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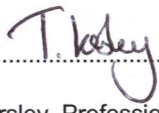
Specification for the use of protective coating systems

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Issue record

Issue	Date	Comments
1	March 2009	First issue, but content largely derived from mandatory requirements given in RT/CE/C/002: <i>Application and reapplication of protective treatments to Railtrack infrastructure</i> [Issue 4: February 2004.]

Compliance

This Network Rail standard shall be complied with by Network Rail and its Contactors from 5th December 2009.

When this Specification is implemented it is permissible for 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.

Reference documentation

Railway Group Standards

[GK/RT0031](#): *Lineside signals and indicators.*

Network Rail standards

[NR/GN/CIV/002](#): *The use of protective coatings and sealants.*

[NR/GN/CIV/202](#): *Management of the risk of Bridge Strikes.*

[NR/L3/CIV/039](#): *Specification for the assessment and certification of protective coatings and sealants.*

[NR/L3/CIV/041](#): *Waterproofing systems for Underline Bridge decks.*

British Standards

BS 381C: 1996	<i>Specification for colours for identification coding and specific purposes.</i>
BS 4800: 1989	<i>Paint colours for building purposes.</i>
BS 4921: 1988	<i>Specification for sherardized coatings on iron or steel.</i>
BS 5499-5: 2002	<i>Graphical symbols and signs. Safety signs, including fire safety signs. Signs with specific safety meanings.</i>
BS 6213: 2002	<i>Selection of constructional sealants. Guide.</i>
BS 7371-3: 1993	<i>Coatings on metal fasteners. Specification for electroplated zinc and cadmium coatings.</i>
BS 7371-6: 1998	<i>Coatings on metal fasteners. Specification for hot dipped galvanized coatings.</i>
BS 7644-1: 1993	<i>Direct tension indicators. Specification for compressible washers.</i>

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BS 7644-2: 1993	<i>Direct tension indicators. Specification for nut face and bolt face washers.</i>
BS EN 12329: 2000	<i>Corrosion protection of metals. Electrodeposited coatings of zinc with supplementary treatment on iron or steel.</i>
BS EN 12899-1: 2001	<i>Fixed, vertical road traffic signs. Fixed signs.</i>
BS EN ISO 1461: 1999	<i>Hot dipped galvanized coatings on fabricated iron and steel articles. Specifications and test methods.</i>
BS EN ISO 2063: 2005	<i>Thermal spraying - Metallic and other inorganic coatings - Zinc, aluminium and their alloys.</i>
BS EN ISO 2808: 2007	<i>Paints and varnishes. Determination of film thickness.</i>
BS EN ISO 4624: 2003, BS 3900-E10: 2003	<i>Paints and varnishes. Pull-off test for adhesion.</i>
BS EN ISO 4628-1: 2003, BS 3900-H1: 2003	<i>Paints and varnishes. Evaluation of degradation of coatings. Designation of quantity and size of defects, and of intensity of uniform changes in appearance. General introduction and designation system.</i>
BS EN ISO 4628-2: 2003, BS 3900-H2: 2003	<i>Paints and varnishes. Evaluation of degradation of coatings. Designation of quantity and size of defects, and of intensity of uniform changes in appearance. Assessment of degree of blistering.</i>
BS EN ISO 4628-4: 2003, BS 3900-H4: 2003	<i>Paints and varnishes. Evaluation of degradation of coatings. Designation of quantity and size of defects, and of intensity of uniform changes in appearance. Assessment of degree of cracking.</i>
BS EN ISO 4628-5: 2003, BS 3900-H5: 2003	<i>Paints and varnishes. Evaluation of degradation of coatings. Designation of quantity and size of defects, and of intensity of uniform changes in appearance. Assessment of degree of flaking.</i>
BS EN ISO 8501-1: 2007	<i>Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.</i>
BS EN ISO 8501-3: 2007, BS 7079-A3: 2006	<i>Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Preparation grades of welds, edges and other areas with surface imperfections.</i>

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BS EN ISO 8501-4: 2006	<i>Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Initial surface conditions, preparation grades and flash rust grades in connection with high-pressure water jetting.</i>
BS EN ISO 8502-3: 2000	<i>Preparation of steel substrates before application of paints and related products. Tests for the assessment of surface cleanliness. Assessment of dust on steel surfaces prepared for painting (pressure-sensitive cleaned steel tape method).</i>
BS EN ISO 8502-6: 2006	<i>Preparation of steel substrates before application of paints and related products. Tests for the assessment of surface cleanliness. Extraction of soluble contaminants for analysis. The Bresle method.</i>
BS EN ISO 8503-2: 1995, BS 7079-C2: 1989	<i>Preparation of steel substrates before application of paints and related products. Surface roughness characteristics of blast-cleaned steel substrates. Method for the grading of surface profile of abrasive blast- Comparator procedure.</i>
BS EN ISO 8503-5: 2004, BS 7079-C5: 2004	<i>Preparation of steel substrates before application of paints and related products. Surface roughness characteristics of blast-cleaned steel substrates. Replica tape method for the determination of the surface profile.</i>
BS EN ISO 8504-2: 2000, BS7079-D2: 2000	<i>Preparation of steel substrates before application of paints and related products. Surface preparation methods. Part 2: Abrasion blast-cleaning.</i>
BS EN ISO 9002: 1994	<i>Quality systems. Model for quality assurance in production, installation and servicing.</i>
BS EN ISO 11600: 2003	<i>Building construction. Jointing products. Classification and requirements for sealants.</i>
BS EN ISO 12944-2: 1998	<i>Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Classification of environments.</i>
BS EN ISO 12944-3: 1998	<i>Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Design considerations.</i>
BS EN ISO 16276-1: 2007	<i>Corrosion protection of steel structures by protective paint systems. Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength) of a coating. Pull-off testing.</i>

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Other standards

ASTM D3359-08	<i>Standard test methods for measuring adhesion by tape test.</i>
ASTM D4541-02	<i>Standard test method for pull-off strength of coatings using portable adhesion testers.</i>
ISO 19840: 2004	<i>Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces.</i>
TX 772188340RAL 840 HRÜ2	<i>Übersicht über die RAL - Farbendes Farbregisters RAL 840 HR mit ihren Hilfsbezeichnungen.</i>

Other publications

Control of Lead at Work Regulations (2002).

Control of Substances Hazardous to Health Regulations (1999). (COSHH).

Joint Surface Preparation Standard NACE No. 5/SSPC- SP 12. Surface Preparation and Cleaning of Steel and other Hard Materials by High- and Ultrahigh Pressure Water Jetting Prior to Recoating.

British Adhesives and Sealants Association (BASA). Guidance to British Standard BS 6213, Guidance to the ISO 11600 Classification of Sealants for Building Construction.

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Comments

The applicability and content of this standard will be reviewed on a regular basis. Written comments on the accuracy and utility of this standard will be taken into account when assessing the need for a new issue of the standard; such comments should be sent to the Principal Policy and Assurance Engineering (Civil Engineering) at 40 Melton Street, London NW1 2EE.

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Reference notes

This standard is to be used in conjunction with [NR/GN/CIV/002](#): *The use of protective coatings and sealants* and [NR/L3/CIV/039](#): *Specification for the assessment and certification of protective coatings and sealants*.

The Item Numbers of the material types defined in this suite of standards are referenced as **5.1.7** (for example): see Appendix **A**. For ease of use, the same information on protective coating systems is provided in Appendixes of [NR/L3/CIV/040](#) and [NR/L3/CIV/039](#). The protective coating systems defined in this suite of standards are referenced as **N1** (for example).

The standards governing the application and testing of protective coatings are subject to frequent change. Where necessary, the latest version of the standards listed in the Reference documentation (above) shall be followed.

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1 Purpose

The purpose of this Specification is to define the requirements for the selection and use of protective coating systems for Network Rail's infrastructure.

The prime reason for applying and reapplying protective coatings is to preserve and protect the infrastructure so that it provides the required service life in the most cost-effective manner. However, there are cases where the colour of the final coat has to comply with regulations that govern the safe operation of the railway and/or to satisfy aesthetic requirements.

2 Scope

This Specification applies to the application and reapplication of protective coating systems to Network Rail's infrastructure, except for rails and other track components.

This Specification covers the use of coating systems for the corrosion protection and fire protection of structural steelwork, and for the protection of timber, concrete, and masonry structures. In addition, details of procedures for undertaking coating and corrosion surveys are provided in Appendix A.

Ideally, a protective coating product/system will provide a nominal 25 year service to its first maintenance. However, products and systems that had been tested under the 3000 hours (15 years) protocol under RT/CE/S/039 (RT98) may continue to be used (see 8 of NR/L3/CIV/039).

There will be instances where it would not be practicable to comply with all requirements of this Specification; for example, with minor works, maintenance works, and when the work has to be completed within short possessions. In such cases a 'do best' approach shall be followed under the direction and approval of the Engineer with regard to, for example, surface preparation, coating application and containment, but in all cases the coating materials shall be certified in accordance with [NR/L3/CIV/039](#) *Specification for the assessment and certification of protective coatings and sealants*. Accordingly, some of the requirements given in Contract documentation, Task briefings, Method statements etc. may differ from those stated herein.

Guidance and background information on the application of this Specification are provided in [NR/GN/CIV/002](#): *The use of protective coatings and sealants*.

3 Definitions

Contractor

A company or organisation contracted directly or via a sub-contract to Network Rail.

Engineer

A nominated representative of Network Rail assigned to the contract/project.

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4 Safety

4.1 General

All surface preparation and coating application work shall be carried out in accordance with legal and statutory requirements.

Unauthorised access to the work areas shall be prevented as far as is reasonably practicable.

Product data sheets, safety data sheets and Control of Substances Hazardous to Health Regulations (1999) (COSHH) statements for all materials shall be readily available on site at all times.

4.2 Lead-based coatings

It can be reasonably assumed that protective coatings applied before 1970 contain Lead; existing coatings applied after this can also contain Lead pigments. Therefore, unless there is good evidence to the contrary, methods of work shall be established assuming that all existing coatings contain Lead. All work to remove Lead-based paints shall be carried out in accordance with the Control of Lead at Work Regulations (2002).

4.3 Other hazardous materials

In accordance with COSHH, coating applicators are required to (a) put in place safe working practices for their operatives, and (b) specify the use of the least hazardous materials (compliant with [NR/L3/CIV/039](#)).

4.4 Confined spaces

Operatives required to work in confined spaces shall be trained and hold valid certification for undertaking such work.

5 Contractor requirements

5.1 General

The Contractor shall operate a Quality system complying with BS EN ISO 9002 and hold a currently valid certificate for that system.

The Contractor is responsible for;

- pre-work survey (when instructed),
- liaison with controlling authorities - such as the Environment Agency,
- supply of experienced and competent personnel,
- procedure trials for the coating system (where required),

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- containment systems for the surface preparation and application of the coatings,
- removal of existing coatings (where specified),
- repair of damaged galvanizing (where applicable),
- supply of materials and equipment for surface preparation,
- preparation of surfaces - including the removal of defects,
- supply of coating materials,
- supply of equipment for applying the coatings,
- safe storage of all materials and equipment,
- as contracted, the coating and/or recoating of surfaces and the application of sealants,
- supply of inspection equipment - as necessary,
- inspection of the works,
- recording the progress of work - including inspection reports,
- disposal of waste water, spent grit and general debris,
- all relevant Health and Safety issues,
- provision of an Warranty (where required).

Prior to any work commencing on site, the Contractor shall forward to the Engineer for acceptance; risk assessments; a Construction Phase Plan; a Works Package Plan (supported, as necessary, by Task briefings and Method statements) that details the procedures to be used; and an Inspection and Quality Plan.

The Inspection and Quality Plan shall include details of;

- procedure trials for the coating system (where required),
- testing and traceability of materials,
- storage of materials,
- surface cleaning,
- surface preparation work,
- preparation of the coating materials,
- application of the coatings,
- control of ambient conditions,
- inspection and testing,
- restoration and repair of subsequent damage or defects,
- recording and reporting of results.

5.2 Operatives

Operatives shall be appropriately skilled and experienced in the use of the specified materials and in the methods used to prepare the surfaces and to apply the coatings.

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Contractors shall be registered with the ICATS Scheme: details of which are provided in 5.3 of [NR/GN/CIV/002](#). At least 80% of the operatives of a Contractor employed to apply coatings to metal substrates shall be trained and accredited through this Scheme; where there are fewer than 5 operatives they all shall be fully trained. When requested, Contractors shall provide evidence to the Engineer that they comply with these requirements.

5.3 Coating manufacturers and suppliers

The Contractor shall obtain the necessary technical and Health and Safety data from the coating manufacturer for review and approval before commencing work on site.

Technical data shall include confirmation of certification (in accordance with [NR/L3/CIV/039](#)) and performance data that demonstrate that the proposed coating system is capable of (a) meeting the stated service requirements and, unless otherwise directed, (b) providing a nominal 25 year service to first maintenance. In addition, the manufacturer shall provide information on the track record of the coating materials/system.

The Contractor shall obtain the coating materials from a reputable supplier who is able to provide a back-up technical service. Prior to work commencing on site, the Contractor shall inform the Engineer of the selected manufacturer and supplier.

5.4 Coating materials

Wherever possible, for a particular project the coatings of a protective coating system shall be sourced from one manufacturer - except when specified otherwise as an approved protective coating system.

The finish coat of a protective coating system shall be formed from the same batch of material. Furthermore, whenever possible, the other coats of a system shall be formed from a single batch but where more than one batch is used the Contractor shall keep the batches separate, allocate them to distinct parts or areas of the works, and inform the Engineer accordingly.

The Contractor shall check that the coating materials are (a) recommended for use by their manufacturers for the particular surface and conditions of exposure, and (b) compatible with each other. Unless otherwise stated in this Specification, coatings shall be applied in the manner recommended by their manufacturer.

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5.5 Preparatory and ancillary materials

The preparatory and ancillary materials used by a Contractor shall be recommended by their manufacturers, and also by the manufacturer of the protective coatings, for the type and condition of the surfaces being prepared.

5.6 Inspection and quality control

The Contractor is responsible for carrying out all inspection and quality control testing in accordance with this Specification.

The personnel used to monitor and inspect coating operations shall be trained and certified to a minimum of Level 1 under the ICorr Scheme, but Level 2 is preferred. Network Rail reserves the right to undertake any monitoring, inspection and testing to confirm compliance with this Specification and any specific requirements of the contract.

The Contractor shall permit coating manufacturers (or their representatives) to inspect the work in progress, including surface preparation, and to take samples of their products if so required. However, the Contractor shall not comply with any direction or request of a manufacturer/supplier until this is confirmed in writing by the Engineer.

The Contractor shall notify the Engineer of the projected dates for (a) the start of surface preparation and the application of coatings, and (b) hold points defined in the Inspection and Quality Plan. The Engineer shall be notified of the date of hold points that are also agreed witness points at least 3 days prior to the inspection.

5.7 Handling, storage and transportation of coated steelwork

The Contractor shall;

- use methods and equipment that will minimise chafing, chipping and other damage to coated components,
- allow an adequate drying/curing period for each coat before handling,
- use suitable packing, lashings, lifting harnesses, nylon slings, rubber protected chains and chocks, etc,
- stack coated components clear of the ground and separated by timber chocks so that ponding of water on the stack does not occur.

Coated steel shall not be stored outdoors until all the specified shop coats have been applied. Following the application of the final shop applied coat, at least seven days (or longer where recommended by the coating manufacturer) shall elapse before the steelwork is stacked or transported.

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5.8 Protection

The Contractor shall;

- protect freshly applied surface coatings from damage - including from the weather,
- where necessary, exhibit 'Wet paint' signs and provide protective barriers around coated parts,
- protect surfaces adjacent to those being prepared and coated from damage.

Containment shall be provided so that spent grit, other debris and overspray from coating works does not contaminate the ground or adjacent buildings, or affect personnel or vehicles outside the work boundary. Contaminated surfaces shall be cleaned by Contractors at their own expense.

5.9 Compatibility of coatings

Repairs to an existing coating system shall only be undertaken with the agreement of the Engineer. Prior to the repair work, the Contractor in conjunction with the coating manufacturer shall check that the new coatings are compatible with existing coatings.

5.10 Remedial work and repairs

The degradation of coatings within the Defects Liability period (for example, by blistering, peeling, flaking, cracking, lack of adhesion) shall be made good by the complete removal of the degraded coatings followed by the preparation and reapplication of the coatings as directed.

Inadequate dry film thickness or surface defects due to adverse weather conditions may, depending on the type of coating, be remedied by rubbing down and applying further coat(s) as instructed.

Mechanical damage to new coatings and any authorised repairs to existing coatings, including galvanizing, shall be made good by local cutting back of the coatings, preparing the surface and re-applying all the coats to provide a neat, continuous and smooth finish. The minimum overlap onto sound coatings shall be 50 mm, and the area to be overlapped shall be abraded to provide good adhesion. Unless otherwise agreed, surface preparation of bare steel shall be by dry abrasive blast cleaning to a minimum surface standard Sa2½ to BS EN ISO 8501-1 and the specified coating system shall be re-instated.

Where bare metal has been exposed by damage to the coatings or by subsequent surface preparation, the metal shall be thoroughly cleaned and prepared, and then primed before there is any degradation of the prepared surface and any case within four hours of being exposed.

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Failures of coatings within the Warranty period shall be investigated and reasons for the failure agreed by all involved parties before undertaking any rectification work.

5.11 Environmental and other responsibilities

The Contractor shall comply with all applicable environmental legislation, including that controlling solvent emissions from coatings and contamination of water, land and air. Agreements shall be reached with the Environment Agency or Scottish Environmental Protection Agency before work commences on sites over or close to water or other environmentally sensitive locations.

Work over canals and other navigable waterways will require agreements to be reached with British Waterways.

5.12 Procedure trial

Unless otherwise agreed with the Engineer, the Contractor shall undertake a procedure trial in advance of the main works: such trials are more commonly undertaken for works on existing structures but they may be undertaken on new works. The need for such trials will be determined from, inter alia, an assessment of the work required and experience of the use of the coating system.

Where undertaken, approval of the Contractor's Work Package Plans (and, where appropriate, Task briefings and Method statements), and inspection and testing procedures shall be given only after the Contractor has demonstrated their suitability through the trial.

As part of the trial, a reference panel shall be produced. The area selected for the reference panel shall be typical of the structure, be not less than 1 m² and, where applicable, include areas of sound coatings and degraded coatings (including areas where there is evidence of corrosion). The location and size of the area shall be agreed by all parties, and activities associated with all the steps in producing the panel shall be photographed.

Where a procedure trial is not undertaken in advance of the main works, a reference panel shall be produced at the start of the main works.

6 Specification for protective coating systems

6.1 General

The specification included within the contract documentation for a protective coating system shall provide a performance based requirement so that the main Contractor, applicator, coating manufacturer or equipment supplier can select the optimum solution for Network Rail in terms of whole life costs.

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The selection of the protective system depends upon;

- the nature of the substrate including the presence of any existing coatings,
- the required life of the structure, equipment, housing or enclosure and/or of the coating,
- the existing or anticipated environment against which the structure, equipment, housing or enclosure has to be protected.

Performance requirements and further technical details for protective systems for steel, iron, non-ferrous, timber, masonry and concrete substrates are provided in [NR/L3/CIV/039](#). However, a Contractor may propose the use of a protective system that is not listed in that standard provided that it (a) is certificated as compliant with that standard by an Independent Test House, (b) is registered in Products and Drawings database (PADS), and (c) complies with the particular contract performance requirements.

6.2 New structural steelwork and ironwork

6.2.1 General

The protective coating system to new structural steelwork, other fabricated steel items and ironwork shall be one of those specified in Appendix B, or an approved alternative. Unless there are any over-riding technical or economic reasons for not doing so, the system shall include a thermally sprayed metal or hot dip galvanized coating.

6.2.2 Metal spray

For general usage, a sprayed aluminium metal coating is preferred to sprayed zinc one. However, where a structure will be subject to contamination from salt and/or be subject to impact (such as from a bridge strike) a sprayed zinc metal coating shall be used.

A sprayed aluminium metal coating shall be used when a thermally sprayed metal coating is specified for the faying surfaces of High Strength Friction Grip (HSFG) bolted or similar friction grip connections.

Aluminium and zinc metal sprayed coatings shall comply with BS EN ISO 2063. The minimum adhesion of such coatings, when tested in accordance with BS EN ISO 4624 or BS EN ISO 16276-1, shall be 1000 psi (70 kgf/cm²). Unless otherwise agreed with the Engineer, adhesion tests shall be done on test plates prepared and coated alongside the parts being treated.

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A sprayed metal coating shall be applied before any deterioration of the blast-cleaned surface occurs and in any case within 4 hours of the blast cleaning. During the interim period, the steelwork shall be protected from the weather and contamination.

Sprayed metal shall be applied using the oxygen/fuel gas process. The sprayed metal coating shall be continuously applied to each 0.5m² of the run or the area of the component, whichever is the lesser, until the specified thickness has been achieved.

The application of sprayed metal coatings shall only be carried out by a specialist Contractor who is accepted by the Engineer for that work.

6.2.3 Galvanizing

Galvanizing is a well-proven and acceptable method of protecting new structural steelwork against corrosion. Where visual considerations are not important and the size and form of the item allows galvanizing, consideration of whole life costs may allow a galvanized coating to be the sole protective treatment. In such circumstances, galvanizing shall be in accordance with the requirements of Table 1.

Environment as defined in BS EN ISO 12944-2	Coating requirement
C2	Hot dip galvanize to BS EN ISO 1461
C3, C4, and C5	Hot dip galvanize to BS EN ISO 1461 to provide a nominal coating weight of 1000 g/m ² (140 microns)
Sub-surface stations	Hot dip galvanize to BS EN ISO 1461

Table 1: Requirements for galvanizing

As a minimum, galvanizing shall meet the requirements of BS EN ISO 1461 and a certificate of product conformity should be obtained from the galvanizer.

The position and size of holes for access, venting or draining should be in accordance with guidance from the Galvanizers' Association. Following galvanizing, no holes shall be drilled in an item without the written acceptance of the Engineer. Following hot dip galvanizing, vent holes in hollow sections shall be plugged.

Hot dip galvanized coatings shall be free of imperfections, including areas of porosity.

The application of organic coatings to newly galvanized structural steelwork and other fabricated items will provide additional protection against corrosion, and these can also be applied for

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aesthetic or decorative purposes. Surface contaminants shall be removed prior to the application of any organic coatings. Passivation treatments should be avoided where possible, but where used the treatment shall be suitable for the particular application.

Hot dip galvanized structural steelwork shall be stored in dry, well ventilated conditions to prevent the development of zinc corrosion products (wet storage staining). Where such products are present they should be removed prior to applying the galvanizing (see 7.5).

Galvanizing should only be undertaken by a member of the Galvanizers' Association or other equivalent European organisation.

6.2.4 Electroplated coatings

Electroplated zinc coatings shall comply with the requirements of BS EN 12329, and sherardized coatings with the requirements of BS 4921.

Details of protective coating systems for steel less than 3 mm thick and for application to electroplated zinc coatings are described in Appendix B.

Guidance on the selection of protective coating systems is given in [NR/GN/CIV/002](#).

6.3 Existing structural steel and ironwork

The protective coating system selected for application to existing steel and ironwork, and other fabricated items, shall be one of those specified in Appendix C, or an approved alternative.

Where the detailed structural examination indicates that the existing protective system has significant defects and that consideration should be given to its repair or replacement, a survey shall be undertaken by a specialist Consultant and a report obtained on the condition and composition of the existing system. Usually this survey would be done under the control of the Engineer, but it may be placed in the Contractor's scope of work. The survey report shall specify or recommend the method of surface preparation and the protective coating system to be used.

Each structure for which a complete re-application of the protective coatings is proposed shall be considered on an individual basis.

Where total removal of the existing protective coatings is unnecessary, repairs shall be carried out using materials that are compatible with the existing coatings.

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6.4 Non-ferrous substrates

The protective coating system selected for application to non-ferrous surfaces, such as aluminium and galvanized steel, shall be one of those specified in Appendix B or C.

6.5 Timber

Protective coating systems for structural timber are specified in Appendix D: note that [NR/L3/CIV/039](#) does not include cover the preservation of timber by impregnation.

Wherever possible, structural timber shall be treated with a preservative. The application of coatings or stains shall be considered as a means of providing additional protection and/or decoration. The protective coating shall be compatible with any preservative and fire retardant treatment.

A microporous coating system or stain shall be used for new timber.

Protective coatings applied to existing timber shall be compatible with any existing coatings.

Unless otherwise advised by the coating manufacture, waterborne coatings shall be used for all internal applications.

6.6 Concrete and masonry

Protective coating systems for concrete and masonry are specified in Appendix E.

When required to prevent 'dusting up' of concrete floors to relay rooms, location huts and other equipment rooms, Item 5.12.4 shall be applied. The colour shall be a suitable shade of red or green.

Unless there are any over-riding technical or economic reasons for not doing so, waterborne coatings shall be used.

6.7 Fire protection

Intumescent fire protection systems for steel and for timber are specified in Appendix B and Appendix D respectively.

Only intumescent coatings certified under a recognised accreditation scheme such as 'Certifire' or its equivalent shall be used. Advice and guidance on the use of an intumescent coating system shall be obtained from the manufacturer, who shall recommend the thicknesses of the product necessary to give the required fire protection performance. This advice should be complied with at all stages of preparation, application and inspection of the product: actual or planned deviations from this advice shall be reported and discussed with the Engineer.

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An epoxy intumescent coating shall be used for structural steelwork that is exposed to the weather.

Signs shall be fixed on steelwork protected by intumescent coatings that identify the type of protection applied. In addition, structural protection shall be provided where it is likely that mechanical damage to the intumescent coating will occur either during the works or in service.

Unless otherwise agreed with the Engineer, a Contractor applying intumescent coatings shall be a member of the Association for Specialist Fire Protection, or an equivalent European organisation.

6.8 Sealants

A sealant for a specific application and service environment shall be selected in accordance with BS 6213 and advice given by the British Adhesives and Sealants Association (BASA) regarding BS 6213 and BS EN ISO 11600.

The sealant shall be compatible with the protective coating system and, where necessary, the colour of the sealant shall closely match the colour of the finish coat of the system.

Unless otherwise agreed with the Engineer, sealant shall be applied following the application of Intermediate coats and prior to application of the finish coat. Unless otherwise recommended by the manufacturer of the sealant or coating, the finish coat shall be applied over the sealant.

6.9 Surfaces in contact with concrete and/or waterproofing

6.9.1 Concrete

Structural steelwork that is to be fully encased in concrete shall not be coated (including galvanizing). Prior to encasement, loose rust and millscale shall be removed from the steelwork; this can be done by light blast cleaning.

Structural steelwork that is to be partially encased in concrete shall be blast-cleaned and primed only. No metal coating shall be applied, and 'metallic' primers such as zinc rich types shall not be used.

Structural steelwork that abuts concrete shall receive the full specified protective coating system.

All coats of the protective system shall be applied with an overlap of 25 mm $\pm$ 5 mm on surfaces that will be in contact with concrete.

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6.9.2 Waterproofing

Where a loose laid waterproofing system is to be applied to a bridge deck, the steel substrate shall receive the full protective treatment.

Where a tightly bonded waterproofing system is to be applied to a bridge deck, one coat of a Primer compatible with the waterproofing materials shall be applied to the steel substrate: unless otherwise agreed by the Engineer, the Primer shall be supplied by the manufacturer of the waterproofing system.

Structural steelwork that abuts a waterproofing treatment shall receive the full specified protective coating system.

All coats of the protective system shall be applied with an overlap of 25 mm $\pm$ 5 mm on surfaces that will be in contact with a waterproofing system.

Details of waterproofing systems are provided in [NR/L3/CIV/041](#): *Waterproofing systems for Underline Bridge decks*.

6.10 Equipment housings, enclosures and casings

Equipment housings, enclosures and casings shall be supplied with a protective coating system compliant with [NR/L3/CIV/039](#). A certificate of compliance shall be submitted with the application for their use.

Where it is proposed to supply proprietary equipment housings, enclosures and casings etc. with a protective coating system, the Contractor shall obtain written agreement from the Engineer prior to application of the system. In such cases the following shall be provided with the application for approval;

- details of the method used to prepare the substrate, including the relevant standard(s),
- details of the protective coating system, including the number, sequence and dry film thicknesses of component coats,
- the estimated minimum service life of the protective system in the in-service environment of the equipment, and any in-service limitations,
- the recommended maintenance regime,
- other relevant information such as case histories and testimonies.

In the submission for approval, equipment manufacturers shall demonstrate that consideration has been given to any special requirements for heat, oil, water or chemical resistance.

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Insulation or another method shall be used to limit condensation within lineside apparatus cases and other exposed equipment housings.

6.11 Bolts and other fasteners

Unless otherwise approved by the Engineer, bolts, nuts and washers for structural steelwork shall either be hot dip galvanized and centrifuged to BS 7371-6, or zinc plated and passivated to Zn5A in accordance with BS 7371-3.

Load indicating washers shall be Grade 1 in accordance with BS 7644-1, and associated nut face and bolt face washers to BS 7644-2 shall be sherardized to Grade 2 in accordance with BS 4921.

Nut threads shall be tapped after galvanizing. Bolts, nuts and washers which are to be coated shall not be passivated unless the passivation system used can be covered with the same coating system specified for the structural steel.

Tension control bolts coated with a zinc-aluminium surface treatment, also referred to as 'thermo-chemical surface modification' or 'TCSM' coated, may be used with the approval of the Engineer. Such bolts shall be coated with a system appropriate to the project and in accordance with this Specification. Unless otherwise advised by the supplier, bolts with this surface treatment do not require any pre-treatment prior to the application of the coating system.

6.12 Treatment of bolted connections and contact surfaces

6.12.1 Interface between new and existing steelwork

When new plates or sections are fastened by bolts to existing structural steelwork, the ingress of water into the interface shall be prevented. All surfaces except faying or abutting surfaces shall be coated.

Whenever possible, a complete protective coating system shall be applied to both front and back of the new structural steelwork, and encompass any drilled holes in the steelwork. Interfaces within steelwork shall be sealed with a bead of sealant in accordance with **6.8** and **8.10**.

The protective coating system on an interface shall be compatible with the adjacent coatings on both the new and existing structural steelwork, and they shall be applied following pressure water washing of the sound existing coatings and surface preparation in accordance with **7.3**.

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6.12.2 Faying surfaces of bolted connections

Unless otherwise agreed with the Engineer, faying surfaces for HSFG bolted connections shall be provided with an aluminium metal spray coating in accordance with this Specification. The thickness of the sprayed aluminium metal coating shall be closely controlled and be between 90 and 150 microns. The coating system applied to the surrounding steel shall overlap a minimum of 50 mm onto the sprayed area.

Where a sprayed aluminium metal coating is not used, faying and abutting surfaces, together with the peripheral area extending 12 mm beyond these joints, shall be blast-cleaned to a standard Sa2½ in accordance with BS EN ISO 8501-1.

No subsequent coating shall be applied to faying or abutting surfaces, which shall be masked accordingly.

Immediately prior to assembly, faying and abutting surfaces of friction grip bolt connections including the peripheral area shall be unmasked and inspected for rust deposits, oil, grease or other contamination. Where contamination is present the surfaces shall be cleaned using a method that does not reduce the slip resistance of the connection.

Immediately following assembly, the exposed parts of friction grip and black bolts, washers, nuts and other fittings, together with the peripheral area of the joint, shall be cleaned and prepared to receive the full protective coating system including a Stripe coat.

6.12.3 Bolted joints generally

Uncoated bolts shall not be used where joints have a sprayed metal coating, hot dip galvanizing or protective coating system.

Bolt heads, washers, nuts and other fittings whether hot dip galvanized, plated or sherardized, shall receive a coat of Mordant Wash (Item 5.13.11). However, when agreed with the coating manufacturer, a chromate free etch Primer (Item 5.6.1) may be used. Thereafter the full number of coats of the specified protective system shall be applied including a Stripe coat.

For joints provided with a sprayed metal coating, Item 5.13.11 or Item 5.6.1 shall only be applied after that coating has been fully sealed. In all instances excess etch primer shall be removed from the coated surfaces local to the bolt heads, washers, nuts and other fittings that have been treated.

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Prior to the application of the Topcoat, all joint peripheries and load indicating washers (where used) shall be sealed with a bead of an appropriate sealant in accordance with **6.8** and **8.10**.

6.13 Additional items

6.13.1 Walkways

Where the top flanges of main girders or other decking of structural steelwork provide a defined walking route or walkway, an anti-slip self adhesive film (Item **5.12.5**) shall be applied to the protective coating system (after that system has fully dried and cured).

6.13.2 Footbridge decks

The steel deck of footbridges shall be coated with an anti-slip treatment in accordance with **7.4** and the manufacturer's instructions. Normally, a thermally sprayed metal coating would be included as part of the coating system, although a hot dipped galvanized coating may be used as an alternative. The surfaces to be treated shall be shown on the Contract Drawings.

6.13.3 Box girders

Prior to fabrication, the internal surfaces of new box girders, excluding a 50 mm wide strip around any weld areas, shall be blast-cleaned and painted with **N11.1** or **N12.1** as defined in Appendix **B**.

Following fabrication, weld areas on the internal surfaces of box girders shall be blast-cleaned to a surface standard Sa2½ in accordance with BS EN ISO 8501-1. In addition, unless otherwise agreed with the Engineer the full coating system shall be applied including a Stripe coat, which shall be applied prior to the Topcoat.

6.13.4 Metal bearings

The appropriate coating system shall be applied to all surfaces of bearings that will be exposed after erection. The standard coating system provided by the supplier of the bearings may be considered for approval, in which case a detailed submission shall be provided to the Engineer.

The undersides of bearings in contact with concrete, mortar or other bedding materials shall be treated in accordance with **6.9**.

Machined, rocking, sliding or rotating surfaces shall not be coated but shall be treated in accordance with the manufacturer's instructions.