



HIGHWAYS DEPARTMENT

GUIDANCE NOTES

***MINOR WORKS SPECIFICATION FOR
BITUMINOUS PAVEMENT CONSTRUCTION***

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GUIDANCE NOTES No. RD/GN/018

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BITUMINOUS PAVEMENT CONSTRUCTION

1.0 INTRODUCTION

- 1.1** Bituminous pavement construction works under the Lands and Works Group contracts are required to comply with Section 9 of the General Specification for Civil Engineering Works, 1992 Edition (GS). However, it is generally considered that the requirements stipulated in the GS are too stringent for minor works such as small-scale road maintenance or trench reinstatement works and for large-scale works where materials are required to be laid in small sections or by hand. In view of this, this document has been prepared to give engineers some guidelines for the construction of minor bituminous pavement works where hot-mix materials are used, and to introduce a particular specification which can be readily incorporated in the relevant contract documents.
- 1.2** To maintain the format of the GS, the particular specification for minor bituminous pavement works is put under Section 29 with the heading "Minor Bituminous Pavement Works". This is included as an Appendix to this document. Its format is mainly based on Section 9 of the GS with appropriate modifications to reflect the difficulty in achieving the specified GS requirements.
- 1.3** The Engineer should use the guidelines in this document to decide when to apply this particular specification for minor bituminous works with a view to maintaining an acceptable standard in materials and workmanship.

2.0 CONSIDERATIONS

In classification of minor bituminous works, the following criteria should be taken into consideration:

2.1 Run Size

Runs of single-lane width with length less than 30 m and runs of greater widths but with their areas not exceeding 100 m² should be regarded as minor works. Runs with area exceeding 100 m² but less than 200 m² may be regarded as minor works if the Engineer considers it appropriate in respect of the particular site condition. Runs of less than a single-lane width such as trench reinstatement should also be regarded as minor works irrespective of their lengths. As far as practicable, panels should be constructed in rectangular shape of at least one traffic lane wide and a minimum of 5 m long for roadbase and base course and 15 m long for wearing course. Friction course should also be constructed in runs of at least one traffic lane wide and 15 m long except for road reinstatement after the removal of thermoplastic road markings where the replacement strips should be minimum 300 mm wide.

2.2 Laying and Compaction

In areas such as roundabouts and cul-de-sacs where the use of a paving machine and/or the use of the compaction plant as described in GS Clause 9.33 (1)(a) are impracticable, the bituminous materials should be laid by hand and compacted by equipment as described in GS Clause 9.33 (1)(b). The areas so constructed should be assessed in accordance with this document.

2.3 Pothole Patching

This document does not apply to patching of potholes. However, areas with closely-spaced potholes should be milled and resurfaced with hot-mix bituminous materials of minimum run size stated in Clause 2.1 of this document.

2.4 Trench Reinstatement

This document applies to permanent trench reinstatement and reference should also be made to Guidance Notes No. RD/GN/014 issued by the Highways Department, Research and Development Division.

3.0 SUBMISSIONS

(Refer GS Clause 9.10 to 9.14 and Clause 29.04 in Appendix)

3.1 Under the current practice, all bituminous materials used in highway works have to be assessed by the Research and Development (R&D) Division of the Highways Department under the Centralised Mix Design Vetting System. Particulars of all bituminous mixes for use in roadbase, base course, wearing course and friction course can be obtained from the R&D Division. A list showing the major details of the approved mixes are circulated quarterly within the Highways Department and the Territory Development Department.

3.2 Advice on properties of the aggregate, filler and bitumen of the proposed bituminous material may be sought from the R&D Division if required.

4.0 LAYING AND COMPACTION OF BITUMINOUS MATERIALS

(Refer GS Clause 9.30 to 9.34 and Clause 29.08 in Appendix)

4.1 Friction course material should only be laid by paving machine except for road reinstatement after the removal of thermoplastic road markings where the material may be hand laid.

4.2 Laying of bituminous materials by hand should be done very carefully and the materials should be distributed uniformly to avoid segregation of the coarse aggregate. Materials should not be broadcast or spread from shovels as this causes segregation. The material should be deposited from shovels into small piles and then evenly spread. Any part of the mix that has formed into lumps and does not break down easily should be discarded.

4.3 Compaction should start as soon as possible after the bituminous material has been

uniformly laid in place by the paver or by hand. When the use of a roller is impracticable, regularity of the surface should be closely checked with a straight-edge.

- 4.4 Joints with existing surfaces should be adequately compacted with the transverse joints being compacted first followed by the longitudinal joints.

5.0 **PROTECTION OF SURFACES OF BITUMINOUS MATERIALS**

(Refer GS Clause 9.35 and Clause 29.09 in Appendix)

If permitted by the Engineer, the time for re-opening to traffic on minor works of bituminous construction at road junctions, roundabouts and other key areas can be shortened, but under no circumstances should it be less than 2 hours after the material has been laid and compacted.

6.0 **TESTING: SURFACE REGULARITY**

(Refer GS Clause 9.39 to 9.40 and Clause 29.11 in Appendix)

The longitudinal regularity of the final surface may be checked with a 3 m straight-edge if a rolling straight-edge is not readily available.

7.0 **TESTING: AGGREGATES, FILLER AND BITUMEN FOR BITUMINOUS MATERIALS**

(Refer GS Clause 9.47 to 9.49 and Clause 29.12 in Appendix)

Relevant test data of the aggregate, filler and bitumen of bituminous materials used in minor works may be obtained from the R&D Division if required.

8.0 **TESTING: BITUMINOUS MATERIALS**

(Refer GS Clause 9.50 to 9.57 and Clause 29.13 in Appendix)

Separate sampling and testing of bituminous materials are not necessary if they are supplied under the Supply Contract of the Highways Department where the materials supplied are routinely monitored by the R&D Division. If necessary, relevant quality control test records can be obtained from the R&D Division at the request of the Engineer.

9.0 **TESTING: BITUMINOUS MATERIAL CORES**

(Refer GS Clause 9.58 to 9.61 and Clause 29.14 in Appendix)

It is considered not worth taking cores from minor works with area less than 50 m², nor from narrow trench reinstatement especially in the lower layers where a plate compactor may have to be used.

PARTICULAR SPECIFICATION

SECTION 29 - MINOR BITUMINOUS PAVEMENT WORKS

29.01 APPLICATION

The Engineer shall decide when to apply this PS for bituminous pavement works where hot-mix materials are used. If applied, the provisions contained in this PS shall prevail over the provisions contained in Section 9 of the GS.

29.02 MATERIALS

Materials to be used in minor bituminous pavement works shall be in accordance with GS Clause 9.03 to 9.07.

29.03 DESIGN OF BITUMINOUS MATERIALS

Design of bituminous materials shall be in accordance with GS Clause 9.09.

29.04 SUBMISSIONS

(1) The Contractor is not required to submit documents or certificates as stipulated in GS Clause 9.10 to 9.12 showing particulars of the aggregates, filler, bitumen and bituminous mixtures provided the proposed mixes have been vetted by the Research and Development (R&D) Division of the Highways Department unless otherwise specified by the Engineer.

(2) Unless otherwise specified by the Engineer, the Contractor is not required to submit samples of each type of aggregate, filler and bitumen of the proposed bituminous materials to the Engineer. Quality control testing records of the bituminous materials undertaken by the suppliers within the previous 3 months shall be submitted to the Engineer if required.

(3) The Contractor shall submit the proposed method of laying and the details of the compaction equipment for use in minor bituminous works to the Engineer at least 7 days before the works are executed.

29.05 TRIALS

Trial areas of bituminous materials as stipulated in GS Clause 9.15 to 9.19 are not required in minor works but bituminous mixes in particular those new or updated mixes which have not been subjected to satisfactory field trials shall not be used.

29.06 HANDLING, STORAGE AND TRANSPORT OF MATERIALS

Handling, storage and transport of bituminous materials for minor works shall be in accordance with GS Clause 9.23 and 9.24.

29.07 MIXING OF BITUMINOUS MATERIALS

Mixing of bituminous materials for minor works shall be in accordance with GS Clause 9.25 to 9.27.

29.08 LAYING AND COMPACTION OF BITUMINOUS MATERIALS

(1) Bituminous materials shall be laid by manual method only if in the opinion of the Engineer the use of a paving machine is impracticable.

(2) Vibrating plates or rammers shall be used for compaction in confined areas only when the use of a roller is impracticable.

(3) Preparation of joints in minor bituminous pavement works shall be in accordance with GS Clause 9.34.

(4) The minimum bituminous mixture temperature at start of compaction shall be 80 °C for roadbase material and 85 °C for base course and wearing course materials. When roller compaction cannot be used, these minimum temperatures shall be raised by 10 °C - 15 °C to allow for the longer period required for adequate compaction.

29.09 PROTECTION OF SURFACES OF BITUMINOUS MATERIALS

Unless otherwise agreed by the Engineer, surfaces of minor bituminous pavement works shall be protected in accordance with GS Clause 9.35.

29.10 TOLERANCES

(1) Unless otherwise required by the Engineer, it is not necessary to measure the levels of the finished surface of minor bituminous works as stated in GS Clause 9.37(1).

(2) The difference in level of the final surface of minor bituminous works across joints shall not exceed 4 mm.

(3) The achieved thickness of the final layer in minor bituminous works shall not be reduced by more than 5 mm from the specified thickness.

(4) Tolerances for level of covers, frames and other hardware in minor bituminous works shall be the same as that specified in GS Clause 9.38.

29.11 TESTING: SURFACE REGULARITY

(1) Surface regularity of the final surface of minor bituminous works shall be determined as stated in GS Clause 10.55 unless otherwise specified by the Engineer.

(2) There shall be no irregularity exceeding 10 mm in both the longitudinal and transverse directions.

29.12 TESTING: AGGREGATES, FILLER AND BITUMEN FOR BITUMINOUS MATERIALS

Unless otherwise required by the Engineer, it is not necessary to test the aggregate, filler and bitumen of bituminous materials used in minor works.

29.13 TESTING: BITUMINOUS MATERIALS

(1) Unless otherwise required by the Engineer, the sampling and testing requirements as stipulated in GS Clause 9.51, 9.52, 9.55 and 9.56 for bituminous materials laid in minor works can be waived but the Supplier's routine quality control test records relevant to the works shall be submitted to the Engineer.

(2) The compliance criteria for bituminous materials other than friction course material laid in association with minor works shall be the same as that specified in GS Clause 9.53.

(3) The compliance criteria for friction course material laid in association with minor works shall be the same as that specified in GS Clause 9.57.

29.14 TESTING: BITUMINOUS MATERIAL CORES

(1) Bituminous material cores shall be taken in accordance with GS Clause 9.58.

(2) Unless otherwise instructed by the Engineer, 2 cores shall be taken from each layer of bituminous material other than friction course material laid in minor works with area greater than 50 m².

(3) Each core taken in minor works from each layer of bituminous material other than friction course material shall be tested to determine the air void content which shall not be greater than 9.0%. If the test result does not comply with the specified requirement, two additional cores shall be taken at locations agreed by the Engineer and the averaged air void content determined from these 2 cores shall replace the original value for re-checking compliance. Notwithstanding this, no cores shall have an air void content exceeding 10.0%.

(4) If no bulk sample is taken for determination of the Rice's specific gravity, the corresponding value obtained from the mix design shall be used in determining the air void content of the core unless otherwise other value is suggested by the Contractor and agreed by the Engineer.

(5) Each core taken in minor works from the final surfacing layer shall also be

measured to determine the compacted layer thickness which shall comply with the thickness requirement stated in Clause 29.10 (3). If the compacted layer thickness as measured does not comply with the thickness requirement, two additional cores shall be taken at locations agreed by the Engineer and the averaged compacted layer thickness determined from these 2 cores shall replace the original measured value for re-checking compliance.

29.15 TESTING: TEXTURE DEPTH AND PERMEABILITY

(1) Tests for texture depth and permeability shall be carried out on the final surface of friction course at positions as agreed by the Engineer. The testing methods and the compliance criteria shall be the same as that specified in GS Clause 9.62 to 9.64.

(2) Unless otherwise agreed by the Engineer, the rate of testing for texture depth and permeability in minor works shall be 2 tests each for area of less than 100 m² and 4 tests each for area of 100 - 200 m².

29.16 RECTIFICATION

Any bituminous pavement course in minor works which does not comply with the requirements of surface regularity, layer thickness, material property, air void content, texture depth or permeability shall be removed unless otherwise agreed by the Engineer. The Engineer shall determine the extent of work which is unsatisfactory for rectification if necessary.