SERIES 2600
MISCELLANEOUS

Contents

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2601 Bedding Mortar

General

1 Bedding mortar shall satisfy the following performance requirements:

(i) Unless otherwise described in Appendix 26/2, bedding mortar shall have a compressive strength not less than 50 N/mm² when tested in accordance with sub-Clause 4(iv) or 4(v) of this Clause.

(ii) The flow characteristics shall be such that the volume of the bed or plinth as shown on the Drawings is completely filled with homogeneous material when placed within the range of ambient temperature between 5°C and 25°C, or as otherwise described in Appendix 26/2.

(iii) The physical and chemical properties shall be compatible with those of all adjoining surfaces.

The stress in the mortar shall not exceed that defined in Appendix 21/1 for bridge bearings and Appendix 26/2 for other applications. Where the mortar is required to resist stress before attaining its 28-day strength the compressive strength shall be confirmed by tests on mortar cubes stored under conditions that simulate the field conditions.

Materials

2 (i) (11/03) The maximum aggregate size in bedding mortar shall be 2.8 mm.

(ii) Proprietary materials shall be stored as follows:

(a) The materials shall be stored in a dry environment at a temperature of between 10°C and 27°C.

(b) The containers shall be damp-proof, leak-proof and readily emptied of their contents.

(c) Containers shall be marked with the batch reference number, component identification, manufacturer's name, net weight and such warnings or precautions concerning the contents as are required.

(iii) The material shall not be removed from the store for use in the Works until immediately prior to mixing.

(iv) Material shall not be used more than six months after the date of manufacture or any lesser period specified by the manufacturer or supplier.

(v) The Contractor shall supply with each batch or part of a batch of the material delivered to the Site, certificates furnished by the supplier or manufacturer stating the following:

(a) Manufacturer's name and address.

(b) Manufacturer's agent's name and address where applicable.

(c) Description of material and brand name.

(d) Batch reference number, size of batch, and number of containers in the delivery order.

(e) Date of manufacture.

(f) The chloride ion content, expressed as a percentage by mass of cement.

(vi) Calcium chloride or admixtures containing chloride salts shall not be used and the total chloride ion content shall not exceed 0.1% of the mass of cement.

(vii) (11/03) Portland cement CEM I shall comply with BS EN 197-1.

(viii) (11/03) The total acid-soluble sulfate content of the mortar mix, as SO_4 shall not exceed 5% of the mass of cement in the mix. The acid-soluble sulfate (AS) shall be determined in accordance with Test No. 2 in TRL Report 447. The sulfate content shall be calculated as the total from the various constituents of the mix.

(ix) (11/03) If water for the Works is not available from a water company's supply, the Contractor shall ensure that the water complies with the guidance given in BS EN 1008. Water from a water company supply may be used without testing. Where testing is required, the sulfate content of the water shall be tested in accordance with Test No. 1 in TRL Report 447. The water shall not be

used if the sulfate content exceeds 1.4 g of sulfate (as SO_4) per litre. Water from the sea or tidal rivers shall not be used.

(x) Resinous bedding mortars shall be based on thermosetting organic polymers consisting of stable fluid and/or solid components which on mixing react chemically to form a hardened solid mass. Products shall be formulated from epoxide, polyester, polyurethane or acrylic resin systems. Fillers or aggregates to be incorporated in accordance with the manufacturer's recommendations, to extend or modify the properties of the resinous composition, shall be pre-bagged, dry and factory proportioned. The addition of other fillers or aggregates shall not be permitted.

Site Mixing, Placing and Curing

3 (i) Mixing, placing and curing of proprietary bedding mortar shall be carried out in accordance with the manufacturer's written instructions together with the following:

(a) The material shall not be mixed or placed in the Works at ambient temperatures of less than 5°C. If for 24 hours before, during or after placing, the ambient temperature falls below 5°C the Contractor shall maintain the temperature of the substrate and other adjoining surfaces at not less than 5°C for the duration of the curing period recommended by the manufacturer.

(b) For cementitious bedding mortars the water/cement ratio shall not exceed 0.4. The water content shall be confirmed during the approval tests, and maintained within a tolerance of ± 1 per cent in mortars placed in the Works.

(c) Only full packs of mortar as supplied shall be mixed. On-site proportioning shall not be permitted.

(d) The temperature of the mortar on completion of mixing shall be between 5°C and 25°C.

(ii) For cementitious bedding mortars, the substrate shall be flushed clean with water two hours before placing and maintained wet until placing commences. Any free water on the surface of the substrate shall be removed before placing the mortar. The underside of the base plate shall be clean and free from loose rust and loose mill scale at the time of bedding. The mortar shall be placed in its final position within 25 minutes of commencement of mixing. Immediately after casting, the mortar shall be protected to prevent evaporation for at least three days.

(iii) For resinous bedding mortars the substrate shall be dry, free from loose dirt and dust and shall meet the conditions specified by the manufacturer. The underside of the base plate shall be clean and free from loose rust and loose mill scale at the time of bedding. The mortar shall be placed in its final position within one hour, or lesser period specified by the manufacturer, of commencement of mixing.

(iv) The mortar shall be poured in one corner of the plinth. The addition of mortar to the sides of the plinth shall only be permitted after the mortar has flowed completely under the plinth.

(v) No internal metal shims shall be allowed to remain in the hardened bedding mortar except where described in Appendix 26/2.

Laboratory Approval Tests

4 (i) General

Every batch of mortar to be used in the Works shall be tested by the Contractor. Where more than one batch of mortar is to be used in the Works the Elastic Stability Test may be omitted from the testing regime subsequent to the initial laboratory approval tests.

The Contractor shall state the water content to be used, expressed as a percentage by weight of the material. Mixing shall be carried out in accordance with the manufacturer's written instructions.

(ii) Flow Cone Test, Calibration of Flow

(a) (11/03) The flow characteristics of the mortar shall be determined by the Flow Cone Test method described in ASTM Standard C939-02.

(b) Tests shall be conducted at ambient temperatures of 5°C and 20°C within 15 minutes of commencement of mixing.

(c) For the test at 5°C the temperature of the flow cone and the mixer shall be 5°C, the temperature of the dry material 10°C, and the temperature of the water where required, 20°C.

(d) For the test at 20°C the temperature of the flow cone, the mixer, the dry material and the water where required shall be 20°C.

(e) For each temperature at least two tests having times of efflux within ± 5% shall be made and the average time of efflux to the nearest 0.2 second shall be reported.

(iii) Flow Between Glass Plates

(a) The flow characteristics of the mortar between glass plates shall be determined using the apparatus shown in HCD Drawing Number K2.

(b) Tests shall be conducted at ambient temperatures of 5°C and 20°C.

(c) The temperature of the apparatus, dry material and water for each test shall comply with sub-Clause 4(ii)(c) and (d) of this Clause.

(d) The mortar shall be poured in one corner of the apparatus commencing between 18 minutes and 20 minutes after commencement of mixing.

(e) A satisfactory flow shall be achieved when the mortar flows under the glass plate and rises at least 10 mm above the underside of the top plate at all positions, without signs of segregation, bleeding, effervescence or air inclusions.

(iv) Compressive Strength (Cementitious)

(a) The compressive strength of cementitious bedding mortars shall be carried out on six 70 mm cubes at an age of 28 days.

(b) The temperature of the mixer, the dry material, the water and the moulds shall be 20°C.

(c) (11/03) The 70 mm cube moulds shall comply with BS EN 12390-1. Test specimens shall be made by filling the moulds carefully through a funnel to produce a void-free mortar. The moulds shall be covered by a steel plate to prevent expansion of the mortar.

(d) (11/03) There shall be no compaction. Specimens shall be damp-cured for the first 24 hours, removed from the moulds and then water cured. Curing shall comply with BS EN 12390-2.

(e) (11/03) Testing shall comply with BS EN 12390-3.

(f) The strength requirement shall be satisfied if none of the compressive strengths obtained is lower than 50 N/mm² and the difference between the highest and lowest values is not more than 20% of the average. All results shall be reported.

(v) Compressive Strength (Resinous)

(a) The compressive strength for resinous bedding mortars shall be carried out on six 40 mm cubes at an age of 24 hours.

(b) The 40 mm cube moulds shall comply with BS 6319 : Part 1 and shall be carefully filled using a funnel to ensure void-free cubes. There shall be no compaction.

(c) Testing shall comply with BS 6319 : Part 2.

(d) The strength requirement shall be satisfied if none of the compressive strengths obtained is lower than 50 N/mm² and the difference between the highest and lowest values is not more than 20% of the average. All results shall be reported.

(vi) Expansion Test

(a) (11/03) Short term expansion shall be determined by the method described in ASTM Standard C827-01a. Results shall be determined from the mean of two tests.

(b) The expansion of cementitious bedding mortars at 24 hours shall be less than 2.5% and greater than 0.25%.

(c) The volume change of resinous bedding mortars at 24 hours shall be between -0.6% and +1.0%.

(vii) Water Absorption Test

(a) (11/03) Absorption of water by resinous bedding mortars shall be determined by the method described in ASTM Standard C413-01. The absorption shall be not more than 0.4%.

(viii) Elastic stability tests for cementitious bedding mortars shall be carried out on one set of three cubes made at 20°C as described in sub-Clause 4(iv) of this Clause.

(a) (11/03) Curing shall comply with BS EN 12390-2. After a minimum of 28 days, the cubes shall be placed in water at 20°C heated at a uniform rate to 45°C in 24 hours.

(b) Upon attaining 45°C the cubes shall be sealed in a plastic bag and then loaded at a compressive stress of 30 N/mm² maintained for six hours at 45°C and the strain measured.

(c) The total compressive strain shall not exceed 1% on each cube.

(ix) Elastic stability tests for resinous bedding mortars shall be carried out on one set of two 40 mm cubes complying with BS 6319 : Part 1.

(a) On removing the cubes from the moulds after 24 hours they shall be heated at a uniform rate to 45°C in a further 24 hours.

(b) Upon attaining 45°C the cubes shall be loaded at a compressive stress of 30 N/mm² maintained for six hours at 45°C and the strain measured.

(c) The total compressive strain shall not exceed 1% on each cube.

Site Control Tests

5 (i) If the efflux times at 5°C and 20°C determined as described in sub-Clause 4(ii) of this Clause are within 10% or two seconds of each other, whichever is the greater, then site control tests for flow shall be carried out as described in (a) below. In other cases, when the air temperature is less than 10°C site control tests for flow shall be carried out as described in (b) below and when the air temperature is greater than 10°C site control tests for flow shall be carried out as described in (a) below.

(a) Each load of mortar mixed for placing in the Works shall be tested at ambient temperature by the flow cone test method as described in sub-Clause 4(ii) of this Clause. The results shall agree within ± 10% or ± two seconds whichever is the greater, of the values obtained in the approval tests at 20°C.

(b) Each load of mortar mixed for placing in the Works shall be tested at ambient temperature by the flow cone test method as described in sub-Clause 4(ii) of this Clause. The results shall agree within ± 10% or ± two seconds whichever is the greater, of the values obtained in the approval tests at 5°C.

(ii) Compressive Strength. Three cubes from each load of mortar mixed for placing in the Works shall be tested for compressive strength as described in sub-Clause 4(iv) or 4(v) of this Clause as appropriate.

Tolerances

6 The following tolerances shall apply to all temperatures referred to in this Clause:

5°C (- 0°C + 2°C)

10°C (- 0°C + 2°C)

20°C (- 0°C + 2°C)

45°C (- 2°C + 2°C)

110°C (- 5°C + 5°C)

The tolerances applying to all linear dimensions, unless otherwise shown on the Drawings shall be ± 1%.

2602 Concrete for Ancillary Purposes

General

1 Concrete mixes referred to in the Contract as ST followed by a number shall mean concrete for ancillary purposes which shall comply with this Clause and any additional requirements in Appendix 26/1.

2 (11/03) Concrete for ancillary purposes shall be a standardised prescribed concrete complying with BS EN 206-1 and BS 8500 and with the additional requirements of this Clause.

Cement

3 (11/04) Cement types as defined in BS 8500, see Table A.17 of BS 8500-1 or Table 1 of BS 8500-2, shall comprise one of the following:

CEM I, CEM II/A-V, CEM II/B-V, BIIIA

or, where required in Appendix 26/1, SRPC (sulfate-resisting Portland cement).

Aggregates

4 (11/03) Aggregates shall comply with BS EN 12620 and unless otherwise described in Appendix 26/1 the maximum size shall be 20 mm. The total acid-soluble sulfate content of the concrete mix, as SO_4, shall not exceed 5% of the mass of cement in the mix. The acid-soluble sulfate (AS) shall be determined in accordance with Test No. 2 in TRL Report 447.

(11/03) **Consistence**

5 (11/03) The consistence of the concrete shall be defined by its consistence class (slump) and be within either consistence class S2 or consistence class S3 of BS EN 206-1 BS 8500 as appropriate to the purpose.

(11/03) **Standardised Prescribed Concrete**

6 (11/03) The standardised prescribed concrete used for each purpose shall be as described in Table 26/1 unless otherwise described in Appendix 26/1.

TABLE 26/1: (05/04) **Concrete for Ancillary Purposes**

Purpose	Standardised prescribed concrete*
1 Footings for fence posts and augered foundations for traffic sign posts	ST2
2 Foundations for environmental barrier posts and planted lighting columns	ST5
3 Blinding concrete, backfill for structural foundations, overdig of post holes and preparation of formation to Clause 616	ST1
4 Bedding and backing to precast concrete kerbs, channels, edgings and quadrants	ST1
5 Bed to drains Type A#. Foundations, channels and benching to chambers	ST4
6 Bed, haunch and surround to drains other than Type A#. Surround to chambers and gullies	ST2

* Unless otherwise described in Appendix 26/1
# Refer to HCD drawing number F1 and F2

Transporting, Placing and Compacting Concrete

7 (05/05) Concrete shall be transported and placed so that contamination, segregation and loss of materials does not occur. The maximum temperature of the concrete at any time between mixing and placing shall be no greater than 30°C. Concrete shall be placed and compacted within two hours of mixing. After compaction it shall not be disturbed within 12 hours.

8 (11/03) Concrete shall be compacted by tamping or vibrating until it is thoroughly worked around any embedded metal and into corners of formwork or excavations, until a solid mass substantially free from voids is obtained without segregation and with no free water on the surface. The Contractor shall select the consistence as described in sub-Clause 5 of this Clause to achieve this.

9 Surface finishes shall comply with Clause 1708 and, unless otherwise described in Appendix 26/1, the following:

Buried surfaces:

Unformed surfaces shall be Class U1
Formed surfaces shall be Class F1

Exposed surfaces:

Unformed surfaces shall be Class U2 except benching to chambers, which shall be Class U3
Formed surfaces shall be Class F2

10 Formwork shall be struck without damage to the concrete not less than two days after placing the concrete and exposed surfaces shall be cured as described in Clause 1027 or by covering them with an opaque impermeable membrane or with hessian or sand which shall be kept damp. Such covering shall not be removed for two days after placing.

11 (11/03) This Clause shall be complied with where standardised prescribed concrete to BS EN 206-1 and BS EN 8500-2, are shown on the Drawings for purposes other than those in Table 26/1.

2603 Porous No Fines Concrete

1 (11/03) No fines concrete shall consist of Portland cement CEM I to BS EN 197-1 and 40 mm single size aggregate complying with BS EN 12620.

2 The ratio of aggregate to cement shall be 8:1 by volume or 10:1 by mass.

3 The concrete shall be mixed by machine or by hand to a uniform colour and consistency before placing. The quantity of water used shall not exceed that required to coat all of the aggregate particles without forming excess grout.

4 The concrete shall be compacted by hand only.

2604 Plastic Coating to Fencing Posts, Gates and Ancillaries

1 (11/03) Plastic coating to steel or galvanized steel fence posts, gates and ancillaries shall comply with BS 1722: Part 16. Preparation of steel and galvanizing shall comply with Series 1900.

2605 Plastic Coated High Tensile Wire

1 (11/03) Wire shall be 4.40 mm diameter high tensile drawn carbon steel wire with a minimum tensile strength of 1050 N/mm², zinc coated to class A to comply with BS EN 10244-2 and plastic coated to

comply with the following sub-Clauses and shall be grade designated Grade A.

2 Plastic coatings shall be applied to wire by extrusion using a compound complying with BS 2571 Type E1A and with the following additional requirements (i) to (iii):

(i) The vinyl chloride homopolymer shall be mixed with appropriate primary plasticizers, heat and light stabilizers, lubricants and pigments. No extender or filler other than stabilizers or pigments shall be used. No other material shall be added to the compound.

(ii) Not more than 5% of clean, once re-worked material, which shall be of the same composition, shall be added to the virgin material from which the compound is to be manufactured.

(iii) The softness number of the compound shall be not less than five nor greater than 15, when tested as described in BS 2782 : Part 3 : Method 365A.

3 The surface of extruded plastic coatings shall be smooth, continuous and free from discolouration. The colour of the coating shall be as required by Appendix 3/1 either green or black in accordance with BS 4800.

4 The overall nominal diameter of the plastic coated wire shall be 4.00 mm. When two diameter measurements are made at right angles to each other at a cross-section, the average of the two measurements shall not differ from the specified nominal diameter by more than + 0.05 mm.

2606 Cored Thermoplastic Node Markers

General

1 Cored thermoplastic node markers shall be white and installed in pairs or sets of three at the locations described in Appendix 26/3.

Node Markers

2 The node markers shall be constructed as follows:

(i) 100 mm diameter pockets 10 mm ± 5 mm deep shall be cored in the finished road surface at 175 mm ± 5 mm centres within a longitudinal tolerance of ± 0.25 m. The pockets shall be cored using a drill consisting of central pilot bit surrounded by a 100 mm annular bit. The material within the annulus shall be carefully broken out leaving a rough surface to the base of the pocket. The line joining the centres of the markers shall be perpendicular to the centre line of the lane in which the markers are installed.

(ii) (05/05) The base of the pockets shall be cleaned and dried ensuring that all loose material is removed.

(iii) (11/03) Thermoplastic road marking material or paint shall be in accordance with BS EN 1871, shall then be poured into the pockets until the material projects slightly above the level of the road surface, but the material must not be allowed to spread onto the surrounding carriageway surface.

3 The completed markers shall be free from raggedness at their edges and free from streaks, and be flush (ie not more than 2 mm above) with the surface of the adjacent carriageway.

2607 Granolithic Concrete Rendering and Screed

1 (11/06) Granolithic concrete shall be designed concrete to Clause 1701 and shall be strength class C32/40 with maximum aggregate size 4/10 mm to Clause 1704. It shall conform to Clauses 1702, 1705, 1706, 1707 and 1710.

2 (11/06) Aggregate shall be crushed granite complying with BS EN 12620 for heavy duty concrete floor finishes. The aggregate shall comply with either the grading requirements in Table 6 for 0/10 G_A90 or 0/6.3 G_A90 maximum size, all-in aggregate, or the coarse aggregate grading in Table 2 for 4/10 $G_C85/20$ single sized aggregate and the sand within the limits of 0/4 (CP) or 0/2 (MP) of BS EN 12620.

3 (11/06) Granolithic concrete to this Clause shall be laid on base concrete which has been prepared in the following manner. The laitance on the base concrete shall be removed by wire brushing and by hosing with water. This shall be done after the initial set of the base concrete but before hardening and without disturbing the aggregate. Granolithic concrete to this clause shall be laid not later than three days after placing the base concrete.

4 (11/06) After compaction the surface of the render or screed shall be trowelled to a smooth finish to the required levels, profiles and contours and shall present a surface finish Class U3 to Clause 1708.

2608 (03/20) Foamed Concrete for Structures

1 (03/20) Foamed concrete for use in structures and other related applications (except for highway reinstatements) shall comply with this Clause and any additional contract specific requirements in Appendix 26/8.

2 (03/20) Foamed concrete shall have the following compressive strengths:

(i) a minimum cube compressive strength of 4 N/mm^2 at an age of 7 days; and

(ii) a maximum cube compressive strength of 10 N/mm^2 at an age of 7 days.

3 (03/20) The compressive strength shall be determined by testing foamed concrete cubes which have been made in accordance with BS EN 12390-1 except that the foamed concrete shall be placed in the mould without any tamping or vibration other than gently rocking the mould on a firm base. The test cubes shall be cured in accordance with BS EN 12390-2 and tested for compressive strength in accordance with BS EN 12390-3.

4 (03/20) All aggregate used in foamed concrete shall pass a 6.3 mm sieve and shall comply with the MP and FP grading limits given in BS EN 12620. Larger size aggregate may be used provided it can be shown to be practicable.

5 (03/20) The foamed concrete permissible constituents shall exclude potash and incinerator bottom ash aggregate.

6 (03/20) Admixtures shall comply with the requirements of BS EN 934-2. The stability of foamed concrete shall be tested in accordance with Annex D of BS 8443.

7 (03/20) Fibres shall not be used for foamed concrete for structures.

8 (03/20) The maximum depth of a single pour shall not exceed 1.0m within a 16 to 24 hour period.

9 (03/20) Where the foamed concrete surface is exposed the poured foamed concrete must remain visible until it has set.