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MODEL CLAUSES FOR CIVIL ENGINEERING WORKS

SECTION 80

STRUCTURAL CONCRETE

NOTES TO SPECIFIER:

These notes do not form part of the Specification.

Use of this Section and interface with other Sections

80.1 *This Section is based on BS 5400: Part 7, and was originally derived for specifying concrete for use in bridges.*

However, the Section has been amended to specify requirements for concrete where a designed mix is required. It is thus suitable for use for any structural concrete where close control of concrete quality is required to ensure compatibility of design requirements. Examples of structures for which this Section should be used include bridges, buildings, and retaining walls.

Section 85 (Concrete for ancillary purposes) should be used for minor works or when small quantities of concrete are needed, and control of quality for design purposes is not essential. In such cases standard mixes should suffice. Examples are mass concrete foundations to platform walls, manholes, duct or drainpipe surrounds, and fence post surrounds.

Concrete for pavements should be as specified in Sections 200 - 204: Roads and Pavings.

High alumina cement concrete

80.2 *High alumina cement complying with BS EN 14647 should be used with caution and should not be specified to be mixed with other cements to produce concrete.*

In concrete containing high alumina cement, the hydrated cement undergoes a chemical change, known as conversion, which may lead to loss of concrete strength and reduced resistance to aggressive chemicals. How the conversion occurs and the effects on the properties of the concrete will depend on the free water/cement ratio of the concrete mix, and the temperature and/or humidity of the concrete during curing and throughout its subsequent life.

Guidance on the correct use of high alumina cement should be sought from the manufacturers and current specialised publications.

Repairs to concrete

80.3 *No specification for concrete repairs has been included. Should, however, concrete repairs be necessary the Specifier should use relevant Clauses from Section 83: Structural Concrete Repairs.*

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- Fire resistance** **80.4** *Where the design requires a degree of fire resistance, an aggregate having a satisfactory behaviour when exposed to high temperatures (such as lightweight aggregates or limestone) should be specified.*
- Sulphate environment** **80.5** *Where the surrounding soils have a very high sulphate concentration (see Building Research Establishment Special Digest 1) a form of lining should be specified to prevent access by the sulphate solution. Examples of acceptable linings are:*
- (i) *sheet polyethylene or polychloroprene,*
- (ii) *epoxy or polyurethane materials.*
- Additional protective measures shall be taken in accordance with Building Research Establishment Special Digest 1 in addition to product literature.*
- Use of silica fume in concrete** **80.6** *For further information on the use of silica fume in concrete refer to Concrete Society Technical Report No. 41 "Microsilica in Concrete".*
- Controlled permeability formwork** **80.7** *Controlled permeability formwork may be used in the following situations:*
- *bridge parapets subject to de-icing and road salts,*
 - *sea walls,*
 - *bridge piers where scour may occur,*
 - *abutments or retaining walls requiring enhanced durability,*
 - *structures where air entrainment might otherwise be considered.*
- Further details can be obtained in CIRIA Report C511 "Controlled Permeability Formwork".*
- Surface impregnation** **80.8** *The areas to be covered (shown on the Contract Drawings) should be those parts at risk from chloride attack. Because of a wide variety of structural types and span arrangements, all parts of a structure are not equally at risk from attack. Generally the risk depends upon the degree of exposure to water and salts which in turn will depend on the geometry, design and location of the individual members. It is essential to treat all exposed reinforced and prestressed concrete surfaces subject to spray and/or possible leakage from deck joints. The following examples are intended as a guide.*
- (a) *Piers, columns, crossheads, and abutments subject to spray.*

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- (b) *Piers, columns, crossheads, and abutments with a deck joint above but with no provision for drainage. The tops of those members should be treated where possible.*
- (c) *Bearing shelves, ballast walls and deck ends with a deck joint above.*
- (d) *Structures in marine environments and columns and soffits over brackish water. A marine environment is usually experienced within 1 km of the coast or tidal waters unless there are special local conditions.*
- (e) *Where possible, concrete parapets and parapet plinths (all inclinations) and those areas not protected with deck waterproofing.*
- (f) *Deck beams and soffits.*
- (g) *Wing walls within 8 metres of the edge of the carriageway.*
- (h) *Retaining walls within 8 metres of the edge of the carriageway.*
- (i) *The webs and tops of bottom flanges of all pre-cast beams with gaps between the bottom flanges as placed should be treated before erection.*

Surface Finish **80.9** *To produce a concrete with an acceptable finish, the British Cement Association's publication 'Appearance matters 1: Design and production' lists six elements that combine to produce an acceptable finish. Of the six elements, durability requirements should mean that recommendations for cement content, sand content, total aggregate and water/cement ratio are satisfied by most mixes, and an increase in the recommended workability of the concrete should not have a significant affect on the concrete finish.*

Consideration should be given however to limiting the coarse aggregate (5 to 20 mm) to not more than 20% to pass a 10 mm sieve to produce a concrete that will provide an acceptable finish. An appropriate paragraph should be included in this Clause if such a restriction is considered necessary.

Air-entrained concrete **80.10** *The limits of 3% and 4% for air content in concrete given in Clause 80.025 are not applicable for air entrained concrete, when the limits from BS 5328: Part 1 should apply. In BS 5328: Part 1, the limits are provided for concrete C40/50 and below, subject to freezing and thawing and de-icing salts, with a proviso that for concrete C32/40 and above, or with a cement content of 350 kg/m³, problems may be encountered in achieving the specified compressive strength. Such a limit is not applied to this Model Clause and the Specifier should thus give careful consideration when specifying air entrainment for any concrete C32/40 and above to the attainment of the specified strength.*