TBY

TECHNICAL REGULATIONS

FOR

SURFACE TREATMENT

Edition: 3

This document has been produced jointly by the Swedish nuclear power utilities Barsebäck Kraft AB, Forsmarks Kraftgrupp AB, OKG AB, Ringhals AB, Svensk Kärnbränslehantering AB and Teollisuuden Voima Oyj.

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LIST OF REVISIONS - TBY

Edition	Reason for revision	Applicable pages	Date
1	-	Revision of the entire document	2002-11-07
2	SKB partaking, general revision exclusive annex 1 -8. Chapter 2 is revised totally	Entire document	2007-11-30
3	General revision	Entire document	2013-12-31

0 INTRODUCTION

0.1 BACKGROUND

The present painting specifications and approved paint systems for the Swedish and Finnish nuclear power stations were drawn up in the 1960s and 1970s. Since then, new experience has been acquired, and new environmental legislation has been introduced. This has meant that, for example, several types of paint or paint systems are no longer available for use in nuclear power plants. In addition to national standards, there are also several requirements that are specific to nuclear power plants that must be fulfilled.

The TBY project was started in 1995, bringing together the Swedish nuclear power plant operators (BKAB, FKAB, OKGAB and RAB) and the Finnish (TVO). Its objective has been to develop appropriate test programmes, to set requirement levels and to ensure that the necessary tests are carried out and evaluated. In 1998, agreement was reached that this cooperation should be extended through the production of a joint performance specification and regulations document on surface treatment. SKB AB is partaking from year 2007. Barsebäck NPP is under decommissioning and it will not be in future actively partaken in updating TBY but it will be used in need.

0.2 OBJECTIVE

The objective of TBY is that the provisions should be applied by the licensees / plant owners for surface treatment in connection with:

- procurement of surface treatment for new nuclear power stations and nuclear storage units
- maintenance work and modernisation / upgrading of buildings
- maintenance work and modernisation / upgrading of process equipment

TBY is part of the PAKT documentation for Swedish nuclear power plants.

0.3 TECHNICAL DATA

Important sources used in the preparation of TBY include:

- USASI N5.9-1967
- VAST Målning i kärnkraftanläggningar, Rapport från VAST-Vattenfalls arbetsgrupp, April 1971
- ANSI N5.12-1974
- Instruktion I-1417, Ytskyddsföreskrift, OKG
- SV-bestämmelse BK – 002:1, stålmålning, Vattenfall
- SV-bestämmelse BK004:1, byggnadsmålning, Vattenfall
- TVO I och TVO II, målningsbeskrivningar
- TR Teknisk Rapport RF 74-46, 74-39, Tekniska bestämmelser för korrosionsskydd av metalliska material, Asea-Atom
- RM 87-69, Korrosionsskyddsstandard för utrustningar som levereras av Asea-Atom för samtliga svenska kärnkraftverk, OL1, OL2 samt CLAB

- Asea-Atom Nuclear Power Companies' requirement specifications for non-metallic technical products
- StBk-N5, Tunnplåtsnorm 79. Statens Stålbyggnadskommitté Stockholm 1980
- Hus AMA and AMA Hus
- Rakennustöiden yleiset laatuvaatimukset (RYL)
- BSK
- SS-EN ISO 12944, Paints and varnishes - Corrosion protection of steel structures by protective paint systems
- STUK / YVL-guide 1.8, 4.1 and 4.2, Radiation and Nuclear Safety Authority of Finland
- EUR, European Utility Requirements for LWR Nuclear Power Plants, Volume 2, Chapter 6, Rev. C, State 04
- NRC Generic Letter 98 - 04
- USNRC Regulatory Guide 1.54, Revision 2, October 2010
- STUK-YTO-TR 179, 2001
- STUK-YTO-TR 210, 2004.
- SS-EN 1993-1-8:2005 (Eurocode 3)
- Reference list of the detailed standards, see Appendix 4.
- Feedback of experience from surface treatment in nuclear power plants

0.4 APPLICATION

- TBY must be used in connection with the erection of new nuclear units
- TBY must be used for maintenance works and changes to plants.
- TBY must be used in connection with the erection of new buildings and for their process equipment.
- TBY must be used, where applicable, together with other technical regulations.
- TBY may also be used as guidance for work and equipment not specifically covered by the specified application areas.

0.5 ADMINISTRATION AND UPDATING

- TBY must be updated. All updating must be done in consultation with the respective owners who are part of the Surface Protection Group. During revisions, new standards and feedback must be introduced into the regulations.
- There must be documentation of approved paints and paint systems and this must be revised after updating of the regulations.

0.6 TO PAY ATTENTION TO THE ENGLISH AND FINNISH TRANSLATIONS

- In case of disputes on the interpretation of the Finnish or English translation of this instruction, the Swedish version applies.
- When the Swedish or English version refers to SS-EN standards, the Finnish version refers to SFS-EN standards, when this is possible.

In case of interpretation disputes, the Swedish version applies.

1 RECOMMENDATIONS FOR CHOICE OF MATERIALS, SURFACE TREATMENT AND CONSTRUCTIVE DESIGN

The TBY instructions, Technical Regulations for Surface Protection, comprise recommendations for choice of materials, methods of surface treatment, constructive design considerations, quality assurance and documentation of and for **surface treatments**.

Within controlled zones, it is assumed that floors, walls and ceilings in buildings are made mainly of concrete and carbon steel. Lightweight concrete, gypsum board or similar materials shall be avoided, but can be allowed (in respect of radioactive considerations) in areas with very low classified ratings.

When specifying materials and types of treatment, items shall be first classified in respect of their required **Painting Class**, followed by room category, radiation zone, environmental class, moisture and temperature conditions, as set out in Chapter 2. See Chapters 5 and 6 for further details of the types of treatment, together with the application areas in 6-1, 6-2 and 6-3.

1.1 DESIGN OF ITEMS TO BE GIVEN ANTI RUST TREATMENT

1.1.1 General

The results, in terms of obtaining the required level of anti rust protection of surfaces that are to be provided with such protection by painting, are very dependent on the condition of the surfaces and physical elements of their design. It is therefore very important that the design of parts should be such as to ensure that not only pre-treatment prior to painting, but also application of the anti rust coating itself, can be carried out in the prescribed manner. The recommendations in SS-EN ISO 12 944-3, Edition 1 Annexes A D must be observed. For structures etc. in very aggressive environments, the **Good** category is a minimum requirement.

Any and all weld spatter, slag, sharp edges and burrs must be removed before the item is passed for painting.

It is important that the manufacturing documents clearly indicate which surfaces are to be painted, and what type of treatment (S1 etc.) they are to be given. Documents should also show which surfaces are NOT to be painted, if there are any such surfaces. Indicate too, if necessary, how surfaces are to be protected against damage caused by blasting.

Parts or objects which, after assembly or installation, have surfaces that are not accessible for technically correct pre-treatment and painting must be finish painted before they are assembled or installed. If this is not done, the prescribed anti rust protection will NOT be achieved. In addition, the painted surface on parts that have been painted after assembly, installation etc. will usually be destroyed if the parts etc. are subsequently removed or dismantled.

Painting of bolts and nuts with a view to protecting them against rust must be avoided; as such, painting does not provide good rust protection. If, nevertheless, painting is prescribed, it is essential that the thickness of the paint applied to nuts and the heads of

bolts must not be so much that the spanners needed to tighten them no longer fit. Note, too, that paint on the threads can cause the joint to seize.

It is of the utmost importance that all parts are inspected and approved for painting by a duly authorised person before being passed to the paint shop.

1.1.2 Requirements in respect of unmachined surfaces

Unmachined surfaces to which surface protection is to be applied after pre-treatment must meet the following requirements in respect of the amount of rust in accordance with SS-EN ISO 8501 1:2007, Edition 2.

a) Not worse than Rust Grade B for all internal surfaces of tanks or items belonging to Painting Class IV.

b) Not worse than Rust Grade C for other surfaces.

1.1.3 Constructive design considerations

Unless there are design considerations to the contrary, parts etc. shall be designed/constructed with smooth surfaces with good accessibility for blasting and painting. Round and/or rectangular sections are preferred over other sections, such as T, L or U profiles. If such profiles (T, L or U etc.) have to be used, they must be arranged if possible so that water cannot remain in them. Pipe sections must always be seal welded at the ends as well.

Drainage holes and holes between reinforcing springs and the reinforced section must be sufficiently large - to enable sandblasting of the edges - and any "cavities" accessible. If possible, gaps should be seal welded.

Cavities that are not accessible for blasting, cleaning and/or painting shall be closed if possible so that moisture cannot find its way into them. If closure cannot be accepted, necessary drain holes must be provided and an approved alternative means of rust protection must be prescribed for the cavity. (Note that 'approved', as used here, means approved by an appropriate person within the respective nuclear power station organisation.) The required intervals for inspection and renewal of temporary rust protection shall be specified, e.g. on drawings.

Containers, pipes etc. should be designed so that they can be completely emptied.

Containers, pipes etc. should be provided with the necessary manholes of such a size as to permit maintenance work to be carried out in the container, pipe etc. See AFS 1985:10, Manholes in Certain Containers. In Finland, Finnish regulations are to be used

Intermittent welds shall be avoided. Open gaps on items in Painting Class IV cannot be accepted. Holes and gaps etc., provided for painting of inaccessible surfaces, such as tack welded joints, in steel and cast parts in Painting Classes I, II, III and VI shall be sealed with an elastic sealant based on Class 20 HM polyurethane as given in Table ZSB11/1 in AMA Hus 11. Gaps in objects in Painting Class V need not be sealed.

Parts made of materials having a considerable difference in their electrochemical potential must be electrically insulated from each other in order to avoid galvanic corrosion. In certain cases, such insulation may be effected by partly or completely painting the more noble metallic part: see the Swedish Corrosion Institute's Bulletin no. 107, Guide to Anti rust Protection Painting, page 22, 1999.

Surfaces to be protected from rust by painting must be sufficiently smooth to allow the paint to be applied to the specified thickness. Generally, undamaged surfaces of metal plate that fulfil the requirements concerning the amount of rust as set out in Section 1.12 can be accepted as far as their smoothness prior to blasting is concerned.

Cut and punched surfaces may need machining to an acceptable smoothness as follows:

a) Objects in Painting Class IV: Edges and surface irregularities shall comply with SS-EN ISO 12 944 3:2007, Edition 1 "Preparation Grade 2".

b) Painted surfaces that are masked or protected, e.g. edges of welded plates, shall comply with SS-EN ISO 8501-3:2007, Edition 1, "Preparation Grade 2". The same requirements apply for items in Painting Classes I, II, III, V and .

In general, all burrs and flash must be removed, and the surface must be machined or treated so that the necessary rust protection in accordance with the applicable requirements can be applied. Welds must normally fulfil quality class C in SS-EN ISO 5817, Edition 2. In the case of items belonging to Painting Class IV, welds must normally fulfil quality class B in SS-EN ISO 5817, 2007, Edition 2.

Note:

1 References to quality classes as given above relate only to requirements in respect of rust protection. Higher requirements may apply in respect of strength.

2 Drawings must show the quality class that fulfils the requirements applicable in each particular case.

After blasting for painting, surfaces shall have a surface roughness classed as 'Medium' in SS EN ISO 8503-2, Edition 2. Surfaces that have been worked by a chip cutting process, and which are unsuitable for painting, or which must not be painted for some other reason, shall be protected against rust by some other approved method.

Fasteners shall be fitted with washers both under bolt heads and under nuts in order to prevent unnecessary damage to paint when tightening the fastener.

Support legs and other parts welded to austenitic stainless steel containers should be made of the same type of material as used in the container. This is because if ordinary carbon steel is used for such parts, damage to the rust protection coating usually occurs during transport and/or erection, so that the damage has to be made good after erection. The total cost of the cheaper carbon steel parts plus repair and maintenance of the rust protection probably ends up higher than if the parts had been made from austenitic stainless steel in the first place.

1.1.4 Showing regulations on manufacturing drawings

Requirements such as those set out above in 1.12 and 1.13 must be shown on the respective drawings or by reference to the relevant documents in which the requirements are specified. It is important that the information shown on drawings is checked by a person or persons familiar with the requirements and performance of painting.

1.2 RECOMMENDATIONS FOR CHOICE OF MATERIALS AND METHOD OF SURFACE TREATMENT

1.2.1 General

See Chapters 5 and 6 and Table 6-1. Table 6-1 and Table 6-3 for more detailed descriptions of the types of surface treatment and painting (if required) of hot-dip-galvanized parts. The sections below give some guidance on the choice of materials in other applications.

1.2.1.1 Aluminium parts

a) Steps, ladders and rails (but not in the wet areas of the strainer plant, pump sumps or the wetwell.)

b) Certain grating walkways or grating plates in the drywell and in the strainer building.

1.2.1.2 Austenitic stainless steel parts

a) Sheet cladding, including welding plates etc. in the wetwell and in pools, ponds, basins etc. containing de-ionised water.

b) All steel structures including penetrations, MCT frames, cable ladders etc. in the wetwell. Departures from this requirement can be considered for grating walkways.

c) Pump sumps for active media.

d) SMO 254 steel, having a high molybdenum content, may be used as an alternative to internal rubber coating of pipes.

1.2.1.3 Hot-dip-galvan*i*zed standard parts

a) Parts such as grating walkways, gratings, cable ladders, ventilation ducts, ventilation air intakes, lifting eyes and pulling eyes.

b) Outdoor steel structures, e.g. in transformer bays, projecting roofs etc.

c) Thin sheet outdoors, e.g. cover-plates, ventilation covers, sheet in hatches, entrances or doors, facade cladding etc., all in combination with painting.

1.2.1.4 Painted steel structures

a) Floor/ceiling support structures, ceiling/roof beams, crane rails, hoist rails and cranes.

b) Pipe penetrations, pipe sleeves.

c) Lifting and pulling eyes.

d) Welding plates.

e) Rails, steps and ladders in pump sumps and in the wet areas of the strainer plant.

f) Fire doors, covers and other doors.

g) Cast parts such as drainpipes, gearboxes (on cranes and lifting devices), cooling fins (e.g. on electric motors) and pump parts.

h) Process equipment, such as pipes, pipe parts, valves, pumps, tanks, pressure vessels, stays and supports, i.e. essentially all equipment in a process system.
Hot pipes - insulated or uninsulated - must be painted, see Table 6-3. Main steam pipes are hereby an exception.
See item 1.2.1.8 and section 1.3 for information on HVAC and sanitation equipment, electrical equipment and standard components.

1.2.1.5 Rubber-coated parts, structures etc.

It may be necessary to apply rubber coating to parts when other forms of surface protection, such as painting, do not provide the necessary protection or are not optimum on the basis of some other consideration. When deciding on rubber coating, tests must always be carried out to determine whether the coating is appropriate from the point of view of its resistance to ionising radiation, e.g. whether it suffers from accelerated ageing, or can be decontaminated etc.

Soft rubber coatings

Soft rubber coatings may be used according as given below:

- The turbine condenser inlet and outlet chambers.
- Tanks, strainers, filters, pressure vessels and piping systems subject to mechanical loads, heavy chemical attack and/or in combination with high temperatures, but not over +80 °C.
- Piping systems containing seawater.

Note: It may not be feasible to apply rubber protection to small-bore piping systems, due to the design arrangement.

Hard rubber coatings

Hard rubber coatings can be used, for example, for piping systems containing seawater. However, the aspects below should also be considered for this area of application.

Note, hard rubber is very sensitive to rapid temperature changes and to external damage. Particular care is required when transporting and during assembly/erection at low temperatures.

1.2.1.6 Hot-dip-galvanized structures and parts

Hot-dip galvanizing may be selected to some extent as an alternative to painted structures: see table 6-2 and 6-3. See 1.2.1.2 above for requirements relating to steel structures in the wetwell.

Zinc flame spraying of structures must be considered from case to case. It is unsuitable for use within controlled zones (see Chapter 2). When flame-spraying zinc, the purity of the metal should be 99,99 %. See also SS-EN ISO 2063:2005, Edition 1.

Electrolytically zinc plated parts should not be chosen, unless they are standard products supplied as off-the-shelf items and intended for use in dry areas. See the table in Section 1.2.1.9 for information on areas where electrolytic coatings can be accepted.

Electrolytic zinc coatings must fulfil the requirements of SS-EN ISO 2081:2008, Edition 1, Service condition 2 (Annex C table C.1). Electrolytically zinc coated threaded steel parts must fulfil the requirements of SS-EN ISO 4042 Edition 1 or an equivalent standard. The thickness of the coating, in combination with the chromating, should be in accordance with Category Fe/Zn/12 Class 2 (C, D or Bk) in table B.2, Annex 2.

Note that there is a risk of hydrogen embrittlement with electrolytic zinc coating.

1.2.1.7 Parts in/of cooling water inlets and outlets

Strainer equipment such as manholes, pumps, etc. should not contain hot-dip-galvanized parts or hot-dip-galvanized that are then painted parts.

Apply surface treatment in the form of painting as shown in Table 6-2 and Table 6-3. When deciding on the type of paint system, consider the requirements and/or effects of additional corrosion protection in the form of cathodic protection (sacrificial anodes or impressed current).

Fasteners for products in cooling water inlets and – outlets (bolts, washers and nuts, but excluding expansion bolts and their associated parts), can be accepted with hot-dip galvanizing in accordance with the highest environmental class of SS-EN ISO 10684:2004, Edition 1, possibly also in combination with painting after erection. The requirements of SS-EN ISO 1461, Edition 2, shall be applied for washers and nuts.

Expansion bolts and their associated parts must be made of stainless steel material to SS 142343 Edition 14, or of equivalent material in respect of corrosion performance.

1.2.1.8 HVAC and sanitary equipment

Wherever possible, standard-finished equipment or equipment finished in accordance with the requirements of AMA VVS&Kyl 09 shall be used. Note, however, the requirements of Section 1.3.

However, the following requirements apply for the cases listed below:

a) Carbon steel, in areas where it is exposed to constant condensation or a relative humidity of more than 90 % (i.e. Painting Class IV), must be surface-treated in accordance with treatment types S2, S3 or S4. See Table 6-2 and Table 6-3.

b) Carbon steel pipes that will not be insulated must be surface-treated in accordance with treatment types S9 or S12.

c) Brackets and support devices in environments as in a) above must be surface-treated in accordance with treatment type 8.

The thickest possible zinc coating must be applied to threaded parts, e.g. pipe hangers. Layers thinner than Fe/Zn12 in accordance with SS-EN ISO 4042, Edition 1, must be avoided. Parts shall also be chromated in accordance with one of alternatives Class 2 (C, D or Bk) in table B.2, Annex 2.

Fasteners for HVAC equipment (bolts, washers and nuts), excluding expansion bolts and their associated parts, can be accepted with hot-dip galvanizing in accordance with SS-EN ISO 10684:2004, Edition 1, possibly in combination with painting after assembly. For Painting Class IV or Corrosivity Category C5-I in SS-EN ISO 12 944-2, Edition 1, stainless steel (SS 142343 Edition 14) fasteners must be used.

1.2.1.9 Fasteners

The term 'fasteners', as used here, includes all types of bolts, nuts and expansion bolts. It is essential to provide anti-rust protection for all parts in order to ensure an acceptably slow rate of corrosion and/or to prevent rust products from spreading to, say, painted parts.

Where there are bolted joints on painted parts, it is essential to place washers under both the head of the bolt and the nut in order to prevent unnecessary damage to the surfaces when the joint is tightened.

The most suitable method of rust protection of fasteners for each of the nuclear power stations seems to be hot-dip galvanizing as described below. The other methods - electro-galvanizing, anti-rust painting and the use of anti-rust oils - should be seen as alternatives that may be considered under certain circumstances.

Hot-dip galvanizing

Bolts must be zinc-plated in accordance with the requirements in SS 3192, Edition 3 (see asterisk 3 in Table 1- 1). The zinc thickness must be Class 3 or 4, using the maximum possible zinc thickness as given for the particular bolt size.

Nuts and washers must be zinc-plated in accordance with the requirements in SS-EN ISO 1461:2009, Edition 2.

Electro-galvanizing

Electro-galvanized parts should be avoided. However, fasteners smaller than M6 are not available in hot-dip-galvanized versions, and so electro-galvanized fasteners can be considered as alternatives. However, the first choice is to see whether stainless steel fasteners can be obtained.

If electro-galvanized parts are selected, then the galvanizing shall be in accordance with the requirements in SS-EN ISO 4042, Edition 1. The thickness of the surface coating should be according to Fe/Zn12 class 2 (SS-EN ISO 2081:2008 Edition 1), in combination with chromating in accordance with one of categories C1 - C4, A – D or Bk in accordance with table B.2 in annex B (SS-EN ISO 2081:2008 Edition 1).

SS-EN ISO 4042, Edition 1, does not apply to washers. However, washers shall be treated in the same way as described above for bolts and nuts.

Corrosion protection classes

Definition of corrosion protection classes:

Service condition number 2, 12 µm SS-EN ISO 2081:2008 Edition 1 Fe/Zn 12/A or F

Environmental example:

- Indoors in heated areas, with dry air and insignificant contamination.

Service condition number, Class 3, 25 µm SS 3192, Edition 3, *Fe/Zn 25*

Environmental example:

- Indoors in areas with low to moderate humidity, where condensation does not normally occur. Such conditions are encountered in heated or unheated areas, where humidity is below 90 % RH for at least 50 % of the time.

Service condition number, Class 4, 45 µm SS 3192, Edition 3, *Fe/Zn 45*

Environmental example:

- Indoors in areas with high humidity, where condensation can occur.
- Indoor surfaces that are at times partly damp with condensation.
- Outdoor surfaces, in areas protected against precipitation, but where ventilation is so poor that moisture is generally present.
- Outdoor surfaces, in areas not protected against precipitation.
- Unheated areas with poor ventilation.
- Surfaces that are wet due to constant splashing of fresh water.

Painting Class IV (TBY Table 1-2) - Acid-resistant steel (by which is meant SS 142343, Edition 14, or equivalent).

Environmental example:

- Surfaces that are wet due to constant splashing with de-ionised water (the reactor enclosure's condensate room)
- Surfaces that are at times in contact with water, e.g. fastening devices in floors or in various types of foundation, where water can remain in contact with the fastening device.

Anti-rust painting - Fasteners

Painting alone of fasteners shall be avoided.

If, nevertheless, painting has to be selected as the means of rust protection, it is important to inspect, prior to assembly/erection, that the entire surface - but not the thread - of the bolt and of the nut is painted so that it meets the requirements of the particular type of treatment. After assembly/erection, any damaged surfaces must be made good, in accordance with the requirements of the particular type of treatment.

Note: The across-flats dimension of bolt heads and nuts is normally increased so much by anti-rust painting that the prescribed fixed spanner sizes no long fit. It is therefore necessary for the across-flat dimensions to be reduced prior to painting by an amount equal to the thickness of layer produced by the prescribed treatment system. This dimension must be checked and, if necessary, adjusted after the paint has cured/dried.

Think, too, of the risk of seizing if paint is applied to threads. Keep paint, in other words, off threaded parts.

Threads that are not protected in some other way can be protected against rust using some approved anti-rust oil. However, bear in mind that painted surfaces may become more difficult to clean and touch up at some time in the future if the oil somehow finds its way on to them.

Recommendations for choice of coating thickness for various environments

Table 1-1 must be applied to all categories of fasteners for determining an appropriate thickness of zinc on galvanized parts.

Zn layer thickness	**Service condition**	**Painting class** In acc with TBY chapter 2.5.1[1)]	**Env. class** In acc with TBY chapter 2.5.1 [1)]	**Definition**
12 µm	Number 2 [2) 4)]	II, III, V	N1	Normal, dry to moderately damp indoor environment.
25 µm	Class 3 [3) 4)]	II	N2a	Indoors, on surfaces exposed to radioactive contamination.
45 µm	Class 4 [3) 4)]	IV	N2b	Indoors, on surfaces exposed to radioactive contamination and moisture and condensation
Stainless steel (acid-resistant)	SS 142343 Edition 14	IV	V	Water, unventilated rock chambers etc. and equivalent. Corrosivity category C5-I in SS-EN ISO 12 944-2, Edition 1
25 and 45 µm	Class 3 resp. 4 [3) 4)]	I, IV	R (R1)	Reactor containment Drywell and wetwell
Stainless steel (acid-resistant)	SS 142343 issue14	IV	R (R2)	Reactor containment Condensation areas
45 µm	Class 4 [3) 4)]	VI	U	Outdoors, equivalent to Corrosivity category C4 and C5-M in accordance with SS-EN ISO 12 944-2, Edition 1

Table 1-1 Zinc thickness on galvanized fasteners

Note:

1) See Chapter 2 for a definition of "Painting Class and Environmental Class.
2) According to SS-EN ISO 2081:2008 Edition 1.
3) According to SS 3192 Edition 3. This standard is now repealed but it can be obtained on request from the Surface Protection Group. The reason for citing SS 3192, Edition 3, is the fact that the replacement standard, SS-EN ISO 10684:2004, Edition 1, is difficult to grasp.
4) In floors or on other construction components that are temporarily in contact with residual water, any fasteners must always be in austenitic stainless steel, in accordance with SS 1422343, Edition 14, or equivalent material.

1.2.1.10 Anti-rust oils

Temporary rust protection in the form of rust protection oils must not be used on items that will later be painted to provide rust protection.

Temporary rust protection - for periods of up to a few years - can be provided by application of some form of anti-rust oil. **NOTE** that such oils must be approved by a suitably qualified person/persons on the staff of the nuclear power station.

1.3 ASSESSING SUPPLIERS' STANDARD PAINTING OF COMPONENTS

1.3.1 Areas where standard painting can be accepted

It is essential to determine whether the standard finish of mass-produced, and possibly off-the-shelf, painted parts and components can be accepted in terms of the parts' ability to withstand the environment (moisture, ionising radiation, risk of contamination etc.) in the areas in which they are to be installed. Thus, the object must be classified environmentally according to chapter 2. Approval for standard painting must be granted by the person in charge of surface issues for the respective nuclear power station, or another expert in this area who is consulted by the person in charge. It may be technically and economically preferable to arrange for standard components, too, to be painted with a painting system that is approved for our power station.

Areas in Painting Classes II, III and V that can be defined as Environment Class N1 are dry areas with ionising radiation less than 25 µSv/h. If the conditions in Table 1-2 as well as areas according to a) below are met, the supplier's standard finish can be accepted for equipment to be installed in these areas. The supplier's standard painting may also be accepted for areas belonging to painting classes I (R1, R2), on the condition that the conditions in Table 1-2, as well as according to a) below, are met.
In general, standard painting systems are not permitted to be based on chlorinated rubber or polyvinyl chloride.

The following applies for other areas:

a) The following requirements shall be fulfilled in areas that are exposed to the RPV or to the reactor primary system (including the feed water system and the turbine and condensate systems) in connection with refuelling or service:

   Paints and paint systems that are to be used in painting classes I and II must not normally contain more than a total of 1 % by dry weight of copper (Cu), lead (Pb), antimony (Sb), cobalt (Co), fluorine (F), chlorine (Cl) or sulphur (S). Requirements for zinc are not being introduced, but it shall be limited where possible in process systems.

   The requirement in respect of resistance to ionising radiation, as set out in TBY section 12.2.2 of Chapter 12, shall be verified.

b) Apart from the exceptions as set out in a) above, standard components that have been given anti-rust paint treatment in accordance with the requirements of SS-EN ISO 12 944-1 to 12944-8 can be accepted, if evaluated in accordance with Table 1-2 below. This evaluation can include, for example, reviewing test reports for painting systems. Note, however, the special requirements as indicated by footnotes 1, 2 and 3 to the table.

Painting class as given in TBY	**Env. class** as in TBY Chapter 2.65.2	**Corrosivity class** as in SS - EN ISO 12 944-2, Edition 1	**Durability** SS-EN ISO 12 944-6, Edition 1 Table 1
I	R1	C4[2)3)]	High (>15 years)
I	R2	C4, C5-I	High (>15 years)
II	N1, N2a	C1-C3[2)3)]	High (>15 years)
III	N1,V	C1-C5-I	Assessed from case to case
IV	R1	C4[2)3)]	High (>15 years)
IV	N2b, V, R1, R2	C4-C5-I, C5-M, Im1-3[1)3)]	High (>15 years)
V	N1,N2a	C1-C3	Assessed from case to case
VI	U	C5-M at Ringhals, other NPP C4	High (>15 years)

Table 1-2 Selection of anti-rust protection systems

1) All paints must be of two-component type.
2) For painting equipment in areas in the following radiation zone or room categories:

For B1, B2, F1 and F2, O1, O2, OL1, OL2	**IIIRed/B, IIYellow/C1, IIIRed/C1, IIYellow/C2 and IIIRed/C2**
For R1, R2, R3 and R4	**Yellow/C3, Red/B, Red/C C4, Red/C1**
For B1, B2, F3, O1, O2, O3, Block 0, CLAB	**2Yellow/D, Yellow2/E, Red, 3/B, C, D and E**
OL3	**Under development**

3) Radiation resistance is required, but as the total radiation dose in most cases is considerably less than 106 Gy, verified testing is not normally required for standard-painted components, as most paints can withstand this irradiation. Note, however, the other requirements in Section 1.3.1a.

1.3.2 The tenderer's description(s) of anti rust painting and of extent of inspection

Form no. D.106 (Information for assessing items already painted in accordance with suppliers' standard specifications) must be used for evaluation of the supplier's painting systems and attached to the enquiry.

Generally, form no. D.107 (Inspection report from anti rust painting treatment in accordance with suppliers' standard specifications) is to be presented in the final documentation.

If neither of the above alternatives can be presented, another supplier should be sought. If necessary, the nuclear power station can perform/arrange for the anti rust painting.

2 PAINTING CLASSES, RADIATION ZONES AND ROOM CATEGORIES

2.1 B1, B2, F1, F2, F3, O1, O2, O3, BLOCK 0 AND CLAB

The following class and category classifications conform to those used respective units radiation zones.

2.1.1 Radiation zones

Depending on gamma radiation, plant areas are divided up into the following classes:

Radiation zone	Dose rate
0	<2 µSv/h[1)]
Blue	<25 µSv/h
Yellow	25 -1000 µSv/h
Red	>1000 µSv/h

Table 2-1

4) This limit applies only for uncontrolled areas (see Table 2-3) There are additional dose restrictions where permanent or temporary workplaces are directly adjoining walls facing controlled areas. In such areas, the dose rate may not exceed 0.5 and 1.5 µSv/h respectively.

2.1.2 Room categories

Areas are divided up into the following categories in Table 2-2, depending on the risk of radioactive contamination.. In table the term " radioactive contamination" means both airborne radioactive contamination and loose radioactive material on the surfaces.

Room category	Risks
A	No risk of radioactive contamination
B	Little risk of radioactive contamination
C	Potential risk of radioactive contamination but not D or E
D	Contains components with pressurised reactor steam
E	Contains components with hot pressurised reactor water upstream

Table 2-2 Risks of radioactive contamination

Table 2-3 shows access restrictions to various areas. Designations 0/A to Red E (inclusive) were employed during the project stage and are dimensioned for project planning the surface treatment. In the commissioned blocks, these designations have been replaced by colour coding as shown in the Table 2-4

Radiation zone	**Room category**				
	A	**B**	**C**	**D**	**E**
0	0A	0B			
Blue	BlueA	BlueB	BlueC		
Yellow	YellowA	YellowB	YellowC	YellowD	
Red		RedB	RedC	RedD	RedE

Table 2- 3 Access restrictions

White areas

Yellow areas

Blue areas

Red areas

Irrelevant combination

Uncontrolled areas are defined as Class 0A, while other classes belong to controlled areas.

The following access restrictions apply:

Uncontrolled area:

– white areas unrestricted access

Controlled areas:

– blue areas unrestricted access
– yellow areas restricted access
– red areas restricted access under supervision (normally no access)

2.1.3 Zone limits

	Radiation zones	Surface contamination zones	Airborne contamination zones
Blue	**< 25 µSv/h**	**For tot β: < 40 kBq/m^2** **For tot α: < 4 kBq/m^2**	**< 1 DAC**
Yellow	**25 µSv/h – 1 m Sv/h**	**tot β: 40 – 1000 kBq/m^2** **For tot α: 4 – 100 kBq/m^2**	**1 – 10 DAC**
Red	**> 1 mSv/h**	**> 1000 kBq/m^2** **> 100 kBq/m^2**	**> 10 DAC**

Table 2- 4.

Zone limits are applied by radiation protection when classified commissioned rooms and equipments in units.

2.1.4 Presentation of surface treatment in B1 , B2, F1, F2, F3, O1, O2, O3, Block 0 and CLAB

This table is a summary presentation of the environments of the respective areas.
In turn, applicable conditions determine the choice of type of treatment, as shown in the tables in Chapter 6.

Painting classes	**I**	**II**	**III**	**IV**	**V**	**VI**
Indoors	x	x	x	x	x	
Outdoors				x		x
Room category						
A			x	x	x	x
B	x	x		x	x	
C+D	x	x		x		
E	x	x		x		
Radiation zone						
0[2)]		x	x	x		x
Blue[2)]	x	x		x		x
Yellow[2)]	x	x		x		x
Red[2)]	x[1)]	x		x		x
Environmental class						
N1		x	x			
N2a		x				
N2b				x		
V	x			x		
R1	x			x		
R2	x			x		
U						x
Humidity						
≤ 90% RH	x	x	x		x	
> 90% RH	x	x	x	x		
Under water				x		
Temperature						
≤ 55°C	X	x	x	x	x	
≥ 55°C + steam	x[3)]	x				

Table 2-5

1) max 10^6Gy
2) This radiation level is negligible as far as the paint product is concerned, but not negligible from a decontamination point of view.
3) Paints for use on concrete must fulfil the requirements in 12.2.2 in Chapter 12.

2.2 F1 AND F2

The following class and category classifications conform to the respective block's classification.

2.2.1 Radiation zones

Depending on the external radiation, plant areas are divided up into the following classes:

Radiation zone	Dose rate level, µSv/h
0	< 2 µSv/h [1)]
Blue	< 25 µSv/h
Yellow	25 µSv/h – 1000 µSv/h
Red	>1000 µSv/h

Table 2- 6

1) This limit is only applied for uncontrolled areas (see Table 2- 8).

2.2.2 Room categories

Classification in accordance with the estimated risk of radioactive contamination is as shown in Table 2-7. In the table, the term "radioactive contamination" refers to airborne activity as well as loose surface activity.

Room category	Risks
A	Areas without risk of radioactive contamination
B	Areas with low risk of radioactive contamination
C	Areas with possible risk of radioactive contamination except D below
D	Areas with components containing hot pressurized reactor water before ion exchanger

Table 2- 7 Risks of radioactive contamination

Table 2- 8 shows access restrictions to various areas. Designations 0A to Red D (inclusive) were employed during the project stage. In the commissioned blocks, the colour coding shown in Table 2- 9 now apply.

Radiation zone	**Room categories**			
	A	**B**	**C**	**D**
0	0A	0B		
Blue	BlueA	BlueB	BlueC	
Yellow	YellowA	YellowB	YellowC	YellowD
Red		RedB	RedC	RedD

Table 2- 8 Access restrictions

White areas

Yellow areas

Blue areas

Red areas

Irrelevant combination

Uncontrolled areas are defined as Class 0A, while other classes belong to controlled areas.

The following access restrictions apply:

Uncontrolled area:

– white areas unrestricted access

Controlled areas:

– blue areas unrestricted access
– yellow areas restricted access
– red areas restricted access under supervision (normally no access)

2.2.3 Zone limits

	Radiation zones	Surface contamination zones	Airborne contamination zones
Blue	**< 25 µSv/h**	**For tot β: < 40 kBq/m^2** **For tot α: < 4 kBq/m^2**	**< 1 DAC**
Yellow	**< 25 µSv/h – 1 m Sv/h**	**For tot β: < 40 – 1000 kBq/m^2** **For tot α: < 4 – 100 kBq/m^2**	**< 1 – 10 DAC**
Red	**> 1 mSv/h**	**> 1000 kBq/m^2** **> 100 kBq/m^2**	**> 10 DAC**

Table 2- 9.

Zone limits are applied by radiation protection when classifying commissioned rooms and equipment in units.

2.2.4 Presentation of surface treatment in F1 and F2

This table is a summary presentation of the environments the respective areas are expected to have when dimensioning surface treatment. In its turn, the prevailing conditions determine the choice of type of treatment, as shown in the selection tables in Chapter 6.

Painting classes	**I**	**II**	**III**	**IV**	**V**	**VI**
Indoors	x	x	x	x	x	
Outdoors				x		x
Room category						
A			x	x	x	x
B	x	x		x	x	
C + D	x	x		x		
Radiation zone						
0[2)]		x	x	x		x
Blue[2)]	x	x		x		x
Yellow[2)]	x	x		x		x
Red	x[1)]	x		x		x
Environmental class						
N1		x	x			
N2a		x				
N2b				x		
V	x			x		
R1	x			x		
R2	x			x		
U						x
Humidity						
≤ 90% RH	x	x	x		x	
> 90% RH	x	x	x	x		
Under water				x		
Temperature						
≤ 55°C	x	x	x	x	x	
≥ 55°C + steam	x[3)]	x				

Table 2-10

1) max 10^6Gy
2) The radiation level is negligible as far as the paint product is concerned. However, not negligible from a decontamination point of view.
3) Paints for use on concrete must fulfil the requirements in 12.2.2 in Chapter 12

2.3 R1, R2, R3, R4 AND BLOCK RG

The following class and category classifications conform to those used for Ringhals AB's classification of R1, R2, R3, R4 and Block RG.

2.3.1 Radiation zones

To state the radiological conditions and thus the accessibility, the nuclear power station's areas are divided into radiation zones, which state the external radiation (dose rate) and the risk for contamination.

Depending on ionising radiation, plant areas are divided up into the following classes:

Radiation zone	**Dose rate**
0	<2 µSv/h[1)]
Green	<25 µSv/h
Orange	25 -1000 µSv/h
Red	>1000 µSv/h

Table 2-11

2.3.2 Room categories

Areas are divided up into the following categories, depending on the risk of incidence of airborne activity according to Table 2-12. The risks are assessed based on the activity concentration to be found in the systems that are in the room.

Room category	**Risks**
A	Uncontrolled area
B	Controlled zone, with little risk of airborne radioactive contamination
C	Controlled zone, with possible risk of high concentration of airborne radioactive contamination - C1 Areas containing systems with hot non cleaned up reactor water under pressure - C2 Areas containing components with pressurised reactor water after ion exchanger - C3 Areas containing components with pressurised reactor steam - C4 Other areas in category C

Table 2-12

Table 2-13 shows access restrictions to various areas. Designations 0A to RedC1 (inclusive) were employed during the project stage, and are dimensioned for the project planning of surface treatment. In the commissioned blocks, these designations have been replaced by colour coding as shown in the Table 2-14.

Radiation zone	**Room category**					
	A	**B**	**C, C4**	**C3**	**C2**	**C1**
0	0A	0B				
Blue	BlueA	BlueB,	BlueC, C4			
Yellow	YellowA	YellowB	YellowC, C4	YellowC3	YellowC2	
Red		RedB	RedC, C4	RedC3	RedC2	RedC1

Table 2- 13 Access restrictions, R1, R2, R3 and R4

White areas

Yellow areas

Blue areas

Red areas

Irrelevant combination

Uncontrolled areas are defined as Class 0A, while other classes belong to controlled areas.

The following access restrictions apply:

Uncontrolled area:

– white areas unrestricted access

Controlled areas:

– blue areas unrestricted access
– yellow areas restricted access
– red areas restricted access under supervision (normally no access)

2.3.3 Zone limits

	Radiation zones	Surface contamination zones	Airborne contamination zones
Blue	**< 25 µSv/h**	**For tot β: < 40 kBq/m^2** **For tot α: < 4 kBq/m^2**	**< 0.3 DAC**
Yellow	**25 µSv/h – 1 m Sv/h**	**For tot β: < 40 – 1000 kBq/m^2** **For tot α: < 4 – 100 kBq/m^2**	**< 0.3 – 30 DAC**
Red	**< 1 mSv/h**	**> 400 kBq/m^2** **> 40 kBq/m^2**	**> 30 DAC**

Table 2- 14

Limits are applied by radiation protection when classified commissioned rooms and equipments in units.

2.3.4 Presentation of surface treatment in R1, R2, R3 and R4

This table is a summary presentation of the environments the respective areas are expected to have when dimensioning for surface treatment. In turn, prevailing conditions determine the choice of type of treatment, as shown in the tables in Chapter 6.

Painting classes	**I**	**II**	**III**	**IV**	**V**	**VI**
Indoors	x	x	x	x	x	
Outdoors				x		x
Room category						
A			x	x	x	x
B1	x	x		x	x	
C, C2, C3, C4		x		x		
C1	x	x		x		
Radiation zone						
0[2)]		x	x	x		x
Blue[2)]	x	x		x		x
Yellow[2)]	x	x		x		x
Red	x[1)]	x		x		x
Environmental class						
N1		x	x			
N2a		x				
N2b				x		
V	x			x		
R1	x			x		
R2	x			x		
U						x
Humidity						
≤ 90% RH	x	x	x		x	
> 90% RH	x	x	x	x		
Under water				x		
Temperature						
≤ 55°C	x	x	x	x	x	
≥ 55°C + steam	x[3)]	x				

Table 2-15

1) max 10^6Gy
2) This radiation level is negligible as far as the paint product is concerned, but not negligible from a decontamination point of view.
3) Paints for use on concrete must fulfil the requirements in Section 12.2.2 in Chapter 12.

2.4 OL1 AND OL2

The class and category allocation below agrees with TVO's classification into OL1 and OL2.

2.4.1 Radiation zones

Depending on ionising radiation, plant areas are divided up into the following zones:

Radiation zone	**Dose rate level, µSv/h**
0	≤3 µSv/h
Green	<25 µSv/h
Orange	25 µSv/h - 1000 µSv/h
Red	>1000 µSv/h

Table 2 - 16

2.4.2 Room categories

Depending on the risk of incidence of airborne activity, areas are divided up into the following categories:

Room category	**Risks**
A	Uncontrolled area
B	Controlled zone, with little risk of airborne radioactive contamination
C	Controlled zone, with possible risk of high concentration of airborne radioactive contamination - C1 Areas with systems containing pressurised reactor water prior to ion-exchanger - C2 Other areas in category C

Table 2 - 17

Table 2-18 shows access restrictions to various areas. Designations 0A to RedC2 (inclusive) were employed during the project stage, and are dimensioned for the project planning of surface treatment. In the commissioned blocks, these designations have been replaced by colour coding as shown in the Table 2-19.

Radiation zones	**Room category**			
	A	**B**	**C1**	**C2**
0	0A	0B		
Green	GreenA	GreenB	GreenC1	GreenC2
Orange	OrangeA	OrangeB	OrangeC1	OrangeC2
Red		RedB	RedC1	RedC2

Table 2 - 18 Access restrictions OL1 and OL2

White areas

Orange areas

Green areas

Red areas

Irrelevant combination

Uncontrolled areas are defined as Class 0A, while other classes belong to controlled areas.

The following access restrictions apply:

Uncontrolled area:

– white areas unrestricted access

Controlled areas:

– green areas unrestricted access
– orange areas restricted access
– red areas restricted access under supervision (normally no access)

2.4.3 Zone limits

	Radiation zones	Surface contamination zones	Air contamination zones
Green	**< 25 µSv/h**	**For tot β: < 40 kBq/m^2** **For tot α: < 4 kBq/m^2**	**< 0.3 DAC**
Orange	**25 µSv/h – 1 mSv/h**	**For tot β: 40 – 400 kBq/m^2** **For tot α: 4 – 40 kBq/m^2**	**0.3 – 30 DAC**
Red	**≥ 1 mSv/h**	**For tot β: > 400 kBq/m^2** **For tot α: > 40 kBq/m^2**	**≥ 30 DAC**

Table 2 -19

Limits applied by radiation protection when classifying commissioned rooms and equipment in units.

2.4.4 Presentation of surface treatment in OL1 and OL2

This table is a summary presentation of the environments the respective areas are expected to have when dimensioning for surface treatment. In turn, prevailing conditions determine the choice of type of treatment, as shown in the tables in Chapter 6.

Painting classes	**I**	**II**	**III**	**IV**	**V**	**VI**
Indoors	x	x	x	x	x	
Outdoors				x		x
Room category						
A			x	x	x	x
B	x	x		x	x	
C1 and C2	x	x		x		
Radiation zone						
0[2)]		x	x	x		x
Green[2)]	x	x		x		x
Orange[2)]	x	x		x		x
Red	x[1)]	x		x		x
Environmental class						
N1		x	x			
N2a		x				
N2b				x		
V	x			x		
R1	x			x		
R2	x			x		
U						x
Humidity						
≤ 90% RH	x	x	x		x	
> 90% RH	x	x	x	x		
Under water				x		
Temperature						
≤ 55°C	x	x	x	x	x	
> 55°C + steam	x[3)]	x				

Table 2 - 20

1) max 10^6Gy
2) This radiation level is negligible as far as the paint product is concerned, but not negligible from a decontamination point of view.
3) Paints for use on concrete must fulfil the requirements in Section 12.2.2 in Chapter 12.

2.5 OL3

Painting classes, radiation zones and other general requirements for surface treatment are defined in separate room descriptions for each building.

2.6 COMMON CLASSIFICATIONS FOR ALL PLANTS

2.6.1 Painting classes

Class	Example of area
I	Reactor containment only
II	Areas within controlled zones
III	Areas outside controlled zones
IV	Areas with high humidity (> 90 % RH), and areas either intermittently or constantly under water or at times covered with condensation, within or outside controlled zones
V	Office areas etc.
VI	Outdoors

2.6.2 Environmental requirements

Definition of ABB Atom's environmental classes.

Environmental class N1
Normal, dry to moderately damp indoor environment. No risk of condensation on painted surfaces.
Corrosivity Category C1 or C2 in accordance with SS-EN ISO 12 944-2, Edition 1.

NB: My be applied in areas belonging to radiation zones, according to below, in which the normal dose rates are less then 3 Sv/ h.

B1, B2, F1, F2, F3,: O1, O2, O3, Block 0, CLAB	0/A, 0/B, Blue/A, Blue/B, Yellow/A, Red/B and Red/C
OL1 and OL2:	0/A, 0/B, Green/A, Green/B and Red/B
OL3:	**-**
R1, R2, R3 and R4:	0/A, 0/B, Blue/A, Blue/B, Yellow/A, Yellow/B, Red/B and Red/C,C4

Environmental class N2a

Indoors on surfaces exposed to radioactive contamination.
Corrosivity Category C1, C2 or C3 in accordance with SS-EN ISO 12 944-2, Edition 1.

NB: For application in areas belonging to all radiation zones if there is no risk of condensation on painted surfaces.

Environmental class N2b

Indoors on surfaces exposed to radioactive contamination and to moisture and condensation.
Corrosivity Category C4 in accordance with SS-EN ISO 12 944-2, Edition 1.

NB: Environmental class N2b includes areas and surfaces in/on which there is always (or at least intermittently) risk of high relative humidity (> 90 % RH) and a risk of condensation. This environmental class may be applied in areas belonging to all radiation zones.

Environmental class V

Water, unventilated rock caverns etc., equivalent to environmental class C4, C5-I, C5-M or Im1-3 in accordance with SS-EN ISO 12 944-2, Edition 1.

NB: Painted surfaces must normally be in contact with water or oil, which may contain moisture. This classification may be applied in areas belonging to all radiation zones.

Environmental class R1

Environmental class R1 includes only the reactor containment's upper and lower drywells.

Environmental class R2

Environmental class R2 includes only the reactor containment's condensation areas.

Environmental class U

Outdoors, corresponding to environmental class C5-M in Ringhals and C4 in Barsebäck, Oskarshamn, Forsmark and Olkiluoto in accordance with SS-EN ISO 12 944-2, Edition 1.

3 SURFACE PROTECTION IN THE BUILDING PARTS

3.1 GENERAL

Where there is any reference in this chapter to requiring approval from the respective licensee/plant owner, or its authorised representative, this means that such approval must be given by the respective unit's authorised person responsible for surface protection.

3.1.1 Validity of these documents

These instructions set out requirements for surface treatment and protection of concrete, lightweight concrete, plaster, brickwork, sheet materials, wood and steel.

Limitations in the application of the regulations set out in this document, or departures from them, can occur in certain cases. To be valid, all changes must be specified in writing and must be signed by an authorised person.

In the event of conflicting details, these documents shall apply in the following order.

a) contract or other purchasing document
b) changes in these instructions issued by the respective licensee/plant owner
c) these instructions, with associated appendices
d) room descriptions
e) Chapter L in AMA Hus 11 for plants in Sweden, or MaalausRYL, 2012 for plants in Finland.

3.1.2 General regulations

As used in these documents, **'Purchaser'** means the respective licensee/plant owner and/or its/their main or general contractor. Before starting to apply surface protections to roofs, walls and floors, the surfaces shall be inspected by the surface protection contractor and the Purchaser's representative. The purpose of this inspection is to ensure that the surfaces to be treated are equivalent to the reference surfaces, and that any other necessary conditions, such as scaffolding, electricity supply, lighting, air humidity, humidity of materials and temperature, are fulfilled.

Records of these pre inspections shall be kept on form no. D.111, Inspection of concrete surfaces before painting. By approving the surface to be treated, the surface protection contractor accepts technical and economic responsibility for ensuring that the standard of the finished surface will be equivalent to that of the reference surfaces, and also checks the requirements of the applicable regulations.

Paint tins have to be marked according to NPP`s regulations.

All temporary storage places for paint products, regardless of where they are, must be approved by the Purchaser. In doing so, the Purchaser will pay particular attention to the flammability of the products and to the temperature of the area in which they are stored.

When carrying out painting in the respective licensee/plant owner's plants, the surface protection contractor shall be responsible for all transport of paint products to each

working area, and shall also be responsible for ensuring that all packaging materials, empty paint tins, anti splash cover sheets etc. shall be removed without delay to a place etc. indicated by the Purchaser. The surface protection contractor is responsible, both in terms of action and of cost, for ensuring that hazardous waste is properly disposed of in accordance with the requirements of regulations and any instructions issued by the Purchaser.

The extent of documentation to be prepared and submitted to the respective nuclear power station is set out in Section 8.1.1of Chapter 8. The following is a summary presentation of the forms available.

The surface protection applied shall be documented by the contractor on the form intended for the purpose as below:

- Before the work is started, the intended materials shall be discussed with the contractor in order to reach agreement on how the various forms are to be filled in.
- In the case of items, areas etc. to be painted, specified in Sections 4.1.2 a) - g), and of items/surfaces situated in areas that are open to the reactor pressure vessel or to the reactor primary systems (including the feed water system and systems connected to the turbine or condenser system) in connection with refuelling or service, and/or objects/surfaces that require special and/or complicated pre-treatment and painting processes, **a separate inspection plan must be prepared**, using form no. D.109, Inspection plan painting.

  An inspection plan shall also be prepared for fire protection painting, and must be approved by the respective nuclear power station(s) or its/their authorised representative(s) in order to be valid.

Concrete painting:	Form no. D.102, Report for paint inspection building concrete painting most be filled in for items belonging to painting classes I, II and IV. Form D.118 For coatings with the coating types G1-G6b, G9a,G9b, G11 and G12 must be filled in.
Steel painting: (When applied in the respective rooms)	Form no. D.103, Report for paint inspection building, steel painting for steel surfaces in painting classes I, II must be filled in. Use form no. D.101, Report for anti corrosive painting, for items belonging to painting class IV and those that require fire protection painting.
Steel painting: (As applied in a paint station)	Form no. D.100, Report for anti corrosive painting, and no. D.101, Report for anti corrosive painting, for steel surfaces specified in Section 4.1.2 must be filled in.
Hot dip galvanizing:	Form no. D.105, Report for hot galvanizing must be filled in.
Painting of process equipment	See Section 4.1.2 for items classified as process equipment.

Standard painted mass produced components:	Form no. D.106, Information for evaluation of corrosion protection according to suppliers standard procedure or form no. D.107, Report for performed inspection by anti-corrosive painting according to suppliers standard program must be filled in.

The surface protection contractor shall give notice of inspection of items to the Purchaser **at least three working days** (not Saturdays, Sundays or public holidays) in advance. If this is not done, the surface protection contractor will not be entitled to quote delays caused by delayed surface protection inspection.

Inspection costs resulting from spurious or phantom notices of readiness for inspection, or due to the need for further inspection as a result of failure of work etc. to pass inspection, are borne by the surface protection contractor.

The surface protection contractor is required to contact the respective licensee/plant owner immediately if it is not possible to comply with any aspect of the applicable regulations.

A discrepancy report must be prepared by the surface protection contractor if it is not possible to comply with any aspects of the applicable regulations, and must be approved by the respective nuclear power station'(s') authorised representative(s) in order to be valid. Use form no. D.104, Non-conformity report.

The quality of materials and workmanship must be such that, at the end of the guarantee period, the quality of paint finishes in painting classes I and II must not be less than the following values:

Paint applied to concrete, lightweight concrete, brickwork and plaster:

Crack formation	0(S0)	SS-EN ISO 4628-4:2004, Edition 1
Blister formation	1(S2)	SS-EN ISO 4628-2:2004, Edition 1
Flaking	0(S0)	SS-EN ISO 4628-5:2004, Edition 1
Adhesion/ Surface tensile strength values		As Table 3- 1

For anti rust painting:
See Section 4.1.2.

3.2 REQUIREMENTS RELATING TO MATERIALS AND SUPPLIES

3.2.1 General

The regulations relating to materials and supplies are identical for both 'Surface protection in the building parts' and 'Surface protection in process parts'.

If the paint manufacturers introduce new types of paint, which would be of interest to the respective nuclear power station(s), the products shall be tested (verified testing) to show that they fulfil the respective nuclear power station'(s') requirements, as set out in Chapter 12 of this document, MATERIALS AND SUPPLIES: REGULATIONS.

The necessary testing can suitably be carried out, or arranged, by the respective paint manufacturers, in conjunction with the joint Surface Protection Group set up under the terms of the joint cooperation agreement between the power companies.

Testing must be documented in accordance with Test certificate (**Type certificate D.116**), as shown in Chapter 12 of TBY.

In addition, paints etc. approved by the power companies' joint Surface Protection Group shall also be documented by the paint manufacturer in accordance with **form no. D.116 Product data sheet.** Reults from paint tests shall be documented according to the specification in Chapter 12.

Copies of the Test certificates **(Type certificates)** for the paints etc. that fulfil the requirements in the above-mentioned MATERIALS AND SUPPLIES in Chapter 12 of TBY will be archived by the respective nuclear power station(s) through their member of the power companies' joint Surface Protection Group.

The **original** will be archived by OKG's archive department. When a paint etc. or painting system has been approved, it will be included in the relevant section of TBY.

The test certificates (Type certificates) and Product data sheet form D.116 should **NOT** be unnecessarily circulated.

Product data sheets form D.116 for the paints etc. approved by the respective nuclear power station(s), shall be archived as test certificates (type certificates), as above.

THE NECESSARY DOCUMENTATION of the products used for surface protection work, whether for maintenance or for new installation in the respective nuclear power station'(s') blocks, is specified below in Sections 3.2.2 and 3.2.3.

3.2.2 Test records

Deliveries of paint intended for use as surface protection within the building or process areas for the blocks in the respective nuclear power station(s) shall be accompanied by a batch inspection certificate on **form D.117**, Quality control of paint manufacturing, issued by the paint manufacturer.

It is the responsibility of the painting contractor, or of the party ordering the paint, to specify that the above-mentioned test certificate form must be supplied, and to satisfy himself that the delivery fulfils the specified requirements. Forms D.117, as needed for verification, are reproduced in Chapter 10.

Batch inspection certificates on form D.117 shall be included in the inspection documentation for the particular items etc. painted. See also Chapter 8.

3.2.3 Inspection sample

The paint manufacturer shall take a sample, not less than 1/3 litre, of each newly manufactured batch of paint, and shall store it for at least two years.

3.2.4 Approved paint products

Only paint products that meet the requirements of TBY may be used.
Approved paint products are defined in the document Approved Paint Systems for TBY.

3.2.5 Types of treatment for the painting of buildings and/or anti-rust protection painting

See Chapter 5 for details of types of treatment.

3.3 REGULATIONS FOR CARRYING OUT PAINTING WORK

Concrete surfaces

Paint floor, wall and ceiling surface in accordance with the relevant area or room descriptions, and with the instructions in this chapter, with associated specifications of types of treatment.

Steel surfaces

Paint, and apply rubber and plastic coatings to, steel surfaces in accordance with the instructions in Chapter 4, 'SURFACE PROTECTION IN PROCESS PARTS'

Galvanized surfaces

Paint galvanized surfaces in accordance with the instructions in Chapter 4, 'SURFACE PROTECTION IN PROCESS PARTS'.

Painting of wood

Paint wooden sheet materials, carpentry, fittings etc., and carry out external painting work, in accordance with the instructions in this chapter.

Requirements in respect of painting surfaces as above

a) The paint treatments are intended to suit the requirements of the particular environments, in accordance with the conditions as shown in Table 6-1 and Table 6-2.

b) The surface finish must be equal to that of the respective reference surface, which can be found in the Oskarshamn 3 nuclear power station: see Table 3-2.
If necessary, the reference surfaces may be transferred to the respective power stations some time in the future.
If there are no reference surfaces, then such surfaces shall be prepared on the respective substrates and for the respective types of treatment, using approved materials and in such a way as to show the various stages of the work, before painting starts. These reference surfaces shall make up an entire floor, wall or ceiling surface for each type of treatment. In the same way, reference surfaces must

be prepared, representing floor corners, ceiling corners, wall corners, intersection corners of floors and ceilings, external corners, chamfer surfaces, connections to steel door frames and to cast in items.

c) Each layer of paint in one and the same system shall normally be of a different colour. Unless otherwise specified in item 3.3.2, each layer of paint in one and the same system shall be painted with paints etc. from one and the same supplier.

d) Painted surfaces shall be cleaned between application of two consecutive coats if the earlier coat becomes dirty. The choice of cleaning method and materials shall be suited to the type of dirt to be removed, to the type of paint etc. and to local conditions at the site. See also Section 4.5 in Chapter 4.

e) Unless otherwise specified, substrates, painted surfaces and filled surfaces shall be rubbed down before the next layer is applied.

f) Unless otherwise specified in these instructions, recommendations from the paint manufacturers shall be complied with. However, neither the paint manufacturer nor the contractor may modify the applicable instructions without previous permission in writing from the respective licensee/plant owner.

g) Paint shall be applied only to dry surfaces, at temperatures at least +3 °C above the dew point.

h) When using two component or multi component paints, the air temperature must not be less than +15 °C and the relative humidity may not exceed 80 % RH. Some products require lower relative humidity values, together with the use of mechanical dehumidifiers.

i) Single component paints may not be applied at air temperatures below +5 °C or at relative humidity above 85 % RH.

j) Two component paints may not simply be rolled on, but must be smoothed out by a flat brush immediately after application.

k) A basic principle when performing improvement painting on concrete surfaces shall be to restore damaged layers of paint to the same quality and finish as that of the surrounding areas. On visible surfaces, the paint should be continued up to natural boundaries. Improvement/making good painting of non-visible surfaces may be applied in patches, but with straight edges and restricted to as small areas as possible.

l) Smoothing of concrete, lightweight concrete and plaster surfaces, and the application of adhesive for woven fabrics, shall be carried out before setting up liner materials, architraves, skirting boards etc.

m) In offices or similar areas, carry the ceiling paint down about 6 mm on to the tops of walls.

n) Tape and fill joints between gypsum boards at wall/ceiling joints, in corners and where jointing on to concrete etc.

o) Signs etc. must not be painted over.

p) When making good damaged or missing painted areas, make sure that all damaged paint is sufficiently removed in order to ensure that the quality of the finished surface will be the same as that of a newly painted surface.

3.3.1 Quality requirements in respect of finished painted surfaces for site painting of concrete, lightweight concrete, brickwork, plaster, wood, gypsum board and chipboard sheets

All painting must be carried out to a good standard of workmanship.

Colour — Colours shall comply with the colour samples provided by the respective licensee/plant owner, or shall fulfil specified colour values. See also the colour scheme description.

Coverage — Coverage shall be good, with the same colours at edges and on open surfaces.

Quality requirements — The surface of the paint shall not suffer from running, sagging, cracks, crocodiling, crystallisation, flaking, discoloration, mottling, holidaying or other defects.

There may not be any more blisters, pores or craters in the painted surface of concrete surfaces etc. than in the respective reference surfaces, and nor may such defects be any larger than those in the reference surfaces.

Orange peel must not occur other than to only a limited extent. Sandpaper structure is not accepted.

Surface smoothness — The smoothness of the finish painted concrete surfaces shall comply with that of the reference surface.

Surface tensile strength/Adhesion

Surface tensile strength and adhesion shall fulfil the requirements in Table 3- 1 for respective coat of paint (minimum mean values for five test pieces placed on a 50 x 50 cm area). Adhesion test/surface tensile strength is carried out in accordance with 7.1.4.8.

Substrate	**Painting class**	**Minimum mean value in MPa**			**Notes**
		Concrete	**Plaster**	**Repair materials**	
Floors	I, II, IV	2.0		2.0	For treatment types G1-G4 3.0 MPa
Floors	III, V, VI	1.5		1.5	For treatment types G1-G4 3.0 MPa
Walls, ceilings	I, II, IV	1.5	1.5	1.5	Also beams and pillars
Walls, ceilings	III	1.0	1.0	1.0	Also beams and pillars
Walls, ceilings	V	0.5	0.5	0.5	Also beams and pillars

Table 3- 1 Surface tensile strength values and adhesion to substrate and between layers

Type of treatment	Type of shuttering	Room no. for finish-painted surface	Room no. for concrete surface	Room no. For base and fillet radii
G1, G2	Cut steel trowelled concrete	KC01.71	KC01.43	KC01.43
G3, G4	Cut steel trowelled concrete	KC01.71	KC01.43	KC01.43
G5a, G6a	Cut steel trowelled concrete	N1.13[3)]		N1.13
G5b, G6b	Cut steel trowelled concrete	M6.272[5)]		M6.272[5)]
G7a	Steel trowelled concrete	KC01.81	KC01.81	KC01.81
G7b	Steel trowelled concrete	B7.65	KC01.81	KC01.81
G7c	Steel trowelled concrete	B7.29	KC01.81	KC01.81
G9a	Steel trowelled concrete	KD2.54[4)]		KD2.54
G10a	Steel trowelled concrete	KC01.71	KC01.81	KC01.81
G10b	Steel trowelled concrete	KC01.71		KC01.81
V1	Slipform	B01.26	B1.26[1)]	
V2	Panel form	B01.88	B1.26	
V3	Board form	B01.88[2)]	B01.86/ B01.96	
V4	Slipform	B1.34	B1.26[1)]	
V5	Board form	B01.87/B01.97	B01.86/ B01.96	
V5	Panel form	B1.34	B1.26	
V6	Slipform	B1.34	KC01.81	
V6	Board form	B01.87/B01.97	B01.86/ B01.96	
V6	Panel form	B1.34	B1.26	
V7	Slipform	B1.26	KC01.81	
V7	Board form	B01.86/ B01.96	B01.86/ B01.96	
V7	Panel form	B1.26	B1.26	
V8	Slipform		KC01.81	
V8	Board form		B01.86/ B01.96	
V8	Panel form		B1.26	
T1	Panel form	B01.88	B01.88	
T2	Panel form	B1.34	B1.26	
T3	Panel form	B1.26	B1.26	

Table 3- 2 Reference surfaces in O3

1) The local area above the door to room B1.39 has non-compliant surface unevenness.
2) Increase the amount of filler to reduce the number of pores to about half.
3) The shower areas are not included in the reference area. Free area in front of the urinals, and the thick layer of clear varnish in front of the tiled pillar, are not included. This room is situated in the Central Mechanical Workshop building, CMV.
4) The reference area extends only up to the top of the doorframe. The floor and walls are included in the reference area.
   The top coat includes free area, contamination and pores that are not part of the reference surface. This paint is been applied by brush.
5) This room is located in O1/O2 and OKP/2

3.3.1.1 Transport, handling and storage of paints

Handle and store paints in accordance with the paint manufacturers' instructions.

Once it has left the factory, nothing must be added to any paint without the approval of the respective licensee/plant owner and of the manufacturer of the paint.

3.3.2 Standards and quality requirements for completed paint systems for industrial painting of wood and sheet materials

The requirements of SS 056812, Edition 1, apply for industrial painting. Minimum requirements must be fulfilled.

3.3.3 Standards and quality requirements for galvanized and other metallised surface layers

Such coatings shall comply with the requirements set out in the following documents:

SS 3192, Edition 3 Inorganic surface coating - Hot-dip galvanization of threaded steel components This standard is now repealed but it can be obtained on request from the joint Surface Treatment Group

SS-EN ISO 14713-1 Edition 1
Inorganic surface coatings - Zinc coatings - Recommendations for protection against corrosion in iron and steel structures - Part 1: General guidelines for design and corrosion protection (ISO 14713-1:2009)

SS-EN ISO 14713-2 Edition 1
Inorganic surface coatings - Zinc coatings - Recommendations for protection against corrosion in iron and steel structures - Part 2: Hot-dip galvanisation (ISO 14713-2:2009)

SS-EN ISO 14713-3 Edition 1
Inorganic surface coatings - Zinc coatings - Recommendations for protection against corrosion in iron and steel structures - Part 3: Sherardising (ISO 14713-3:2009)

ASTM A 525 M Standard Specification for Steel sheet, Zinc coated (galvanized) by the Hot-dip process, general requirements (Metric)
Hot-dip galvanized steel sheet (Sendzimir process)

ASTM 525 M Standard Specification for General Requirements, Steel sheet, Zinc-coated (galvanized) by the hot-dip process

SS-EN 1993-1-3:2006,Edition 1
Eurocode 3 – Dimensioning of steel structures - Parts1-3: Cold-formed sections and shaped sheet metal

SS-EN ISO 1461:2009, Edition 2
Inorganic surface coatings - Hot-dip galvanised coatings on iron and steel articles - Specifications and test methods (ISO 1461:2009)

SS-EN 1670:2007, Edition 2
Building fittings – Corrosion Protection – Requirements and test methods
Annex A must be applied

SS-EN ISO 10684:2004 Edition 1
Fasteners – Hot dip galvanisation of fasteners (ISO 10684:2004)

SS ISO 2081, Edition 1
Metallic coatings– Electroplated coatings of zinc on iron or steel (ISO 2081:2008)

SS-EN 10169:2010+A1 2012 edition 1 Continuously organic coated (coil coated) steel flat products – Technical delivery conditions

SS-EN 10346:2009, Edition 1
Continuously hot metalized flat products – Technical terms of delivery

SS-EN 2063:2005, Edition 1
Metallic and other inorganic coatings – Thermal spraying – Zinc, aluminium and their alloys (SS-EN ISO 2063:2005). See also item 1.2.1.6.

If some other form of metallic surface treatment than listed above is foreseen, the requirements must be specified from case to case.

3.3.4 Quality requirements in respect of metallised surface layers

If any other metallic surface treatment, as specified in item 3.3.3, is required, details must be specified from case to case.

3.3.5 Industrial painting

Surface treatment of cast iron and steel carried out in the factory shall comply with the requirements of Chapter 4, SURFACE PROTECTION IN PROCESS PARTS. Any departures from these requirements must be approved by the respective licensee/power plant owner.

Any other surface treatment carried out in the factory must be of a quality as approved by the respective nuclear power station(s), complying with SS 05 68 12, Edition 1. Minimum requirements of the standard must be fulfilled.

3.3.6 Painting of buildings

General requirements for casting and pouring concrete, and for its subsequent treatment that can affect surface treatment.

Shuttering release oil, protection, markings etc. must not damage or discolour the finished concrete surface, nor may they discolour or prevent the adhesion of any subsequent surface treatment.

Shuttering release oil must not be used in concrete surfaces that are to receive a subsequent surface treatment in areas belonging to painting classes I or IV. In other areas, shuttering release oil may be used only after approval by the respective licensee/power plant owner.

Membrane curing liquid (shrinkage protection) must not be used on concrete surfaces that are subsequently to receive painting classes I, II or IV treatment. The use of membrane hardening liquid on surfaces in other areas must be approved by the respective licensee/power plant owner before it is used.

When selecting shuttering plywood, the coating film on the sheet must have been tested, with documented results, and shown not to involve any risk of affecting the specified requirements in respect of the surface tensile strength of the concrete. See Table 3- 1.

After striking the shuttering, any pieces of the shuttering, fixing wires, nails, pouring flash etc. must be removed from the surface of the concrete. Indoors, steel strip, nails etc. must be removed to a depth of at least 10 mm, while outdoors they must be removed to a depth of at least 20 mm.

Any surface unevenness that exceed the specified tolerances must be dealt with by grinding down, filling or some other approvable method. Such repairs etc. must be made, using such materials, in such a way that the treated surface fulfils the original specified requirements, and that (as far as possible) visible surfaces have the same structure and colour as the rest of the concrete surface. Only concrete-based fillers, as specified in the 'Approved Painting Systems for TBY' series of documents may be used.

Holes left by shuttering bolts etc. must be filled with cement mortar or some other approvable material, such that the requirements in respect of tolerance, performance and appearance are fulfilled.

3.3.6.1 Preparation of concrete surfaces

Mechanical grinding of concrete wall and ceiling surfaces must be performed such that joints and uneven areas are ground away, and any layers of weak surface material are removed.

Carry out machine grinding of concrete floors in two directions in the form of surface grinding to a depth of about 0.5 mm. If, after such grinding, there is still a cement skin and/or weak surface layers left, remove them by deep grinding to a depth of about 1.5 mm. See Table 3- 1 for values of required surface tensile strength. The extent of machine grinding, in respect of dealing with surface unevenness, shall comply with that of the respective reference surface.

Rout concrete floors with, for example, a rotating cylinder router. The extent of the routing shall be as indicated by the respective reference surface.

Carry out sandblasting of concrete floors using an Autoblast AB-9 sandblasting machine, such that the process removes weak surface layers and achieves a surface smoothness

equivalent to that of the appropriate reference surface. Only use sandblasting material as stated in the document Approved Painting Systems for TBY. A strip about 10 cm wide may be machine ground as above along the foot of walls, around foundations, pillars etc. The extent of blasting shall be indicated by the respective reference surface.

After grinding and, in appropriate cases, milling or blasting, surfaces shall be carefully vacuum cleaned.

3.3.6.2 Painting of concrete, lightweight concrete, brickwork and plaster

General

The moisture content of the material may not exceed the maximum value as specified by the paint manufacturer and as approved by the respective licensee/plant owner.

When applying treatment types G1 G6b, G9a, G9b, G10a and G10b, the relative humidity of the concrete may not exceed 93 % if the air temperature in the room continuously exceeds +20 °C.

The effect of temperature difference is of the order of 0.3 - 0.5 % RF/°C. See report TVBM 1003, Hygroscopic Moisture in concrete – Drying, Measurements&Rolated materials properties moment 10.4, 1980, Division of building Materials Lunds Institute of Technology.

In Swedish power plants, make measurements in accordance with AMA Hus 11 YSC.12. In Finnish power plants, make measurements in accordance with BY 40-2003 Betonipinnat, kappale 6.2. Record results on form no. D.110, Report of moisture measurement.

In the case of other types of treatment, assess the relative humidity in accordance with what is known as the plastic principle, i.e. by setting up a sheet of plastic film, having a diffusion coefficient of 0.15 g/m²h mm mercury, over the surface, one day before painting, and securing it by tape all round its edges. Assess the moisture ratio of the concrete surface about 24 hours later by examining the change in the colour of the surface.

If a surface is not of sufficiently good quality, any weak surface layers must be removed and the surface tensile strength improved by some treatment as approved by the respective licensee/plant owner.

The use of filler and the repair of damaged areas shall be such as to ensure that the resulting surface is similar to, and level with, the surrounding areas.

It is particularly important that any layer of filler is as thin as possible. Remove dust from surfaces before painting or applying filler.

Clean surfaces to remove materials that would interfere with painting, such as oil, grease etc.

If the surface is dirty, the reason for the accumulation of the dirt, and some appropriate means of cleaning the surface, must be decided from case to case, with the method of cleaning being appropriate to the dirt etc.

It is the duty of the contractor to contact the respective licensee/plant owner to obtain approval of the intended method of cleaning.

Surfaces which will become covered, or difficult of access, after erection, shall be finish painted while they are still accessible for painting.

Unless otherwise specified, wall and ceiling surfaces may be spray applied before erection.

During and after erection, or at other times, e.g. during maintenance painting, spray application may be performed only after permission has been obtained from the respective licensee/plant owner.

When applying two component paints by roller, the resulting layer of paint must be smoothed out by a brush immediately after application.

All surfaces shall be painted (regardless of the point from which they are seen) unless it is specifically specified that they shall be left untreated.

Unless otherwise specified, painting of walls and ceiling surfaces shall include the following surfaces: pillars, doorway, window, MCT reveals, recesses that are not to be filled, exposed ends of staircases and floor/ceiling structures shall be regarded as wall surfaces, while waists, beams and ducts in ceilings shall be regarded as ceiling surfaces.

Frames, architraves and edging strips shall be painted in the same colour as their associated gates, doors, hatches and windows.

The tops of concrete crane beams shall be regarded as painted floors.

Treatment of skirting boards and concrete foundations is specified together with the types of treatment for floors. See 5.1.1 in chapter 5.

Minor surface areas, for which specific painting requirements have not been specified, shall be painted to the same quality and with the same finish etc. as that of contiguous specified surfaces.

Coats of paint must be applied within the maximum time specified by the paint manufacturer. If the maximum permissible time, within which the next coat must be applied, has expired, without the next coat having been applied, the entire surface area must be treated in a manner as approved by the respective licensee/plant owner and the paint manufacturer in order to ensure proper adhesion.

3.3.6.3 Painting of carpentry, wood sheet materials etc

Wherever possible, such painting should first be applied as a factory process: see item 3.3.5.

Types of treatment may be only those as approved by the respective licensee/plant owner.

The following general requirements apply for painting at site:

- all accessible surfaces shall be treated.
- unless otherwise specified, all surfaces shall be sanded smooth.
- items etc. with any more serious damage may not be painted until repairs have been made.
- materials having a humidity that exceeds the value allowed by the paint manufacturer, or as approved by the respective licensee/plant owner, must not be painted.
- the humidity of wood shall be measured according to, in Sweden, AMA Hus 11 YSC.122, in Finland according to Maalaus RYL 2012 chapter 1032 in a manner as approved by the respective licensee/plant owner.

In Swedish nuclear power stations, other painting regulations shall be as set out in Chapter LC of AMA Hus 98, while in Finnish nuclear power stations they shall comply with Maalaus RYL.

3.3.7 MASTIC - Jointing

3.3.7.1 General information on joints and mastic

Sealing of movement joints etc. in Buildings shall be carried out in accordance with AMA Hus 11 section ZSB SEALING OF JOINTS and its pyramid rules with associated Advice and instructions for AMA Hus 11 RA Hus 11 apply.
Only mastics that fulfil the requirements in TBY may be used.

Approved mastics, primers for jointing and retainer strips are given in Approved Paint Systems for TBY.

3.3.7.2 Application areas for jointing

In the case of jointing in Painting Class I, the quality expert in the licensee/plant owner's organisation determines the choice of product and method.
Floor joints in concrete external.
Floor joints in concrete internally with areas belonging to painting Classes II, III or V.
Cracks or narrow openings in concrete structures within areas belonging to Painting Class II, III or V. See section 11.6.6.
Movement joints in concrete structures' floor structures, floors, walls, roofs and cladding in Painting Classes II, III or V.
Dilatation joints externally and internally belonging to Painting Classes II, III, V and VI.
Fire sealing of joints in Building is not covered in TBY.

3.3.7.3 Requirements on execution, Quality Control of finished joints

See AMA Hus 11 and RA Hus 11 section ZSB.11.

3.3.7.4 Material and product regulations

Presentation on the mastic's properties, how well it can be decontaminated, radiation resistance, heat resistance, chemical resistance and long-term durability is required.

Mastics shall fulfil the requirements for the class given in AMA Hus 11 table ZSB.11/1, depending on the application area. The classes concerned are 25LM, 25HM, 20LM and 20HM. The use of plastic mastics is not permitted.
Mastics to be used must fulfil the requirements in sections 12.2.1. and 12.2.1.2.

The following properties shall also be presented:
a) How decontaminable it is
b) Radiation resistance according to the method used for testing electrical cable material
c) Heat resistance according to SS-EN 13880-13:2003, Edition 1
d) Chemical resistance according to SS-EN 13880-8:2003, Edition 1
e) Long-term durability according to SP method 4372

3.3.7.4.1 Assessment of approval criteria

–	Decontamination properties	must be good
–	Radiation resistance	cracking must not occur delamination must not occur severe chalking must not occur severe colour changes must be noted
–	Heat resistance	results must be presented
–	Chemical resistance	must be good
–	Long-term durability	must be good

4 SURFACE PROTECTION IN PROCESS PARTS

4.1 GENERAL

Approval from the respective licensee/plant owner, or its authorised representative, must be given by the respective unit's authorised person responsible for surface protection.

4.1.1 Validity of these documents

These instructions relate to requirements applicable to anti rust treatment of metallic materials. Limitations in the application of the regulations set out in this document, or departures from them, can occur in certain cases. To be valid, all changes must be specified in writing and must be signed by an authorised person.

In the event of conflicting details, these documents shall apply in the following order:

a) the contract or other purchasing document

b) changes in these instructions issued by the respective nuclear power station(s)

c) these instructions, with associated appendices

4.1.2 General requirements

Before starting preparation or pre-treatment of the surfaces, the surface treatment contractor shall check that the surfaces to be painted fulfil the specified requirements in respect of amount of rust, preparation etc.

When carrying out painting work within the respective nuclear power station'(s') plants, all temporary storage places for paint products, regardless of where they are, must be approved by the purchaser. Proper allowance must be made for the flammability of the products, their toxicity and the temperature of the storage premises.

Paint tins have to be marked according to NPP`s regulations.

When carrying out painting within the respective nuclear power station'(s') plants, the surface protection contractor shall be responsible for all transport of paint products to each working area, and shall also be responsible for ensuring that all packaging materials, empty paint tins, anti splash cover sheets etc. shall be removed without delay to a place etc. indicated by the Purchaser. The surface protection contractor is responsible, both in terms of action and of cost, for ensuring that hazardous waste is properly disposed of in accordance with the requirements of regulations and any instructions issued by the Purchaser.

The extent to which documentation is to be prepared and submitted to the Purchaser is set out in Section 8.1.1 of Chapter 10. A summary of the forms available is given below:

- Before the work is started, the intended materials shall be discussed with the contractor in order to reach agreement on how the various forms are to be filled in.
- A separate inspection plan must always be prepared on Form D.109 for items a) to h) inclusive according to the following. The same applies for items located in areas where the reactor tank, the reactor's primary system, feedwater system as well as turbine and condensate system have been opened for fuel replacement or servicing. An inspection plan shall also be prepared for items with advanced and complicated pre-treatment and painting conditions. To be valid, the inspection plan shall be approved by the respective nuclear power station or its authorised representative.

Painting in painting stations or on site on the plant's premises

Form no. D.100, Report for anti corrosive painting, must always be filled in for the following objects:

a) All objects belonging to painting classes I and IV, or environment classes R1, R2, N2b and V.
b) Cisterns/tanks (for all corrosive media used).
c) Cranes in the reactor halls and turbine halls, and in CLAB rooms M1.01, F91.01 and F91.05.
d) The refuelling machine in the reactor halls and corresponding lifting equipment in CLAB rooms M00.02, F91.01, F91.05 and M2.35.
e) The turbine condenser
f) The main circulation pumps
g) Heat exchangers
h) All items with operating temperature $\geq +70^{o}C$ that are surface treated according to treatment type S12
i) Form D.100 can also be used for other objects, if so agreed.

Form no. D.101, Report for anti corrosive painting, must be filled in for other objects belonging to painting classes II, III and VI.

Standard painted mass-produced components

Fill in form no. D.106, Information for evaluation of corrosion protection according to suppliers' standard procedure, or form no. D.107, Report for performed inspection by anti corrosive painting according to suppliers' standard program.

Hot dip galvanizing

Fill in form no. D.105, Report for hot dip galvanizing.

The surface protection contractor shall give notice of inspection of items to the Purchaser **at least three working days** (not Saturdays, Sundays or public holidays) in advance. If this is not done, the surface protection contractor will not be entitled to quote delays caused by delayed surface protection inspection.

Inspection costs resulting from spurious or phantom notices of readiness for inspection, or due to the need for further inspection as a result of failure of work etc. to pass inspection, will be charged to the surface protection contractor.

Any treatment needed to improve or ensure adhesion, resulting from failure by the surface treatment contractor to apply paint etc. within the maximum time prescribed by the paint manufacturer, shall be paid for by the surface treatment contractor.

The surface protection contractor shall contact the respective nuclear power station(s) immediately if it is not possible to comply with any aspect of the applicable regulations.

A discrepancy report must be prepared by the surface protection contractor if it is not possible to comply with any aspects of the applicable regulations, and must be approved by the respective nuclear power station'(s') authorised representative in order to be valid. Use form no. D.104, Non-conformity report.

At the time of final inspection of the painting work, adhesion shall fulfil the requirements given in Table 4- 1.

At the end of the guarantee period, the quality of paint finishes must not be less than the following values:

Rust protection value	SS-EN ISO 4628-3:2004, Edition 1	Ri 1 [1)]
Blistering	SS-EN ISO 4628-2:2004, Edition 1	2 (S2)[2)]
Adhesion	SS-EN ISO 2409:2007, Edition 2	1
	SS-EN ISO 4624, Edition 1	2.5 MPa
Crack formation	SS-EN ISO 4628-4:2004, Edition 1	Class 0
Chalking	SS-EN ISO 4628-6:2004, Edition 3	5.0 [3)]
Flaking	SS-EN ISO 4628-5:2004, Edition 1	0

The above guarantee values must be achieved for objects of which the surface temperature does not exceed +55 °C.
However, the corresponding temperature for zinc silicate (ESI) is +400 °C.
For objects exposed to chemicals in liquids, where the surface temperature continuously exceeds 50 ºC, there are no requirements regarding blistering.

1) Internal in cisterns/tanks Ri 0
2) Internal in cisterns/tanks, Extent of blistering 0 (S0)
3) For outdoor exposure, extent of chalking 4.0

4.2 REQUIREMENTS FOR MATERIALS AND SUPPLIES

4.2.1 General

The regulations relating to materials and supplies are identical for both 'Surface protection within buildings' and 'Surface protection within process areas'.

If the paint manufacturers introduce new types of paint, which would be of interest to the respective licensee/plant owner, the products shall be tested (verified testing) to show that they fulfil the respective licensee/plant owner's requirements, as set out in Chapter 12 of this document, MATERIALS AND SUPPLIES: REGULATIONS.

The necessary testing can suitably be carried out, or arranged, by the respective paint manufacturers, in conjunction with the joint Surface Protection Group set up under the terms of the joint cooperation agreement between the power companies.

Testing must be documented in accordance with a Test certificate (**Type certificate D.116**), as shown in Chapter 12 of TBY.

In addition, paints etc. approved by the power companies' joint Surface Protection Group shall also be documented by the paint manufacturer in accordance with **form no. D.116 Product sheet**. Reults from paint tests shall be documented according to the specification in Chapter 12.

Copies of the test certificates (Type certificates) for the paints etc. that fulfil the requirements in the above mentioned MATERIALS AND SUPPLIES: REGULATIONS in Chapter 12 of TBY will be archived by the respective licensee/plant owner through their member of the power companies' joint Surface Protection Group.

The original will be archived by OKG's archive department.

The **test certificates (Type certificates)** and product data sheet form D.116 should **NOT** be unnecessarily circulated.

Product data sheets form D.116 for the paints etc. approved by the respective licensee/plant owner, shall be archived as test certificates (type certificates), as above.

THE NECESSARY DOCUMENTATION of the products used for surface protection work, whether for maintenance or for new installation in the respective nuclear power station(s') respective blocks, is specified below in Sections 4.2.2 and 4.2.3.

4.2.2 Test forms

Deliveries of paint intended for use as surface protection within the building or process areas for the blocks in the respective nuclear power station(s) shall be accompanied by a batch inspection certificate on **form D.117**, Quality control of paint manufacturing, issued by the paint manufacturer.

It is the responsibility of the painting contractor, or of the party ordering the paint, to specify that the above mentioned test certificate form must be supplied, and to satisfy

himself that the delivery fulfils the specified requirements. Forms D.117, as needed for verification, are reproduced in Chapter 10.

Batch inspection certificates on form D.117 shall be included in the inspection documentation for the particular items etc. painted. See also Chapter 8.

4.2.3 Inspection sample

The paint manufacturer shall take a sample, not less than 1/3 litre, of each newly manufactured batch of paint, and shall store it for at least two years.

4.2.4 Approved paint products

Only paint products that meet the requirements of TBY may be used.

Approved paint products are defined in the document Approved Paint Systems for TBY.

4.2.5 Types of treatment for anti-rust painting - Building structures

See Chapter 5.

4.3 REGULATIONS FOR CARRYING OUT PAINTING WORK

4.3.1 Requirements in respect of unmachined surfaces

Unmachined surfaces that are to be provided with surface protection after pre-treatment must fulfil the following requirements in respect of the degree of rust in accordance with SS-EN ISO 8501-1:2007, Edition 2 (SS 05 59 00, Edition 3)

a) **Not worse than rust class B** for all internal surfaces in tanks or objects belonging to painting class IV.

b) **Not worse than rust class C** for other surfaces.

4.3.2 Requirements in respect of surfaces to be painted

At the time of painting, surfaces shall meet the requirements of pre-treatment in accordance with SS EN ISO 8501-1:2007, Edition 2 (SS 05 59 00, Edition 3), as specified in details of the required type of treatment and on drawings.

Surfaces must be free from:

a) Paint, oil, soot, welding smoke, grease, graphite, dust, earth, markings from spirit pens, chalk etc., water soluble salts, chlorides, sulphates etc.

b) Weld spatter, casting or rolling skin, mill scale and visible flaking.

c) Sharp edges and flash. Sharp notches etc., e.g. from lifting appliances.

d) Quality level C in SS-EN ISO 5817:2007, Edition 2 must be fulfilled for objects belonging to painting classes I, II, III, V and VI, which means that welded joints, and surfaces around welds, must be free of discontinuities such as cracks, poor penetration, end craters, ignition marks or overrun welds.

   However, the following local defects can be permitted, provided that they do not

have sharp edges: burn through, undercuts, inadequately filled welds, concave roots and scattered surface pores and the occasional individual sphere of weld spatter.

Objects in painting classes I, II, III, V and VI, pre-treatment class P2, according to SS-EN ISO 8501-3:2007, Edition 2, must be fulfilled.

e) Quality level B in accordance with SS-EN ISO 5817:2007, Edition 2, must be achieved for objects in painting class IV, which means that welded joints, and surfaces around welds, must be free of discontinuities such as cracks, burn through, end craters, inadequately filled welds and concave roots.

Intermittent welds not allowed.

Edges must fulfil pre-treatment class 3 according to SS-EN ISO 8501-3:2007, Edition 2.

Surface discontinuities such as sharp undercuts, incomplete penetration, surface pores and shrinkage depressions must be smoothed out or removed.

Ignition marks, weld spatter and slag residues must be carefully removed.

In order to be able to ensure proper adhesion and specified paint layer thicknesses, cut edges or surfaces machined by chip cutting methods must meet the surface smoothness requirement of R_{max} 30-50 μm and at least 30 peaks per linear cm, unless more stringent requirements are shown on the drawing. For painted surfaces that will be cast into concrete, e.g. the edges of welding plates, pre-treatment class P2 according to SS-EN ISO 8501-3:2007, Edition 2, must be fulfilled.

Surfaces to be painted must be dry, and at a temperature not below the value required for the specified type of paint Beware of the risk of condensation on cold surfaces, which means that surface temperatures must be at least +3°C above the dew point.
If the paint manufacturer specifies more stringent requirements than those specified here, they must be approved by the respective licensee/plant owner.

Abrasive blast and paint parts that will be grouted in to a depth of at least 50 mm below the intended upper surface of the concrete before grouting them in. Abrasive blast and paint angle irons, welding plates etc. on their front surfaces and edges. Clamps must not be painted. Anti rust protection painting etc. must be applied to all parts of objects, including under name plates etc. Name plates must not be painted over.

Surfaces that will subsequently be covered or inaccessible must be painted while they are still accessible.

Sealing surfaces that are **not** to be treated must be protected before pre-treatment and painting are carried out.

Parts that are subsequently to be welded must be masked over a distance of 0 – 100 mm from the future weld position before painting. Masking shall be applied using a halogen free waterproof tape, approved by the respective nuclear power station(s). This tape shall also provide temporary corrosion protection for the parts during storage and transport.

A test panel must always be painted, under the same conditions as apply for the objects themselves, for objects to which anti rust protection painting is to be applied in accordance with treatment type S13a and S13b. The various stages of painting shall be carried out in connection with painting the objects themselves. The test panel, which will be not less than 5 mm x about 100 x 200 mm in size, must be of the same type of material as the objects, and have the same amount of rust.

The test panel is intended for use in destructive tests in order to determine whether the surface protection of the objects concerned meets the specified requirements.

Test panels as above should also be prepared for other anti rust protection systems for which severe demands on the protection can be expected.

4.3.3 Preparation prior to painting

4.3.3.1 Degreasing

Surfaces must always be degreased before blasting or before any other mechanical pre-treatment. The use of halogenated hydrocarbons within controlled zone is forbidden, see Chapter 2. Degreasing chemicals and equipment must be appropriate to the type of dirt, contamination etc. in order to ensure their complete removal.

Degreasing may be carried out using organic solvents, alkaline detergents or emulsions.

4.3.3.2 Blasting

Surfaces to be abrasive blasted to the prescribed pre-treatment level in accordance with SS-EN ISO 8501-1:2007, Edition 2, (SS 05 59 00 Ed. 3) must first have been degreased.

In general, all contamination, unevenness and rolling defects must be removed before the materials are degreased and blasted. Rolling defects, flaking etc., found during degreasing or blasting must be ground down, after which the local area must again be degreased and blasted. No work that involves removal of anything more than the immediate surface layer may be carried out without the approval of the designer.

The same conditions in respect of humidity and temperature as apply to the painting work also apply to blasting: see item 4.3.5. Objects may not be allowed to cool down between blasting and painting.

The abrasive to be used must be approved by the respective licensee/plant owner.

The abrasive to be used for blasting austenitic stainless steel must be approved by the respective licensee/plant owner: normally, aluminium oxide or aluminium silicate may be used.

In the case of hot dip galvanized material, perform a light sweep blasting(at low air pressure) to produce surface finish Fine in accordance with SS-EN ISO 8503-2, Edition 2, (G).

Abrasives used for blasting austenitic stainless steel must not have been used for previous blasting of any other material. Concentrations of contamination in the abrasive materials

may not exceed 100 ppm of halogens, 100 ppm of sulphur in the form of sulphides or 100 ppm of metals such as copper, zinc or heavy metals such as lead.

The abrasive material may not contain more than 100 mg/kg of oil: this is particularly important if the material is reused.

Abrasive blasting materials and blasting conditions shall be such as to ensure that the specified and/or recommended profile depth and surface smoothness are obtained. Unless otherwise specified, surface roughness shall meet the requirements of class Medium in accordance with SS-EN ISO 8503-2, Edition 2, (G). Sling blasting using steel shot is permitted only if approval has been obtained in writing from the respective licensee/plant owner's responsible expert.

Compressed air used for blasting equipment shall be dry, clean and oil-free.

The abrasive material must be carefully removed from the blasted surface after blasting, either by an ejector vacuum cleaner of through the use of dry, clean, oil free compressed air. However, when preparation is intended to achieve Class Sa3 standard, only ejector vacuum cleaning can be accepted as the final cleaning method.

Objects belonging to painting class IV may not exceed a chloride concentration of more than 1 $\mu g/cm^2$ (10 mg/m^2)when tested in accordance with SS-EN ISO 8502-6, Edition 2, (the Bresle method) and SS EN ISO 8502-10. For other objects max 10 $\mu g/cm^2$ (100 mg/m^2).

After blasting, steel surfaces must be painted as soon as possible: under ambient conditions of 20 °C and 60 % RH, the guide value is that painting should be carried out within 8 hours of conclusion of blasting. If this cannot be done, a dehumidifier should be used to reduce the relative humidity.

No work operations must be performed on the blasted material between blasting and painting.

4.3.3.3 Hydroblasting

Permission to perform hydroblasting must first be obtained from the responsible person on the staff of the respective licensee/plant owner before the work is started. There must be a programme for hydroblasting, which is approved by the quality manager. Hydroblasting is defined as being performed with water at ultra high pressure exceeding 230 MPa (2300 bar). In case of hydroblasting, the appropriate pre-treatment class as well as extent of re-rusting according to SS EN ISO 8501-4:2007, Edition 1. When the use of an inhibitor is permitted, it must be added continuously throughout the blasting and rinsing process.

4.3.3.4 Grinding, scraping, brushing and peening

Steel brushing is not permitted without the approval of the expert body in the licensee/plant owner's organisation. This requirement applies both during factory manufacturing as well as during maintenance in the plants.

Unless otherwise specified, grinding, scraping, brushing and peening shall be performed to Class St 3 of SS EN ISO 8501-1:2007, Edition 1, (SS 05 59 00, Edition 3).
Where technically possible and justifiable in cost terms, grinding and brushing shall be performed by machines. No work that involves anything other than the removal of surface materials may be carried out without the approval of the designer.

In general, areas of uneven material and rolling defects must be removed before the material is degreased. Rolling defects discovered during degreasing must be ground down, after which the local area must again be degreased.

Welding pearls, spatter, slag and other unevenness on the surface must be removed by machine grinding and/or scraping.

Unevenness on and around welds shall be removed by mechanical grinding.

Rolling defects - flaking - in the form of lightly attached flakes of metal must be removed by machine grinding.

After grinding and scraping, all loose materials must be removed by careful vacuum cleaning, the use of clean, oil free compressed air or a clean brush.

After grinding, scraping and brushing, the surface shall be degreased, even if it has been degreased prior to these operations.

When using a steel brush on austenitic stainless materials, the brush must be of the same type of material as the base material.

4.3.4 Requirements in respect of surfaces, paint layers and paint systems

4.3.4.1 Requirements in respect of surfaces to be painted

Surfaces to be painted must, at the time of painting, fulfil the requirements specified above under 4.3.1 and 4.3.2.

4.3.4.2 Requirements in respect of individual coats of paint

a) The identity and colour of each coat of paint shall comply with the relevant specification.

b) The thickness of each coat of paint shall comply with the relevant specification. See also item 7.2.4.5.

c) Each coat of paint shall be visually coherent, without visible runs, drops, blisters, pores, craters or other defects, and shall provide a single smooth surface. A small amount of orange peel effect is permissible, but sandpaper structure is not. There must be no unpainted areas.

d) Any defects etc., as described above in a) - c), shall be made good before the next coat of paint is applied.

e) The results from adhesion testing shall fulfil the required conditions set out in Table 4- 1.

4.3.4.3 Requirements in respect of finished paint systems

a) Identity, colour and gloss shall comply with the specification.

b) The coverage must be good, with a consistent colour at edges and on free surfaces.

c) Each coat of paint shall be visually coherent, without visible runs, drops, blisters, pores, craters or other defects, and shall provide a single smooth surface. A small amount of orange peel effect is permissible, but sandpaper structure is not. There must be no unpainted areas.

d) The finish of the completed coat of paint shall agree with that of any sample surfaces.

e) The nominal total dry film thickness of the paint system shall comply with the specification. Measure the film thickness on metallic substrates in accordance with SS ISO 19840:2012, Edition 2, and Annex A and B. The minimum film thickness on test surfaces is defined i SS ISO 19840:2012, Edition 2. See also item 7.2.4.5. The mean value for each individual test surface must not exceed double the nominal film thickness. If this requirement cannot be kept, corrective actions must be taken or a deviation report prepared.

f) The results from adhesion testing shall fulfil the conditions set out in Table 4- 1.

Minimum values in MPa in accordance with SS-EN ISO 4624, Edition 1, for individual test pieces, all values in accordance with SS-EN ISO 2409:2007, Edition 2				
Treat-ment Type	**Base/ primer AB**	**Primer/ undercoat BC**	**Undercoat/ top coat CD**	**Notes.**
S1	3.0	3.0	3.0	
S2	3.0	3.0	3.0	
S3	3.0	3.0	3.0	
S4	3.0	3.0	3.0	
S5	3.0	3.0	3.0	
S6	3.0	3.0	3.0	
S7	3.0	3.0	3.0	
S8	3.0	3.0	3.0	
S9	3.0	-	-	
S10	3.0	2.0	2.0	
S11	3.0	2.0	2.0	
S12	3.0	-	-	
S13a	5.0	5.0	5.0	
S13b	5.0	5.0	5.0	
S13c	20.0	20.0	20.0	
S13d	3.0	3.0	3.0	
S13e	5.0	-	-	
S14	5.0	3.0	3.0	
S15	3.0	2.5 x)	2.5 x)	x) Guide value
S16	3.0	2.5 x)	2.5 x)	x) Guide value
S17	1	1	1	SS-EN ISO 2409:2007, Edition 2
S18	1	1	1	SS-EN ISO 2409:2007, Edition 2
S19	3.0	3.0	3.0	
S21	1	1	1	SS-EN ISO 2409:2007, Edition 2
S22	3.0	2.5	2.5	
S23	1	1	1	SS-EN ISO 2409:2007, Edition 2

Table 4- 1 Adhesion requirements for final inspection

Measure adhesion in accordance with ISO 4624, Edition 1, or SS-EN ISO 2409:2007, Edition 1, and show the results in accordance with the requirements set out in the respective standards.

4.3.4.4 Requirements in respect of the transport, handling and storage of paints

Paint shall be handled and stored in accordance with the paint manufacturer's instructions.

No additives of any kind may be added to a paint once it has left the factory, except with the approval of the respective licensee/plant owner and the paint manufacturer.

4.3.5 Applying the paint

Unless otherwise specified in TBY or in the respective data sheet for the particular type of treatment, all recommendations concerning the paint from its manufacturer shall be complied with. Neither the paint manufacturer nor the painting contractor may modify the relevant instructions without written approval from the respective licensee/plant owner.

In general, painting materials and supplies shall be at the same temperature as the area in which they are to be applied at the time of painting.

When painting with two-component paints, the temperature in the area where the painting is being carried out shall not be less than +15 °C. The relative humidity of the air shall not exceed 80 % RH and the surface temperature shall be at least +3 °C above the dew point.

When painting with single-component paints, the temperature in the area where the painting is being carried out shall not be less than +5°C. The relative humidity of the air shall not exceed 85% RH and the surface temperature shall be at least +3 °C above the dew point.

During curing of ethyl zinc silicate paints, the local air humidity **shall** exceed 60 % RH.

Coats of paint shall normally be allowed to dry or cure at temperatures above +15 °C and with local air humidity below 80 % RH. The length of time required for drying or curing depends on local conditions of temperature, air humidity, thickness of the paint layer, type of paint etc.

If paint is applied from a roller, it must immediately be smoothed out with a flat brush.

Coats of paint must be applied within the maximum period of time stated by the paint manufacturer. If this time is exceeded, any necessary adhesion treatment shall be carried out.

Holes and gaps in inaccessible surfaces, e.g. encountered in connection with tack welded joints, when painting steel and cast parts in painting classes I, II, III and VI shall be filled with elastic mastic of Group 20 HM polyurethane type, as shown in Table ZSB 11/1 of AMA Hus 11. This mastic must be suitable for painting over with the solvent containing paints listed in the 'Approved Paint Systems - TBY' document.
The mastic must be mould resistant and fulfil the requirements for chemicals according to section 12.2.1.
It is not a requirement, in painting class V, that gaps should be filled with mastic.
All mastics must be applied only to undercoated surfaces

4.3.5.1 Priming

Apply primer to parts in accordance with the specification for them.

Welded joints and other joints must always be given a coat of primer **by brush before the main process of applying the primer**.

The use of rollers is not permitted when applying the first coat.

When painting using zinc epoxy or ethyl zinc silicate paints, where several coats are required in order to achieve the specified film thickness, each coat shall be lightly rubbed down over the entire surface before the next coat is applied, unless the paint is being applied by the wet on wet method.

Before making any bolted or riveted joints, both contact faces must be degreased, followed by application of the intended primer to produce a minimum film thickness of 30 µm. Any expressed surplus paint shall be removed before it dries.

Friction joints shall not be painted, unless this is specifically indicated.

4.3.5.2 Filling

Filler or mastic must always be applied only to undercoated surfaces.

Where filling is required, material in Approved Paint Systems for TBY must be used.

Fine filling shall be performed as 'scrape filling' in order to smooth out defects from previous filling.

Using abrasive paper, smooth the layer of filler down to an even surface. Always finish using a fine grained abrasive paper in order to avoid leaving visible scratches in the finished surface

4.3.5.3 Undercoat

Filled surfaces must be 'sealed' through application of an undercoat, which can consist of primer, undercoat to top coat, depending on the type of treatment.

If the maximum time allowed for applying paint to a previously applied layer is exceeded, the entire painted surface must be treated in a manner as approved by the respective licensee/plant owner and the paint manufacturer in order to ensure proper adhesion.

4.3.5.4 Top coat

Apply top coats as specified for the parts concerned.

If the maximum time allowed for applying paint to a previously applied layer is exceeded, the entire painted surface must be treated in a manner as approved by the respective licensee/plant owner and the paint manufacturer in order to ensure proper adhesion.

Damaged primer or undercoat surfaces shall be touched up before applying the top coat. When doing so, observe the specified requirements in respect of cleanliness. See items 4.3.5.5 and 4.3.5.6 for details of touch up painting.

The surface must be clean before the top coat is applied. Only those cleaners and solvents approved by the paint manufacturer and by the respective licensee/plant owner may be used for such cleaning.

4.3.5.5 Touch up painting, repainting or maintenance painting

Prior to erection

Paintwork that has been damaged, or on which other defects are seen, shall be touched up. In general, paintwork damaged during transport shall be touched up before the equipment is installed or erected in the plant.

After erection or during maintenance

Erected/installed items, equipment etc. shall always be inspected, and any damage shall be dealt with.

General:

- Carry out touch up painting so that, after touching up, the damaged area is of the same quality and finish as the surrounding area. Where possible, extend touch up work to natural boundaries. Cut off galvanized parts, having a zinc thickness of ≤ 1.5 mm, do not need to be touched up.
- Deciding whether a damaged part should be merely touch up painted, or should be repainted in its entirety, depends on the extent of the damage or the degree to which the paint has broken down. See Chapter 11 in TBY. The objective is to ensure that the finished surface meets the specified requirements.

Cleanness:

- Painting shall always be applied to cleaned surfaces. Cleaning and preparation must always be performed such as to fulfil the requirements set out in items 4.3.2 and 4.3.3.
- When touching up or repairing paint, an area of at least 1 cm wide undamaged paint must be removed around the damaged area, partly in order to ensure that any paint with reduced adhesion is removed.
- Damage that affects only the coat of paint shall be rubbed down at the edges of the areas so that the use of filler can be avoided.

Priming, undercoating and top coating:

- Carry out touch up painting or repainting using the same paints as for new painting, and to obtain the specified dry film thicknesses.
- Welded joints and other joints must always be given a coat of primer by brush **before the main process of applying the primer.**

- If, when the item was being painted as a new item, priming would be carried out using ESI ethyl zinc silicate paint, it must be replaced by the use of EP Zn (R) zinc epoxy paint, if the temperature of the object does not exceed +55 °C.
- An intermediate coat of paint will be required if any filling has been carried out. This intermediate coat will consist of primer, undercoat or top coat, depending on the type of treatment

4.3.5.6 Touch up painting after erection or during maintenance within and outside controlled indoor zones

The following points apply, in addition to those set out above under item 4.3.5.5.

Bearing in mind the cleanliness requirements applicable to the erection site, preparation prior to painting must be carried out in such a way as to produce as little dirt as possible.

The following types of mechanical treatment are appropriate:

a) machine grinding
b) peening
c) the use of abrasive cloth or paper
d) vacuum blasting
e) hydroblasting
f) manual scraping

Note:

- Jet blasting or hydroblasting must **not** be performed without permission from the component supplier and from the respective licensee/plant owner.
- Machine grinding and vacuum blasting may be performed only if the area is carefully screened off from its surroundings.
- The treated surface, and the area around the workplace, must be vacuum cleaned immediately after conclusion of treatment.
- Cleaning agents such as paint strippers, organic solvents, emulsifiers or other cleaning preparations must be approved by the respective licensee/plant owner. The use of some already approved cleaning agents may be temporarily prohibited.

4.3.6 Rubber coating, soft rubber

4.3.6.1 General

a) The application of rubber to components specified here is intended to protect the surface of the steel against corrosion and erosion attack by salt water, brackish water and fresh water. The rubber coating is required to withstand the temperatures, flow velocities, turbulence effects and operating pressures encountered in the respective connections and water chambers, tanks, strainers, filters, pressure vessels and piping. The rubber coating is also required to withstand contamination and foreign materials as encountered in the water, such as clay, sand, algae, humus and snails. When deciding on the type of rubber to be applied, tests must always be carried out to determine whether the material is capable of withstanding ionising radiation.

b) Before making the final choice of contractor for supplying and applying the rubber coatings, the presumptive companies shall submit their internal regulations, instructions etc. that they intend to apply to the respective licensee/plant owner for approval.

   A time plan for the work shall be submitted to the respective licensee/plant owner in good time before commencement of the work, in order to allow the licensee/plant owner to plan its/their own work and inspection activities.

   The contractor's internal instructions, codes etc. shall provide details of at least the following:

   - Identification/description of each item
   - The proposed rubber material and the coating thickness
   - The requirements in respect of environmental conditions while performing the work
   - The requirements in respect of the condition, preparation etc. of the substrate
   - Standards or other regulations concerning application and performance of the rubber coating
   - Details of the vulcanisation process
   - Details of possible method tests
   - Repair instructions
   - The extent of internal inspection, together with names of persons responsible for manufacturer and inspection
   - Final documentation

c) It is most important that the selected contractor should be given the opportunity of expressing its views on (approving) the constructive design of the equipment concerned, as well as on the grade of rubber coating selected (e.g. in flange joints), and that it should be able to put forward views that can assist ensuring satisfactory rubber coating of the equipment.

d) Before starting to apply the rubber coating, the rubber coating contractor shall inspect the equipment to ensure that it has been made and erected in such a way that the completed rubber coating can be expected to be of the intended quality, i.e. that it will be possible to achieve the specified performance requirements.

   If it is suspected that it would not be possible to meet the specified requirements, a non compliance report shall be prepared and the respective licensee/plant owner or its/their representative shall be notified as soon as possible in order to decide what is to be done. Minor defects that do not affect the strength of the equipment etc. may be rectified by the rubber coating contractor.

e) The process of application of the rubber coating, and the finished product, shall be documented by the contractor on the form intended for the purpose Form D.108. See items 7.5.4.3 and 8.1.3.

f) Rubber coating material shall fulfil the requirements on the maximum permitted levels of certain substances/elements, see specification from the respective licensee/plant owner.

4.3.6.2 Substrate and other requirements

a) Unless otherwise specified, the instructions in SS EN 14879-4:2007, Edition 1, shall apply.

b) The condition of steel surfaces, in respect of rust, to which the rubber coating is to be applied, shall not be less than Class B in accordance with SS-EN ISO 8501-1:2007, Edition 2, (SS 05 59 00 Ed. 3).

c) Any welds in steel surfaces to which the rubber coating is to be applied shall be continuous, and the weld convexities shall have been completely ground down. Undercut is not permitted. Riveted joints are not permitted. There must not be any pores, inclusions or edge misalignments of welds. Weld spatter and flaking of the steel surface shall be removed. Edges and corners shall be rounded according to SS-EN 14879-1:2005, Edition1, table 1. Work involving anything more than surface operations may not be performed without the approval of the designer.

d) Surface preparation shall be started by degreasing, to remove oil, grease, graphite, soot, dust, clay and water soluble salts such as chlorides and sulphates before carrying out blasting.

e) Surfaces to which the rubber coating is to be applied may not be pressure tested using salt water.

f) Pressure testing of components shall be completed before surface preparation is started.

g) Scaffolding support surfaces shall be prepared (vacuum blasting) and rubber coated in the same way as other surfaces.

h) Outlets, pipe stubs, flanges, manholes and pipe connections shall be rubber coated in accordance with the design drawings.

i) Thermal insulation shall be applied to tanks or pressure vessels, erected in position outdoors, before the rubber coating is applied.

4.3.6.3 Preparation of the steel surface

a) It is the responsibility of the contractor to satisfy himself that the substrate is suitable for ensuring proper finished quality of the rubber coating work.

b) The surface to which the rubber coating is to be applied shall have reached a stable temperature. The ambient temperature shall be not less than 15 °C, and the humidity shall be measured and monitored to ensure that there is no risk of condensation. The surface temperature of the metal shall be at least +3 °C above the dew point.

c) Compressed air and blasting media shall be dry and clean.

d) Surfaces to be coated shall fulfil the Sa3 requirements of SS-EN ISO 8501-1:2007, Edition 2, (SS 05 59 00 Ed. 3), and shall also fulfil the requirements in respect of surface finish for Grit (G) in accordance with SS-EN ISO 8503-2, Edition 2. Other requirements in respect of abrasive media are set out in item 4.3.3.2. The proposed blasting medium for use on site built equipment, or when the object also contains materials other than carbon steel, shall be approved by the respective licensee/plant owner. The requirements as set out below in item 4.3.6.2 shall be complied with.

e) After blasting, the surface of the steel shall be carefully cleaned by ejector vacuum cleaning. Only smaller components and pipes, inaccessible to ejector vacuum cleaning, may be blown clean using oil free clean, dry compressed air.

f) Steel surfaces, in case of new manufacture, to which the rubber coating is to be applied may not have a chloride content exceeding 10 mg/m^2, and steel surfaces for reapplication of the rubber coating may not have a chlorine content exceeding 100 mg/m^2, when tested in accordance with SS-EN ISO 8502-6, Edition 2, (the Bresle method) and SS-EN ISO 8502-10.

g) Surfaces to which the rubber coat is not to be applied shall be protected during blasting.

h) After blasting, steel surfaces shall be treated with primer as soon as possible. As a guide, priming shall be completed within 8 hours of conclusion of blasting under ambient conditions of 20 °C and 60 % RH. If this cannot be done within the time, the permitted time may be extended through the use of a dehumidifier to reduce the humidity to a level suitable for the time that will be required. Alternatively, the work may be carried out in stages.

4.3.6.4 Rubber quality

a) Pipes, tanks, strainers, filters and pressure vessels

The rubber coating shall consist only of Natural Rubber (NR) and shall withstand the operating conditions specified above under item 4.3.6.1. The thickness of the rubber coating shall be at least 4 mm ± 0.4 mm. The coating shall be calendared in the form of at least four layers of unvulcanised rubber. A Shore A hardness of 60°± 5°, according to SS-ISO 7619-1:2010, Edition 2, or ASTM D2240-05 is required after vulcanisation. The rubber material shall fulfil at least the required characteristics of those set out in SS 16 26 02 and in the documents referred to in that standard. It shall be possible to check the sealing performance of the rubber coating using an electric pore tester at least 15 kV AC or DC. A test voltage shall be varied to suit the thickness of the rubber. The coating may not include rubber

materials of different hardness. Adhesion to the metal shall be in accordance with SS-ISO 813:2010, Edition 3, min 150 N/25 mm rubber. Brittle point shall be 52 °C.

b) Connection chambers and end chambers

The rubber coating for use in connection chambers and end chambers shall be low temperature vulcanised rubber, and shall withstand the operating conditions described under item 4.3.6.1. The thickness of the rubber coating shall be at least 4 mm ± 0.4 mm. The coating shall be calendared in the form of at least four layers of unvulcanised rubber. A Shore A hardness of 55°± 5°, according to SS-ISO 7619-1:2010, Edition 2, or ASTM D2240-05, is required after vulcanisation. The rubber material shall fulfil at least the required characteristics of those set out in SS 16 26 02 and in the documents referred to in that standard. It shall be possible to check the sealing performance of the rubber coating using an electric pore tester at least 15 kV AC or DC. Adhesion to the metal shall be in accordance with SS-ISO 813:2010, Edition 3, min 150 N/25 mm rubber. Brittle point shall be 52 °C

4.3.6.5 Application of rubber coatings

a) Unless otherwise agreed, rubber coatings shall be applied in accordance with SS EN 14879-4:2007, Edition 1.

b) The ambient temperature shall not be less than 15 °C, and the humidity shall be monitored and controlled in order to ensure that there is no risk of condensation while the work is being carried out. The temperature of the surface shall be at least 3 °C above the dew point.

c) Contact surfaces intended for sacrificial anodes etc. shall not be rubber coated.

d) Unless otherwise indicated on the drawing, rubber coatings on flanges shall cover the entire sealing surface.

e) Wherever possible, rubber coatings in pipes shall be applied in a single piece from flange to flange, without transverse joints or seams. If transverse joints or seams cannot be avoided, the layout must take into consideration the direction of flow.

Note:
It may not be possible to comply with this requirement when applying rubber coatings to small pipes with bends, branches etc. In addition, as it is almost impossible properly to inspect such work, such parts should **NOT** be rubber coated at all, but should instead be manufactured from some material that does not require surface protection.

f) If necessary, rubber coatings on flange surfaces shall be ground flat, in order to ensure proper sealing between the different parts, although the prescribed minimum thickness of the rubber coating must be maintained.

g) When applying rubber coatings to different types of substrates together, the rubber coating shall be extended at least 30 mm on to the surface of the more noble material.

h) At joints, the total contact surface area shall be at least 4 times the total thickness of the rubber coating, but shall not exceed 32 mm at any point.

i) No areas of inadequate adhesion, cavities, blisters or air inclusions are allowed, whether between the steel and the rubber or between different calendared rubber

layers. This means that even the thin chamfered edge of overlap at joints must be properly vulcanised into and through the underlying rubber. In the event of finding defects in smaller objects, consideration should be given to removing the rubber coating (burning it off) and re applying it

4.3.6.6 Vulcanisation

The vulcanisation process shall be described by the contractor in its internal documentation, with details of parameters such as pressure, rates of temperature rise and times.

a) Pipes, smaller tanks, strainers, filters and pressure vessels, rubber coated at their manufacturers' premises.
Hot air/steam vulcanisation in an autoclave.

b) Tanks and pressure vessels, rubber coated at site.
Vulcanisation by water and steam.

c) Connection chambers and end chambers, which are coated on the site, are coated with low-temperature vulcanised or prevulcanised synthetic rubber. If vulcanization must be performed, it can be done with hot air.

d) Vulcanisation by hot air.

4.3.6.7 Method testing

If an agreement has been reached on method testing, testing shall be performed in good time before starting the coating work. The test must involve applying a rubber coating to a test piece of an agreed size, in order to assess the profile depth of blasting, the thickness of the rubber, its appearance, the lengths of joints and its hardness. Adhesion to metal testing shall be performed by the supplier in accordance with SS-ISO 813:2010, Edition 3, ensuring that the requirements as set out above in item 4.3.6.4 are fulfilled. The Purchaser, or his representative, shall be given the opportunity of witnessing the testing. The results of such a method test shall be taken as those of a reference test.

4.3.6.8 Repair

The rubber coating contractor shall prepare a set of repair instructions.

Damage to rubber coatings shall be repaired by the supplier in accordance with the instructions given in SS-EN 14879-4:2007, Edition 1, or in accordance with some other agreed standard. Repairs shall be made using the same materials and working methods, and under the same conditions, as applied for the original rubber coating of the component. If any other material or method is used, it must first be approved by the Quality Manager. Treatment types S2, S13a, S13c, S13d or S13e should preferably be used.

4.3.6.9 Guarantee

The rubber coating shall be entirely defect free at the time of expiry of the guarantee period.

4.3.7 Rubber coating, hard rubber

4.3.7.1 General

a) The application of rubber to components specified here is intended to protect the surface of the steel against corrosion and erosion attack by salt water, brackish water and fresh water. The rubber coating is required to withstand the temperatures, flow velocities, turbulence effects and operating pressures encountered in the respective connections and water chambers, tanks, strainers, filters, pressure vessels and piping. The rubber coating is also required to withstand contamination and foreign materials as encountered in the water, such as clay, sand, algae, humus and snails. When deciding on the type of rubber to be applied, tests must always be carried out to determine whether the material is capable of withstanding ionising radiation.

b) Before making the final choice of contractor for supplying and applying the rubber coatings, the presumptive companies shall submit their internal regulations, instructions etc. that they intend to apply, submitting them to the respective licensee/plant owner for approval.

   A time plan for the work shall be submitted to the respective licensee/plant owner in good time before commencement of the work, in order to allow the licensee/plant owner to plan its/their own work and inspection activities.

   The contractor's internal instructions, codes etc. shall provide details of at least the following:

   - Identification/description of each item
   - The proposed rubber material and the coating thickness
   - The requirements in respect of environmental conditions while performing the work
   - The requirements in respect of the condition, preparation etc. of the substrate
   - Standards or other regulations concerning application and performance of the rubber coating
   - Details of the vulcanisation process
   - Details of possible method tests
   - If the work will involve transport, any necessary special transport or storage instructions shall be prepared
   - Repair instructions
   - Details of the extent of internal inspection, together with names of persons responsible for manufacture and inspection
   - Final documentation

c) It is most important that the selected contractor should be given the opportunity of expressing its views on (approving) the constructive design of the equipment concerned, as well as on the grade of rubber coating selected (e.g. on flange joints),

and that it should be able to put forward views that can assist ensuring satisfactory rubber coating of the equipment.

d) Before starting to apply the rubber coating, the rubber coating contractor shall inspect the equipment to ensure that it has been made and erected in such a way that the completed rubber coating can be expected to be of the intended quality, i.e. that it will be possible to achieve the specified performance requirements.

If it is suspected that it would not be possible to meet the specified requirements, a non compliance report shall be prepared and the respective licensee/plant owner or its/their representative(s) shall be notified as soon as possible in order to decide what is to be done. Minor defects that do not affect the strength of the equipment etc. may be rectified by the rubber coating contractor.

e) The process of application of the rubber coating, and the finished product, shall be documented by the contractor on the form intended for the purpose (D.108). See items 7.5.4.3 and 8.1.3.

f) Rubber coating material shall fulfil the requirements on the maximum permitted levels of certain substances/elements, see specification from the respective licensee/plant owner.

4.3.7.2 Substrate surface and other requirements

a) The condition of steel surfaces, in respect of rust, to which the rubber coating is to be applied, shall not be less than Class B in accordance with SS EN ISO 8501-1:2007, Edition 2, (SS 05 59 00, Ed. 3).

b) Any welds in steel surfaces to which the rubber coating is to be applied shall be continuous, and the weld convexities shall have been completely ground down. Undercut may not occur. Riveted joints are not allowed. There must not be any pores, inclusions or edge misalignments of welds. Weld spatter and flaking of the steel surface shall be removed. Edges and corners shall be rounded to a minimum radius of R = 5 mm. Work involving anything more than surface operations may not be performed without the approval of the designer.

c) Surface preparation shall be started by degreasing, to remove oil, grease, graphite, soot, dust, clay and water soluble salts such as chlorides and sulphates before carrying out blasting.

d) Surfaces to which the rubber coating is to be applied may not be pressure tested using salt water.

e) Pressure testing of components shall be completed before surface preparation is started.

f) Scaffolding support surfaces shall be prepared (vacuum blasting) and rubber coated in the same way as other surfaces.

g) Outlets, pipe stubs, flanges, manholes and pipe connections shall be rubber coated in accordance with the design drawings.

h) Thermal insulation shall be applied to tanks or pressure vessels, erected in position outdoors, before the rubber coating is applied.

4.3.7.3 Preparation of the steel surface

a) It is the responsibility of the contractor to satisfy himself that the substrate is suitable for ensuring proper finished quality of the rubber coating work.

b) The surface to which the rubber coating is to be applied shall have reached a stable temperature. The ambient temperature shall be not less than 15 °C, and the humidity shall be measured and monitored to ensure that there is no risk of condensation. The surface temperature of the metal shall be at least +3 °C above the dew point.

c) Compressed air and blasting media shall be dry and clean.

d) Surfaces to be coated shall fulfil the Sa3 requirements of SS EN ISO 8501-1:2007, Edition 2, (SS 05 59 00, Ed. 3), and shall also fulfil the requirements in respect of surface finish in accordance with SS-EN ISO 8503-2(G), Edition 2. Other requirements in respect of abrasive media are set out in item 4.3.3.2. The proposed blasting medium for use on site built equipment, or when the object also contains materials other than carbon steel, shall be approved by the respective licensee/plant owner. The requirements as set out below in item 4.3.7.2 shall be complied with.

e) After blasting, the surface of the steel shall be carefully cleaned by ejector vacuum cleaning. Only smaller components and pipes, inaccessible to ejector vacuum cleaning, may be blown clean using oil free clean, dry compressed air.

f) Steel surfaces, in the case of new production, to which the rubber coating is to be applied may not have a chloride content exceeding 10 mg/m^2, and steel surfaces for recoating with rubber may not have a chloride content exceeding 100 mg/m^2, when tested in accordance with SS-EN ISO 8502-6:2006, Edition 2, (the Bresle method).

g) Surfaces to which the rubber coat is not to be applied shall be protected during blasting.

h) After blasting, steel surfaces shall be treated with primer as soon as possible. As a guide, priming shall be completed within 8 hours of conclusion of blasting under ambient conditions of 20 °C and 60 % RH. If this cannot be done within the time, the permitted time may be extended through the use of a dehumidifier to reduce the humidity to a level suitable for the time that will be required. Alternatively, the work may be carried out in stages

4.3.7.4 Rubber quality

The necessary rubber quality must be determined from case to case, depending on the object to be protected. The thickness of the rubber coating, the number of calendared layers, the hardness after vulcanisation, adhesion to the metal, tensile strength and the voltage for electric pore testing must always be determined when deciding on the agreed quality.

When deciding on the type of rubber protection, tests must always be carried out to determine whether the coating is suitable from the point of view of withstanding ionising radiation.

4.3.7.5 Application of rubber coatings

a) The ambient temperature shall not be less than 15 °C, and the humidity shall be monitored and controlled in order to ensure that there is no risk of condensation while the work is being carried out. The temperature of the surface shall be at least 3 °C above the dew point.

b) Contact surfaces intended for sacrificial anodes etc. shall not be rubber coated.

c) Unless otherwise indicated on the drawing, rubber coatings on flanges shall cover the entire sealing surface.

d) Wherever possible, rubber coatings in pipes shall be applied in a single piece from flange to flange, without transverse joints or seams. Joints or seams must not occur at or in the vicinity of connections between pipe runs and flanges.

   Note:
   It may not be possible to comply with this requirement when applying rubber coatings to small pipes with bends, branches etc. In addition, as it is almost impossible properly to inspect such work, such parts should **NOT** be rubber coated at all, but should instead be manufactured from some material that does not require surface protection.

e) If necessary, rubber coatings on flange surfaces shall be ground flat, in order to ensure proper sealing between the different parts, although the prescribed minimum thickness of the rubber coating must be maintained.

f) When applying rubber coatings to different types of substrates together, the rubber coating shall be extended at least 30 mm on to the surface of the more noble material.

g) At joints, the total contact surface area shall be at least 4 times the total thickness of the rubber coating, but shall not exceed 32 mm at any point.

h) No areas of inadequate adhesion, cavities, blisters or air inclusions are allowed, whether between the steel and the rubber or between different calendared rubber layers. This means that even the thin chamfered edge of overlap at joints must be properly vulcanised into and through the underlying rubber. In the event of finding defects in smaller objects, consideration should be given to removing the rubber coating (burning it off) and re applying it.

4.3.7.6 Vulcanisation

The vulcanisation process shall be described by the contractor in its internal documentation, with details of parameters such as pressure, rates of temperature rise and times

a) Pipes, smaller tanks, strainers, filters and pressure vessels, rubber coated at their manufacturers' premises.
   Hot air/steam vulcanisation in an autoclave.

b) Tanks and pressure vessels, rubber coated at site.
   Vulcanisation by water and steam..

4.3.7.7 Method testing

If an agreement has been reached on method testing, testing shall be performed in good time before starting the coating work. The test should involve applying a rubber coating to a test piece of an agreed size, in order to assess the profile depth of blasting, the thickness of the rubber, its appearance, the lengths of joints and its hardness. Adhesion to metal testing shall be performed by the supplier in accordance with SS EN 14879-4:2007, Edition 1, ensuring that the requirements as set out above in item 4.3.7.4 are fulfilled. The purchaser, or his representative, shall be given the opportunity of witnessing the testing. The results of such a method test shall be taken as those of a reference test.

4.3.7.8 Repair

The rubber coating contractor shall prepare a set of repair instructions.

Damage to rubber coatings shall be repaired by the supplier in accordance with instructions or some other agreed standard. Repairs shall be made using the same materials and working methods, and under the same conditions, as applied for the original rubber coating of the component. If any other material or method is used, it must first be approved by the Quality Manager. Treatment types S2, S13a, S13c, S13d or S13e should preferably be used.

4.3.7.9 Guarantee

The rubber coating shall be entirely defect free at the time of expiry of the guarantee period.

4.3.8 Standards and quality requirements for galvanized or metallised surface layers

Such coatings shall comply with the requirements set out in the following documents:

SS-EN ISO 14713-1-3:200,9 Edition 1	Protection against corrosion iron and steel structures – Recommendations for protection against corrosion in iron and steel structures
SS-EN 1993-1-3:2006, Edition 1	Eurocode 3 – Dimensioning of steel structures - Parts 1-3 Cold-formed sections and shaped sheet metal
SS-EN ISO 1461:2009, Edition 2	Hot-dip-galvanized coatings on fabricated iron and steel articles – Specifications and test methods (ISO 1461:1999)
SS 3192, Edition 3	Fasteners – Hop dip galvanisation of fasteners. This standard is now repealed but it can be obtained on request from the joint Surface Protection Group
SS-EN ISO 2081:2008, Edition 1	Inorganic coatings – Electrolytic galvanisation with subsequent coating of iron and steel.
SS-EN 10346:2009, Edition 1	Continuously hot metalized flat products – Technical terms of delivery
SS-EN ISO 2063:2005, Edition 1	Metallic and other inorganic coatings - Thermal spraying – Zinc, aluminium and their alloys (SS-EN ISO 2063:2005). See also item 1.2.1.6

If some other form of metallic surface treatment than listed above is foreseen, the requirements must be specified from case to case.

4.4 REQUIREMENTS IN RESPECT OF HANDLING, TRANSPORT AND STORAGE OF PAINTED STEEL STRUCTURES

Goods may not be handled until the painted parts can be moved or turned without marking the paint. Goods may not be transported until the paint has thoroughly dried or cured, in accordance with the paint manufacturer's data sheet. In this context, 'thoroughly dried or cured' means that the paint film is sufficiently dry not to be marked by moderate pressure.

Goods may not be transported or stored if the ambient conditions during the drying or curing process have been less good than the specified requirements. In the case of any doubt concerning how objects should be handled, e.g. in connection with lifting, the surface treatment contractor shall contact the purchaser for instructions intended to avoid damage. However, it is the duty of the purchaser to notify the parties of possible risks associated with vulnerable or sensitive designs, structures etc.

Painted structures, objects etc. shall be stored so that chemical curing, hardening etc. **proceed sequentially**. Painted structures, objects etc. shall be stored in well protected conditions, intended to ensure optimum quality of the painting system.

4.5 REQUIREMENTS IN RESPECT OF CLEANING WORK

This section complies essentially with the regulations applicable to construction of new plants and facilities.
The intention of this section is to prevent damage occurring on surface treated components and concrete surfaces.

4.5.1 General

The Contractor shall contact the power company's Purchaser immediately if it appears that it will not be possible to comply with applicable regulations.

Any damage to objects in connection with clearing up and cleaning shall be immediately reported to the Purchaser.

If a discrepancy report is required in those cases where cleanliness requirements cannot be maintained, such a report shall be immediately prepared by the Contractor, for approval by the power company's purchaser's authorised representative to confirm its validity. Use form no. D.104, Discrepancy Report.

Clearing up of areas, systems or components may not be started until the necessary permission has been obtained.

Before clearing up is started, checks should be made to ensure that enclosures and protection for components are in satisfactory condition.

4.5.2 Regulations

4.5.2.1 Regulations for clearing up

Clearing up relates to cleaning of areas, systems or components.

The Contractor is required to familiarise himself at site with the layout of the premises and/or with the appearance of systems and components.

The Contractor may use existing working floor drains, provided that they are not sealed. Under no circumstances may the strainers in floor drains be removed while clearing up work is in progress.

In areas where there are no floor drains, or if the drains are sealed, all water shall be immediately cleared up by wet vacuum cleaning. This wet vacuum cleaning shall be repeated when the water has run off walls and ceilings, in order to prevent water collecting on the floors and being left there for sufficient time to discolour the paint.

The Contractor shall use covering materials and tapes that have been approved by the respective licensee/plant owner. **Note**, some tapes are so adhesive that there is a risk of the paint coming loose when the tape is removed.

The Contractor shall make proper allowance for any fire risks associated with the covering of electrical equipment, heating equipment or hot pipes. Bearing in mind the need to withstand high pressure washing, covering materials must be strong and impermeable. Where necessary, covers over equipment must leave space as needed for air to circulate. Scaffolding etc. must not be in contact with, or lean against, systems, components or insulated systems. Openings and penetrations shall also be covered in order to protect adjacent areas. The contractor is responsible for removing excess materials, covering materials after use, empty packaging etc. to the indicated waste container.

4.5.2.2 Clearing up programme for areas, systems and components

Clearing up of building areas prior to painting and after completion of erection shall follow established procedures, with observation of regulations in accordance with item 4.5.2.1.

Clearing up work consists of four main parts:

a) Cleaning and covering components that may not be cleaned by high pressure jetting or onto which spills may occur.
b) Clearing up the area, which involves cleaning all surfaces in each area.
c) Taking samples of rinsing water, possibly performing a smear test on stainless steel surfaces and, where required, performing analyses of samples.
d) Uncovering and drying components, together with removal of covering materials and water on the floor

Most of the clearing up and cleaning work will be performed by high pressure jet washing. This does not apply, of course, in energised electrical areas, switchgear rooms, control rooms etc., where high humidity may not occur, and where the use of high pressure washing is therefore forbidden. In such areas, clearing up must be done using a dry method, with vacuum cleaners and, in the case of more stubborn dirt, the use of damp wipes. Manual clearing up in such areas shall use some form of milder general purpose detergent.

When cleaning objects etc. on which there is dirt that is unlikely to be removed by approved cleaning materials, the Contractor shall suggest the use of alternative cleaning materials, for approval by the Purchaser. If necessary, a special cleaning programme will be established.

Special cleaning and inspection programmes shall be established and complied with when clearing up and cleaning fuel ponds, condensation ponds, stainless piping systems before the application of thermal insulation, charging machines and cranes in the reactor hall and turbine hall.

4.5.3 Carrying out the work

While components are being covered, opportunity shall be taken to perform initial heavy duty cleaning, removing larger pieces of material etc. Any splashes of cement or concrete that have fastened to equipment shall be removed, using some method as approved by the Purchaser. Care must be taken not cause damage to parts such as stainless steel or painted surfaces.

Unless otherwise agreed, de ionised water shall be used for high pressure washing, with the addition of an approved detergent.

The temperature of this water shall not exceed 20 °C. Painted surfaces must be inspected before cleaning in order to check that they have properly dried/cured.

When washing surfaces with any mixture of detergents or chemicals, start from the bottom and work upwards, in order to avoid striping of painted surfaces. It may not be practical to do this when washing very high walls: instead, they should first be rinsed using de ionised water alone, and starting from the top, after which washing can be started, again from the top. As the surface is cleaned, it must be rinsed until all detergent solution has been removed. Rinsing must start as quickly as possible in order to prevent the detergent solution from drying on the surface. **Concentrated** detergent shall immediately be rinsed off any surface with which it becomes in contact.

When carrying out high pressure washing, the jet nozzle must not be held too close to any painted surface. The nozzle must be held at an angle of about 45° to the surface being cleaned, and be held at a distance of not less than 30 cm.

Even after high pressure washing, it may be necessary to complement cleaning by some form of mechanical cleaning and, in severe cases, also with the use of bleaching/flatting of the dirt. In any such case, the purchaser shall always approve both the intended bleach and the method of working. Mechanical cleaning shall be carried out with a paint scrubber or nylon scourer pad of not too hard a grade.

All foreign objects, such as marking labels, tape and their adhesive shall be removed from piping systems and components, preferably through the use of approved solvent. On painted surfaces, a solvent that does not adversely affect the paint must be used.

When carrying out high pressure washing of insulated systems, the water jet shall be aimed so that the water does not penetrate into the insulation. The jet must not be aimed directly at the covered component. Cable ladders etc., and insulation must not be walked on, as they can easily be damaged.

When cleaning is finished, components shall be uncovered and dried off. All larger items of scrap, dirt etc. shall be collected on the floor. When finishing off by cleaning the floors, clean water shall be flushed into the floor drains for a sufficiently long period of time to ensure that the system contains only clean rinsing water. After doing this, the floor shall be vacuum cleaned dry.

While the work is being carried out, foremen must check that the clearing up regulations are being complied with and that all dirt etc. is being removed. In addition, they must check that there are no dried on stains or residues of detergents, whether on washed and rinsed surfaces or on surrounding surfaces not directly affected by the cleaning.

4.5.3.1 Washing and cleaning using floor machines

Before applying further surface treatment, surfaces shall be cleaned in order to ensure satisfactory adhesion and quality.

Cleaning should preferably be carried out using suitable cleaning machines, which apply the cleaning chemicals, rinse the floor and finally suck up the liquid in one pass over the floor. In areas where the use of such machines is unsuitable, floors shall be cleaned by rotating brush machines, performing mechanical cleaning, followed by rinsing.

Floors shall be rinsed for a sufficiently long time to ensure that the drainage system contains only clean rinsing water. On completion of rinsing, the floors shall be vacuum cleaned dry.

In areas such as energised electrical equipment rooms, computer rooms, control rooms or other premises where high humidity may not occur, or where flammable solvents may not be used, cleaning methods must be modified to accommodate such restrictions and the level of dirt. This will normally mean that such areas must be cleaned by the use of damp wipes. Cleaning is checked as the work proceeds, finishing by inspection of cleanliness of the floor surfaces. Surface treatment can start after cleaning is concluded and approved.

See section 7.6 for inspection details.

4.5.4 Cleaning contractors

Cleaning contractors shall document their capability by reference to previous similar clearing up and cleaning contracts within process industries or similar.

The cleaning contractor management shall be thoroughly familiar with clearing up and cleaning within such types of industries, and shall also be familiar with water chemistry and associated sampling. The company's working personnel shall also be thoroughly

familiar with clearing up and cleaning work of this type. Equipment to be used shall be suited to the various types of work that will be encountered. Equipment etc. to be used on (for example) stainless steel components shall be made of austenitic stainless steel or of nylon. High pressure washing units shall have manual control of pressure, chemicals and water quantities.

4.5.5 Inspection

Notification of cleared up and finish cleaned areas shall be given to the Purchaser in accordance with current procedures. Each area shall be inspected and details shall be noted.

4.5.6 Chemical products

Only approved products may be used in the work of clearing up and cleaning: this applies also to materials used in the work such as tape, protective plastic etc.

5 TYPES OF TREATMENT FOR SURFACE PROTECTION WORK

Chapter 6 describes where the different types of treatment are to be carried out.

5.1 TYPES OF TREATMENT FOR CONCRETE, LIGHTWEIGHT CONCRETE AND GYPSUM BOARDS

Lists of approved products are listed in the 'Approved Paint Systems for TBY' document, which is available from the respective licensee/plant owner.
See also the data sheets in the 'Approved Paint Systems for TBY' document for more detailed application data of the products used for the respective types of treatment.

5.1.1 Floors

G1

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Grinding or blasting, as described in Item 3.3.6.1.
An area, about 4 cm wide, around floor drains and grouted in items (not welding pads), will be chiselled down to a level about 5 mm below the upper surface of the item. (This work will not be performed by the surface treatment contractor.)
If the floor is prepared by blasting, the surface must be carefully cleaned by ejector vacuum cleaning after conclusion of the blasting, followed by further cleaning by a magnetic cleaner.

Painting before and during erection

Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Impregnate the surface with epoxy. While erection is in progress, this treatment must be touched up and maintained as necessary, to an extent as subsequently decided.

Painting after erection

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Priming with epoxy, ensuring that all pores are filled.
Fill any damage or remaining pores using solvent free epoxy filler.
First coating, using 4 mm solvent free flooring compound.
Second coating, of about 0.5 mm (500 µm) using solvent free epoxy top coat.

Painting during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Careful ejector vacuum cleaning.
Second coating, of about 0.5 mm (500 µm) solvent free epoxy top coating.

Plinths

Filling in accordance with the prescribed method of dealing with walls.
Make a fillet, with a 20 mm wide chamfer, using solvent free epoxy filler.
Paint with primer and top coat in the same way as for concrete foundations (plinth height, 150 mm).

Concrete foundations

Make a fillet as for plinths.
Machine rubbing down, followed by careful ejector vacuum cleaning.
Filling of pores, using solvent free epoxy filler or cement filler.
1 coat of polyurethane or epoxy primer before erection.
1 coat of polyurethane or epoxy top coat after erection.

G2

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Grinding or blasting, as described in Item 3.3.6.1.
An area, about 4 cm wide, around floor drains and grouted in items (not welding pads) will be chiselled down to a level about 5 mm below the upper surface of the item. (This work will not be performed by the surface treatment contractor.)
If the floor is prepared by blasting, the surface must be carefully cleaned by ejector vacuum cleaning after conclusion of the blasting, followed by further cleaning by a magnetic cleaner.

Painting before erection

Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Impregnation with epoxy to fill all pores.
Coating I: 4 mm of solvent free epoxy flooring compound.

Painting after erection or during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Careful ejector vacuum cleaning.
Second coating, of about 0.5 mm (500 µm) solvent free epoxy top coating.

Plinths

Filling in accordance with the prescribed method of dealing with walls.
Make a fillet, with a 20 mm wide chamfer, using solvent free epoxy filler.
Paint with primer and top coat in the same way as for concrete foundations (plinth height, 150 mm).

Concrete foundations

Make a fillet as for plinths.
Machine rubbing down, followed by careful ejector vacuum cleaning.
Filling of pores, using solvent free epoxy filler or cement filler.
1 coat of polyurethane or epoxy primer before erection.
1 coat of polyurethane or epoxy top coat after erection.

G3

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Grinding or blasting, as described in Item 3.3.6.1.
An area, about 4 cm wide, around floor drains and grouted in items (not welding pads) will be chiselled down to a level about 5 mm below the upper surface of the item. (This work will not be performed by the surface treatment contractor.)

If the floor is prepared by blasting, the surface must be carefully cleaned by ejector vacuum cleaning after conclusion of the blasting, followed by further cleaning by a magnetic cleaner.

Painting before and during erection

Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Impregnate the surface with epoxy. While erection is in progress, this treatment must be touched up and maintained as necessary, to an extent as subsequently decided.

Painting after erection

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Priming with epoxy, ensuring that all pores are filled.
Fill any damage or remaining pores using solvent free epoxy filler.
First coating, using 2 mm solvent-free epoxy flooring compound.
Second coating, of about 0.5 mm (500 µm) using solvent free flooring compound.

Painting during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Careful ejector vacuum cleaning.
Second coating, of about 0.5 mm (500 µm) solvent free epoxy top coating.

Plinths

Filling in accordance with the prescribed method of dealing with walls.
Make a fillet, with a 20 mm wide chamfer, using solvent free epoxy filler.
Paint with primer and top coat in the same way as for concrete foundations (plinth height, 150 mm).

Concrete foundations

Make a fillet as for plinths.
Machine rubbing down, followed by careful ejector vacuum cleaning.
Filling of pores, using solvent free epoxy filler or cement filler.
1 coat of polyurethane or epoxy primer before erection.
1 coat of polyurethane or epoxy top coat after erection.

G4

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Grinding or blasting, as described in Item 3.3.6.1.
An area, about 4 cm wide, around floor drains and grouted in items (not welding pads) will be chiselled down to a level about 5 mm below the upper surface of the item. (This work will not be performed by the surface treatment contractor.)
If the floor is prepared by blasting, the surface must be carefully cleaned using a magnetic cleaner, after careful ejector vacuum cleaning has been carried out.

Painting before erection

Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Impregnate the surface with epoxy, filling all pores.
First coating: 2 mm of solvent free epoxy flooring compound.

Painting after erection or during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Careful ejector vacuum cleaning.
Second coating, of about 0.5 mm (500 µm) solvent free epoxy coating.

Plinths

Filling in accordance with the prescribed method of dealing with walls.
Make a fillet, with a 20 mm wide chamfer, using solvent free epoxy filler.
Paint with primer and top coat in the same way as for concrete foundations (plinth height, 150 mm).

Concrete foundations

Make a fillet as for plinths.
Machine rubbing down, followed by careful ejector vacuum cleaning.
Filling of pores, using solvent free epoxy filler or cement filler.
1 coat of polyurethane or epoxy primer before erection.
1 coat of polyurethane or epoxy top coat after erection.

G5a

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Rubbing down with steel potty knife.

Painting before erection

Ejector vacuum cleaning.
1 coat: impregnation with epoxy.
While erection is in progress, this treatment must be touched up and maintained as necessary, to an extent as subsequently decided.

Painting after erection

Grinding or blasting, as described in Section 3.3.6.1.
An area, about 4 cm wide, around floor drains and grouted in items (not welding pads) will be chiselled down to a level about 5 mm below the upper surface of the item. (This work will not be performed by the surface treatment contractor.)
If the floor is prepared by blasting, the surface must be carefully cleaned using a magnetic cleaner, after careful ejector vacuum cleaning has been carried out.
Careful ejector vacuum cleaning of the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Priming with epoxy, ensuring that all pores are filled.
Fill any damage using solvent free epoxy filler.
First coating, using 2 mm solvent-free epoxy flooring compound and 250 g/m² of colour flakes.
Second coating, of about 0.5 mm (500 µm) using unpigmented solvent free clear epoxy varnish.

Painting during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Careful ejector vacuum cleaning.
Coating I, of 2 mm solvent free bulk epoxy and 250 g/m² of colour flakes.
Coating II, of about 0.5 mm (500 µm) unpigmented solvent free clear epoxy varnish.

Plinths

Extend the floor finish 150 mm up plinths, using the same material.

G5b

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Rubbing down with steel potty knife.

Painting before erection

Ejector vacuum cleaning.
1 coat: impregnation with epoxy.
While erection is in progress, this treatment must be touched up and maintained as necessary, to an extent as subsequently decided.

Preparation

Grinding or blasting, as described in Section 3.3.6.1.
An area, about 4 cm wide, around floor drains and grouted in items (not welding pads) will be chiselled down to a level about 5 mm below the upper surface of the item. (This work will not be performed by the surface treatment contractor.)
If the floor is prepared by blasting, the surface must be carefully cleaned using a magnetic cleaner, after careful ejector vacuum cleaning has been carried out.

Painting after erection

Careful ejector vacuum cleaning of the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Priming with epoxy, ensuring that all pores are filled.
Fill any damage using solvent free epoxy filler.
First coating, using 2 mm solvent-free epoxy.
Application of anti slip material (laid while Coating I is wet).
Second coating, of about 0.5 mm (500 µm) using unpigmented solvent free clear epoxy varnish.

Painting during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Careful ejector vacuum cleaning.
Coating I, of 1 mm solvent-free epoxy compound.

Laying of anti slip material (laid while Coating I is wet).
Coating II, of about 0.5 mm (500 µm) unpigmented solvent free clear epoxy varnish.

Plinths

Extend the floor finish 150 mm up plinths, using the same material (except anti slip material).

G6a

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Grinding or blasting, as described in Item 3.3.6.1.
An area, about 4 cm wide, around floor drains and grouted in items (not welding pads) will be chiselled down to a level about 5 mm below the upper surface of the item. (This work will not be performed by the surface treatment contractor.)
If the floor is prepared by blasting, the surface must be carefully cleaned by ejector vacuum cleaning after conclusion of the blasting, followed by further cleaning by a magnetic cleaner.

Painting

Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Impregnate the surface with epoxy, filling all pores.
Coating I with 2 mm solvent free bulk epoxy and 250 g/m² of colour flakes.
Coating II of about 0.5 mm (500 µm) unpigmented solvent-free clear epoxy varnish.

Painting during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Careful ejector vacuum cleaning.
Coating I with 1 mm solvent free bulk epoxy and 250 g/m² of colour flakes.
Coating II of about 0.5 mm (500 µm) unpigmented solvent-free clear epoxy varnish.

Plinths

Extend the floor finish 150 mm up plinths, using the same material.

G6b

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Grinding or blasting, as described in Item 3.3.6.1.
An area, about 4 cm wide, around floor drains and grouted in items (not welding pads) will be chiselled down to a level about 5 mm below the upper surface of the item. (This work will not be performed by the surface treatment contractor.)
If the floor is prepared by blasting, the surface must be carefully cleaned by ejector vacuum cleaning after conclusion of the blasting, followed by further cleaning by a magnetic cleaner.

Painting

Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Impregnate the surface with epoxy, filling all pores.
Coating I with 2 mm solvent-free epoxy flooring compound.
Laying of anti slip material (laid while Coating I is wet).
Coating II of about 0.5 mm (500 µm) unpigmented solvent-free clear epoxy varnish.

Painting during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Careful ejector vacuum cleaning.
Coating I with 1 mm solvent free bulk.
Laying of anti slip material (laid while Coating I is wet).
Coating II of about 0.5 mm (500 µm) unpigmented solvent-free clear epoxy varnish.

Plinths

Extend the floor finish 150 mm up plinths, using the same material (except anti slip material).

G7a

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation
Rubbing down with a power sander, as described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
1 coat of epoxy primer, rolled and smoothed out.

Painting after erection or during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Filling of any erection damage, using epoxy filler, of the same colour as the floor.
Rubbing down of filled surfaces (use power sander if necessary).
1 coat of epoxy primer, applied to filled and sanded down areas, rolled on and smoothed.
Rubbing down.
1 coat of polyurethane topcoat, rolled and smoothed down over the entire surface, to produce a 60 μm dry film layer.

Plinths

Filling, as prescribed for walls.
Make a fillet, with a 20 mm wide chamfer, using solvent free epoxy filler or cement filler.
Painting with primer and topcoat, as for concrete foundations (plinth height, 150 mm).

Concrete foundations

Rubbing down (powered sander).
Careful ejector vacuum cleaning.
Filling of pores, using solvent free epoxy filler or cement filler.
1 coat of epoxy primer before erection.
1 coat of polyurethane topcoat after erection.
Fillets, as for plinths.

G7b

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Rubbing down with a power sander, as described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
1 coat of rolled and smoothed water based epoxy paint to produce a 60 µm dry film layer.

Painting after erection or during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Filling of any erection damage, using epoxy filler, of the same colour as the floor.
Rubbing down of filled surfaces (use a power sander if necessary).
1 coat of rolled and smoothed water based epoxy paint over filled and/or worn surfaces to produce a 60 µm dry film layer.
Rubbing down.
1 coat of rolled and smoothed water based epoxy paint over the entire surface to produce a 50 µm dry film layer.

Plinths

Filling, as prescribed for walls.
Make a fillet, with a 20 mm wide chamfer, using solvent free epoxy filler or cement filler.
Painting with primer and topcoat, as for concrete foundations (plinth height, 150 mm).

Concrete foundations

Make a fillet as for plinths.
Machine rubbing down, followed by careful ejector vacuum cleaning.
Filling of pores, using solvent free epoxy filler or cement filler.
1 coat of epoxy primer before erection.
1 coat of epoxy topcoat after erection.

G7c

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Rubbing down with a power sander, as described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
1 coat of diluted unpigmented potassium silicate (water glass) impregnation liquid, applied by roller.

Painting after erection or during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Filling of any erection damage, using cement filler.
Rubbing down of filled surfaces (use power sander if necessary).
Ejector vacuum cleaning (if surfaces have been rubbed down).
2 coats of acrylate latex paint, applied by roller, to produce a 60 µm thick dry film per layer.

Plinths

Make a fillet, with a 20 mm wide chamfer, using cement filler.
Filling, as prescribed for walls.
Painting with primer and topcoat, as for concrete foundations (plinth height, 150 mm).

Concrete foundations

Make a fillet as for plinths.
Machine rubbing down, followed by careful ejector vacuum cleaning.
Filling of pores, using cement filler.
1 coat of unpigmented potassium silicate (water glass) impregnation liquid before erection.
2 coats of acrylate latex paint after erection.

G8

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

Rubbing down with steel potty knife.

Painting prior to erection or during maintenance

Remove surface dust.
1 coat of unpigmented potassium silicate (water glass) impregnation liquid.

Concrete foundations

Same treatment as for the floor.

G9a

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish of floors shall correspond to that of the reference surface. See Table ESE.2/1, Class A, or Table ESE.24/2, Class A, in AMA Hus 11 in those cases where the concrete surface consists of a wall or ceiling surface.

Preparation

As described in Section 3.3.6.1.
Conclude preparation of the concrete surface by lightly blasting it with olivine sand or aluminium silicate.

Painting before erection

Blow wall and ceiling surfaces clean with compressed air, followed by ejector vacuum cleaning of all surfaces to which surface treatment is to be applied, to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Prepare fillets, using solvent free epoxy filler.
Fill any depressions using solvent free epoxy filler.
Finish fill the surface as necessary, using solvent free epoxy filler.
Using a power sander, rub down any unevenly filled areas.

Apply a 250 µm coat of solvent free epoxy primer.
Fill any remaining surface unevenness using solvent free epoxy filler.
Apply a 250 µm cover coat of solvent free epoxy coating.
Total dry film thickness must be 500 µm.

Painting after erection or during maintenance

Decide on any necessary painting work from case to case, depending on the degree of damage, in order to produce a finished surface equivalent to that of the reference surface.
Remove all loose paint.
Light vacuum blasting of and around damaged areas.
Apply any necessary filler, using solvent free epoxy filler.
Carry out priming and top-coating as for painting before erection.

G9b

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish of floors shall correspond to that of the reference surface. See Table ESE.2/1, Class A, or Table ESE.24/2, Class A, in AMA Hus 11 in those cases where the concrete surface consists of a wall or ceiling surface.

Preparation

As described in Section 3.3.6.1.
Conclude preparation of the concrete surface by lightly blasting it with olivine sand or aluminium silicate.

Painting before erection

Blow wall and ceiling surfaces clean with compressed air, followed by ejector vacuum cleaning of all surfaces to which surface treatment is to be applied, to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Prepare fillets, using solvent free epoxy filler.
Fill any depressions using solvent free epoxy filler.
Finish fill the surface as necessary, using solvent free epoxy filler.
Using a power sander, rub down any unevenly filled areas.
Apply a 250 µm coat of solvent free epoxy primer.
Fill any remaining surface unevenness using solvent free epoxy filler.
Apply a 250 µm intermediate coat of solvent free epoxy coating.
Topcoat, polyurethane, 40 µm (only when colour fastness cannot be ensured, but is required).

Painting after erection or during maintenance

Decide on any necessary painting work from case to case, depending on the degree of damage, in order to produce a finished surface equivalent to that of the reference surface.
Remove all loose paint.
Light vacuum blasting of and around damaged areas.
Apply any necessary filler, using solvent free epoxy filler.
Carry out priming and top-coating as for painting before erection.

G10a

Surface tensile strength

See Table 3- 1.

Surface smoothness of the substrate

The surface finish shall correspond to that of the reference surface.

Preparation

Machine rubbing down in accordance with Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Impregnate the surface with epoxy, filling all pores.

Painting after erection or during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Application of epoxy undercoat, to the extent as indicated necessary after inspection.
Painting with 300-500 µm of solvent free epoxy coating.

Plinths

Filling in accordance with the prescribed method of dealing with walls.
Make a fillet, with a 20 mm wide chamfer, using solvent free epoxy filler or cement filler.
Paint with primer and top coat in the same way as for concrete foundations (plinth height, 150 mm).

Concrete foundations

Make a fillet as for plinths.
Machine rubbing down, followed by careful ejector vacuum cleaning.
Filling of pores, using solvent free epoxy filler or cement filler.
1 coat of water based epoxy paint (see G7b) before erection.
1 coat of water based epoxy paint (see G7b) after erection.

G10b

Surface tensile strength

See Table 3- 1.

Surface smoothness of substrate

The surface finish shall correspond to that of the reference surface.
Preparation

Blasting, as described in Section 3.3.6.1.
Remove all abrasive blasting material with a magnetic collector after careful ejector vacuum cleaning has been carried out.

Painting before erection

Carefully ejector vacuum clean the surface to remove all loose concrete, grit, rubbish and dust from and around the prepared area.
Impregnate the surface with epoxy, filling all pores.

Painting after erection or during maintenance

High-pressure washing and rinsing, as described in Section 4.5.
Light rubbing down (using power sander). No. 60 abrasive paper.
Careful ejector vacuum cleaning.
Repair of damage using solvent free epoxy filler.
Rubbing down of repaired/filled surfaces.
Application of epoxy undercoat, to the extent as indicated necessary after inspection.
Painting with 300-500 µm of solvent free epoxy coating.

Plinths

Filling in accordance with the prescribed method of dealing with walls.
Make a fillet, with a 20 mm wide chamfer, using solvent free epoxy filler.
Paint with primer and top coat in the same way as for concrete foundations (plinth height, 150 mm).

Concrete foundations

Make a fillet as for plinths.
Machine rubbing down, followed by careful ejector vacuum cleaning.
Filling of pores, using solvent free epoxy filler or cement filler.

1 coat of water based epoxy paint (see G7b) before erection.
1 coat of water based epoxy paint (see G7b) after erection.

G11 (Action I, see 11.6.6.10.2)

Surface tensile strength

See Table 3- 1.

Preparation before injection
The floor's surface treatment must be washed thoroughly clean of all dirt and contamination.
Removal of existing coat of paint or coating using suitable equipment so the entire floor's concrete surface is completely clean of all paint residues.

Injection of dry cracks
Cracks are injected according to 11.6.6.6.1. (Treatment type G11 is not recommended for wet or water carrying cracks)
Injection is to be done using epoxy plastic or polyurethane as stated in Approved Paint Systems for TBY.

Preparation
Light machine grinding.
Thorough ejector vacuum cleaning.

Processing of painted surface
Repair of any damage using solvent-free epoxy filler.
Priming with epoxy (all pores must be filled)
Application of 2 mm solvent-free epoxy filler.

G12 (Action II, see 11.6.6.10.2)

Surface tensile strength

See Table 3- 1.

Preparation before injection
The floor's surface treatment must be washed thoroughly clean of all dirt and contamination.
Removal of existing coat of paint or coating using suitable equipment so the entire floor's concrete surface is completely clean of all paint residues.

Injection of dry cracks
Cracks are injected according to 11.6.6.6.1. (Treatment type G12 is not recommended for wet or water carrying cracks)
Injection is to be done using epoxy plastic or polyurethane as stated in Approved Paint Systems for TBY.

Preparation
Light machine grinding.
Thorough ejector vacuum cleaning.

Processing of painted surface
Repair of any damage using solvent-free epoxy filler.
Priming with epoxy (all pores must be filled)
Application of 2 mm solvent-free polyurethane filler.

5.1.2 Walls

V1-Concrete against slipform (AMA Hus 11 18-5 48 34)

Surface tensile strength

See Table 3- 1.

Surface smoothness

Steel floated and smoothed, leaving the smooth finishing as the final surface.
The surface finish shall correspond to that of the reference surface.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Dusting.
1 application of filler, using solvent free epoxy filler.
Rubbing down.
1 application of filler by scraper, using solvent-free epoxy filler.
Power sanding of fillers.
Dusting.
1 coat of water based epoxy primer, by spraying or rolling, followed by smoothing.

Painting after erection or during maintenance

Determine the appropriate preparation and priming on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.
Washing and rinsing, as described in Section 4.5.
Rubbing down.
1 coat of water based epoxy paint, finish sprayed, or 2 coats of water based epoxy primer by rolling followed by smoothing.

V2 -Concrete against panel form (AMA Hus 11 28-5 49 34)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.2/1, Class B, in AMA Hus 11. Also applies for precast concrete.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Dusting.
1 application of filler, using solvent free epoxy filler.
Rubbing down.
Joint filling (once) using solvent free epoxy filler.
Rubbing down.
1 application of filler by scraper, using solvent-free epoxy filler.
Power sanding of fillers.
Dusting.
1 coat of water based epoxy primer, by spraying, or by rolling followed by smoothing.

Painting after erection or during maintenance

Washing and rinsing, as described in Section 4.5.
Rubbing down.
Determine the appropriate preparation and priming on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.
1 coat of water based epoxy paint, finish sprayed, or 2 coats of water based epoxy paint by rolling followed by smoothing.

V3-Concrete against standing board form (AMA Hus 11 38-5 14 34)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.2/1, Class B, in AMA Hus 11. Also applies for precast concrete.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Dusting.
Patching and stopping (once), using solvent free epoxy filler.
Rubbing down.
1 application of filler by scraper, using solvent-free epoxy filler.
Power sanding of fillers.
Dusting.
1 application by spraying or rolling of water based epoxy primer, followed by smoothing.

Painting after erection or during maintenance

Washing and rinsing, as described in Section 4.5.
Rubbing down.
Determine the appropriate preparation and priming on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.
1 coat of water based epoxy paint, finish sprayed, or 2 coats of water based epoxy paint by rolling followed by smoothing.

V4 - Concrete against slipform (AMA Hus 11 16-0 11 35)

Surface tensile strength

See Table 3- 1.

Surface smoothness

The surface finish shall correspond to that of the reference surface.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Dusting.
1 application of filler, using acrylate latex filler.
Rubbing down.
1 smoothing application of acrylate latex filler.
Rubbing down.
1 coat of acrylate latex paint, sprayed to provide full coverage, or 2 rolled coats, to produce a minimum dry film thickness of 150 µm and maximum thickness of 300 µm.

Painting after erection or during maintenance

Determine the appropriate painting required on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.

V5 - Concrete cast against panel or board form (AMA Hus 11 26-0 11 35, 36-0 11 35,)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.2/1, Class A in AMA Hus 11. Also applies for precast concrete.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Dusting.
1 application of filler, using acrylate latex filler.
Rubbing down.
1 smoothing application of acrylate latex filler.
Rubbing down.
1 coat of acrylate latex paint, sprayed to provide full coverage, or 2 rolled coats, to produce a minimum dry film thickness of 150 µm and maximum thickness of 300 µm.

Painting after erection or during maintenance

Determine the appropriate painting required on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.

V6 - Concrete against slip, panel or board form (AMA Hus 11 16-0 46 35, 26-0 46 35, 36-0 46 35.

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.2/1, Class B in AMA Hus 11. Also applies for precast concrete.
The surface finish for slipform cast concrete must be equivalent to that of the reference surface.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Dusting.
1 coat of diluted acrylate copolymer latex or acrylate latex paint primer, white or near white.
1 application of filler, using acrylate latex filler.
Rubbing down.
1 coat of acrylate latex paint, sprayed to provide full coverage, or 2 rolled coats, to produce a minimum dry film thickness of 150 µm and maximum thickness of 300 µm.

Painting after erection or during maintenance

Determine the appropriate painting required on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.

V7 - Concrete against slip, panel or board form (AMA Hus 11 16-0 00 36, 26-0 00 36, 36-0 00 36).

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.2/1, Class B in AMA Hus 11. Also applies for precast concrete.
The surface finish for slipform cast concrete must be equivalent to that of the reference surface.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Dusting.
1 coat of diluted acrylate copolymer latex or acrylate latex paint primer, white or near white.
1 coat of acrylate latex paint, sprayed to provide full coverage, or 2 rolled coats, to produce a minimum dry film thickness of 150 µm and maximum thickness of 300 µm.

Painting after erection or during maintenance

Determine the appropriate painting required on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.

V8 - Concrete against slip, panel or board form (AMA Hus 11 16-0 00 08, 26-0 00 08, 36-0 00 08)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.2/1, Class B in AMA Hus 11. Also applies for precast concrete.
The surface finish for slipform cast concrete must be equivalent to that of the reference surface.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Dusting.
1 coat of penetrating colourless clear latex varnish, applied by spray or roller.

Painting after erection or during maintenance

Touch up any patches, filled holes or other concrete correction works etc. in accordance with 'Painting before erection'.

V9 - Gypsum boards (AMA Hus 11 56-0 28 19)

Painting

2 filler applications, using latex filler, to nail and screw holes.
2 filler applications, using latex filler, to joints between sheets.
Application of fabric strips.
2 coats of acrylate copolymer latex paint.

V10a - Gypsum boards (AMA Hus 11 56-0 40 10)

Painting

2 filler applications, using latex filler, to nail and screw holes.
1 filler application, using latex filler, to joints between sheets, with application of fabric strips.
2 filler applications, using latex filler, to joints between sheets.
2 coats acrylate copolymer latex paint.

V10b - Gypsum boards (AMA Hus 11 56-0 40 10)

Painting

2 filler applications, using latex filler, to nail and screw holes.
1 filler application, using latex filler, to joints between sheets, with application of fabric strips.
2 filler applications, using latex filler, to joints between sheets.
2 coats acrylate latex paint.

V11 - Gypsum boards (AMA Hus 11 56-0 26 10)

Painting

1 filler application, using latex filler, to nail and screw holes.
1 filler application, using latex filler, to joints between sheets.
2 coats acrylate copolymer latex paint.

V12 - Lightweight concrete thin joint blocks (AMA Hus 11 28-0 13 44)

Surface smoothness

Maximum height difference across joints: 2 mm.

Painting

1 application of filler, to holes and gaps, using solvent free epoxy filler.
1 smoothing application of filler, using solvent free epoxy filler.
Power sanding of fillers.
1 application of water based epoxy primer, by spraying or rolling.
1 application of water based epoxy topcoat, by finish spraying or rolling.

V13 - Lightweight concrete thin joint blocks (AMA Hus 11 26-0 13 10S alternative 26-0 13 08SP)

Surface smoothness

Maximum height difference across joints: 2 mm.

Painting

1 application of filler, to holes and gaps, using acrylate latex filler.
1 smoothing application of filler, using acrylate latex filler.
1 coat of acrylate latex paint, either sprayed to provide full coverage or applied by 2 applications of rolling.

V14 - Lightweight concrete thin joint blocks (AMA Hus 11 26-0 00 45)

Surface smoothness

Maximum height difference across joints: 3 mm.

Painting

1 spray or roller application of diluted acrylic copolymer latex primer, or of acrylate latex paint, white or near white.
1 coat of acrylate latex paint, either sprayed to provide full coverage or applied by 2 applications of rolling.

V15 - Lightweight concrete prefabricated elements (AMA Hus 11 26-0 57 45)

Painting

2 smoothing applications of acrylate latex filler, including filling of element joints.
1 spray application of diluted acrylic copolymer latex primer, or of acrylate latex paint, white or near white.
1 coat of acrylate latex paint, either sprayed to provide full coverage or applied by 2 applications of rolling.

V16 - Lightweight concrete prefabricated elements (AMA Hus 11 26-0 00 45)

Painting

1 spray or roller application of diluted acrylic copolymer latex primer, or of acrylate latex paint, white or near white.
1 coat of acrylate latex paint, either sprayed to provide full coverage or applied by 2 applications of rolling.

V17 - Gypsum boards (AMA Hus 11 56- 0 00 10)

Painting

2 coats of acrylate latex paint.

V18 - Gypsum boards (AMA Hus 11 56-0 35 10)

Painting

2 applications of filler in nail and screw holes.
Application of fibre strips into the filler.
2 applications of joint filler.
2 coats of acrylate latex paint.

V19 Gypsum boards (AMA Hus 11 56-0 84 19)

Painting

2 applications of filler in nail and screw holes.
3 applications of joint filler.
Application of fabric strips.
2 coats of acrylate latex paint.

V20 Concrete (AMA Hus 11 26-0 13 23)

Painting

Filling of holes and joints.
Smoothing application of filler.
Application of adhesive.
Application of fabric strips.
2 coats of acrylate latex paint.

V30 Repainting of existing latex paint (AMA Hus 11 966-3 00 10)

Painting

Washing prior to repainting, with scraping.
2 coats of acrylate latex paint.

V31 Repainting of existing latex paint (AMA Hus 11 966-3 04 10)

Painting

Washing prior to repainting, with scraping.
Surface filling for smoothing.
2 coats of acrylate latex paint.

V32 Repainting of existing latex paint (AMA Hus 11 966-3 05 10)

Painting

Washing prior to repainting, with scraping.
Filling of holes and levelling.
2 coats of acrylate latex paint.

V33 Repainting of existing latex paint (AMA Hus 11 966-3 11 10)

Painting

Washing prior to repainting, with scraping.
Surface filling for smoothing.
Smoothing filling.
2 coats of acrylate latex paint.

V34 Repainting of existing latex paint (AMA Hus 11 966-3 11 23)

Painting

Washing prior to repainting, with scraping.
Surface filling for smoothing.
Smoothing filling.
Application of adhesive.
Application of fabric strips.
2 coats of acrylate latex paint.

V35 Repainting of existing latex paint (AMA Hus 11 966-3 13 23)

Painting

Washing prior to repainting, with scraping.
Filling of holes and joints.
Smoothing filling.
Application of adhesive.
Application of fabric strips.
2 coats of acrylate latex paint.

V36 Repainting of existing latex paint (AMA Hus 11 966-3 16 23)

Painting

Washing prior to repainting, with scraping.
Surface filling for smoothing.
2 applications of smoothing filler.
Application of adhesive.
Application of fabric strips.
2 coats of acrylate latex paint.

V37 Repainting of previously painted varnished surfaces (AMA Hus 11 956-3 00 10)

Painting

Washing prior to repainting, with scraping.
2 coats of acrylate latex paint.

V38 Repainting of previously painted varnished surfaces (AMA Hus 11 956-3 05 23)

Painting

Washing prior to repainting, with scraping.
Filling of holes and joints.
Application of adhesive.
Application of fabric strips.
2 coats of acrylate latex paint

V39 Repainting of papered surfaces (AMA Hus 11 916-3 04 10)

Painting

Scraping off of loose wallpaper.
Filling of holes and joints.
2 coats of acrylate latex paint.

V40 Repainting of papered surfaces (AMA Hus 11 916-3 78 10)

Painting

Scraping off of loose wallpaper.
Rubbing down and filling of joints and edges.
2 coats of acrylate latex paint.

V41 Repainting, application of fabric strips to surfaces previously covered by woven fabric (AMA Hus 11 966-3 10 23)

Painting

Washing prior to repainting, with scraping.
Smoothing filling.
Application of adhesive.
Application of fabric strips.
2 coats of acrylate latex paint.

5.1.3 Ceilings

T1 - Concrete against panel form (AMA Hus 11 28-5 49 34)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.24/2, Class A in AMA Hus 11. Also applies for precast concrete.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Dusting.
1 application of filler in holes and joints, using solvent free epoxy filler.
Rubbing down.
1 application of filler by scraper, using solvent free epoxy filler.
Power sanding of fillers.

Dusting.
1 spray or roller application (followed by smoothing out) of water based epoxy primer paint.
Rubbing down.
1 finish coat application of water based epoxy paint, either by spraying or by rolling (followed by smoothing out).

Painting after erection or during maintenance

Determine the appropriate preparation and priming on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.
Washing and rinsing, as described in Section 4.5.
Rubbing down.
1 application of water based epoxy finishing coat, or 2 applications by rolling and smoothing out.

T2 - Concrete against panel form (AMA Hus 11 26-0 04 35)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.24/2, Class B in AMA Hus 11. Also applies for precast concrete.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Dusting.
1 application of diluted acrylic copolymer latex or acrylate latex primer, white or near white, by spraying or rolling.
1 application of filler, using acrylate latex filler.
Rubbing down.
1 coat of acrylate latex paint, sprayed to provide full coverage, or 2 rolled coats, to produce a minimum dry film thickness of 150 µm and maximum thickness of 300 µm.

Painting after erection or during maintenance

Determine the appropriate painting required on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.

T3 - Concrete against panel form (AMA Hus 11 26-0 00 35)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.24/2, Class B in AMA Hus 11. Also applies for precast concrete.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

1 application of diluted acrylic copolymer latex or acrylate latex primer, white or near white, by spraying or rolling.
1 coat of acrylate latex paint, sprayed to provide full coverage, or 2 rolled coats, to produce a minimum dry film thickness of 150 µm and maximum thickness of 300 µm.

Painting after erection or during maintenance

Determine the appropriate painting on a room by room basis, depending on the amount of damage, in order to produce a finished surface equivalent to that of the reference surface.

T4 - Concrete against panel form (AMA Hus 11 26-0 00 08)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.24/2, Class B in AMA Hus 11. Also applies for precast concrete.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Dusting.
1 coat of clear penetrating colourless latex varnish, applied by spray.

Painting after erection or during maintenance

Touch up any patches, filled holes or other concrete correction works etc. in accordance with 'Painting before erection'.

T5 - Concrete against panel form (AMA Hus 11 26-0 13 07)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.24/2, Class A in AMA Hus 11. Also applies for precast concrete.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting before erection

Rubbing down.
Dusting.
1 application of filler in holes and joints.
Smoothing application with latex filler, sprayable.
Graining, using sprayable latex filler.

T6 - Prefabricated concrete elements with joints (AMA Hus 11 26-0 58 10)

Surface tensile strength

See Table 3- 1.

Surface smoothness

See Table ESE.24/2, Class B in AMA Hus 11.

Preparation

As described in Section 3.3.6.1 (not performed by the surface treatment contractor).

Painting

Rubbing down.
Dusting.
Filling of joints between elements using acrylate latex filler.
1 sprayed or rolled application of acrylate latex filler.
1 sprayed or rolled application of acrylic copolymer latex.
1 full cover finish coat of acrylic copolymer latex, applied by 1 spray application or 1 roller application.

T7 - Lightweight concrete prefabricated elements (AMA Hus 11 26-0 00 10)

Painting

1 full cover coat of acrylic copolymer latex, applied by 1 spray application or 2 roller applications.

T8 - Concrete (AMA Hus 11 26-0 00 10)

Painting

1 full cover coat of acrylate latex paint, applied by 1 spray application or 2 roller applications, to include building services systems as well as ceiling surfaces.
NB: Fire protection and fire-fighting equipment etc. must not be painted.

T10 - Repainting of existing latex paint (AMA Hus 11 966-3 05 10)

Painting

Washing prior to repainting, with scraping.
Filling of holes and joints.
2 coats of acrylate latex paint.

5.2 TYPES OF TREATMENT FOR STEEL

See Chapter 6 for details of the areas for which the various types of treatment are prescribed.
Approved products are listed in the 'Approved Paint Systems for TBY' document, which is available from/at each of the power stations.
See also the data sheets forming part of the 'Approved Paint Systems for TBY' document for more details of application data for the products in each application or treatment class.
The anti-rust system's codes are as given in SS-EN ISO 12 944-5:2007, Edition 2, Annex A

S1

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
40 µm primer, EP Zn (R).
60 µm intermediate coat, EP.

After erection or during maintenance

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter 4.
160 µm top coat, EP resin modified (at least two coats).
Total, 260 µm

S2

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.(In the case of hot dip galvanized material, perform a light sweep blasting to produce surface finish Fine in accordance with SS-EN ISO 8503-2 (G), Edition 2.)
300 µm top coat, EP resin modified (at least three coats).
Total, 300 µm.

After erection or during maintenance

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter4.
Total, 300 µm.

S3

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
40 µm primer, EP Zn (R).
100 µm intermediate coat, EP resin modified

After erection or during maintenance

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter 4.
100 µm top coat, EP resin modified
Total, 240 µm.

S4

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.

40 µm primer, EP Zn (R).
200 µm top coat, EP resin modified (at least two coats).
Total, 240 µm.

After erection or during maintenance

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter4.
Total 240 µm.

S5

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
40 µm primer, EP Zn (R).
80 µm intermediate coat, EP.

After erection or during maintenance

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter 4.
40 µm top coat, PUR or EP.
Total, 160 µm.

S6a

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
80 µm primer, EP.

After erection or during maintenance

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter 4.
40 µm top coat, PUR or EP.
Total, 120 µm.

S6b

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
80 µm primer, EP.
80 µm intermediate coat, EP.

After erection or during maintenance

Touching up of any damage or repainting, see chapter 4, 4.3.5.5 and 4.3.5.6.
40 µm top coat, EP.
Total 200 µm.

S7

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
40 µm primer, EP Zn (R).
120 µm intermediate coat, EP.

After erection

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter 4.
40 µm top coat, PUR or EP.
Total, 200 µm.

S8

Before erection

Hot dip galvanized in accordance with SS-EN ISO 1461:2009, Edition 2.

Continuous hot dip galvanized thin sheet to ASTM A 525 M. Coating thickness 275 g/m² double sided (Sendzimir galvanized sheet).

Perform light sweep blasting of hot dip galvanized material to produce surface finish Fine in accordance with SS-EN ISO 8503-2 (G), Edition 2.
60 µm primer, EP.

After erection or during maintenance

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter 4.
Touch up any damage to the galvanizing using EP Zn (R) primer to produce a thickness equal to that of the specified hot dip galvanizing.

200 µm top coat, EP resin modified (at least two coats).
Total, 260 µm.

S9

Before erection

Hot dip galvanized in accordance with SS-EN ISO 1461:2009, Edition 2.

After erection or during maintenance

Touching up of any damage: see Items 4.3.5.5 and 4.3.5.6 in Chapter 4.
Touch up any damage to the galvanizing using EP Zn (R) primer to produce a thickness equal to that of the specified hot dip galvanizing.

S10

Before erection

Hot dip galvanized in accordance with SS-EN ISO 1461:2009, Edition 2.

After erection or during maintenance

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter 4.
Touch up any damage to the galvanizing using EP Zn (R) primer to produce a thickness equal to that of the specified hot dip galvanizing.

Perform priming and topcoat painting as for the surrounding ceiling, wall and floor areas.

S11

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
40 □m primer, EP Zn (R).

After erection or during maintenance

Touching up of any damage or repainting: see Items 4.3.5.5 and 4.3.5.6 in Chapter 4.
Touch up any damage to the galvanizing using EP Zn (R) primer to produce a thickness equal to that of the specified hot dip galvanizing.
Perform priming and topcoat painting as for the surrounding ceiling, wall and floor areas.

S12

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
40 μm primer, EP Zn (R)[1)].

After erection or during maintenance

Touch up any damage to the galvanizing using EP Zn (R)[1)] primer to produce a thickness of 40 μm.

1) Use ESI Zn (R) primer if the operating temperature is normally continuously above +70 °C but not above +400 °C.

S13a

Before erection

Sa 3. Surface roughness, Coarse, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
Primer and top coat, EP (at least two coats).
Total, at least 500 μm.

Alternatively, primer and top coat may be applied in 1 coat if approval is first obtained from the respective nuclear power station(s).

After erection or during maintenance

Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Total, at least 500 μm.

S13b

Before erection

Sa 3. Surface roughness, Coarse, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
Primer and topcoat, EP (at least two coats).
Total, 500 µm.

Alternatively, primer and undercoat may be applied in 1 coat if approval is first obtained from the respective nuclear power station(s).

After erection or during maintenance

Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Total, 500 µm.

S13c

Before erection

Sa 3. Surface roughness, Coarse, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
Primer and topcoat with composite (at least two coats).
Total, at least 600 µm.

After erection or during maintenance

Touching up of any damage, or recoating: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Any damage in the form of deeper corrosion pits, or other hollows, must be filled with a suitable composite.
Total, at least 600 µm.

S13d

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
50 µm primer, EP.
200 µm intermediate coat, EP.
200 µm top coat, EP.
Total, 450 µm.

After erection or during maintenance

Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Total, 450 µm.

S13e

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
300 – 400 µm epoxy powder paint
Total, 300 – 400 µm

After erection or during maintenance

Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Total, 300 – 400 µm.

S14

Before erection

Hot dip galvanized in accordance with SS-EN ISO 1461:2009, Edition 2.
Perform light sweep blasting of hot dip galvanized material to produce surface finish Fine in accordance with SS-EN ISO 8503-2 (G), Edition 2.
80 µm primer, EP.

After erection or during maintenance

Touching up of any damage, or recoating: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Make good any damage in the zinc coating using EP Zn (R) primer, to produce a thickness equal to that specified for hot dip galvanizing.
40 µm top coat, PUR or EP.
Total, 120 µm.

S15

Blasting, Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
Fire protection painting, including anti rust painting and top-coating of load bearing R30 Fire Resistance Category R30 steel structures in accordance with the respective paint manufacturers' instructions.

S16

Blasting, Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
Fire protection painting, including anti rust painting and top-coating of load bearing R60 Fire Resistance Category R60 steel structures in accordance with the respective paint manufacturers' instructions.

S17

Cleanliness Class 3, in accordance with AMA Hus 11.
60 µm primer, AY.
40 µm top coat, AY.
Total, 100 µm.

After erection or during maintenance

Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Total, 100 µm.

S18

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
120 µm primer and intermediate coat, AK or AY, (at least two coats).
40 µm top coat, AK or AY.
Total, 160 µm.

After erection or during maintenance

Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Total, 160 µm.

S19

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
200 µm primer and top coat, EP resin-modified.
Total, 200 µm.

After erection or during maintenance

Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Total, 200 µm.

S21

Before erection

Steel sheet coated with aluminium-zinc cladding (Aluzink), 150 g/m², double sided, or continuously hot dip galvanized thin steel sheet in accordance with ASTM A 525 M.
Coating weight 275 g/m², double sided (Sendzimir galvanized sheet).
Degreasing with alkaline cleaner and emulsion.
Light sweep blasting (at low air pressure) of the entire area (theoretical removal, max. 5 µm). Surface roughness Fine in accordance with SS-EN ISO 8503-2 (G), Edition 2.
60 µm primer, EP.

After erection or during maintenance

Degreasing with alkaline cleaner and emulsion.
Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
Areas of damage to the metal coating, ≥ 1 dm², and which do not require filling, must be touched up using EP Zn (R) primer to produce a film thickness equal to the original specified thickness, and shall then be primed with 60 µm of EP primer.

Damage that requires filling must be sanded down with coarse sandpaper to produce a clean surface, followed by filling with an approved filler. See item 4.3.5.2. Paint filled areas with 20 µm of EP primer.
40 µm top coat, AK.
Total paint film thickness, 100 µm.

S22

Before erection

Sa 2½. Surface roughness, Medium, in accordance with SS-EN ISO 8503-2 (G), Edition 2.
40 µm primer, EP Zn (R).
60 µm intermediate coat, EP.

After erection or during maintenance

Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.
40 µm top coat, AK.
Total, 140 µm

S23

Before erection

Primed in accordance with the manufacturer's standard.

After erection or during maintenance

Verify the ability of the lift door manufacturer's primer to accept further paint before applying undercoat or topcoat.
Degreasing with alkaline cleaner and emulsion.
Touching up of any damage, or repainting: see Chapter 4, Items 4.3.5.5 and 4.3.5.6.

Damage that does not require filling must be touched up using AK primer to produce a film thickness of 40 µm.

More extensive damage and/or other damage that requires filling must be sanded down with coarse sandpaper to produce a clean surface, followed filling with an approved filler as listed in the 'Approved Paint Systems - TBY' document. See Item 4.3.5.2.

60 µm intermediate coat, AK.
40 µm top coat, AK.
Total, 100 or 140 µm, excluding factory finish.

S30 (AMA Hus 11 98 85-3 00 10)

After erection

Cleanliness Class 3.
2 coats of varnish.

S31 Repainting of previously painted varnished surfaces (AMA Hus 11 98 955-2 00 41)

Cleanliness Class 2
2 coats of varnish.

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6 TABLES OF TYPES OF TREATMENT

6.1 GENERAL

Where there is any reference in this chapter to requiring approval from any of the licensee/plant owners, or its/their authorised representatives, this means that such approval must be given by:

- **the authorised person(s) on the staff of the respective nuclear power station(s) responsible for surface protection**, or by some other person(s) consulted by him/her/them and knowledgeable in the particular matter concerned.

Table 6-1, Table 6-2 and Table 6-3 specify the types of treatment that shall normally be prescribed for premises and equipment/items in Painting Classes I, II, III, IV, V and VI.

Use **Table 6-1** (and the clarifications to it as set out in section 6.1.1.1) for identifying and determining the types of treatment required for concrete, lightweight concrete, mortar, plaster, gypsum board and wood fibre board surfaces.

Use **Table 6-2** for identifying and determining the types of treatment required for carbon steel structures etc. belonging to the building.

Use **Table 6-3** for identifying and determining the types of treatment required for carbon steel equipment/items belonging to the process equipment.

6.1.1 Painting the building structure

Use **Table 6-1** for identifying and determining the types of treatment required for concrete, lightweight concrete, mortar, plaster, gypsum board and wood fibre board surfaces. See 6.1.1.1 for clarification of types of treatment required for special areas.

Before specifying the types of treatment for a given room description, the area must first be classified with respect to **Painting Class**, together with room category, radiation zone, environmental class, moisture and temperature conditions, all as described in TBY Chapter 2.

When preparing a room description (and this applies both for new building work and for maintenance painting), allowance must be made for factors such as the radiological environment, decontamination requirements, moisture conditions, temperatures, the effect of chemicals, fire classification, mechanical effects/damage, wear and tear due to friction etc.

Treatment types V4 - V41, T2 - T10 and G3 - G8 shall normally be chosen for Painting Class V (offices) when painting and flooring compounds are involved. When preparing room descriptions for areas belonging to Painting Class V, it must be particularly noted that top coats can differ in terms of type of paint, gloss and colour. Compare, for example, V4 and V10a, or T2 and T6. Example: Rooms X and Y both belong to Painting Class V. Treatment type T2 is wanted in Room X, and treatment type T6 in Room Y. The top coat for T2 must be an acrylate later paint, while that for T6 must be an acrylate copolymer paint of the required colour. For Room X we therefore specify the use of an

acrylate copolymer paint in the required colour, as top coat for treatment type T2. In other respects, we specify the prescribed filler paints in accordance with the requirements of the respective treatment types.

Each and every new room description, and/or any changes in existing premises in connection with maintenance painting, must be submitted to the respective nuclear power station'(s') quality manager(s) for approval before the work is carried out.

Examples of room types	**Concrete**			**Notes**	**Painting classes**
	Floor	**Walls**	**Ceilings**		
Reactor containment	G1, G2 G7b	V1. V2, V3	T1	Special requirements in respect of resistance to steam. Concrete surfaces in the wet-well and RPV areas	I
Rooms in controlled zones	G1 - G8, G10a. G10b	V1 - V10b, V12 - V16	T1 – T4, T7	G1 or G2 in heavily trafficked transport routes and corridors etc.	II
Rooms outside controlled zones	G1, G2 G4 - G8 G10a, G10b	V1 - V40	T1 - T10		III
Areas with high humidity and with surfaces that are partly or wholly under water, whether inside or outside controlled zones	G9a, G9b G10a, G10b	G9a, G9b	G9a G9b	Pump pits, pools, tanks, inner parts of water intakes to strainer plant etc. Concrete surfaces of water intakes to strainers are normally not treated.	IV
Office rooms and similar	G3 - G8	V4 - V11, V13 - V41	T2 - T10	As specified by the respective power station's instructions	V
Outdoors				Adjust the thickness of the treatment to suit conditions.	VI

Table 6- 1 for building painting - Concrete (See section 6.1.1.1 for notes, clarifications etc)

6.1.1.1 Clarification of Table 6-1 concerning application areas for the various types of treatment.

G1 and G2

This treatment is prescribed for use in the following areas in Painting Classes I, II and III:

a) The reactor containment upper dry-well, the lower dry-well and floors over which air cushion transport is used, or surfaces having high surface smoothness requirements.
b) The main transport routes in the reactor and turbine buildings.
c) Corridors, passages and set-down areas that are very heavily trafficked by internal trucks, lorries or other heavier transport or handling movements.
d) Decontamination areas with heavy handling.
e) Floor areas in front of lift doors (size = the opening width of the lift door + 5 m).
f) Local workshop areas as used during overhaul work

G3 and G4

This treatment is prescribed for use in the following areas in Painting Classes II and III:

a) Corridors that are heavily trafficked by internal trucks, lorries or other heavier transport or handling movements.
b) The reactor hall.
c) Floor drains and floor surfaces within bunds where a high resistance to chemicals is required.

G5a and G6a

This treatment is prescribed for use in the following areas in Painting Classes II and III: Floor tiles may be an alternative to floor coating in Painting Class III.

a) Personnel areas such as cafeterias, rest rooms, changing rooms, washing and shower rooms etc.

NB: This type of treatment must not be specified for evacuation routes.

G5b and G6b

This treatment is prescribed for use in the following areas in Painting Classes III or V:

a) Washing and shower rooms
b) Areas where particular resistance to slipping is required

NB: This type of treatment must not be specified for evacuation routes.

G7b and G7c

This treatment is prescribed for use in the following areas:

Type of treatment	**Painting class**	**Room category**	**Environment class in accordance with Asea-Atom** (See Chapter 2.5.2)	**Notes**
G7b	I, II, III, V	A and B in all plants C, D and E in B1, B2, F3, O1, O2, O3. C and D in F1 and F2. C1, C2 in OL1 and OL2. C4 in R1 – R4	N1	
G7c	II, III, V	A and B in all plants	N1	Electrical equipment rooms, fan rooms, cable rooms, telephone exchange equipment rooms, variable-purpose rooms with minimal wear and tear. There must not be any floor trenches or floor drains in these areas.

NB: **All** conditions in each column must be fulfilled if the particular type of treatment is to qualify for selection.

E.g.: G7b cannot be selected for rooms belonging to Painting Class II, room category B and environment class N1. Choose G7c instead if the information in the Notes column agrees with the other characteristics of the room.

G8

The treatment is prescribed in the following areas in Painting Classes II and III and V:

a) Electric cable culverts, pipe culverts, cable chutes or other similar areas where it is only necessary to bind the dust.
b) Pipe culverts belonging to Painting Classes III and V, if there are no aesthetical reasons.
c) Lift shafts excl. fronts.

G9a and G9b

This treatment is prescribed for use in the following areas in Painting Class IV:

a) Pump pits in controlled zones.
b) Pools or tanks containing de ionised water.
c) Pump pits or tanks outside controlled zones where oils, acids etc. must not come into contact with concrete.

NB

1. For the paint products listed in Approved Paint Systems for TBY, the approval of the application areas is limited.. See the respective manufacturers' information in Item 3.3.2.
2. Subject to the concrete structure having the necessary crack reinforcement.

G10a and G10b

This treatment is prescribed for use in the following areas in Painting Classes II, III and IV:

a) Corridors, staircases, passages or similar communication routes that carry mainly heavy pedestrian traffic and which are not to be treated in accordance with G1 - G7b.

   Treatment types G10a and G10b lie between G3 and G4 on the one hand and G7b on the other. G10a and G10b must not be used if there is a risk of any greater mechanical wear or damage.

G11 and G12.

This treatment is prescribed when repair alternatives are appropriate in accordance with that stated in 11.6.6.10.

V1, V2 and V3

This treatment is prescribed for use in the following areas in Painting Classes I, II and III:

a) Areas in OL1 and OL2 in room categories C1 and C2.

   Areas in F1 and F2: C and D.
   Areas in B1, B2, O1, O2, F3 and O3: C, D and E.
   The areas in R1-R4: C1, C2 and C3 i R1 - R4.
   The above applies for all areas containing tanks and/or components such as pumps, valves and flanges where there is a risk of leakage of hot pressurised reactor water and reactor steam.

   Exceptions include, for example, the turbine enclosure in O2 and O3, which is dealt with in accordance with V4 or V5.

b) Areas where the requirements in respect of decontaminability are greatest, e.g. decontamination areas for process equipment and personnel, certain rooms in the waste building etc.

c) Areas where there are higher requirements in respect of resistance to chemicals, such as in battery rooms, certain sampling rooms, laboratory rooms and certain rooms containing chemicals in water treatment plants, effluent treatment plants and waste buildings.

d) Areas where wet washing is frequently carried out.

V4 and V5

This treatment is prescribed for use in the following areas in Painting Classes II and III:

a) Areas belonging to room categories C1 and C2 in OL1 and OL2,
C and D for F1 and F2.
C, D and E in B1, B2, O1, O2, F3 and O3.
C1, C2, C3 and C4 in R1 – R4.
The above applies for all areas where there is little risk of leakage apart from that of pipe failure.

b) Areas where a higher standard of surface finish than that given by V6 and V7 is required; e.g. personnel hygiene areas, local control rooms, sampling rooms, fuel storage rooms, fan rooms, office rooms in Painting Class II, active instrument workshops, telephone exchange equipment rooms, relay rooms, staircases and corridors.

c) Areas where a higher standard of surface finish is required from floor level and up to about 2 m; e.g. in the reactor hall, transport routes, turbine building, set-down areas, active workshops and at workplace positions (only during shutdowns and in Painting Class II).

V6

This treatment is prescribed for use in the following areas in Painting Classes II, III and V:

a) Areas in Painting Class II that belong to room categories B and C in B1, B2, O1, O2, B and C2 in OL1 and OL2 and B, C, D and E in F3 and O3 as well as in B and C4 i R1 - R4. B and C in F1 and F2. The above applies to all areas with process pipe installations.

b) Areas with process pipe installations in Painting Classes III and V (see V8).

V7

This treatment is prescribed for use in the following areas in Painting Classes II and III:

a) Areas belonging to room categories B and C in B1, B2, O1, O2, B and C2 in OL1 and OL2 and B, C, D and E in B1, B2, O1, O2, F3 and O3 as well as in B and C4 i R1 - R4. B and C in F1 and F2.The above applies for areas without process pipe installations, e.g. other electrical rooms, cable culverts, stores, ventilation shafts or similar.

b) Areas in Painting Class III; e.g. electrical equipment rooms, cable culverts (see V8), or similar.

V8

This treatment is prescribed for use in the following areas in Painting Classes II and III and V:

a) Cable culverts, cable trenches or other similar surfaces, which require treatment only in order to prevent dust formation.

b) Pipe culverts in Painting Classes III and V, unless there are aesthetic considerations for painting.

c) Lift shafts, excluding front panels. Fronts that comprise shaft walls are treated in accordance with V1-V3 or V4.

V9

This treatment is prescribed for use in the following areas in Painting Class V:

a) Office rooms with higher aesthetic requirements.

b) Control rooms.

V10a

This treatment is prescribed for use in the following areas in Painting Classes III and V:

a) Office rooms with normal industrial standard, laboratory rooms, sampling rooms, instrument workshops, electrical workshops and local control rooms.

b) Other areas where a higher finish than that produced by V11 treatment is required.

V10b

This treatment is prescribed for use in the following areas, belonging to Painting Class II:

a) Office rooms with normal industrial standard, laboratories, sampling rooms, instrument workshops, electrical workshops and local control rooms.

b) Other areas where a higher finish than that produced by V11 treatment is required.

V11

This treatment is prescribed for use in the following areas in Painting Classes III and V:

a) Stores, other electrical equipment rooms, fan rooms, HVAC equipment rooms, cleaning rooms/cupboards and similar.

V12

This treatment is prescribed for use in the following areas in Painting Classes II and III:

a) Areas in B1, B2, O1, O2, ,OL1 and OL2 in room categories C1 and C2. Areas in F1 and F2: C and D.
Areas in B1, B2, O1, O2, F3 and O3: C, D and E.
The areas in R1-R4: C1, C2 and C3 i R1 - R4.
The above applies for all areas containing cisterns and/or components such as pumps, valves and flanges where there is a risk of leakage of hot pressurised reactor water and reactor steam.

b) Areas where the requirements in respect of decontaminability are greatest, e.g. decontamination areas for process equipment and personnel, certain rooms in the waste building etc.

c) Areas having the highest requirements in respect of resistance to chemicals, such as in battery rooms, certain sampling rooms, laboratory rooms, rooms containing acids etc. e.g. water treatment plant buildings.

d) Areas where wet washing is frequently carried out.

V13

This treatment is prescribed for use in the following areas in Painting Classes II, III and V:

a) Areas belonging to room categories C1 and C2in B1, B2, O1, O2, , OL1 and OL2. C and D for F1 and F2.
C, D and E in B1, B2, O1, O2, F3 and O3.
C1, C2, C3 and C4 in R1 – R4.
The above applies for all areas where there is little risk of leakage apart from that of pipe failure.

b) Areas where a higher standard of surface finish than that given by V14 is required; e.g. personnel hygiene areas, local control rooms, sampling rooms, fan rooms, office rooms in Painting Class II, active instrument workshops, archives, telephone exchange equipment rooms, relay rooms, staircases and corridors.

c) Areas in Painting Class II where a higher standard of surface finish is required from floor level and up to about 2 m; e.g. in active workshops and at workshop positions (only during shutdowns).

V14

This treatment is prescribed for use in the following areas in Painting Classes II, III and V:

a) Areas belonging to room categories B and C in B1, B2, O1, O2, B and C2 in OL1 and OL2 and B, C, D and E in B1, B2, O1, O2, F3 and O3 as well as in B and C4 i R1 - R4. B and C in F1 and F2. The above applies for areas without process pipe installations, e.g. other electrical rooms, cable culverts, ventilation shafts or similar (see V7), stores etc.

b) Areas belonging to Painting Class III, e.g. other electrical equipment rooms, cable culverts (see V8), stores etc.

V15

This treatment is prescribed for use in the following areas in Painting Classes II, III and V:

a) Areas belonging to room categories C1 and C2 in B1, B2, O1, O2, , OL1 and OL2.
C and D for F1 and F2.
C, D and E in B1, B2, O1, O2, F3 and O3.
C1, C2, C3 and C4 in R1 – R4.
The above applies for all areas where there is little risk of leakage apart from that of pipe failure.

b) Areas where a higher standard of surface finish is required; e.g. personnel hygiene areas, local control rooms, sampling rooms, fan rooms, office rooms in Painting Class II, active instrument workshops, archives, telephone exchange equipment rooms, relay rooms, staircases and corridors.

c) Areas where a higher standard of surface finish is required from floor level and up to about 2 m; e.g. in active workshops and at workshop positions (only during shutdowns and in Painting Class II).

V16

This treatment is prescribed for use in the following areas in Painting Classes II and III:

a) Areas belonging to room categories B and C in B1, B2, O1, O2, B and C2 in OL1 and OL2 and B, C, D and E in B1, B2, O1, O2, F3 and O3 as well as in B and C4 in R1 - R4. B and C in F1 and F2.
The above applies for areas without process pipe installations, e.g. other electrical rooms, cable culverts, ventilation shafts or similar (see V7), pipe culverts, stores etc.

b) Areas belonging to Painting Class III, e.g. other electrical equipment rooms, cable culverts and pipe culverts (see V7), stores etc.

T1
This treatment is prescribed for use in the same areas as for V1, V2, V3 and V12.

T2

This treatment is prescribed for use in the same areas as for V4, V5 and V6.

T3

This treatment is prescribed for use in the same areas as for V7.

T4

This treatment is prescribed for use in the same areas as for V8.

T5

This treatment is prescribed for use in offices and similar areas belonging to Painting Class V.

T7

This treatment is prescribed when a diffusion permeable ceiling paint is required.
NB: This type of paint is not decontaminable.

6.1.2 Surface treatment of carbon steel forming part of the building structure

Select the appropriate surface treatment in accordance with **Table 6-2**.

Start by classifying items, objects, equipment etc. with respect to **Painting Class** and room category, radiation zone, environment class, moisture and temperature as described in Chapter 2, and then use the table to identify the type of treatment.

In the case of items, equipment etc. in damp conditions, determination of the type of treatment depends first and foremost on the item's etc. own environment and then secondly on the environment in the area in which the item etc. is sited.

Example: A pipe system that is constantly exposed to condensation, but which is sited in a Painting Class II environment, shall be treated as for a Painting Class IV item, as the pipe system's own conditions represent a Painting Class IV environment.

Each and every new surface treatment specification, with associated manufacturing drawings, and/or any changes to existing equipment in connection with maintenance painting, must be submitted to the respective licensee/plant owner's quality manager(s) for approval before the work is carried out.

Table 6- 2 for building painting - carbon steel						
Item / object / equipment	**Painting classes**					
STEEL AND CAST STEEL ITEMS ETC.	**I**	**II**	**III**	**IV**	**V**	**VI**
Fire doors and door frames, frames around hatches, window frames and wall areas[10)] in room categories C, D and E in B1, B2, F3,F1, F2, O1, O2 and O3.OL1 as well as OL2. C1, C2 in OL1 and OL2.as well as C3 in R1- R4 as well as D and E i F3 and O3 C and D in F1 and F2.	S4[3)21)]	S5[3)]		S2[3)]		
Other fire doors and door frames, frames around openings, window frames and wall areas.[10)]	S4[3)21)]	S21[3)] S22[3)]	S21[3) 4)] S22[3) 4)]	S2[3)]	S21[4)] S21[3) 4)]	S21[3) 4)] S22[3) 4)]
Fire ventilators in room categories C1 in B1, B2, F1 F2, O1, O2, OL1 as well as OL2, C, D and E in B1, B2, F3, O1, O2 and O3. C1, C2 and C3 in R1- R4. As well as D and E in F3, O3. C and D in F1 and F2.	S4[21)]	S5		S2		
Other fire ventilator openings		S22	S22	S2	S22	S22
Chequered plate and edging strips	S11[5)]	S11[5)]	S11[5)]	S3[6)22)]		S3[6)]
Elkington covers, top. Elkington covers, underside		S3 S2	S3 S2	S3 S2		
Lift door surrounds	S4[21)]	S23	S23		S23	
Embedment pipes through the reactor containment (PS-penetrations)	S4[21)]	S11				
Cooling plates in the RPV area	S12					
Lifting and pulling eye mounts	S4[21)]	S11	S11	S2		S11
Lifting and pulling eyes	S12[1)]	S12[1)]	S12[1)]	S12[1)]		S12[1)]
MCT frames	S3[12)21)]	S11[1)]	S11[1)]	S2		S3[1)]

Table 6- 2 for building painting - carbon steel						
Item / object / equipment	**Painting classes**					
STEEL AND CAST STEEL ITEMS ETC.	**I**	**II**	**III**	**IV**	**V**	**VI**
Pump pits				S13a		
Rails on concrete bases in room categories C1 [1)] in B1, B2, F1, F2, O1, O2, OL1 as well as OL2, C1 [1)] , C2 as well as C3 in R1- R4 as well as D and E in F3, O3. C, D and E in B1, B2, O3 and F3. C1 and C2 in OL1 and OL2. C2 and C3 in R1-R4. C and D in F1 and F2. [1)7)]	S4[21)]	S4				
Other rails on concrete bases [7)]		S11[8)]	S11[8)]	S4[22)]		
Rails on steel bases in room categories C1[1)] in B1, B2, F1, F2, O1, O2, OL1 as well as OL2, C1[1)], C2 as well as C3 in R1- R4 as well as D and E in F3, O3 C, D and E in B1, B2, O3 and F3. C1 and C2 in OL1 and OL2. C2 and C3 in R1-R4. C and D in F1 and F2.[1)7)]	S4[21)]	S12				
Other rails on steel bases[7)]		S12	S12	S4[22)]		
Pipe penetrations	S4[21)]	S11	S11	S2		S3
Other steel structures, not specified separately	S4[21)]	S4	S4	S2		S4[2)]
Welding plates and strip plates	S3[21)]	S11	S11	S2		S3
Transport shafts for main circulation pumps	S2					
Ceiling/roof beams, including load transfer beams	S5[21)]	S12	S12	S4[22)]		S5[1)]

Table 6- 2 for building painting - carbon steel						
Item / object / equipment	**Painting classes**					
STEEL AND CAST STEEL ITEMS ETC.	**I**	**II**	**III**	**IV**	**V**	**VI**
Stair-rails, handrails, guides and steps in room categories C1 in B1, B2, F1, F2, O1, O2, OL1 as well as OL2, C1, C2 as well as C3 in R1- R4 as well as D and E in F3, O3. C, D and E in B1, B2, O3 and F3. C1 and C2 in OL1 and OL2. C1, C2 and C3 in R1-R4. C and D in F1 and F2.	S5[21)]	S5				
Other stair-rails, handrails, guides and steps		S22	S22	S4[22)]	S22	S22
Crane rails, hoist beams	S4[21)]	S12	S12	S4[22)]		S5
Ventilation grids		S11[1)13)]	S11[1)13)]	S3[9)22)]		S22
Other cast-in items not specified separately	S3[21)]	S3	S3	S2		S3[2)]

Table 6- 2 for building painting - carbon steel						
Item / object / equipment	**Painting classes**					
	I	**II**	**III**	**IV**	**V**	**VI**
GALVANIZED OBJECTS						
Anchor rails	S14[21)]	S10	S10	S10 + S2[22)]	S10	S9
Fire doors and door frames, frames around hatches, window frames and wall areas in room categories C1 in B1, B2, F1, F2, O1, O2, OL1 as well as OL2, C1, C2 as well as C3 in R1- R4 as well as D and E in F3, O3. C, D and E in B1, B2, F3, O1, O2 and O3. C1, C2 in OL1 and OL2. C3 in R1- R4. C and D in F1 and F2. 13) 17) 18) 19)		S14				
Other fire doors and door frames, frames around openings, window frames and other wall areas 13) 17) 18) 19)		S21	S21	S9 + S2[22)]	S21	S21
Fire ventilators in room categories C1 in B1, B2, F1, F2, O1, O2, OL1 as well as OL2, C1, C2 as well as C3 in R1- R4 as well as D and E in F3, O3 and E C, D and E in B1, B2, F3, O1, O2 and O3. C1, C2 in OL1 and OL2. C1, C2 samt C3 in R1- R4. C and D in F1 and F2. 13) 18) 19)	S9[15)21)]	S9		S9 + S2[22)]		
Other ventilation openings 13) 18) 19)		S9[15)]	S9[15)]	S9 + S2[22)]	S9[15)]	S9 + S17

Table 6- 2 for building painting - carbon steel						
Item / object / equipment	**Painting classes**					
	I	**II**	**III**	**IV**	**V**	**VI**
GALVANIZED OBJECTS						
Chequered plates in room categories C1 in B1, B2, F1, F2, O1, O2, OL1 as well as OL2, C1, C2 as well as C3 in R1- R4 as well as D and E in F3, O3. C, D and E in B1, B2, F3, O1, O2 and O3. C1, C2 in OL1 and OL2. C1, C2 samt C3 in R1- R4. C and D in F1 and F2. [17)]		S14				
Other chequered plates [17)]		S9	S9	S9 + S2[22)]	S9	S9
Gratings	S9	S9	S9	S9	S9	S9
Cable ladders	[12)]	S9	S9	[11)22)]	S9	S9
Cooling plates in reactor areas	S9					
Lifting and pulling eye mounts [17)]	S9 + S2[21)]	S9	S9	S9 + S2[22)]	S9	S9
Lifting and pulling eyes [17)]	S9	S9	S9	S9	S9	S9
MCT frames [17)]	S10[12)21)]	S10	S10	S9 + S2[22)]	S10	S9
Steel structures			S9			
Steel structures in floor/roof beams and stairs	S9[17)]	S9[17)]	S9	[16)]	S9	S9
Steel structures cast into concrete	S8[17)21)]	S8[17)]	S10	S9 + S2[17)22)]	S10	S9
Welding plates [17)]						S9

Table 6- 2 for building painting - carbon steel						
Item / object / equipment	**Painting classes**					
	I	**II**	**III**	**IV**	**V**	**VI**
GALVANIZED OBJECTS						
Stair-rails, handrails, guides and steps in room categories C1 in B1, B2, F1, F2, O1, O2, OL1 as well as OL2, C1, C2 as well as C3 in R1- R4 as well as D and E in F3, O3. C, D and E in B1, B2, F3, O1, O2 and O3. C1, C2 in OL1 and OL2. C1, C2 samt C3 i R1- R4. C and D in F1 and F2.[17)]	S9[12)]	S14				
Other stair-rails, handrails, guides and steps [17)]		S9	S9	S9 + S2[22)]	S21	S9
Ventilation ducts [13)]	S9 [17)]	S9[14)]	S9[14)]	S9 + S2[22)]	S9[14)]	S9
Ventilation grids [13)]	S9	S9	S9	S9 + S2[22)]	S9[15)]	S9 + S17
Ventilation hoods [13)]						S9 + S17
Cladding sheet						[20)]

Key to notes in Table 6- 2

1) Or S9.
2) S12 for the structure behind the cladding plate. Or see notes 13 and 19.
3) To be treated internally with an approved anticorrosion agent
4) Use S15 or S16 for fire protection painting.
5) Use S3 for floors given G1-G6, G7b, G7c, G10a or G10b treatment.
6) S4 can be used where it is felt that better corrosion protection will be achieved by finish painting before erection/assembly.
7) Do not paint surfaces in contact with wheels.
8) Or S5.
9) Or S8.
10) Also applies for steel door frames around doors of aluzinc.
11) Duplex painting of hot dip-galvanized materials to be performed within four hours of galvanizing: known as Wibe three stage treatment.
See section 1.3.
12) Acid-resistant in the wetwell.
13) The zinc thickness on thin sheet must be at least 275 g/m², and double sided instead of SS EN ISO 1461:2009,Edition 2. (Equivalent to 20 µm per side in accordance with the SS-EN 10346:2009, Edition 2, triple test.)
14) Use treatment type S8 in highly corrosive environments, e.g. extraction from fume hoods in laboratories.
15) Use S14 if colour is required.
16) Hot-dip-galvanizing must not be used in Painting Class IV.
17) Choose hot-dip-galvanizing only in special cases.
18) Door hinges must be hot-dip-galvanized, and must meet the requirements of SS-EN ISO 1461:2009, Edition.2
19) The thickness of the aluzinc layer must be at least 150 g/m² (AZ 150). (Equivalent to 20 µm per side in accordance with the SS-EN 10346:2009, Edition 1 triple test.)
20) Facade steel sheet Sendzimir-galvanized in Class G90 ASTM A525 or 150 g/m² Aluzinc AZ in accordance with SS-EN 10346:2009, Edition 1, coated with Steelcoat 3000 polyurethane system or Kynar 500 PVF2.
These types of treatment apply only for factory manufacture
21) These types of treatment do not fulfil the Finnish regulatory requirements STUK-YTO-TR 210 (DBA-test)
22) This treatment type must not be used for objects located within the reactor containment (Painting Class I).

6.1.3 Surface treatment of carbon steel process equipment

Select the appropriate surface treatment in accordance with **Table 6-3**

Start by classifying items, objects, equipment etc. with respect to **Painting Class** and room category, radiation zone, environment class, moisture and temperature as described in Chapter 2, and then use the table to identify the type of treatment.

In the case of equipment etc. in damp conditions, determination of the type of treatment depends first and foremost on the equipment's etc. own environment and then secondly on the environment in the area in which the equipment etc. is sited.

Example: A pipe system that is constantly in a condensing environment, but which is situated in a Painting Class II environment, shall be treated as for a Painting Class IV item, as the pipe system's own conditions represent a Painting Class IV environment.

Each and every new surface treatment specification, with associated manufacturing drawings, and/or any changes to existing equipment in connection with maintenance painting, must be submitted to the respective nuclear power station'(s') quality manager(s) for approval before the work is carried out.

Table 6- 3 for process equipment painting – Carbon steel					
Item / object / equipment etc.	**Painting classes**				
	I	**II**	**III**	**IV**	**V**
STEEL AND CAST STEEL PARTS					
Uninsulated pipes operating at temperatures ≤ +55 °C	S3[18)]	S3	S3[16)]	S3	S7
Blowdown pipe in wet-well					
Pipes operating at temperatures ≤ +55 °C, but which are to be insulated	S12[1)]	S12[1)]	S12[1)]	S12[1)]	S12[1)]
Pipes operating at temperatures > +55 ºC	S12	S12	S12	S12	S12
Valves and parts of valves operating at temperatures ≤ +55 °C	S4[4)18)]	S4[4)]	S4[4) 16)]	S3	S7
Valves and parts of valves operating at temperatures > +55 ºC	S12[4)]	S12[4)]	S12[4)]	S12	S12
Uninsulated cisterns/tanks and pressure vessels, external treatment, operating at temperatures ≤ +55 °C	S3[18)]	S4	S5	S3	S18
Cisterns/tanks and pressure vessels, internal treatment, operating at temperatures ≤ +55 °C	3)	3)	3)	3)	
Cisterns/tanks and pressure vessels, external treatment, operating at temperatures ≤ +55 °C, but which are to be insulated				S12	S19[2)]
Oil coolers, internal treatment, operating at temperatures ≤ +55 °C	3)	3)		3)	
Oil coolers, external treatment, operating at temperatures ≤ +55 °C	S4[18)]	S4		S2	S7
Cast-in items and strainer equipment in the strainer plant in water chambers and intake areas				S13a[3) 11) 12)]	
Intake gates from the sea				S13a[3) 11) 12)]	

Table 6- 3 for process equipment painting – Carbon steel					
Item / object / equipment etc.	**Painting classes**				
	I	**II**	**III**	**IV**	**V**
STEEL AND CAST STEEL PARTS					
Hoist beams	S5[4)18)]	S5[4)]	[4)]	S2[4)]	[4)]
Cranes [5)]	S4[18)]	S4	[4)]	S2	S7[4)]
Turbine casing, including ancillary equipment		S13a[3)] S3/S4 or S2	S13a[3)] S3/S4 or S2		
Reheater with temp > 55°C		S12	S12		
Turbine condenser		S2	S2		
Main circulation pumps to reactor tank	S13a[3)] S6a, S6b				
Other pumps	S4[18)]	S4	S4[4) 16)]	S2 [11) 12)] S13a[3) 11) 12)]	S4
Heat exchangers	S4[18)]	S4	[4)]	S2	
Gearboxes	S4[18)]	[4)]	[4)]	S2	
Electric motors, motor actuators on/for valves	S4[4) 18)]	S4[4)]	[4)]	S2	[4)]
Control governing and electrical equipment cubicles	[4)]	[4)]	[4)]	S2	[4)]
Containment head, exterior O1, O2, O3, B1, B2 , F1, F2, F3, OL1, OL2, R1-R4	S13a[6)]				
Containment head, interior O1, O2, O3, B1, B2, F1, F2, F3, OL1, OL2, R1-R4	S13a[6)]				
Liner plate in reactor containment in PWR reactor	S6b				
Containment airlocks	S4[18)]				
Pipe and component support devices	S4[18)]	S12	S12	S3[19)]	S4

Table 6- 3 for process equipment painting – Carbon steel					
Item / object / equipment etc.	**Painting classes**				
	I	**II**	**III**	**IV**	**V**
STEEL AND CAST STEEL PARTS					
Internal and external ventilation equipment - cold-rolled and other steel - thin sheet that must not be abrasive-blasted	S4[13) 15)18)]	S4	[4)]	S2 [14)]	S7

Table 6- 3 for process equipment painting – Carbon steel					
Item / object / equipment etc.	**Painting classes**				
	I	**II**	**III**	**IV**	**V**
GALVANIZED OBJECTS					
Pipe and component support devices	S9[7) 8)]	S9	S9	S8[19)]	S9
Supports for small-bore pipes	S9[7) 8)]	S9	S9	S8[19)]	S9
Pipe whip restrains	S9[7) 8)]	S9	S9	S8[19)]	S9
Cable trenches, cable ladders	[13) 15)]	S9	S9	S9 [7) 14)]	
Bolts (not expansion bolts and accessories/ancillaries), nuts, washers, etc. in water parts of the strainer plant [10)]				S8[9)19)]	

Key to notes in Table 6- 3

1) Treat pipe systems at risk of condensation as S3. Treat pipe systems that are constantly exposed to condensation according to S2.
2) Applies to surfaces exposed to higher corrosion stress.
3) S13a or S13b, depending on limitations on the field of application. See the document 'Approved Paint Systems for TBY'.
4) Standard-painted. See Item 1.3.
5) Finish paint cranes before erection.
6) Stainless in O3 and F3.
7) Only austenitic stainless steel in the wetwell.
8) Items etc. in contact with concrete floors in accordance with S8.
9) If the item etc. is painted in accordance with S2, the securing/mounting element may also be painted in accordance with S2.
10) See 1.2.1.9 for guidelines for selection of fasteners.
11) Alternatively S13c or S13d after approval from the authorised person on the staff of the respective licensee/plant owner responsible for surface protection, or by some other person(s) consulted by him/her/them and knowledgeable in the particular matter concerned.
12) S13c and S13d may be used only outside radiologically classified environments in Painting Class IV.
13) Acid-resistant in the wetwell.
14) S9 + duplex painting on hot-dip-galvanized material to be performed within 4 – 6 hours of hot-dip-galvanizing.
See Item 1.3.
15) S9.
16) Treatment type S13e may be used instead of S3/S4 when painting externally painted pipes and components containing sea water for cooling. Internally rubber coated pipe parts containing cooling water and which temporarily require maintenance can be surface treated in accordance with S13e.
Consult TVO for further investigation before making a decision.
17) Treatment in accordance with SS EN ISO 12944-2, Edition 1, is prescribed for Corrosivity Classes C4 and C5-M at Barsebäck and Ringhals. This has been agreed with the power plants' representatives.
18) These types of treatment do not fulfil the Finnish regulatory requirements STUK-YTO-TR 210 (DBA-test).
19) This treatment type must not be used for objects located within the reactor containment (Painting Class I).

7 INSPECTION

7.1 PAINTING OF BUILDINGS AND PARTS OF BUILDINGS

Where there is any reference in this chapter to requiring approval from the respective licensee/plant owner, or its/their authorised representative(s), this means that such approval must be given by:

- **The authorised person on the staff of the respective** licensee/plant owner **responsible for surface protection**, or by some other person(s) consulted by him/her/them and knowledgeable in the particular matter concerned.

7.1.1 Inspection of contractors

Prior to selection of the contractor, the respective licensee/plant owner's authorised expert(s) shall check and verify that the presumptive painting contractor possesses the resources and skills necessary for the work, and that the contractor is familiar with the regulations applicable to, and in connection with, the respective licensee/plant owner's TBY. The contractor's resources, procedures and qualifications for performing its own inspection and verification of the quality of the painting work shall also be determined and confirmed.

The environmental status of the contractor shall be determined and approved by the respective nuclear power station(s). Requirements for environmental assurance at the supplier are divided into three groups.

1 Contractor holds EMAS, SS-EN ISO 14001:2004, Edition 2, certification or equivalent.

2 The Contractor has a documented, agreed and implemented environmental management system that has been assessed and approved by the respective licensee/plant owner.

3 The Contractor does not have an agreed environmental management system.

It is the responsibility of the contractor to verify, and to confirm to the respective licensee/plant owner, that any subcontractors whose services the main contractor proposes/intends to use possess qualifications and resources at least equal to those required of the main contractor.

The respective licensee/plant owner's approval of presumptive subcontractors shall be obtained before the services of the subcontractors are engaged.

See Item 7.2.1 for requirements applicable to anti corrosion painting.

7.1.1.1 Other requirements applicable to those painting and performing work on concrete

Painters who are to paint concrete or perform associated work on it shall have received documented information and training on the particular type of treatment and practical principles, in principle according to ASTM D 4227-05.

In Sweden the number of apprentices in relation to trained persons working in a controlled zone (See chapter 2) should not exceed the number stated in the National Painting Trade Agreement.
In Finland, only qualified personal may work in a controlled zone, but some ancillary work may be done by apprentices.

7.1.2 General

a) All work must be inspected in order to verify that it is being/has been carried out in accordance with the requirements set out in the respective nuclear power station'(s') surface protection regulations.

b) The painting contractor shall keep a daily record in accordance with AB 04, General Conditions for Building, Installation and Contract Works (AB Svensk Byggtjänst).

c) Performance of the painting work shall be verified by filling in and signing the particular form intended for the work in question. See also Item 3.1.2.

These forms are as follows:

- Form no. D.102, Painting inspection report form, Building, Painting of concrete
- Form no. D.103, Painting inspection report form, Building, Painting of steelwork
- Form no. D.118, Inspection plan for floor coatings.

These forms, when filled in and signed, form part of the final documentation. Any photographs that have been taken in order to verify particular conditions of surfaces, together with reports of any investigations, shall also be attached to the final documentation.

d) Before painting is started, the painting contractor's site manager shall satisfy him/herself of the following points:

- That all environmental requirements have been / are being fulfilled.
- That all prescribed preparation has been performed, and the results meet the specified requirements.
- That the paint to be used is the correct paint intended for the item/object/equipment, and that it fulfils the requirements for the particular type of treatment concerned.
- That the person(s) to perform the work have access to the relevant painting instructions, is/are thoroughly familiar with the requirements and possess(es) the necessary skills and knowledge as needed in order to be able to carry out the painting work using the particular painting system.

e) The painting contractor should be able to produce certificates confirming that site managers, painters and inspectors have received the necessary training, and acquired experience, as appropriate to their respective duties.

See Item 7.2.1 for requirements applicable to anti corrosion painting.

7.1.3 Paints

The painting contractor shall ensure that:

a) Each container of paint shows or is provided with at least the following information:
   - The name of the manufacturer.
   - The name and type number of the product.
   - The production batch number, and indication that the batch fulfils the requirements as set out in the surface protection regulations.
   - The 'Use by' date for paints having a limited shelf life.

b) All paint products have been transported and are stored in accordance with the paint manufacturer's instructions in respect of maximum and minimum temperatures, bearing in mind that there is a risk of freezing of certain paints at low temperatures.

c) That the test record (D.117) form for the batch shows that the paint meets the specified requirements.

d) That any paint that has been stored for longer than the permitted time specified by the paint manufacturer is NOT used.

e) That no paints are thinned other than as specified by the manufacturer, and then only after approval from the respective licensee/plant owner's authorised person(s) responsible for surface treatment.

7.1.4 The contractor's inspection of the painting work

7.1.4.1 General

The painting contractor is responsible for ensuring that the agreed regulations are being followed, and that specified requirements are being fulfilled.

The following inspection work shall be performed, in addition to that specified in Item 7.1.3.

7.1.4.2 Environmental conditions

Inspection to ensure that preparation prior to painting, and painting itself, are carried out under conditions suitable for the particular types of paint materials, and that the requirements in the painting specification are being met.

Inspection in connection with the painting of surfaces shall be concerned with the following aspects:

a) Cleanliness of rooms where painting is to be carried out, in respect of freedom from dust or other loose contamination.

b) Relative humidity, room temperature and surface temperature shall be measured before and during the work of painting.

c) The dampness/humidity of surfaces shall be checked.

7.1.4.3 The underlying (basic) surface and preparation

a) The underlying (basic) surface shall be inspected in order to check that the surfaces to be painted fulfil the requirements set out in the surface treatment regulations, and that painting is not carried out until these requirements are fulfilled. There shall be due comparison with the relevant reference surfaces.

   The surface adhesion strength (see the requirements set out in Table 3- 1) shall be checked to at least the extent required for cured/dried/hardened paint in accordance with Item 7.1.4.8.

b) The underlying (basic) surface shall be inspected to ensure that it has been properly cleaned and prepared in accordance with the requirements set out in the surface treatment regulations.

   The results of all preparation shall be inspected before further paint etc. may be applied.

7.1.4.4 Application

Where appropriate, the application of each coat shall be inspected to ensure that it fulfils the requirements of Item 3.3.1.

7.1.4.5 Coating thickness

a) Measure the coating thickness of the dry film on steel, using a suitable instrument, after obtaining approval from the respective licensee/plant owner's authorised person(s) responsible for surface treatment.

b) The film thickness of wet paint can be estimated using an appropriate method of wet film thickness measurement, e.g. in accordance with SS-EN ISO 2808:2007, Edition 2, Method 7A.

c) The dry film thickness on **non** metallic substrates can be estimated by measuring the amount of paint used on a particular given area. Calculate the quantity in respect of the solid constituents of the paint.

d) The film thickness on **non** metallic substrates can be measured in accordance with SS-EN ISO 2808:2007, Edition 2, Method 5b.

e) Measure the film thickness on metallic substrates in accordance with SS ISO 19840:2012, Edition 2, Annex A and B.

7.1.4.6 Porosity

a) Perform inspection to ensure that the film of paint is homogeneous and free from holidays, pores and craters.

b) Inspect finish-painted surfaces to verify that their appearance is at least equal to that of the reference surfaces. Unless otherwise specified, perform this inspection visually.

c) Inspection of certain types of treatment applied to metallic substrates shall be performed using high voltage instruments: see Inspection Procedure Appendix 1 of TBY. Detector voltage shall be 0,5 kV/100 µm + 1 kV for each type of treatment, i.e. 2,5 kV for a total film thickness of 300 µm as with, for example, treatment type S2.

Determine the test voltage in accordance with the following formula:
E = A x 0,5 kV / 100 + 1 kV, where
E = Test voltage, and
A = Measured total film thickness.

However, increase the test voltage in the following cases:

- If the average measured film thickness is 20% greater than the prescribed film thickness, decide the required test voltage as appropriate to the measured thickness.
- Increase the test voltage by 0.5 kV if testing is being carried out under conditions of relative humidity below 40 % RH and if the surface temperature is at least 3 °C above the dew point.

d) Do not use high-voltage instruments to test the porosity if the film thickness is less than 300 µm.

e) Do not test the porosity until the paint has dried to tack-free in accordance with SS 184207, Edition 1.

f) When testing the porosity, the humidity must not exceed 85 %, and the surface temperature must be at least 3 °C above the dew point.

g) Surfaces to be tested must be dry.

h) Record the results of porosity testing of paint applied to metallic substrates on form no. D.112, Report for holiday inspection of coating.

7.1.4.7 Treatment after application

The inspector must assure him/herself that the requirements of the respective licensee/plant owner and the paint manufacturer in respect of environmental conditions (temperature, relative humidity etc.) and curing/drying time have been, and are being, complied with.

7.1.4.8 Surface tensile strength / Adhesion

Testing of surface tensile strength and adhesion shall be performed in principle according to GBR Industry Standard Edition 1:2012. Specifically, the following must be considered.

a) The adhesion of paint films, and the surface tensile strength of substrates, shall be determined using instruments that can be approved by the respective licensee/plant owner. **Elcometers Model 106 Adhesion Tester** is approved for field use. In case of disputes, instruments shall be chosen that fulfil the design requirements in SS-EN ISO 4624, Edition 1.

b) Perform sample testing of the adhesion of cured paint films on surfaces at the start of the painting contract, followed by at least one test per 5000 m².

Two tests shall be performed as soon as possible for Painting Class 1 surfaces (the reactor containment), followed by further tests at a rated of one per 1000 m².

c) For preventive reasons, the surface tensile strength of substrate surfaces shall be determined before the work of the painting contract proper starts. This can most suitable be done by applying surface treatment, in the form of the first coat of paint of the respective type as prescribed for the surface, to a representative 50 x 50 cm area of the surface.

d) One adhesion test, or test of the surface tensile strength of a concrete surface, consists of five test pieces (3,14 cm^2) on a randomly selected 50 x 50 cm sample surface, from which the mean value is calculated.

e) Perform adhesion testing of cured/dried paint layers otherwise in accordance with SS-EN ISO 4624, Edition 1. To be approved, the results must fulfil the values given in Table 3- 1 and in Table 4- 1.

7.1.4.9 Testing the resistance to steam of concrete surfaces in Painting Class I.

The following steps shall be performed in connection with more extensive repainting or new building work.

a) When pouring the reactor containment, cast two concrete slabs (test slabs), 500 x 500 x 50 mm in size, for each 1000 m² of concrete roof/ceiling and/or wall surface to be given a surface treatment.
Make two test slabs for floor surfaces as well, pouring them with the same concrete, and giving them (as closely as possible) the same treatment before and after curing as the floor surfaces themselves.

b) When applying the surface treatment to the concrete surfaces of the reactor containment, apply the same treatment to the test slabs. Remove the slabs to a suitable test site when the paint is regarded as fully cured, and perform the steam test immediately. The temperature of the slabs must not be below +10 °C when this test is performed.

c) Perform the steam test on one of the two test slabs (i.e. so that one slab is available as a reserve). See Item 12.2.4 in Chapter 12 for details of the steam test.

7.1.5 Qualification requirements for inspectors

Inspectors who perform inspection to assess the need of maintenance and inspection of maintenance painting done must have documented training concerning building painting and/or anti-corrosion painting, depending on the level of work involved. The goal is to eventually fulfil the requirements in ASTM D 4537-12.
The following requirements applicable to inspectors are a recommendation, and may be replaced by training and experience assessed as equivalent by the Purchaser.

Level 1 inspectors

As a minimum, Level 1 inspectors must have/be:

- Technical training equivalent to secondary school level.
- At least three years' experience of specialised inspection work in the field of building painting and/or anti-corrosion painting, and preferably experience of surface treatment work in a nuclear power station.
- The knowledge and ability to carry out and inspect all the required application procedures.
- Able to verify instrument calibrations.
- Be able to confirm that all inspection activities have been performed in accordance with the applicable specifications.

Level 2 inspectors

As a minimum, Level 2 inspectors must have/be:

- Technical training equivalent to secondary school level.
- At least four years' experience of specialised inspection work in the field of building painting and anti-corrosion painting respectively.
- At least 1-year's experience of surface treatment at Level 1 in nuclear power stations.
- Able to perform all the duties of, and to meet all the requirements for, Level 1 inspectors.
- Able to draw up inspection plans for work to be performed by Level 1 inspectors, and to manage the work of such inspectors.
- Able to initiate changes in quality control inspection work.
- Able to implement quality assurance programmes for authorised or approved contractors.

Level 3 inspectors

As a minimum, Level 3 inspectors must have/be:

- Technical training equivalent to secondary school level and at least ten years' experience of inspection work, or work as a foreman in the field of building painting and/or anti-corrosion painting.
- At least two years' experience of Level 2 painting in a nuclear power station.
- Responsibility for ensuring that all inspection performed by a Level 2 inspector fulfils the requirements of the duty.
- Able to recommend the appointment of inspectors to Levels 1, 2 or 3.
- Responsibility for all safety-related inspection plans, and for their approval.

7.1.6 Reporting

The results of inspection shall be recorded on the relevant inspection record forms: see Item 7.1.2.

7.1.7 Purchaser's (the respective licensee/plant owner's) inspection of painting work

The amount of inspection work performed by the Purchaser depends on the extent of the painting work and on the type of treatment, and will be determined from case to case.

Note, however, that the Purchaser reserves the right, at any time during the painting work and for any reason, to check to ensure that the painting contractor is complying with given instructions, and is also exercising supervision and inspection as agreed. If necessary, this work of checking that the painting contractor is complying with given requirements may be performed either by the Purchaser or by a third party.

7.2 ANTI CORROSION PAINTING

7.2.1 Inspection of contractors

The Supplier's painting contractor shall have been authorised by the Swedish Authorisation Board for Anti Corrosion Painting (www.rostskyddsmalning.se) for Type F and Type V work, depending on the object to be painted
If a painting contractor from another country is engaged, the same requirements apply in principles, for information on requirements see www.rostskyddsmalning.se.

The painting contractor's personnel who are actively involved in the work of performing anti corrosion painting shall have successfully taken the diploma training course for anti corrosion painters. An exception from this rule is that those painters who are working in teams of two persons may have helpers who have not received this training. In Sweden, this training is governed by the Swedish Authorisation Board for Anti Corrosion Painting and in Finland by Turun Ammattiopistosäätiö. If requested by the Purchaser, personnel must be prepared to confirm receipt of such training. Any departures from these requirements shall be approved by the respective licensee/plant owner's authorised person(s) responsible for surface treatment.

Prior to selection of the contractor, the respective licensee/plant owner's authorised expert(s) shall check and, **in writing**, confirm that the presumptive painting contractor has the necessary resources and skills to perform the work, and that the contractor is familiar with the regulations associated with TBY. The contractor's resources, procedures and qualifications for performing its own inspection and verification of the quality of the painting work shall also be determined and confirmed. See requirements www.rostskyddsmalning.se.

The environmental status of the contractor shall be determined and approved by the respective licensee/plant owner. Requirements for environmental assurance at the supplier are divided into three groups.

1 Contractor holds EMAS, SS-EN ISO 14001:2004, Edition 1, certification or equivalent.

2 The Contractor has a documented, agreed and implemented environmental management system that has been assessed and approved by the respective licensee/plant owner.

3 The Contractor does not have an agreed environmental management system.

It is the responsibility of the Contractor to verify, and to confirm **in writing** to the respective licensee/plant owner, that any subcontractors whose services the main Contractor proposes/intends to use possess qualifications and resources at least equal to those required of the main contractor.

The respective licensee/plant owner's approval of presumptive subcontractors **must** be obtained before the services of the subcontractors are engaged.

7.2.1.1 Other requirements applicable to those performing anti-corrosion painting

Painters who are to perform anti-corrosion painting shall have received documented information and training on the particular type of treatment and practical principles, in accordance with ASTM D 4228-05.

7.2.2 General

a) All work must be inspected in order to verify that it is being/has been carried out in accordance with the requirements set out in TBY.

b) Performance of the painting work shall be verified by filling in and signing the particular form intended for the work in question. See also Item 4.1.2.

These forms are as follows:
- Form no. D.100, Painting inspection report form, Anti-corrosion painting
- Form no. D.101, Painting inspection report form, Anti-corrosion painting
- Form no. D.112, Painting inspection report form, Porosity of coating

The completed and signed forms constitute part of the final documentation. Even photographs that are taken to verify special conditions for areas and any investigation reports must be appended to the final documentation.

c) A separate inspection plan shall be prepared, using Form no. D.109, Inspection Plan Painting, for items/objects/equipment specified in Items 4.1.2a - h and for items/objects/equipment in areas that, in connection with refuelling or service, are open to the reactor pressure vessel or to the reactor primary systems, including the feed water system, and/or to the turbine and turbine condenser systems or which required special and/or complicated preparation and/or painting procedures or conditions. This inspection plan shall be approved by the respective licensee/plant owner's authorised representative(s) if it is to be valid.

The completed and signed form constitutes part of the final documentation.

d) Before painting is started, the painting contractor's site manager shall satisfy him/herself of the following points:

- That all environmental requirements have been / are being fulfilled.
- That all prescribed preparation has been performed, and the results have met the specified requirements.

- That the paint to be used is the correct paint intended for the item/object/equipment, and that it fulfils the requirements for the particular type of treatment concerned.
- That the personnel that will perform the work have access to the relevant painting instructions, is/are thoroughly familiar with the requirements and possess(es) the necessary skills and knowledge as needed in order to be able to carry out the painting work using the particular painting system.

e) The painting contractor shall be able to produce certificates confirming that site managers, painters and inspectors have received the necessary training, and acquired experience, as appropriate to their respective duties, and that they have received the power companies' internal training on TBY.

7.2.3 Paints

The painting contractor shall ensure that:

a) Each container of paint shows or is provided with at least the following information:
   - The name of the manufacturer.
   - The name and type number of the product.
   - The production batch number, and indication that the batch fulfils the requirements as set out in the surface protection regulations.
   - The 'Use by' date for paints having a limited shelf life.

b) All paint products have been transported and are stored in accordance with the manufacturer's instructions in respect of maximum and minimum temperatures, bearing in mind that there is a risk of freezing of certain paints at low temperatures.

c) That the test record form (D.117) for the batch shows that the paint meets the specified requirements.

d) That any paint that has been stored for longer than the permitted time specified by the paint manufacturer is NOT used.

e) That no paints are thinned other than as specified by the manufacturer, and then only after approval from the respective licensee/plant owner's authorised person(s) responsible for surface treatment.

7.2.4 The contractor's inspection of the painting work

7.2.4.1 General

The painting contractor is responsible for ensuring that the agreed regulations are being followed, and that specified requirements are being fulfilled.

The following inspection work shall be performed, in addition to that specified in Item 7.2.3, 7.2.4.2-7.2.4.8.

7.2.4.2 Environmental conditions

Inspect to ensure that preparation prior to blasting and painting is being / will be carried out under conditions that are suitable for the respective types of paint, and that the requirements in the surface treatment regulations are being / will be complied with.

Inspect the following points in connection with preparation and painting:

a) The air temperature and relative humidity in areas where blasting, painting and/or curing/drying of paint is/are to be carried out.

b) The temperature of the materials of the item/object before blasting is started.

c) The dew point.

d) Damp and contamination from the blasting material.

e) Damp and contamination of the compressed air to be used for blasting, spray painting and/or cleaning of blasted surfaces.

7.2.4.3 Substrate and preparation

Inspect the substrate to ensure that the surfaces to be prepared for painting comply with the requirements set out in the surface treatment regulations, and that surface preparation is not started before these requirements are fulfilled.

Inspect to ensure that prepared surfaces meet the specified cleanliness requirements, and that the first coat of paint is applied within the specified period of time.

Inspect to ensure that preparation fulfils the requirements of Item 4.3.3 in all other respects.

7.2.4.4 Application

Perform inspection to ensure that, as appropriate, each application meets the requirements of Item 4.3.4.

7.2.4.5 Film thickness

a) Measure the coating thickness of the dry film on steel, using a suitable instrument, after obtaining approval from the respective licensee/plant owner.

b) The film thickness of wet paint can be determined using wet film thickness measurement in accordance with SS-EN ISO 2808:2007, Edition 2, Method 7B.

c) Measure the film thickness on metallic materials in accordance with SS ISO 19840:2012, Edition 2, and Annex A and B.

d) The mean value for each individual test surface must not exceed double the nominal film thickness. If this requirement cannot be kept, corrective actions must be taken or a non-compliance report prepared.

7.2.4.6 Porosity

a) Perform inspection to ensure that the film of paint is homogeneous and free from holidays, pores and craters.

b) Inspection of certain types of treatment shall be performed using high voltage instruments: see Appendix 1 to TBY. The detector voltage shall be 0,5 kV/100 µm + 1 kV for each type of treatment, i.e. 2,5 kV for a total film thickness of 300 µm as with, for example, treatment type S2.

Determine the test voltage in accordance with the following formula:
E = A x 0,5 kV / 100 + 1 kV, where
E = Test voltage kV, and
A = Measured total film thickness, µm

However, increase the test voltage in the following cases:

- If the average measured film thickness is 20 % greater than the prescribed film thickness, decide the required test voltage as appropriate to the measured thickness.
- Increase the test voltage by 0,5 kV if testing is being carried out under conditions of relative humidity below 40 % RH and if the surface temperature is at least 3 °C above the dew point.

c) Do not use high-voltage instruments to test the porosity if the film thickness is less than 300 µm.

d) Do not test the porosity until the paint has dried to tack-free in accordance with SS 184207, Edition 1 .

e) When testing the porosity, the humidity must not exceed 85 % RH, and the surface temperature must be at least 3 °C above the dew point.

f) Surfaces to be tested must be dry.

g) Record the results of porosity testing on form no. D112, Report for holiday inspection of coating.

7.2.4.7 Treatment after application

The inspector must assure him/herself that the requirements of the respective nuclear power station and the paint manufacturer in respect of environmental conditions (temperature, relative humidity etc.) and curing/drying time have been, and are being, complied with. See also Item 4.4.

7.2.4.8 Adhesion

a) Perform adhesion testing of the paint film using a suitable instrument that meets the requirements of SS-EN ISO 4624, Edition 1, or SS-EN ISO 2409:2007, Edition 2, depending on what is specified.

b) At the time of final inspection, adhesion of the cured paint film must fulfil the requirements set out in Table 4- 1, while at the end of the guarantee period it must fulfil the requirements set out in Item 4.1.2.

7.2.5 Qualification requirements for inspectors

Inspectors must be familiar with paint systems and methods of treatment, and must have documented training in inspection of building painting and/or anti-corrosion painting, appropriate to the level of the work involved, and must (in principle) fulfil the requirements in ASTM D 4537-12.
The following requirements applicable to inspectors are a recommendation, and may be replaced by training and experience assessed as equivalent by the Purchaser.

Level 1 inspectors

As a minimum, Level 1 inspectors must have/be:

- Technical training equivalent to secondary school level.
- At least three years' experience of specialised inspection work in the field of building painting and/or anti-corrosion painting, and preferably experience of surface treatment work in a nuclear power station.
- The knowledge and ability to carry out and inspect all the required application procedures.
- Able to verify instrument calibrations.
- Be able to confirm that all inspection activities have been performed in accordance with the applicable specifications.

Level 2 inspectors

As a minimum, Level 2 inspectors must have/be:

- Technical training equivalent to secondary school level.
- At least four years' experience of specialised inspection work in the field of building painting, and preferably at least one year's experience of Level 1 surface treatment in a nuclear power station.
- At least 1-year's experience of surface treatment at Level 1 in nuclear power stations.
- Able to perform all the duties of, and to meet all the requirements for, Level 1 inspectors.
- Able to draw up inspection plans for work to be performed by Level 1 inspectors, and to manage the work of such inspectors.
- Able to initiate changes in quality control inspection work.
- Able to implement quality assurance programmes for authorised or approved contractors.

Level 3 inspectors

As a minimum, Level 3 inspectors must have/be:

- Technical training equivalent to secondary school level and at least ten years' experience of inspection work, or work as a foreman in the field of building painting and/or anti-corrosion painting.
- At least two years' experience of Level 2 painting in a nuclear power station.

- Responsibility for ensuring that all inspection performed by a Level 2 inspector fulfils the requirements of the duty.
- Able to recommend the appointment of inspectors to Levels 1, 2 or 3.
- Responsibility for all safety-related inspection plans, and for their approval.

7.2.6 Reporting

The results of inspection shall be recorded on the relevant inspection record forms: see Item 7.2.2.

7.2.7 Purchaser's (the respective nuclear power station'(s') inspection of painting work

The amount of inspection work performed by the Purchaser depends on the extent of the painting work and on the type of treatment, and will be determined from case to case.

Note, however, that the Purchaser reserves the right, at any time during the painting work and for any reason, to check to ensure that the painting contractor is complying with given instructions, and is also exercising supervision and inspection as agreed. If necessary, this work of checking that the painting contractor is complying with given requirements may be performed either by the Purchaser or by a third party.

7.3 HOT-DIP GALVANIZING

7.3.1 Inspection of contractors

Prior to selection of the contractor, the respective licensee/plant owner's authorised expert(s) shall check and verify that the presumptive hot-dip galvanizing contractor has the necessary resources and skills to perform the work, and that the contractor is familiar with the regulations associated with the respective nuclear power station'(s') surface treatment regulations.

The company should be a member of the Nordic Galvanizers, European General Galvanizers Association (EGGA) or International Zinc Association (IZA). The company's resources, procedures and qualifications for performing its own inspection and verification of the quality of the galvanization work shall also be determined and confirmed.

It is the responsibility of the contractor to verify, and to confirm to the respective licensee/plant owner, that any subcontractors whose services the main contractor proposes/intends to use possess qualifications and resources at least equal to those required of the main contractor.

The respective licensee/plant owner's approval of presumptive subcontractors shall be obtained before the services of the subcontractors are engaged.

7.3.2 General

a) Before manufacture is started of any item/object that is intended by the designer to be galvanized, a presumptive hot-dip galvanizing company should be consulted in

order to assess the feasibility of ensuring successful hot-dip galvanizing in accordance with the relevant regulations.

b) Before sending an item/object to the hot-dip galvanizing company, the Purchaser should visit the manufacturer of the item/object to ensure that it has been manufactured in accordance with the drawings, and that it is free from any defects that could prevent successful galvanization. See also Item 7.3.3b.

7.3.3 Duties of the hot-dip galvanizing contractor

a) The hot-dip galvanizing contractor shall have appropriately skilled and qualified personnel who check that the various operations are correctly performed and that the relevant technical regulations are applied.

Form D.105, Report for hot galvanizing, shall be filled in and signed by the company's quality manager in order to verify the final result. When so filled in and signed, the form forms part of the final documentation. Any photographs that have been taken in order to verify particular conditions of surfaces, together with reports of any investigations, shall also be attached to the final documentation.

b) Before hot-dip galvanizing is started at the hot-dip galvanizing contractor's premises, an appropriately qualified person at the contractor shall check to ensure that the item/object concerned is designed and produced in such a way as to ensure successful hot-dip galvanizing and that, prior to pickling or blasting, it is completely free of contamination such as oil or grease, and that it is also free of weld spatter, welding slag and any other unevenness.

Faults or defects that require action by the Purchaser shall be reported as soon as possible to the Purchaser for a decision. Galvanization must not be started until the Purchaser has made a decision on any necessary action and possibly also approved the result.

c) If required by the Purchaser, the hot-dip galvanizing company shall be able to verify and confirm that the zinc used complies with the requirements of SS EN ISO 1461:2009, Edition 2.

7.3.4 Inspection of the galvanization work

All inspection shall be performed by an appointed person on the staff of, or whose services are employed by, the galvanizing company. He/she shall be thoroughly familiar with hot-dip galvanizing, and shall have extensive practical experience of quality control of the various processes involved.

7.3.4.1 Preparation and galvanization

The inspector shall satisfy him/herself that:

- The requirement set out in Item 7.3.3b is fulfilled.
- Preparation (pickling or blasting) has been carried out with a sufficiently clean pickling bath. If the object/item etc. has been pickled, the inspector shall be satisfied that it has not been over-pickled.
- Any blasting has been performed using clean, dry abrasive, with appropriate equipment and with the necessary care.

- Rust had not formed again on the material before it was immersed in the zinc bath.
- The zinc reaches all parts that are to be galvanized.
- The item/object is immersed in the molten zinc in such a way as to minimise any thermal distortion.
- The item/object is removed from the zinc bath in such a way as to ensure good draining of the zinc and to prevent concentration of the zinc in any particular areas.

7.3.4.2 Galvanized objects/items etc.

The inspector shall satisfy him/herself that:

- Objects have not become distorted or misshapen to any extent that exceeds good practice or any tolerances shown on the drawing.
- The appearance of the coating conforms to the requirements of the surface treatment specifications.
- The bond of the coating to the metal is good, in accordance with the method of testing as agreed between the Purchaser and the Supplier.
- The thickness of the coating meets the requirements of SS-EN ISO 1461:2009, Edition 2, preferably as measured by the magnetic method (SS-EN ISO 2808:2007, Edition 2).
- In the event of any dispute, the gravimetric method as set out in SS ISO 1460, Edition 1, shall be used.
- The coating is unbroken, and as smooth as possible as allowed by the shape and characteristics of the object.
- There is no contamination in the form of flux, hard zinc or lumps that could threaten performance.
- The coating has been deburred etc. so that there is no risk of injury to hands when the item is handled.
- That there is no white rust on the object, if so agreed.
- The metallic bond is good.

7.3.4.3 Touch-up painting

Before performing any touch up painting, the hot-dip galvanizing company should always consult with the Purchaser to ensure that there is no confusion or misunderstanding concerning touch up paints and/or touch up work.

When any touching-up work is carried out on the zinc coating, the person responsible for the work shall satisfy him/herself that it is done using the treatment system as prescribed, or as approved in writing, by the respective nuclear power station(s).
The inspector shall satisfy him/herself that:

- The prescribed paint system is used for touching up.

- Touching up is carried out in accordance with the requirements of Chapter 4, and that the requirements set out there are complied with. In addition, Form D.101, Painting inspection report form, Anti-corrosion painting, shall be filled in.

7.3.4.4 Reporting

The results of inspection shall be reported on Form D.105, Report for hot galvanizing. Photographs shall be attached where practical. If touch up painting has been carried out, a relevant report on Form D.101, Report for anti-corrosion painting, Anti-corrosion painting, shall also be submitted. Any investigation reports or non compliance reports shall also be attached.

7.3.4.5 Reception inspection

Faults and/or defects in hot-dip galvanizing, or transport damage, can never be entirely avoided, and so items, objects etc. shall always be inspected on reception.

Reception inspection shall consist of:

- Checking to ensure that the correct surface treatment specification has been applied.
- Visual inspection, looking for contamination such as inclusions of flux or hard zinc, lumps that could affect performance or function of the object, and also looking to see that the object has been deburred so that it can be handled without risk of injury.
- Visual inspection of any touch up painting.
- Inspection of the coating thickness and of any touch-up painting.
- Bond strength inspection.
- That there is no white rust on the object, if so agreed.
- Noting of any damage in transport.

7.3.4.6 Reporting from reception inspection

The results of reception inspection shall be reported on the intended form, Form D.105, Report for hot galvanizing, with photographs where practical.

7.4 ZINC SPRAYING

7.4.1 Inspection of contractors

Prior to selection of the contractor, the respective licensee/plant owner's authorised expert(s) shall check and verify that the presumptive hot-dip galvanizing contractor has the necessary resources and skills to perform the work, and that the contractor is familiar with the regulations associated with the respective licensee/plant owner's surface treatment regulations.
The company's resources, procedures and qualifications for performing its own inspection and verification of the quality of the galvanization work shall also be determined and confirmed.

It is the responsibility of the galvanizing contractor to verify, and to confirm to the respective licensee/plant owner that any subcontractors whose services the contractor proposes/intends to use possess qualifications and resources at least equal to those required of the main contractor.

The respective licensee/plant owner's approval of presumptive subcontractors shall be obtained before the services of the subcontractors are engaged.

7.4.2 General

a) Before manufacture is started of any item/object that is intended by the designer to be spray galvanized, a presumptive spray-galvanizing company should be consulted in order to assess the feasibility of ensuring successful spray galvanizing in accordance with the relevant regulations.

b) Before sending an item/object to the galvanizing company, the Purchaser should visit the manufacturer of the item/object to ensure that it has been manufactured in accordance with the drawings, and that it is free from any defects that could prevent successful galvanization.

7.4.3 Duties of the galvanizing contractor

a) The galvanizing contractor shall have appropriately skilled and qualified personnel who check that the various operations are correctly performed and that the relevant technical regulations are applied.

b) The galvanizing company shall prepare a detailed report of the work that it has done, describing the results of visual inspection, measured values etc. It shall be signed by galvanizing company's quality manager and shall be submitted to the Purchaser for approval. Reports approved by the Purchaser shall form part of the final documentation.

   The galvanizing company should liaise with the Purchaser concerning the form of the report. See Item 7.4.4 for details of the contents of the report.

c) The galvanizing company shall be able to verify and confirm that the zinc used meets the prescribed standards of purity.

7.4.4 Extent of inspection

Tests and inspection as set out in SS-EN ISO 2063:2005, Edition 1, shall be performed, and the results shall be recorded. The full extent of inspection should cover:

- Temperature and humidity in working areas.
- The cleanliness of abrasive and compressed air as used for blasting.
- The temperature of the object.
- Dew point.
- Preparation prior to blasting.
- The preparation grade of blasted surfaces.
- Cleanliness of the blasted surface.

- Freedom of the object from new rust immediately prior to zinc spraying.
- Visual inspection of the completed zinc layer.
- The thickness of the zinc layer.
- The bond between the zinc and the underlying metal.

7.4.5 Reporting

The report referred to in Item 7.4.3 shall be submitted to the Purchaser for approval.

7.4.6 Reception inspection

Items/objects/equipment etc. shall be inspected on arrival in order to find any damage caused in transit.

7.5 RUBBER COATING

7.5.1 Inspection of contractors

Prior to selection of the contractor, the respective licensee/plant owner's authorised expert(s) shall check and verify that the presumptive rubber coating contractor has the necessary resources and skills to perform the work, and that the contractor is familiar with the regulations associated with the TBY surface treatment regulations.
The company's resources, procedures and qualifications for performing its own inspection and verification of the quality of the rubber coating work shall also be determined and confirmed.

It is the responsibility of the rubber coating contractor to verify, and to confirm to the respective licensee/plant owner, that any subcontractors whose services the main contractor proposes/intends to use possess qualifications and resources at least equal to those required of the main contractor.

The respective licensee/plant owner's approval of presumptive subcontractors shall be obtained before the services of the subcontractors are engaged.

7.5.2 General

a) Before manufacture is started of any item/object that is intended by the designer to be rubber-coated, a presumptive rubber coating company should be consulted in order to assess the feasibility of ensuring successful rubber coating in accordance with the relevant regulations.

b) Before sending an item/object to the rubber coating company, the Purchaser should visit the manufacturer of the item/object to ensure that it has been manufactured in accordance with the drawings, and that it is free from any defects that could prevent successful rubber coating. See also Item 7.5.3b.

c) No repairs of the rubber coating may be started without the prior approval of the Purchaser.

d) The rubber coating company shall submit its internal operating instructions etc. to the Purchaser for approval.

7.5.3 Duties of the rubber coating contractor

a) The rubber coating contractor shall have appropriately skilled and qualified personnel who check that the various operations are correctly performed and that the relevant technical regulations are applied.

b) Form D.108, Report for rubbering, and Form D.112, Report for porosity inspection of coating, shall be filled in and signed by the company's quality manager in order to verify the final result. When so filled in and signed, the forms form part of the final documentation. Any photographs that have been taken in order to verify particular conditions of surfaces, together with reports of any investigations, shall also be attached to the final documentation.

   Faults or defects that require action by the Purchaser shall be reported as soon as possible to the Purchaser for a decision. Rubber coating must not be started until the Purchaser has made a decision on any necessary action and possibly also approved the result.

c) Rubber coatings may not be repaired until the Purchaser has given his approval of repair.

d) The rubber coating company shall submit its internal operating instructions etc. to the Purchaser for approval.

7.5.4 Inspection of the rubber coating work

Testing shall be performed by an appointed person on the staff of, or whose services are employed by, the rubber coating company. He/she shall be thoroughly familiar with rubber coating, and shall have extensive practical experience of quality control of the various processes involved.

The tests and inspections of which the results are to be submitted to the respective licensee/plant owner are specified on Form D.108, Report for rubbering, and Form D.112, Report for holiday inspection of coating. In addition, it is assumed that the rubber coating company performs its own inspection and testing to the extent necessary.

It is assumed that inspection of the coating material consists of at least the following elements:

- Inspection/testing of the raw materials used.
- The batch compositions when manufacturing coating materials for the objects concerned.
- Marking, handling and storage of the material.
- Ensuring that the material selected for the object is that which has been prescribed, that it is of the necessary thickness and that any calendaring has been carried out in accordance with regulations.
- That adhesives and coating materials have not aged in such a way, or to such an extent, that the final result would be at risk.
- Inspection of autoclaves and other equipment as needed for vulcanisation.

7.5.4.1 Preparation and rubber coating

A summary of the inspection procedures called for on Form D.108, Report for rubbering, means that the following aspects must be inspected:

- The condition of the object.
- Environmental conditions in working areas, transport routes and of the object to be rubber coated.
- Preparation.
- Blasting equipment, blasting abrasive and compressed air.
- The condition of the coating before and after vulcanisation.
- The positions of joints in the rubber coating.
- Absence of non bonded areas and pores in the coating.
- The hardness and thickness of the coating.
- Checking that the workmanship of the coating conforms to the results of the agreed test method.

7.5.4.2 Porosity testing

Unless otherwise agreed, pore testing shall be carried out at a voltage of at least 15 kV. The results shall be recorded on Form D.112, Report for holiday inspection of coating.

Where repair of the coating is required, the position of the defect shall be recorded. Before the repair is started, the Purchaser shall be informed of both the position of the defect and the intended method of repair.

7.5.4.3 Reporting

The results of inspection shall be recorded on Form D.108, Report for rubbering, and Form D.112, Report for holiday inspection of coating. Any investigation reports, photographs and/or non compliance reports shall be attached.

7.5.4.4 Purchaser's inspection of rubber coating work

The amount of inspection work performed by the Purchaser depends on the extent of the rubber coating work, and will be decided from case to case.

Note, however, that the Purchaser reserves the right, at any time during the rubber coating work and for any reason, to check to ensure that the rubber coating contractor is complying with given instructions, and is also exercising supervision and inspection as agreed. If necessary, this work of checking that the rubber coating contractor is complying with given requirements may be performed either by the Purchaser or by a third party

7.5.4.5 Reception inspection

a) Inspection for damage in transit shall always be performed.

b) If the Purchaser has not himself performed inspection at the premises of the rubber coating contractor, or if he feels for some other reason that the extent of inspection should be increased, the following inspections of the coating should be performed on at least a sampling basis:

   – Visual inspection of the coating, with particular attention being paid to the position and overlapping of joints, absence on unbonded coating around holes and at the edges of sealing surfaces, and to the quality of vulcanisation at joints in the material.

   – Coating thickness.

   – Hardness.

c) During rubber coating, the entire area shall always be pore tested before the object/equipment is taken into service. This is particularly important if the service conditions of the object/equipment expose it to low temperatures, substantial temperature changes (e.g. from sunshine) and/or if it is feared that the object/equipment could be subjected to heavy shocks.

7.6 CLEANING/DECONTAMINATION INSPECTION

7.6.1 General

Cleaning inspection can include parts of buildings, systems and components externally and, to some extent, also internally.

Decisions on selection of a contractor shall take account of the contractor's expertise, resources and equipment.

Special inspection programs may be required for certain cleaning work.

7.6.2 Qualification requirements for inspectors

Inspectors shall be thoroughly familiar with all aspects of cleaning, with extensive practical experience of quality control in such applications.

7.6.3 Inspection

The inspector shall satisfy him/herself that the contractor's equipment, tools and chemicals fulfil agreed requirements.

He/she shall also satisfy him/herself that the contractor's personnel who will use the machinery, equipment and chemicals possess the necessary knowledge to do so.

It is the responsibility of the inspector to monitor preparatory work and covering of components prior to cleaning that the work and covering have been satisfactorily performed.

7.6.4 Inspection of the building parts

When notified by the contractor, the inspector shall inspect the finish cleaned area.

7.6.5 Inspection of the process parts

When notified by the contractor, the inspector shall inspect the finish cleaned system and components, together with the area containing them.

When inspecting cleaned tanks, vessels and pools, samples of the rinsing water shall be taken for analysis, performed either by the inspector or by a laboratory approved by the respective nuclear power station(s).

The following conditions apply for approval pH of water samples shall lie between 5.5 and 8.6.
Chloride concentration must be less than 0.5 ppm.

The rinse water must not contain any particles larger than 200 µm.
There must not be more than 20 particles larger than 100 µm per litre of water.
The filter must show any brown discolouration.
The conductivity of the water must not exceed 10 µS/cm at 25 ºC.

Another test shall be carried out with a clean white lint free cloth, moistened with approved solvent, and used to wipe the surface of equipment such as pool sides, the interiors of tanks and vessels etc.

After smear test, the cloth shall be clean, although very slight discolouration may be acceptable.

The results of testing shall be documented on Form D.115, Analysis report for rinsing water.

7.6.6 Reporting

The reports on Form D.115 shall be submitted to the Purchaser on request.

8 DOCUMENTATION

8.1 DOCUMENTATION

Where there is any reference in this chapter to requiring approval from the respective licensee/plant owner or the licensee/plant owner's authorised representatives, this means that such approval must be given by:

– The authorised person(s) on the staff of the respective licensee/plant owner responsible for surface protection, or by some other person consulted by him/her and knowledgeable in the particular matter concerned.

8.1.1 General

The requirements set out in this documentation apply to new manufacture of items, to maintenance painting and to changes. The required documentation shall be prepared in step with performance of the work for all types of surface treatment and/or changes to existing equipment.

Note, however, in respect of **maintenance painting**, that the requirements set out in this chapter 8 in respect of the extent of documentation shall be seen only as **recommendations**, and it is up to each licensee/plant owner to be responsible for ensuring that the necessary documentation is prepared and archived.

See also Chapter 13 for further requirements in respect of maintenance painting of items.

This chapter describes the documentation to be handed over to the respective licensee/plant owner by not later than the time of final inspection of the items, equipment concerned. Documentation shall be available to the Purchaser in step with the manufacturing process or in step with maintenance painting.

When the final documentation is handed over, it shall have been properly sorted and arranged, with paper copies inserted in binders and provided with a detailed list of contents.

If so agreed, the documents may also be supplied in electronic form.

Documentation shall be supplied:

– for each system for the process parts of the plant, and
– if possible, for each room for the building parts of the plant.

The following material shall be included in the documentation:

a) Test reports from paint manufacture Form D.117 see Chapters 3.2 and 4.2.

b) Reports from/of the respective surface treatments as follows:

- Reports or record forms etc. from special investigations or inspections.
- Reports prepared on the specific forms for the particular type of surface treatment. These forms are listed in Chapter 12 of these documents.
- The forms should be gone through with the contractors before work starts.
- Inspection plans, with the various inspection operations initialled on the form and on any separate inspection certificates. All material shall be traceable to the particular inspection operations set out in Inspection Plan Forms D.109 or D.118.
- Any non-conformity reports (Form no. D.104).
- Final inspection record forms.
- Inspection forms (from regular maintenance).
- Lists of any work remaining to be done.

c) One copy (preferably the originals) of each item of documentation as in a) and b) shall be supplied to the respective licensee/plant owner. It is assumed that all text is legible, even any on photocopies.

d) All documents that have been prepared, manufacturing drawings and room descriptions shall be consulted when deciding on the extent of presentation required.

e) Sections 8.1.2 - 4 (below) describe the reports required in connection with the performance of surface treatment, and also set out to what extent the reports are to be attached to final documentation and/or kept available for inspection by the Purchaser.

f) To the extent that it is available, the following final documentation shall be prepared for painting work for which there is not a requirement for submission of painting reports:

- Updated specifications and drawings.
- Room descriptions (updated).
- Non-compliance reports.
- Inspection reports or other inspection documents.
- Lists of any remaining work.

8.1.2 Documentation relating to the building parts of all blocks

See also requirements in respect of the documentation required, as described above in Section 8.1.1.

Steel foundation and anchoring elements, other steel structures and process plant items to be corrosion protected - new manufacture

a) For all items in accordance with Sections 3.1.2 and 4.1.2, a h (inclusive): records are to be kept and presented on Form D.100 'Report for anti-corrosion painting' for all building parts of steel that have been anti rust painted. If possible, forms to be filled in on/for a room by room basis.

b) For other items in Painting Classes II, III, V and VI, and covered by Sections 3.1.2 and 4.1.2: unless otherwise agreed, the Form D.101 'Report for anti-corrosion painting' is to be filled in and to be kept available for inspection by the respective licensee/plant owner during the guarantee period.

c) For galvanized items, intended for installation in rooms in Painting Classes I and IV, and for all items (irrespective of painting class) that are expected to be exposed at least at times - to condensation, the protocol on Form D.105 'Report for hot galvanizing' on a room by room basis shall be drawn up.

   This form shall also be filled in, on a room by room basis, for items in Painting Class II in Room Categories C, C1, C2, C3, C4, D and E.

Floors, walls and ceilings before and after erection, and associated steelwork and steel items that are finish painted after erection.

a) When first being painted: surfaces shall be approved by the surface treatment contractor and be documented on Form D.111.

b) Use Form D.102, 'Report for paint inspection building, concrete painting', on a room by room basis for Painting Classes I, II and IV in Room Categories B, C1, C2, C3, C4, D or E.

c) Use Form D.103, 'Report for paint inspection building, steel painting', on a room by room basis for Painting Classes I and II in Room Categories B, C1, C2, C3, C4, D or E.

d) Use Form D.101, 'Report for anti-corrosion painting', on a room by room basis for rooms in Painting Class IV and for items requiring fire protection painting.

e) Fill in Form D.100, 'Report for anti-corrosion painting', on a room by room basis for items specified in Section 4.1.2, b - h.

f) Regardless of painting class, use Form D.118, 'Inspection plan for floor surfacing', and Form D.102, 'Report for paint inspection building, concrete painting' (both on a room by room basis), for floors in rooms for which Treatment Classes G1- G6b, G9a, G9b G11 and G12 are specified.

Floors, walls and ceilings and associated steelwork and steel items that are painted as part of maintenance.

a) Use Form D.102, 'Report for paint inspection building, concrete painting', on a room by room basis for Painting Classes I and II in Room Categories C1, C2, C3, C4, D or E.

b) Use Form D.103, 'Report for paint inspection building, steel painting', on a room by room basis for Painting Classes I and II in Room Categories C1, C2, C3, C4, D or E.

c) Use Form D.101, 'Report for anti-corrosion painting', on a room by room basis for items requiring fire protection painting.

d) Use Form D.101, 'Report for anti-corrosion painting', on a room by room basis for rooms in Painting Class IV.

e) Fill in Form D.100, 'Report for anti-corrosion painting', on a room by room basis for items specified in Section 4.1.2, b - h.

f) Regardless of painting class, use Form D.118, 'Inspection plan for floor surfacing', and Form D.102, 'Report for paint inspection building, concrete painting' (both on a room by room basis), for floors in rooms for which Treatment Classes G1 - G6b, G9a, G9b G11 and G12 are specified.

8.1.3 Documentation relating to process parts (anti-corrosion protection) for all blocks

See also requirements in respect of the documentation required, as described above in Section 8.1.1.

The information specified below relates to surface treatment applied or performed by manufacturing companies and/or site built items - first painting

Note details on the forms specified below for all items receiving anti corrosion painting or zinc galvanisation:

- Form D.100, "Report for anti-corrosion painting'. See also the specification in Section 4.1.2.
- Form D.101, 'Report for anti-corrosion painting'. See the specification in Section 4.1.2.
- Form D.109, 'Inspection plan painting'. See the specification in Section 7.2.2.
- Form D.105, 'Report for hot galvanizing'.

  Use this form for all items in Painting Classes I and IV and for all items in the plant, regardless of painting class, that are expected to be exposed - at least at times - to condensation.

  Use this form for items in Painting Class II in Room Categories C, C1, C2, C3, C4, D or E.

- Form D.108 , 'Report for rubbering'.
- Use this form for all items in the plant, regardless of their placing, that are rubber coated. See Section 7.5.3.

The information specified below relates to surface treatment applied as maintenance painting by manufacturing companies and/or to items at site.

Note details on the forms specified below for all items receiving anti corrosion painting or zinc galvanisation:

- Form D.100, 'Report for anti-corrosion painting'. See also the specification in Section 4.1.2.
- Form D.101, 'Report for anti-corrosion painting'. For items in Room Categories C, C1, C2, C3, C4, D or E.
- Form D.109, 'Inspection plan, painting'. See the specification in Section 7.2.2.
- Form D.105, 'Report for hot galvanizing'.

  Use this form for all items in Painting Classes I and IV and for all items in the plant, regardless of painting class, that are expected to be exposed - at least at times - to condensation.

  Use this form for items in Painting Class II in Room Categories C, C1, C2, C3, C4, D or E.
- Form D.108 , 'Report for rubbering'.

  Use this form for all items in the plant, regardless of their placing, that are rubber coated. See Section 7.5.3.

8.1.4 Items that have their manufacturer's standard paint finish

The following forms, filled in and signed by the Supplier, should be included in the final documentation:

a) Form D.106, 'Information for evaluation of corrosion protection according to suppliers standard procedure'.
b) Form D.107, 'Report for performed inspection by anti-corrosive painting according to suppliers standard program'.

9 COLOURS TBY

9.1 FOR CHOICE OF COLOUR, PLEASE SEE CHAPTER 4 IN APPROVED PAINT SYSTEMS FOR TBY

10 FORM SHEETS - ENCLOSURES TO TBY

Doc No	Head line	Pages	Issued	Rev
D.100	REPORT FOR ANTI-CORROSION PAINTING	2	020121	131231
D.101	REPORT FOR ANTI-CORROSION PAINTING	1	020121	131231
D.102	REPORT FOR PAINT INSPECTION BUILDING, CONCRETE PAINTING	1	0201210	131231
D.103	REPORT FOR PAINT INSPECTION BUILDING, STEEL PAINTING	1	020121	131231
D.104	NON CONFORMITY REPORT	1	020121	131231
D.105	REPORT FOR HOT GALVANIZING	2	020121	131231
D.106	INFORMATION FOR EVALUATION OF CORROSION PROTECTION ACCORDING TO SUPPLIERS STANDARD PROCEDURE	2	020121	131231
D.107	REPORT FOR PERFORMED INSPECTION BY ANTI-CORROSIVE PAINTING ACCORDING TO SUPPLIERS STANDARD PROGRAM	2	020121	131231
D.108	REPORT FOR RUBBER COATING	2	020121	131231
D.109	INSPECTION PLAN PAINTING/RUBBER COATING	3	020121	131231
D.110	REPORT FOR HUMIDITY MEASUREMENT	1	020121	131231
D.111	INSPECTION OF CONCRETE SURFACES BEFORE PAINTING	1	020121	131231
D.112	REPORT FOR HOLIDAY INSPECTION OF COATING	1	020121	131231
D.113	REPORT FROM ADHESION AND SURFACE TENSILE STRENGTH VALUE DETERMINATION TO CONCRETE SURFACE	1	020121	131231
D.115	ANALYSIS REPORT FOR RINSING WATER	1	020121	131231
D.116	PRODUCT SHEET FOR PAINT MANUFACTURING	2	020121	131231
D.117	QUALITY CONTROL OF PAINT MANUFACTURING	1	020121	131231
D.118	INSPECTION PLAN FOR FLOOR SURFACING	2	020121	131231

11 MAINTENANCE GUIDELINES

11.1 GENERAL

In Sweden, property owners are liable under the PBL 2010:900 (Plan- och bygglag [Planning and Building Act]) for ensuring that a building is maintained in such a way as to retain its essential technical features and requirements.

All steel structures must be constantly inspected in accordance with the requirements of Sections 10.2 and 10.3 of BSK 99. All steel structures included in SS-EN 1993-1-1:2005, Edition 1 and SS-EN 1993-1-3:2006, Edition 1 must be constantly inspected.

In Finland (OL1 and OL2), maintenance must be planned and carried out in accordance with the applicable regulations and legislation. Corrosion protection must be planned in accordance with the requirements of SFS-EN ISO 12944-8, Edition 1. The requirements of Guide YVL 1.8, 4.1 and 4.2, published by STUK, must be applied.

Regulatory Guide 1.54 Revision 2, October 2010 gives recommendations for the quality assurance and maintenance of nuclear power plants, but the responsibility for doing so rests with the owner.
The extent and quality of maintenance must be determined in accordance with the licensee/plant owner's various maintenance classification levels.
The following instructions, comments etc. are not linked to defects or faults that may occur in connection with guarantee inspection, but are linked only to the quality levels applicable to maintenance.
Guidelines for the maintenance of surface treatments by means of painting are given in the following sections.
As used in this document, 'maintenance' covers both the upgrading of existing (earlier) surface treatments or merely maintaining them. This can be done by touch up painting, repainting or new painting. ('New painting', as used here, means repainting on a surface from which earlier paint systems or coatings have been completely removed.)
Rubber coatings may be maintained in accordance with the same principles.

The purpose of these maintenance guidelines is to assure the status of the plant, the quality of the maintenance work and the quality of the workmanship, as needed to fulfil the requirements in Chapter 12 and, in principle, in accordance with Regulatory Guide 1.54, Revision 2, October 2010.

11.2 MAINTENANCE CLASSIFICATION

See Chapter 2 for details of classification of areas and process equipment.
Apply the following levels and categories as indicated by, or as appropriate to, the area's or process equipment's function and physical site (position).

Level 1

This level includes all surfaces and items belonging to Painting Classes I and IV.

Level 2

These are surfaces and items in Painting Class II in Room Categories having Red, Yellow or Orange access restrictions due to surface radioactive contamination or radiation level.

Level 3
These are other surfaces and items in Painting Class II and not belonging to Level 2.

Level 4

These are surfaces and items in Painting Class III, but which require a higher maintenance status than Level 5.

Level 5

Other surfaces or items in Painting Class III.

11.3 INSPECTION PERIODS, FREQUENCY

Plan inspections and the frequency of inspection to suit, or as required by, availability in the power stations as provided by shutdowns etc., so that the performance of surface treatments does not put the safety of the plant at risk.
The owner is responsible under the PBL for ensuring that a building is maintained in such a way as to retain its essential technical features and requirements.
Requirements applicable to maintenance are set out in the (BVL), 2 §, last paragraph, and in the PBL, Section 3, 13 §.
All steel structures must be constantly inspected and regularly examined, see section 11.1.

In Finland, it is the responsibility of the owner that buildings and, for example, nuclear power stations, must be maintained in accordance with applicable regulations and legislation. The requirements of STUK / YVL Guide 1.8 4.1 and 4.2 must be applied.

Normally, decide on inspections or testing of process equipment via inspection plans that are drawn up to suit the type of equipment, technical and economic requirements.

11.3.1 Building parts

Generally, take the opportunity of shutdowns to inspect surface treatments. It will normally be possible to plan inspections for most areas on the basis of one, two or five year cycles.

11.3.1.1 Level 1

Level 1 surfaces and items (Painting Class 1) must normally be inspected visually once a year.

Inspect carbon steel structures in Painting Class IV at such intervals that no rust will have become worse than Grade Ri 5 (SS-EN ISO 4628-3:2004, Edition 1) before maintenance can be carried out.

11.3.1.2 Levels 2 and 3

Inspect Levels 2 and 3 surfaces and items at such intervals that ensure that the performance and safety of the painting is not affected.

11.3.1.3 Levels 4 and 5

Decide the need for inspection of Levels 4 and 5 surfaces and items individually with the respective licensee/plant owner, observing the requirements of Chapter 11.3.

11.3.2 Process parts

Generally, take the opportunity of shutdowns to inspect surface treatments. It will normally be possible to plan inspections for most items on the basis of one, two or five year cycles.

11.3.2.1 Level 1

Level 1 surfaces and items (Painting Class 1) must normally be inspected visually once a year.

Inspect carbon steel items in Painting Class IV at such intervals that no rust will have become worse than Grade Ri 5 (SS-EN ISO 4628-3:2004, Edition 1) before maintenance can be carried out.

11.3.2.2 Levels 2 and 3

Inspect Levels 2 and 3 surfaces and items at such intervals that ensure that the performance and safety of the painting is not affected.

11.3.2.3 Levels 4 and 5

Decide the need for inspection of Levels 4 and 5 surfaces and items individually with the respective licensee/plant owner, observing the requirements of Item 11.3.

11.4 EXTENT OF INSPECTION - INSPECTION PLANS – INSPECTION METHODS

11.4.1 General

The purpose of inspection is to ascertain the condition of the surfaces, and any changes in them. Although it is difficult to inspect some surfaces or items during operation of the plant or equipment, this must not restrict the extent of the inspection or result in neglect of maintenance.

Inspection must include noting of blistering, crackling, cracking, flaking, softening, tack, rusting (on steel surfaces), adhesion, gloss changes, chalking, colour changes, abrasion, ageing or other physical changes.

11.4.2 Inspection methods for painted or composite-coated surfaces

Apply the following methods of inspection to identify any changes observed.

Blistering

Identify blistering and report it in accordance with SS-EN ISO 4628-2:2004, Edition 1.

Cracking

Identify cracking and report it in accordance with SS-EN ISO 4628-4:2004, Edition 1

Flaking

Identify flaking and report it in accordance with SS-EN ISO 4628-5:2004, Edition 1

Softening

Softening is not acceptable. There are no standards.

Tack (stickiness)

Identify and report it in principle in accordance with SS 184216, Edition 1.

Rust (breakdown of paint coat)

Identify rusting and report it in accordance with SS-EN ISO 4628-3:2004, Edition 1

Rust (description of the appearance of steel surfaces)

Determine the amount of rust in accordance with SS-EN ISO 8501-1:2007, Edition 2, and report it in those cases where it can affect the strength or integrity of the structure.

Adhesion (cohesion/adhesion/layering)

Determine adhesion and report it in accordance with SS-EN ISO 4624:2003, Edition 1. Adhesion for some types of treatment, determination and report in accordance with SS-EN ISO 2409:2007, Edition 2.

Test the adhesion of painted concrete surfaces every five years, unless some incident has occurred that can justify more frequent testing.

See Chapter 7. Item 7.1.4.8 b for a description of the extent of testing of adhesion on concrete surfaces.

Gloss

Determine gloss and report it in accordance with SS-EN ISO 2813, Edition 1, or through the use of gloss standard samples.

Chalking

Identify chalking and report it in accordance with SS-EN ISO 4628-6:2011, Edition 3.

Colour change (staining)

Determine colour changes and report them using colour samples as a first stage of inspection. If more exact determination is required, it may be necessary to measure the colour using some agreed method.

Abrasion

Determine the amount of abrasion primarily by visual inspection, in accordance with DIN 53233:2003-06, Section 8.

Mechanical damage

Determine the extent of mechanical damage, if the damage is such as to require rectification. Such damage must be reported.

Resistance to steam

Determine the resistance to steam using the test method described in Chapter 12, Item 12.2.4. Note that this applies only to Painting Class 1 painted concrete surfaces in 11.2.2.1 Level 1. Unless there are indications of problems, perform this testing every five years after the tenth year from new painting or repainting.
A representative sample piece is taken from each floor, wall or ceiling surface on each test occasion.

Resistance to ageing

One of the ways in which the effects of ageing can be determined is by comparing the gloss conversion temperatures (Tg), while another is to use an IR spectrophotometry. Perform these tests on painted concrete surfaces in 11.2.2.1 Level 1 every five years after the tenth year from new painting or repainting, in order to plan any necessary correction work.
A representative sample is taken from each floor, wall or ceiling surface on each test occasion.
This method may be used for anti corrosion painting where it is regarded as suitable.

Emission determination

Emission determination may be used as a complement to the above methods of inspection for steel tanks or similar items with corrosion protection that are very difficult to inspect.

Anti-corrosion painted surfaces in combination with cathodic protection

Surfaces showing damage must be inspected to determine whether the damage is due to incorrect setting of the cathodic protection or whether the paint system is less suitable for the necessary protective current.

11.5 RULES FOR MAINTENANCE MEASURES

11.5.1 Building structures and hard plastic floor coatings

Painting of building structures and hard plastic floor coatings in section 11.5.1.1 Level 1 must be such as to maintain a level of quality that meets all the original requirements on the painting as at the time of new building.

In order to meet requirements as given above, it is necessary that the paint has not been broken down by more than as described below. Note, however, that requirements in this respect may be higher if aesthetic considerations are involved.

11.5.1.1 Level 1

Blistering

Identify blistering and report it in accordance with SS-EN ISO 4628-2:2004, Edition 1. Local blistering may not be worse than 2 (S2).

Cracking

Identify cracking and report it in accordance with SS-EN ISO 4628-4:2004, Edition 1. There must be no cracking in the substrate, except that local cracking that is not worse than 3 (S2) b is acceptable.

Flaking

Identify flaking and report it in accordance with SS-EN ISO 4628-5:2004, Edition 1. Flaking is not acceptable.

Softening

Softening is not acceptable.

Tack freeness

All items must be tack-free.

Adhesion (cohesion/adhesion/layering)

Determine adhesion and report it in accordance with SS-EN ISO 4624:2003, Edition 1. Adhesion must meet the requirements given in Table 3- 1, Chapter 3 of TBY.

Gloss

Determine gloss and report the results in accordance with SS-EN ISO 2813, Edition 1. The gloss must not have been broken down by more than 20 % of the original.
Note: See below ('Abrasion') for requirements applicable to hard plastic floor coatings. Alternatively, the gloss quality can be determined by comparison with gloss standard samples.

Chalking

Identify chalking and report it in accordance SS-EN ISO 4628-6:2011, Edition 3. Chalking is not acceptable.

Colour change (staining)

Determine colour changes and report them using colour samples as a first stage of inspection. Slight colour changes can be accepted, unless special requirements have been agreed. If more exact determination is required, it may be necessary to measure the colour using some agreed method.

Abrasion (of painted floors and of hard plastic floor coatings)

Determine the amount of abrasion first by visual inspection, in accordance with DIN 53233:2003-06 section 8.
Abrasion exceeding Kennwert A for solvent-containing products and Kennwert B in accordance with DIN 53233:2003-06 section 8 for low solvent products is not acceptable for floors and floor coatings.

Mechanically damaged surfaces

Determine the extent of mechanical damage by visual inspection and report the results. If damage to floor surfaces is such as to reveal the concrete, the damage must be made good (if possible) before commissioning. Deal with other mechanical damage when regarded as appropriate, although trying to repair it before commissioning and certainly by not later than during the next shutdown.

Resistance to steam

Drill out a 100 mm core sample, about 50 mm thick, from the existing painted surface. Testing must be performed and the results must fulfil the requirements in 12.2.4.2 (Test Method 1, Steam Test) or 12.2.4.3 in chapter 12 (Test Method 2, DBA Test).

Resistance to ageing

Take representative samples as agreed with the laboratory that will determine the effects of any changes due to ageing. The results must be interpreted by an appropriate expert.

11.5.1.2 Level 2

Blistering

Identify blistering and report it in accordance with SS-EN ISO 4628-1:2004, Edition 1. Blistering greater than 3 (S3) is not acceptable.

Cracking

Identify cracking and report it in accordance with SS-EN ISO 4628-4:2004, Edition 1. Cracks not worse than 3 (S4) C can be accepted: for floors, cracks not worse than 2 (S3) B are acceptable. However, in the case of floors, there must be no cracking in the substrate.

Flaking

Identify flaking and report it in accordance with SS-EN ISO 4628-5:2004, Edition 1.
Flaking in excess of 4 (S5) B is not acceptable.

Softening

Softening on floors is not acceptable: slight softening is permissible on walls and ceilings.

Tack (stickiness)

Tack on floors is not acceptable. Slight tackiness is permissible on walls and ceilings.

Adhesion (cohesion/adhesion/layering)

Determine adhesion and report it in accordance with SS-EN ISO 4624:2003, Edition 1.
Adhesion must meet the requirements given in Table 3- 1, Chapter 3 of TBY.

Gloss

Changing in gloss shall be performed at first against a standard colour sample. Report the results. When more accurate checking is required, determination and report the results in accordance with SS-EN ISO 2813, Edition 1.
Note: See below ('Abrasion') for requirements applicable to hard plastic floor coatings. For other treatments, the gloss must not have been broken down by more than 30 % of the original.

Chalking

Identify chalking and report it in accordance with SS-EN ISO 4628-6:2011, Edition 3.
A slight amount of chalking can be accepted.

Colour change (staining)

Determine colour changes and report them using colour samples as a first stage of inspection. Slight colour changes can be accepted, unless there are special aesthetic requirements. If more exact determination is required, use colour measurement methods.

Abrasion (of painted floors and of hard plastic floor coatings)

Determine the amount of abrasion first by visual inspection, in accordance with DIN 53233:2003-6 section 8.
Abrasion exceeding Kennwert A for solvent-containing products and Kennwert B in accordance with DIN 53233:2003-6 section 8 for low solvent products is not acceptable.

Mechanically damaged surfaces

Determine the extent of mechanical damage by visual inspection and report the results. If damage to floor surfaces and surface is such as to reveal the concrete, the damage must be made good (if possible) before commissioning. Deal with minor local damage by not later than during the next shutdown, i.e. generally within one year.

Deal with other mechanical damage when necessary, although trying to repair it before commissioning and certainly by not later than during the next shutdown, i.e. within one year. (This period can be extended to two years for local damage at heights above the level of pedestrian traffic and for local damage in ceilings.)

11.5.1.3 Level 3

Blistering

Identify blistering and report it in accordance with SS-EN ISO 4628-2:2004, Edition 1. Blistering greater than 3 (S5) is not acceptable.

Cracking

Identify cracking and report it in accordance with SS-EN ISO 4628-4:2004, Edition 1. Cracks not worse than 3 (S4) C can be accepted: for floors, cracks not worse than 3 (S3) B are acceptable, but there must be no cracking in the substrate.

Flaking

Identify flaking and report it in accordance with SS-EN ISO 4628-5:2004, Edition 1. Flaking greater than 4 (S5) B is not acceptable.

Softening

A slight amount of softening is permissible.

Tack (stickiness)

A slight amount of tackiness is permissible.

Adhesion (cohesion/adhesion/layering)

Determine adhesion and report it in accordance with SS-EN ISO 4624:2003, Edition 1. Adhesion must meet the requirements given in Table 3- 1, Chapter 3 of TBY.

Gloss

Changing in gloss shall be performed at first against a standard colour sample. Report the results. When more accurate checking is required, determination and report the results in accordance with SS-EN ISO 2813, Edition 1.
Note: See below ('Abrasion') for requirements applicable to hard plastic floor coatings. For other treatments, the gloss must not have been broken down by more than 30 % of the original.

Chalking

Identify chalking and report it in accordance with SS-EN ISO 4628-6:2011, Edition 3.
A slight amount of chalking can be accepted.

Colour change (staining)

Determine colour changes and report them using colour samples as a first stage of inspection. Slight colour changes can normally be accepted, unless there are special aesthetic requirements. If more exact determination is required, use colour measurement methods.

Abrasion (of painted floors and of hard plastic floor coatings)

Determine the amount of abrasion first by visual inspection, in accordance with DIN 53233:2003-06 section 8.
Abrasion of floors and floor coatings classed as Kennwert C or worse, in accordance with DIN 53233:2003-06 section 8 is not acceptable for floors and floor coatings.

Mechanically damaged surfaces

Determine the extent of mechanical damage by visual inspection and report the results. If damage to floor surfaces is such as to reveal the concrete, the damage must be made good (if possible) before commissioning, but by not later than during the next shutdown, i.e. generally within one year. Deal with minor, very local, damaged floor surfaces within five years.
Deal with other mechanical damage when regarded as appropriate, although trying to repair it before commissioning and certainly by not later than during the next shutdown. (This period can be extended to five years for local damage at heights above the level of pedestrian traffic and for local damage in ceilings.)

11.5.1.4 Levels 4 and 5

Decision of the need for maintenance will be determined by the respective power stations, in accordance with their criteria, but observing the requirements of Item 11.3.

11.5.2 Anti-corrosion painting – Process- and buildings parts

Normally, decisions on inspections or testing of process equipment is determined by inspection plans that are drawn up to suit the type of equipment, technical and economic requirements.

11.5.2.1 Level 1

Blistering

Identify blistering and report it in accordance with SS-EN ISO 4628-1:2004, Edition 1.
Local blistering greater than 5 (S3) is not acceptable.

Cracking

Identify cracking and report it in accordance with SS-EN ISO 4628-4:2004, Edition 1.

Cracks not worse than 3 (S2) A can be accepted: apart from this, there must be no cracking.

Flaking

Identify flaking and report it in accordance with SS-EN ISO 4628-5:2004, Edition 1.
Flaking is not acceptable.

Softening

Softening is not acceptable.

Tack (stickiness)

Stickiness is not acceptable.

Rust (breakdown of paint coat)

Identify rusting and report it in accordance with SS-EN ISO 4628-3:2004, Edition 1.
Rusting worse than Ri 3 is not acceptable. For closed tanks and similar items containing liquid media, the limit for acceptability is Ri 0.

Rust (description of the appearance of steel surfaces)

Determine the amount of rust, and report it, in accordance with SS-EN ISO 8501-1:2007, Edition 2, in those cases where it has reached Rust Grade D. If it has reached Rust Grade D, the designer must decide whether the amount of rust is acceptable before maintenance of the surface treatment is carried out.

Adhesion (cohesion/adhesion/layering)

Determine adhesion and report it in accordance with SS-EN ISO 4624, Edition 1.
Adhesion must meet the requirements given in Table 4- 1, Chapter 4 of TBY.
As indicated by the table referred to, certain types of treatment must be examined, and the results reported, in accordance with SS-EN ISO 2409:2007, Edition 2.

Gloss

Determine the gloss, and report the results, in accordance with SS-EN ISO 2813, Edition 1.
Gloss degradation exceeding 30 % of the original is not acceptable.
Alternatively, check the gloss against standard colour samples.

Chalking

Identify chalking and report it in accordance with SS-EN ISO 4628-6:2011, Edition 3.
Chalking is normally not acceptable.

Colour change (staining)

Determine colour changes and report them using colour samples as a first stage of inspection. Slight colour changes can normally be accepted, unless the system is classified as colourfast.
If more exact determination is required, use colour measurement methods.

Mechanically damaged surfaces

Determine the extent of mechanical damage by visual inspection and report the results. Items etc. with mechanically damaged surfaces in Painting Class IV must not be commissioned without rectification unless the person responsible for painting in the power station has confirmed that this is permissible. Attempts must be made to deal with all other larger mechanical damage before commissioning, but by not later than during the next shutdown, i.e. generally within one year

Resistance to steam

There are no requirements relating to resistance to steam pressure for steel surfaces in Painting Class I in Swedish Power Plants. In Finish Power Plants STUK-YTO-TR 210 applies.

Anti-corrosion painted surfaces with cathodic protection

Investigate any defects in the surface treatment system to see whether there is any connection with the design or operation of the cathodic protection system.

11.5.2.2 Level 2

Blistering

Identify blistering and report it in accordance with SS-EN ISO 4628-2:2004, Edition 1. Blistering greater than 3 (S3) is not acceptable.

Cracking

Identify cracking and report it in accordance with SS-EN ISO 4628-4:2004, Edition 1. Surface cracks not worse than 4 (S4) A can be accepted: apart from this, there must be no cracking.

Flaking

Identify flaking and report it in accordance with SS-EN ISO 4628-5:2004, Edition 1. Flaking greater than 4 (S5) is not acceptable.

Softening

Slight softening is allowed, except for hard plastic floor coatings, for which no softening is allowed.

Tack freeness (stickiness)

Slight stickiness is allowed, except for hard plastic floor coatings, for which no stickiness is allowed.

Rust (breakdown of paint coat)

Identify rusting and report it in accordance with SS-EN ISO 4628-3:2004, Edition 1.
Rusting worse than Ri 3 is not acceptable.

Rust (description of the appearance of steel surfaces)

Determine the amount of rust, and report it, in accordance with SS-EN ISO 8501-1:2007, Edition 1 in those cases where it has reached Rust Grade D. If it has reached Rust Grade D, the designer must decide whether the strength (e.g. in accordance with BSK 99, Section 8:74) requirements are met before maintenance of the surface treatment is carried out.

Adhesion (cohesion/adhesion/layering)

Determine adhesion and report it in accordance with SS-EN ISO 4624, Edition 1.
Adhesion must meet the requirements given in Table 4- 1, Chapter 4 of TBY.
As indicated by the table referred to, certain types of treatment must be examined, and the results reported, in accordance with SS-EN ISO 2409:2007, Edition 2.

Gloss

Determine gloss, and report the results, in accordance with SS-EN ISO 2813, Edition 1.
Alternatively, check the gloss against standard colour samples.
Gloss degradation exceeding 50 % is not acceptable.

Chalking

Identify chalking and report it in accordance with SS-EN ISO 4628-6:2011, Edition 3.
A slight amount of chalking is acceptable.

Colour change (staining)

Determine colour changes and report them using colour samples as a first stage of inspection. Reasonable colour changes can normally be accepted, unless there are aesthetic requirements.
If more exact determination is required, use colour measurement methods.

Mechanically damaged surfaces

Determine the extent of mechanical damage by visual inspection and report the results.
Try to repair it before commissioning and by not later than during the next shutdown, i.e. generally within one year.
Smaller patches of local damage can be planned for repair within two years of their being caused.

Anti-corrosion painted surfaces with cathodic protection

Investigate any defects in the surface treatment system to see whether there is any connection with the design or operation of the cathodic protection system.

11.5.2.3 Level 3

Blistering

Identify blistering and report it in accordance with SS-EN ISO 4628-2:2004, Edition 1.
Blistering greater than 3 (S5) is not acceptable.

Cracking

Identify cracking and report it in accordance with SS-EN ISO 4628-4:2004, Edition 1.
Cracks not worse than 3 (S2) A can be accepted: apart from this, there must be no cracking.

Flaking

Identify flaking and report it in accordance with SS-EN ISO 4628-5:2004, Edition 1.
Flaking worse than 4 (S5) B is not acceptable.

Softening

A slight amount of softening can be accepted.

Tack (stickiness)

A slight amount of tack (stickiness) can be accepted.

Adhesion (cohesion/adhesion/layering)

Determine adhesion and report it in accordance with SS-EN ISO 4624, Edition 1.
Adhesion must meet the requirements given in Table 4- 1, Chapter 4 of TBY.
As indicated by the table referred to, certain types of treatment must be examined, and the results reported, in accordance with SS-EN ISO 2409:2007, Edition 2.

Gloss

Determine gloss, and report the results, in accordance with SS-EN ISO 2813, Edition 1.
Alternatively, the gloss may be determined against a standard colour samples.
Gloss degradation exceeding 80 % is not acceptable.

Chalking

Identify chalking and report it in accordance with SS-EN ISO 4628-6:2011, Edition 3.
A slight amount of chalking is acceptable.

Colour change (staining)

Determine colour changes and report them using colour samples as a first stage of inspection. Reasonable colour changes can normally be accepted, unless there are aesthetic requirements.
If more exact determination is required, use colour measurement methods.

Mechanically damaged surfaces

Determine the extent of mechanical damage by visual inspection and report the results. Try to repair it before commissioning and by not later than during the next shutdown, i.e. generally within one year.
Smaller patches of local damage can be planned for repair within two years of their being caused.

11.5.2.4 Levels 4 and 5

Decide the need for maintenance from one power station to another, in accordance with their owners' criteria, but observing the requirements of Item 11.3.

11.6 TYPES OF TREATMENT FOR MAINTENANCE

11.6.1 General

Deciding on the type of treatment to be performed or applied depends on the type of existing painting system and on its condition at the time of inspection. Maintenance work can consist of touch up painting, repainting or complete repainting, i.e. generally the same as painting from new.
Details of the types of treatment to be used in maintenance are given in Chapter 5.
Chapter 6 describes how to decide on the appropriate choice of treatment to suit changes, e.g. due to changed operating conditions.
It is assumed that the choice of treatment will be decided on the basis of the results of inspection, and on whether there is documentation of earlier treatment that can give ideas for the choice of future maintenance.

Maintenance painting must be carried out in accordance with one of the types of treatment described in TBY.

11.6.2 Choosing the type of treatment for painting of concrete

Select the type of treatment to be applied in the same way as would be done for painting from new, i.e. as described in Chapters 7 and 8 in TBY.

11.6.3 Choosing the type of treatment for anti-corrosion painting

Select the type of treatment to be applied as described in Chapters 7 and 8 in TBY.

11.6.4 Choosing the type of treatment for galvanizing (metallisation)

Select the type of treatment to be applied as described in Chapters 7 and 8 in TBY.

11.6.5 Choosing the type of treatment for rubber-coating

Decide on repair or re-rubbering with the help of the contents of Sections 4.3.6 and 4.3.7 in Chapter 4 of TBY.

11.6.6 Methods for repairing cracks in concrete structures

11.6.6.1 Repair methods

- Injection with epoxy or polyurethane
- Cement injection
- Injection of penetrant
- Repair with epoxy filler
- Filling
- Repair with sealing compound
- Application of flooring compound

These repair methods are described below and are used in principle according to Table 11- 1. Inventory of cracks is drawn up and subsequently a repair programme drawn up. In case of doubt about the repair method, the responsible expert must be contacted.

When there alternative methods given in the table, the expert states the alternative to be used.

11.6.6.2 Injection with epoxy or polyurethane

Normally, two-component polyurethane or epoxy are used. Approved products are given in the document Approved Paint Systems for TBY.

11.6.6.3 Injection of dry cracks

On the front, i.e. the side from which the injection is performed, injection plates are glued into place over the crack using epoxy glue. c/c must not exceed the structure's thickness, however max c/c = 50 cm.
Between the injection plates, the crack is sealed with epoxy filler.
On the rear, the crack is plastered over using epoxy filler. Single plates are glued in place to check the plastic penetrates all the way during injection.
For concrete structures with a thickness exceeding 50 cm, where the crack goes all the way through, injection should be done from both sides to ensure the crack is fully filled.

As a rule, once the filler has hardened, the injection process is started from the lowest point of the crack. Injection nipple is screwed on to the pipe on the injection plate. When the plastic exits the pipe that is nearest, the injection nipple is screwed on to this pipe and the injection process continues from this point and so on. When all pipes above the crack have been equipped with an injection nipple, the injection process is restarted from the first nipple until the stop pressure is attained. The injection pressure is approx. 0.8 MPa.

All injection nipples must have non-return valves both to stop the plastic from forcing its way backwards after injection and to maintain the pressure built up in the injected plastic during the injection process for as long as possible.

During injection of cracks that go all the way through, where it is not possible to carry out injection on the structure's rear, if the material consumption tends to be greater than estimated (leak through), the injection must be stopped until the plastic has jellified, thereafter, new injection is done.
The injection process cannot be considered to be concluded before the stop pressure is attained.
Post-pressurisation is carried out before the injected plastic has hardened.

When the injected plastic has hardened, the injection plates are knocked off and the filler over the cracks sanded off.

11.6.6.4 Injection of water carrying and wet cracks

A slit approx. 20 x 20 mm is drilled in the concrete over the crack.
½" soft plastic hose, in which the injection pipes are fastened with a c/c separation of approx. 50 cm, is placed in the slit over the crack.
The hose is plastered into place with fast acting mortar.

In principle, the injection is carried out as described in 11.6.6.3 above.
When the injected plastic has hardened, the injection pipes and most of the adhesive mortar are removed. The slit is repaired using concrete filler. See Approved Paint Systems for TBY, section 2.2. 2.1.

11.6.6.5 Injection with cement mortar

According to proven procedure.

11.6.6.6 Injection of penetrant (I.e. injection of plastic under its own pressure)

11.6.6.6.1 Cracks in floors

A slot is drilled into the crack to a depth of approx. 1.0 – 1.5 cm.
Epoxy plastic (for sealing in accordance with point 1 above) is poured in the slot. The procedure is repeated 3-4 times during a period of 4 – 8 hours (3 – 4 cm penetration is the aim).
The slot is filled in with epoxy filler. See Approved Paint Systems for TBY section 2.2.2.2 for G1-G4, G7a, G7b, G9a, G9b, G10a and G10b.

11.6.6.7 Repair with epoxy filler

11.6.6.7.1 Cracks in walls

A slot is drilled in the crack, for example with a stone-setting hammer, to a max depth of 3 cm. The slot is filled in with epoxy filler. See Approved Paint Systems for TBY, section 2.2.2.3 for V1- V3.

11.6.6.8 Filling

The crack is filled with concrete filler, or epoxy filler, in connection with the processing of the painted surface. See Approved Paint Systems for TBY, section 2.2.2.1, or section 2.2.2.3, for V1 – V3 or 2.2.2.4 for T1, depending on whether it concerns walls or floors.

11.6.6.9 Repair with sealing compound

For mobile cracks, repair with sealing compound is used. See TBY, chapter 3.3.7. Painting over sealing compound is not recommended. In special cases, this can be done if the licensee/plant owner takes responsibility.

11.6.6.10 Application of flooring compound

For areas in accordance with B and D, in Table 11- 1, relaying the floor with flooring compound can be a repair alternative, above all in those cases where the floor in question has a large crack frequency and it has previously been surface treated with a G7a, G7b, G7c and G8 type thin film coat.
The measures I – II, given below, are based on treatment types G11 and G12 respectively, in accordance with chapter 5.

11.6.6.10.1 Floors on ground within room categories A, B and C

Crack width > 0.3 ≤ 3.0 mm

Existing floor with treatment type:	Measure
G7a, G7b, G8	I
G1-G4, G10a, G10b	II

Crack width > 1.5 ≤ 3.0 mm

Existing floor with treatment type:	Measure
G1 – G4, G7a, G7b, G8, G10a, G10b	II

11.6.6.10.2 Floors belonging to room category D and E in accordance with Table 2-2, C, C1, C2 and C3 in accordance with Table 2-7 as well as C1 and C2 in accordance with Table 2-12 bordering on areas with the same or lower risk of contamination

Crack width > 0.3 ≤ 3.0 mm

Existing floor with treatment type	Measure
G1 – G4, G7a	II

Description of measures I – II:
(For materials, methods etc, the treatment type in brackets applies where appropriate)

Measure I (Treatment type G11, see chapter 5)
Concerns floors that have been previously treated with thin film coat type G7a, G7b, G7c and G8.

Measure II (Treatment type G12, see chapter 5)

Areas/buildings	**Repair methods**						
	Injection of plastic	Cement injection	Injection of penetrant	Epoxy filler	Filling	Sealing compound	Application of flooring compound
A. Building sections exposed to one-sided water pressure Crack width ≥ 0.2 ≤ 3 mm Crack width > 3 mm	X	X					
B. Floors on ground within controlled areas Crack width ≥ 0.3 ≤ 3 mm Crack width > 3 mm	X	X	X				X
C. Walls on ground within controlled areas Crack width ≥ 0.4 ≤ 3 mm Crack width > 3 mm	X	X					
D. Areas according to 11.6.6.10.2 Crack width > 0.3 ≤ 3 mm Walls, crack width > 0,4 mm			X	X			X
E. Areas belonging to Painting Class III, Crack width > 1 mm					X		
F. Other areas and buildings Floors, crack width > 0.3 ≤ 3 mm Walls, crack width > 0.4 mm					X X		X
G Mobile cracks						X	

Table 11- 1 Repair methods for cracks in concrete

11.7 INSPECTION OF MAINTENANCE WORK

11.7.1 General

The quality of maintenance work in the form of site painting, anti corrosion painting, hot-dip-galvanizing, flame spray galvanizing or rubber coating, must be inspected in accordance with the requirements of Chapter 7, unless additional inspection requirements are specified below.

11.7.2 Site painting, anti-corrosion painting

11.7.2.1 Requirements in respect of inspectors' qualifications

Inspectors who perform inspections as described above in order to decide the need for maintenance, and those who inspect the finished work, must have documented experience of site painting and anti-corrosion painting that depends on the levels involved in the work. The goal is to eventually fulfil the requirements in ASTM D 4537-12.
The following requirements applicable to inspectors are a recommendation, and can be replaced by training and experience judged by the Purchaser to be equivalent.

Level 1 inspectors

Inspectors, as a minimum, must:

- Have technical training equivalent to upper secondary education level.
- Have at least three years' experience of specialised inspection activities in the fields of building painting and anti-corrosion painting and experience of surface treatment work in a nuclear power station.
- Be able to implement and inspect all the application procedures required.
- Be able to verify instrument calibrations, and
- Be able to attest that all inspection points have been performed in accordance with applicable specifications.

Level 2 inspectors

Inspectors, as a minimum, must:

- Have technical training equivalent to upper secondary education level.
- At least 4 years' experience of specialised inspection activities in the fields of building painting and anti-corrosion painting
- At least one year's experience of Level 1 surface treatment in nuclear power stations.
- The inspector must be able to perform all work as required for Level 1.
- Be able to direct the work of Level 1 inspectors, and to prepare inspection plans for them.
- Be able to initiate changes in quality control work.
- Be able to implement quality assurance programmes for authorised or approved contractors.

Level 3 inspectors

Inspectors, as a minimum, must:

- Have training equivalent to that of upper secondary technical education level, and at least ten years' experience of inspection work or foreman's duties in the fields of building painting and anti-corrosion painting.
- Have at least two years' experience of Level 2 painting in nuclear power stations.
- Be responsible for ensuring that all inspection work performed by Level 1 and Level 2 inspectors is performed in accordance with prescribed duties and instructions.
- Be able to recommend an inspector's promotion to Level 1, 2 or 3 work.
- Be responsible for, and approve, all safety related inspection plans.

11.7.3 The building parts (Building painting: see 'Process Painting for details of anti corrosion painting). Requirements applicable to suppliers.

11.7.3.1 Inspection of suppliers

Before accepting the services of a supplier/contractor, a suitably qualified person among the licensee/plant owner's personnel shall check and verify that the potential painting contractor has the necessary resources and skills as required by the work, and that the contractor accepts the regulations that apply in accordance with TBY. The contractor's resources, procedures and qualifications for performing the necessary own inspection and verification of the quality of the work must also be determined.

Environmental requirements applicable to the contractor must be agreed and approved by the respective licensee/plant owner as follows:
Requirements in respect of environmental quality by the contractor are divided into three levels:

1 The contractor holds EMAS, ISO 14001:2004, Edition 1, or equivalent certification.

2 The contractor has a documented, agreed and implemented environmental quality management system, assessed and approved by the respective licensee/plant owner.

3 The contractor does not have a formal environmental quality management system.

It is the responsibility of the contractor to verify that any sub-contractors, whose services the contractor proposes to use for a respective licensee/plant owner, possess the necessary qualifications and resources that are at least equal to those required of the contractor.

Before the services of any proposed sub-contractor are employed, the sub-contractor shall have been approved by the respective licensee/plant owner.

11.7.3.2 Other requirements applicable to painters and those applying coatings to concrete

Professional painters who will actually perform maintenance painting must have been provided with documented information and training on the way in which the particular type of treatment is be carried out, and also on the practical properties and aspects of the treatment, in principle in accordance with ASTM D 4227-05.
In Sweden the number of apprentices in relation to trained persons working in a controlled zone (See chapter 2) should not exceed the number stated in the National Painting Trade Agreement.

11.7.4 The process parts (anti-corrosion painting) - Requirements applicable to suppliers

11.7.4.1 Inspection of suppliers

The supplier's painting contractor shall have received authorisation from the Anti-Corrosion Painting Authorisation Board for Type F or Type V work, as appropriate to the item(s) to be painted.
If a painting contractor from another country is engaged, the same requirements apply in principles, for information on requirements see www.rostskyddsmalning.se

The painting contractor's personnel who actively participate in the work of anti corrosion painting shall have successfully taken the diploma painting course for anti corrosion painters. (An exception from this rule is that anti corrosion painters who work in pairs may have assistants who have not received this training.)
In Sweden, this training is governed by the Swedish Authorisation Board for Anti Corrosion Painting and in Finland by Turun Ammattiopistosäätiö.
Proof of successful completion of such courses must be provided, if requested by the Purchaser.
Any departures from these requirements must be approved by the duly authorised person at the respective licensee/plant owner.

Before accepting the services of a supplier/contractor, a suitably qualified person among the respective licensee/plant owner's personnel shall check and verify in writing that the potential painting contractor has the necessary resources and skills as required by the work, and that the contractor accepts the regulations that apply in accordance with TBY. The contractor's resources, procedures and qualifications for performing the necessary own inspection and verification of the quality of the work must also be determined. See requirements www.rostskyddsmalning.se.

Environmental requirements applicable to the contractor must be agreed and approved by the respective licensee/plant owner as follows:
Requirements in respect of environmental quality by the contractor are divided into three groups:

1 The contractor holds EMAS, ISO 14001:2004, Edition1, or equivalent certification.

2 The contractor has a documented, agreed and implemented environmental quality management system, assessed and approved by the respective licensee/plant owner.

3 The contractor does not have a formal environmental quality management system.

It is the responsibility of the contractor to verify in writing that any sub-contractors, whose services the contractor proposes to use for the respective licensee/plant owner, possess the necessary qualifications and resources that are at least equal to those required of the contractor.
Before the services of any proposed sub-contractor are employed, the sub-contractor shall have been approved by the respective licensee/plant owner.

11.7.4.2 Other requirements applicable to anti-corrosion painters

Anti-corrosion painters who will actually perform maintenance painting must have been provided with documented information and training on the way in which the particular type of treatment is be carried out, and also on the practical properties and aspects of the treatment, in principle in accordance with ASTM D 4228-05.

11.8 METALLISATION (GALVANISATION ETC.)

11.8.1 Inspection of suppliers

Requirements applicable to suppliers, inspectors etc. in connection with the supply of galvanized or spray galvanized products are given in Sections 7.3 and 7.4 of Chapter 7.

11.9 RUBBER COATING

11.9.1 Inspection of suppliers

Requirements applicable to suppliers, inspectors etc. are given in Section 7.5 of Chapter 7.

11.10 DOCUMENTATION

11.10.1 General

Documentation from building painting, anti-corrosion painting, galvanisation and rubber-coating must be supplied to the respective licensee/plant owner in accordance with the requirements as set out in Chapter10.

12 MATERIALS AND SUPPLIES: REGULATIONS

12.1 GENERAL

Wherever approval from the respective licensee/plant owner's authorised representative(s) etc. is specified in this appendix, this means that the approval is required from:
The respective licensee/plant owner's **official who is responsible for matters relating to surface treatment processes (protective coating processes)**.

In addition to the standard requirements issued by public authorities, the following requirements also apply in respect of testing and verification of technical data of paint products to be used in the nuclear power stations.

Test certificates (type test certificates) that verify that the requirements specified for paints to be used in the various treatment groups in Table 12- 1, Table 12- 2, Table 12- 3, Table 12- 4, Table 12- 5 and Table 12- 6 shall be submitted to the respective purchaser(s) for approval.

Materials and supplies etc. to be tested shall be tested in accordance with the latest issue of the standards or codes etc. shown in the table.

The requirements set out in Table 12- 1, Table 12- 2, Table 12- 3, Table 12- 4, Table 12- 5 and Table 12- 6 relate to dry and cured coats of paint.

The requirements relating to radiation resistance, decontamination, resistance to steam, resistance to demineralised water, resistance to saponification and resistance to chemicals are the most stringent versions of the respective requirements. The following pages specify within which painting classes approved test results in respect of the above properties are required, and also (in such cases) specify the requirements to be fulfilled.

If testing is carried out to the extent as specified in Sections 12.2.1 - 12.2.7, the recommendations given in EUR European Utility Requirements for LWR Nuclear Power Plants Volume Chapter 2.6 as well as USNRC Regulatory Guide DG-1242, March 2010, Service Level I, II, III Protective Coatings Applied to Nuclear Power Plants as well as STUK-YTO-TR 210, 2004, Requirements For Coatings Of Nuclear Power Plant Containments can be regarded as being fulfilled in principle.

Products and paint systems that have been approved by the respective licensee/plant owner, and which have been verified as fulfilling the requirements in this chapter, shall be listed in the document entitled Approved Paint Systems for TBY.

12.2 PERFORMANCE SPECIFICATION

Unless otherwise specified, test panels shall be prepared and test procedures are performed in accordance with specified standards.

12.2.1 Maximum permitted levels of certain elements in pigments and sealing compounds

Paints and paint systems to be used in Painting Classes I and II must not normally contain more than a total of 1 % by weight of copper (Cu), lead (Pb), antimony (Sb), cobalt (Co), Fluorine (F), Chlorine (Cl), Bromine (Br) and sulphur (S), as measured for the dried paint. The cobalt level must not exceed 1000 ppm. If the level of a single element approach the permitted total level, an assessment shall be done be an expert in the field. There are no specific requirements for zinc, but concentrations shall be limited if possible where the paints are used for process systems. Analysis certificates from suppliers or independent laboratories, stating the actual concentrations and/or detection limits of the above substances, will be required. These analyses shall normally be carried out in connection with type testing of the paints. The laboratory shall be certified by the supervisory authority in the country where it operates, for example, SWEDAC in Sweden.
The analyses are to be performed using X-ray fluorescence instrument on dry/hardened paint film or by wet chemical analysis.
Analysed products shall have documented traceability to the batch certificate.
Guarantees by the paint manufacturer that none of the above substances is added during the manufacturing process is not sufficient for approval. Unless otherwise agreed, the analyses shall be performed every 5 years after approval.

12.2.1.1 Requirements for certain leachable substances in paint materials and sealing compounds

Paints and paint systems to be applied to or used in process systems may have to meet specific requirements in respect of concentrations of leachable contaminants. The values of such permissible concentrations will be determined in the light of consideration of the capacities of treatment systems. The leaching tests are best performed on a painted test plate. Leaching test and analysis are performed at the power station laboratory where the paint is to be used. Paints and painting systems to be used in potable water systems shall fulfil public authority requirements in respect of the concentrations of leachable substance and other prohibited substances.

12.2.1.2 Products that can cause "silicone contamination"

Products that contain low-molecular weight/volatile silicones can cause serious problems with the function of some electronic equipment (so-called silicone infection). This type of products must not be used under any circumstances.

12.2.2 Radiation resistance

Approved testing of the resistance of the paints or paint systems to ionising radiation will be required for those to be used in Painting Classes I and II.

Approved testing will also be required for paints or paint systems to be used in areas in Painting Class IV within controlled areas. See also Chapter 2.

Testing shall be performed at 100 % RH and up to a total radiation dose of at least 10^6 Gy. The dose rate must be between 1.4×10^3 and 8.3×10^3 Gy/h. In other respects, radiation testing shall be performed in accordance with (for example) the instructions in ASTM D 4082-10.

The test panels, immediately after irradiation, shall be evaluated and documented.

12.2.2.1 Determination of radiation resistance shall comprise

A	Cracking	SS-EN ISO 4628-4:2004, Edition 1
B	Flaking	SS-EN ISO 4628-5:2004, Edition 1
C	Blistering	SS-EN ISO 4628-2:2004, Edition 1
D	Chalking	SS-EN ISO 4628-6:2004, Edition 3
E	Colour change	-
F	Rusting (only for anti rust treatments)	SS-EN ISO 4628-3:2004, Edition 1
G	Physical properties of irradiated panels:	
	1 Adhesion	SS-EN ISO 4624, Edition 1
	2 Impact test (anti rust treatments)	ASTM G14-04 (2010)
	3 Wear resistance (floor treatments)	ASTM D4060-10 with CS-17 wheels 1000 cycles and 1000 g weight.

12.2.2.2 Requirements in respect of evaluation of tests as specified in 12.2.2.1

A Cracking cannot be accepted

B Flaking cannot be accepted

C Blisters cannot be accepted in the reactor containment (RI). Otherwise, blisters can be accepted up to and including Size 4 and density 2, or smaller sizes and density.

D Severe chalking cannot be accepted.

E Substantial colour changes must be considered.

F Rusting shall be not worse than Ri 0.

G Physical properties:

1 Adhesion shall be at least 1.4 MPa.
2 Impact testing shall ≥ 19 mm.
3 For wear, the weight loss must not ≥ 175 mg.

12.2.3 Decontamination

Paints and paint systems to be used in Painting Classes I and II, as well as certain items, such as containment head, pump sumps, interior surfaces in tanks etc. in controlled areas in Painting Class IV, are required to be decontaminable. Decontaminability shall be determined as specified in SS ISO 8690, Edition 1 Nuclear Energy - Decontamination of Surfaces Contaminated with Radioactive Materials - Method of Testing and Determination of Decontaminability.

12.2.3.1 Determination of decontaminability shall comprise

a Non-irradiated surface

b Irradiated surface

c Non-irradiated surface that has been abraded in accordance with SS 184165, Edition 2. This applies only to floor systems given below:

1 for Category A surfaces (Kennwert A) in DIN 53233:2003-06 for products containing solvents.

2 for Category B surfaces (Kennwert B) in DIN 53233:2003-06 for low solvent or solvent free products

12.2.3.2 Requirements in respect of evaluation of tests

For areas in the following radiation or room categories:

Painting class	**Room category**	**Type of substrate**	**Surface-bound activity Zone division**	**Criteria: Final pulses/min**
I	B, C, C_1, C_2, C1, C2, C3, D and E	Surfaces in accordance with 12.2.3.1 a and b	Red	FRP<3500
	B, C, C_1, C_2, C1, C2, C3, D and E	Surfaces in accordance with 12.2.3.1 c (1 and 2)	Red	3500<FRP<60000
II	B, C, C_1, C_2, C1, C2, C3, D and E	Surfaces in accordance with 12.2.3.1 a and b	Yellow or orange	3500<FRP<15000
	B in N1 in TBY Chapter 2, Section 2.5.2	Surfaces in accordance with 12.2.3.1 a and b	Blue or green	60000<FRP<3100000
	C, C_1, C_2, C1, C2, C3, D and E	Surfaces in accordance with 12.2.3.1 c (1 and 2)	Yellow or orange	15000<FRP<60000
	B, C, C_1, C_2, C1, C2, C3, D and E	Surfaces in accordance with 12.2.3.1 c (1 and 2)	Blue or green	15000<FRP<100000

When decontaminating the samples as above, no changes may occur to the paint apart from very minor changes in the colour and/or a reduction in gloss not exceeding 10 units as measured in accordance with SS-EN ISO 2813, Edition 1.

12.2.4 Resistance to steam

12.2.4.1 General

In existing Swedish nuclear power plants, steam tests are required for painted concrete surfaces inside the reactor containment (Painting Class I). In this connection, Test Method 1 (High Pressure Steam Test) or Test Method 2 (DBA Test in accordance with ASTM D3911-08) can be used.

For existing Swedish Power Stations, there are no requirements for steam tests on anti-corrosion systems.

In Finnish Power Stations, tests are required in accordance with Test Method 2 (DBA-test according to ASTM D3911-08) for both building painting and anti-corrosion systems.

12.2.4.2 Test Method 1, Steam Test

Requirements in respect of approved resistance to steam apply only in Painting Class I for concrete surfaces. See Table 12- 1, Table 12- 2 and Table 12- 3.

The following are required for steam testing:

A A concrete test slab, 500 x 500 x 50 mm, treated with the treatment system to be tested. The concrete of the slab must meet the requirements for Concrete Class I-K30-T-VT, or as otherwise agreed. For the test, the painting system is not irradiated.

B A steam generator capable of supplying about 460 kg/h of steam, and a nozzle with an opening about 100 mm long and 2-3 mm wide.

It must be possible to rotate the nozzle through 90° and to arrange an angle of incidence of 60° for Test Position B without altering the centre position of the nozzle opening.

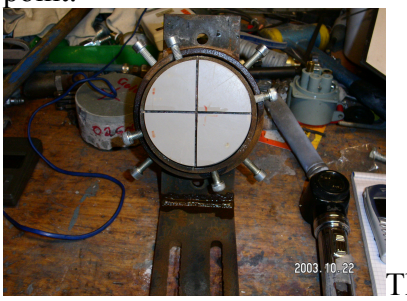
Perform the steam test in two test positions, A and B, as follows:

1 In both test positions A and B, the nozzle shall be so mounted that the long axis of the opening is parallel to the surface under test. The distance between the nozzle opening and the test surface in test position A shall be 10 mm, with a steam angle of incidence of 90°.

The test piece in the picture belongs to 11.5.1

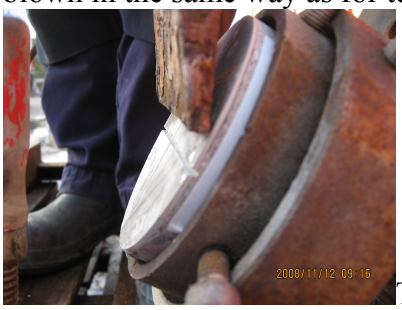
2 Test position A involves blowing a jet of steam at a pressure of 4 atm and a temperature of 95 - 105 °C at the nozzle on to the test piece for 20 minutes. As soon as the steam jet is turned off, make two perpendicular 2 mm cuts, using a low speed cutting-machine, through the full thickness of the paint layer. The intersection of the two cuts shall coincide with the point opposite to the centre of the nozzle opening. The cuts shall be about 25 mm long on each side of the centre

point.



The test piece in the picture belongs to 11.5.1

3 For test position B, immediately after making the cuts - while the test surface is still hot - turn the nozzle through 90° and change the angle of incidence to 60°. The distance of the nozzle opening to the test surface must be 10 mm. Steam is then blown in the same way as for test position A.


The test piece in the picture belongs to 11.5.1

12.2.4.2.1 Determination of steam resistance shall include

(For Test Method 1 according to 12.2.4.2)
The test results - after conclusion of the test - shall be evaluated at two different times, that is 1) after two hours, 2) after two weeks.
Assessment shall include the following defects:

A	Checking	SS-EN ISO 4628-4: 2004, Edition 1
B	Cracking	SS-EN ISO 4628-4:2004, Edition 1
C	Flaking	SS-EN ISO 4628-5:2004, Edition 1
D	Blistering	SS-EN ISO 4628-2:2004 Edition 1
E	Chalking	SS-EN ISO 4628-6:2004, Edition 3

12.2.4.2.2 Requirements for evaluation of test according to Test Method 1 in 12.2.4.2

A	The coat of paint must not have flaked off between coats or from the concrete at distances exceeding 5 mm from either of the cuts.
B,C,D	The following defects must not be visible on the surface at a distance of 5 mm or more from either of the cuts. - Checking - Cracking - Flaking
E	Blistering is acceptable up to maximum size 4 and density 2.
F	Severe chalking must not occur

12.2.4.3 Test Method 2, DBA test

As an alternative to the above test method, testing may be carried out in accordance with ASTM D3911-08 as specified for BWR or PWR, depending on the application for which the paint system is intended.

For new stations, testing may be carried out in accordance with ASTM D3911-08 as specified for BWR or PWR, depending on the application for which the paint system is intended.

12.2.4.1.1 Determination of steam resistance shall include (For Test Method 2 according to 12.2.4.3)

The test results - after conclusion of the test - shall be evaluated at two different times, that is 1) after two hours, 2) after two weeks.
Assessment shall include the following defects:

A	Adhesion	SS-EN ISO 4624, Edition 1
B	Cracking	SS-EN ISO 4628-4:2004, Edition 1
C	Flaking	SS-EN ISO 4628-5:2004, Edition 1
D	Blistering	SS-EN ISO 4628-2:2004 Edition 1
E	Chalking	SS-EN ISO 4628-6:2004, Edition 3

12.2.4.3.2 Requirements for evaluation of test according to Test Method 2 in 12.2.4.3

A Adhesion shall fulfil 1.4 MPa

B Cracking must not occur

C Flaking must not occur

D Blistering is acceptable up to maximum size 4 and density 2.

E Severe chalking must not occur.

12.2.5 Resistance to demineralised water

Testing for resistance to demineralised water at 55 °C for six months shall only be performed for certain paint systems. See Table 12- 1, Table 12- 2, Table 12- 3, Table 12- 4 and Table 12- 5.

Immerse panels to be tested in demineralised water. The electrical conductivity of the water must be less than 2 μS cm^{-1} at +25 °C for the duration of the test period.

The results of the test must not be evaluated for at least 24 hours after removing the samples from the demineralised water.

No changes (i.e. relative to the conditions as determined prior to the test) can be accepted.

12.2.5.1 Assessment shall include the following properties:

A	Adhesion	SS-EN ISO 4624, Edition 1
B	Blistering	SS-EN ISO 4628-2:2004 Edition 1
C	Flaking	SS-EN ISO 4628-5:2004, Edition 1
D	Softening	(No standard)
E	Tack (stickiness)	TNC 88 (1988)
F	Gloss	SS-EN ISO 2813, Edition 1
G	Colour change	
H	In addition to the above, special requirements may be specified for individual items, such as pools or cisterns or process systems. There can be a requirement, for example, for determination of leachable contaminants for comparison with the cleaning systems' capacity. See 12.2.1.2.	

12.2.5.2 Requirements during evaluation of tests according to 12.2.5.1

A The adhesion shall correspond to the requirements for the treatment system in question in Table 3-1 and 4-1 in TBY chapters 3 and 4 respectively.

B Blistering is acceptable up to maximum size 4 and density 2.

C Flaking is not accepted.

D Softening is not accepted.

E Tack (stickiness): The surface must be tack-free to moderate finger pressure.

F Gloss: Slight changes in gloss are acceptable.

G Colour change: Slight changes in colour are acceptable.

12.2.6 Resistance to saponification

Painting Class I paint systems that are intended to be painted directly on to concrete must be tested for their resistance to saponification. See Table 12- 1, Table 12- 2 and Table 12- 3.

Immerse the test panel in a saturated calcium hydroxide solution - $Ca(OH)_2$ - at 50 °C for three months.

After removing the panel from the solution, do not evaluate the results until at least 24 hours have passed.

No changes (i.e. relative to the conditions as determined prior to the test) can be accepted.

12.2.6.1 Evaluation shall consider the following properties

A	Flaking	SS-EN ISO 4628-5:2004, Edition 1
B	Blistering	SS-EN ISO 4628-2:2004, Edition 1
C	Adhesion	SS-EN ISO 4624, Edition 1

12.2.6.2 Requirements in respect of evaluation of tests in accordance with Item 12.2.6.1

Note that these requirements apply to evaluation of the samples both before and after immersion.

A Flaking cannot be accepted.

B Blistering can be accepted up to a maximum size of 4 and a closeness of 2.

C Adhesion shall meet the requirements for the particular types of surface treatment system concerned as set out in Table 3- 1 of TBY Chapter 3.

12.2.7 Resistance to chemicals

Test the resistance of the paint system to chemicals: see Table 12- 1, Table 12- 2, Table 12- 3, Table 12- 4, Table 12- 5 and Table 12- 6.

Paintings systems in BWR- and PWR- reactor containments shall be tested for resistance to chemicals according to STUK-YTO-TR 210, 2004 Requirements For Coatings Of Nuclear Power Plant Containments, Chapter 5.5 Table 2

Resistance to alkaline cleaning substances, ethyl alcohol and acetone must always be met.
Test shall be done according to ISO 2812-1, Edition 2, method 1.

After removing the samples from the test solution, do not evaluate the results until at least 24 hours have passed, but before 48 hours have passed.

No changes (i.e. relative to the conditions as determined prior to the test in the respective test solutions) can be accepted.

12.2.7.1 Evaluation shall consider the following properties

A	Adhesion Adhesion need be tested only after testing in citric acid, alkaline cleaning substances, ethyl alcohol and acetone.	SS-EN ISO 4624, Edition 1
B	Blistering	SS-EN ISO 4628-2:2004, Edition 1
C	Delamination	SS-EN ISO 4628-5:2004, Edition 1
D	Extensibility (Embrittlement). See the requirements for evaluation.	SS-EN ISO 1519 , Edition 2
E	Softening	(No standard)
F	Tack (stickiness)	TNC 88(1988)
G	Gloss	SS - EN ISO 2813, Edition 1 at 60º Gardner.
H	Colour change	-

12.2.7.2 Requirements in respect of evaluation of tests in accordance with Item 12.2.7.1

Note that these requirements apply to evaluation of samples both before and after testing in the respective test solutions.

A The adhesion shall fulfil the requirement for the particular surface treatment system as given in Table 3- 1 and Table 4- 1 in TBY Chapters 3 and 4 respectively

B Blistering can be accepted up to a maximum size of 4 and a closeness of 2.

C Flaking cannot be accepted.

D Extensibility: No cracks can be accepted. Results shall be reported.
This test is not required for systems intended for application to concrete surfaces or for solvent free products intended for use on steel.

E Softening cannot be accepted.

F Tack (stickiness): the surface must be tack-free when tested by moderate finger pressure.

G Gloss: a limited reduction in gloss can be accepted.

H Colour change can be accepted to a limited extent.

12.2.8 Resistance to Fire

12.2.8.1 Classification according to SS-EN 13501-1:2007+A1:2009, Edition 1

In Sweden, the general principles are presented in Code of Statutes of the Swedish National Board of Housing, Building and Planning, BBR 2008, section 5.
In Finland, rules and regulations are presented in the National Building Code of Finland part E1 (Structural Fire Safety) The classification procedure is presented in SS-EN 13501-1:2007+A1:2009, Edition 1. In general, only floor coverings in the reactor containment (RC) and along evacuation routes are classified.

12.2.8.2 Test methods

The following tests shall be used for the classification of coatings:

A. SS-EN ISO 9239-1:2010, Edition 2 Fire Test for Determination of the Burning Behaviour of Floorings - Part 1: Determination of the Burning Behaviour using a Radiant Heat Source

B. SS-EN ISO 11925-2:2010, Edition 2 and SS-EN ISO 11925-2:2010/AC 2011 Edition 1 Reaction to Fire tests - Ignitability of products subjected to direct impingement of flame - Part 2 Single-flame source test

12.2.8.3 Test slabs

All test slabs (concrete) are to be treated on one side using the complete coating system in accordance with the manufacturer's written instructions. The coat thickness must be in accordance with the specified treatment system. The test slab's manufacture and the method used shall be documented.

According to ASTM D5139-12, Standard Specifications for Sample Preparation for Qualification Testing of Coating to be Used in Nuclear Power Plants, the documentation shall contain the following:

A manufacturing times

B preparation prior to coating

C coat structure

D individual coat thicknesses, dry coat thicknesses

E. total dry coat thickness

F. environmental conditions, temperature, humidity etc.

G. product identification (product name, batch number)

Number and size of test slabs in accordance with SS-EN ISO 9239-1:2010, Edition 2:
- 230x1050 mm for substrate ≤ 19mm
- 230x1025 mm for substrate > 19mm
- Number of test slabs: 6.

SS-EN ISO 11925-2:2010, Edition 2:
- 90x250x max 60mm
- Number of test slabs: 6.

12.2.8.4 Evaluation and reporting of results

Test results are reported in accordance with SS-EN ISO 9239-1:2010, Edition 2 and SS-EN ISO 11925-2:2010, Edition 2.
The detailed content of the classification report is set out in SS-EN 13501-1:2007+A1:2009, Edition 1.

12.2.8.5 Acceptance criteria

In Swedish stations, floor coatings along evacuation routes shall fulfil fire class Cfl-s1 in accordance with SS-EN 13501-1:2007+A1:2009, Edition 1.
In Finnish stations, floor coatings and other areas in Swedish station shall fulfil fire class Dfl-s1 in accordance with SS-EN 13501-1:2007+A1:2009, Edition 1.

12.2.9 Summary of requirements for different types of treatment

Type of treatment	**G1-G4** [1)]	**G5-G6** [1)]	**G7a, G7b**	**G7c**	**G9a, G9b**	**G10a, G10b** [1)]	**G11, G12**
Radiation resistance Gy	10^6	10^6	10^6	10^6	10^6	10^6	10^6
Decontaminability	X	X	X	X	X	X	X
Resistance to steam (method 1)/DBA test (method 2)	X[18)]		X[18)]			X[18)]	X[18)]
Resistance to demineralised water	X		X		X	X	X
Resistance to saponification	X	X	X		X	X	X
Fire resistance classification Surface Class [1)]	Chapter 12.2.8					Chapter 12.2.8	Chapter 12.2.8
Resistance to chemicals [5)]	X	X	X		X	X	X
Gloss in accordance with SS-EN ISO 2813, Edition 1	>70	>70	>70	30 - 59	>70	>70	>70
Wet abrasion resistance in accordance with 184164,Edition 3 (Degrees)				3			
Testing and requirements in accordance Appendix 3	X	X	X		SSG 1030 Edition 7, TF. SS-EN ISO 4624, Edition 1	X	

Table 12- 1 Performance specification for floor surfaces

Type of treatment	**V1 - V3**	**V4 - V5**	**V6**	**V7**	**V9, V10a, V10b, V11**	**V12**	**V13 - V16**
Radiation resistance Gy	10^6	10^6	10^6	10^6	10^6	10^6	10^6
Decontaminability	X	X	X	X	X	X	X
Resistance to steam (method 1) / DBA test (method 2)	X[18]						
Resistance to demineralised water							
Resistance to saponification	X						
Fire resistance classification Surface Class 1 [8)]	X	X	X	X	X	X	X
Resistance to chemicals[5)]	X	X	X	X	X	X	X
Gloss in accordance with SS-EN ISO 2813, Edition 1	>70	30 - 59	30 – 59	30 – 59	30 – 59	>70	30 – 59
Wet abrasion resistance in accordance with SS 184164, Edition 3 (Degrees)		[3)]	[3)]	[3)]	[3)]	[3)]	[3)]
Testing and requirements in accordance Appendix 3	X						
Testing and requirements, filler, in accordance with SS [2)]		181651 181652 181653	181651 181652 181653		181651 181652 181653		181651 181652 181653

Table 12- 2 Performance specifications for wall surfaces

Type of treatment	**T1**	**T2**	**T3**	**T4**
Radiation resistance Gy	10^6	10^6	10^6	10^6
Decontaminability	X	X	X	X
Resistance to steam (method 1) / DBA test (method 2)	X[18]			
Resistance to demineralised water				
Resistance to saponification	X			
Fire resistance classification Surface Class 1[8)]	X	X	X	
Resistance to chemicals [3)]	X	X	X	
Gloss in accordance with SS – EN ISO 2813	>70	30 - 59	30 - 59	
Wet abrasion resistance in accordance with SS 184164, Edition 3 (Degrees)		[3)]	[3)]	
Testing and requirements in accordance Appendix 3	X			
Testing and requirements, filler, in accordance with SS [2)]		181651 181652 181653	181651 181652 181653	

Table 12- 3 Performance specification for ceiling surfaces

Type of treatment	**S1, S3, S5, S6a S6b –S8 S14**	**S9 – S12**	**S2, S4**	**S13a S13b**	**S13c, S13d, S13e**	**S15, S16**	**S18**	**S21, S22**	**S23**
Radiation resistance Gy	10^6	10^6	10^6	10^6	10^6 7)	10^6 7)		10^6 7)	10^6 7)
Decontaminability		X		X 7)	X 7)	X 7)		X 7)	X 7)
Resistance to steam									
Resistance to demineralised water									
Resistance to saponification									
Resistance to chemicals 3)									
Gloss in accordance with SS-EN ISO 2813, Edition 1									
Wet abrasion resistance in accordance with SS 18 41 64, Edition 3 (Degrees)									
Testing and requirements in accordance with SSG-standard 9)	SSG 1021 10)	SSG 1022 11)	SSG 1022 12) SSG 1026 14)	SSG 1030 15)		SSG 1024 16)	SSG 1024 16)	SSG 1021 10) SSG 1022 11)	SSG 1024 16)

Table 12- 4 Performance specifications for steel surfaces –Primers and undercoats

Type of treatment	**S5, S6a, S6b,S7, S14**	**S1-S4**	**S13a, S13b**	**S13c-S13d**	**S13e**	**S15, S16**	**S18**	**S2, S22**	**S23**
Radiation resistance, Gy	10^6	10^6	10^6	10^6 7)	10^6 7)	10^6 7)		10^6	10^6
Decontaminability	X	X	X	X 7)	X 7)	X 7)		X	X
Resistance to steam (method 1) / DBA test (method 2)	18)	18)	18)	18)	18)	18) 18)	18)	18)	18)
Resistance to demineralised water			X	X SS-EN ISO 2812-2, Edition 2	X SS-EN ISO 2812-2, Edition 2				
Resistance to saponification									
Fire resistance classification 5)						X			
Resistance to chemicals 3)	X	X	X	X		X		X	X
Gloss in accordance with SS-EN ISO 2813, Edition 1	>70	>30	>60	>60		6)		>70	>70
Testing and requirement in accordance with SSG-standard 9)	SSG 1026 13)	SSG 1026 14)	SSG 1030 15)				SSG 1028 17)	SSG 1028 17)	SSG 1028 17)
Cathodic protection			BS 3900:Part F10:1985	BS 3900:Part F10:1985					
Corrocell				NACE TM 0174-2002					

Table 12- 5 Performance specification for finishing paint on steel surfaces when applied on the correct substrate or to primer and undercoat

Key to notes in Table 12- 1, Table 12- 2, Table 12- 3, Table 12- 4 and Table 12- 5:

1) Specific tests for thermosetting plastic floor coatings: see Appendix 2.
Thermosetting plastic floor coatings in accordance with definitions in SS-EN 13318, Edition 1.

2) Determination of adhesion between sand-based filler and concrete. Pull-off test. [in Swedish], SS 181651, Edition 2.
Determination of shrinkage of sand-based filler. SS 181652, Edition 2.
Determination of resistance of sand-based filler to mechanical impression. SS 181653, , Edition 1.
(The standards are now repealed but it can be obtained on request from the joint Surface Protection Group)

3) See Table 12- 6.
Comparison of short time resistance to liquids SS 184161, Edition 2.

   (The standard is now repealed but it can be obtained on request from the joint Surface Protection Group)

4) This note has expired

5) Defining of fire protection painting according to SS-EN 1090-2:2008+A1:2011, Edition 1 and SS-EN 1993-1:2006, Edition 1.

6) In office rooms belonging to Painting Category V the gloss shall be defined together with customer.

7) Required if the system is to be used in Painting Classes I or II.

8) Requirement in accordance with the National Board of Housing, Building and Planning's Building Regulations (BBR) [in Swedish]. Required only if the type of treatment is prescribed for use in emergency evacuation routes.

9) SSG Surface protection standard www.ssg.se

10) SSG 1021, Edition 7, paint type GA and GS respectively.

11) SSG 1022, Edition 7, paint type GB.

12) SSG 1026, Edition 7, paint type TA.

13) SSG 1026, Edition 7, paint type TB.

14) SSG 1026, Edition 7, paint type TD.

15) SSG 1030, Edition 7, paint type TF.

16) SSG 1024, Edition 7, paint type GP.

17) SSG 1028, Edition 7, paint type TP.

18) In Finnish stations, DBA test (method 2) is required for paint products within the reactor containment

Type of chemical	Concentration	Temperature °C	Test time, hours	Types of treatment		
				G1-G4, G7a, G7b, G9a, G10a, G10b, G11, G12, V1-V3, S5-S7, S13a, S13b, S13c	S1- S4, S8	Other types of treatment as used within and outside controlled zones
Sulphuric acid	245 g/l [1)]	23	24	X	X	
Nitric acid	5 %	23	2	X		
Hydrochloric acid	5 %	23	2	X		
Citric acid	5 %	23	2	X		
Sodium hydroxide	250g/l	23	24	X	X	
Alkaline cleaning substances ca 12[3)]	2 %	50	0.5	X	X	All types of floor treatments
Ethyl alcohol	95 %	20	0.1	X	X	X
Acetone	100 %	20	0.1	X	X	X

Table 12- 6 Resistance to chemicals

Notes

1) Concentrated sulphuric acid, density 1.84 g/cm^3.

2) Does not apply for painting systems with high zinc primer on steel

3) Choice of alkaline cleaning substances must be made in consultation with the joint Surface Protection Group

12.3 PRODUCT INSPECTION BY THE PAINT MANUFACTURER

Quality control material shall be prepared and approved by the official who is responsible for matters relating to surface treatment processes (protective coating processes) at the respective licensee/plant owner, or by some other person knowledgeable in the area concerned and consulted by him/her.
Before delivery of paints etc, the paint manufacturer shall perform product inspection of each batch in order to verify that it conforms to the type tested material. The results of this testing shall be documented as follows.

12.3.1 Type test certificates

Type test certificates shall verify that, where applicable, the paint product fulfils the requirements set out in Items 12.1 and 12.2. These documents shall be approved by a person knowledgeable in matters relating to surface treatment processes (protective coating processes) and employed by the respective purchaser.

12.3.2 Product data sheets

A product data sheet, covering the properties etc. as given in Form D.116 in Chapter 10, shall be supplied to the respective purchaser for approval. The properties of the product as shown on the form shall be shown to the required extent, with details of tolerance limits where possible. The name of the persons responsible for product development and for product inspection shall be stated.

12.3.3 Test result forms

A test result form, showing the properties as given in Form D.117 in Chapter 10, shall be produced for each new production batch. The form shall be signed by the persons responsible for product development and for product inspection, and shall be delivered to the painting contractor or to the purchaser who has ordered the product.

12.3.4 Documentation to be held by the paint manufacturer

Following documents shall be archived by the paint manufacturer:

A Copies of test reports, records etc. supplied.

B Production order data for the particular batch, showing the mix, the method of working and quantitative adjustments, e.g. viscosity or nuance.

C The product card, being an easily comprehended presentation of test values obtained for all batches of the product concerned.

D An inspection sample container (⅓ litre) of the product of each batch. To be kept for at least two years.