Eskom	Standard	Technology

Title: **CORROSION PROTECTION STANDARD FOR NEW INDOOR AND OUTDOOR ESKOM EQUIPMENT, COMPONENTS, MATERIALS AND STRUCTURES MANUFACTURED FROM STEEL STANDARD**

Unique Identifier:	**240-75655504**
Alternative Reference Number:	**34-1658**
Area of Applicability:	**Engineering**
Documentation Type:	**Standard**
Revision:	**2**
Total Pages:	**42**
Next Review Date:	**September 2025**
Disclosure Classification:	**Controlled Disclosure**

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Date: 11 Aug 2020	Date: 11 Aug 2020	Date: 11 Aug 2020

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Date: 11 Aug 2020

PCM Reference: **Perform High Voltage Plant Engineering Technical Studies**

SCOT Study Committee Number/Name: **Plant Equipment Study Committee**

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1. Introduction

It is important that a site be characterised in terms of its expected atmospheric corrosivity prior to the selection of appropriate corrosion protection systems.

Typical on-site factors or types of microclimates which can cause breakdown of protective coatings include the following:

- Exposure to sunlight
- Exposure to sea breezes
- Temperature
- Moisture
- Air pollutants
- Use or normal wear and tear
- Land contours etc.

2. Supporting clauses

2.1 Scope

The document specifies the corrosion protection methods to be used for new Eskom Distribution and Transmission equipment exposed to indoor and outdoor environments. The standard covers coatings for new mild steel and hot dip galvanised mild steel, as well as 3CR12, 316 and 304L stainless steel fabricated equipment for use in various corrosive environments.

The *Contractor* shall refer to the *Project Manager* for queries related to this standard or items not addressed in this standard.

The standards detailed herein shall not be modified in any way without the written approval of the *Project Manager.*

2.1.1 Purpose

None

2.1.2 Applicability

This document shall apply to Eskom Distribution and Transmission Divisions.

2.2 Normative/informative references

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ASTM D4414: Standard practice for measurement of wet film thickness by notch gauges

[2] ASTM E376: Measuring coating thickness by magnetic field or eddy current electro-magnetic test methods. (Can be used as alternative to SANS ISO 2808).

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

[4] ISO 2409. Paints and varnishes – Cross cut test.

[5] ISO 4624. Paints and varnishes – Pull-off test for adhesion.

[6] ISO 4628 – 1. Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance – Part 1: General introduction and designation system.

[7] ISO 4628 – 3. Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance – Part 3: Assessment of degree of rusting.

[8] ISO 8501-1. Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.

[9] ISO 8502-3. Preparation of steel substrates before application of paint and related products – Test for the assessment of surface cleanliness – Part 3: Assessment of dust on steel surfaces prepared for painting (pressure sensitive tape method). (Can be used as alternative to SANS 5769).

[10] ISO 8502-6. Preparation of steel substrates before application of paint and related products – Test for the assessment of surface cleanliness – Part 6: Extraction of soluble contaminants for analysis – The Bresle method.

[11] ISO 8503-4. Preparation of steel substrates before application of paint and related products – Surface roughness characteristics of blast-cleaned steel substrates – Part 4: Method for the calibration of ISO surface profile comparators and for the determination of surface profile – Stylus instrument procedure. (Can be used as alternative to SANS 5772).

[12] SANS ISO 9002: Quality systems – Model for quality assurance in production, installation and servicing.

[13] ISO 12944-3. Paint and varnishes – Corrosion protection of steel structures by protective paint systems. Part 3: Design considerations.

[14] ISO 9223: Corrosion of metal and alloys – Corrosivity of atmospheres – Classification.

[15] ISO 14713: Protection of iron and steel structures – Zinc and aluminium coatings – Guidelines.

[16] SAHDGA 01-1990 – Code of practice for surface preparation and application of organic coatings.

[17] SANS 1091: National colour standards for paints

[18] SANS 10064: The preparation of steel surfaces for coating.

[19] SANS 1274: Coatings applied by the powder-coating process.

[20] SANS 1391 (1-3): Thermally sprayed metal coatings Part 1: Zinc and aluminium coatings for the protection of iron and steel against atmospheric corrosion.

[21] SANS / ISO 2808: Paints and Varnishes: Determination of film thicknesses (Can be used as alternative to ASTM E376).

[22] SANS 5159: Adhesion of paint and varnish films (cross-cut test).

[23] SANS 5769: Cleanliness of blast-cleaned steel surfaces for painting thicknesses (Can be used as alternative to ISO 8502-3).

[24] SANS 5770: Preparation of steel substrates before the application of paints and related products – Test for the assessment of cleanliness of blast-cleaned steel surface – Freedom from certain soluble salts.

[25] SANS 5772: Preparation of steel substrates before the application of paints and related products – Surface roughness characteristics of blast-cleaned steel surfaces – Profile of blast-cleaned surfaces determined by a micrometer profile gauge (Can be used as alternative to ISO 8503-4).

[26] SANS 630:1972: Decorative high gloss enamel paints

[27] SANS 121 (ISO 1461): Hot-dip galvanised coating on fabricated iron and steel articles – Specification and test methods.

[28] SANS 53811 (EN 13811). Sherardizing – Zinc diffusion coatings on ferrous products – Specification.

[29] SIS 055900: Swedish Code of Practice - Pictorial surface preparation standard for painted steel surfaces. (Can be used as alternative to ISO 8501 – 1).

[30] Eskom Distribution – Technical Bulletin No. 10TB-011.

2.2.2 Informative

None

2.3 Definitions

2.3.1 General

Definition	Description
Approved	Refers to written approval by the Project Manager
Coat/coating/film	Refers to single layer of a product.
Coating System	Coating system is an all-embracing term including generic type, the number of coats, the thickness of each and the overall thickness of the system
Contractor	Means the person(s) named as Contractor in the Contract Agreement.
Detailed Specification (DS)	Plant/Item specific corrosion protection specifications as attached in Section 3.1.9
High strength friction grip bolts	High strength friction grip bolts are bolts of high tensile steel, used in conjunction with high strength nuts and hardened steel washer, which are tightened to a pre-determined shank tension in order that the clamping action thus afforded will transfer loads in the connected members by friction between the parts in contact and not by shear or bearing in the bolts.
Inspector	Someone with vast experience in the application of coatings and ideally qualified as a NACE International or SAQCC [South African Quality Certification Committee] Coating Inspector.
Manufacturer	Means the company that supplies the paint.
Product Data Sheet	Technical document issued by the Paint/Material Supplier for their products, detailing the physical, chemical and performance qualities of the material, as well all necessary information related to the safe handling and application of the materials.
Supervisor	Refers to a person having a minimum of two years' experience in the field of surface preparation and application of surface coatings.

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
DFT / d.f.t	Dry film thickness.
DS	Detailed specification
ISO	International Organisation for Standardisation
MIO	Micaceous ion oxide

Abbreviation	Description
RP	Repair Procedures
SANS	South African National Standards
SAQCC	South African Qualification and Certification Committee for Corrosion.
w.f.t	Wet film thickness

2.5 Roles and responsibilities

Not applicable.

2.6 Process for monitoring

Not applicable.

2.7 Related/supporting documents

Not applicable.

3. Requirements

3.1 Health and Safety

a) It is important to realise that health and safety hazards can occur at different stages of the coating process, i.e. during surfaces preparation, storage of paint, application of paint and the service use of the coated surface, and that regular exposure to toxic elements may cause long-term health problems. Therefore, before any work commences, the *Contractor* shall ensure that he conforms to all statutory and regulatory requirements as reflected in all applicable Acts and regulations governing occupational safety and health.

b) Emphasis is placed on the following:

1) Proper safety procedures and risk assessments shall be in place prior to any painting work being carried out.

2) Special care shall be taken when working with all organic liquid materials. Prior to the use of any of these specifications, the Material Safety Data Sheets for each product to be used shall be obtained from the relevant coating supplier/manufacturer.

3) The use of any flammable products, such as solvents, cleaning agents, etc. in confined spaces shall be closely monitored by a Qualified Safety Representative. Proper ventilation of the internals shall be established and strictly monitored.

4) The *Contractor* shall ensure that the necessary protective equipment, clothing and safety measures are provided for each of his workers.

3.2 Environmental

The *Contractor* shall ensure that any solid waste materials or liquids stripped or generated during the surface preparation and coating processes are discarded in accordance with all statutory and regulatory requirements, or as governed by Eskom's Environmental Management Procedures.

3.3 Quality assurance, control and surveillance

3.3.1 Paint supervisor and coating inspector requirements

Most coating failures on newly painted surfaces are the result of poor surface preparation. Therefore, all coating work shall be overseen by a full-time, experienced paint supervisor. As a “minimum” this person shall have a recognised SAQCC or NACE coatings inspection qualification and at least two years’ experience in the field of surface preparation and application of surface coatings.

3.3.2 Contactor quality requirements and documentation

a) The Contractor and his paint manufacturer shall have in place a quality system detailing application techniques, processes, quality control methods and inspection points. SABS ISO 9000 series shall be referred to for guidance.

b) Eskom may witness the final inspection and may elect to have witness and hold points other than the final inspection. Prior to the commencement of work, the Contactor shall confirm with Eskom in writing, the date of the commencement of work and Eskom’s inspection requirements.

c) In all cases, the Contractor shall be responsible for meeting the quality requirements and keep records of all inspections and tests. These shall include quality control plans, inspection sheets, batch certificates, daily inspection reports, as well as material and safety data sheets. The use of an independent coating inspector by the Contractor is also strongly advised.

3.3.3 Eskom or third party quality surveillance inspections

The *Project Manager* may enforce witness and hold points during surface preparation and application of the coating system. Quality surveillance inspections may also be carried out by a third party inspectorate team. However, any quality surveillance inspections carried out by Eskom staff, the *Project Manager* or by an appointed third party inspector shall not relieve the *Contractor* of his duties or liabilities in terms of quality assurance and control during application of the coating system, and it is expressly understood that the *Contractor* shall not rely on any reports or representations made by such a third party inspector.

3.3.4 Contractor quality documents and inspections

a) Prior to the commencement of work, the Contractor shall confirm with the Project Manager in writing, the date of the commencement of work and the Project Manager’s inspection requirements.

b) The Contractor shall provide a detailed quality control plan of how the work will be done. This shall be verified by the Project Manager or a coating specialist i.e. for technical correctness and whether all the factors have been considered.

c) Prior to the application of any coating material, the selected manufacturer's product and safety data sheets for the products to be used, shall be obtained by the Contractor. Copies of these data sheets shall be signed by the coating supplier. This is to ensure that the latest product data sheet has been provided to the Contractor, that the material manufacturer is aware of this standard, the conditions under which their product/s will be applied/used and to allow for technical back-up where required.

d) In addition to obtaining updated product data sheets, the Contractor shall establish the impact of any deviations from the standard recommended application procedures and exposure conditions of the coating, as well as limitations of use, i.e. compared to the information provided in the most current product data sheet, prior to the use of the material.

e) The Contractor shall be responsible for preparing and inspection of the metal surfaces to be protected, the coating application/inspection of the work during and after coating, as well as testing for electrical insulation defects, if required.

f) In order to comply with this standard, as well as to monitor and record the following parameters throughout the coating process, the Contractor shall have suitable calibrated equipment on-site at all times.

Parameters to be monitored:

- Storage conditions of abrasives and coating materials (here the ambient temperature and humidity shall be recorded).
- Expiry dates of paint materials.
- Calibration dates of all quality control test equipment.
- Acceptance of surfaces for coating – i.e. filling of imperfections and removal of sharp edges, burrs, rags, weld spatter in accordance with ISO 12944-3.
- Degree of surface preparation – in accordance with ISO 8501/1 or SIS 055900.
- Blast profile readings – in accordance with SANS 5772 / ISO 8503-4.
- Degree of surface cleanliness – as per SANS 5769 / ISO 8502-3.
- Soluble salts – By means of the Weber Riley, Chlor*Test or Bresle Method (ISO 8502-6) or other approved standard methods.
- Ambient and substrate temperatures – by means of calibrated temperature probes.
- Relative humidity – with a calibrated humidity meter.
- Dew point – by means of a dew point calculator.
- Other environmental conditions, e.g. incidence of industrial fall-out, mist, rain, etc.
- Mixing times of paint and quantities used.
- Wet film thickness (w.f.t) per each individual coat - in accordance with ASTM D4414.
- Dry film thickness (d.f.t) per each individual coat – in accordance with ASTM E376 / SANS ISO 2808.
- Overcoating times – as per product data sheet

3.4 Design Requirements

Cognisance shall be taken of the fact that up to 15% of a steel component is seen as critical in terms of corrosion protection because of inadequate welds, bolted surfaces, sharp edges and areas where dirt and water can collect. Perfection of such finer points shall form an integral part of the design phase, the details of which can be obtained from ISO 12944-3, Paint and varnishes – Corrosion protection of steel structures by protective paint systems. Part 3:

3.5 Material Selection and Manufacture

3.5.1 Alternative manufacturer's or materials

a) In the case of most detailed specifications (DSs), specific products and suppliers are specified of which the details and performance criteria are provided in Technical Bulletin No. 10TB-011 (Latest revision). Where alternative manufacturers/materials are favoured, prior approval shall be obtained from the Project Manager.

b) Where alternative corrosion protection systems or improved methods are known to the Contractor, prior to the granting of any concessions for change, information of these systems or methods shall be supported by detailed, technical reports and applicable case studies to show that the proposed alternatives will meet or exceed Eskom's performance requirements. Prior approval shall be obtained from the Project Manager before any alternative coating systems or protection methods can be used.

c) In the case of equipment manufacturer proprietary finishes, these proprietary systems shall only be used if prior approval has been obtained.

3.5.2 Material supply, storage, testing, composition and application methods

3.5.2.1 Material Supply

a) All materials, i.e. paint, solvents and cleaning agents for a specific paint system shall be supplied by the same manufacturer.

b) All coatings, solvents and cleaning materials shall be supplied in sealed, sturdy containers which have been labelled with all the information necessary to ensure proper storage, mixing, application and traceability. The coating containers shall be of a size large enough to allow mixing in the containers themselves.

3.5.2.2 Material Storage

a) All containers (i.e. coatings, solvents and cleaning materials) shall be kept in a storage area that is completely dry, enclosed, well ventilated, covered and maintained at a temperature compatible with good preservation of the materials.

b) Should any of the coating containers show traces of leakage prior to use, the contents of that container shall not be used.

c) Similar to the coatings, all abrasive media shall be stored in an area that is completely dry and covered to allow for good preservation of the materials.

3.5.2.3 Material Testing

a) All materials (coatings) shall be regularly tested at the manufacturers' factories. The *Contractor* shall make sure that regular quality control tests are carried out to ensure that good quality of the materials is maintained.

b) The following properties shall be closely monitored:

- Quality of raw materials
- Analytical formulation of finished products
- Percentage solids by volume
- Specific gravity
- Colour and gloss
- Drying time
- Viscosity

c) Records of the batch numbers, expiry dates, dates of manufacturing of each type of system used, shall be retained by the Contractor. These records shall be presented to the Project Manager or his appointed third-party inspector, prior to commencement of work. The Contractor shall also ensure that the coating/material manufacturer retains a sample of each batch for at least the guarantee period (see Section 3.8).

3.5.2.4 Material composition and application methods

a) All coatings shall be consistent and formulated for the proposed application method. If the *Contractor* regards the proposed application method as unsuitable for the materials specified, he shall notify the *Project Manager* in writing. His proposed alternative application method shall only be used after approval has been obtained from the *Project Manager*.

b) All coats of a coating system shall come from the same manufacturer.

c) During application, solvents shall only be used for thinning of the coating:

- When they are specified by the manufacturer as being compatible with the coating material,

- When the percentage added does not exceed the limits given by the paint manufacturer's product data sheet.

d) Under no circumstances shall solvents be used that are not supplied by the relevant coating manufacturer.

e) In the case of 2-part materials, the splitting of kits as supplied from the factory will not be permitted. The *Contractor* either has to make use of smaller kits or needs to plan the coating work in such a way that any unnecessary wastage of paint is avoided.

3.6 Surface Preparation

3.6.1 General

a) No leniency shall be tolerated in terms of the quality of surface preparation prior to application of the coatings. It is extremely important that the *Contractor* endeavour to achieve the best surface preparation possible, by means of using the latest technologies when it comes to surface preparation apparatus and materials. The minimum degree of surface preparation shall be as stipulated in the Detailed Plant/Item Corrosion Protection Specifications (DS).

b) Industrial type surface preparation apparatus shall be used to ensure effective and time-efficient cleaning of surfaces. The *Contractor* shall ensure that operative standard moisture and grease traps are installed on all pressurised airlines of which the effectiveness may have to be demonstrated.

c) In general the following aspects shall always be considered:

- Before application of the protective system, the substrate shall be prepared, in accordance with each Detailed Plant/Item Corrosion Protection Specification (DS)'s requirements and where applicable, as described in detail below.
- All harmful contaminants such as scale, grease, oil, soil, salt residues, corrosion product and any foreign matter or residues that may affect the performance of the coating system shall be removed, prior to application of the protective system.

3.6.2 Degreasing

a) All detrimental deposits of oil or grease spots and any other contaminants shall be removed prior to the application of the coating system.

b) Depending on the degree of contamination, degreasing shall be carried out using a water-soluble alkaline cleaner, alkaline detergent or cold organic solvents.

c) Following the degreasing operation, all surfaces shall be thoroughly rinsed with clean potable water to remove any traces of the cleaning agent residues. The surfaces shall thereafter be allowed to dry completely prior to coating or before continuing with the rest of the surface preparation process.

d) It is important that clean potable water is used for cleaning, or the surfaces will be left contaminated after washing.

3.6.3 Acid Cleaning

a) Cleaning with acids shall only apply where specified in the Detailed Plant/Item Corrosion Protection Specifications (DS).

b) Cleaning with acids shall be followed by neutralisation, passivation and rinsing with clean, potable water.

c) All acid solutions shall be applied and removed as directed by the manufacturer.

d) The *Contractor* shall ensure that no smut is present after acid cleaning or the adhesion of the coating/lining will be impaired.

3.6.4 High pressure water jetting

a) High to ultra-high pressure water jetting may be required prior to, or after abrasive blast cleaning, or subsequent to power and hand-tool cleaning of surfaces to remove excessive salts, paint, scale and other loose contaminants.

b) All surfaces shall be tested for salt contamination prior to coating. In general the maximum permissible limit is 100mg/m2. However, where lower values are preferred or considered critical by the paint supplier, their maximum value shall apply.

c) In the case where water jetting is specified as the only form of surface preparation, the visual assessment of surface cleanliness shall be as stipulated in the Detailed Item/Plant Corrosion Protection Specification (DS) and in accordance with ISO 8501-4.

3.6.5 Power and hand-tool cleaning

a) Cleaning by means of hand or power-tools, i.e. wire brushes, chipping hammers, scrapers, grinders, sanders, needle descalers etc. may only be used where specified in the Detailed Plant/Item Corrosion Protection Specification (DS) and the condition of the substrate metal is such that efficient cleaning can be achieved and where the protective system is designed for application to brushed or ground surfaces, e.g. in the case of surface tolerant coatings.

b) Prior to power or hand-tool cleaning, all welds shall be free of slag, slag inclusions and pinholes. Adjacent areas shall be free of weld spatter, which shall be removed by grinding or scraping.

c) Oil and grease deposits shall be removed prior to cleaning as detailed above. In this regard, special attention shall be paid to drillings, bolt holes, etc.

d) Following the degreasing as described above, all surfaces of steelwork and plant under this category shall be prepared to remove all loose millscale, rust, paint and other deleterious matter.

e) Hand-tool cleaning may be utilised provided the required standard of finish is achieved. The finish shall be to the stipulated standard Grade in the Detailed Plant/Item Corrosion Protection Specification (DS) and in accordance with ISO 8501-1 or SIS 055900. Where necessary, power-tool cleaning shall be used. Burnishing of the surface shall not be permitted.

f) In all cases, after wire brushing or grinding, all traces of loose material shall be removed from the surface by compressed air or vacuum cleaning.

g) Cleaned surfaces shall not be contaminated with oil, grease, rust or other deposits before coating/lining.

3.6.6 Abrasive blast cleaning

a) Abrasive blast cleaning is by far the preferred method for surface preparation and shall always be considered first before any other cleaning method is used.

b) Prior to blast cleaning, all surfaces shall be free of oil and grease. Degreasing shall be carried out as detailed above. In this regard special attention shall be paid to drillings, bolt holes, etc.

c) Prior to abrasive blast cleaning, all welds shall be free of slag, slag inclusions and pinholes. Adjacent areas shall be free of weld spatter, which shall be removed by grinding or scraping. Here the onus is on the *Contractor* to ensure that the surfaces are ready for coating.

d) Different grades and types of blasting media exist. The *Contractor* shall select the most suitable abrasive to be used, in combination with a specific coating system. Here the required blast profile height shall also be taken into consideration.

e) Abrasive blast cleaning shall be carried out by means of industrial equipment suitably designed for this purpose.

f) The visual degree of surface cleanliness shall be to the requirements stipulated in the Detailed Plant/Item Corrosion Protection Specification (DS) and in accordance with ISO 8501-1 or SIS 055900.

g) In general, Grade Sa 2 ½ and Sa 3 are specified in the case of most protective coating systems. In the case of the former grade, the requirement is very thorough blast cleaning where at least 95% of the mill scale, rust and other matter are removed, whereas in the case of Grade Sa 3, the surfaces must be blast-cleaned to white metal where all traces of rust, mill scale and other foreign matter are removed. The *Contractor* shall refer to the relevant pictorial standards as provided in ISO 8501-1 or SIS 055900 for verification purposes.

h) In general an anchor profile height of 25 to 75μm is recommended for most industrial coating systems up to a dry film thickness of about 250 micrometres. However, in the case of heavy-duty thicker film systems, the anchor profile needs to be increased in order to cope with the mounting stresses exerted by the coating.

i) The required blast profile height shall be carefully considered and be within the range of the specified coating system, and as recommended in the product data sheets.

j) It is important that the blast profile does not exceed the specified thickness of the primer or first coat, especially where delays in over coating are expected / encountered. Any primed or coated surfaces showing signs of “measle” corrosion shall be considered defective and shall be re-blasted.

k) Blast cleaning of severely corroded surfaces may result in high profiles (i.e. > than 100 micrometres). In these cases, an additional primer coat or second coat will be required. However, agreement shall be reached between the *Contractor* and coating manufacturer as to the most suitable profile range for a specific coating system. The following shall only be used as a guideline with respect to blast profile requirements.

Table 1: Typical profile ranges

Coating/Lining Thickness (Total)	Minimum profile (μm)	Maximum profile (μm)
90 to 180 micrometres	30 micrometers	60 micrometers
120 to 225 micrometres	40 micrometers	75 micrometers
150 to 300 micrometres	50 micrometers	100 micrometers
300 to 500 micrometres	75 micrometers	100 micrometers
>500 micrometres	75 micrometers	125 micrometers

l) Abrasive blast cleaning shall be carried out on dry surfaces by means of dry air, free from impurities (in particular grease or oils), in an atmosphere where relative humidity is less than 85%, and the ambient temperature above +5°C. The *Project Manager* may require the *Contractor* to demonstrate that the air is clean and dry.

m) Blast cleaned surfaces shall be coated as soon as possible after treatment and preferably within 4 hours. Alternatively, provided no deterioration of the blast has taken place, and the surface cleanliness requirements of ISO 8501-1 or SIS 055900 are maintained, the primer coat may be applied within the same working shift. Under no circumstances shall uncoated blast-cleaned surfaces be permitted to stand overnight. Any surfaces showing signs of flash rusting or change of colour shall be re-blasted.

n) Caution shall be taken to ensure adequate protection of machined parts or any other part not requiring blast cleaning and coating/lining. Every effort shall be taken to avoid deformation of the substrate and damage to welds, as well as to machined surfaces.

o) Blast cleaning may be carried out using grit or slag (silica sand is not allowed). Irrespective of the type of abrasive used for blast cleaning, it shall in all cases be free of foreign matter such as clay, humus, chlorides and bitumen. The use of re-cycled blasting media is not allowed for the final blast.

p) The *Contractor* shall satisfy himself that the abrasive materials used conform to all national health and safety standards.

q) Good quality abrasives shall be used in order to minimise the amount of waste grit being generated and contamination of the surfaces.

r) Subsequent to blast cleaning, all traces of blasting media and dust shall be removed from the surface by vacuum cleaning or compressed dry air.

s) Cleaned surfaces shall not be contaminated with oil, grease, rust or other deposits before coating. Unnecessary traffic prior to painting shall be avoided.

t) Blast cleaning on site shall only be carried out in areas approved by the *Project Manager*.

3.7 Coating Application General Procedures

a) Except where alternative application methods are mentioned in the Detailed Plant/Item Corrosion Protection Specification (DS), all coatings shall be applied by means of airless spray technique. This technique is not only normally quicker than other common application methods, but also usually produces higher film thicknesses per coat, as well as a smoother and more uniform film of coating. The correct hose, pump, tip and air cap shall be used.

b) General requirements that shall be followed to ensure that the coating is given optimal opportunity to perform to acceptable standards are:

1) Painting is a skilled process and shall only be carried out by capable and experienced personnel, as well as with equipment suitably designed for application of the coating.

2) All surfaces shall be inspected prior to coating, to ensure that the standard of cleaning complies with the criteria as stipulated in the Detailed Plant/Item Corrosion Protection Specification (DS) and is in accordance with ISO 8501-1 or SIS 055900. The blast profile shall also be verified.

3) Immediately before coating, the blast-cleaned steel shall not exhibit more than 0,2% dust and debris when tested in accordance with SANS 5769.

4) Coating application and cleaning shall not take place when site conditions are likely to negatively affect these operations. The *Contractor* shall ensure that the necessary protective equipment is used to prevent contamination of the coatings and to minimise delays due to such site conditions.

5) Surrounding areas shall be protected from overspray and paint contamination.

6) Equipment name plates and identification plates shall be protected from coating. No coatings shall be applied over any surfaces where these will adversely affect the performance of the item or component.

7) All newly primed steelwork, prior to erection, shall be stored clear of the ground on trestles or other suitable material. The steelwork shall be placed in such a manner as to ensure adequate drainage of rainwater and condensation.

8) The different coats shall all be evenly applied to form smooth, continuous, unbroken layers free from sags, runs and other defects. Each coat shall provide complete coverage and the film thicknesses for the different coats shall be as specified in the Detailed Plant/Item Corrosion Protection Specifications (DS).

9) With respect to the methods of application, overcoating requirements, pot life, mixing, induction time, straining, thinning, drying times, etc. the manufacturer's recommendations (as per the product data sheet) shall be strictly adhered to.

10) Mixing of the paint shall be carried out in accordance with the product data sheet. Here proper industrial type power mixing tools shall be used and the paint shall be supplied in containers large enough for mixing of the paint.

11) During application, the relative humidity shall not exceed 85% and ambient temperatures shall be between 10°C and 30°C. However, in the case of special coatings, these conditions may be waived providing the requirements as stipulated in the product data sheet are met.

12) Using the above data, the dew point shall be determined by means of a suitable dew point calculator. During coating application, the substrate temperature shall be at least 3°C above the dew point.

13) The maximum/minimum substrate temperature at the time of coating application shall be in accordance with the product data sheet.

14) Care shall be taken to ensure adequate coating of all bolt and mouse holes, welds, fasteners, edges and other areas normally prone to corrosion attack. These areas shall always be stripe coated by brush prior to application of the rest of the coating system. Under no circumstances shall stripe coating be carried out by roller or spray-application.

15) Where more than one coat is applied, the colour of each coat shall be clearly different from the colour of the previous coat. However, two finishing coats of the same colour may be applied to achieve complete colour uniformity. All finishing colours shall be to the *Project Manager's* approval. In the case where aesthetic requirements are secondary, repairs after final testing shall be carried out using a different colour. All primers shall be of a contrasting colour to the newly prepared substrate.

16) The coating shall be evenly applied to form a smooth, continuous, unbroken layer/s free from sags, runs and other defects.

17) Each coat shall provide complete coverage and the film thickness per coat shall be as specified in the product data sheet, providing any necessary deviations and the impacts thereof can be supported by technically correct research data.

18) The coating thicknesses shall comply with the relevant Detailed Plant/Item Corrosion Protection Specification (DS). All coating thicknesses on metal substrates shall be measured in accordance with ASTM E376 or ISO 2808. These measurements shall be made on surfaces free of contaminants. Calibrated electronic instruments and shims shall be used for determination of film thicknesses.

19) Thicknesses of both magnetic and non-magnetic substrates shall also be checked by verification of the quantity of coating consumed and by means of wet film thickness measurements.

20) The average thickness of each coat shall be within the range as defined in the Detailed Plant/Item Coating Specification (DS). 90% of random readings shall be equal to or greater than the lower specified thickness. No individual reading shall be less than 80% of the lower specified thickness. No individual reading shall be greater than 120% of the upper specified thickness. In the areas where stripe coating is carried out, the maximum total specified dry film thickness range shall allow for the additional coat.

21) All deficient film thicknesses shall be rectified prior to release.

22) Where excessive film thicknesses can be detrimental to the integrity of the coating, the manufacturer's recommended maximum (as indicated in the Product Data Sheet) shall apply.

23) During application of the coatings, the *Contractor* shall ensure adequate ventilation to avoid explosions or toxic effects of the solvent vapour.

24) Damaged paint, due to handling and erection of components, shall be cleaned and repaired. Rust spots and any other deleterious matter shall be removed. Spot repairs shall be carried out such that the patch painting extends at least 25 mm beyond the damaged areas. Spot repairs shall reinstate each of the previous coats and shall commence directly after surface preparation.

25) Due to the difficulty in repairing some coatings, if the defect cannot be rectified by patch repairing or by application of an additional coat of the material, then the component shall be repainted.

26) In the case where dust and other light contaminants have settled on newly painted surfaces, or in the case of pre-coated steel, prior to the application of additional coats of paint or overcoating on site, the contaminants shall be removed by washing of the surfaces with clean potable water, followed by drying. Removal of more persistent contaminants shall be dealt with on a case by case basis.

27) All coatings shall be given adequate time for curing prior to service. On average, for most organic coating systems, full cure is achieved after 7 days at 25°C providing good ventilation is maintained.

28) Prior to commencement of any coating process, the following shall be verified:

i. That the *Contractor* has the correct paint on site as specified.

ii. The materials are all from the same supplier and if relevant, of different colours.

iii. The containers are sealed / unopened.

iv. The paint is fresh and within its expiry date.

v. The *Contractor* has the proper mixing equipment, e.g. electric mixers.

vi. The *Contractor* and employees have proper safety equipment on site.

29) The adhesion of the coating may be verified by means of cross cut or pull-off adhesion tests. The method to be used shall be approved by all parties concerned and the damaged areas repaired by the *Contractor* at no additional expense to Eskom.

3.8 Guarantees

3.8.1 Signing of product data sheets and contract order acceptance

It is important to note that all the Detailed Specifications (DSs) have been compiled based on long-term laboratory and natural exposure testing of numerous materials, as well as written recommendations provided by the various paint suppliers. Since the *Contractor* is obliged to submit signed product data sheets to the *Project Manager* at the time of the Contract Order Acceptance, in doing so, and by supplying materials to the *Contractor*, both the *Contractor* and his paint supplier bind themselves to a minimum guarantee period of 36 months in terms of the performance of the corrosion protection system.

3.8.2 Performance guarantee

As a minimum, the guarantee regarding the performance of the corrosion protection system is stipulated as follows:

The coating will be considered defective should rusting of the coated surfaces develop within 36 months where it is rated more than Ri 1 or 0.05% (in accordance with ISO 4628-3)

and/or

Blistering, flaking, delamination, cracking, alligatoring, or any other defects not specifically listed, are present that in the opinion of the *Project Manager* or his coating specialist, reduces the aesthetic appearance or compromises the integrity of the coating system.

It is important to note that this guarantee period is based on the natural exposure testing of coatings over a period of more than 20 years, where it has been shown that most defective or unsuitable coatings fail within the first two to three years of service. Research has also shown that when the rating for the degree of rusting of coated surfaces exceeds Ri 1 (>0.05%), that the coating is no longer providing adequate protection of the underlying substrate.

3.9 Classification and Selection of Corrosion Protection Systems

3.9.1 Classification of corrosivity of atmospheres

The Detailed Specification (DS) to be used for the corrosion protection of the various items of plant shall be as defined in 3 of this document. Each procedure has been provided with an arbitrary reference number (e.g. DS -1) which should not be linked to other specifications or previous versions of this document. The procedures distinguish between different atmospheric environments of which the corrosivity is classified in terms of ISO 9223 as follows:

Table 2: Categories of corrosivity of atmospheres

Corrosivity category	General description	Corrosivity	Corrosion rate for mild steel
C1	Indoors and Desert to rural	Very low	≤1.3 μm/yr
C2	Rural to light industrial	Low	≤25 μm/yr
C3	Moderate industrial or marine	Medium	≤50 μm/yr
C4	High industrial or marine	High	≤80 μm/yr
C5	Severe / heavy industrial or marine	Very high	≤200 μm/yr

References:

- CSIR - Callaghan, BG Atmospheric corrosion testing in Southern Africa – Results of a twenty year national exposure programme
- TSI Investigation Reports - Eskom Resources and Strategy Research Reports and SABS ISO 12944 -2: 1998.
- ISO 9223: Corrosion of metal and alloys – Corrosivity of atmospheres – Classification.

3.9.2 Corrosion protection requirements

Table 3: Type of environment versus corrosion protection requirements

Corrosivity Rating	**Environment**	**Corrosion rate of mild steel**	**Mild steel**	**Hot dip galvanised and zinc metal sprayed steel**	**Stainless steel**	**3CR12**
VERY LOW (C1)	Indoors	Less than 5μm/yr	Must be painted DS-1 or DS-2 or DS-3 or DS5	DS 13 or DS14 Painting optional - more for aesthetic/colour coding purposes	Painting optional - more for aesthetic/colour coding purposes	Painting optional - more for aesthetic/colour coding purposes
LOW TO HIGH (C2 to C4)	Outdoors (Inland and industrial)	5 to 80μm/yr	Must be painted DS-5 or DS-6 or DS-7 (DS-8*)	DS 13 or DS14 Painting optional - more for aesthetic/colour coding purposes If required: DS-15 or DS-16 or DS-17	Painting optional - more for aesthetic/colour coding purposes If required: DS-18 or DS-19	Painting optional - more for aesthetic/colour coding purposes If required: DS-9 or DS-10 (DS12*)

Corrosivity Rating	Environment	Corrosion rate of mild steel	Mild steel	Hot dip galvanised and zinc metal sprayed steel	Stainless steel	3CR12
HIGH TO VERY HIGH (C4 to C5)	Outdoors (Coastal and Very High industrial)	80 to 200μm/yr	Must be galvanised or zinc metal sprayed and then duplex coated	DS 13 Or DS 14 Must be duplex painted DS-15 or DS-16 or DS-17	Painting recommended to protect from rust staining DS-18 or DS-19	Painting recommended DS-11 (DS12*)

* DS-8 and DS-12 - Coating specifications only to be used where spray painting techniques cannot be used.

Table 4: Summary of Detailed Specifications

DS Number	Indoors / Outdoors	Environmental Conditions	Applicability
DS-1	Indoors	Very low to Low corrosive environments	Powder coating of mild steel indoor components
DS-2	Indoors	Very low to Low corrosive environments	Spray painting of mild steel indoor components – Alkyd system
DS-3	Indoors	Very low to Low corrosive environments	Powder coating of mild steel outdoor components - Epoxy system
DS-4	Indoors	Very low to Low corrosive environments	Spray painting of mild steel outdoor components – Polyurethane system
DS-5	Outdoors	Low to High corrosive environments	Spray painting of mild steel outdoor components – Polyurethane system
DS-6	Outdoors	Low to High corrosive environments	Powder coating of mild steel outdoor components
DS-7	Outdoors	Low to High corrosive environments	Spray painting of mild steel outdoor components – Epoxy/polyurethane system
DS-8	Outdoors	**Warning:** **This specification shall only be used to protect mild steel components, which due to their complicated geometry, cannot be properly painted by normal spray techniques. Before this technique can be used, the supplier shall submit full details regarding the specific products to be used, as well as the reasons why the spray-application specifications cannot be used. Permission to use this specification shall only be given once Eskom has confirmed that spray application isn't feasible.**	The following procedure applies to the flow coating of mild steel components
DS-9	Outdoors	Low to High corrosive environments	Spray painting of 3CR12 fabricated components – Epoxy/polyurethane system
DS-10	Outdoors	Low to High corrosive environments	Powder coating of 3CR12 fabricated components

DS Number	Indoors / Outdoors	Environmental Conditions	Applicability
DS-11	Outdoors	High to Very High corrosive environments	Spray painting of 3CR12 fabricated components – Epoxy/Polyurethane system
DS-12	Outdoors	**Warning:** **This specification shall only be used to protect 3CR12 steel components, which due to their complicated geometry, cannot be properly painted by normal spray techniques. Before this technique can be used, the supplier shall submit full details regarding the specific products to be used, as well as the reasons why the spray-application specifications cannot be used. Permission to use this specification shall only be given once Eskom has confirmed that spray application isn't feasible**.	Flow coating of 3CR12 components
DS-13	Outdoors	Low to Medium corrosive environments – Uncoated Medium to Very High corrosive environments – Duplex coated	Hot dip galvanising of structural steelwork and other fabricated components
DS-14	Outdoors	Low to Medium corrosive environments – Uncoated Medium to Very High corrosive environments – Duplex coated	Zinc metal-spraying of mild steel surfaces
DS-15	Outdoors	Medium to Very High Corrosive Environments	Duplex coating of new hot dip galvanised or zinc metal-sprayed surfaces – Epoxy/polyurethane system
DS-16	Outdoors	Medium to Very High Corrosive Environments	Duplex coating of new hot dip galvanised or zinc metal-sprayed surfaces - Epoxy/polyurethane system
DS-17	Outdoors	Medium to Very High Corrosive Environments	Duplex coating of new hot dip galvanised or zinc metal-sprayed surfaces – Water based system
DS-18	Outdoors	High to Very High Corrosive Environments	Spray painting of 316 or 304L stainless steel fabricated components - Epoxy/polyurethane system
DS-19	Outdoors	High to Very High Corrosive Environments	Spray painting of 316 or 304L stainless steel fabricated components – Water-based system
DS-20	Outdoors	Where required	Repair of new galvanised or zinc metal-sprayed surfaces
DS-21	Outdoors	Where required	Patch repair of newly painted damaged surfaces
DS-22	Outdoors	Small items	Hot spun galvanising or sherardizing of small to medium threaded and cast iron articles.

3.9.3 Special Notes

a) It is important to realise that not all site conditions can be simulated under laboratory conditions. Therefore, the practical applications of the specified corrosion protection systems will depend on the specific product requirements and actual site conditions. These must be considered by the *Contractor* prior to Contract Signature.

b) Various options are provided. This is to provide the opportunity for the *Contractor* to select a material that he is most familiar with and to accommodate *Contractor* specific constraints. The *Contractor* needs to familiarise himself with the constraints related to the site application of these materials.

c) Where proprietary coatings are specified, these shall be subject to the *Project Manager's* approval.

d) Special care needs to be taken when working with all organic coatings. Prior to the use of any of these specifications, the Material Safety Data Sheets shall be obtained from the relevant coating supplier/manufacturer and a copy shall be given to the *Project Manager*.

e) With respect to the particulars not covered by the Detailed Plant/Item Corrosion Protection Specifications (DS) (e.g. equipment requirements, overcoating and curing times, mixing ratios, pot life, thinning, safety precautions etc.), the manufacturer's recommendations shall be strictly adhered to (refer to Product Data Sheets).

f) All coatings shall be given adequate time for curing prior to service according to the Detailed Plant/Item Corrosion Protection Specifications (DS) or Product Data Sheets. On average, for most organic coatings systems, full cure is achieved after 7 days at 25°C.

g) The performance of all of these systems will depend on the quality of application.

h) During the applications of all coatings, care shall be taken to ensure adequate ventilation, to allow for good visibility and proper curing of the coatings and to avoid/minimise health and safety risks.

i) Any solid waste materials or liquids stripped or generated during the coating operation shall be discarded in accordance with the Site Environmental Management Plan.

j) Repairs to galvanising shall be carried out in accordance with SANS 121 or ISO 1461

k) The colour of each coat shall be different to the previous coat and the final coat shall be as specified.

l) The specifications mentioned in this document shall apply unless otherwise specified by the *Project Manager* whereby his alternative requirements shall take precedence.

m) For Very Low to Medium corrosive environments, unless otherwise detailed in the equipment specification the colour of the final coat shall be "Avocado", C12 of SANS 1091.

n) For High to High Corrosive conditions, unless otherwise detailed in the equipment specification the colour of the final coat shall be "Dark Admiralty Grey", G12 of SANS 1091.

3.9.4 Detailed plant/item corrosion protection specifications.

3.9.4.1 Specification DS – 1

3.9.4.1.1 Applicability and conditions of use

The following procedure applies to powder coating of mild steel indoor components.

(Indoors)

Activity:	Detail
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1) or degrease, rinse, pickle and phosphate.
Pre-treatment:	The method used for cleaning the substrate and the need to prime the substrate prior to the application of the powder coating shall be at the discretion of the Powder Coating Applicator whom shall be held responsible for the satisfactory adhesion of the powder coating to the substrate.
Coating system:	Epoxy/polyester Resin Powder coating system applied by electrostatic process in accordance with the Coating Manufacturer's proprietary procedure. Dry film thickness 60 to 70 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.2 Specification DS – 2

3.9.4.2.1 Applicability and conditions of use

The following procedure applies to spray painting of mild steel indoor components.

(Indoors)

Activity:	Detail
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1).
Coating system:	
Primer coat:	Apply one coat Semi High Build Alkyd Zinc Phosphate Primer by brush, roller or spray to a dry film thickness of 60 to 80 micrometres.
Final coat:	Allowing sufficient time for the primer coat to cure, apply one coat High Quality High Gloss Enamel by brush roller or spray to a dry film thickness of 30 to 50 micrometres. Total dry film thickness of the system 90 to 130 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.3 Specification DS – 3

3.9.4.3.1 Applicability and conditions of use

The following procedure applies to spray painting of mild steel indoor components.

(Indoors)

Activity:	**Detail**
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1).
Coating system:	
Primer coat:	Apply one coat general purpose epoxy primer by brush, roller or spray to a dry film thickness of 35 to 50 micrometres.
Final coat:	Allowing sufficient time for the primer coat to cure, apply one coat epoxy or polyurethane enamel finish by brush roller or spray to a dry film thickness of 30 to 50 micrometres. Total dry film thickness of the system 65 to 100 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.4 Specification DS – 4

3.9.4.4.1 Applicability and conditions of use

The following procedure applies to the spray painting of mild steel indoor components

(Indoors)

Activity:	**Detail**
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1).
Coating system:	
First coat:	Apply one coat, Two Component High Build Polyurethane Primer/Finish to a dry film thickness of 80 to 120 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.5 Specification DS – 5

3.9.4.5.1 Applicability and conditions of use

The following procedure applies to the spray painting of mild steel outdoor components

(Low to High corrosive environments)

Activity:	**Detail**
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1).
Coating system:	
First coat:	Apply one coat, Two Component High Build Polyurethane Primer/Finish to a dry film thickness of 80 to 120 micrometres.
Stripe coat:	After allowing sufficient time for the first coat to cure, all edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat with the same material as the primer coat.

Activity:	Detail
Second coat:	Allowing sufficient time for the first coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply an additional coat of Two Component High Build Polyurethane Primer/Finish to a dry film thickness of 80 to 120 micrometres.
Final coat:	Allowing sufficient time for the second coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply an additional coat of Two Component High Build Polyurethane Primer/Finish to a dry film thickness of 80 to 120 micrometres. Total dry film thickness of the system 240 to 360 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.6 Specification DS – 6

3.9.4.6.1 Applicability and conditions of use

The following procedure applies to the powder coating of mild steel outdoor components

(Low to High corrosive environments)

Activity:	Detail
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1) or degrease, rinse, pickle and phosphate.
Pre-treatment:	The method used for cleaning the substrate and the need to prime the substrate prior to the application of the powder coating shall be at the discretion of the Powder Coating Applicator whom shall be held responsible for the satisfactory adhesion of the powder coating to the substrate.
Coating system:	
Primer coat:	Apply one coat zinc-rich epoxy primer to a dry film thickness of 65 to 90 micrometres.
Final coat:	Apply one coat exterior polyester powder coating system by means of electrostatic spraying in accordance with the Coating Manufacturers proprietary procedure Dry film thickness 85 to 120 micrometres. Total dry film thickness of the system 150 to 210 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.7 Specification DS – 7

3.9.4.7.1 Applicability and conditions of use

The following procedure applies to the spray painting of mild steel outdoor components

(Low to High corrosive environments)

Activity:	**Detail:**
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1).
Coating system:	
Primer coat:	Apply by airless spray, one coat Twin Pack Zinc-rich Epoxy Primer to a dry film thickness of 75 to 100 micrometres.
Stripe coat:	After allowing sufficient time for the first coat to cure, all edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat with the same material as the primer coat.
Second coat:	Allowing sufficient time for the primer coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by airless spray, one coat Twin Pack Epoxy MIO to a dry film thickness of 100 to 150 micrometres.
Nuts and Bolts:	All fixings shall be additionally protected with one coat intermediate coat prior to application of the final coat.
Final coat:	Allowing sufficient time for the second coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by airless spray, one coat Twin Pack High Build Recoatable Polyurethane Acrylic Finish to a dry film thickness of 60 to 80 micrometres. Total dry film thickness of the system 235 to 330 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.8 Specification DS – 8

3.9.4.8.1 Applicability and conditions of use

The following procedure applies to the flow coating of mild steel components

Warning:

This specification shall only be used to protect mild steel components, which due to their complicated geometry, cannot be properly painted by normal spray techniques. Before this technique can be used, the supplier shall submit full details regarding the specific products to be used, as well as the reasons why the spray-application specifications cannot be used. Permission to use this specification shall only be given once Eskom has confirmed that spray application isn't feasible.

Activity:	**Detail:**
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1) or Phosphoric acid etch.
Coating system:	
Primer coat:	Apply by flow coating technique, one coat Phenolated Alkyd Primer to a dry film thickness of 40 to 55 micrometres.
Second coat:	Apply by flow coating technique, one coat Quick Dry Alkyd Gloss Enamel to a dry film thickness of 40 to 55 micrometres.
Final coat:	Upon completion of assembly, apply by airless spray a second coat Quick Dry Alkyd Gloss Enamel to a dry film thickness of 40 to 55 micrometres. Total dry film thickness of the system 120 to 165 micrometres.

Activity:	**Detail:**
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.9 Specification DS – 9

3.9.4.9.1 Applicability and conditions of use

The following procedure applies to the spray painting of 3CR12 fabricated components

(Low to High corrosive environments)

Activity:	**Detail:**
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1).
Coating system:	
First coat:	Apply one coat, Two Component High Build Polyurethane Primer/Finish to a dry film thickness of 80 to 120 micrometres.
Stripe coat:	After allowing sufficient time for the first coat to cure, all edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat with the same material as the primer coat.
Second coat:	Allowing sufficient time for the first coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply an additional coat of Two Component High Build Polyurethane Primer/Finish to a dry film thickness of 80 to 120 micrometres. Total dry film thickness of the system 160 to 220 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.10 Specification DS – 10

3.9.4.10.1 Applicability and conditions of use

The following procedure applies to the powder coating of 3CR12 fabricated components

(Low to High corrosive environments)

Activity:	**Detail**
Surface preparation:	Chemical cleaning or pickling.
Pre-treatment:	Chemical cleaning or pickling of 3CR12 steel is carried out using formulations based on Nitric (HNO_3) and Hydrofluoric (HF) acids designed specifically for 3CR12. Thorough washing with copious amounts of clean cold water is required after pickling to remove all traces of the acids used. Passivation of 3CR12 steel is carried out within a short period after post weld cleaning as possible. A solution made up of 10% to 20% HNO_3: balance water (H_2O) is suitable for passivation of 3CR12 steel. Thorough washing with clean, cold water after passivation is required.
Coating system:	

Primer coat:	Apply one coat liquid or powder epoxy primer to a dry film thickness of 60 to 90 micrometres.
Final coat:	Apply one coat exterior polyester powder coating system by means of electrostatic spraying in accordance with the Coating Manufacturers proprietary procedure. Dry film thickness 80 to 120 micrometres. Total dry film thickness of the system 140 to 210 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.11 Specification DS – 11

3.9.4.11.1 Applicability and conditions of use

The following procedure applies to the spray painting of 3CR12 fabricated components

(High to Very High corrosive environments)

Activity:	**Detail:**
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1).
Coating system:	
Primer coat:	Apply by airless spray, one coat Twin Pack General Purpose Epoxy Primer to a dry film thickness of 80 to 100 micrometres.
Stripe coat:	After allowing sufficient time for the first coat to cure, all edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat with the same material as the primer coat.
Undercoat:	Allowing sufficient time for the first coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by airless spray one coat Polyamide Cured Epoxy MIO to a dry film thickness of 100 to 150 micrometres.
Final coat:	Allowing sufficient time for the undercoat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by airless spray, one coat Twin Pack High Build Recoatable Polyurethane Acrylic Finish to a dry film thickness of 60 to 80 micrometres. Total dry film thickness of the system 240 to 330 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.12 Specification DS – 12

3.9.4.12.1 Applicability and conditions of use

The following procedure applies to the flow coating of 3CR12 components.

Warning:

This specification shall only be used to protect 3CR12 steel components, which due to their complicated geometry, cannot be properly painted by normal spray techniques. Before this technique can be used, the supplier shall submit full details regarding the specific products to be used, as well as the reasons why the spray-application specifications cannot be used. Permission to use this specification shall only be given once Eskom has confirmed that spray application isn't feasible.

Activity:	**Detail:**
Surface preparation:	Abrasive blast-clean to Grade Sa 2,5 (ISO 8501-1) or Phosphoric acid etch.
Coating system:	
Primer coat:	Apply by flow coating technique, one coat Modified Alkyd Flow-coating Primer to a dry film thickness of 40 to 55 micrometres.
Second coat:	Apply by flow coating technique, one coat Quick Dry Alkyd Gloss Enamel to a dry film thickness of 40 to 55 micrometres.
Final coat:	Upon completion of assembly, apply by airless spray a second coat Quick Dry Alkyd Gloss Enamel to a dry film thickness of 40 to 55 micrometres. Total dry film thickness of the system 120 to 165 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.13 Specification DS – 13

3.9.4.13.1 Applicability and conditions of use

The following procedure applies to hot dip galvanising of structural steelwork and other fabricated components.

(Low to High corrosive environments) – Uncoated hot dip galvanised steel as per SANS 121.

(Medium to Very High corrosive environments) – Duplex coating, i.e. Hot dip galvanised mild steel overcoated with a suitable organic coating system.

Activity:	**Detail:**
Design:	Special design considerations need to be taken in terms of all items to be protected by means of hot dip galvanising. Here the design engineer needs to refer to ISO 14713 and the "Design for hot dip galvanizing" from HDGASA for guidance. In order to ensure proper hot dip galvanising of the steel surfaces, the Contractor shall ensure that the steel to be used for galvanising shall comply with the requirements of SANS 121 (ISO 1461).
Surface preparation:	All weld areas shall be abrasively blast-cleaned to Grade Sa 2,5 (ISO 8501-1). Following blastcleaning of the welds, all items shall be suitably pickled, rinsed, dried and fluxed.
Galvanising:	All items shall be hot dip galvanised in accordance with SANS 121 (ISO 1461), to a minimum coating thickness as laid down in the appropriate tables of SANS 121 (ISO 1461).

Activity:	Detail:
	All nuts, bolts, clips and other items, including High Strength Friction Grip and High Tensile Bolts up to M10 size required for the fixing of galvanised articles shall be hot dip galvanised to this Standard. Hot dip galvanising of higher strength bolts greater than M10 size is not allowed (due to the possibility of hydrogen embrittlement) and these shall be Electro-plated in accordance with BS 3382.
Tolerances:	Tolerances on all threaded articles shall be according to SANS 121 (ISO 1461). Threaded items shall be spun in a Centrifuge during the galvanising process.
Note:	In addition to the requirements of SANS 121 (ISO 1461), the following criteria with respect to white rust and passivation treatments shall apply.
1) White rust:	All material shall be free from white rust and black staining when it is handed over to *Eskom.* To assist in meeting this requirement, close attention shall be paid to the manner in which the material is stacked and stored at the galvaniser's works and also during its subsequent handling until such time as it is handed over to *Eskom.* Material, which has been inspected at the galvaniser's or manufacturer's works and passed by *Eskom*'s appointed inspectors will still be liable to rejection if it has been found that white rust has developed between the date of inspection and the date when the material is handed over to *Eskom.* If the material is affected by white rust the *Contractor* may clean it (using non-metallic brushes) before handing over and if the weight of zinc coating still meets the requirements specified in the appropriate tables of SANS 121 (ISO 1461), the material will be accepted. Unless galvanised items are to be subsequently painted, all items shall be passivated.
2) Passivation	The passivation coating shall be applied to the material immediately after galvanising to afford temporary protection to the galvanised surfaces This coating shall be even, and shall be sufficiently transparent to enable *Eskom*'s appointed inspectors to examine the underlying surfaces for any defects.
Duplex coating:	Duplex coating is a special process and requires proper surface preparation to avoid delamination of the organic coating system. (SAHDGA 01-1990 – "Code of practice for surface preparation and application of organic coating can be consulted in this regard). When a further paint system is to be applied over the hot dip galvanised surfaces, this shall be done in accordance with Detailed Specification DS – 15, DS 16 or DS -17.
Approved galvanisers:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.14 Specification DS – 14

3.9.4.14.1 Applicability and conditions of use

The following procedure applies to zinc metal-spraying of structural steelwork and other fabricated components.

(Medium to Very High corrosive environments) – Duplex coating, i.e. Zinc metal-sprayed mild steel overcoated with a suitable organic coating system.

Activity:	Detail:
Surface preparation:	Abrasive blast-clean to Grade Sa 3.
Metal spraying:	All metal spraying shall be carried out by Plasma Arc or the hot wire spraying process. Maximum atomisation of wire shall be attained, at all times, to obtain a fine-grained, dense sprayed film. Zinc sprayed coatings shall be carried out in accordance with BS EN 22063. The wire analysis shall be: -Zinc 99,995% minimum.
Metal spray types:	Unless otherwise agreed to by *Eskom*, the minimum coating thickness shall be 110 to 130 micrometres.
Coating thickness:	The final metal-sprayed surface shall be free of all lumps, atomised wire and other surface irregularities.
General:	Prior to the application of a paint system, the surface shall be brushed down to remove all loose oxidation deposits and blown off with clean, dry compressed air.

3.9.4.15 Specification DS – 15

3.9.4.15.1 Applicability and conditions of use

The following procedure applies to the duplex coating of new hot dip galvanised or zinc metal-sprayed surfaces.

(Medium to Very High Corrosive Environments)

Activity:	Detail:
Surface preparation:	Hot dip galvanised or zinc-metal sprayed surfaces shall be cleaned prior to painting to provide a water break-free surface, using a solvent detergent degreaser specifically formulated by the supplier of the paint system, for cleaning new galvanising surfaces. Water rinsing after cleaning is essential to remove all traces of the cleaner. This is best achieved by hosing with a high-pressure water spray. Allow drying. Or Micro blasting can be carried out in accordance with SAHDGA 01- 1990 – Code of practice for surface preparation and application of organic coatings. It is critical that the micro blasting does not damage or remove the hot dip galvanised or zinc metal-sprayed coating.
Coating system:	
Primer coat:	As soon as the surfaces are dry, apply by airless spray, one coat Twin Pack Epoxy Primer specifically formulated for zinc surfaces to a dry film thickness of 80 to 100 micrometres.
Stripe coat:	After allowing sufficient time for the first coat to cure, all edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat with the same material as the primer coat.
Second coat:	Allowing sufficient time for the primer coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply one coat of Two Component High Build Polyurethane Primer/Finish to a dry film thickness of 80 to 120 micrometres.
Final coat:	Allowing sufficient time for the second coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply an additional coat of Two Component High Build Polyurethane Primer/Finish to a dry film thickness of 80 to 120 micrometres.

Activity:	**Detail:**
	Total dry film thickness of organic coating system 240 to 340 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.16 Specification DS – 16

3.9.4.16.1 Applicability and conditions of use

The following procedure applies to the duplex coating of new hot dip galvanised or zinc metal-sprayed surfaces.

(Medium to Very High Corrosive Environments)

Activity:	**Detail:**
Surface preparation:	Hot dip galvanised or zinc-metal sprayed surfaces shall be cleaned prior to painting to provide a water break-free surface, using a solvent detergent degreaser specifically formulated by the supplier of the paint system, for cleaning new galvanising surfaces. Water rinsing after cleaning is essential to remove all traces of the cleaner. This is best achieved by hosing with a high-pressure water spray. Allow drying. Or Micro blasting can be carried out in accordance with SAHDGA 01- 1990 – Code of practice for surface preparation and application of organic coatings. It is critical that the micro blasting does not damage or remove the hot dip galvanised or zinc metal-sprayed coating.
Coating system:	
Primer coat:	As soon as the surfaces are dry, apply by airless spray, one coat Twin Pack Epoxy Primer specifically formulated for zinc surfaces to a dry film thickness of 80 to 100 micrometres.
Stripe coat:	After allowing sufficient time for the first coat to cure, all edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat with the same material as the primer coat.
Second coat:	Allowing sufficient time for the first and stripe coats to cure, the manufacturer's recommendations shall be adhered to in this regard, apply one coat Twin Pack Epoxy MIO to a dry film thickness of 100 to 150 micrometres.
Final coat:	After allowing sufficient time for the second coat to cure, apply by airless spray, one coat of Twin Pack High Solids Polyurethane Acrylic Finish to a dry film thickness of 50 to 60 micrometres. Total dry film thickness of organic coating system 230 to 310 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.17 Specification DS – 17

3.9.4.17.1 Applicability and conditions of use

The following procedure applies to the duplex coating of new hot dip galvanised or zinc metal-sprayed surfaces.

(Medium to Very High Corrosive Environments)

Activity:	**Detail:**
Surface preparation:	Hot dip galvanised or zinc-metal sprayed surfaces shall be cleaned prior to painting to provide a water break-free surface, using a solvent detergent degreaser specifically formulated by the supplier of the paint system, for cleaning new galvanising surfaces. Water rinsing after cleaning is essential to remove all traces of the cleaner. This is best achieved by hosing with a high-pressure water spray. Allow drying. Or Micro blasting can be carried out in accordance with SAHDGA 01- 1990 – Code of practice for surface preparation and application of organic coatings. It is critical that the micro blasting does not damage or remove the hot dip galvanised or zinc metal-sprayed coating.
Coating system:	
Primer coat:	As soon as the surfaces are dry, apply by airless spray, one coat Water-based Acrylic Primer specifically formulated for zinc surfaces to a dry film thickness of 25 to 35 micrometres.
Stripe coat:	After allowing sufficient time for the primer coat to cure, all edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat with the same material as the following coat.
Second coat:	Allowing sufficient time for the primer coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by airless spray, one coat Water-based Modified Vinyl Acrylic to a dry film thickness of 180 to 220 micrometres.
Final coat:	Allowing sufficient time for the second coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by airless spray, a second coat Water-based Modified Vinyl Acrylic to a dry film thickness of 180 to 220 micrometres. Total dry film thickness of organic coating system 385 to 475 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.18 Specification DS – 18

3.9.4.18.1 Applicability and conditions of use

The following procedure applies to the spray painting of 316 or 304L stainless steel fabricated components.

(High to Very High Corrosive Environments)

Activity:	**Detail:**
Applicability:	This specification covers the overcoating of 316 Stainless Steel for outdoors applications and can be used where stainless steel are preferred for their non-magnetic properties or where these materials are to be painted for colour coding purposes. This specification also applies to High to Very High corrosive environments.
Surface preparation:	Remove all loose oxidation deposits by means of brushing down with “Scotch Brite” Pads. Scrub down all surfaces using a suitable degreaser. Rinse with fresh water and allow drying. No more than 4 hours shall elapse between cleaning and the application of the coating.
Metal spraying:	
Primer coat:	As soon as the surfaces are dry, apply by airless spray, one coat Twin Pack General Purpose Epoxy Primer to a dry film thickness of 50 to 80 micrometres.
Stripe coat:	After allowing sufficient time for the first coat to cure, all edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat with the same material as the primer coat.
Final coat:	After allowing sufficient time for the first coat to cure, apply by airless spray, one coat of Twin Pack Polyurethane Acrylic Finish 60 to 80 micrometres. Total dry film thickness of organic coating system 110 to 160 micrometres.
Safety note:	The manufacturer’s recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.19 Specification DS – 19

3.9.4.19.1 Applicability and conditions of use

The following procedure applies to the spray painting of 316 or 304L stainless steel fabricated components.

(High to Very High Corrosive Environments)

Activity:	**Detail:**
Applicability:	This specification covers the overcoating of 316 Stainless Steel for outdoors applications and can be used where stainless steel are preferred for their non-magnetic properties or where these materials are to be painted for colour coding purposes. This specification also applies to High to Very High corrosive environments.
Surface preparation:	Remove all loose oxidation deposits by means of brushing down with “Scotch Brite” Pads. Scrub down all surfaces using a suitable degreaser. Rinse with fresh water and allow drying. No more than 4 hours shall elapse between cleaning and the application of the coating.
Metal spraying:	
Primer coat:	As soon as the surfaces are dry, apply by airless spray, one coat Water-based Acrylic Primer specifically formulated for non-ferrous surfaces to a dry film thickness of 25 to 35 micrometres.

Activity:	**Detail:**
Stripe coat:	After allowing sufficient time for the primer coat to cure, all edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat with the same material as the following coat.
Second coat:	Allowing sufficient time for the primer coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by airless spray, one coat Water-based Modified Vinyl Acrylic to a dry film thickness of 100 to 150 micrometres.
Final coat:	Allowing sufficient time for the second coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by airless spray, an additional coat of the Water-based Modified Vinyl Acrylic to a dry film thickness of 100 to 150 micrometres. Total dry film thickness of organic coating system 225 to 335 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.20 Specification DS – 20

3.9.4.20.1 Applicability and conditions of use

The following procedure applies to the repair of new hot dip galvanised or zinc metal-sprayed surfaces

(Only applicable where hot dip galvanising or zinc metal-spraying is specified)

Activity:	**Detail:**
Applicability:	The following specification covers the repair of new galvanised or zinc-metal sprayed surfaces prior to erection.
Inspection:	A detailed visual inspection shall be carried out to identify all areas where the galvanising coating is damaged.
Surface preparation:	The affected and close surrounding areas shall be degreased using a solvent detergent degreaser specially formulated for galvanising. Water rinses after cleaning is essential to remove all traces of the cleaner. The damaged area shall then be lightly abraded with sandpaper to remove all corrosion products and any other deleterious matter. Following abrading of the surface, the affected area shall be cleaned down to a smooth surface and feathered back to a hard edge, using abrasive paper. This cleaning shall be extended to a minimum distance of 25 mm beyond the periphery of the affected area. It is vitally important that the sound, existing galvanising/zinc coating be abraded in order to provide a good "key" for the repair coating. After sanding, the affected area shall be washed with clean potable water to remove all dust, abrasive products etc. and finally allowed to dry.
Spot repair: **Option 1:**	
First coat:	As soon as the surfaces are dry (no more than 4 hours shall elapse between cleaning and the application of the repair system to avoid recontamination of the surface) apply by brush, one coat Single Pack Zinc-Rich (> 90%) Primer to a dry film thickness of 40 to 60 micrometres.

Activity:	**Detail:**
Second coat:	After allowing sufficient time for the first coat to cure (the Manufacturer's recommendations shall be adhered to in this regard) apply a second coat Single Pack Zinc-Rich (>90%) Primer to a dry film thickness 40 to 60 micrometres.
Spot repair: **Option 2:**	
First coat:	As soon as the surfaces are dry (no more than 4 hours shall elapse between cleaning and the application of the repair system to avoid recontamination of the surface) apply by brush, one coat Twin Pack Solvent free Zinc-Rich (>80%) Epoxy to a dry film thickness of 90 to 110 micrometres.
Safety note:	The manufacturer's recommendations regarding the safe handling and use of these materials shall be adhered to.
Approved suppliers and/or products:	See Technical Bulletin No. 10TB-011 (Latest revision)

3.9.4.21 Specification DS – 21

3.9.4.21.1 Applicability and conditions of use

The following procedure applies to the patch repair of newly painted damaged surfaces.

(Applicable in terms of all organic coating specifications)

Activity:	**Detail**
Inspection:	A detailed visual inspection shall be carried out to identify all areas where localised rusting or mechanical damage to the existing coating is evident.
Surface preparation:	The damaged area shall be thoroughly mechanically and/or hand wire brushed to remove all paint, corrosion product and any other deleterious matter. Following wire brushing, the affected area shall be cleaned down to a smooth surface and feathered back to a hard edge, using abrasive paper. This cleaning shall be extended to a minimum distance of 25 mm beyond the periphery of the affected area. It is vitally important that the sound, existing coating be abraded in order to provide a good "key" for the repair coating. After sanding, the affected area shall be washed with clean potable water to remove all dust, abrasive products etc. and finally allowed to dry.
Coating system:	It is imperative that all surface dirt and contaminants are completely removed before over-coating or the adhesion between the existing and new coats will be impaired. No more than 4 h shall elapse between cleaning and the application of the primer coat to avoid recontamination of the surface. The repair coating shall then be applied by brush or roller in accordance with the relevant specification. Patch repair those areas where the metal substrate are exposed with the full coating system as per original specification. Where only the intermediate or final coats have been damaged, these should be re-instated as per original specification.

3.9.4.22 Specification DS – 22

3.9.4.22.1 Applicability and conditions of use

The following procedure applies to the hot spun galvanising or sherardizing of small to medium threaded and cast iron articles.

(All environments where hot dip galvanised or sherardized fasteners/articles are specified)

Item:	Detail
Standards:	Hot spun galvanised fasteners shall be purchased from an SABS approved bolt manufacturer to SANS 121 (ISO 1461) and sherardized zinc coated items from DiSTek or LEVICOR Technologies SA to SANS 53811 (EN 13811). If this is not stipulated there is likelihood that zinc or cadmium electroplated fasteners will be supplied.
Supply:	Sheradized zinc coatings can be considered for the protection of small to medium size steel articles that may otherwise be protected by means of the hot spun galvanising process, providing the coatings are applied to a minimum coating thickness of 45 microns (Class 45 in terms of SANS 53811) and the mechanical properties of the items are not jeopardized in the process.
	However, the implementation of extensive quality control measures by the user/s and supplier/s of these products cannot be overemphasized. If incorrectly applied, the performance of the Sheradized zinc coatings will be inferior to that of Hot dip galvanising and will result in early corrosion of the mild steel substrate. Similar to Hot dip galvanising, over-application of Sheradized zinc coatings can result in problems being experienced with the screwing on of nuts and bolts. Hence, all threaded articles, whether coated by means of the sherardizing process or hot spun galvanising shall be supplied in a nutted-up condition. This ensures that bolts and nuts have been matched, supplied by the same manufacturer and that no losses are experienced. When repacking is necessary at premises other than those of the sherardizing / galvanising works, threaded articles shall be repacked in the assembled state, with the repacker ensuring a proper fit between bolt and nut.
	Wear and tear during transport shall be avoided to limit mechanical damage of the coatings. Hence, the articles shall be packed in closed containers that can withstand transport conditions. Any defective articles following transport or subsequent processing shall be replaced. As part of the quality control procedures, all items shall be free of white and red rust when Taken over. To assist in meeting this requirement, close attention shall be paid to the manner in which the material is stacked and stored at the sherardizing / galvanising works and during its subsequent handling.
	Any material that has been inspected at the sherardizing / galvanising works and passed by the user shall still be liable to rejection if it has been found that excessive white rust has developed between the date of inspection and Take over. Unless sherardized / galvanised items are to be subsequently Duplex Coated / Painted, all items shall be passivated, to afford additional protection to the zinc coated surfaces. This coating shall be even, and shall be sufficiently transparent to enable the user to examine the underlying surfaces for any defects.

Item:	Detail
	It is considered that the risk of under-protected areas and for mechanical damage of Sheradized zinc coated items increases with an increase in the size of the articles. Hence, these methods shall only be used or specified for the corrosion protection of small to medium size Eskom components.
Overcoating and Repair:	As far as the overcoating and repairing of Sheradized zinc coated items are concerned, no major problems are envisaged and the same processes can be followed in terms of surface preparation and duplex coating than what normally would be specified in the case of Hot dip galvanising. However, whereas micro/sweep blasting of Hot dip galvanised surfaces will enhance the adhesive strength of organic coatings, it shall not be done in the case of the Sheradized zinc coated items, since any removal of the coating may result in early corrosion. The use of small galvanised items in combination with larger Sheradized zinc coated articles should be avoided, since galvanic cells may develop which will result in an increase in the depletion of the Hot dip galvanised zinc coating. However, the use of small Sheradized zinc coated items in combination with larger Hot dip galvanised articles can be considered since no significant galvanic effects are anticipated.
Marking:	Where the SABS Mark applies, this Mark shall appear on every container or on a label securely attached to the container.

4. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Sibongile Maphosa	Engineer
Abre Le Roux	Chief Engineer
Bheki Ntshangase	Senior Manager HV Plant

5. Revisions

Date	Rev	Compiler	Remarks
Sept 2020	2	Sibongile Maphosa	Revised document and change applicability from Eskom to Distribution and Transmission. Eskom encompassed Generation and more content was required to suit Generation purposes as well.
Dec 2014	1	Sibongile Maphosa	Document reformatted. Changed Distribution to Eskom in the title and standard content to suit both Eskom and Transmission. This document supersedes document number: DSP_34-1658

Date	Rev	Compiler	Remarks
July 2011	1	DT Janse van Rensburg	Incorporated TESCOD comments Added definition for high strength bolts Added details of pre-treatment for 3CR12 Document title changed to include structural steelwork Names added as part of the development team Changes made to specifications to explain and simplify different corrosion categories Application guide and example added to facilitate use of specification]and provide additional information regarding what is classified as Inland and Coastal. Technical Bulletin 10TB-011 Rev.0 added as important reference document to facilitate the performance testing and approval of suitable protective systems
June 2009	B	DT Janse van Rensburg	Document unique identifier changed from SCSCAAP9 to 34-1658 Changes to national and international standards reference in the text. Replacement of obsolete products and/or supplier information. Improvement of certain Detailed Plant/Item Corrosion Protection Specifications. Changes to quality requirements. Incorporation of performance guarantees Powder coating of 3CR12 surfaces. Alternatives to zinc metal spraying.
June 2002	A		The corrosion protection of indoor mild steel components Changes to national and international standards reference in the text To address environmental, safety and health issues surrounding the use of protective coating systems Corrosion protection quality requirements – incorporate ESKCAAB8 revision 2 requirements Overcoating of 316 and 304 stainless steel fabricated components Repair procedure for new galvanised or zinc metal-sprayed surfaces Repair procedure for organic coatings A guide to assist Eskom staff with the selection of suitable corrosion protection system.

6. Development team

The following people were involved in the development of this document:

- DT Janse van Rensburg
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- V Singh
- J Scholtz
- B Hill
- R Theron
- M Grove
- R Kelly
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7. Acknowledgements

Not applicable.

Annex A – Application Guide for New Equipment Classified as Inland and Coastal

(Normative)

The purpose of this guide is to assist the compilers of equipment specifications with the selection of corrosion protection requirements. It will also promote a standardised approach in the specification of corrosion protection requirements in Eskom's equipment specifications.

The corrosion protection specification distinguishes between five corrosivity ratings in accordance with 3. Due to practical and logistical reasons, Eskom has standardised on only two corrosion classifications for outdoor applications, namely INLAND and COASTAL. These two classifications correspond to a corrosivity rating of "Low to Medium" (C2 to C3) and "High to Very high" (C4 to C5) respectively, as indicated in A1.

Table A1: Eskom's application classification versus corrosivity rating

Dx Application Classification	Corrosivity Rating	Corrosivity category
INLAND	Low to Medium [1)]	C2 to C3
COASTAL	High to Very high	C4 to C5

NOTE: That the classification of INLAND and COASTAL refers to the corrosivity rating of the environment and not necessarily the location of the equipment. Equipment classified as COASTAL will for example be required in Gauteng at a location with a heavy industrial pollution environment.

A2 provides a summary of which detailed corrosion specifications (i.e. DS numbers) are required for the various substrate types, in relation to Eskom's INLAND and COASTAL classifications. It therefore provides a quick lookup reference for the user, eliminating the need to study the entire corrosion protection specification.

The required/acceptable detailed corrosion specifications must be selected from Table B2 and then referenced in the equipment specification. If only certain of the DS options are acceptable, it should be referenced as such. For example, if it is specified that metering kiosks are to be manufactured from 3CR12 only, then only DS-9 and DS-10 should be referenced for INLAND applications. If subcomponents of a product (e.g. transformers tank and radiator) have different corrosion protection requirements, it should be referenced as such.

The supplier will be required to indicate in technical schedule B, which of the corrosion protection systems is offered.

The accepted coating suppliers and products are provided in technical bulletin 10TB-011. The most current version of this bulletin must be included in enquiry documentation to ensure that equipment suppliers are aware of it.

An example of how the corrosion protection requirements should be specified is provided at the end of this guide.

Table A2: Summary of Detailed specifications

Dx Application Classification	Environment	Substrate Type	Protective Coating Application Method	Special Notes	DS Number
-	Indoors	Mild Steel	Powder Coat	-	DS-1
	Indoors	Mild Steel	Spray Paint	-	DS-2
	Indoors	Mild Steel	Spray Paint	-	DS-3
	Indoors	Mild Steel	Spray Paint	-	DS-4

Dx Application Classification	Environment	Substrate Type	Protective Coating Application Method	Special Notes	DS Number
Inland	Outdoors	Mild Steel	Spray Paint	-	DS-5
	Outdoors	Mild Steel	Powder Coat	-	DS-6
	Outdoors	Mild Steel	Spray Paint	-	DS-7
	Outdoors	Mild Steel	Flow Coat (to be used with caution)	This specification only applies to those components, which due to their complicated geometry, cannot be properly painted by normal spray techniques.	DS-8
	Outdoors	3CR12	Spray Paint	-	DS-9
	Outdoors	3CR12	Powder Coat	-	DS-10
	Outdoors	3CR12	Spray Paint		DS-11
	Outdoors	3CR12	Flow Coat (to be used with caution)	This specification only applies to those components, which due to their complicated geometry, cannot be properly painted by normal spray techniques.	DS-12
	Outdoors	Mild Steel	HDG	Excludes a duplex coating.	DS-13
	Outdoors	Mild Steel	ZMS	Excludes a duplex coating.	DS-14
	Outdoors	Mild Steel + HDG	Spray Paint	Duplex coating system of new HDG surfaces.	DS-13 + DS-15 or DS-16 or DS-17
	Outdoors	Mild Steel + ZMS	Spray Paint	Duplex coating system of new ZMS surfaces.	DS-14 + DS-15 or DS-16 or DS-17
Coastal	Outdoors	3CR12	Spray Paint	-	DS-11
	Outdoors	3CR12	Flow Coat (to be used with caution)	This specification only applies to those components, which due to their complicated geometry, cannot be properly painted by normal spray techniques, e.g. radiators.	DS-12
	Outdoors	Mild Steel + HDG	Spray Paint	Duplex coating system of new HDG surfaces.	DS-13 + DS-15 or DS-16 or DS-17
	Outdoors	Mild Steel + ZMS	Spray Paint	Duplex coating system of new ZMS surfaces.	DS-14 + DS-15 or DS-16 or DS-17
	Outdoors	S/S (316 or 304L)	Spray Paint	-	DS-18 or DS-19
	Outdoors	Mild Steel	HDG	Excludes a duplex coating. This specification only applies to structural steelwork, equipment mounting brackets and fabricated components such as line hardware, nuts, bolts and washers.	DS-13

NOTE:

1) Abbreviations: HDG - Hot dip galvanising, ZMS - Zinc metal-spraying

2) The use of a higher corrosion specification is acceptable. E.g. coating systems that are specified for Coastal applications are also acceptable for Inland and Indoor applications

Typical example

The following are typical clauses that should be included in each equipment specification to specify the corrosion protection requirements.

1) Corrosion protection

The corrosion protection shall be conducted in accordance with Eskom specification 240-75655504. The acceptable detailed corrosion protection specifications will be indicated in schedule A of the technical schedules of an enquiry document. The manufacturer/supplier shall state in Schedule B the specific detailed specification number offered.

Annex B – Technical schedules A and B

For pole mounted transformers

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4
Sub clause	**Description**	**Schedule A**	**Schedule B**
1.1	Corrosion protection detailed specification number (according to DSP 34-1658) offered for:		
	- Transformer tank for INLAND applications	DS-6; DS-7; DS-9; DS-10; DS-13 + DS-15 or DS-14 + DS-15	_____
	- Transformer tank for COASTAL applications	DS-11; DS-13 + DS-16; DS-14 + DS-16; DS-13 + DS-16; DS-14 + DS-16; or DS-18	_____
	- Radiators for INLAND applications	DS-8 or DS-12	_____
	- Radiators for COASTAL applications	DS-12	_____