

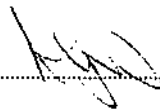
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Issue	2
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Business Process Document

Concrete for overhead line equipment structures

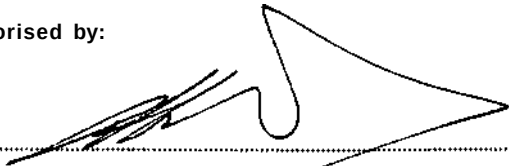
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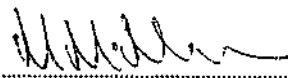
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Implementation

4 February 2006

Compliance

This Network Rail specification is mandatory and must be complied with by Network Rail and its contractors from 4 February 2006

When this specification is implemented, it is permissible for all projects, which have formally completed GRIP Level 4 to continue to comply with the Issue of any relevant Network Rail standards current when GRIP Level 4 was reached and not to comply with requirements contained herein unless the head of electrification and plant has stipulated otherwise in the accompanying briefing note.

Where the head of electrification and plant has specified that all projects will comply with the requirements, specific authority not to comply can be sought in the usual manner using the appropriate non-compliance authority processes described in Network Rail standard, [NR/SP/STP/045](#) *Managing the process for non-compliance authority* (formerly RT/LS/P/045).

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I Introduction

I.1 Purpose

This Specification pertains to every aspect of the use of concrete for overhead line electrification foundations and associated concrete structures.

I.2 Scope

This Specification applies to concrete for foundations, reinforced or otherwise, for railway electrification purposes only.

Except as modified herein, the materials for concrete generally, their measurement, mixing, transport, delivery at the point of use, inspection, sampling, testing and tolerances shall comply with BS 5328 Parts 1 - 4 and BS 8110 Part 1, where applicable.

All references to British Standard Specifications or Codes of Practice or other documents shall be deemed to be the current editions and to incorporate all the amendments in issue where the context so permits.

Where conflict occurs between any of the British Standard Specifications, Codes of Practice and other documents referred to herein and this Specification, this Specification shall overrule all others.

I.3 Definitions

The Engineer	The "Engineer" shall be the person appointed by the Network Rail Board to act as engineer for the purposes of the contract and shall include any representative of the Board to whom the Engineer may delegate his rights and duties.
The Contractor	The "Contractor" shall mean the tenderer whose tender has been accepted by the Network Rail Board and shall include the Contractor's legal personal representatives, successors and authorised assigns.
The Works	The "Works" shall be deemed to mean the area or areas where concrete is actually being placed.
Structural Concrete	Concrete designed to carry imposed loads, with designed reinforcement.
Mass Concrete	Concrete that is without designed reinforcement and is usually of large bulk.

Ready-mixed Concrete	Fresh concrete that is delivered to a user (not batched on site).
Blinding	Concrete laid over exposed ground to form a working surface (usually of a non-structural mix).
Admixture	Material added in small quantities during the mixing process to modify the properties of the mixture.
Release Agent	A substance, usually liquid, applied to the contact face of the formwork to facilitate ease of release and to prevent adhesion of the concrete.
Batch	A quantity of concrete mixed in one cycle of operations of a batch mixer, or the quantity of concrete conveyed ready-mixed in a vehicle or the quantity discharged during a stated period from a continuous mixer.
Site Batching	Where a batch of concrete is mixed on site, ie. concrete not mixed at the depot or delivered as ready mixed.
Designed Mix (or Mix)	A concrete mix for which the Engineer is responsible for specifying the required performance and the Contractor is responsible for selecting the mix proportions to produce it.
Characteristic Cube Strength	The compressive strength of a standard concrete cube at 28 days after casting, obtained in accordance with BS 1881 Part 116.
Grade of Concrete	A number that is the specified Characteristic Cube Strength in Newtons per square millimetre.
Core Strength	The compressive strength of a standard concrete cylinder, obtained in accordance with BS 1881 Part 120.
Preliminary Cube Strength	A cube crushing test to determine the mean strength of a series of standard cubes at the same age.
Free Water/Cement Ratio	The water/cement ratio in which the mass of water is the total mass of water in the concrete less the water absorbed by the aggregate.

Slump Test	A test of fresh concrete sampled during the progress of work to measure the vertical distance through which the top of a moulded sample sinks on removal of the mould, under standard conditions of test.
Sulphate Attack	The deterioration of concrete caused by sulphate salts in solution.
Cage	A rigid assembly of reinforcement.
Site	The site is deemed to be the location where concrete is to be placed.
Flakiness Index	A number that represents the proportion of the particles of aggregate whose thickness is small relative to the other two dimensions.
Striking Time	The shortest time after concrete has been cast that formwork can be removed.
ggbs	Ground Granulated Blast furnace Slag.
pfa	Pulverised Fuel Ash.

For definitions not found in this section, refer to BS 6100, sections 6.2, 6.3, 6.4, 6.5 and subsection 6.6.1.

1.4 Responsibilities

The Contractor shall have a responsibility to familiarise himself with all the drawings and technical documents supplied by the Engineer and to be aware of the latest editions/amendments of all relevant British Standard Specifications, Codes of Practice and any other Network Rail Specification or Instruction mentioned herein.

2 Materials for concrete (site batching)

2.1 Cement

2.1.1 Permissible types

For Ordinary Structural Concrete being used where sulphates are not present in the soil, the cement shall be Ordinary Portland Cement (OPC) conforming to BS 12.

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For Ordinary Structural Concrete being used where sulphates are present in the soil to varying degrees, the cements that may be used shall be as follows:

Ordinary Portland Cement (OPC)	to BS 12
Rapid Hardening Portland Cement (RHPC)	to BS 12
Portland Blast furnace Cement (PBFC)	to BS 146
Sulphate-Resisting Portland Cement (SRPC)	to BS 4027
OPC or RHPC combined with ggbs	to BS 146
	to BS 4246
	to BS 6699
OPC or RHPC combined with pfa	to BS 6588
	to BS 6610
	to BS 3892

For correct mix proportions of the above cement binders, refer to sections 3.2.1, 3.2.2 and 3.2.3 of this document.

2.1.2 Certificates and delivery notes

All cement shall be certified by the manufacturer as complying with the requirements of BS 12. The Contractor shall, when required by the Engineer, obtain for him the manufacturers test certificate for any consignment, which shall show the numerical values of the test results relating to that consignment, as soon as possible after delivery.

2.1.3 Storage

The Contractor shall store the cement at the depot or site either in bags sealed by the manufacturers before dispatch or in bulk containers/silos. Consignments of cement in bags shall be stored in separate, easily accessible lots so arranged that use follows the sequence of deliveries, in a suitable weatherproof building with raised floors, or in box vans, giving adequate protection against the effects of moisture from any source whatsoever.

Should the Contractor intend to store cement at site or depot in bulk containers, he shall first bring this to the attention of the Engineer.

Any cement that has become adversely affected by damp or other causes or has been stored for longer than 3 months shall be removed from the site immediately at no additional expense to the Board.

2.1.4 Sampling and testing

The Contractor shall at any time on the request of the Engineer draw samples of any type of cement according to the second paragraph of clause 9 of BS 12 from locations to be selected by the Engineer and shall test the cement samples in accordance with BS 4550 section 3.4. under laboratory conditions, at no additional expense to the Board.

2.2 Aggregates

2.2.1 General

The aggregates shall comply with BS 882 "Concrete Aggregates From Natural Sources". For the purpose of this specification it shall be deemed that the concrete may be exposed to frost.

The water absorption of the aggregates when determined in accordance with BS 812 shall not exceed 5%.

The flakiness index when determined by the method described in BS 812, Part 105.1, shall not exceed 35 for the aggregates referred to herein.

Aggregates shall be certified by the supplier as complying with the requirements of the appropriate specification. The Contractor shall, when required by the Engineer, obtain for him the supplier's certificate to this effect.

The Contractor shall store each grade of aggregate separately in such a manner so as to prevent intermingling of materials between separate stockpiles and contamination of these stockpiles from the ground, rubbish or windblown dust. They shall be kept well drained and preferably should be stored for at least 24 hours before use.

2.2.2 Sampling & Testing

At any time on the request of the Engineer, the Contractor shall draw samples and test the aggregate in respect of the specified properties in accordance with the relevant clauses of BS 812 and provide the Engineer with the results.

2.3 Water

2.3.1 The Contractor shall provide water for all purposes and shall notify the Engineer of the proposed source or sources of supply.

2.3.2 Such water shall be clean and free from impurities liable to have a deleterious effect on the concrete and shall generally conform to BS 5328. Should the Engineer consider it necessary, the Contractor shall sample and test the water in accordance with BS 3148 and supply the Engineer with the results at no additional expense to the Board.