SERIES NG 700
ROAD PAVEMENTS - GENERAL

Contents

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

Northern Ireland

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

ROAD PAVEMENTS - GENERAL

NG 700 General

1 Advice on the design, construction and maintenance of roads is published in The Design Manual for Roads and Bridges (DMRB) Vol. 7.

NG 701 Pavement Construction

1 Unless otherwise agreed by the Overseeing Organisation all types of pavement construction (flexible, flexible composite, rigid and rigid composite; as defined in Standard HD 26) should be permitted as alternatives for the main carriageways on new works and reconstruction work and work to side roads on trunk road contracts. Also the alternative component layers and layer materials within these 4 types should wherever possible be permitted.

Where a restriction of pavement types and/or their component layers/ materials is considered necessary on the main carriageway in new works and reconstruction work and work to side roads on trunk road contracts, details and justification are to be submitted to the Overseeing Organisation for approval.

2 A separate Appendix 7/l Sheet l (see Sample) is to be completed for each permitted flexible pavement, flexible composite pavement, and surfacing for rigid composite pavement.

Only one Appendix 7/1 Sheet 2 (see Sample) is necessary to cover both rigid and rigid composite pavements but it must clearly state which alternative construction types (URC, JRC, CRCP, CRCR) are permitted.

Sheets 1 and 2 of Appendix 7/1 should cover all permitted alternatives for each length of carriageway and paved area.

3 Where the subgrade CBR value is estimated to be of a value requiring capping for one type of pavement (eg. rigid or rigid composite) but not for others permitted for the same length of carriageway this should be clearly shown on the Appendix 7/l (Sheet 2) and allowed for in Appendix 6/7.

4 A summary may be included as sheet 3 of Appendix 7/1.

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

1 All levels of pavement courses are related to the specified level of the final road surface. Tolerances and limits in levels and irregularity are given in Tables 7/1 and 7/2 respectively. These should be strictly enforced to maintain a good ride and constant thickness of material. As they are based on the capabilities of most pavers to lay to a level they do not allow for any intentional reduction of the pavement thickness.

2 Surface levels of different pavement courses should be measured at points on a grid described in Appendix 7/1 in order to be able to determine the thickness of each course from the successive measurement of levels at the grid points. The spacing of the grid should normally be 10 m longitudinally and 2 m transversely. Where a greater degree of level control is required, eg. at junctions of the carriageway with side roads, on slip roads and roundabouts, but not joints in the carriageway, the grid points should be at some lesser spacing. Measurement of surface levels at points on a grid does not mean that the surface can be outside the permitted tolerances at other points between the grid.

3 The tolerances on surface levels of wearing course and concrete slabs are set in order to provide as good a ride as possible and avoid undulations of an individual or cyclic nature, which are of a wavelength outside the range detectable by the rolling straight-edge or equivalent apparatus. If, however, through a fault in the paving plant the whole surface as laid is consistently high over long lengths, it would be unnecessary to impose the limits of the true surface level tolerances, provided:

(i) Clearances under bridges are adequate, and allow for overlays.

(ii) The drainage of the carriageway is not impaired.

(iii) All tolerances except those on the final road surface design level comply with the Specification.

(iv) The area affected is of such length as to provide an acceptable ride.

4 The limits for surface regularity of sub-bases under concrete pavement surface slabs is necessarily less when the slabs are laid in a single layer and only compacted by surface compacting beams. With a standard

surcharge and a fixed degree of compaction with such equipment, upward variations in the sub-base can be reflected in the surface when the concrete is fully compacted, whereas downward variations will result in lack of compaction locally. These tighter tolerances do not apply when internal vibration is used.

5 Two categories of road are given in Table 7/2 and for each different section of road the category must be stated in Appendix 7/1. The Overseeing Organisation will decide the category on the quality and quantity of traffic, on the road layout and potential speeds of traffic. Category B generally is for low speed (under 50 km/h) roads.

6 The surface should be thoroughly swept to remove extraneous matter before measurements are taken. All such measurements should be taken early, and any deficiencies in the pavement should be reported as soon as possible to allow the Contractor sufficient time to complete all remedial work and to allow for concrete to cure before opening the road to traffic. The rolling straight-edge should be used at about 2 km/hour. Some coarse textures can lead to incorrect readings if the surface is traversed too quickly. Areas shown not to comply with the Specification should be rectified as soon as possible and checked by a 3 m straight-edge or, for longer lengths, by the rolling straight edge or equivalent apparatus.

7 Traces from profilometers are useful in picking out particular areas for remedial work from the whole stretch shown not to comply with the Specification by the rolling straight-edge or equivalent apparatus.

8 For rectifying concrete slabs use of a bump cutter with a long wheel base is essential to produce an even plane without local overcutting. Grinding down either side of depressions may improve the riding quality, if they are small. Deeper depressions should normally be rectified by cutting out and refilling.

NG 703 Weather Conditions for Laying of Unbound Granular and Cementitious Materials

1 Thermal insulation blankets laid on the finished concrete can enhance the rapidity of curing by the retention of heat. This is of benefit not only in cold weather, but also at other periods to accelerate the curing of the concrete slabs.

NG 704 Use of Surfaces by Traffic and Construction Plant

1 Under the Conditions of Contract the Contractor is responsible for care of the Works including the protection of the sub-base and subgrade. The choice of permitted materials is intended to allow the Contractor to make the most economical use of available materials suitable for his method of construction. It will not be known when drawing up the documents what materials, plant, methods and programme the Contractor will adopt. Therefore, generally, it will not be possible to justify restriction of the choice allowed nor specify measures required specifically for construction, but where any particular circumstances are known any materials which would put the Permanent Works at risk of failure should not be included in Appendix 7/1.

2 As some unbound sub-bases are moisture susceptible and are unsuitable for construction traffic in wet periods the Contractor's choice of sub-base should be related to the time of year and his programme and method for laying the roadbase and subsequent layers. Long delays could be avoided by the use of cement-stabilised material. Traffic running on the sub-base may cause irreparable damage to the subgrade or capping. Protection of the sub-base against weather can best be achieved by laying the subsequent layers as soon as possible.

Some sub-base and roadbase materials degrade during normal laying and compacting operations. If there is any doubt about degradation of the material during laying and compacting then sampling points should be chosen for each material which will be representative of the quality of the laid material.

Under wet conditions some Type 2 granular sub-base material can rapidly deteriorate if used by construction traffic and the subgrade can be damaged by rutting, which could result in permanent soft spots. Type 2 granular sub-base material is suitable for its purpose if its moisture content is kept around the optimum. Work should preferably be programmed so that the roadbase is applied before the sub-base is wetted.

Any thickening shall be across the full width of that part of the pavement which is in new construction. If temporary haul roads are laid and later removed they must be placed so that drainage of the formation and sub-base surface is not impeded.

3 Where there is a need to open a section of concrete pavement or roadbase to traffic early after placing the concrete, high strength mixes may be used. To estimate the time when the required strength may be achieved trial mixes should be tested at various early periods to establish a rate of strength development. These times can be confirmed by testing cubes which were placed alongside the pavement in moulds insulated around the sides. However, such results can only be used as an expedient for the purpose and not for compliance with the Specification.

NG 705 General Requirements for Sub-bases and Roadbases

1 Clause 705 applies to all sub-base and roadbase materials whether unbound (800 Series), bituminous bound (900 Series) or cement bound (1000 Series).

Frost Heave

2 The frost heave test described in BS 812: Part 124: 1989 is costly and time consuming and is not suitable for routine control checks on Site. The test has been developed from earlier test methods to overcome problems of repeatability and reproducibility. The test is primarily intended as a method to establish whether or not an aggregate from a particular source is likely to be frost-susceptible when used in an unbound condition within that part of the road pavement subject to frost penetration. Material for the frost heave test must be representative of the source and comply with all other requirements of the Specification otherwise the test is superfluous. Once a material has been established as non-frost-susceptible the test need only be repeated if the material varies from the original sample, or where the source is changed.

3 Clause 6 of BS 812 : Part 124 : 1989 sets down the procedure for adjusting the water level in the self-refrigerated unit (SRU). A possible problem has been identified that with the tolerances given to the dimensions for the cradle and specimen carriers it is possible for the porous discs in the specimen carriers to be located incorrectly in relation to the water level. In order to guard against this it is recommended that before testing commences the cradle and specimen carriers be put into the SRU without samples. A check is then made to ensure that discs are set at the level specified in the above-mentioned standard.

4 The requirement for material to be non-frost susceptible within 450 mm of the surface of a road or paved central reserve may be reduced to 350 mm if the Mean Annual Frost Index (MAFI) of the site is less than 50. The Frost Index is a measure of the severity of a period of cold weather and provides a means of assessing likely penetration of frost into a road. Frost index is measured in 'degree days Celsius below zero' and is calculated by taking the mean air temperature for each twenty four hour period and adding those values together. Frost penetration into a modern road in the British Isles may be estimated using the formula $x = 40\sqrt{I}$ where x is the approximate penetration in mm and I is the frost index for the freezing spell. The Annual Frost Index is the frost index accumulated over a year commencing September 1st. Mean Annual Frost Index (MAFI) is the average of all the frost index values computed for each year since September 1959. The MAFI for a site is determined using records from one or more meteorological stations close to the site, taking account of local geographical variation, such as high ground or frost hollows. Different requirements for different parts of a contract length may be used.

Further information on the MAFI can be found in HD 25.

Advice relating to any site, including the MAFI calculated for that site, may be purchased from:

Building and Transport Consultancies
The Met. Office
Commercial Services
Johnson House
London Road
Bracknell
Berks RG12 2SY

Telephone No: 01344-856856
Fax No: 01344-854906

#NG 706 Excavation, Trimming and Reinstatement of Existing Surfaces

1 Clause 706 describes a method of excavation and reinstatement of existing paved and unpaved surfaces:

(i) Where the Contractor is required to break into paved areas for the installation of utilities.

(ii) Where the Contractor unavoidably has to break into work which he has carried out as part of the Works.

(iii) Where he is required to break into paved areas existing prior to the Works being constructed.

(iv) Where pavements are constructed to abut or join into existing pavements.

2 Instructions on the installation of utilities in roads carrying 30 msa or less are given in a Code of Practice entitled "Specification for the Reinstatement of Openings in Highways" dated June 1992 by the Highway Authorities and Utilities Committee. This Code of Practice was produced as a result of certain provisions of the New Roads and Street Works Act 1991.

3 As much information as possible should be provided in Appendix 7/2 and on the Drawings for 1(ii) and (iii) above, especially to show the areas and depth of pavement required to match levels between new and existing construction. The intention is to ensure that at least a new wearing course should be provided over the minimum area of existing pavement as will avoid feathering below 40 mm thickness, after preparation of the existing surface by scarifying and planing. Where existing and new concrete pavements abut or join into

each other it is normal practice to use a bituminous pavement between the two sections, details of which should be given in Appendix 7/2.

4 Paved areas already constructed as part of the Permanent Works should only be excavated when it is necessary to carry out the Permanent Works or where no other practical means of completing the Permanent Works can be devised.

5 Advice and methods of reinstating pavements are given in the "Design Manual for Roads and Bridges. Vol 7: Pavement Design and Maintenance. Section 4 Pavement Maintenance Methods. Parts 1 and 2".

Advice and methods of reinstating concrete pavements are given in the 'Manual for Maintenance and Repair of Concrete Roads' produced jointly by the Department of Transport and the Cement and Concrete Association (now the British Cement Association).

NG 708 Weather Conditions for Laying of Bituminous Materials and Dense Tar Surfacing

1 This Clause describes the requirements for laying hot rolled asphalt wearing course and increases the layer thickness in relation to prevailing weather conditions expected on site. It also contains requirements for laying hot rolled asphalt and dense macadam basecourse and roadbase materials. It takes into account the cooling effect of wind, in addition to air temperature, on hot rolled asphalt wearing course.

2 It is the Contractor's choice at the time of tender to select the wearing course thickness. This should be either 45 mm or 50 mm, with a corresponding reduction in the overall thickness of basecourse, or of roadbase when basecourse is omitted, to maintain the overall designed pavement thickness. This should be included in Appendix 7/1. The Contractor's option to select one of the above thicknesses of wearing course should not be removed unless there are particular operational or technical reasons.

3 For hot rolled asphalt materials, when site conditions are such that the time available for compaction is excessively long, such as when air temperatures are high, wind speeds are low or solar radiation is high, the delivery temperature may be reduced. However, the delivery temperature for hot rolled asphalt wearing course materials should not be less than 150°C for a layer thickness of 45 mm or 145°C for a layer thickness of 50 mm.

4 For dense macadam roadbase and basecourse materials, when compaction is not determined in accordance with sub-Clause 901.19, the weather conditions at the time of laying should comply with the requirements of sub-Clauses 1, 2 and 7 of this Clause.

5 For dense macadam materials, when compaction is determined in accordance with sub-Clause 901.19 there is no requirement to state additional constraints on laying conditions other than those given in sub-Clauses 1 and 2 of this Clause.

6 The term 'light precipitation' is considered as rainfall less than 0.5 mm or equivalent per hour. This can be verified either by a local rain gauge, or a telephone call to the nearest Environment Agency Station in England or Wales, the relevant River Purification Board in Scotland, or the Environmental Protection Branch of the Department of the Environment for Northern Ireland, Culvert House, Castle Place, Belfast BT1 1FY, where the officer responsible for liaison with the Meteorological Office will obtain a reading from the nearest available rainfall recording source. A local rain gauge, of a suitable design, could be located at the site office or in close proximity to the Works. BS 594 Part 2 Clause 5.2 states: "Laying shall be suspended during periods of continuous or heavy rain ..."

7 The requirements of sub-Clauses 3, 4 and 6 of this Clause are based on a minimum available compaction time of 10 minutes from the time the material emerges from the paver. The requirements of Clause 901 still apply, unless specifically amended by this Clause.

NG SAMPLE APPENDIX 7/1: SHEET 1

PERMITTED PAVEMENT OPTIONS — Flexible, Flexible Composite and Surfacing for Rigid Composite Construction

[Note to compiler: Complete one sheet per option see NG 701.2].

1. Location *[eg. Chainage, Road Name, Carriageway Reference]*
2. Grid for checking surface levels of pavement courses *[702.4]:* Longitudinal dimension: Transverse dimension
3. Surface regularity *[702.5]* Category of Road:
   [702.7] Interval for measurement of longitudinal regularity:
   [702.8]: Interval for measurement of transverse regularity:
4. Requirements for determination of compaction level of roadbase and basecourse macadams, if different from the requirements of sub-Clause 901.19.
5. Coated chippings *[915]:* Nominal size: Minimum PSV: Maximum AAV:
6. Whether measurement of surface texture is required *[921.2].*
7. BS 4987 : Part 1 Traffic Category *[909, 912, 914, 933 and 934].*
8. Whether longitudinal construction joints to cement-bound roadbase in flexible composite construction are to comply with Clause 1042.
9. Requirements for hardness, durability and cleanness of aggregates if different from the requirements of sub-Clauses 901.2. and 942.3.
10. Requirements for regulating course *[907].*
11. High Friction Surfaces *[924]:* Type Classification *[924.3]* PSV *[924.4]*
12. Porous Asphalt *[938]:* PSV *[938.2]* Binder *[938.4]*
13. Hot rolled asphalt wearing course *[910 and 911]* other bituminous materials and dense tar surfacing *[708]:* Coarse aggregate percentage: Minimum delivery temperature: Thickness: Maximum wind speed: Minimum air temperature:
14. Trafficking trial required and procedure *[850.SO.9]*
15. Thin Wearing Course Systems *[942]* course Aggregate if different to Cl 942.3: Ten Per Cent Fines Values (TPV) *[942.4]:* AAV *[942.4]:* Binder Penetration *[942.9]* Texture Depth *[942.22]:*

16. Hot Rolled Asphalt Wearing Course (Performance Related Design Mix) *[943].*

    Thickness if not 45 or 50 mm *[943.2].*

17. Modified Binder and Mixture Data Requirements

The following data shall be provided to the Overseeing Organisation as required in sub-Clauses 943.5 and 943.7 in respect of the proposed modified binder and of the proposed mixture as appropriate:

I Binder Samples

For polymer modified bitumens the binder shall be sampled from the delivery according to BS 598. For modifiers blended with the other component materials of the mixture at the mixer a simulated binder shall be prepared. Such modifiers are generally less intimately mixed with the bitumen and less well dispersed throughout the mixture than when pre-blended. Evidence that the simulated binder offers the same performance as the binder produced when the modifier is added at the mixer shall be provided.

II Penetration

Binder penetration at 25°C BS 2000 100 g 5 secs and at 5°C 200 g 60 secs, before and after hardening in the Rolling Thin Film Oven Test (RTFOT) in accordance with ASTM D 2872.

III Product Identification Test and Rheological Properties

Results for the binder(s) proposed shall comprise rheological data for each binder in the form of complex stiffness modulus (G^*) and phase angle (delta) determined in accordance with Clause 928.

IV Storage Stability Test

All binders shall be stored strictly in accordance with the manufacturer's instructions. Binders claimed to remain homogeneous in storage without agitation shall be tested for storage stability in the manner described in Clause 941. The mean of the differences in softening point between the top and bottom samples, of not less than five pairs of such samples shall not exceed 5°C. Manufacturers of pre-blended modified binders shall state what precautions are necessary to ensure that adequate homogeneity is maintained during storage.

V Photomicrograph

A typical photomicrograph of the modified binder (UV) shall be supplied together with details of sample preparation techniques.

VI Cohesion

Vialit Pendulum cohesion test curve of the modified binder, as supplied.

VII Mixing and compaction temperatures

Maximum and minimum mixing temperatures shall be stated.

Maximum and minimum compaction temperatures shall be stated and any wind chill factor differing from conventional hot rolled asphalt utilising unmodified bitumen.

VIII FRAASS Brittle Point (IP 80)

IX Mix Sensitivity Analysis

Wheel-tracking rate for the proposed mixture but with the binder content by mass increased above the target to the maximum binder content anticipated by the Contractor, but not more than + 0.6% above the target.

Modified Binder and Mixture Data to be supplied if available

The following additional data concerning the modifier and the mixture shall be supplied if it is available:

X Ageing

Results of ageing in the Strategic Highway Research Program (SHRP) Pressure Ageing Vessel (PAV) after carrying out the RTFOT in accordance with ASTM D 2872.

XI Rheology after Ageing

Rheological master curve and data as specified in Item III above, after RTFOT and PAV.

XII Yield Strain

Results of the TRL Yield Strain Test (TRL Proced. YS Version 1st February 1995).

XIII FRAASS Brittle Point after Ageing

Fraass in accordance with IP 80 after hardening in RTFOT and after ageing by PAV.

XIV Indirect Tensile Stiffness Modulus (ITSM) to DD 213 before and after water immersion (LINK Protocol)

XV Repeated Load Axial Test (RLAT) to DD 226 (for correlation to performance in terms of deformation).

XVI Indirect Tensile Fatigue Test (ITFT) - after ageing, see LINK Protocol (for correlation to performance in terms of fatigue).

18. Requirements for taking cores in hot rolled asphalt wearing course and for material to backfill the coreholes if different from the requirements of sub-Clause 943.16.
19. Test temperature for wheel-tracking rate and rut depth tests *[943.20]*.
20. Wheel-tracking rate and wheel-tracking rut depth *[943.26]*.

NG SAMPLE APPENDIX 7/1: SHEET 1 (Continued)

	Clause	Material	Grade of Binder	Thickness (mm)	Special Requirements
Surfacing Wearing Course Thin Wearing Course Systems			*[see Note 2]*		BS 594 : Part 1 : Table Nos: Column Nos: Marshall Stability range: Marshall Flow: *[Clause 911]* Site classification: Wheel tracking rate: Rut depth: Test temperature: *[Clause 943]* BS 4987 : Part 1 Clause Nos: BS 5273 Clause Nos: Aggregate Types: Nominal Size: Minimum PSV: Maximum AAV: Nominal coarse aggregate content *[910.3, 911.3]:* Binder Penetration *[942.9]* Texture Depth *[942.22]*
Base-Course					*[see Note 3]*
Roadbase Upper Roadbase Lower Roadbase					Aggregate Types:
Sub-base					Minimum CBR: *[804.3]*

TOTAL PAVEMENT THICKNESS _____

_____

[Notes to compiler:

1. *Select the Clauses appropriate to option permitted and only state those required.*
2. *Grade of binder is not to be specified when the wearing course is to comply with Clause 911.*
3. *When heavy duty macadam (HDM) basecourse and/or dense bitumen macadam (DBM 50) basecourse with 50 pen binder are permitted options the following should be stated in the Special Requirements column but only stating those sizes required:*

Binder Content	***Aggregate Size***
4.5%	*40 mm*
4.7%	*28 mm*
4.7%	*20 mm*

4. *Where rubber is a required additive details should be stated in the Special Requirements column.*
5. *Refer to NG 708 concerning thickness of wearing course.*
6. *Mix designs for roadbase and basecourse macadams should be in accordance with the requirements of the relevant British Standard, or in accordance with the requirements of Clause 929. A minimum binder content for macadam should not be specified in this Appendix if the macadam is to be designed in accordance with Clause 929].*

NG SAMPLE APPENDIX 7/1: SHEET 2

PERMITTED PAVEMENT OPTIONS — Rigid and Rigid Composite Construction

1. Location [eg. Chainage, Road Name, Carriageway Reference]
2. Grid for checking surface levels of pavement courses *[702.4]*
   Longitudinal dimension:
   Transverse dimension:
3. Surface regularity *[702.5]*
   [702.7]
   [702.8]
   Category of Road:
   Interval for measurement of longitudinal regularity:
   Interval for measurement of transverse regularity:
4. Prescribed mixes for rapid construction *[1001.2]:*
5. Testing intervals for concrete cubes *[1004.7]:*
6. Permission for butt welding *[1033.10]:*
7. Coarse aggregate size,minimum PSV and maximum AAV *[1044.5].*
8. Texture depth *[1044.27]*
   Average:
   Maximum:
   Minimum:

NG SAMPLE APPENDIX 7/1: SHEET 2 (Continued)

Slab Type	Slab Thickness	Max Spacing (m) of Transverse Contraction joints	Longtitudal Steel Reinf.	Special Requirements
Un-reinforced concrete surface slabs (URC)			None	1.Maximum transverse joint spacing may be increased by 20% if limestone coarse aggregate is used throughout the depth of the slab. 2.Alternatively when the slab is constructed in two layers with the top layer not exceeding 50 mm nominal thickness the maximum transverse joint spacing may be increased by 20% if limestone coarse aggregate is used throughout the lower layer.
Jointed reinforced concrete surface slabs (JRC)			..... mm^2/m width	1.The range of reinforcement and max transverse joint spacings corresponds to slab thicknesses given and intermediate values may be interpolated. 2.Max transverse joint spacings may be increased by 20% if limestone coarse aggregate is used throughout the depth of the slab. 3.Alternatively when the slab is constructed in two layers with the top layer not exceeding 50 mm nominal thickness the maximum transverse joint spacing may be increased by 20% if limestone coarse aggregate is used throughout the lower layer. 4.Transverse reinforcement *. . . .[if required for differential settlement]*
Continuously reinforced concrete surface slabs (CRCP)		No joints	16 mm dia at ..... spacing	1.Where required, transverse reinforcement shall be 12 mm dia at 600 mm spacing and shall be at 90/60* degrees to the longitudinal bars. *[*Compiler to delete one figure]* 2.Anchorages shall be provided at ends and any discontinuities in the pavement (ground beam or wide flange beam conforming to HCD).
Continuously reinforced concrete roadbase (CRCR)		No joints	12 mm dia at ..... spacing	1. Where required, transverse reinforcement shall be 12 mm dia at 600 mm spacing and shall be at 90/60* degrees to the longitudinal bars. *[*Compiler to delete one figure]* 2.Anchorages are not required. 3.100 mm surfacing shall comprise basecourse and wearing course as described in Appendix 7/1, Sht 1.

Slab Type	Slab Thickness	Max Spacing (m) of Transverse Contraction joints	Longtitudal Steel Reinf.	Special Requirements
Sub-base	Clause	Material	Thickness (mm)	
	1030 1035 & 1038 1030 1035 & 1037	Wet lean concrete C15 or CBM 3 Wet lean concrete C10 or CBM 2	150 150	*[Compiler to delete as appropriate]*

Notes:

1. Concrete for surface slabs and roadbases shall be Grade C40 complying with Clause 1001.
2. Concrete for CRCP anchorages shall be Grade C30 complying with Clause 1001.
3. Reinforcement shall comply with Clause 1008.
4. Capping is not required/is required* as described in Appendix 6/7.

   **[Compiler to delete as appropriate]*
5. References to drawings showing reinforcement layout and bay layouts at slip roads and junctions, if required.
6. Transverse joints for jointed reinforced slabs adjacent to CRCP ground beam anchorages shall be provided in accordance with Highway Construction Details C18 and C20.
7. Expansion joints are required at the approach slabs to anchorages for CRCP pavements.

NG SAMPLE APPENDIX 7/1: SHEET 3

PERMITTED PAVEMENT OPTIONS—Summary of Alternatives

[Notes to compiler:

1. Sheet 3 of Appendix 7/1 may be used to summarise all the permitted types of pavement and inherent options as stated in Sheets 1 and 2 of Appendix 7/1.

2. Where this summary is considered better placed on a Drawing, Sheet 3 of Appendix 7/1 should be omitted and sheets 1 and 2 should cross-refer to the Drawing Number.]

NG SAMPLE APPENDIX 7/2: EXCAVATION, REPAIR AND REINSTATEMENT OF EXISTING SURFACES

[Note to compiler: Include here:]

1. Locations of any trenches, pits, etc, which require to be excavated in existing paved surfaces in order to carry out the Works. Reference to any drawings giving further details. *[706.2]*
2. Locations and estimated areas of existing paved areas which require to be trimmed, regulated and reinstated to match levels where new and existing pavements abut. Reference to any drawings giving further details. *[706.7]*
3. Cross-section diagram of typical trench reinstatement in bituminous and concrete pavements giving details of materials. *[Examples are given in HCD Drawing Number K4.]*
4. References to drawings which show construction at junctions between the following pavement materials
   (i) concrete/concrete,
   concrete/bituminous,
   (iii) concrete/porous asphalt,
   (iv) bituminous/porous asphalt,
   (v) bituminous/bituminous,
   (vi) porous asphalt/porous asphalt
   For junctions with porous asphalt see HA 50.
5. Full depth repairs and reinstatements
   (i) Repair criteria if different from sub-Clause 1033.4
   (ii) Reinstated sub-base material *[1033.9]*
   (iii) Stitched crack repair type *[1033.12]*
   (iv) Filling of slots *[1033.13]*
   (v) Longitudinal joint grooves to be recut *[1033.15]*
   (vi) Transverse joint grooves to be recut *[1033.16]*

NG SAMPLE APPENDIX 7/3: SURFACE DRESSING

SHEET 1: Information to be provided by the compiler

[Note to compiler: Complete one sheet per section]

1. Location *[919.1, 922.1 - eg road number, name, OS grid reference of start and finish, lane]*
2. System of surface dressing required *[919.1]*
3. Limitations on binder cohesivity *[919.2, 922.4 - minimum peak Table NG 9/1 and NG 9/6]*
4. Rate of spread of binder, stage 1 of Road Note 39 *[919.1]*
5. Chipping size(s) required *[919.1 Road Note 39]*
6. Minimum PSV of chippings *[919.5, 922.7 - HD 28]*
7. Maximum AAV of chippings *[919.5, 922.7 - HD 28]*
8. Special traffic control requirements *[speed limit when first opened and minimum period of control 922.2]*
9. Minimum class of spraybar accuracy required *[919.4, 922.6 - Table NG 9/2 and NG 9/7]*
10. Minimum class of chipping spreader required *[919.6, 922.8 - Table NG 9/3 and NG 9/8]*
11. Minimum class for tolerance of design rate of spread of binder *[919.4, 922.6 - Table NG 9/4 and NG 9/9]*
12. Minimum class for tolerance of design rate of spread of chippings *[919.6, 922.8 Table NG 9/5 and NG 9/10]*
13. Guarantee period *[919.1, normally 1 year, 922.3, normally 2 years]*
14. Period for monitoring dressing if different from minimum of 2 hours *[919.16, 922.18]*
15. Traffic count *[922.1 - total and commercial vehicle count required for each lane]*
16. Traffic speed, 85 percentile *[922.1]*
17. Category of site *[922.1 - letter category from HD 28]*
18. Description of existing surface *[922.1 - Texture, existing defects, variability, etc.]*
19. Road hardness *[922.1, Road Note 39]*
20. System of surface dressing permitted *[922.1 - eg any, not single, racked-in, double, multiple]*
21. Maximum texture depth after 4 weeks trafficking *[922.21 - only required where noise is a problem, normally 3 mm sand patch texture depth]*
22. Maximum percentage decrease in texture between 12 months and 24 months after start of trafficking *[922.21, NG 926]*
23. Minimum (and maximum if required) texture depth at end of guarantee period *[922.21 - Table NG 9/11 and HD 37]*
24. Alternative intervals for measurement of texture depth *[922.21]*
25. Minimum class of fretting (% chipping loss - P1) acceptable *[922.22 - Table NG 9/12]*
26. Minimum class of defects (% area affected - P2) other than fretting, acceptable *[922.22 - Table NG 9/13]*
27. Minimum class of localised chipping loss in one square metre (P3) acceptable *[922.22 - Table NG 9/14]*
28. Special restrictions *[919.10; 922.11; 922.12 and 922.17 - for example: max road surface temperature at which working permitted is 40°C]*

    (Note to compilers: If a number of sites are involved then it would be convenient to set out the above data in tabular form).

NG SAMPLE APPENDIX 7/3: SURFACE DRESSING

SHEET 2: Information to be provided by the Contractor

The Contractor shall provide the following information with his tender:

1 A copy of BS EN ISO 9002 certificate showing at least the name of the Company, the name of the certification body and the reference number and date of the certificate. A copy of the relevant part of the company Quality Assurance (QA) documentation showing the scope and limitations of the certification. The Overseeing Organisation will wish to inspect all or any of the company's QA documentation as part of the vendor assessment system and may wish to satisfy itself on the nature of the QA systems of the company's material suppliers. *[919.1, 922.2] [Note to compiler: Omit this requirement for contracts let exclusively in Northern Ireland]*

2 Proposed binders together with their data sheets, product identification data, cohesivity data and COSHH information as specified. *[919.2, 919.3, 922.4, 922.5] [Note to compiler: A suitable form for the provision of binder data is given attached to this Appendix, other layouts are permitted but all the required data should be supplied]*

3 Proposed source or sources of chippings together with statement of properties including target grading, target flakiness, PSV and AAV. *[919.5, 922.7]*

4 Vialit shock plate adhesivity test results for each combination of chipping and binder to be used in the contract. Where multi-layered surface dressings are proposed then only the results for the larger chipping are required. *[919.2, 922.4]*

5 A method statement for each site or group of similar sites showing how it is proposed to carry out the works in conformance with the specification. *[The Contractor will be expected to commit enough resources to carry out the proposed design in one single continuous pass, eg if a double dressing is proposed on a heavily trafficked road then 2 sprayers, 2 chip spreaders, 2 rollers and 2 sweepers will be a minimum requirement. The type of plant, age and number should be detailed eg 2 speed controlled sprayers three years old].*

6 Proposals for traffic control and aftercare for each site, and reaction times for carrying out remedial measures, sweeping and site visits with the Overseeing Organisation. *[919.9, 919.15, 919.16, 919.17, 922.11, 922.17, 922.18, 922.19]*

7 Contingency plans in the event of any breakdown of plant or failure of the dressing and provision for dusting. *[919.16, 922.18]*

8 A statement of any previous applications on roads similar, in site type and road hardness, to the Contract sites. *[919.1, 922.2]*

9 A statement of relevant experience and expertise, naming managers supervisors and teams responsible for and allocated to the Contract. *[919.1, 922.2]*

10 Design proposal for surface dressing for each location. *[922.2]*

11 Estimated design life of the surface dressing for each location. *[922.2]*

12 For the performance specification, the results of any other tests or other data the Contractor considers would assist the Overseeing Organisation in assessing the technical merit of the design.

The contractor shall provide the following information not more than 30 days after completion of the works:

13 An 'As Built Manual' as specified. *[919.19, 922.20]*

Binder Data Sheet	**Surface Dressing**		
Manufacturer of Binder:		Product name:	
Binder type:		Batch no:	
Adhesion agent included in conventional cut-back binder? yes/no		Hot storage life of agent hrs	
Binder Grade (highlight as required)	Conventional	Intermediate	Premium
Aggregate source:		Chipping size: mm	

Binder source **Test**	**Base Binder** before preparation of emulsion or of cutback (where possible)	**Supplied Binder** as supplied to site	**Recovered Binder** recovered in accordance with Clause 923
Penetration at 25°C dmm 100 g 5secs			
Penetration at 5°C dmm 200 g 60 secs			
Manufacturer's QA viscosity test for supplied cutback binder within temp range 100-160°C or alternatively Penetration at 5°C dmm 100 g 5 secs		†	
Vialit pendulum cohesion# Clause 939 maximum peak J/cm²		†	
Vialit Adhesion - mechanical adhesion, adhesivity value			
Vialit Adhesion - active adhesivity value			
Vialit Adhesion# - wetting temp °C		†	
Vialit Adhesion# - fragility temp °C			
Product identification test# sub-Clause 922.5 Complex stiffness modulus (G*) and phase angle (δ) data. See Clause 928			
Minimum viscosity STV 4 mm cup at 40°C or Redwood II at 85°C		‡	
Other properties the Contractor considers useful			
Weather limits - information from binder manufacturer: (road temperatures, humidity, wind chill adjustment, tolerance of surface dampness etc)		Temperature max: Temperature min: Humidity max:	

Where indicated with # the Contractor shall attach a graphical output to this schedule.

† Cutback binders only

‡ Emulsions only.

Shaded cells do not require data.

NG SAMPLE APPENDIX 7/4: BITUMINOUS SPRAYS

[Note to compiler: Include here details of:]

Location:

Type of binder *[920.3]*: (Binder Data sheet given)

Rate of spread *[920.3]*:

Blinding material *[920.6]*:

Binder Data Sheet (Emulsions only)	**Bond or Tack Coat**	
Manufacturer of Binder:	Product name:	
Breaking agent to be used? (highlight as required)	Yes	No
Binder Grade (highlight as required)	Conventional	Intermediate / Premium
Binder source **Test**	**Base Binder** before preparation of emulsion (where possible)	**Recovered Binder** recovered in accordance with Clause 923
Penetration at 25°C dmm 100 g 5secs		
Penetration at 5°C dmm 200 g 60 secs		
Vialit pendulum cohesion# Clause 939 maximum peak J/cm²		
Product identification test# - Clause 928 Complex stiffness modulus (G*) and phase angle (δ)		Data and Graphs# to Clause 928

Information from Binder Manufacturer:

Weather limitations - surface temperature and humidity limits	Temperature max: Temperature min: Humidity max:
Safe trafficking by plant (where applicable)	Typical time: Average temperature: Average Humidity

Where indicated with # the Contractor shall attach a graphical output to this schedule.
Shaded cells do not require data.

NG SAMPLE APPENDIX 7/5: IN SITU RECYCLING - THE REMIX AND REPAVE PROCESSES

[Note to compiler: Include here details of the following, cross-referring with Appendix 7/1 as required]

Location:

Requirements for milling *[926.1]*:

Requirements for wearing course material:

Thickness *[926.3]*

Materials *[926.11, 16]*

Proportions of new and existing bituminous material and road surface levels *[926.12]*

Stability and flow *[926.21]*

NG SAMPLE APPENDIX 7/6: BREAKING UP OR PERFORATION OF EXISTING PAVEMENT

[Note to compiler: Include here details of the treatment required, cross-referring to drawings as necessary.]

NG SAMPLE APPENDIX 7/7: SLURRY SURFACING

SHEET 1: Information to be provided by the compiler

[Note to compiler: Complete one sheet per section]

Information required for all sites

1. Location *[918.1- eg road number, name, OS grid reference of start and finish, lane and suitable location plan]*
2. Description of site *[918.1- eg. road, footway, central reserve with approximate lengths, widths and areas]*
3. Traffic count *[918.1 - total and commercial vehicle count required for each lane]*
4. Traffic speed, if applicable, *[918.1- 85 percentile]*
5. Category of site if applicable *[918.1- letter category from HD 28]*
6. Description of existing surface *[918.1 - Texture, existing defects, variability, etc.]*
7. Range of thickness of slurry surfacing *[918.1, minimum 1.5 mm, maximum 8 mm]*
8. Guarantee period if not 2 years *[918.1, normally 2 years]*
9. Minimum PSV of coarse aggregate *[918.4, HD 28]*
10. Maximum AAV of coarse aggregate *[918.4, HD 28]*
11. Definition of colour required *[918.8, only required when pigment is to be added to the mix]*
12. Special restrictions *[918.17 - for example: max road surface temperature at which working permitted is 40°C]*

[Note to compiler: If a number of sites are involved then it would be convenient to set out the above data in tabular form]

NG SAMPLE APPENDIX 7/7: SLURRY SURFACING

SHEET 2: Information to be provided by the Contractor:

1. A copy of BS EN ISO 9002 certificate showing at least the name of the Company, the name of the certification body and the reference number and date of the certificate. A copy of the relevant part of the company Quality Assurance (QA) documentation showing the scope and limitations of the certification. The Overseeing Organisation will wish to inspect all or any of the Company's QA documentation as part of the vendor assessment system and may wish to satisfy himself on the nature of the QA systems of the Company's material suppliers. *[918.1]*
2. Where the proposed system is not to BS 434 a copy of the BBA/HAPAS Certificate. *[918.2]*
3. A method statement for each site or group of similar sites showing how it is proposed to carry out the works in conformance with the specification. *[918.1 Contractors will be expected to commit enough resources to carry out the proposed design; the type and age of the Slurry Surfacing Machine should be detailed].*
4. Proposals for traffic control and aftercare for each site, and reaction times for: carrying out remedial measures; sweeping; and site visits with the Overseeing Organisation. *[918.15, 918.28, 918.30]*
5. Contingency plans in the event of any breakdown of plant or failure of the Slurry Surfacing and provision for dusting. *[918.1]*
6. Proposed System together with target grading and binder content, data sheets, product identification data, time for opening to traffic, and COSHH information, as specified. *[918.2]*
7. Proposed binder together with data sheets and cohesivity data, *[918.6, 918.7, 918.8] [Note to compiler: A suitable form for the provision of data is given attached to this appendix, other layouts are permitted but all the required data should be supplied]*
8. Proposed source or sources of coarse aggregate together with statements of properties including target grading, target flakiness, PSV and AAV. *[918.4]*
9. Proposed source or sources of fine aggregate including target grading and other constituents together with statements of properties. *[918.4]*
10. Estimated design life of the Slurry Surfacing for each location. *[918.1]*
11. A statement of relevant experience and expertise, naming managers, supervisors and teams responsible for and allocated to the contract. *[918.1]*

If available the following information should be provided in order to assist the Overseeing Organisation to assess the technical merits of the proposal

12. Trafficability time, including method of test *[918.2]*
13. Permeability test carried out on the system, if it is claimed that the process seals the existing surface together with the method of test *[918.2]*
14. Bond test results using the BBA/HAPAS test on either a bituminous or a concrete substrate as appropriate to the site, if available. *[918.14]*
15. Binder-aggregate adhesivity, including method of test *[918.3]*
16. Wear test or wet track abrasion test *[918.3]*
17. Slurry surfacing mix cohesion (prEN12274-4:1997) *[918.3]*
18. The results of any other tests or other data the Contractor considers would assist the Overseeing Organisation in assessing the technical merit of the design. *[918.3]*

The Contractor shall provide the following information not more than 30 days after completion of the Works:

19. An "As Built Manual" as specified. *[918.29]*

Binder Data Sheet **To be filled in and submitted with Tender**	**Slurry Surfacing**	
Manufacturer of Binder:	Product name	
Manufacturer of Dope and Type:	Batch no.	
Binder Type and Grade		
Binder modifiers to be added at the mixer		
Aggregate source Coarse: Fine:	Filler: Cement; Hydrated Lime Fibres:	
Weather limits - road temperatures, humidity, wind chill adjustment, tolerance of surface dampness etc.	Road Temperature max: Road Temperature min: Humidity max:	
Binder Source **Test**	**Base Binder** before preparation of emulsion (where possible)	**Recovered Binder** Recovered in accordance with Clause 923
Penetration at 25 °C dmm 100 g 5 secs		
Penetration at 5 °C dmm 200 g 60 secs		
Vialit pendulum cohesion # max. J/cm² (Clause 939)		
Product identification test # Clause 918.7. Complex stiffness modulus (G*) and phase angle (δ) (Clause 928)		Data and graphs # to Clause 928
Equi-stiffness Temp. (T_{2000Pa} °C) from G*		
†		
†		
†		
†		

Where indicated with # the Contractor shall attach a graphical output to this schedule

† Other properties the Contractor considers useful.

NG SAMPLE APPENDIX 7/8: MICRO-SURFACING

SHEET 1: Information to be provided by the compiler

[Note to compiler: Complete one sheet per section]

1. Location *[927.1 - eg road number, name, OS grid reference of start and finish; include a plan where appropriate]*
2. Traffic count *[927.1, - total and commercial vehicle count required for each lane]*
3. Traffic speed *[927.1, 85 percentile]*
4. Category of site *[927.1 - letter category from HD 28]*
5. Description of existing surface *[927.1 - Texture, existing defects, variability, etc.]*
6. Range of thickness of Microsurfacing *[927.1]*
7. Guarantee period if not 2 years *[927.1, normally 2 years]*
8. Minimum PSV of coarse aggregate *[927.4, HD 28]*
9. Maximum AAV of coarse aggregate *[927.4, HD 28]*
10. Definition of colour required *[927.8]*
11. Minimum period and level of speed control after opening heavily trafficked roads to traffic. *[927.22, 927.24,72 hours minimum, 50 mph maximum].*
12. Minimum (and maximum if required) texture depth at end of guarantee period *[919.27]*
13. Maximum texture depth after 4 weeks trafficking *[927.27 - only required where noise is a problem, normally 3 mm sand patch texture depth]*
14. Maximum percentage decrease in texture between 12 months and 24 months after start of trafficking *[927.27]*
15. Intervals for measurement of texture depth if different from Clause 927.28
16. Minimum class of fretting (% area affected) acceptable *[927.30 - Table NG 9/17]*
17. Minimum class of defects (% area affected) other than fretting, acceptable *[927.30 - Table NG 9/18]*
18. Minimum class of defects for localised material loss *[927.30 - Table NG 9/19]*
19. Minimum class of transverse regularity *[927.29 - Table NG 9/20]*
20. Maximum class of longitudinal regularity *[927.29 -Table NG 9/22]*
21. Special restrictions *[927.16 - for example: max road surface temperature at which working permitted is 40°C]*

[Note to compiler: If a number of sites are involved then it would be convenient to set out the above data in tabular form with columns left for Contractors proposals.]

NG SAMPLE APPENDIX 7/8: MICRO-SURFACING

SHEET 2: Information to be provided by the Contractor

The Contractor shall provide the following information with his tender:

1. A copy of BS EN ISO 9002 certificate showing at least the name of the Company, the name of the certification body and the reference number and date of the certificate. A copy of the relevant part of the company Quality Assurance (QA) documentation showing the scope and limitations of the certification. The Overseeing Organisation will wish to inspect all or any of the Company's QA documentation as part of the vendor assessment system and may wish to satisfy himself on the nature of the QA systems of the Company's material suppliers. *[927.1]*
2. A copy of the BBA/HAPAS Certificate for the proposed system *[927.2]*
3. Proposed source or sources of aggregate together with statements of properties including target grading. *[927.4]*
4. A method statement for each site or group of similar sites showing how it is proposed to carry out the works in conformance with the Specification. *[927.1 Contractors will be expected to commit enough resources to carry out the proposed design; the type and age of the Microsurfacing Machine should be detailed].*
5. Proposals for traffic control and aftercare for each site, and reaction times for: carrying out remedial measures; sweeping; and site visits with the Overseeing Organisation. *[927.15, 927.22-25]*
6. Contingency plans in the event of any breakdown of plant or failure of the Microsurfacing and provision for dusting. *[927.1]*
7. Design Proposal for Microsurfacing for each location. *[927.1]*
8. Proposed System together with data sheets, product identification data, and COSHH information. *[927.1]*
9. Proposed binder together with data sheets, cohesivity data, *[927.5, 927.6, 927.7] [Note to compiler: A suitable form for the provision of data is given attached to this Appendix, other layouts are permitted but all the required data should be supplied]*
10. Proposed source or sources of coarse aggregate together with statements of properties including target grading, target flakiness, PSV and AAV. *[927.4]*
11. Proposed source or sources of fine aggregate including target grading and other constituents together with statements of properties. *[927.4]*
12. Estimated design life of the Microsurfacing for each location. *[927.1]*
13. A statement of any previous applications of the Design Proposal on roads similar, in site type and condition, to the contract sites. *[927.1]*
14. A statement of relevant experience and expertise, naming managers, supervisors and teams responsible for and allocated to the contract. *[927.1]*

    If available the following information should be provided in order to assist the Overseeing Organisation to assess the technical merits of the proposal
15. Trafficability time including method of test *[927.3]*
16. Wheel tracking test at 45°C or 60°C or other suitable measure of the ability of the proposed system to resist deformation and flow. *[927.2]*
17. Water sensitivity test results from the test in Link Bitutest protocol or from wet wheel tracking (whichever is available) *[927.2]*
18. Permeability test carried out on the system, if it claimed that the process seals the existing surface together with the method of test *[927.2]*
19. Long term ageing test results in accordance with the appropriate BBA/HAPAS test. *[927.2]*

20. Bond test results using the BBA/HAPAS test on either a bituminous or a concrete substrate as appropriate to the site. *[927.14]*
21. Binder-aggregate adhesivity if available, including method of test *[918.2]*
22. Microsurfacing mix cohesion (prEN12274-4:1997) *[927.3]*
23. The results of any other tests or other data the Contractor considers would assist the Overseeing Organisation in assessing the technical merit of the design. *[927.2, 927.3]*

The Contractor shall provide the following information not more than 30 days after completion of the works:

24. An "As Built Manual" as specified. *[927.26]*

Binder Data Sheet **To be filled in and submitted with Tender**	**Microsurfacing**	
Manufacturer of Binder:	Product name	
Manufacturer of Dope and Type:	Batch no.	
Binder Type and Grade		
Binder modifiers to be added at the mixer		
Aggregate source Coarse: Fines:	Filler: Cement, Hydrated Lime Fibres:	
Weather limits - road temperatures, humidity, wind chill adjustment, tolerance of surface dampness etc.	Road Temperature max: Road Temperature min: Humidity max:	
Binder Source **Test**	**Base Binder** before preparation of emulsion (where possible)	**Recovered Binder** Recovered in accordance with Clause 923
Penetration at 25 °C dmm 100 g 5secs		
Penetration at 5 °C dmm 200 g 60 secs		
Vialit pendulum cohesion # max. J/cm² (Clause 928)		
Product identification test # Clause 927.7 Complex stiffness modulus (G*) and phase angle (δ) (Clause 928)		Data and graphs # to Clause 928
Equi-stiffness Temp. (T_{2000Pa} °C) from G*		
†		
†		
†		
†		

Where indicated with # the Contractor shall attach a graphical output to this schedule.

† Other properties the Contractor considers useful.

NATIONAL ALTERATIONS OF THE OVERSEEING ORGANISATION OF NORTHERN IRELAND

NG 706NI Excavation, Trimming and Reinstatement of Existing Surfaces

1 Clause 706 describes a method of excavation and reinstatement of existing paved and unpaved surfaces:

(i) Where the Contractor unavoidably has to break into work which he has carried out as part of the Works.

(ii) Where he is required to break into paved areas existing prior to the Works being constructed.

(iii) Where pavements are constructed to abut or join into existing pavements.

2 As much information as possible should be provided in Appendix 7/2 and on the Drawings for 1(ii) and (iii) above, especially to show the areas and depth of pavement required to match levels between new and existing construction. The intention is to ensure that at least a new wearing course should be provided over the minimum area of existing pavement as will avoid feathering below 40 mm thickness, after preparation of the existing surface by scarifying and planing. Where existing and new concrete pavements abut or join into each other it is normal practice to use a bituminous pavement between the two sections, details of which should be given in Appendix 7/2.

3 Paved areas already constructed as part of the Permanent Works should only be excavated when it is necessary to carry out the Permanent Works or where no other practical means of completing the Permanent Works can be devised.

4 Advice and methods of reinstating concrete pavements are given in the 'Manual for Maintenance and Repair of Concrete Roads' produced jointly by the Department of Transport and the Cement and Concrete Association.