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16 MISCELLANEOUS

16.1 GENERAL

16.1.1 Scope

1 This Part deals with miscellaneous items related to concrete works including pavement quality concrete, no fines concrete, lightweight concrete, cementitious grout, screeds, repair of concrete and guniting.

2 Related Sections and Parts are as follows:

This Section

Part 2, ... Aggregate
Part 3, ... Cementitious Material
Part 4, ... Water
Part 5, ... Admixture
Part 6, ... Property Requirements
Part 7, ... Concrete Plants
Part 8, ... Transportation and Placing of Concrete
Part 9, ... Formwork
Part 10, ... Curing
Part 15, ... Hot Weather Concreting.

16.1.2 References

1 The following standards are referred to in this Part:

ACI 506, ... Guide to Shotcrete

ASTM C827/C827M Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures

ASTM C989/C989M Standard Specification for Slag Cement for Use in Concrete and Mortars

ASTM D648..... Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position

ASTM D2584..... Standard Test Method for Ignition Loss of Cured Reinforced Resins

ASTM D6783..... Standard Specification for Polymer Concrete Pipe

BS 146, ... Portland-blast furnace cement

BS 812, ... Testing aggregates

BS 1881, ... Testing concrete

BS 2782, ... Methods of testing plastics

BS 3892, ... Pulverised fuel ash

BS 4551, ... Methods of testing mortars, screeds and plasters

BS 5075, ... Concrete admixtures

BS 6319, ... Testing of resin and polymer / cement compositions for use in construction

BS 6610, ... Specification for pozzolanic pulverised-fuel ash cement.

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BS 8110 ..... Structural use of concrete

BS 8203, ... Code of practice for installation of resilient floor coverings.

BS 8500, ... Concrete

EN 197-1, ... Cement. Composition, specifications and conformity criteria for common cements

EN 480, ... Admixtures for concrete, mortar and grout. Test methods (parts: 1, 2, 4, 5, 6, 8, 10, 11, and 12)

EN 934, ... Admixtures for concrete, mortar and grout (parts: 2, 6)

EN 998, ... Specification for mortar for masonry

EN 1744-1, ... Tests for chemical properties of aggregates. Chemical analysis

EN 12350, ... Testing fresh concrete

EN 12390, ... Testing hardened concrete

EN 12620, ... Aggregates for concrete

EN 197-4, ... Cement. Composition, specifications and conformity criteria for low early strength blastfurnace cements

EN 13121 ..... GRP tanks and vessels for use above ground

EN 1744-1, ... Tests for chemical properties of aggregates. Chemical analysis

EN 1992 ..... Eurocode 2: Design of concrete structures

EN 206, ... Concrete Specification, performance, production and conformity

ISO 75 ..... Plastics — Determination of temperature of deflection under load

ISO 18672-1 ..... Plastics piping systems for non-pressure drainage and sewerage — Polyester resin concrete (PRC) — Part 1: Pipes and fittings with flexible joints

SHW 1000..... Specification for Highway Works – UK ROAD PAVEMENTS – CONCRETE MATERIALS

16.2 PAVEMENT QUALITY CONCRETE

16.2.1 Scope

1 This Subpart covers the mix design for concrete used for aircraft aprons and roadworks as surface slabs, continuously reinforced concrete roadbase, and wet lean mix except cement bound granular material used as a roadbase or sub-base or as a backfill material for excavations.

16.2.2 Mix Designs

1 Concrete in rigid or composite pavements shall be one of the grades given in Table 16.1 below, in accordance, with the pavement design shown on the Drawings or as directed by the Engineer.

2 All concrete for use in pavements shall be designed mixes or equivalent standard mixes in accordance with the relevant clauses of BS 8500 and EN 206, except where otherwise specified.

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3 Prescribed mixes may be used for rapid construction with the approval of the Engineer.

Table 16.1
Pavement Grades

Pavement Layer	BS 8500 and EN 206 Designed Mix	BS 8500 and EN 206 Standard Mix
Surface Slabs		
Unreinforced Concrete	C40	
Jointed Reinforced Concrete (JRC)	C40	
Continuously Reinforced Concrete Pavement (CRCP)	C40	
Continuously Reinforced Concrete Roadbase (CRCR)	C40	
Ground Anchorage Beam	C40	
Wet Lean Mix Concrete 4	C20	ST4
Wet Lean Mix Concrete 3	C15	ST3
Wet Lean Mix Concrete 2	C10	ST2
Wet Lean Mix Concrete 1	C7.5	ST1

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16.2.3 Cement

1 The general term 'cement' in this Part means the materials shown below.

Cement	Complying with
Cement. Composition, specifications and conformity criteria for common cements	EN 197-1
Portland blast furnace cement	BS 146 or EN 197-4
Specification for pozzolanic pulverised-fuel ash cement (grades C20 or below)	BS 6610

2 The use of a combination of Portland cement and ground granulated blast furnace slag is permitted subject to the approval of the Engineer. In such cases, the Engineer will stipulate the minimum combined cementitious material content required for the mix.

3 The use of a combination of Portland cement and pulverised fuel ash (PFA) is permitted subject to the approval of the Engineer. In such cases, the Engineer will stipulate the minimum combined cementitious material content required for the mix. PFA shall be in accordance with BS 3892.

4 The use of microsilica in the mix designs will be permitted if approved by the Engineer.

5 The Engineer will stipulate the minimum combined cementitious material content required for the mix where PFA or GGBFS are used.

6 The maximum proportion of ground granulated blastfurnace slag with Portland cement shall be as per Table 6.6 of Part 5.6.

7 In combination with Portland cement, the proportion of PFA by mass to the total cement shall be as per Table 6.6 of Part 5.6.

8 The limit of chloride content of the concrete shall be as stated in Table 6.5 of Part 5.6.

9 The minimum cement content for concrete pavements shall be as requested and/ or preapproved by the Engineer.

16.2.4 Water

1 Water for use in the making and curing of concrete shall conform to the requirements of Part 4 of this Section.

2 The water content shall be the minimum required to provide the agreed workability for full compaction of the concrete to the required density, as determined by trial mixes or other means approved by the Engineer.

16.2.5 Aggregates

1 The requirements of Part 2 of this specification will govern, except as modified below.

2 Aggregates for all pavement concrete shall be complying with EN 12620

3 Alternatively coarse aggregate of recycled and secondary aggregate materials may be used to replace up to 50% by mass of coarse aggregate

4 The nominal size of coarse aggregate shall not exceed 40 mm. When the spacing between longitudinal reinforcement is less than 90 mm, the nominal size of coarse aggregate shall not exceed 20 mm.

5 If requested by the Engineer, the Contractor shall carry out tests on the proposed aggregate combination to check for the possibility of alkali silica reaction. Such tests shall be carried out in accordance with the procedure laid down in Part 2 of this Section.

16.2.6 Admixtures

1 Plasticisers or water reducing admixtures shall comply with BS 5075, EN 480 and EN 934. Admixtures containing calcium chloride shall not be used.

2 Other chloride-free admixtures may be used with the approval of the Engineer.

16.2.7 Air content

1 The total quantity of air in air-entrained concrete as a percentage of the volume of the mix shall be 5 ± 1.5 % for mixes of nominal aggregate size 20 and be 4 ± 1.5 % for mixes of nominal aggregate size 40.

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2 The air content shall be determined at the point of delivery by a pressure type air meter in accordance with EN 12350-7, at the rate of one determination per 300 m2 of slab or at least six times per day whichever is the greater, in conjunction with tests for workability and strength. For areas less than 300 m^2, the rate shall be at least one determination to each 20 m length of slab or less constructed at one time or at least three times per day. If the air content is outside the specified limits, a further determination shall be made immediately on the next available load of concrete before discharging. If the air content is still outside the limit, the Contractor shall immediately adjust the air content of the concrete to improve its uniformity, before further concrete is used in the Works.

3 The air-entraining agent shall be added at the mixer, by an apparatus capable of dispensing the correct dose within the tolerance for admixtures given in EN 206, and so as to ensure uniform distribution of the agent throughout the batch during mixing.

16.2.8 Density

1 The density of concrete Grades greater than C30 shall be such that without air-entrainment the total air voids are not more than 3 %. With air entrainment, the total air voids shall be not more than 8 %, for 20 mm aggregate or 7 % for 40 mm aggregate.

2 The density of concrete Grades B15 and B20, mix ST4 or below shall be at least 95 %, of the theoretical maximum dry density.

16.3 CEMENTITIOUS GROUT

16.3.1 General

1 This Subpart covers a general purpose non-shrink cementitious grout. The grout shall be used to where it is necessary to eliminate shrinkage when filling the void between a base plate and a substrate such as in the grouting of stanchion bases, anchorage fixings, including masts, anchor bolts and fence posts.

2 The grout shall be supplied by a reputable construction chemical company as a single pack prepackaged cement based product which is chloride free.

3 For a particular application, the Contractor shall submit a method statement detailing how the formwork will be placed and the points where the grout will be poured.

4 Before beginning work on large repetitive works, the Contractor shall arrange for a site trial of the materials and methods with the suppliers representative being present to train the Contractor's personnel in the correct use of the material.

16.3.2 Material

1 The grout shall be suitable for filling gaps of thickness up to 100 mm and shall be free flowing and non shrink.

2 Positive volumetric expansion shall take place while the grout is plastic by means of gaseous expansion to avoid shrinkage and cracking.

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3 The compressive strength of the grout when tested in accordance with EN 12390-3 shall be a minimum of 25 MPa at 24 h, 40 MPa at 7 d and 50 MPa at 28 d.

4 The grout shall exhibit a high early strength gain yet not be subject to cracking or other detrimental effects.

5 At ambient temperatures above 35 °C, cool water shall be used for mixing the grout before placing.

16.3.3 Workmanship

1 The storage handling and pouring of the grout shall be in strict accordance with the manufacturer's instructions.

2 The substrate surface shall be free from oil grease or loose or partially bonded material.

3 If the concrete surface is defective or has laitance it shall be cut back to a sound base.

4 Bolt holes and fixing pockets shall be blown clean of dirt or debris.

5 The substrate shall be soaked with fresh potable water before grouting, although immediately before grouting, free water shall be removed and blown out of bolt holes or pockets.

6 Grout shall not be placed in a gap of less than 25 mm for base plates larger than 1 m wide. For larger base plates or flow areas the manufacturers instructions shall be followed.

7 Base plates and metallic items shall be clean and free from oil, grease, or scale.

8 Vent holes shall be provided to allow the release of air from isolated spots.

9 Formwork shall be made leak proof by the use of form rubber strip or mastic sealant between the constructive formwork and joints. Formwork shall extend above the required pour height and if necessary shall be extended to allow a hydrostatic head to aid placement.

10 The grout shall be mixed mechanically with a slow speed drill fitted with a high-shear mixer.

11 The quantity of water to be added to the preweighed bags shall be enough to give the desirable consistency as trowelable or flowable.

12 Mixing shall take place for a minimum of 5 min.

13 The grout shall be placed within the time limit specified by the manufacturer depending on the actual application temperature.

14 Grout shall be poured from one side and it shall be verified that the grout has flowed under all of the base plate with no voids. Pouring from several sides shall not be permitted.

15 Exposed areas of grout shall be thoroughly cured in accordance with Part 10 of this Section.

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16.4 SCREEDS

16.4.1 Scope

1 This Subpart covers screeds that provide by means of a layer of mortar a level surface in flooring applications and to provide falls on flat concrete roofs.

16.4.2 General

1 Screeds shall be suitable for application onto a concrete substrate.

2 The screeds shall be suitable for receiving surface finishes which may arrange from thin flexible sheeting to ceramic tiling. The screed is not intended to be the final wearing surface.

3 Screed mortars shall generally comprise sand and cement modified by additives or substituted by other materials such as polymers in order to provide specific performance requirements.

4 For screeds of thickness greater than 40 mm it is permissible to incorporate a proportion of 10 mm aggregate.

5 Aggregates used for screeds shall not contain deleterious materials such as coal or iron particles which may affect the finish the surface of the screed.

6 Admixtures for mortar screeds shall assist workability or alter rates of setting and hardening and shall comply with the appropriate part of EN 480 and EN 934.

7 Polymer based additives may be used to improve adhesion and strength of thin or featured screeds, these shall be based on polyvinyl acetate (PVA) styrene bituene rubber (SPR) or acrylic polymers.

8 Ready to use sand cement screeds shall comply with the material requirements EN 998.

9 Screeds with a rapid drying time to enable earlier floor finishes to be applied shall be used strictly in accordance with the manufacturers' instructions.

10 The interface of the screed in the concrete substrate shall be specified as one of the following options by the Engineer:

(a) Monolithic with the concrete base: The screed shall be applied within 3 hours of placing the concrete base.

(b) Bonded to the concrete base: Screed shall be laid onto a concrete base which is hardened and is subsequently been prepared to receive the screed, the minimum thickness of the screed shall be 25 mm and the maximum thickness 40 mm.

(c) As an unbonded screed: The screed shall be laid on a separating layer.

(d) As a floating screed: The screed shall be laid on an insulating material.

11 The cement and sand screed mix shall have the minimum amount of water added to give sufficient workability and allow the material to be thoroughly compacted.

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12 Pan type mixes shall be used to ensure efficient mixing of materials, the cement to aggregate ratio shall be between 1 to 3 and 1 to 4.5 by weight. The mixing of the sand cement, water and admixtures shall ensure a thorough homogeneous mixture with no balling up of the cement.

13 Screeds shall be laid either between carefully levelled and trued batons or between strips of screed laid and compacted to a finished level.

14 For bonded screed where a high degree of bond is required the surface laitance of the concrete base shall be mechanically removed to expose the coarse aggregate. A thin layer of neat cement grout shall be applied to the prewetted or dampened concrete and the screed applied and compacted while the grout is wet.

15 Screeds shall be fully compacted by heavy hand or mechanical tamping. The screed at joints around the perimeter shall be particularly well compacted to avoid breaking out and curling.

16 Screeds thicker than 50 mm shall be laid in two approximately equal layers; screed shall be kept protected by waterproof sheeting for at least 7 days after laying.

17 Sheet and non ceramic tiling finishes shall only be applied after the screed has cured and necessary strength achieved.

18 If requested by the Engineer the Contractor shall carry out a soundness and impact test in accordance with BS 8203.

19 Screeds shall be laid in bays of a size to minimise thermal moisture contraction. Contraction or movement joints shall be provided as appropriate, where shown on the drawings or as directed by the Engineer. Bays shall be laid alternatively.

20 Bay sizes shall be approximately 15 m2 for 100 mm thick screed and 12 m2 for 75 mm thick screed.

16.5 CELLULAR CONCRETE

1 Cellular Concrete (CC) is conventional concrete, where natural aggregate (gravel) is exchanged for an insulation medium, namely air, embedded in an organic and bio-degradable foam. It behaves, like conventional concrete, in particular concerning curing, hardening and most important "ageing ". CC infinitely increases its strength by hydration as long as exposed to humidity in the atmosphere.

2 CC offer more thermal insulation and a substantially higher fire-rating than conventional concrete.

3 Minimum compressive strengths shall be 4.0 MPa.

4 The required density and strength of the CC shall be specified on the drawings and approved by the Engineer.

5 The method of production of Cellular Concrete shall be shown on the drawings or directed by the Engineer. The Contractor shall submit full technical details of the materials and method of production for the CC along with a list of previous projects where the particular system has been used.

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6 After source approval of the material and system the Contractor shall submit a mix design for the CLC for the approval of the Engineer. After the review and approval of the mix theoretical mix design the Contractor shall carry out a trial mix to check the workability of the fresh concrete and to allow samples to be made for compressive strength and density.

7 The Engineer may also instruct that tests are carried out for abrasion resistance and thermal insulation properties.

8 Cellular Concrete shall not be used for structural reinforced members.

16.6 REPAIR OF CONCRETE

16.6.1 General

1 The extent and nature of the defects in concrete shall be established in accordance with Part 15 of this Section. Based on these results the Engineer shall confirm the acceptability of the work and whether remedial works are required.

2 If remedial works are required the Contractor shall submit a detailed method statement identifying the specific materials to be used and the sequence of activities for the repair.

3 Only proprietary proven materials that form part of a standard repair system shall be used.

16.6.2 Honeycombing or Spalling

1 Where there is honeycombed concrete or concrete damaged by physical forces such as impact that has caused spalling, the concrete shall be replaced using a high strength free flowing cementitious micro-concrete.

2 The areas of repair shall be marked out and agreed with the Engineer.

3 All honeycombed, loose, cracked or friable concrete in these areas shall be removed until sound concrete is reached. Due account shall be taken of propping or other instructions given by the Engineer regarding sequences of removal and repair.

4 The equipment and methods used to break out the concrete shall be such that no reinforcing steel or other embedded items such as conduits, lifting sockets, or other inserts are loosened or damaged unless so directed by the Engineer.

5 Where the removal of concrete by mechanical means is difficult due to reinforcement congestion, then the use of high pressure water jetting shall be considered and necessary provisions for protecting the rest of the structure shall be made.

6 The prepared void shall be profiled so that entrapment of air is avoided during the repair process using fluid micro-concrete.

7 The minimum depth of repair shall be 40 mm throughout. The perimeter of the area to be repaired shall first be cut to a depth of 10 mm using a suitable tool. Feather edges will not be accepted.

8 The prepared concrete surface shall be sound and clean and free of loose particles, dust and debris.

9 Where exposed reinforcement is sound, it shall be mechanically cleaned of rust and loose millscale.

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10 Reinforcement damaged during the removal of concrete or the preparation process shall, if required by the Engineer, be repaired or replaced.

11 Adequate formwork shall be provided in accordance with of Part 9 of this Section. This shall be securely fixed to withstand the hydraulic pressures of the fluid micro-concrete repair material without distortion or movement during placement.

12 The formwork shall be watertight at all joints between panels and between the formwork and the existing concrete surface so as to prevent grout leakage.

13 The formwork shall be constructed from appropriate materials as agreed with the Engineer to achieve the required finish.

14 Formwork surfaces that are to be in contact with the repair micro-concrete shall be treated with a suitable mould release agent. This shall be used in accordance with the manufacturer's recommendations.

15 The entry point of the feed pipe into the form shall be at the lowest point of the void. Sufficient hydrostatic head or pumping pressure shall be maintained to ensure that the void is filled completely and no air remains entrapped.

16 Where necessary, provision shall be made for controllable bleed points to prevent air entrapment and enable the extent of flow of the repair material to be assessed.

17 The formwork shall be inspected by the Engineer and, if approved, filled with clean water which demonstrates that the formwork is grout-tight and saturates the prepared concrete surfaces. The formwork shall be then be completely drained and resealed

18 In situations where the completed repair will be subjected to constant immersion an epoxy bonding agent shall be applied in accordance with the manufacturers' instructions.

19 Both the Compressive strength and Flexural strength shall be at a water:powder ratio of 0.18 and tested at 20 oC

20 The thermal conductivity and the elastic modulus of the repair material shall be compatible with the host concrete.

21 If requested by the Engineer, recent test results of the material for the following properties shall be submitted:

(a) thermal conductivity
(b) elastic modulus, BS 1881
(c) expansion characteristics, ASTM C 827, CRD 621-82A
(d) flow characteristic, UK DOT BD 27/86 paragraph 4.6 B.

22 The micro-concrete shall be mixed and placed in accordance with the manufacturer's recommendations, particularly with regard to water content, mixing equipment and placing time.

23 As far as possible the placing of the micro-concrete shall be continuous. The mixing operation shall be timed so that there is minimal interruption in the material flow. If, however, placing is interrupted, the operation shall recommence as soon as possible while the repair material retains its flow characteristics.

24 The formwork shall not be removed until the repair micro-concrete has achieved a compressive strength of at least 10 MPa or as directed by the Engineer.

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25 Immediately after removal of the formwork the repair area shall be cured in accordance with Part 10 of this Section.

26 The repair material shall:

(a) be shrinkage compensated in both liquid and cured states

(b) contain no metallic expansion system

(c) be prepacked and factory quality controlled

(d) be a free-flowing cementitious material that has a coefficient of thermal expansion fully compatible with the host concrete and which complies with the requirements of Table 16.3.

Table 16.3
Property requirements of micro concrete

Property	Test Method	Minimum Value
Compressive strength	EN 12390-3 @ 28 d	50 MPa
Flexural strength	BS 4551 @ 28 d	10 MPa
Anchorage bond	BS 8110	Passes

16.6.3 Crack injection

1 This clause of the specification covers non-active cracks within concrete elements caused by shrinkage or other structural movement. Non-active cracks shall be injected with a low-viscosity epoxy resin to fill and seal the crack and restore the structural integrity.

2 Before to starting the injection operation it shall be established by testing and investigation work that cracks manifest within concrete elements due to either or both shrinkage or structural movement are non-active.

3 The extent of the cracks to be filled will be as directed by the Engineer. The cracks to be filled shall be marked out in detail on the concrete elements by the Contractor and agreed with the Engineer before proceeding.

4 The extent of the work may be adjusted by the Engineer as the project proceeds, according to the conditions found.

5 Grease, oil or other contaminants shall be removed. Algae and other biological growth shall also be removed by scrubbing with bactericide or detergent and clean water. If necessary, wire brushes shall be used.

6 Loose or spalling areas of concrete, laitance, traces of paint or other coating materials within the marked out scope of the work shall be removed.

7 All cracks shall be thoroughly cleaned out using clean, oil-free compressed air. Both the concrete surface and the cracks shall be allowed to dry thoroughly before continuing.

8 The injection nipples shall be fixed at intervals along the length of each crack. The distance between each nipple will depend on the width and depth of the crack.

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9 Spacing shall be close enough to ensure that the resin will penetrate along the crack to the next point of injection. This will normally be between 200 mm and 100 mm.

10 Each nipple shall be firmly bonded to the concrete surface by using a sealant. The sealant shall be supplied in two pans (liquid base and hardener system). The two components shall be thoroughly mixed together for 3 to 4 min until a putty-like consistency is achieved.

11 The mixed sealant shall be applied to the metal base of each surface-fixed nipple. They shall be pressed firmly into place and held for several seconds until secure. The mixed sealant shall be applied around each embedded nipple, ensuring a complete seal is made. In this way, all the nipples shall be fixed along the length of the crack.

12 In the case of a wall or slab which is cracked all the way through, nipples shall be located on both sides with those at the back placed at midway points between those it the front.

13 The surface of the cracks between the nipples shall be sealed with a band of sealant 30 to 40 mm wide and 2 to 3 mm thick. Both sides if cracks which go all the way through a wall or slab shall be sealed in this way.

14 The prepared cracks shall be allowed to cure for 12 to 24 h. At low ambient temperatures (5 °C to 12 °C) the curing time will be extended and the Contractor shall ensure that the surface sealant has adequately cured before continuing.

15 One end of the injection hose shall be attached to the lowest nipple on vertical cracks or to either end of horizontal cracks.

16 Each crack shall be treated in a single, continuous operation. Sufficient material shall therefore be made ready before the commencement of the work.

17 The Contractor shall to ensure that sufficient cracks are prepared to provide effective use of the mixed material.

18 The preparation, mixing and application of the materials shall be undertaken in strict accordance with the manufacturer's recommendations. The Contractor is to ensure that all necessary tools and equipment are on Site.

19 Both the compressive strength and flexural strength shall be tested at 7 d.

20 The material shall exhibit excellent bond to concrete and when tested for tensile adhesion the failure shall be in the concrete and not at the interface.

21 The injection resin shall be of a prepackaged or preweighed type and only the use of full units will be allowed. No part packs or on-Site batching will be allowed under any circumstances.

22 In all operations of storage, mixing and application, the Contractor shall comply with the health and safety recommendations of the manufacturer and governing authorities.

23 The injected system shall be allowed to cure for 24 h and shall be left undisturbed for this time.

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24 The nipples and bands of surface sealant shall then be removed and damaged areas made good to the satisfaction of the Engineer.

25 The injection material shall be compatible with the host concrete and shall have the properties shown in Table 16.4 when tested in accordance with the relevant standards.

Table 16.4
Property Requirement for Epoxy Crack Injection Material

Property	Method	Minimum Value
Compressive strength	BS 4551, BS 2782 BS 6319	70 MPa
Flexural strength	EN 12390-5	

16.7 POLYESTER RESIN CONCRETE (PRC) - PIPING SYSTEMS FOR NON-PRESSURE DRAINAGE AND SEWERAGE

16.7.1 General

1 Polyester resin concrete is a mixture formed from aggregates and fillers which are bound together using a polyester resin (also called Polymer concrete pipes), as defined in ISO 18672-1 or ASTM D 6783 with the amendments given below.

2 Polyester resin concrete is permitted for use in infrastructure drainage and sewage systems (pipes, manhalls, soakways).

16.7.2 Resin

1 The resin used in the pipe system and manufactured as per ISO 18672-1shall have a temperature of deflection of at least 85 °C, when tested in accordance with Method A of ISO 75-2 with the test specimen in the edgewise position. It shall also conform to the applicable requirements of EN 13121-1.

2 The resin used in the pipe system and manufactured as per ASTM D 6783 shall have a minimum deflection temperature of 85°C when tested at 1.82 MPa following Test Method D648. The resin content shall not be less than 7 % of the weight of the sample as determined by Test Method D2584.

16.7.3 Minimum strength

1 The minimum strength classes for different pipe shapes are given below.

Table 16.4

Minimum strength classes for pipes designated PRC-OC or PRC-TC

Nominal size DN	Strength class Sc N/mm	
	PRC-OC	PRC-TC
150 ≤ DN ≤ 500	180	180
600 ≤ DN ≤ 1000	145	160
1200 ≤ DN≤ 3000	120	145

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Table 16.5
Minimum strength classes for pipes designated PRC-OE or PRC-TE

Nominal width/height WN/HN	**Strength class** S_C N/mm	
	PRC-OE	PRC-TE
300/450 ≤ WN/HN ≤ 600/900	**180**	**180**
700/1050 ≤ WN/HN ≤ 1000/1500	**145**	**160**
1200/1800 ≤ WN/HN ≤ 1400/2100	**120**	**145**

Table 16.6
— Minimum strength classes for pipes designated PRC-OK or PRC-TK

Nominal size DN	**Strength class** S_C N/mm	
	PRC-OK	PRC-TK
800 ≤ DN ≤ 1000	**145**	**160**
1200 ≤ DN ≤ 1800	**120**	**145**

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