



## 1 - PURPOSE

### 1-1 - Nature of the work

This specification defines the systems and methods of painting for the protection of wagons and containers against corrosion.

Failing special provisions prescribed by the purchasing Railway on the order or its appended documents, this specification shall apply to complete vehicles, constructional components and separate parts.

### 1-2 - Classification

The work of painting newly assembled wagons and containers shall consist of :

- the preparation of the surfaces before painting,
- the application of the paints,
- the affixing of inscriptions,
- where appropriate, special protection of the upper surfaces of the under-frame components in contact with the timber floor.

### 1-3 - Reference documents

Reference is made to the following documents in the text of this specification :

UIC Leaflet 842-1: Supply of paint products for the protection of railway vehicles and containers.

UIC Leaflets 842-2 : Methods for testing paint products

842-3 : Surface preparation of metallic and non-metallic materials used in the construction of railway vehicles and containers.

842-6 : Quality inspection of railway vehicle paint systems.

ISO/R 1461 : Hot galvanizing on iron products.

ISO/R 2085 : Treatment of metal surfaces.  
Anodizing of aluminium and alloys.  
Inspection of the continuity of thin coats.  
Copper sulphate test.

ISO/R 2128 : Treatment of metal surfaces.  
Anodizing of aluminium and its alloys.  
Measuring of the thickness of oxide coatings.  
Non-destructive method by optical section microscope.

## 2 - MATERIALS

### 2-1 - Paints

2.11 - The paints used must satisfy the conditions defined in UIC Leaflet 842-1.

The characteristics of these paints shall be checked in accordance with the test methods defined in UIC Leaflet 842-2.

2-12 - Before use, the paints and auxiliary agents must have satisfied not only the inspections and tests carried out in accordance with the provisions of the UIC Leaflets mentioned above, on the premises of the manufacturer and by the laboratories, but also the test of suitability for application prescribed in Appendix 2.

Materials which have not satisfied the conditions of this final acceptance must not be used.

2-13 - Failing special agreement by the purchasing Railway, all products of a paint system must come from the same supplier. Bituminous and thermal and acoustic insulation products used as a finishing coat must be compatible with the paints of the system to which they are to be applied.

2-14 - In the case of all wagons and containers intended for the transport of foodstuffs in bulk, the paint products applied to the parts in contact with the foodstuffs must conform to the national regulations in force on the purchasing Railway.

## 2-2 - Protective strips

The special protective strips prescribed in point 4 must be of a type approved by the purchasing Railway. Those most widely used are bituminous strips, adhesive vinyl strips, and petrolatum based strips on cloth and vinyl covering.

## 2-3 - Anodized light alloy parts

Anodized light alloy parts are not generally painted. The thickness of the anodized coat is measured in accordance with ISO Standard R 2128 and must be greater than 15 microns. In addition, its

thickness must be checked in accordance with ISO Standard R 2085 and must be continuous.

## 2-4 - Galvanized parts

Galvanized parts must satisfy the conditions of ISO Recommendation R 1461.

# 3 - PAINTING

## 3-1 - Preparation of the surfaces before painting

Before applying any first coat of paint, all surfaces shall be prepared in accordance with one of the methods contained in UIC Leaflet 842-3.

### 3-11 - Steel metal surfaces

In principle, the surface preparation is carried out after the wagon has been assembled.

If, for technical reasons, this working process is not possible, separate components may be cleaned in advance, subject to the agreement of the purchasing Railway. In this case, all parts which have been welded or heated, together with the adjacent surfaces, must receive surface preparation, after assembly, by shot peening or, as an exception if authorized by the purchasing Railway, by grinding.

However, irrespective of the working process adopted, before assembly superimposed parts must receive adequate preparation.

They are then :

- in the case of non-hermetically sealed welded assemblies, given a coat of anti-corrosion priming paint or a special paint approved by the purchasing Railway compatible with the welding process. The thickness of the dry coat must be defined in relation to the welding process ;
- in the case of riveted or bolted assemblies, given a coat of anti-corrosion priming paint and, in the case of the "3 coat" system, the intermediate coat of paint also ;

In the case of assembly of carbon steel and stainless steel by welding, the superimposed surfaces shall be given an appropriate coat of paint, approved by the purchasing Railway.

Spare parts and assembled components from sub-contractors must undergo surface preparation in accordance with the provisions of this leaflet, before the first coat of paint is applied.

### 3-2 - Application of the paints

#### 3-21 - Paint systems, thickness of coats, drying time

The paint systems prescribed for the various components are given in Appendix 1,

The thickness of the dry film and the drying times for various protective products are given in Appendix 2.

The total thickness of the complete system, adopted by the purchasing Railway, when dry, must not be less than the values shown in Appendix 2 (see 7.1.).

These total thicknesses when dry shall apply equally in the case of systems with one or more coats.

**REMARK :** When constructional components have been given a coat of anti-corrosion priming paint in the factory, before transport and storage, this coat is not taken into consideration in the protection system to be applied.

In the event of doubtful adhesion, underlying oxidation or risk of incompatibility with the subsequent coats, the existing coat must be completely removed.

Products for temporary protection must be eliminated, unless they are compatible with the paints of the protection systems.

The same applies for the painting of other types of parts, irrespective of their origin.

#### 3-22 - Painting programme

The parts shown in the following list must not be painted:

- the sides of tyres or rims of solid wheels,

- wheel running treads,
- threaded or sliding functional components,
- elastomer components,
- braking surfaces of brake blocks, shoes and discs, items of equipment requiring greasing,
- the front of buffers,

and, at the request of the purchasing Railway :

- axles,
- the centres of solid wheels.

These surfaces and parts must be protected against any splashing of paint.

The parts listed below may not be painted :

- timber floors (1)
- wooden plywood panels protected with formophenolic resins, except for the edges,
- the inside visible surface of the body of open high-sided wagons, failing special provisions,
- coupling parts (in principle, coupling screws are not painted),
- galvanized parts,
- light alloy components.

(1) However, it is obligatory to paint the edges of planks in contact with the under frame or wall, throughout their length.

All separate parts which have already been given complete protection are allowed to retain their original paint, for example:

- brake distributor and brake-rod adjuster,
- empty-loaded box.

### 3-23 - Technical conditions of application

The application and drying of the various coats of paint must be carried out in a room free from dust, where the temperatures of the room itself, the paint and the object to be painted cannot fall below 12°C.

When a 2-component paint is used, this temperature must not be less than + 18°C.

In all cases, no condensation must occur on the surfaces to be painted. The successive coats of the protection system must be applied without the vehicle being moved outside in the meantime. However, when this working process is impossible, and if the purchasing Railway so authorizes, the vehicles can be placed outside between the application of two successive coats, but provided that the paint has reached the stage where it is "dry to the touch" defined in § 3,242 of UIC Leaflet 842-2.

One or more of the processes listed below must be used to apply the coats of paint. These processes must be approved by the purchasing Railway :

- spraying by air gun, where appropriate with heating of the paint or one of its components,
- electrostatic spraying,
- spraying with over-pressure equipment without air (Airless system), where appropriate with heating of the paint or one of its components.

When two-component products are used, account must be taken of the prior reaction times and the "pot life".

In the case of a two-component paint, the proportions stipulated for the mixture must be observed.

Small parts can also be treated by a dip process, provided that the paint to be applied consists of one component only.

*3-24 - Details relating to paint products in general*

*3-241 - Reactive priming paints (Wash primer)*

Reactive priming paints (Wash primer) are delivered as materials in either one or two separate components. Except for the special indications in Appendices 1 and 2, two-component reactive priming paint (Wash primer) should be used.

Generally speaking, reactive priming paints (Wash primer) consist of a polyvinylbutyral based binder, zinc chromate based pigments, and free phosphoric acid in organic solution.

In the case of reactive priming paints delivered as two separate components, the dissolved free phosphoric acid constituting one of the components is added to the other component in the proportion prescribed, just before application. The chemical reaction of the mixture begins immediately after addition of the catalyst. (Even the metal object to be painted participates in the reaction, thus giving very good adhesion):

One-component reactive priming paint (Wash primer) must be delivered ready for use.

Two-component reactive priming paint (Wash primer) must be used in accordance with the instructions supplied by the manufacturer.

*3-242 - Zinc powder paint*

Zinc powder paint is an anti-corrosion priming paint for steel structures. It can be applied in one or two coats, without a finishing paint according to the work planned. It is also used for steel/steel assemblies where spot welding is employed, but which are not sealed. The prescribed thinner must be used to obtain the correct spraying consistency.

*3-243 - Anti-corrosion priming paint*

The anti-corrosion priming paint exists in the form of one or two components. To obtain the correct consistency for use, the specific thinners prescribed for the respective binders (alkyd resin, epoxy resin, polyurethane resin) must be used. With regard to the two-component paint, see also 3-2410 (two-component paint). Failing prior agreement of the purchasing Railway, two-component paints may not be applied to anti-corrosion priming paints with an alkyd resin base.

*3-244 - Alkyd resin paints*

Alkyd resin paints are generally delivered ready for use. For painting by spraying, a suitable solvent is generally used to obtain correct consistency for application. The same applies for obtaining the correct application consistency for painting by other methods.

### 3-245 - Bituminous paints

Bituminous solutions are delivered ready for use and must not be diluted. In the case of thickening of the product due to storage at low temperature or for a prolonged period, the paint should be heated in a water-bath before application, at a temperature of +30 to 35° C.

Bituminous emulsions are delivered ready for use. The paint may only be diluted with water in a maximum proportion of 2%, in the event of thickening due to prolonged storage.

### 3-246 - Dispersion paints

Dispersion paints, intended for the painting of the insides of vehicle bodies and for insulation purposes when inscriptions are to be placed on bituminous paints, are applied as delivered. In the event of thickening due to prolonged storage, they can be diluted with water in a maximum proportion of 2%. Dispersion paints intended for the painting of the outsides of vehicle bodies are delivered ready for use. To obtain the correct spray, the paint is diluted, if necessary, with water in a maximum proportion of 2%.

### 3-247 - Epoxy or polyurethane resin based two-component paints

Epoxy or polyurethane resin based two-component paints are products which are generally not delivered ready for use. They consist of a basic component and a hardening agent which must be mixed before use in a prescribed proportion. The instructions of the manufacturer must be observed when mixing and using these products.

To obtain the correct consistency for use, a special thinner must be used.

The chemical reaction of the mixture begins immediately after the addition of the hardening agent. The service life in the paint pot - time elapsing between suitability for application of the base-hardening mixture until thickening occurs - varies according to the composition of the product and the manufacturers.

Application must cease as soon as the "pot life" indicated by the manufacturer is exceeded.

The paint prepared in this way may only be applied after elimination of air introduced when mixing the two components. Generally speaking, a waiting time of 30 minutes is sufficient. This waiting time is eliminated when the paint is mixed away from the air (gun with two heads, equipment with a premixing chamber).

### 3-248 - Aluminium paint

Aluminium paint is delivered ready for application. When the paint is to be applied by spraying it is brought to the required spraying consistency by using adequate thinner. Due to its tendency to settle it must be stirred continually even during use. The aluminium paint, used for welding, must not be covered by other paints.

### 3-25 - Application of the first coat of paint

#### 3-251 - Period of application

The first coat of paint must be applied within a maximum of four hours after the surface preparation.

#### 3-252 - Temporary protection

The first coat can be applied after a long interval on components which have received temporary protection treatment by app-

lication of an approved product within four hours following the surface preparation.

However, the purchasing Railway shall be the sole judge of the advisability of authorizing the use of this kind of product, and shall fix the acceptance tests in respect of it.

When it is not necessary to remove this kind of product before painting, its thickness need not be taken into consideration when assessing the total thickness of the protection system.

3-26 - Application of the other coats of paint

3-261 - Compatibility

Temporary protection products, also the anti-corrosion priming paint applied to separate parts and assembled components emanating from sub-contractors, must be compatible with the paints prescribed for the subsequent painting of the wagon and, in particular, give satisfactory adhesion with the paint system adopted.

If the contrary is the case, they must be removed in accordance with the regulations of UIC Leaflet 842-3.

3-262 - Intermediate cleaning

When applying successive coats of paint, it is essential for each coat of paint to be dry and, if necessary, carefully degreased and dusted before the following coat is applied.

3-263 - Touching up paintwork during construction

If surfaces already painted are damaged during construction (for example during assembly or adjustment operations), the protection system prescribed must be reconstituted.

Coats of paint which are already completely dry must be roughened before touching up.

When the damage is more extensive, particularly if the surface of the material is affected, the latter must be prepared in accordance with the regulations of UIC Leaflet 842-3.

3-3 - Inscriptions

3-31 - Marks and inscriptions to be applied

The marks and inscriptions to be applied on each vehicle are prescribed in the working drawings.

3-32 - Affixing of marks and inscriptions

Marks and inscriptions are normally affixed by means of transfers or by another process approved by the purchasing Railway.

With polyurethane resin paints, the marking can be effected with:

- polyurethane resin inscription paints when stencillers are used,
- approved self-adhesive stickers.



In the case of dispersion paints the marking can be effected with:

- epoxy esters or alkyd resins inscription paints when stencillers are used,
- serigraphy processes using alkyd resin paint,
- varnish transfer stickers.

With bituminous paints, the marking must be effected after applying to the paint, to insulate it, a coat of dispersion paint for the outside of the vehicle bodies. It is then necessary to apply the procedures indicated above for polyurethane resin and dispersion paints.

#### 4 - PROTECTION OF THE UPPER SURFACES OF UNDERFRAME COMPONENTS

The upper flanges of all metal parts in contact with the timber floor are insulated by special protective strips of a type approved by the purchasing Railway. These strips are positioned to project over the edge of the parts to be protected by about 10 mm.

When two strips are used to line very wide sections, they must overlap.

Bituminous strips are placed directly on bituminous paint. Vinyl strips are glued after application of the complete system.

Petrolatum based strips on cloth and vinyl covering are placed directly on the anti-corrosion priming paint.

The application process depends on the nature of the protective strip.

When a sealing system between the floor and walls is prescribed by the purchasing Railway, this sealing can be obtained by using a packing product approved by the purchasing Railway or, if its nature so permits, by folding the protective strip.

#### 5 - QUALITY INSPECTION OF THE WORK

Representatives of the purchasing Railway must be able to inspect all the anti-corrosion protection work (preparation, application of the materials, drying, thickness of the dry film, etc.) at any time.

These checks are carried out in accordance with the directives of UIC Leaflet 842-6.

#### 6 - GUARANTEE

The builder of the vehicle shall accept a guarantee period of two years with regard to the performance of the system of protection. Different periods must be covered by special agreements between the purchasing Railway and the rolling stock builder. The guarantee shall take effect from the date the vehicle is placed in service.

For each vehicle, the vehicle builders must record, in a register, the origin of the painting products subject to guarantee and their conditions of use. This register may be consulted at any time by the representative of the purchasing Railway.

### 7 - APPENDICES 1 AND 2 "PRELIMINARY REMARKS"

#### 7-1 - Painting system

Depending on the stressing to which the parts or an assembly of these parts are subjected, a painting system with 3, 2 or 1 coat, may be used.

The number of coats of the paint system shall be fixed by the purchasing Railway.

The conditions of application and drying of systems with 2 or 1 coats and the quality inspection regulations for one coat, must be observed.

Irrespective of the painting system adopted by the purchasing Railway, the total thickness (e) of the dry film of the painting system must not be less than the values shown below :

- systems consisting of alkyd resin products, epoxy resins or polyurethane resins, also systems comprising dispersion paints utilized as intermediate and finishing coats, e ≥ 130 μ m
- systems comprising a bituminous finishing coat, e ≥ 250 μ m
- systems with a finishing coat consisting of a bituminous mixed paint, e ≥ 170 μ m
- zinc powder coats of paint e ≥ 150 μ m

In assessing the thicknesses indicated above, the thickness of the following must not be taken into consideration :

- passive coats with 1 or 2 components (Wash primer),
- coats of filling,
- coats of insulation

The colours and nature of the binders to be used must be specified by the purchasing Railway.

#### 7-2 - Drying (Appendix 2)

When a paint is dried in a hot air chamber, it must be exposed to the ambient air for 15 to 30 minutes before placing in the chamber. This exposure time must not be taken into consideration when determining the drying time. The time necessary for the painted component to cool to ambient temperature must also not be taken into account.

The drying times shown in Appendix 2 correspond to the times needed,

- in the case of filling, to apply one covering by spraying or with a knife,
- with intermediate paints, to apply finishing paint by spraying,
- with the paints or products indicated elsewhere, to apply by spraying the following coat of the product normally prescribed in the system adopted.

The minimum drying time of coatings before scouring must be 12 hours at + 20 °C or 15 hours at + 18 °C. After rubbing down with water, a minimum drying time of 12 hours at + 20 °C must be observed before any fresh application of the product.

Before applying sound or thermal insulation products, it is necessary to ensure that the coats of products previously applied are completely dry.

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## APPENDICES

## APPENDIX 1

Part of the wagon to be painted	Description of the system	Observations
<p>Covered wagons 1 - <i>Underframe and bogies</i></p> <p>All surfaces + associated equipment such as: - axle guard - brake rigging - buffing and draw gear.</p>	<p>Can be effected either :</p> <p><i>in one coat :</i></p> <ul style="list-style-type: none"> <li>- special 1-coat paint</li> </ul> <p><i>in two coats :</i></p> <ul style="list-style-type: none"> <li>- anti-corrosion priming paint or zinc powder priming paint</li> <li>- finishing paint</li> </ul> <p><i>in three coats :</i></p> <ul style="list-style-type: none"> <li>- anti-corrosion priming paint or zinc powder priming paint</li> <li>- intermediate paint</li> <li>- finishing paint</li> </ul>	<p>The paint system is left to the choice of the purchasing Railway.</p>
<p>2 - Upper surfaces of the iron work of the underframe in contact with the timber parts of the floor</p> <p>3 - <i>Body</i></p> <p>Framework (external and internal)</p>	<p>Can be effected either :</p> <p><i>in one coat :</i></p> <ul style="list-style-type: none"> <li>- special 1-coat paint</li> </ul> <p><i>in two coats :</i></p> <ul style="list-style-type: none"> <li>- anti-corrosion priming paint or zinc powder priming paint</li> <li>- finishing paint</li> </ul> <p><i>in three coats :</i></p> <ul style="list-style-type: none"> <li>- anti-corrosion priming paint or zinc powder priming paint</li> <li>- intermediate paint with either : finishing paint or : vinyl polyacetate ferriferous emulsion.</li> </ul>	<p>See Articles 2-2 and 4</p> <p>The paint system is left to the choice of the purchasing Railway.</p>

<p>4 - External surface of the body metal walls timber walls</p>	<p>as §3 (see above), but, for the timber parts, the anti-corrosion priming paint is replaced by a priming paint</p>	<p>1 - For planks, the priming paint must be applied to all surfaces of the planks, preferably using a paint machine. 2 - The finishing paint can be applied simultaneously to the timber parts and the framework. However, it must be applied before the planks are laid on the parts of the framework to which they are fixed.</p>
<p>5 - Interior surface of the body, metal walls</p>	<p>as §3 (above)</p>	<p>The paint system is left to the choice of the purchasing Railway.</p>
<p>6 - Roof Upper surface</p>	<p>Can be effected either : 1-2-3 with one of the systems given in §1 4 - anti-corrosion priming paint - filler bituminous solution and aluminium bituminous paint</p>	<p>The paint system is left to the choice of the purchasing Railway.</p>

Part of the wagon to be painted	Description of the system	Observations
<p>Interior surface</p>	<p>5 - anti-corrosion priming paint - intermediate paint - aluminium finishing paint either : anti-corrosion priming paint - bituminous solution and filler bituminous solution or : anti-corrosion priming paint - filler bituminous solution</p>	<p>For wagons without double roof, the lower surface must, in the specified places, be protected by an insulating and anti-condensation product applied to the priming paint. The thickness of this latter is <math>\geq 50 \mu</math> m if the product is a solution and <math>\geq 80 \mu</math> m if the product is an emulsion. The nature of the product is fixed by the purchasing Railway.</p>
<p>7 - Ceiling Upper surface Inside surface</p>	<p>bituminous solution  white intermediate paint white finishing paint</p>	<p>apply 2 coats</p>
<p>Open big-sided wagons 1 - Underframe  All surfaces, and associated equipment - axle guard - brake rigging - buffing and draw gear</p>	<p>either as §1 of the system for covered wagons or : anti-corrosion priming paint bituminous solution and filler bituminous solution</p>	<p>1 - Application by air spray for bituminous paints 2 - When the sole bars and head-stocks are situated in the same</p>

APPENDIX 1

	or: anti-corrosion priming paint filler bituminous solution	vertical plane as the body, the latter are painted with finishing paint (see body). Otherwise, i.e. with the body overhanging the sole bars, the en- tire underframe, includ- ing the external sur- faces, is painted with filler bituminous finish- ing paint.
2 - Upper surfaces of the iron work of the underframe in contact with the timber parts of the floor		see Articles 2-2 and 4
3 - Bogies	as § 1 of the system for covered wagons	
4 - Body External surface	as § 2 of the system for covered wagons	
Internal surface		The internal surface of the body is not cleaned or painted, failing special provisions.
Open high-sided wagons with opening roof Opening roof External and internal surface	as § 1 of the system for covered wagons	

APPENDIX 1

Part of the wagon to be painted	Description of the system	Observations
<b>Flat wagons</b> 1 - Underframe + associated equipment	as § 1 and 2 of the system for covered or open high-sided wagons	
2 - Bogies and associated equipment	as § 1 of the system for covered wagons	
3 - Lids and stanchions	as § 3 of the system for covered wagons	
<i>Components common to all wagons</i> Inscriptions	application by stencil or by: - spray - serigraphy - transfer - self-adhesive	On dry bituminous paint, application, where applic- able, at the choice of the purchasing Railway, of an insulating coat, for exam- ple: 25% solution of shellac in methylated spirits.

**THICKNESSES OF COATS AND DRYING TIMES**  
(The preliminary remarks are to be observed)

Serial No.	Paint	Thickness of the coats per application		Drying time in hours at temperatures of			
		dry μm	wet μm	20° C h	40° C h	60° C h	80° C h
1	Passive coats (Wash primer) one component two components	10 - 20 max. 10		1 1			
2	Welding paint - zinc powder: - intermittent arc welding - spot welding - aluminium: - intermittent arc welding - spot welding	15 - 20 10 - 15		1 1			
3	Anti-corrosion priming paints alkyd resin base (1) epoxy resin base polyurethane base	60 60 60		14 14 14	6 6 6	3 3 3	1 1 1

(1) Remark: For certain anti-corrosion priming paints with an alkyd resin base, the drying times can be reduced. The products and the reduction in drying times must be approved by the purchasing Railway.

Serial No.	Paint	Thickness of the coats per application		Drying time in hours at temperatures of			
		dry μm	wet μm	20° C h	40° C h	60° C h	80° C h
4	Thick coatings with 2 components						
5	Smoothing coatings with 2 components - to be diluted with 1 component - to be diluted	250 - 350 150 - 250		3 14	1 6		
6	Intermediate paints alkyd resin base epoxy resin base polyurethane base	min. 45 min. 40 min. 40		6 14 3	2 - 4 5 1 1/2	1 2 1/2	
7	Finishing paints alkyd resin base for interior dispersion base epoxy resin base polyurethane base aluminium paint bituminous solution bituminous emulsion bituminous combination paint	min. 40 min. 80 min. 40 min. 40 min. 40 min. 200 min. 200 min. 120		8 2 14 14 8 14 24 14	4 - 6 1 1/2 4 3 4 - 6 12 .	1 1/2 . 2 1 1/2 1 1/2 . . .	

The drying time is to be fixed in relation to the binder and the thickness of the film.

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APPENDIX 2

	<i>Soundproof and heat-insulating products</i>						
8	Bituminous emulsion for insulation PVA sound insulation	min. 2000 min. 2500		48 48	24 24	- -	- -
9	<i>One-coat paints</i>	min. 130		14	8	3	-
10	<i>2-coat system</i> anti-corrosion priming paint finishing paint zinc powder paint	min. 60-70 min. 60-70 70		14 8 2	6 4-6	1 1 1/2	- -

per coat

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APPLICATION

As from 1st July 1979.

All Railways in the Union.

RECORD REFERENCES

*Headings under which the question has been dealt with :*

- Preparation of Specifications for paints for vehicles.  
(Sub-Committee for Specifications : Paris, January, 1975).
- Revision of UIC Leaflet 842-4 "Protection against corrosion and painting of wagons and containers".  
(Sub-Committee for Specifications : Paris, January, 1979).