

TNZ B/02 Notes: 2005

NOTES FOR THE SPECIFICATION FOR CONSTRUCTION OF UNBOUND GRANULAR PAVEMENT LAYERS

(These notes are for the guidance of supervising officers and must not be included in contract documents)

1. SCOPE

The purpose of this specification is to address some of the difficulties experienced in implementing the previous method type specification.

This specification tends towards a performance based specification as opposed to a method type. This specification is suitable for subbase and base courses in new construction or for shape correction work. It is not suitable for the construction of asphaltic mixes or stabilised materials.

2. CONSTRUCTION DIMENSIONS

As payment is often based on the volume of aggregate used, there is a desire on the client's side to have tight tolerances. On the other hand, the construction tolerances must be practical.

It is expected that construction will often be controlled through the use of lift pegs at 20 m intervals, but any method that would ensure that the specified levels are attained is permitted. Depending on the road geometry and the specified finished roughness levels, lift pegs at a closer spacing than 20 m may be required. This decision is left to the Contractor. The Engineer may do additional checks.

The tolerances that have been included are a balance between the different submissions received.

3. CONSTRUCTION OF PAVEMENT LAYERS

During construction it is desirable that the pavement is not exposed to traffic prior to compaction. It is recognised that in many circumstances this is impractical. It is expected that commonsense will prevail.

Clauses on the placement of aggregate to avoid segregation are retained to reinforce the need to use the best practical methods of placement and spreading. It is expected that areas where an excess of coarse aggregate occurs then the density requirements will not be met.

Layer thickness requirements for sub-base layers are only controlled by a minimum thickness of 2.5 times the maximum particle size. The Contractor should detail in the Quality Plan the combination of layer thickness and compaction plant that is to be used.

A maximum uncompacted thickness of 200 mm for the base course layer is specified to ensure that significant density gradients are not introduced into this layer.

4. COMPACTION

A wide variety of compaction plant could be used, depending on the scope of the contract. The Contractor is expected to take into account the strength of the aggregate and layer thickness in determining the weight, frequency and amplitude of vibration of compaction plant that will be used.

In the 2005 version of TNZ B/2 the Maximum Dry Density (MDD) for construction on Greenfield sites is the higher of the maximum laboratory dry density at optimum water content (OWC) and the plateau density at optimum water content (OWC). This effectively makes the laboratory dry density a minimum requirement and avoids the need to provide roller specifications. It also provides a check that the laboratory test results are appropriate. A maximum number of tonnes mass per metre of roll width has been retained to give some guidance on when rollers are likely to significantly change the gradation of TNZ M/4 basecourse materials.

The number of roller passes that are to be used should be the minimum to achieve the plateau density. The Contractor is required to detail the methodology to be used in the Quality Plan. A range of methodologies could be proposed, including:

- (a) The construction of a test strip before construction starts.
- (b) The close control of roller operation and density testing during initial construction in order to develop density versus roller passes relationships.

TNZ B/2 1994 provided guidance on appropriate levels of compaction by specifying parameters for the rollers to be used and this information may still be useful where difficulties are encountered reaching the requirements of TNZ B/2 2004. It should also be noted that the OWC for the roller will most likely be dryer than the laboratory test. TNZ B/2 1994 noted that compaction shall be achieved by the minimum necessary number of passes of compaction plant, and compaction plant shall include type (i) for primary compaction, and may include either or both types (ii) and (iii) for the final consolidation of the surface.

(a) Type (i): Vibratory roller of either double or single vibrating drum of not more than 3.2 tonnes mass per metre of roll width having vibration frequency of not less than 2200 vpm (37 Hz).

Vibrating rollers not exceeding the above weight limit but of frequency less than 2200 vpm (37 Hz) are approved providing the nominal amplitude does not exceed that shown relative to the weight in tonnes per metre of roll width in Figure 1.

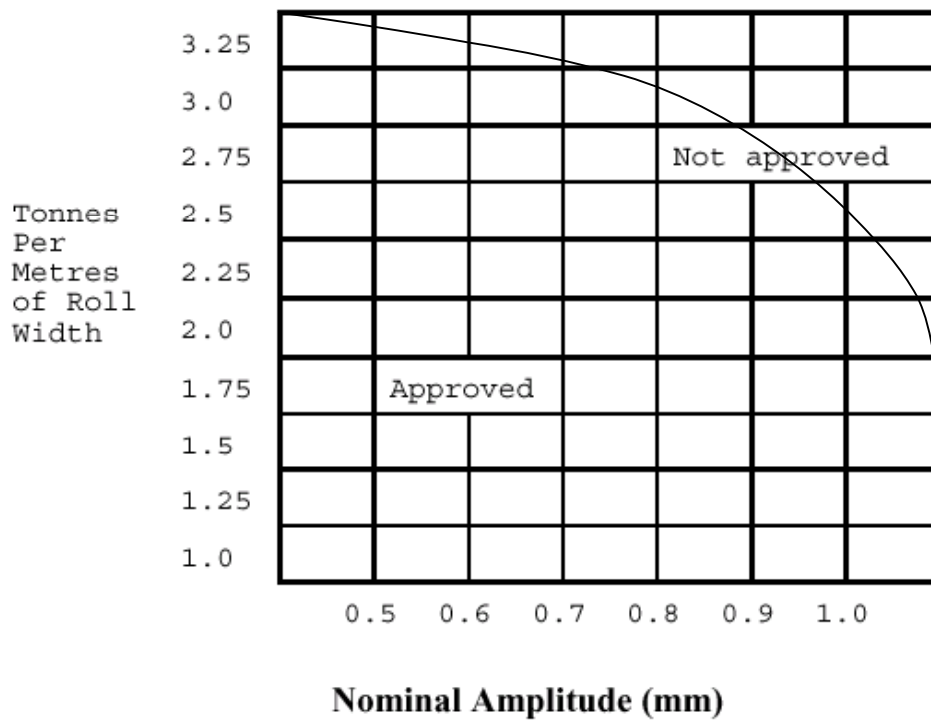


Figure 1: Nominal Amplitude v Roll Weight for Vibratory Rollers

Vibrating rollers of less than 1 tonne per metre of roll width shall not be used to compact any pavement layer of more than 175 mm uncompacted thickness.

(b) Type (ii): Any non-vibrating smooth, steel-tyres roller having not less than 1 tonne nor more than 3.2 tonnes mass per metre of roll width.

(c) Type (iii): Pneumatic tyred roller having a minimum weight when operating of not less than 7 tonnes, spread over at least seven rubber tyred pneumatic wheels.

There have been cases where rutting of the base course layer has occurred where the pavement has not been subjected to traffic before sealing. This situation has prompted

some authorities to require final consolidation to be achieved by extra rolling or the trafficking by a minimum number of vehicles. The Contractor may use road traffic to obtain final consolidation.

5. COMPACTION STANDARD

It is critical to the life of the pavement that a uniform, high degree of compaction is obtained. The values given in Figure 2 of the specification are believed to be achievable.

It is expected that testing will be performed using a nuclear density meter operated in back scatter mode. In order to ensure uniformity without excessive testing costs, a balance between number of tests and the size of the lot was required.

As clause 7.6 states that the "pavement layer shall be compacted to a uniform, dense, stable condition", then the Engineer would have the right to require compaction tests other than those randomly selected in order to ensure that the minimum values have been obtained.

It is important to ensure that the maximum dry density is obtained in accordance with NZS 4402: 1986, Test 4.1.3. The test points (a minimum of five) must straddle the maximum dry density as specified in the standard. Where a flat compaction curve is obtained, an accurate determination of optimum moisture content is not required as the moisture condition at sealing is specified in terms of saturation not as a percentage of optimum moisture content.

The laboratory maximum dry density results should always be accompanied by an aggregate grading so that the variation in density as affected by grading can be obtained for a specific source. Gradings that are near the bottom of the envelope will tend to have lower densities than those near the top of the envelope. If a maximum dry density result is from a material near the middle of the envelope and the material delivered to site is within the specification, regular further tests should be similar.

Where the Acceptance Criteria is based on laboratory results and cannot be met, the Engineer shall nominate an independent laboratory to repeat the laboratory tests and supervise a repeat of the Plateau Density test. Should the Criteria still appear unachievable the Engineer may accept the Plateau Density tests as the Maximum Dry Density. It is expected that a review of compaction plant being used is considered as part of the additional testing.

6. SURFACE SHAPE

A requirement for a maximum roughness level is being used routinely in New Zealand. Provision is made for this in this specification.

The determination of the maximum roughness specified must take into account the geometry of the site. In some cases it is impossible due to changes in levels and constraints such as intersections and services to obtain roughness levels below 70 NAASRA counts/km.

It should be noted that the accuracy of roughness measurement depends on factors such as the equipment used and the length being measured.

7. FEATHER EDGES

There are no specific density requirements for feather edges. The requirement is that the base course will not deform or displace noticeably when subjected to a normally loaded truck wheel.

8. RUNNING COURSE

The Contractor can decide whether or not to use a running course.

9. PRESEALING REQUIREMENTS

Depending on the contract, the Engineer may require the area to be swept or a number of spot checks may be performed in order to determine if the surface finish has been obtained.

It is known that if the base course is sealed when wet then there is a danger of the retained moisture making the base course unstable, i.e. it is saturated, and that the seal coat may not adhere to the base course.

The Engineer's site inspection is designed to allow visual confirmation that the surface finish and shape (except roughness) are adequate. The moisture condition, if sealing is not taking place immediately does not have to be confirmed at this stage.

The DOS requirement has changed as the recent APRG Technical Note 13 "Control of Moisture in Pavements During Construction" recommends that pavements with a traffic loading in excess of 5x10⁶ ESAs, should have a maximum DOS in the basecourse of 60% to prevent early rutting. For other roads the maximum DOS may be increased to 65%. The original requirement in TNZ B/2 was to prevent the sealing of saturated pavements and did not consider rutting performance. Agreement as to the practicality of this could not be reached with industry and thus this concept will be trialled separately.

Where premature failures have been noted for a material the APRG Technical Note requirements should be considered. Where the increased DOS requirements cannot be met consideration should be given to modification of the basecourse material.

These requirements may affect the time of year when construction can be performed. When the weather is wet and cold drying of the base course may not occur.