SERIES NG 800
ROAD PAVEMENTS - UNBOUND MAERIALS

Contents

NATIONAL ALTERATIONS OF THE OVERSEEING ORGANISATIONS OF SCOTLAND, WALES AND NORTHERN IRELAND

Scotland

Northern Ireland

# Denotes a Clause or Sample Appendix which has a substitute National Clause or Sample Appendix for one or more of the Overseeing Organisations of Scotland, Wales or Northern Ireland.

ROAD PAVEMENTS - UNBOUND MATERIALS

NG 800 General

1 Advice on the design and construction of sub-bases is published in The Design Manual for Roads and Bridges (DMRB) Vol. 7.

#NG 801 Unbound Materials for Sub-bases

1 The permitted alternatives for sub-bases include Types 1 and 2 granular sub-base material. For granular sub-bases under cement bound roadbases, where good drainage of the sub-base and subgrade is certain and there is no chance of water standing under cemented material, the Overseeing Organisation may, in order to make significant financial or environmental gains, such as removal of spoil heaps, accept sub-base material with a water soluble sulfate content of up to 2.2 g/litre provided structures are isolated by 500 mm of sulfate-free material or precautions are taken to protect them. (See NG 1704.2).

NG 802 Compaction

1 Sub-Clause 802.5 (viii) permits combinations of different types of compacting equipment provided each type contributes its correct proportion of the total compactive effort. Thus if a machine when operated singly is required in Table 8/1 to apply X passes and that same machine actually applies K passes, then the sum of the values of K/X for each of the types of plant used in combination should equal or exceed unity.

NG 803 and 804 Granular Sub-base Material Types 1 and 2

1 Clause 803 excludes all gravels from granular sub-base material Type 1 and current design requirements exclude granular sub-base material Type 2 in heavily trafficked pavements, but where local experience indicates that these materials can be used successfully, the Overseeing Organisation may require that a Substitute Clause should be written to permit their use.

The inclusion of up to 12.5% natural sand in Type 1 is permitted at the discretion of the supplier to adjust the material grading.

2 The value of CBR required for materials to Clause 804 will depend upon traffic loading. For flexible roads carrying a traffic loading of more than 2 msa the sub-base strength should be at least an equivalent of CBR 30%. For traffic ranges below 2 msa the strength may be reduced to CBR 20%.

3 If more than 10% of the material is retained on a 20 mm sieve the whole material can be assumed without test to have a CBR value of 30% or more. CBR tests should be carried out (when necessary) on specimens which are compacted at a density and moisture content which represent equilibrium conditions under the completed pavement. In most cases the moisture content and density specified in sub-Clause 804.3 will apply but where this is not so it will be necessary to specify separately the required values of density and moisture content for the CBR test. The density relating to a particular air voids content can be calculated using the formula given in BS 1377 : Part 4. Compaction into the CBR mould should be carried out in such a way that the required density is obtained uniformly. The number of surcharge discs used in the CBR test should be equivalent to the weight of road construction above the sub-base.

4 The test procedure for the determination of optimum moisture content in compliance with BS 5835 has been developed specifically for graded aggregates and gives more reproducible results than the vibrating hammer test of BS 1377 : Part 4 for these materials. Whilst there is no specified moisture content for laying and compacting materials to Clause 803, in order to satisfy the requirements of sub-Clauses 802.4 and 803.3 it will be necessary to carry out these operations at optimum moisture content or thereabouts.

5 Where the soundness test is used as a means of confirming source suitability, a certificate from a testing laboratory accredited in accordance with EN 45002 by the United Kingdom Accreditation Service (UKAS) for that test, showing a value in excess of the minimum specified and dated not more than 6 months previous to the start of the contract, should be provided. For those sources seeking suitability based on historical evidence of satisfactory use, the following should be provided:

(i) dated certification showing supply of materials conforming with all other aspects of Clause 803 (804).

(ii) copies of dated delivery tickets showing materials, source and site supplied.

(iii) documentary evidence of material source, site and tonnage supplied.

Evidence should be provided for at least two major sites.

Routine water absorption tests should be made on the delivered material. If any result from these tests exceeds the declared value (d) by more than 0.5 i.e., > (d + 0.5) %, further investigation will be required.

NATIONAL ALTERATIONS OF THE OVERSEEING ORGANISATION OF SCOTLAND

NG 850SO Crushed Gravels for Type 1 Granular Sub-Bases

General

1 Trafficking trials of crushed gravel sub-bases used in Scotland have produced rut depths well within the upper limit (30mm) recommended by the Transport Research Laboratory for the assessment of sub-base materials if laid on Works contracts provided that:

(i) strict control over the grading is maintained

and

(ii) the crushed face requirements are met.

2 Any unusual behaviour of the laid material under construction plant should be investigated and, if considered necessary, the Contractor's laying and compaction methods should be carefully examined. Guidance on the protection of the subgrade and sub-base is already given in NG 704.

3 No limiting traffic design has been imposed for crushed gravel Type 1 Granular Sub-Base complying with Clause 850SO. However its use on roads designed to carry more than 1500 commercial vehicles per lane per day should be clearly identified in the As-Built Records required in accordance with SDD Circular No 27/1989.

4 Where the soundness test is used as a means of confirming source suitability, a certificate from a testing laboratory accredited in accordance with EN 45002 by the United Kingdom Accreditation Service (UKAS) for that test, showing a value in excess of the minimum specified and dated not more than 6 months previous to the start of the contract, should be provided.

For those sources seeking suitability based on historical evidence of satisfactory use, the following should be provided:

(i) dated certification showing supply of materials conforming with all other aspects of Clause 803 (804).

(ii) copies of dated delivery tickets showing materials, source and site supplied.

(iii) documentary evidence of material source, site and tonnage supplied.

Evidence should be provided for at least two major sites.

Routine water absorption tests should be made on the delivered material. If any result from these tests exceeds the declared value (d) by more than 0.5 ie, $> (d + 0.5)\%$, further investigation will be required.

Trafficking Trial Procedure

Introduction

5 The Transport Research Laboratory has recommended that deformation under controlled trafficking provides a suitable criterion for assessing sub-base stability. Research has indicated that 30mm rut depth after 1000 standard axles is an acceptable limiting criterion, and this has been adopted as the basis of assessment of crushed gravels offered as alternatives to Type 1 sub-base materials.

Location

6 (i) The trial area shall be located on suitable prepared sub-formation compacted in accordance with the Specification. The trial area may be located so that it can be incorporated within the Permanent Works if the resistance to wheeltrack rutting complies with Clause 850SO.9.

(ii) The trial area shall be not less than 60 metres long and be not less than 20 metres wide.

Materials

7 (i) If required within the Permanent Works, suitable capping layer material in sufficient quantity shall be provided to construct a platform approximately 50 metres long by 10 metres wide compacted to the thickness required in the contract.

(ii) The crushed gravel sub-base material complying with the requirements of Clause 850SO shall be provided in sufficient quantity to construct a trial area approximately 50 metres long and having a base width of 7.5 metres to 8 metres compacted to the thickness specified in the contract.

Placement

8 (i) The materials shall be placed and compacted using the equipment proposed for use in the Works.

(ii) If required in the Contract, the capping layer material shall be placed and compacted in accordance with Clause 802 at a moisture content within the range 1% above to 2% below the optimum moisture content determined in accordance with BS 5835.

(iii) The crushed gravel sub-base material shall be placed on top of the compacted capping layer or the prepared sub-formation as appropriate and compacted in accordance with Clause 802 at a moisture content within the range 1% above to 2% below the optimum moisture content determined in accordance with BS 5835.

(iv) The trial area shall be ramped at each end and rigid beams (wooden sleepers or similar) shall be incorporated into each end of the area for a distance of approximately 5 metres and shall have their upper faces level with the surface of the compacted crushed gravel sub-base. This will assist correct tracking by the test vehicle and minimise dynamic effects of the vehicle bouncing on its springs.

Trafficking

9 (i) A convenient test vehicle is a three-axle tipper lorry loaded to a gross mass of 24 tonnes (one pass is equivalent to three standard axles). The selection of the test vehicle however shall reflect actual site conditions and the equivalent standard axle loading shall be calculated for monitoring.

(ii) Longitudinal string lines shall be laid out on the trial embankment to help the driver maintain the same track on each pass and to achieve channelled rutting. Five transverse string lines shall be laid out at equal spacing along the length, covering the full width of the trial embankment. The end string lines shall be positioned at least the length of the lorry from the rigid beams at the ends of the trial area.

(iii) Vertical deformation shall be measured in all the wheeltracks using an optical level at monitoring points on each of the 5 transverse string lines after 5, 15, 50, 100, 180 and 350 passes. The mean vertical deformations at the previously mentioned lorry passes shall be plotted against the respective passes and the vertical deformation corresponding to 1000 standard axles shall be interpolated.

(iv) The crushed gravel sub-base material shall be deemed to be an acceptable alternative to Type 1 granular sub-base materials specified in Clause 803 if the mean vertical deformation corresponding to 1000 standard axles is less than 30mm when tested in accordance with the trafficking procedure given in this Clause.

NATIONAL ALTERATIONS OF THE OVERSEEING ORGANISATION OF NORTHERN IRELAND

NG 801NI Unbound Materials for Sub-bases and Roadbases

1 The permitted alternatives for sub-bases include Types 1, 2 and 3 granular sub-base material. For granular sub-bases under cement bound roadbases, where good drainage of the sub-base and subgrade is certain and there is no chance of water standing under cemented material, the Overseeing Organisation may, in order to make significant financial or environmental gains, such as removal of spoil heaps, accept sub-base material with a water soluble sulfate content of up to 2.2 g/litre, provided structures are isolated by 500 mm of sulfate-free material or precautions are taken to protect them. (See NG 1704.2 and Table 17/2).

Frequency of Sampling

2 The recommended rate of sampling for the determination of grading, plasticity and quality should be one sample for every 200 tonnes of material supplied. For schemes using less than 200 tonnes one sample should be taken.

NG 851NI Filter Layer

1 Crushed rock or sand filter layers of 50 mm minimum thickness should be provided immediately below carriageway sub-bases where cohesive materials occur within the top 150 mm of the sub-grade to prevent the ingress of cohesive particles into the sub-base.

Where a capping layer is provided, no filter layer is required at the sub-base or capping layer interfaces but the thickness of the capping layer should be increased by 75 mm if the sub-grade contains cohesive materials.