SECTION 2 : TESTING

2.1 SCALA 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.

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 mm/blow	min blows/100 mm
7	32	3
10	23	4
15	17	6

The CBR vs Penetration graph for sand silt materials is shown on Drawing TS345.

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 at the insitu subgrade, the scala readings are averaged for the top 600 mm. 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 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 and to a depth of 300 mm below the final subgrade 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 m^2 on crossings greater than 15 m^2 (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 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 4402:1986 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 100 m^2. 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.

Compliance Values

	CIV	Equivalent CBR
Subbase	25	40
Basecourse	35	80

2.3 BENKELMAN BEAM TEST

2.3.1 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 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:

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)	***90th Percentile (mm)***	***Maximum (mm)***
A1. Residential cul-de-sacs and privateways ≤40 household units	1.30	1.60	2.10
A2. All other carriageways up to 10^5 EDA	1.10	1.35	1.80
A3. All carriageways between 10^5 and 10^6 EDA	1.00	1.20	1.60

B. 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 privateways ≤40 household units	1.50	1.80	2.40
B2. All other carriageways up to 10^5 EDA	1.25	1.50	2.60
B3. All carriageways between 10^5 and 10^6 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.

2.4 SURFACE TEXTURE

The method for determining surface texture shall be equivalent to or will follow NZTA Specification T/3 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 surfacings 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 under 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.