm and Mix 20 for 50mm and greater.

I4.11 Grass Verge

All areas within the road reserve that are not paved shall be completed with topsoil and sown in grass in accordance with the requirements of Specifications CS2: Streetscape.

I4.12 Bus Shelter Installation

i. Excavation

All excavated material not required for the completion of the works shall be completely removed from the site. Prior to commencement of the Works, the contractor shall advise details of the proposed disposal site or facility to the Engineer.

ii. Concrete Foundation Slab

The construction of a concrete foundation slab, 100mm nom thick (20Mpa) with one layer of 665 reinforcing mesh centrally placed, on 50mm compacted AP20 is required for each installation. Cover to the steel shall be a minimum of 50mm.

The foundation slab shall have a grade varied between 1% to 3% on both direction and free draining.

Two 30mm diameter PVC ducts shall be provided for future electrical power supply and electronic communication cabling out to the outer edge of the concrete slab. They need to be further protected by being placed with a metal leg or strut from the ground level to within the frame of the bus shelter. They must be separated i.e. more than 500mm apart and be sited in the same location on each shelter i.e. at one end and indication provided. The entire metal structure must be "earthed" and indication provided.

iii. Bus Shelter Installation

The contractor shall allow for all materials, tool, machines and labours to load stored bus shelters, transport them to each sites and erect them as required and as detailed in the drawings and maps. Installation work includes bus shelter frame, roof, drains; seat, glass panels and all other accessories.

The contractor must ensure that all frame, glasses and seats are clean and the bus shelter area is clean and tidy as required before leaving the site.

I4.12.1 Additional Footpath

The placement of the shelters, in some instances, may require realignment of the existing footpath around the shelter. In these instances, the following works is required:

- Saw cut and remove to waste existing concrete and other excavated materials.
- Excavated materials shall be completely removed from the site. Prior to commencement of the Works, the contractor shall advise details of the proposed disposal site or facility to the Engineer.
- Supply materials and construct new 100mm thick 20Mpa concrete on 30mm AP20 base. The shape and cross fall of the finished surface shall be formed so that it directs surface water away from the shelter and towards a suitable storm water collection point i.e. kerb and channel.

The contractor shall ensure the works are appropriately barricaded and that an alternative pedestrian route is provided.

I4.12.2 Retaining Wall

The placement of the shelters, in some instances, may require realignment of the ground at the shelters locations. In these instances, a new keystone retaining wall might be needed and the following works is required:

- Excavated materials shall be completely removed from the site. Prior to commencement of the Works, the contractor shall advise details of the proposed disposal site or facility to the Engineer
- Supply materials and construct new Keystone retaining wall. Work to include all materials, drain pipes and workmanship to complete the work to the Engineer satisfaction.

I4.12.3 Reinstatement

The contractor shall take all necessary precautions to avoid damage to neighbouring properties, road signs, property or chattels.

All paths, fences, driveways, gardens, etc which are disturbed during the works shall be restored to their original condition or better with the minimum delay within 7 days of the damage occurring.

All waste materials are to be removed from the site and the site left in tidy order. Finishing work shall consist of but not be limited to top soiling and re-grassing of all affected ground surface areas.

The contractor shall be responsible for obtaining access over private property if such is required.

J Block Paving

J4.1 Bedding Course for Block Paving

All bedding course will be laid in accordance with either Paver Note 1 or NZS3116:2002 – Interlocking Concrete Block Paving, as specified.

J4.2 Laying of Paving Blocks

All paving blocks shall be laid in accordance with either Paver Note 1 or NZS3116:2002 as specified and shall comply with the Drawings in this Code which takes priority over the Standards.

J4.3 Edge Restraints

Edge restraints shall be one of the following:

- kerb and channel
- traffic island kerb
- concrete separating strip
- paving blocks on edge in concrete
- timber edging

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

All paver cuts must be made using a power-saw unless otherwise approved by the Engineer.

K Road Signs and Street Furniture

K4.1 Signs - General

The location and construction of all signs shall be as shown in the drawings and in accordance with the current version of NZTA Manual of Traffic Signs and Markings and Section 4.4 DS4 Appendix 1 of this Code, Pavement Markings and Traffic Signs Supplement"

Construction and installation of signs shall be in accordance with TNZ P/24 Performance Based Specification for Traffic Signs.

K4.2 Armco Safety Barriers

All ARMCO barriers are to be constructed in accordance with the TNZ M/17 P Specification for W-section Highway Guardrails, TNZ P/15P Fabrication & Assembly of Standard Guardrails and Handrails for Highway Bridges & Bridge Approaches, AS/NZS3845:1999 and TNZ M/23 Road Safety Barrier Systems.

K4.2.1 Painting of Barriers

All timber barriers are to be painted with two finish coats of water-based commercial-grade paint (colour to be approved by the Engineer). All dirt, grime and loose and flaky paint is to be removed from the surface prior to painting. It may be necessary to spot undercoat as required. All painting is to be carried out in accordance with the manufacturer's specifications.

K4.3 Timber Bollards and Removable Bollards

All bollards are to be constructed and installed in accordance with the Drawings in this Code.

K4.4 Pedestrian Barrier Rails and Handrails

Pedestrian barrier rails and handrails are to be constructed and installed in accordance with the Drawings in this Code.

K4.5 Parking Meter Poles

All parking meter poles are to be constructed and installed in accordance with the Drawings in this Code.

K4.6 Cycle Barriers and Racks

All cycle barriers and racks are to be constructed and installed in accordance with the Drawings in this Code.

L Road Marking

L4.1 General

The location and application of all road marking shall be in accordance with the drawings, the NZTA Manual of Traffic Signs and Markings, Section 4.4 DS4 Appendix 1 of this Code, "Pavement Marking and Traffic Signs Supplement, and technical specifications TNZ M/07 Road Marking Paints, TNZ P/12 Pavement Marking.

M Rural Vehicle Entrance

M4.1 General

The following notes refer to Drawing Nos. W423 and W424.

M4.1.1 Dimensions

All dimensions are minimums, unless otherwise stated (drawings also include maximums for grades and break over angles).

M4.1.2 Visibility

Refer to the sight distance and lines of clear sight diagrams.

M4.1.3 Gradient

The level of the vehicle entrance shall not exceed ± 350mm from the road centre line level at a point 11m from the centre line except that Council may approve alternatives which will not compromise achieving max grades of 1 in 12 to 6m from the carriageway and max grade of 1 in 6 beyond (taking into account potential road upgrading works).

M4.1.4 Culvert

A culvert (min dia 300mm) shall be designed in accordance with this Code and be installed to manufacturer's specifications to carry water from all of the upstream catchment. It shall be true to line and extend beyond the cleared area. The culvert shall be aligned with the water table unless evidence is provided to Council that an alternative alignment further away from the pavement is more suitable. Stormwater from the entrance shall be directed to the roadside drains.

M4.1.5 Subgrade

Remove organic or waste material and trim and compact.

M4.1.6 Basecourse

Shall be GAP 40 compacted to a dense state. Compacted thickness shall be 170mm minimum. Cleared areas may be grassed. There shall be no areas to pond water.

M4.1.7 Seal Coat

When adjacent to a sealed road the driveway shall be sealed to a minimum 6m clear of the edge of sealed road. Seal coat shall be either 2 coat chip seal, 25mm asphaltic concrete or an alternative approved by Council.

M4.1.8 Fences, Cattlestops and Gates

Fences, cattlestops and gates shall be not less than 1m from the cleared area. New fences, gates and cattlestops may be located outside of the property boundary but will require an encroachment notice from Council.

M4.1.9 Construction

Construction shall be in accordance with this Code.