

**VOLUME 3 HIGHWAY STRUCTURES:
INSPECTION AND
MAINTENANCE**
SECTION 2 MAINTENANCE

PART 2

BD 87/03

**MAINTENANCE PAINTING OF
STEELWORK**

SUMMARY

This Document sets the Standard requirements for and gives advice on the maintenance painting of steelwork. In addition guidance is given on the appointment and duties of painting inspection firms. This Standard supersedes SD 7/94 and SA 7/94 (MCHW Volume 5, Section 2, Parts 2 & 3).

INSTRUCTIONS FOR USE

This is a new Standard to be incorporated in the Manual.

1. Remove existing contents sheet for Volume 3 and insert new contents sheet for Volume 3 dated May 2003.
2. Insert BD 87/03 in Volume 3, Section 2, Part 2.
3. Archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.



THE HIGHWAYS AGENCY



SCOTTISH EXECUTIVE DEVELOPMENT DEPARTMENT



WELSH ASSEMBLY GOVERNMENT
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THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND

Maintenance Painting of Steelwork

Summary: This Document sets the Standard requirements for and gives advice on the maintenance painting of steelwork. In addition guidance is given on the appointment and duties of painting inspection firms. This Standard supersedes SD 7/94 and SA 7/94 (MCHW Vol. 5 Parts 2 & 3).

REGISTRATION OF AMENDMENTS

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1. INTRODUCTION

Mandatory Sections

1.1 Sections of this document which form part of the standards of the Overseeing Organisations are highlighted by being contained in boxes. These are the sections with which the Design Organisations shall comply, or shall have agreed a suitable departure from standard with the relevant Overseeing Organisation. The remainder of the document contains advice and enlargement which is commended to Design Organisations for their consideration.

General

1.2 This Standard supersedes SD 7/94 (Manual of Contract Documents for Highway Works (MCHW Vol 5 Part 2) and SA 7/94 (MCHW Vol 5 Part 3) Maintenance Painting of Steel Highway Structures. This document combines SD 7/94 and SA 7/94 and updates them in accordance with changes to Series 1900 (MCHW 1).

1.3 The maintenance painting of steelwork will normally be carried out under contracts incorporating the Overseeing Organisation's Specification for Highway Works, Manual of Contract Documents for Highway Works Volume 1 Series 5000 (MCHW 1). In such products conforming to equivalent standards and specification of other members states of the European Economic Area and tests undertaken in other member states will be acceptable in accordance with the terms of Clauses 104 and 105 of Series 100 (MCHW 1). Any contract not containing these clauses must contain suitable clauses of mutual recognition having the same effect, regarding which advice should be sought.

Scope

1.4 This Standard provides details of the procedures for putting in hand a maintenance painting project for steel in bridges and other highway structures.

1.5 In addition to providing information on procedures, this Standard contains guidance on the minimum criteria for selection of painting inspection firms.

Use in Northern Ireland

1.6 For use of this Standard in Northern Ireland, the Maintaining Agent shall be considered to be the appropriate Division of Roads Service.

Implementation

1.7 This Standard shall be used forthwith for all schemes currently being prepared provided that, in the opinion of the Overseeing Organisation, this would not result in significant additional expense or delay progress. Maintaining Agents shall confirm its application to particular schemes with the Overseeing Organisation.

Establishing Need for Maintenance Painting

1.8 Generally, the need and timing for routine maintenance painting will be established during structural inspection in accordance with the Overseeing Organisation's requirements as described in the Standards listed in Reference 1 (see Chapter 4 for references). However, if between structural inspections, instances of deterioration requiring urgent attention have been observed, then the remedying of these failures shall not be delayed.

Health & Safety, and Environmental Restrictions

1.9 Certain methods of surface preparation, the contents of the existing protective system or the application of certain types of paint may give rise to health and safety hazards. The Maintaining Agent shall carry out appropriate risk assessments for the work to be undertaken and introduce relevant control procedures with respect of the risks to staff, members of the public and the environment that may be affected by the Works.

1.10 Health and safety hazards and pollution are important factors which have to be taken into account when selecting methods of surface preparation and the application and type of paint systems. Surface preparation and the application of protective coatings can give rise to conditions which, unless precautions are taken, may be injurious to operatives and others in the vicinity, including animal life. Damage to property including plants, crops and pollution of water may also be caused.

The Maintaining Agent shall assess the risks to staff, members of the public and the environment that may be affected by the Works, to determine the need for personal protective equipment, breathing equipment, and any restrictions, enclosures and monitoring to protect staff, the public and the environment (in accordance with the current relevant legislation. See for example, Reference 8 (Chapter 4)).

1.11 Consideration should be given to work restrictions or special requirements for work to structures built on or over internationally protected sites (designated under European or UK laws) such as those described in Environmental Assessment, Ecology and Nature Conservation (DMRB 11.3.4).

1.12 As part of the Maintaining Agent's risk assessment, the views of the Environmental Health Officer, the Health and Safety Executive, the Water Authority and other interested parties, should be considered. Practical guidance is given in the Approved Code of Practice for Control of Substances Hazardous to Health. Additionally, the information given in Series NG 5000 (MCHW 2) should be considered when choosing a particular method or type of system to use.

WITHDRAWN

2. BASIC CONSIDERATION

General

2.1 In order to achieve value for money in present and future maintenance it is essential that, before surface preparation and paint system clauses are drawn up, certain basic considerations are taken into account, viz.:

- (i) At the outset, required life and future use of the structure shall be clarified with the Overseeing Organisation. For structures with a remaining life of less than 20 years, advice on the selection of the most appropriate system shall be sought.
- (ii) For newer structures in particular the first overall maintenance repaint shall be carried out before the condition of the protective systems has deteriorated further than that described as Category II in paragraph 2.5 of this Standard.
- (iii) All structural maintenance work that may affect the protective system, including the remedying of deck leaks and repair of leaking joints, shall be carried out before maintenance painting is put in hand. Where this is not possible approval shall be sought from the Overseeing Organisation.

2.2 When a generally sound protective system requires overall maintenance it must be borne in mind that if the work is delayed the engineering works cost of restoring the system to a satisfactory standard may increase rapidly. It is a question of regular inspection and/or localised repair in time, so that a maintenance cycle can be programmed.

2.3 There is no valid estimated time for first maintenance of galvanizing or aluminium metal spray plus sealer only systems.

2.4 In the case of steelwork protected by a paint system over zinc metal spray, a check should be made as to the origin of any white deposits on the paint surface; these may be the first signs of breakdown of the zinc. If remedial work is not carried out in the early stages, corrosion of the zinc may well become extensive, and blast cleaning to clean steel will become necessary. Aluminium metal spray is less easily attacked, breakdown being usually because the aluminium has been badly applied in the works, e.g. dry spray leading to disintegration.

Breakdown of paint over galvanizing is often due to the lack of adhesion between the zinc and the paint system. If only a few patches are involved, remedial action can be successful. However, an overall check should be made and if the lack of adhesion is widespread, painting should not be attempted until all the loose paint has been removed.

Categories of Failure

2.5 When the need for maintenance painting has been established, the category of failure of the existing protective system shall be determined as follows:

Category	Description
I	Local failures only. Finishing coat otherwise sound, such that a repaint of the whole structure is not necessary. No corrosion of the steel substrate and/or no sign of deterioration of the metal coating.
II	Normal weathering of finishing coat, e.g. chalking, surface affected by deposits, with some areas of local failure. Adhesion generally sound such that, after cleaning down, the system can accept local build up of undercoats and overall coating of the whole structure with an undercoat and finish. No corrosion of the steel substrate and/or no sign of deterioration of the metal coating.
III	General failure of the finishing coat at or before the expiry of its expected life. Some local failure of the finishing coat and the undercoats but primers and/or metal coating appearing to be still sound. Some corrosion (1 - 3% of total area) of the steel substrate. A standard method of assessment is given in ISO 4628.
IV	General failure of system, with direct exposure of the steel substrate. Widespread corrosion varying from heavy rusting showing through the paintwork to localised paint breakdown. In some cases considerable areas of white corrosion products may be visible on the surface, possibly due to extensive corrosion of a metal coating or of a zinc rich paint. Localised or general corrosion of the steel (above 3%) substrate with breakdown of the protective system.

2.6 The purpose of allocating one of the four categories of failure, is to standardize as far as possible the pre-contract procedure and to some extent the level of maintenance, although the main criteria for the latter will be the accessibility, environment, expected life of the structure and cost, including road user delay costs (as outlined in Design Manual for Roads and Bridges: Volume 14 Economic Assessment of Road Maintenance Section 1 The QUADRO Manual) and rail access or train delay costs.

Pre-specification Overall Survey

2.7 For all categories of failure, unless otherwise agreed with the Overseeing Organisation, a comprehensive overall survey shall be carried out, to establish the extent, intensity and methods of surface preparation necessary to ensure satisfactory performance of the maintenance paint system proposed by the Maintaining Agent.

2.8 In the case of a Category I or II failure, the Maintaining Agent shall arrange for its own staff to carry out the survey providing they understand fully the methods of attaining satisfactory standards of surface cleanliness and have experience in supervising maintenance painting. If not, an independent surveyor shall be appointed for the work.

2.9 In the case of Category III and IV failures, an independent surveyor shall be appointed to carry out the survey, unless otherwise agreed with the Overseeing Organisation. The surveyor shall have had proven experience of coatings inspection of steel structures over a period of at least five years and shall be familiar with the maintenance painting specification and the types of coatings used in maintenance contracts. The surveyor shall have proven experience in examining samples of existing coatings for the purpose of establishing the reason for failure and for identifying types and levels of contaminants present.

2.10 The Maintaining Agent shall instruct the surveyor as to the manner in which he requires the areas to be recorded so that a bill of quantities, which is mandatory, can be compiled. The surveyor must report on each main part of the structure separately and may be requested to give the percentage of each method of surface preparation required on each part or he may be requested to state the actual areas.

2.11 Means of access such as hoists shall be agreed with the Maintaining Agent.

2.12 On completion of his work the surveyor shall submit a full report describing failures, including a draft surface preparation and paint system details on Appendix 50/1 Form HA/P1 (Maintenance) Paint System Sheet, parts 1 to 9 in accordance with NG 5008 (MCHW 2) and be prepared to discuss his recommendations with the Maintaining Agent.

2.13 The Maintaining Agent shall also inform the surveyor as to the extent of the survey to be carried out and any limitations and time constraints which are likely to apply during the maintenance painting contract, e.g. restrictions on methods of surface preparation or access to the structure. In cases such as bridges over motorways, gaining adequate access for surveys, except at ends, may well be difficult and could cause excessive disruption to traffic. In exceptional circumstances, the Maintaining Agent may decide therefore to instruct the surveyor to estimate surface preparation for mid-span and this may well result in more extensive surface preparation than necessary. The Maintaining Agent will then have to balance the likely extra cost of the work against a saving in survey costs and avoidance of traffic user delay costs. If several structures are involved it may be worthwhile surveying at least one representative structure thoroughly.

2.14 The Maintaining Agent should refer to Series NG 5000 (MCHW 2), for further advice on the selection of method(s) of surface preparation and paints systems. If sufficient information is not provided, the Maintaining Agent should seek further advice from the Overseeing Organisation.

Feasibility Trials of Proposed Methods of Surface Preparation and Proposed Paint System(s)

2.15 After completing an overall survey, or having otherwise determined the exact nature and extent of the work that is necessary, a complete provisional specification shall be drawn up for surface preparation and paint system, using Appendix 50/1 Form HA/P1 (Maintenance) Paint System Sheet, parts 1 to 9, before any feasibility trials are undertaken. (See Clause 5008 (MCHW 1) and NG 5008 (MCHW 2)). Feasibility trials of the proposed method(s) of surface preparation and painting system shall be carried out for all categories of failure in paragraph 2.5 of this Standard except in the following cases:

- (i) Where the surface preparation has been identified as blast cleaning to clean steel over the whole surface area of the structure.

- (ii) For small section steelwork having ready access where the existing protective system is a Category I, II or III failure.

2.16 At least two separate representative areas shall be selected for the trials. The proposed method(s) of surface preparation shall be carried out in each of these representative areas followed by application of one manufacturer's paint system to each representative area. All paints for each representative area shall have Departmental registration, list available in SA 1 (MCHW 0.3.1) or by contacting the Overseeing Organisation. Requirements for the registration of paints are given in Advice Note BA 27 (DMRB 2.4.2). The types of paints used are listed in the Manual of Paints for Structural Steelwork at Annex A of Standard BD 35 (DMRB 2.4.1). At least two manufacturers, selected at the discretion of the Maintaining Agent, shall supply paints for the trials.

2.17 Except in cases where the whole of the existing protective system is to be removed, it has been found from experience that, in the majority of cases, it has not been possible to specify accurately the full extent or intensity of the surface preparation required, or, to a lesser extent, predict the behaviour of new paints when applied over existing paints, without carrying out feasibility trials. Changes in requirements shown to be necessary during the trials not only prevent delays during the contract but also avoid claims due to inoperable specification clauses. Feasibility trials also provide an opportunity to assess the competence of paint contractors.

2.18 Feasibility trials are not required in cases where it is proposed to remove the whole of the existing protective system over the entire surface area, where the existing protective system consists of aluminium metal spray and/or paint coats. The removal of aluminium metal sprayed coatings by blast cleaning is now well established and feasibility trials to demonstrate this are unnecessary.

2.19 Zinc metal sprayed and galvanized coatings are generally more difficult to clean to an acceptable standard when atmospheric pollutants have reacted with the zinc to form zinc salts. Where it is proposed to remove entirely or in part a zinc metal coating, feasibility trials should be carried out to determine the best method of surface preparation and degree of cleanliness which can be achieved.

2.20 For small section steelwork having ready access, such as some parapets and some steel lighting columns, where failure of the existing protective system is Category I, II or III, the Maintaining Agent may dispense with feasibility trials where the cost of

carrying out such trials is proportionately high, say greater than 15% of the estimated works cost for maintenance painting. In such cases the Maintaining Agent will need to be sure that the risks of incompatibility of the existing protective system with the proposed system are minimal. Where doubts exist about compatibility of systems, advice should be sought from the Overseeing Organisation.

2.21 For Categories I and II steelwork other than that mentioned in paragraph 2.20, it is worthwhile carrying out feasibility trials to check the application properties of new paints and their compatibility with existing coats. The trials may also show up hitherto unsuspected faults, such as an adhesion weakness in the existing system or underlying corrosion which has not been apparent previously.

2.22 In the case of Categories III and IV, trials of several methods of surface preparation are likely to be necessary; these include wet and/or dry blast cleaning as well as abrading and cleaning down. The paint system feasibility trials will necessarily be more comprehensive than for Categories I and II as paint has to be applied over several types of surface presented by the different methods of preparation.

2.23 The work involved in feasibility trials for Categories I and II, i.e. abrading small areas, washing down and applying a paint system over a number of days can be carried out economically by the Maintaining Agent and this method should be adopted if possible. In the case of Categories III & IV, a specialist contractor should be appointed.

2.24 During the feasibility trials it will be necessary to check the adhesion of the existing system by testing to confirm that any contamination or corrosion products are being reduced to acceptable levels and that the proposed paints are tolerant of any existing residues. It is particularly important to check compatibility of proposed paints on older bridges which may have been painted with oil based paints, also that any effects of faulty paint technology in the original paint system can be overcome.

Ordering Paint for Feasibility Trials

2.25 When the feasibility trials are carried out by the Maintaining Agent, Form HA/P4 'Purchaser's Conditions of Order for Paint' (see Annex A) shall be used for ordering paint for the trials.

2.26 It is important that Form HA/P4 ‘Purchaser’s Conditions of Order for Paint’ (Annex A of this Standard) be used for ordering paint for the feasibility trials. This is because the Form, when completed, becomes a specification in its own right. The proposed system ought to have current registration with the Agency or a Departure for the scheme must be agreed.

Colours of Finishing Paints

2.27 Unless the appearance of the structure is of particular importance, colours shall be selected from those in paragraph 2.28. When there is a need for other colours, for example in the case of a large bridge or one which is in an environmentally sensitive area and visually dominant in its locality, or when it is proposed to change a colour previously submitted to the Commission for Architecture and the Built Environment (CABE) in England or to equivalent bodies in Scotland, Wales and Northern Ireland, the matter shall be referred to the Overseeing Organisation describing the structure, its location and present colour, the proposed alternative BS 4800 colour and the reasons for selecting it.

2.28 Where the use of paint formulations conforming to technical specifications of other member states of the European Community has been agreed, colours which are a close match to those specified are acceptable unless there are particular objective reasons why an exact match is necessary.

(i) Gloss Finishes

From the following colours in BS 4800

Light Grey	00 A 05
Medium Grey	18 B 21
Dark Grey	18 B 25
Green-yellow	12 B 21
White	00 E 55

Black gloss paints are not usually required.

(ii) Semi-gloss Finishes

When a semi-gloss finish is preferred, or is specifically required such as for sign gantry steelwork, Item 169, or Item 164 or Item 121 should be used. Paints which contain a

comparatively high percentage of dark grey micaceous iron oxide (MIO) pigment, colours are restricted to the following in BS 4800:

Medium grey approximately	00 A 09
Natural grey	" 00 A 13
Dark blue	" 18 C 39
Dark green	" 14 C 39

High gloss is usually stated as 75 or more gloss units (gu), on a 60° geometry head in accordance with BS 3900: Part A2. Semi-gloss (or sheen) is usually stated as 55gu (±5) on a 60° geometry head. Although accurate matching of MIO paint colours is not feasible, batches of MIO finish paints supplied to a contract should be a close visual match with each other.

3. PAINTING INSPECTION FIRMS

Selection of Painting Inspection Firms

3.1 Before appointing a painting inspection firm, the Maintaining Agent should verify that the firm has the technical competence and resources to undertake inspection. Inspectors shall hold the Institute of Corrosion - Painting Inspector Level 2 qualification or an equivalent qualification. The Maintaining Agent should obtain full details of the qualifications and experience of the Inspectors to be employed in the Works before the appointment.

Briefing of Painting Inspection Firms

3.2 Following the appointment of the inspection firm, the Maintaining Agent should specify the role and responsibilities of the inspector in the contract and fully brief the firm on the particular duties the Inspector is required to perform. For this purpose the firm must be furnished with copies of all relevant Drawings, the Specification for the contract and any other information which may affect the work.

3.3 The Maintaining Agent should establish at the time of the briefing working arrangements and lines of communication with the inspection firm.

3.4 The Maintaining Agent should agree the number of Inspectors to be employed in the Works and the frequency of supervisory visits by the senior Inspector. The Maintaining Agent should continuously review with the inspection firm the general level of resources required during the period of the Works.

3.5 The Maintaining Agent should establish with the inspection firm the frequency of reporting and requirements for the keeping and forwarding of specific records in the Contract.

3.6 The Maintaining Agent should obtain from the inspection firm a quality plan for inspection work in the contract. The quality plan should include the method of working on site and the role of the inspection firm's support services and personnel in the Contract.

Health and Safety

3.7 The Maintaining Agent should provide each Inspector with a copy of the assessment carried out in accordance with paragraph 1.9 and draw attention to the practical guidance given in the Approved Code of Practice for Control of Substances Hazardous to Health.

Duties of Painting Inspectors

3.8 Duties suitable for incorporation in terms of appointment are given in Annex B of this Standard. The duties associated with testing of contract paint samples relate to the standard testing arrangements. They are not wholly applicable in cases where alternative testing arrangements are used.

4 REFERENCES

1. Trunk Road Maintenance Manual (TRMM)

Volume 1: Highways Maintenance Code (for use in England)

2. Design Manual for Roads and Bridges (DMRB)

Volume 2: Section 4 Paints and Other Protective Coatings

BD 35 Quality Assurance Scheme for Paints and Similar Protective Coatings (DMRB 2.4.1)

BA 27 Quality Assurance Scheme for Paints and Similar Protective Coatings (DMRB 2.4.2)

Volume 3: Section 1 Inspection

BD 63 Inspection of Highway Structures (DMRB 3.1.4)

BA 63 Inspection of Highway Structures (DMRB 3.1.5)

Volume 3: Section 2 Maintenance

BD 62 As Built, Operational and Maintenance Records for Highway Structures (DMRB 3.2.1)

Volume 11: Section 3 Environmental Assessment Techniques

Ecology and Nature Conservation (DMRB 11.3.4)

Volume 14: Section 1 The QUADRO Manual

3. Manual of Contract Documents for Highway Works

Volume 0: Section 3 Advice Notes

SA 1 List of Approved/Registered Products (MCHW 0.3.1)

Volume 1: Specification for Highway Works (MCHW 1)

Volume 2: Notes for Guidance on the Specification for Highway Works (MCHW 2)

Volume 4: Method of Measurement for Highway Works (MCHW 4)

4. British and Other Standards

BS 2015: Glossary of paint and related terms

BS 3900: Methods of test for paints. Part A2: Examination and preparation of samples for testing

BS 4800: Schedule of paint colours for building purposes

BS EN ISO 8503-1, BS 7079-C1: Preparation of steel substrates before application of paints and related products. Surface roughness characteristics of blast-cleaned steel substrates. Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces

BS EN 971-1: Paints and varnishes. Terms and definitions for coating materials. General terms

BS EN 22063: Metallic and other inorganic coatings. Thermal spraying. Zinc, aluminium and their alloys

BS EN 24624, ISO 4624: Paints and varnishes. Pull-off test

BS EN ISO 12944-1: Paints and varnishes. Corrosion protection of steel structures by protective paint systems

5. Control of Substances Hazardous to Health Regulation 2002

Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003

6. **The Control of Substances Hazardous to Health Regulations 2002. Approved codes of practice and guidance. Fourth Edition HSE**
7. **Statutory Instrument No. 2676**
The Control of Lead at Work Regulations 2002
- 8 **Environmental Protection Act 1990**

WITTHDRAWN

5. ENQUIRIES

All technical enquiries or comments on this Standard should be sent in writing as appropriate to:

Chief Highway Engineer
The Highways Agency
Room B153a
Romney House
43 Marsham Street
London SW1P 3HW

G CLARKE
Chief Highway Engineer

Chief Road Engineer
Scottish Executive Development Department
Victoria Quay
Edinburgh
EH6 6QQ

J HOWISON
Chief Road Engineer

Chief Highway Engineer
Transport Directorate
Welsh Assembly Government
Llywodraeth Cynulliad Cymru
Crown Buildings
Cardiff
CF10 3NQ

J R REES
Chief Highway Engineer
Transport Directorate

Director of Engineering
Department for Regional Development
Roads Service
Clarence Court
10-18 Adelaide Street
Belfast BT2 8GB

G W ALLISTER
Director of Engineering

ANNEX A. FORM HA/P4

WITHDRAWN

FORM HA/P4 PURCHASER'S CONDITIONS OF ORDER FOR PAINT

A1. The paint(s) described below, subject to our Order No dated shall comply with (paint manufacturer's name) formulation(s) registered with the Overseeing Organisation and shall have the properties stated in Form HA/P2 Paint Data Sheet completed by (paint manufacturer's name) or having been agreed in accordance to Departure..... (ID number). (Purchaser to complete under each heading of list.)

Item No.	Registered Desc.	Method of Application	Value of X% (see 2iic)
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A2. In addition the following requirements shall apply:

i. Keeping properties:

When stored in its original sealed container at a temperature between 5°C and 27°C, the paint shall retain the original properties for 12 months from date of despatch. During this time the paint shall not show hard settling, skinning or tendency to gel when tested in accordance with BS 3900: Part A2.

ii. Application properties:

a. Except for two pack chemically cured and moisture cured paints, paint(s) shall be capable of being applied satisfactorily on suitably prepared surfaces at steel and ambient temperatures above 5°C. Two pack chemically cured and moisture cured paint(s) shall be capable of being applied satisfactorily on suitable prepared surfaces at steel and ambient temperatures advised by the paint manufacturer. Paints shall be overcoatable within the time stated in Form HA/P2 referred to in paragraph A1;

b. The paint(s) shall be supplied ready for use at a viscosity entirely suitable for the method of application;

c. Sag resistance;

There shall be no sagging of paints when applied at 130% of the specified maximum wet film thickness.

iii. Dry film properties:

The paint(s) shall be capable of being applied by a competent operator, in accordance with the Data Sheet(s), such that:

a. Each coat shall be generally free from surface defects, particularly cratering, pinholing, rivelling, sagging, bittiness, dry spray or excessive brush marks and cissing, as defined in BS 2015 Glossary of Paint and Related terms and BS EN 971-1.

b. Each coat shall have a uniform and even appearance and have satisfactory adhesion, checked in accordance with BS EN 24624, ISO 4624 or BS EN 22063 Annex A method 1, before overcoating with the next coat in the system.

c. Unless otherwise agreed, each coat of paint when applied at the minimum dry film thickness of the range stipulated in the Form HA/P2 shall obliterate the substrate or the previous coat in a contrasting colour.

d. Colour and gloss of the finish

The finish coat of paint applied to the structure shall match a coated reference panel provided by the paint manufacturer and approved by the purchaser prior to despatch of the paint. The panel shall be tin plate 150mm x 100mm. The finish coat applied to the structure shall retain its colour and/or gloss, according to type, to the satisfaction of the purchaser.

A3. Containers

i. Paint shall be supplied in tins up to 25-litre capacity with completely removable lids.

ii. The tins shall be marked on the side. The marking shall include the following:

Name of manufacturer

Registered description of the material (incl. purpose, e.g. whether primer, undercoat or finish and also the colour)

Item No

Paint manufacturer's reference No

Batch No

Date of manufacture (as such or in coded form which shall be communicated to the purchaser).

for (purchasing authority)

Signature

Date

ANNEX B. DUTIES OF PAINTING INSPECTORS

B1. Health and Safety

B1.1 The Inspection Firm shall ensure that the Inspector is aware of the firm's duties as Employer in respect of health and safety of employees and other persons at the workplace. The Inspector should also be aware of the duties imposed on him as employee by statutory instruments and regulations concerning health and safety.

B1.2 The Maintaining Agent will provide the Inspector with a copy of all Health and Safety assessments carried out in accordance with regulation 6 of the Control of Substances Hazardous to Health Regulations 2002.

B2. Definitions in the List of Duties

B2.1 Where the word 'verify' has been used in the list of duties, the function of the Inspector is to ascertain by enquiry.

B2.2 Where the word 'check' has been used in the list of duties, the function of the Inspector is to watch and report.

B2.3 Duties which require the Inspector to perform some other task, e.g. testing or measuring specific gravity, are explicitly described.

B3. General Requirements and Duties

B3.1 Painting Inspectors should be familiar with documents referred to in the Contract including this Standard, and British harmonised standards, International and European harmonised Standards relevant to the work to be inspected.

B3.2 Specific duties of the Inspector are given in sections B4 to B9 of this Annex. The duties are set out to correspond with stages of a typical maintenance painting contract carried out in accordance with this Standard.

B3.3 During the procedure trials, the Inspector shall carry out the duties in sections B6 to B8 which are necessary to establish the Contractor's ability to achieve the standards of surface preparation and protection required in the main work. Guidelines to testing procedures are also given in BS EN ISO 12944: Part 7.

B4. Preliminaries at Start of the Contract

B4.1 Verify that the Inspector and the Contractor have identical copies of the Specification.

B4.2 Verify that the Contractor has submitted a quality plan for the work in the Contract, and that this has been agreed with the Maintaining Agent.

B4.3 Verify with the Maintaining Agent any requirement of the Contractor to liaise with or notify the Health and Safety Executive, Environmental Health Officer, Water Authority or any other interested party, of any relevant stage of the Contract at the start or during the work.

B4.4 Verify with the Maintaining Agent that the programme of work and method of working proposed by the Contractor have been accepted and that the Contractor is aware of any limitations e.g. times of access to carriageways.

B4.5 Verify with the Maintaining Agent that the Contractor's proposed access arrangements have been agreed as being suitable for the method of working and inspection.

B4.6 Verify with the Maintaining Agent that the Contractor is fully aware of the limitations in the Contract regarding the effect of unfavourable weather conditions on progress of the work, e.g. planned carriageway closures and access.

B4.7 Verify with the Maintaining Agent that the Contractor is aware of requirements for the enclosure, collection and disposal of spent abrasive, paint, debris and dust.

B4.8 Verify with the Maintaining Agent that the Form HA/P1 (Maintenance) Paint System Sheet has been accepted and that the Inspector and Contractor have identical copies of Forms HA/P2 Paint Data Sheets and Health and Safety data sheets for each of the paints to be used in the Contract.

B4.9 Verify that the Contractor is aware of the time needed for testing 'A' samples and that paint is ordered sufficiently early to allow testing and reporting of samples before painting starts, other than painting in the procedure trial.

B4.10 Verify that the Contractor is aware of his responsibility for the packaging and prompt despatch of paint samples for testing. Check that the Contractor has provided an adequate number of tins and lids for 'B' samples and lid clips for 'A' and 'B' sample tins.

B4.11 Verify with the Contractor the quantity of paint to be used for each coat in the system.

B5. Procedure Trials

B5.1 Verify with the Maintaining Agent the location and steelwork area where the procedure trials are to be carried out.

B5.2 Record names of personnel and details of equipment used in the trials and check that surface preparation and painting equipment proposed are suitable for the method of working and standards required in the specification.

B5.3. Check the efficiency of the equipment used in the trials, including any enclosures or monitoring, and that the standards of surface preparation and painting required in the main work are achieved. Check that adequate lighting, heating, ventilation and access equipment are used.

B5.4 Where hand power tools are used for abrading, check that the Contractor is using the correct technique and that surfaces are not left with a burnished appearance caused by the polishing in of old paint, rust or dirt.

B5.5 Check that the Contractor is capable of detecting and removing unsound coatings and that feathered edges of coatings have satisfactory adhesion.

B5.6 Check that the Contractor is able to identify chemical and visible surface contaminants and that he is able to remove these as required in the specification. Test surfaces for freedom from chemical contaminants.

B5.7 Check that the Contractor is capable of applying the protective coatings in accordance with the specification, including film thickness and that each coat is free from surface defects including cratering, pinholing, rivelling, sagging, bittiness, cissing and dry spray, and that the finished system has an even and uniform appearance. Check that wet and dry paint film thicknesses measured by the Contractor as painting progresses, are comparable with measurements taken by the Inspector.

B5.8 Where required by the Maintaining Agent, check that the Contractor applies all the paints (including stripe coats) stepped back, including the finish coat of paint, to a 150mm x 100mm tinplate panel, to ensure that the coats are applied in the correct order and to be used as a reference for shade and gloss of the finish coat later in the work.

B5.9 Notify and seek approval from the Maintaining Agent any adjustment required to tins of paint

Note: Any adjustment to paint should be made at the paint manufacturer's works and the Inspector should verify that the Contractor has confirmed with the Maintaining Agent that revised formulations are registered with the Overseeing Organisation before paints are offered for use in the work

B5.10 Check that any unsatisfactory application is rectified before the start of the main painting.

B6. Surface Preparation

B6.1 Check that the type and grade of abrasive is the same as that used in the procedure trial and that the abrasive is clean, dry, free from oversize particles and contaminants detrimental to the surface to be prepared.

B6.2 Verify that any chemical cleaning to be used has been agreed by the Maintaining Agent.

B6.3 Check that surfaces contaminated by oil or grease have been wet cleaned before being finally rinsed with clean water.

B6.4 Before blast cleaning, check surfaces of steelwork for severe corrosion and/or contamination, e.g. prolonged damage caused to coating system from a leaking deck joint, and note these areas for close examination after blast cleaning. Record the position of these areas in the structure for future reference.

B6.5 Check that only clean water is used in wet blast cleaning, wet cleaning down and for rinsing.

B6.6 Check that surface defects revealed as surface preparation proceeds are remedied by the Contractor. Areas of surface defects, e.g. hackles, internal discontinuities, etc, which have been remedied should be recorded and notified to the Maintaining Agent before overcoating. Some defects may be remedied after primer application, with mechanical preparation being allowed through the blast primer and the primer re-applied locally by brush.

B6.7 Check for the presence of sharp edges, burrs, weld spatter, etc and record and report these areas to the Maintaining Agent if these have not been removed by fettling or grinding and any final blast cleaning which may be necessary.

B6.8 Check that any loose particles of embedded abrasive in the cleaned surface are removed before overcoating.

B6.9 Where wet/abrasive blast cleaning methods are used, check that prepared surfaces have been dry blast cleaned to remove any subsequent light rusting to present a clean dry surface for overcoating. Check that finally prepared steel and metal coated surfaces are overcoated within the specified time and in accordance with clause B7.2.

B6.10 Check that excessive burnishing of the substrate through prolonged or faulty application of rotary power abrading tools, particularly rotary wire brushes, is avoided and that any visible peaks and ridges produced by mechanical cleaning tools are removed before overcoating.

B6.11 In areas where existing coats have been feathered back, check that boundaries of feathered back coats are firmly adhering.

B6.12 Record any areas of unnecessary damage to sound existing metal coatings which are not required to be removed during surface preparation.

B6.13 Check that sealants which have been raked or cleaned out between plies and gaps are replaced with a type agreed by the Maintaining Agent.

B6.14 Check finally that the specified standard(s) of surface preparation are achieved for each of the areas to be overcoated.

B6.15 Check at the start of every shift that the any sheeting used for enclosure is effective in preventing dust, etc escaping into the atmosphere. Also ensure that any damage to the enclosure is repaired immediately.

B7. Paints

B7.1 General

- (i) Before paints are delivered to site, verify that the Contractor has available a suitable site lock-up store where paints can be kept at between 5°C and 27°C until required for use.

- (ii) Check that all paints delivered to site are in sealed containers and are clearly marked with the name of the manufacturer, registered description, item number, batch number, manufacturer's reference number and date of manufacture.
- (iii) Check that the first delivery of each paint to site consists of at least 10 tins from the same batch, where samples are required to be despatched to the testing authority for checking.
- (iv) Highways Agency does not recommend addition of solvent on site; any addition of solvent necessary to improve application shall be agreed and if possible carried out by the paint manufacturer, preferably in the paint process plant with adequate equipment and controlled measurements.
- (v) Verify that the Contractor has confirmed with the paint manufacturer that the paint data sheets, including health and safety data sheets, cover the conditions under which the paints are to be applied, e.g. temperature, humidity, use in confined spaces, etc.
- (vi) Verify that the Contractor's paint application programme allows for overcoating within the minimum and maximum timescale range recommended by the paint manufacturer and the Specification.

B7.2 Application of paints

- (i) Check that all painting is carried out using the personnel and equipment used in the procedure trial.
- (ii) Check that paints are used in strict rotation of manufacture and are used within the expiration of their shelf life.
- (iii) Check that no addition of solvent to the paint is carried out on site, unless within the guidelines of B7.1.4.
- (iv) Check that 2-pack paints are mixed thoroughly in accordance with the paint manufacturers data sheet and that paints with a limited 'pot life' are not used after the expiration of the pot life.

- Check that other tins of paint with more than 10% ullage are discarded at the end of the working day and not returned to the paint store.
- (v) Check that adjacent surfaces which are not to receive paint are masked or protected from overspray or paint splashes.
- (vi) Check that painting, other than in the procedure trial, is not started until results of satisfactory testing of the first 'A' samples have been reported to the Contractor by the Maintaining Agent.
- (vii) Check that paint is not applied under the following conditions:
- When the ambient temperature falls below 5°C or the relative humidity rises above 90% or, for types of paints in Series 5000 (MCHW 1) sub-Clause 5012.14, outside the temperatures and humidities recommended by the paint manufacturer.
 - During rain, snow, fog, mist or in a dust-laden atmosphere.
 - When the amount of moisture likely to be deposited on the surface by condensation or rain before or after painting, may have a harmful effect on the paint.
 - When wind borne dust may have a harmful effect on the paint.
 - When the steel temperature is less than 3° C above dew point.
- (viii) Check immediately before the application of each coat of paint, that surfaces to be overcoated comply with the specified standard(s) of surface preparation.
- (ix) Check that stripe coats of paint in contrasting colour to the previous overall coat are applied in the correct sequence in accordance with the specification and that the colours of the same Item number are applied in the agreed order.
- (x) Check that each coat of paint is applied at the correct wet film thickness to give the minimum dry film thickness specified.
- (xi) Check that the dry film thickness of each coat of paint, and of the applied system, is in accordance with the specification. Verify that the Contractor is aware of any reduction in dry film thickness of coatings and the overall system resulting from curing/drying, particularly for paints with slow evaporating solvents.
- (xii) Check that each coat of paint is free from surface defects including cratering, pinholing, rivelling, sagging, bittiness, cissing and dry spray, and that the finished system has an even and uniform appearance.
- (xiii) Where applicable, check that the shade and gloss of the finish coat is the same as applied to the reference panel in the procedure trial.

B7.3 Paint Testing

- (i) Immediately on delivery of paint and any reconstituted paint to site, verify that it is for the use specified and carry out the following tests:
- Specific gravity. Samples which fail to comply with the following tolerances should be rejected and not sent to the testing authority:
 - paints with a specific gravity less than 1.4: + or – 3 %
 - paints with a specific gravity of 1.4 or greater: + or - 4 %
 - Wet to dry film thickness ratio (volume solids)
 - Sag resistance. Tolerance to sagging procedure is given in BD 35 Annex A Appendix 1 Clause 5.3 A1
 - Opacity
 - Drying time

- (ii) Following satisfactory site testing by the Inspector, and where required by the Specification, select the first set of 'A' samples of unopened tins of each type of paint and hand to the Contractor for packing, addressing and despatch to the testing authority.
 - (iii) Immediately after the 'A' samples are despatched by the Contractor, record the despatch date in the completed Form HA/P3, Paint Sample Despatch List and send one copy to the testing authority and, together with Form HA/P1 (Maintenance) Paint System Sheet, one copy to Highways Agency, Paint Specialist, Safety Standards and Research (SSR), Sunley Tower, Piccadilly Plaza, Manchester, M1 4BE or the relevant Overseeing Organisation. The Inspector should also retain one copy of each Form HA/P3 as inspection records.
 - (iv) Ensure that subsequent sets of 'A' samples are despatched for testing by the Contractor in accordance with the Specification in sufficient time to allow for testing and reporting of samples before the paints are used in the Works
 - (v) Take 'B' control paint samples at intervals as instructed by the Maintaining Agent from painters' kettles or from airless spray gun nozzles, with a minimum of one batch in three being sampled. Check the specific gravity of 'B' samples immediately samples are taken. Account should be taken of any permitted solvent added to the paint in determining the specific gravity of the sample. If the specific gravity is found to be incorrect, the Inspector should record areas painted with that paint and report immediately to the Maintaining Agent.
 - (vi) Following satisfactory checks on 'B' samples, clip down tin lids and mark tins B1, B2, etc and hand to the Contractor for packing, addressing and despatch to the testing authority in accordance with the Maintaining Agent's instructions, given on Form HA/P3. For two pack systems, samples of base and activator have to be sent to the testing laboratory in separate containers.
 - (vii) Immediately after the 'B' samples are despatched by the Contractor, record the despatch date in the completed Form HA/P3 and send one copy to the testing authority, one copy to Highways Agency, Paint Specialist, Safety Standards and Research (SSR), Sunley Tower, Piccadilly Plaza, Manchester, M1 4BE and retain one copy for the Inspector's records.
- B8. Records and Reporting to the Maintaining Agent**
- B8.1 Record and report progress and compliance with the programme at intervals agreed with the Maintaining Agent.
- B8.2 Record and report immediately to the Maintaining Agent non-compliance with the approved method of working, statutory requirements regarding health and safety and environmental protection, or other health and safety hazards or infringements which may affect the Contractor's workforce or third parties.
- B8.3 Keep and submit records of the work as required.
- B8.4 Record and report immediately sub-standard work.
- B8.5 Keep records of all tests required for the contract and submit reports of all tests and inspections as required.
- B8.6 Record details of equipment and materials used in the procedure trials and in the main work. Check and retain material consumable certificates and certificates of conformity issued by the Contractor. Record type of scaffolding or other access and details of screening and working conditions throughout the work.
- B8.7 Record steel temperature, air temperature, relative humidity and paint temperature, prior to use, at each area to be painted before and at intervals during painting.
- B8.8 Record date of blast cleaning of each area and note if any re-blasting was required and the reason. Record action taken to remedy surface defects.
- B8.9 Record date and time of application of each coat noting weather conditions and area covered by each batch of paint.

B8.10 Keep record copies of all Forms HA/P1 and HA/P3 sheets. Also retain copies of Paint Sample Analyses Reports if so required by the Maintaining Agent.

B8.11 Where authorised to issue certificates of completion in respect of any part of the Works, forward copies immediately to the Maintaining Agent and retain copies for the Inspector's records.

B8.12 On completion of the work, forward one copy of the completed Form HA/P5, (see Annex C) Maintenance Painting Scheme Summary Sheet, together with Form(s) HA/P1 sheets to Highways Agency, Safety Standards and Research (SSR), Sunley Tower, Piccadilly Plaza, Manchester, M1 4BE or the relevant Overseeing Organisation and, where required, one copy to the Maintaining Agent.

B8.13 On completion of the work check that all records have been forwarded

B9. Record Sheets, Tables and Equipment

B9.1 The inspection firm shall provide the Inspector with all necessary record sheets and tables, including the following:

- (i) Inspector's daily record sheets.
- (ii) Inspection firm's instructions and data sheets for carrying out checks for contaminants.
- (iii) Tables or disk calculator for calculating relative humidity.

B9.2 The inspection firm shall provide the Inspector with all the equipment necessary for the Inspector to carry out his duties.

Inspection equipment shall be calibrated at intervals recommended by the equipment manufacturer in accordance with the manufacturer's requirements or other national, international or European standards. Calibration records and certificates shall be retained by the inspection firm and, where required, copies provided to the Maintaining Agent.

The inspection firm shall provide the Inspector with the following minimum inspection equipment:

- (i) Steel and air temperature thermometers or probes.
- (ii) Surface profile gauge conforming to BS. EN ISO 8503 -1.
- (iii) Wet film thickness gauges.
- (iv) Dry film thickness gauge.
- (v) Paint adhesion tester.
- (vi) Metal spray adhesion tester.
- (vii) Telescopic mirror.
- (viii) Equipment to measure relative humidity.
- (ix) Equipment to measure specific gravity.
- (x) Equipment to detect and measure surface chemical contaminants.
- (xi) X10 illuminated magnifying glass or pocket microscope.
- (xii) Wet sponge holiday detector.

ANNEX C. FORM HA/P5

WITHDRAWN

FORM HA/P5 MAINTENANCE PAINTING SCHEME SUMMARY SHEET

[On completion of the work, Inspector to forward one copy of completed Form HA/P5 with Form HA/P1 to: Highways Agency, Paint Specialist, Safety Standards and Research (SSR), Sunley Tower, Piccadilly Plaza, Manchester, M1 4BE or the relevant Overseeing Organisation]

Contract Title.....

Structure No/Name.....

1. Date of original construction, where known.....

2. Date of last major repaint, where known.....

3. Category of failure of previous Coating system (see definitions BD 87)
..... (please tick)

I	II	III	IV
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Details of previous protective system, where known:

Description

Item No.

Metal coat:.....

.....

1st Paint coat:.....

.....

2nd Paint coat:.....

.....

3rd Paint coat:.....

.....

4th Paint coat:.....

.....

5th Paint coat:.....

.....

6th Paint coat:.....

.....

Total mdft of paint system

microns

No. of stripe coats.....

5. Protective system for this Contract

Type.....

6. Date of paint survey, where known.....

7. Date of feasibility trial, where known.....

		Yes	No
8. Have 'A' or 'B' paint samples been sent for testing for this contract? (please tick)		<input type="checkbox"/>	<input type="checkbox"/>

9. Has maintenance painting been major, i.e. affecting greater than 10% of the surface area of the steelwork? (please tick)		<input type="checkbox"/>	<input type="checkbox"/>
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10. If Yes, has minor maintenance painting been undertaken since the last major repaint or, where this is the first major repaint since completion of construction? (please tick)		<input type="checkbox"/>	<input type="checkbox"/>
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11. Has work in the maintenance painting contract been carried out as part of a hybrid maintenance scheme, i.e. in conjunction with other highway or structure maintenance? (please tick)		<input type="checkbox"/>	<input type="checkbox"/>
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If Yes, please give a brief description of the other work

.....
.....

12. Have carriageway/lane restrictions been specially required to carry out work in the maintenance painting contract? (please tick)		<input type="checkbox"/>	<input type="checkbox"/>
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13. Has work in the maintenance painting contract been carried out at night? (please tick)		<input type="checkbox"/>	<input type="checkbox"/>
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14. If you have any constructive comments to make regarding the maintenance painting specification, either general or in relation to work in this contract, please include them on a separate sheet and forward to Safety Standards and Research (SSR) with this form.

Inspecting Firm