SERIES NG 800
ROAD PAVEMENTS – UNBOUND, CEMENT AND OTHER HYDRAULICALLY BOUND MIXTURES

Contents

ROAD PAVEMENTS – (02/16) UNBOUND, CEMENT AND OTHER HYDRAULICALLY BOUND MIXTURES

NG 803 (02/16) Type 1 Unbound Mixtures

1 (02/16) The inclusion of up to 10% natural sand passing the 4 mm test sieve is permitted at the discretion of the supplier to adjust the material grading. Maximum limits of material content are included for asphalt and foreign material in recycled coarse aggregate and recycled concrete aggregate.

2 (11/21) BS EN 13285 details additional requirements to control individual batches of unbound mixtures with an overall grading Category GP, within a system of factory production control. Tables 8/6a and 8/6b in Clause 803 illustrates this. The supplier should nominate a supplier declared value for the intermediate sieves in the grading envelope as part of the system of factory production control for the mixture. The nominated value should lie within the supplier declared value grading range in Tables 8/6a and 8/6b. Individual batches are then assessed using the tolerances in Tables 8/6a and 8/6b, applied to the supplier declared values. As explained in Annex B (informative) of BS EN 13285, the use of tolerances does not change the overall grading range.

3 (11/21) The permitted grading shall normally meet the requirements of of BS EN 13285 and Table 8/6a. Table 8/6b may only be used for trench reinstatements and narrow widenings less than 1 m.

4 (11/21) Tables 8/6a and 8/6b also includes requirements for the calculated difference between the values of percentage by mass passing selected adjacent sieves. These requirements are taken from BS EN 13285 and ensure a 'well graded' mixture by controlling the continuity of the grading curve.

5 (11/21) Because the requirements for aggregates used in the unbound mixtures now refer to the requirements of BS EN 13242, confirmation of conformity with the categories for Los Angeles coefficient and magnesium sulfate soundness can be obtained from the CE Mark Certificate for the aggregates used in the mixture. If a CE Mark Certificate is not available to confirm the suitability of the source, test certificates should be provided from a testing laboratory accredited by an appropriate organisation accredited in accordance with sub-Clause 105.4 for the test, showing a value in excess of the minimum specified and dated not more than 6 months prior to the start of the contract.

6 (11/21) Whilst there is no specified moisture content for laying and compacting unbound mixtures to Clause 803, in order to satisfy the requirements of sub-Clauses 802.8 and 803.7 it will be necessary to carry out these operations at optimum moisture content or thereabouts.

(02/16) **Mixtures Containing Crushed Gravel Aggregates**

7 (11/21) Previous editions of Clause 803 excludes all gravels from granular subbase material Type 1 but crushed gravel aggregate is permitted by BS EN 13285. All types of aggregate must achieve the required installation surface stiffness.

NG 804 (02/16) Type 2 Unbound Mixtures

1 (02/16) Current design requirements exclude Type 2 unbound mixtures from flexible roads carrying a traffic loading of more than 5 msa. Where local experience indicates that these materials can be used successfully at higher traffic levels, the Overseeing Organisation may require that a Substitute Clause should be written to permit their use. Mixtures containing a high proportion of asphalt arisings have been shown to perform well at design traffic levels higher than 5 msa, but performance should be assessed using a trafficking trial.

2 (11/21) Table 8/7 in Clause 804 includes requirements for the calculated difference between the values of percentage by mass passing selected adjacent sieves. These requirements are taken from BS EN 13285 and ensure a 'well graded' mixture by controlling the continuity of the grading curve.

3 (11/21) Although parameters related to the control of the construction of the pavement layer are outside the scope of BS EN 13285, it is appropriate to make information available to assist the purchaser's choice of unbound mixture. BS EN 13285 requires the laboratory dry density and optimum water content of an unbound mixture to be declared at least once each year, as part of the system of factory production control. BS EN 13285 permits choice from a list of four test methods for these properties, reflecting the range of mixtures and techniques used across Europe. In the UK, it is recommended that the vibrating hammer test (BS EN 13286-4) is used. BS EN 13286-4 also includes a test method for the determination of optimum moisture content which was developed specifically for graded aggregates and gives more reproducible results than the vibrating hammer test for these materials.

NG 807 (02/16) Type 4 (asphalt arisings) Unbound Mixtures

1 (02/16) Trafficking trials of mixtures containing a high proportion of asphalt arisings carried out by TRL have produced rut-depths well within the upper recommended limit of 30 mm. However the effects of this material on the surrounding environment should be fully assessed and approvals from statutory bodies obtained where necessary, before including this material as a permitted option in contract specific Appendix 7/1.

2 (11/21) When dry, asphalt arisings exhibit a considerable resistance to compaction due to the friction of the bitumen coating. The addition of water has a significant effect on the state of compaction by reducing the friction between the bitumen coated particles. Type 4 (asphalt arisings) unbound mixtures should, therefore, be compacted at moisture contents close to the declared value of optimum water content.

3 (02/16) The particle size distribution of asphalt arisings is best described by the term 'lump size distribution' because of the binding effect of bitumen. The grading envelope obtained will be dependent on the duration of shaking, the temperature at which the determination is carried out and the grading of the mineral particles within the asphalt arisings.

Agglomeration of lumps can occur in stockpiled material especially in hot weather or when the material is stored for long periods. It is important that, at the time of placing, the asphalt arisings comply with the specified lump size distribution and care should be taken to ensure that, material taken from a stockpile is to the required grading. It may be necessary to demonstrate that the material actually placed meets the grading specification rather than to rely on tests at an earlier time.

Lumps, or individual particles of aggregate separated by the planing process, should be angular in appearance. Rounded particles that can be present when using arisings containing gravel aggregates can lead to difficulties in meeting the rutting criterion.

4 (02/16) Particle durability in terms of the magnesium sulfate soundness test need not be verified for mixtures containing a high proportion of asphalt arisings as the aggregates will have been tested prior to the introduction of bitumen.

5 (02/16) Particle hardness in terms of the Los Angeles test need not be verified for mixtures containing a high proportion of asphalt arisings as the test is unsuitable for materials containing bitumen and because the aggregate components will have been tested prior to the introduction of bitumen.

Cement and Other Hydraulically Bound Mixtures

NG 810 (02/16) General Requirements for Cement and Other Hydraulically Bound Mixtures

(02/16) **General**

1 (11/21) Requirements for Hydraulically Bound Granular Mixtures for base layers should be identified by the compiler in the contract specific Appendix 7/1, including:

(i) the HBGM mixture designation;

(ii) laboratory mechanical performance category;

(iii) aggregate requirements;

(iv) requirements for coefficient of linear thermal expansion of the mixture; and

(v) requirements for induced cracking.

2 (11/21) Requirements for Hydraulically Bound Mixtures for subbase layers should be identified by the compiler in the contract specific Appendix 7/1, including:

(i) HBM mixture designation;

(ii) laboratory mechanical performance category;

(iii) requirements for layer stiffness determined in accordance with Clause 881; and

(iv) requirements for induced cracking.

NG 818 (02/16) Induced Cracking of HBM

1 (11/21) The need for inducing transverse and longitudinal cracks in HBM is determined by the design requirements. Further guidance is given in CD 226 and Appendix B8.2 of BS 9227.

NG 882 Determination of the Construction Subgrade Surface Modulus

1 (03/20) Requirements for determining the construction subgrade surface modulus of each foundation area should be identified by the compiler in the contract specific Appendix 7/1, including:

(i) the measurement interval for the construction subgrade surface modulus testing;

(ii) the method used to determine the construction subgrade surface modulus; and,

(iii) the minimum construction subgrade surface modulus value to be achieved.

2 (03/20) Instructions for how to proceed should the required construction subgrade surface modulus value not be achieved should be detailed in the contract specific Appendix 7/1.

3 (03/20) Instructions for submitting construction subgrade surface modulus results to the Overseeing Organisation should be detailed in the contract specific Appendix 7/1.

NG 883 Demonstration Area for Performance Foundations Designs

1 (03/20) For slow curing HBMs, an extended curing period may be specified in the contract specific Appendix 7/1 before testing and augmented by laboratory evidence showing that the expected 360 day performance will be met.

NG 884 Permanent Works Performance Assessment for Performance Foundations

1 (03/20) Requirements for performance assessment of each performance foundation area should be identified by the compiler in the contract specific Appendix 7/1, including:

(i) the interval of measurement for in-situ density testing;

(ii) the interval of measurement for foundation surface modulus testing;

(iii) the method used to determine the foundation surface modulus;

(iv) the mean of 5 foundation surface modulus value to be achieved; and,

(v) the minimum foundation surface modulus value to be achieved by any test.

2 (03/20) Instructions for how to proceed should the required mean and minimum foundation surface modulus values not be achieved shall be detailed in the contract specific Appendix 7/1.

3 (03/20) Instructions for submitting foundation surface modulus results to the Overseeing Organisation shall be detailed in the contract specific Appendix 7/1.