

# *ROAD PAVEMENTS – GENERAL*

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# Road Pavements – General

## 701 Pavement Construction

- 1 Road pavements shall be constructed from one of the permitted options described in Appendix 7/1 and in compliance with this Series, the NRA Road Construction Details listed in Appendix 7/5 and the appropriate Clauses of Series 800, 900 and 1000.
- 2 The Contractor shall, in his choice of permitted materials for subbases and bases, have regard to the nature of those materials and of the subgrade or any capping and the need to protect them from deterioration due to the ingress of water, the adverse effects of weather and the use of constructional plant. The Contractor shall programme the laying and compaction of the subbase and the subsequent pavement courses and take such other steps as may be considered necessary, to afford protection to the base, subbase and subgrade.

## 702 Horizontal Alignments, Surface Levels and Surface Regularity of Pavement Courses

### Horizontal Alignments

- 1 Horizontal alignments shall be determined from one edge of the pavement surface as described in Appendix 1/12. The edge of the pavement as constructed and all other parallel alignments shall be correct within a tolerance of  $\pm 25$  mm therefrom, except for kerbs and channel blocks which shall be laid with a smooth alignment within a tolerance of  $\pm 13$  mm.

### Surface Levels of Pavement Courses

- 2 The design levels of pavement courses shall be calculated from the vertical profile, crossfalls and the pavement course thicknesses described in Appendix 7/1. The level of any point on the constructed surface of the pavement courses shall be the design level subject to the appropriate tolerances stated in Table 7/1.
- 3 Notwithstanding the tolerances permitted in surface levels of pavement courses, the cumulative tolerance shall not result in a reduction in thickness of the pavement, excluding the subbase, by more than 15 mm from the specified thickness nor a reduction in the thickness of the bituminous surface course by more than 5 mm from that specified.

Furthermore, where the specified total thickness of bitumen bound material is less than 300mm there shall be no negative tolerance on the overall thickness of the bituminous layers.

- 4 For checking compliance with sub-Clause 2 of this Clause, measurements of the surface levels of all courses will be taken on a grid of points at 10m centres longitudinally and 2m centres transversely, unless otherwise described in Appendix 7/1. In any length of pavement, compliance shall be deemed to be met for all surfaces, other than the final road surface, when not more than one of ten consecutive measurements taken longitudinally or one in any transverse line, exceeds the tolerances permitted in Table 7/1, provided that this one measurement shall not exceed by more than 5 mm the tolerance for the course concerned. For the final road surface the tolerance given in Table 7/1 shall apply to any point on that surface.

**TABLE 7/1: Tolerances in Surface Levels of Pavement Courses**

Road surfaces	
- General	$\pm 6$ mm
- Adjacent to a surface water or linear drainage channel**	+ 10 - 0 mm
Binder course **	$\pm 6$ mm
Top surface of CRCP beneath surface course*	$\pm 8$ mm
Base other than above*	$\pm 15$ mm
Subbase directly under concrete pavement surface slabs laid full thickness in one operation by machines with surface compaction	$\pm 10$ mm
Subbases other than above	+ 10 mm - 30 mm

\* The lower layer of base or binder course laid in more than one layer shall comply with the tolerance for base or binder course as appropriate.

\*\* Where a surface water or linear drainage channel is laid before the adjacent road pavement layer the top of that layer, measured from the top of the adjacent edge of the surface water or linear drainage channel, shall be to the tolerances given in Table 7/1.

### Surface Regularity

- 5 The longitudinal regularity of the surfaces of surface courses, binder courses and concrete slabs shall be such that the number of surface

irregularities is within the relevant limits stated in Table 7/2.

An irregularity is a variation of not less than 4 mm or not less than 7 mm of the profile of the road surface as measured by the rolling straight-edge set at 4 mm or 7 mm as appropriate, or equivalent apparatus capable of measuring irregularities within the same magnitudes over a 3 m length. No irregularity exceeding 10 mm shall be permitted.

- 6 Surface macrotexture depth should be checked as soon as possible after laying and prior to trafficking. Prior to checking any surface for level or regularity, it shall be cleaned of loose or extraneous materials. These operations shall be carried out without damaging the surface of the pavement, as soon as possible and within 3 days of construction of the pavement.
- 7 Compliance with Table 7/2 shall be checked by the rolling straight edge along lines parallel to the edge of pavement over sections of 300 m as stated in Appendix 7/1, whether or not it is constructed in shorter lengths. Sections shorter than 300 m forming part of a longer pavement shall be assessed using the number of irregularities for a 300 m length pro-rata to the nearest whole number.

Where the total length of pavement is less than 300 m, the measurements shall be taken on 75 m lengths.

**TABLE 7/2: Maximum Permitted Number of Surface Irregularities**

Irregularity	Surfaces of carriageways, hard strips and hard shoulders				Surfaces of lay-bys, service areas, and all bituminous binder courses			
	4mm		7mm		4mm		7mm	
Length (m)	300	75	300	75	300	75	300	75
Category A* Roads	20	9	2	1	40	18	4	2
Category B* Roads	40	18	4	2	60	27	6	3

\* The Category of each section of road is indicated in Appendix 7/1.

- 8 Pavements shall be measured transversely for irregularities at regular intervals as stated in Appendix 7/1, by a 3 m long straight-edge in accordance with BS 8420 placed at right angles to the centre line of the road. The maximum allowable difference between the pavement surface and the straight-edge shall

be 3 mm.

- 9 A straight-edge 3 metres long, shall be used to check longitudinal surface regularity in the following cases:
- (i) for lengths of less than 75 m of surface course, binder course and concrete slabs;
  - (ii) where use of the rolling straight-edge or equivalent apparatus is impracticable;
  - (iii) for all lengths of subbase under concrete pavement slabs laid full thickness in one operation by machine with surface compaction.

The maximum allowable difference between the surface and the underside of the straight-edge, when placed parallel with, or at right angles to, the centre line of the road shall be:

for pavement surfaces	3 mm
for binder courses	6 mm
for subbases directly under concrete pavements (as in (iii) above)	10 mm

### Rectification

- 10 Where any pavement area does not comply with the Specification for regularity, surface tolerance, thickness, macrotexture depth, material properties or compaction, the full extent of the area which does not comply with the Specification shall be made good and the surface of the pavement course shall be rectified in the manner described below:

- (i) Unbound materials

The top 75 mm shall be scarified, reshaped with material added or removed as necessary, and re-compacted. The area treated shall be not less than 20 m long and 2 m wide.

- (ii) Cement bound subbases and bases

The method of correction will depend on the period which has elapsed between detection of the error and the time of mixing of the material. If this is less than 4 hours, the surface shall be scarified to a depth of not less than 50 mm, surplus material removed or freshly mixed material added as necessary, and re-compacted in accordance with the Specification. If the period is 4 hours or more the full depth of the layer shall be removed from the pavement and replaced with material in accordance with the Specification. In either case the area treated shall be at least 5 m long and the full width of the paving laid in one operation. If the Contractor proposes

rectification within 7 days of laying he shall comply with sub-Clauses 813.15 and 813.16. Alternatively, for subbases under concrete pavements the Contractor may make up low areas to a level within the tolerances of this Clause with a 1:4 cement and sand mortar.

(iii) Bituminous bases

The full depth of the top layer as laid shall be removed and be replaced with fresh material laid and compacted in accordance with the Specification. Any area so treated shall be at least 5 m long and the full width of the paving laid in one operation. Alternatively for low areas in bituminous bases, the Contractor may make up the level with additional binder course material when the binder course is laid subject to demonstrating compliance with compaction and level tolerances.

(iv) Surface courses and binder courses

These shall have the full depth of the course removed and replaced with fresh material laid and compacted in accordance with the Specification.

The area rectified shall be the full width of the paving laid in one operation, and at least 5 m long if binder course (or upper base on pavements without binder course), or 15 m if surface course.

Where the number of surface irregularities exceeds the limits in Table 7/2, the area to be rectified shall be 300 m or 75 m long as appropriate (or such lesser length as necessary to make the number of surface irregularities comply with the limits) and shall be over the full width of the lanes affected.

Checking of the surface course for compliance with this Clause shall be carried out as soon as possible after completion of the surfacing and remedial works completed before the road is opened to traffic.

Where the macrotexture depth requirements under Clause 921 is not met, sufficient 50 m lengths shall be replaced, starting with that length having the least macrotexture depth, until the average requirement for the section length is complied with. A minimum length of 50 m and the full lane width shall be removed and replaced to the full depth of the surface course.

Areas to be removed shall be delineated both longitudinally and transversely by saw cutting prior to the material being removed. Joints shall be formed either by

coating the exposed sawn face with hot bitumen or heating by a suitable heater. The heater shall raise the temperature of the full depth of the course immediately before laying the new material to a figure within the range of minimum rolling temperature and maximum temperature at any stage specified for the material and for a width of not less than 75 mm.

(v) Concrete slabs

Concrete slabs shall be rectified by planing, grinding or bump cutting. Large depressions, which cannot be dealt with in this way, shall be rectified by cutting out the surface and replacing by a thin bonded surface repair complying with Clause 1032.

Retexturing of hardened concrete shall be carried out by sawing grooves in accordance with the Specification or by flailing or bush hammering if the resultant skid resistance value is equal to that of brushed concrete. Texturing of replaced surfaces shall be by brushing in accordance with the Specification. Remedial works involving the placing of fresh concrete shall be completed in sufficient time for the concrete strength to have developed as required in Clause 1048, before that section of pavement is opened to traffic.

## 703 Not Used

## 704 Not Used

## 705 Not Used

## 706 Excavation, Trimming and Reinstatement of Pavements and Paved Areas

### Excavations in Pavements and Paved Areas which have been constructed as part of the Works

- 1 The Contractor shall not excavate pits, trenches or other openings in pavements and paved areas which have been constructed as part of the Works in order to construct other parts of the Works, including Statutory Undertakers and other service works, except with the prior approval of the Employer's Representative.
- 2 Where such excavations are permitted, they shall be carried out and reinstated in

compliance with this Clause and with any additional requirements described in Appendix 7/2. Excavations shall be carried out to the dimensions described in Appendix 7/2, or, if not so described, to the minimum dimensions, subject to sub-Clause 3 of this Clause, necessary to carry out the work.

- 3 Excavations in pavements and other paved areas, except those described in sub-Clause 5 of this Clause, including surfacing, base and sub-base, shall be cut to neat lines to dimensions at least 150 mm greater on each side than the dimensions of any further excavation below formation level.
- 4 Excavations in capping shall be taken at least 75 mm outside the dimensions of any excavation below. Road surfacing of bituminous material shall be cut back by sawing or planing to a further 150 mm on each side. Surface course shall be cut back by sawing or planing to a further distance such that the length of surface course replaced, measured transverse to the trench, is at least 15m. Planing shall be carried out in accordance with Clause 709. Concrete surfacing and concrete bases, except CBGM, shall be cut back by sawing by at least 300 mm on each side to the level of any reinforcement in reinforced slabs and to the full depth of the slab in unreinforced slabs.

If excavations are required to inspect the condition of lower layers, each layer shall be excavated separately and cleaned of debris to permit inspection.

- 5 Concrete blocks, clay pavers and precast concrete flags, kerbs and channels shall be lifted without cutting, to the nearest joint satisfying sub-Clause 3 of this Clause and carefully stored for re-use or dealt with as described in Appendix 2/3. In situ kerbs and channels shall be broken out to at least 150 mm beyond the excavation.
- 6 All excavations shall be carried out in compliance with the Specification and adequately supported at all times. Support shall be withdrawn as backfilling proceeds.

#### **Backfilling**

- 7 Backfilling of excavations shall be carried out as quickly as possible after completion of the work for which the excavation is required, to formation or sub-formation, in compliance with the appropriate Clauses in Series 500, 600, 1200, 1300 and 1400 or as otherwise described in Appendix 7/2, using fill material and compaction described therein.

#### **Reinstatement of Pavements and Paved Areas which have been Constructed as Part of the Works**

- 8 The layers of capping and pavement and other paved area materials shall be reinstated consecutively in compliance with the appropriate Clauses in Series 600, 700, 800, 900, 1000 and 1100, to match the thicknesses and constituents of the existing material or as otherwise described in Appendix 7/2. They shall be laid and compacted in compliance with the appropriate Clauses in the above Series within the tolerances given in Table 7/1.

To allow for settlement in backfill under concrete pavements, temporary repairs to the pavement shall be carried out using bituminous materials. Alternatively, foamed concrete shall be used up to the base of the slab and the slab reinstated as soon as possible. The reinstatement of the concrete slab shall be carried out as described in Appendix 7/2.

- 9 Block and flag paving and precast and in situ kerbs and channels shall be reinstated in compliance with Series 1100 to match the existing construction.
- 10 Where settlement of the reinstatement occurs, the surface level shall be brought to correct levels and surface regularity.
- 11 Immediately before bituminous layers are reinstated, the edges of the existing material shall be cleaned of all loose material and treated in accordance with the requirements for joints in Series 900. Where joints in concrete slabs are affected by the excavation they shall be reinstated by cutting back to at least 0.5 m on each side of a transverse joint and forming an expansion joint on one side of the excavation and a contraction joint on the other and provide longitudinal joints where necessary in the same line before reinstatement in compliance with Series 1000 to match the existing construction.

#### **Excavations and Reinstatement in Existing Pavements and Paved Areas**

- 12 Excavations and reinstatements of openings in existing pavements and paved areas of national roads designed to carry traffic loading of 120 msa or less, shall comply with the "Specification for the Reinstatement of Openings in National Roads" issued by the National Roads Authority and the requirements of Appendix 7/2.

### **Junctions Between New Pavement Construction and Existing Pavement or Other Paved Areas**

- 13 Where new pavement construction abuts an existing bituminous pavement which has to be reduced in level or overlaid to match alignment and levels, the existing surface shall be trimmed by the minimum amount of cold-milling (planing) to a depth which will allow the thickness of new construction specified in Appendix 7/2 to be laid, the edge being trimmed and treated in compliance with this Clause. Where the difference in level makes it necessary, a regulating course and surface course as described in Appendix 7/2 and surfacing material complying with the appropriate Clauses in Series 900 shall be provided over the areas described in Appendix 7/2. Junctions between concrete pavements and between concrete and bituminous pavements shall be constructed as described in Appendix 7/2.
- 14 Where an existing pavement has been trimmed for a new pavement to abut it, regulating layers for changes in crossfall or level shall comply with the requirements for the appropriate sub-base, base or surface layer.

### **707 Breaking Up or Perforation of Redundant Pavement**

- 1 Where redundant pavement construction is to be perforated or broken up, the pavement shall be treated as described in Appendix 7/6.

### **708 Not Used**

### **709 Cold-milling (Planing) of Bituminous Bound Flexible Pavement**

- 1 Where cold-milling of bituminous bound flexible pavement is required, the area of carriageway to be milled shall be removed by a suitable milling machine to the requirements specified in Appendix 7/9. The process shall be carried out so as not to produce excessive quantities of dust, which shall be minimised by damping with water sprays.
- 2 The cut edges shall be left neat, vertical and in straight lines. The Contractor shall brush and sweep the milled surface by mechanical means to produce a clean and regular running surface with a groove depth not greater than 5 mm, and with a uniform texture.

- 3 Carriageways shall be milled to the tolerance of  $\pm 6$ mm. If the tolerances in this Clause are exceeded, the full extent of the area which does not comply shall be rectified by further milling or by regulating with materials in accordance with Clause 907.
- 4 Existing ironwork shall not be disturbed by the milling action. Where necessary, surfacing in the vicinity of ironwork and in small or irregular areas shall be cut out by pneumatic tools or other suitable methods and removed.
- 5 Where milling is carried out on a carriageway open to traffic, temporary ramping to ensure the safe passage of vehicles shall be provided in accordance with the requirements of Appendix 1/17.
- 6 If the milled surface profile varies by more than 5 mm, when measured transversely or longitudinally by a 3 metre straight edge, adjustments or replacements shall be made to the cutting teeth on the milling drum before work continues. Any discontinuity between adjacent milling passes exceeding 5 mm, when measured transversely by a 3 metre straight edge, shall be rectified by further milling or regulating before placing bituminous materials.
- 7 Where milling is required over extensive areas, the Contractor shall programme the work to allow removal of full lane widths unless this is impracticable. The Contractor shall notify his proposed programme of milling to the Employer prior to commencement of the work.
- 8 Immediately after milling, surplus materials shall be removed by a machine of suitable and efficient design and the milled surface swept to remove all dust and loose debris.
- 9 The material removed from the carriageway shall be removed from site, unless otherwise described in Appendix 2/3. No stockpiling shall be allowed on Site unless the material is to be used in the Works.
- 10 Carriageways which are closed to traffic to permit milling shall be resurfaced after milling prior to reopening the carriageway to traffic unless otherwise agreed by the Employer.
- 11 When specified in Appendix 7/9, 48 hours prior to cold-milling the Contractor shall carry out a sweep of the area(s) to locate any buried metalwork within the layer to be cold-milled. The sweep shall be carried out with electronic detection equipment suitable for the purpose. The surface shall be clearly marked above all objects to show their detected extent. The

objects shall be referenced and their location and depth reported to the Employer within 6 hours of discovery. Surfacing in the vicinity of such objects shall be excavated using pneumatic tools or other suitable methods.