

**GAM/MAT/22/104: Kriel Power Station Corrosion Protection for Raw and Cooling
Water Clarifiers.**

This document prescribes and details the specific corrosion protection aspects and shall be considered and read in conjunction with:

1. Specifications (240-101712128 and 240-106365693) for the Internal & External Corrosion Protection of Water Systems, Chemical Tanks and Vessels and Associated Piping with Coatings.
2. EAP0357: Kriel Power Station Pre-treatment Plant Refurbishment Scope of Work.

NOTE: Where conflict or contradiction exists between any of these documents then the more stringent requirement shall apply.

General Corrosion Protection Specification

<p>Component/s</p>	<p>Corrosion Protection of Clarifier and associated internals as per scenarios below:</p> <ul style="list-style-type: none"> • Refurbishment/re-coating of main structures <u>on-site/in-situ</u>. • New mechanical equipment i.e. (piping, valves, pumps, pump impellers, bridge drives) – <u>Generally off site</u>. • Refurbishment of existing equipment namely (piping, associated pumps, valves and flanged surfaces – <u>Generally off site</u>. • Existing piping (limited lengths and number of components) may be stripped down for recoating on site or may require corrosion protection in <u>situ</u>.
<p>Immersion Environment</p>	<ul style="list-style-type: none"> • Operating Temperature: 25°C – 40°C • pH: 7.3 to 10.1 • Medium: Potable/Raw Water • Conductivity (K) < 4000 µS • Chloride < 400 mg.kg⁻¹ as Cl • Sodium < 500 mg.kg⁻¹ as Na • Sulphate < 1000 mg.kg⁻¹

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<p>Lining Systems for Clarifier Steelwork</p>	<p>1. Immersed in water and not exposed to UV light = solvent free epoxy system.</p> <p>2. Immersed in water and exposed to UV light = same as above and High Build Polyurethane Finishing coat.</p> <p>Note:</p> <ul style="list-style-type: none"> • For existing steel there is a high probability of soluble salts contamination of the surface/substrate. (Refer to relevant sections below). • For new steel there is a high probability of oil contamination of the surface/substrate due to the manufacturing process. (Refer to relevant sections below, prior to any final blast cleaning steps).
<p>Surface Decontamination</p>	<p>Prior to blast cleaning, high-pressure wash to remove all salt and loose contaminants. All visible oil and grease shall be removed using a suitable degreaser – rinse clean with potable water.</p>
<p>For oil contamination</p>	<p>Where required degrease with a suitable detergent and water wash and test for residual oil and grease as specified further below. Repeated washing and testing may be required.</p>
<p>For soluble salt contamination</p>	<p>Perform the Bresle method soluble salt test.</p> <p>If not within acceptable limits (as per the manufacturer requirement but not exceeding 100mg/m²), HP clean with minimum 1000 bar hot-water containing a salt decontamination solution.</p> <p>Test patches to be blast cleaned to Sa3.</p> <p>Repeat the Bresle method soluble salt test – if acceptable then proceed with blasting and application steps – if not then repeat hot-water HP washing.</p>
<p>Surface Preparation</p>	<p>Abrasive blast clean to Grade Sa 3</p> <p>For piping a suitable/purpose designed “Pipe Blaster” or retractable boom/lance system shall be used.</p> <p>Surface profile shall be as specified by the coating manufacturer.</p>

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<p>Generic System</p>	<p>(Optional)</p> <p>If a primer is required for holding the blast then the use of a suitable epoxy primer can be considered.</p> <p>The primer as selected by the manufacturer shall be compatible with the epoxy top coats and shall be a primer system that is normally used for immersion. There is a strong likelihood of severe pitting, sharp edges etc.</p> <p>The selected product shall be capable of application to a dry film thickness of 90 – 100 microns. The maximum allowable wet film thickness of solvent borne primers shall not be exceeded. Ensure adequate curing of the solvent-borne primer before over-coating.</p>
<p>First Coat</p>	<p>Immediately prior to spray application of the first intermediate coat all welds, sharp edges, pitting etc. shall be stripe coated by brush using the same solvent free coating system.</p> <p>Apply by airless spray/ "Pipe Coater"/boom retractable lance system; one coat Two Component Solvent Free Amine Cured Epoxy coating from 350 - 450 micron.</p> <p>Thinning in excess of 5% shall not be permitted.</p>
<p>Stripe Coat</p>	<p>After allowing sufficient time (as recommended by coating manufacturer) for the first intermediate coat to cure, all accessible edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat by brush in a different colour to that of the second intermediate coat.</p>
<p>1. For immersion service but not exposed to UV light.</p>	<p>Apply by airless spray, or in the case of piping then "Pipe Coater"/boom retractable lance system; one coat Two Component Solvent Free Amine Cured Epoxy coating from 350 - 450 micron.</p> <p>Thinning in excess of 5% shall not be permitted.</p> <p>Total dry film thickness (full system: immersion): 700 - 900 microns (excluding primer and stripe coated areas)</p>

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<p>2. Immersion and exposed to UV light:</p>	<p>Allowing sufficient time for the final intermediate coat (in 1 above) 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 from 50 to 60 microns.</p> <p>Total dry film thickness (full system: immersion and UV): 750 - 960 microns (excluding holding primer and stripe coated areas)</p>
<p align="center">Primer, Epoxy and High Build Polyurethane finishing coats shall be supplied by the same manufacturer.</p> <p align="center">With respect to aspects not mentioned in the above coating specification table (e.g. mixing ratios, pot life, straining, thinning, induction times, over-coating and curing times), the manufacturer's recommendations shall be strictly adhered to.</p>	
<p align="center">Sealing of high movement joints, crevices, transition areas, flanged and bolted surfaces after coating and during assembly process.</p>	
<p>Environment</p>	<p>Transition areas between steel and concrete surfaces, high movement joints and crevices.</p> <p>Prior to the application of the sealing system, wherever practical, the joints shall be coated as detailed above in section 1) and 2).</p>
<p>Surface Preparation</p>	<p>All joints and overlapping areas (i.e. 50 mm on both sides of joints) shall be sweep-blast cleaned to remove corrosion product, fouling, dirt, laitance etc. and provide a key for the sealing material. After blasting the joint shall be blown out with clean compressed air and vacuum cleaned to remove all dust and grid blasting media.</p> <p>It is imperative that all surface dirt and contaminants are completely removed before the sealant is applied or the adhesion of the sealant will be impaired.</p> <p>There shall be a minimal delay between cleaning and application of the sealant to avoid re-contamination of the surface.</p>

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	Before application of the sealant, thorough inspection of the joints shall be carried out to ensure that the joints have been properly prepared.
Bond Breaker Tape/ Backing Cord	Install a Bond Breaker Tape or Backing Cord to prevent the sealant bonding to the base of the joint.
Filling of Civil Structure Joints	Fill the joint with an elastic, Polysulphide sealant in accordance with the manufacturer's recommendations. The sealant material can be smoothed by means of a spatula. Allow at least one day to cure.
Bandage Joint Sealing System	<p>Apply masking tape parallel to the joint at a minimum of 45 mm from the joint.</p> <p>Activate the Hypalon Sheeting by wiping with a soft cloth dampened with the recommended cleaner. Activate both sides of the sheeting and leave for at least one hour before installation.</p> <p>Apply by trowel, spatula or a stiff brush a 1 mm thick, 40 mm wide layer of a two component, Solvent Free, Epoxy Paste Adhesive. The Epoxy Adhesive should be applied on either side of the joint between the masking tape.</p> <p>Place the activated Hypalon Sheeting over the joint with the red preapplied masking strip facing up and roll it into the Epoxy Adhesive until the adhesive comes through the perimeter holes.</p> <p>Apply a second 1 mm thick layer of Epoxy Adhesive on top of the sheeting and on either side of the joint, ensuring that it extends by a minimum of 5 mm beyond the edges of the sheeting.</p> <p>Finally, before the Epoxy Adhesive has set, remove the red pre-applied masking strip from the centre of the Hypalon Sheeting and the masking tape from both sides of the joint.</p>
Sealing of nuts, bolts, and other fasteners, after coating and during assembly process.	
Surface Preparation	Prior to the application of the sealing system, wherever practical, the fasteners shall be coated as detailed above in section 1) and 2).

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<p>Structural Steel Sealant</p>	<p>It is imperative that all surface dirt and contaminants are completely removed before sealant is applied or the adhesion of the sealant will be impaired.</p> <p>There shall be a minimal delay between cleaning and application of the sealant to avoid re-contamination of the surface.</p> <p>The sealant, i.e. a chemical resistant two component, High Polymer, Manganese Cured Polysulphide Sealant shall then be applied in accordance with the manufacturer's recommendations.</p>
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Specific Project Requirements

It is recommended that where practical:

1. All the launders steelwork is stripped, cleaned, suitably prepared, abrasive grit blast cleaned and the coating applied in close proximity to the clarifier in order to minimise transportation/handling and mechanical damage after coating.
2. In order to minimize/mitigate the unavoidable risk of dust, air borne and cooling tower spray fallout the contractor shall work in a systematic manner from top to bottom and in a continuous circumferential direction around the clarifier cone.
3. All corroded or damaged nuts and bolts shall be replaced with the original design material. During assembly all bolt holes shall be filled with a sufficient bead of sealant described earlier to form a continuous gasket/seal after bolt/nut tightening.
4. A detailed visual inspection shall be carried out by the Eskom engineer to identify and mark-up all areas that need to be repaired/reinstated OR completely coated/recoated. Based on the inspection (section 4.13 of 240-101712128 can assist in providing guidance) Eskom will instruct the contractor whether to perform patch repairs of the coating or complete recoating.
5. The contractor shall take cognisance of the fact that after initial surface preparation as above, Eskom may require access for a further inspection and assessment to determine the need for possible mechanical repairs i.e. welding. Unfortunately, this inspection can only be carried out once the surfaces have been blast cleaned in preparation for coating. The depth and morphology of corrosion damage, extent of component wall thickness loss

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and pitting needs to be considered. Where applicable, the following guide (obviously dependent on installed wall thickness) can be applied to all areas of extensive deep pitting:

- All pits less than 2mm in depth and all edges and weld seams shall be stripe coated after application of the primer/first coat.
 - All pits in excess of 2mm and up to 5 mm in depth shall be filled using a compatible two component solvent free epoxy filler. The filler to be used shall be supplied by the same supplier as the rest of the coating system and confirmed to be compatible to the specified coating system.
 - All severely grooved/corroded welds shall be filled by welding (repair procedure shall be submitted to Eskom for approval). Perforations and defects, pitting etc. which are close to approaching the wall thickness shall be repaired by welding in steel plate. The plate shall be welded onto the internal/immersed surface.
6. At all times care shall be taken to ensure adequate protection of any surfaces and parts of components or systems not requiring blast cleaning and coating (as an example valve seats/trim, pump inlets) and every effort shall be taken to prevent grit, water and other dirt entering drain systems, tank/vessel inlet/outlet piping or settling on isolating valves seats, shafts etc. Equipment name plates and identification plates shall be protected from coatings. No coatings shall be applied over any surfaces where these will adversely affect the performance of the item or component.
7. All materials, i.e. paint, solvents and cleaning agents for a specific paint system shall be supplied by the same manufacturer. The solvents used shall be those recommended and manufactured by the paint manufacturer. Where the recommended 'solvent' and 'clean-up thinners' for a material differs, the 'clean-up' solvent shall not be added to the paint for dilution purposes.
8. The method of surface preparation and coating application for piping > 800 NB shall be by conventional hand help equipment . The method of surface preparation and coating application for piping < 800 NB shall be by "pipe blaster"/retractable boom equipment.

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9. Corrosion Protection shall only proceed once all mechanical, fabrication, manufacturing activities i.e. cutting and welding have been completed and released in terms of the manufacturing/ fabrication Quality Control Plan (QCP).
10. In all cases where existing components/vessels have been exposed to raw or cooling water service, the steel substrate shall be tested for chloride contamination, according to ISO 8502-6. Casting substrates which may be pitted and/or rough and porous are inherently susceptible to soluble salt contamination. Testing shall be performed prior to final surface preparation.
11. Soluble salt testing shall be performed by the Bresle soluble salt test method. If not within acceptable limits (as per the manufacturer requirement but not exceeding 100mg/m²), the surfaces shall then be washed/decontaminated by High Pressure (HP) water washing using fresh/clean water (with a conductivity reading of maximum 100 μ S/cm) at a minimum pressure of 300 bar. A salt decontamination chemical additive with demonstrated capability of removing salts may be used in conjunction with HP cleaning.
12. Soluble salt testing shall be repeated on representative test patches which shall be blast cleaned to Grade Sa 3 (ISO 8501-1) for internal piping surface and Sa 2.5 for external piping surface. If acceptable then proceed with blasting and application steps – if not then repeat HP washing until the salt contamination has been removed to within acceptable limits.
13. Prior to any surface preparation all surfaces that are, or are likely to be contaminated with oil or grease as a result of the fabrication/manufacturing process (new pipe) shall be solvent cleaned with a suitable water-soluble biodegradable alkaline cleaner/detergent or with appropriate organic solvents.
14. Cleaning may be performed by using white lint free rags for small areas, or a spray gun for large areas. The detergent/solvent-cleaned surfaces shall then be thoroughly washed down with fresh/clean water ensuring that the oil-water emulsion formed is completely removed from the metal.

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15. Degreased and water washed surfaces shall be checked for residual oil and grease using the atomized water spray test as per ASTM F21 and further degreasing shall be carried out if residual oil or grease is found to be present.
16. A black light test shall be used to check for oil contamination. Zero oil and grease contamination is the acceptable limit. Washing with fresh/clean water containing a suitable degreasing agent of partially painted components shall take place between coats, if surfaces are found to be contaminated.
17. Surface preparation by abrasive blasting shall be performed by means of conventional hand held blasting equipment capable of removing mill scale, old coating, rust and suitably preparing the substrate to the required cleanliness of Grade Sa 3. The blasting direction shall be “backwards” i.e. moving away from the prepared surface. This is essential in order to ensure the blast operator has good visual accessibility of the invert substrate. Blasting in the other direction would very quickly result in piling up of grit ahead of the blast operator grinding the operation to a halt.
18. Removal of dust and debris shall be performed by vacuuming. The process shall be repeated until the required level of dust and debris removal is achieved.
19. The level of cleanliness required shall be less than “dust quality rating” 1 when tested in accordance with ISO 8502-3.
20. If coating is to be performed downstream of a draft either naturally or by fans then the upstream area shall be completely grit and dust free to prevent any possible carry-over of the dust/grit contamination onto the downstream wet/curing coating.
21. With regards to specifically patch repairs, the compatibility between the existing aged coating and the subsequent coating, as per the above table in this specification shall first be checked prior to proceeding with large scale repairs. The new/repair system shall first be applied to a small test area. If no softening of the existing coating occurs, then full scale repair can proceed.
22. Plural spray equipment is not permitted. Coating application by airless spray shall be performed by means of conventional airless spray equipment with the capability of suitably

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pumping and atomising the paint over a 90 metre distance from the spray pump. The spray nozzle and spray pattern shall be as per the manufacturer's recommendations.

General Requirements

1. The contractor shall be wholly responsible for the surface preparation and coating application. The coated surfaces shall meet the DFT as required by this specification sheet and aspects thereof in referenced documents.
2. Rounded edges are required in order to be able to apply the protective coating uniformly and to attain adequate coating thickness on sharp edges (refer to ISO 12944-3) if more detail is required). All sharp edges from the original fabrication or that have resulted from corrosion in service shall be rounded or chamfered and burrs around holes and along other cut edges shall be removed. All edges to be rounded off with a grinder to a radius of 2 mm or more.
3. Weld beads with a surface irregularity exceeding 3 mm or with sharp crests having a radius less than 2 mm shall be ground. Narrow gaps, blind crevices and lap joints should wherever practical and possible be seal welded. Where this is not possible then the crevice/gap shall be filled with a sufficient bead of sealant described earlier after completion of the complete coating system to form a continuous gasket/seal. Prior to application of the sealant the joint/gap shall be blown clean using suitable compressed air to remove dust and debris. 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.
4. Power and hand tool cleaning is only applicable to only localised touch ups or patch repairs. Specific requirements for patch repairing a coating system are defined in section 4.8.6 of 240-101712128 and 240-106365693. Hand-tool cleaning for isolated/localised areas may be utilised provided the required standard of finish is achieved. For all immersion applications final mechanical cleaning shall be by bristle blaster in order to create a required or specified surface profile.
5. Cleaning by means of hand or power-tools, i.e. wire brushes, chipping hammers, scrapers, grinders, sanders, needle descalers, bristle blasters etc. may only be used where accepted by the Eskom engineer and where the position and condition of the substrate metal is such

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that efficient cleaning and surface profile can be achieved and where the protective coating system is designed for application to brushed or ground surfaces i.e. specifically formulated surface tolerant coatings.

6. Oil and grease deposits shall be removed prior to cleaning as detailed earlier in this specification. Special attention shall be paid to drillings, bolt holes, etc.
7. Burnishing of the surface shall not be permitted.
8. In all cases, after wire brushing or grinding, all traces of loose material shall be removed from the surface by vacuum cleaning. Cleaned surfaces shall not be contaminated with oil, grease, rust or other deposits before coating application.
9. Different grades and types of blasting media exist. It is important that the correct abrasive be used in combination with a specific coating system to achieve the specified surface profile. The required blast profile height should be carefully considered. The contractor shall select an appropriate abrasive type and mesh size to attain the specified surface profile.
10. Only inert mineral grit or steel grit abrasives shall be used. Sand or silica based abrasives shall not be used. Abrasive material for blast cleaning shall be used in line with local environmental regulations.
11. The abrasive shall be used in accordance with the manufacturer's specifications and shall be clean, sound, hard particles free from foreign substances such as dirt, oil, grease, toxic substances, organic matter and water soluble salts. It is important that good quality abrasives are used in order to minimize the amount of waste grit and dust generated and contamination of the surfaces.
12. The use of re-cycled blasting media for the final blast is strictly prohibited.
13. All abrasive media shall be stored in an area that is completely dry, covered and protected from weather.
14. The profile height of the blasted surfaces should be within the range of the specified coating system. Refer to the manufacturers Product Data Sheets. Unless otherwise specified by the coating manufacturer, a profile height of 25 microns to 90 microns is recommended for most coatings systems.

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15. It is important that the blast profile does not exceed the specified DFT of the primer or first coat. Blast cleaning of severely corroded surfaces may result in high profiles i.e. > than 100 microns. In these cases, the primer or first coat shall be applied by brush/roller to ensure complete wet-out of the pitted/jagged surface. In addition a different primer or first coat may be required. However, agreement should be reached between the contractor and coating manufacturer as to the most suitable profile range, with due consideration of the application method, for a specific coating system.
16. The contractor shall consider and detail these potential scenarios or eventualities in the required Method Statement which shall be reviewed by Eskom for acceptance/rejection prior to any work. Ultimately, the contractor shall be responsible for any risk that could arise or be attributed to this choice.
17. The requirement for surface preparation of all metallic surfaces for immersion condition or internal piping surface is strictly Grade Sa 3 (ISO 8501-1), in which case the surfaces shall be blast cleaned to white metal where all traces of rust, mill scale and other foreign matter are removed.
18. In general, Grade Sa 2 ½ (ISO 8501-1), i.e. very thorough blast cleaning where at least 95% of the mill scale, rust and other matter is removed, is specified in the case of most external protective coating systems for atmospheric exposure.
19. All compressed air for blasting activities shall be free from entrained moisture and oil. All traps shall be in a functional condition. The compressed air shall be tested at regular intervals using clean white clothes to assess cleanliness and dryness. This requirement shall be included in the QCP.
20. After surface preparation, all dust, grit blasting media or any other deleterious matter shall be removed from the surfaces by vacuuming. The process shall be repeated until the required level of dust and debris removal is achieved. It is imperative that all surface dirt and contaminants are completely removed before coating or the adhesion of the coating shall be impaired.
21. Cleaned surfaces shall not be contaminated with oil, grease, rust or other deposits before coating application. Unnecessary traffic prior to painting shall be avoided.

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22. Immediately before coating, blast cleaned steel shall not exhibit more than “dust quantity rating” 1 when tested in accordance with ISO 8502-3.
23. The contractor shall ensure that during surface preparation and coating activities the relative humidity (RH) in open, undercover shop environments is less than 80% RH and for tank/vessels (confined spaces) is less than 60% RH. Ambient temperatures shall be between 5°C and 30°C or as per the manufacturer recommendations, whichever is the more stringent. The maximum/minimum substrate temperature at the time of coating application shall be strictly in accordance with the product data sheet. During stable weather conditions environmental parameters shall be measured and recorded at least 4 times per shift.
24. During periods of inclement or cold weather conditions the environmental parameters shall be measured and recorded hourly. In the event that the latest two readings of any of the parameters indicate a deteriorating trend which would likely exceed parameter/s limit then no final surface preparation or spray application shall be permitted. All measurements shall be recorded at the steel surface. Dew point requirements shall be as per the Product Datasheet or 240-101712128.
25. For all inspections of all surface preparation and coating activities the surfaces shall be clean allowing unhindered visual access to the surface. The contractor shall provide sufficient and adequate lighting (Cool White) to enable inspections. Cell phone lighting is not acceptable.
26. In order to avoid recontamination and flash rusting of the surfaces, the primer or first coat shall be applied within 8 hours after final surface preparation of the steel surfaces. Under no circumstances shall the blast be permitted to stand overnight.
27. Many modern organic coatings can be applied without the use of a primer. However, should a primer coat be required for holding of the blast, or otherwise, the contractor shall indicate/describe the reasoning for the need of such a primer i.e. as a holding primer or as a means of enhancing adhesion of the system? Details shall be provided in the Method Statement for the type of primer, generic resin, solvent borne or free, maximum DFT and compatibility with subsequent coats. The detailed Method Statement shall be submitted and reviewed by Eskom for acceptance/rejection prior to any work. Ultimately, the contractor shall be responsible for any risk that could arise or be attributed to this choice.

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28. The spray operator shall ensure application in a smooth and controlled circumferential motion and not in a vertical/horizontal criss-cross manner.
29. The spray operator shall be equipped with a “wet comb” and frequently monitor the wet film thickness to prevent/reduce a wide spread of DFT’s.
30. Immediately prior to spray application of the first intermediate coat all welds, sharp edges, pitting etc. shall be stripe coated by brush using the same solvent free coating system.
31. After allowing sufficient time for the first coat to cure, all edges, weld seams, bolts and nuts, and other crucial areas shall be given an additional stripe coat, by brush application, with the same material as the following coat.
32. Multiple coats shall be applied as per the table at the top of this specification sheet. Single coat systems are not permissible.
33. Where more than one coat is applied, the colour of each coat shall be different from the previous coat. In the case where aesthetic requirements are secondary, repairs after final testing shall be carried out using a different colour. In other cases two finishing coats of the same colour may be applied to achieve complete colour uniformity. All finishing colours for external surfaces shall be in accordance with the Eskom requirements; 240-145581571: Standard for the Identification of the Contents of Pipelines.
34. Where more than one coat is applied in an open exposed yard environment, surface preparation and washing shall be carried out between coats. Where the coating has completely cured or allowed to age before finishing, before application of a subsequent coat the coating manufacturer shall submit a surface preparation procedure which shall consider preparing the surface by light sanding, scrubbing with potable water using a bristle brush and drying before over-coating.
35. Application of subsequent coats shall be in accordance with the specified system. The required over-coating intervals as mentioned in the latest Product Data Sheet shall be observed and adhered to.

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36. The number of coats and DFT per coat required to achieve the total specified DFT shall be agreed between the contractor and coating manufacturer and will be dependent upon the method of application chosen.
37. The total DFT of the applied coating system shall comply with the recommended minimum and maximum DFT limits as recommended in the latest Product System Data Sheet and this specification.
38. The range of DFTs of each coat shall be as follows; 90% of random readings shall be equal to or greater than the minimum specified DFT. No individual reading shall be less than 80% of the specified DFT. In the case of solvent borne coatings no individual reading shall be greater than 150% of the manufacturer's maximum specified DFT. All deficient film DFTs shall be rectified prior to release of components.
39. The coating shall be evenly applied to form a smooth, continuous, unbroken layer free from misses, sags, runs, tears and other defects that could affect the integrity of the coating.
40. Unless otherwise instructed by the Eskom engineer for flange surfaces at least on coat of the coating system shall be brought around onto a third of the surface area of the flange face. In the case of flange face (gramophone surface finish) with compressed fibre gaskets, blasting and coating is not permitted.
41. All surfaces shall be 100% tested for continuity in accordance with SANS 1217 and shall be pinhole free. Perform electrical insulation discontinuity (EID) or Pinhole Detection tests using high spark techniques. The corrosion protection system products shall be capable of being subjected to high spark techniques and voltage settings shall be as per the product manufacturers' requirement. The tests shall be carried out as soon as the final coat has cured. Any faults located shall be marked up and repaired.
42. It is imperative that wherever possible pinhole detection and general patch repairs are to be performed before final cure of the coating system.
43. With the exception of access limitations or as instructed by the Eskom engineer all areas of coating damage shall be patch repaired in a different or contrasting colour and by brush application. The extent of the damage shall be carefully inspected to assess which coats in the system have been damaged and which surface preparation methods are most suitable

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and appropriate. The Eskom engineer shall accept/reject the contractor's recommended method of surface preparation i.e. mechanical power and hand tool cleaning. When more widespread repairs are required and when the damage extends to the steel substrate abrasive blast cleaning to Grade Sa 3 (ISO 8501-1) is required.

44. All coats in the system shall be re-instated. Areas to be primed shall be cleaned of dust, dirt, grease, salts or other deleterious matter and all edges of existing paint shall be feathered back to a hard edge. The patch primer used shall be in accordance with the requirements of the relevant coating system. The over-coating onto an existing coating by subsequent intermediate and finishing coats (where applicable) shall be stepped at 25 mm intervals to produce a feathered edge. Specifics of such instances shall be assessed on a case by case basis.
45. All shop coated surfaces shall be inspected and examined for coating damage on arrival at site. If the damage is excessive it may be preferable to repair the transport damage before installation/assembly/erection whilst access is easier.
46. Provision shall also be made for the repair of handling damage to the coating after installation/assembly/erection/scaffolding removal. Spot repairs shall reinstate each of the previous coats and shall commence directly after the localised surface preparation.
47. All immersed surfaces shall be pinhole tested (only after completion of all handling, moving and equipment and scaffolding removal) to ensure the coating is pinhole free and if required additional repairs shall be performed and once cured then the repair areas shall be retested. The process to be repeated until a pinhole free coating is achieved.
48. After completion of the coating activities sufficient curing time of the coating system shall be given prior to immersion as per the requirements of the Product Data Sheet. Accelerated curing is not permitted. All coated surfaces shall be adequately ventilated until full cure has been achieved. At the end of the curing period and before immersion the full cure of the applied coating shall be verified by the contractor and/or coating manufacturer.

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Safety Requirements and Considerations:

1. During the applications of all coatings/lining, care shall be taken to ensure adequate ventilation and lighting, to allow for good visibility and proper curing of the coatings and to avoid/minimise health and safety risks.
2. A confined spaces (CSs) may be defined as an enclosed, restricted, or limited space in which, because of its construction, location or contents, or any work activity carried on therein, a hazardous substance may accumulate and/or an oxygen-deficient atmosphere may occur, and/or in which a dangerous liquid or dangerous concentration of gas, vapour, dust or fumes may be present. It includes any chamber, tunnel, pipe, pit, sewer, container, valve, pump, sump, chute, bunker, silo, gearbox, tank, receiver, drum or any similar construction, equipment, machinery or object.
3. Flammable Atmospheres: Gases, vapours and dusts can become trapped in CSs and create flammable or explosive atmospheres, and include combustibles e.g. Hydrogen, Acetylene, Paint and thinning/cleaning solvents, etc.
4. Walking / Working Surfaces and Visibility: Poor lighting may add to hazards caused by an irregular, sloped, or constricted working surface.
5. Special care needs to be taken when working with all organic coatings. Prior to the use of any coating material, the Material Safety Data Sheets shall be obtained from the relevant coating manufacturer. The contractor shall be familiar with the contents of these safety data sheets and ensure that the necessary safety precautions are taken in order to comply with local and national safety and health requirements such as the OHS Act.
6. Any solid waste materials or liquids stripped or generated during the coating operations shall be discarded in accordance with the requirements of the appropriate national and/or local authorities or the requirements of Eskom.
7. The contractor shall ensure compliance with all statutory regulations, municipal by-laws, etc. concerning pollution and the health and safety of personnel and/or members of the public who may be affected by the work. The contractor shall provide the personnel with the appropriate required PPE.

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8. The contractor shall provide for all necessary safety precautions and risk assessments.
9. The contractor shall advise Eskom of all hazardous materials to be brought on site.
10. All painting materials on site shall be stored in designated areas in storage facilities that meet the storage requirements of the paint manufacturer and the safety requirements of the specific site. The contractor shall be responsible for the provision of appropriate storage/shipping containers as required. These containers shall include the appropriate refrigeration/conditioning systems for temperature control. This requirement shall be dependent on where the container will be located (indoors/outdoors), typical ambient temperature for the particular season of the year and the maximum storage temperature limits as per the manufacturer's recommendations.
11. The contractor's Safety File for the area to be worked it shall address all the hazardous activities of abrasive blast cleaning and spray painting. The contractor shall verify that the personnel carrying out these activities are suitably qualified.
12. The contractor shall ensure that the abrasive materials used conform to all National Health and Safety Standards.

Specifically with respect to CSs and based on the descriptions and definitions of safety risks as per the above points it is imperative that the contractor's/contractor's Method Statement shall describe in detail, the measures and mitigation steps for the risks and hazards as identified in this specification sheet.

It is compulsory that these safety risks/mitigation measures and any others as identified by the contractor/contractor be included in the Method Statement. Prior to the commencement of any work the Method Statement shall be submitted for review, acceptance/rejection by the respective Power Station Risk and Safety office/department.

Handling, Transportation, Storage and Erection of Piping

1. Every precaution must therefore be taken to correctly support and protect the pipework during handling, transportation, storage and erection.

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2. Flanges shall be protected with wooden shields bolted in such a manner to apply uniform pressure to the lining.

Prior to commencement of any work the applicator/contractor shall submit a procedure for handling, transportation, storage and erection for all components/piping for Eskom's approval.

Reference Documents

The following list of references shall apply in addition to the requirements of 240-106365693 and 240-101712128. The latest revision of the referenced standards shall apply.

Where conflict exists between any of these documents the more stringent requirement shall apply.

1. 240-101712128: Standard for the internal corrosion protection of water systems, Chemical Tanks and Vessels and Associated Piping with Coatings.
2. 240-106365693: Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings.
3. 240-145581571: Standard for the Identification of the Contents of Pipelines.
4. ISO 9001: Quality Management Systems - "is defined as the international standard that specifies requirements for a quality management system (QMS). Organizations use the standard to demonstrate the ability to consistently provide products and services that meet customer and regulatory requirements."
5. ASTM D4414: Standard practice for measurement of wet film DFT by notch gauges.
6. ASTM D4541: Standard Method for Pull-off Strength of Coatings using Portable Adhesion Testers.
7. ASTM D5162: Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
8. ASTM E376: Measuring coating DFT by magnetic field or eddy current electro-magnetic test Methods.
9. ASTM F21: Standard Test Method for Hydrophobic Surface Films by the Atomizer Test.

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10. BS EN ISO 16961: Petroleum, petrochemical and natural gas industries — Internal coating and coating of steel storage tanks.
11. EAP0357: Kriel Power Station Pre-treatment Plant Refurbishment Scope of Work
12. ISO 2409: Paints and varnishes – Cross cut test.
13. ISO 4624: Paints and varnishes – Pull-off test for adhesion.
14. 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.
15. 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.
16. 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.
17. 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).
18. 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.
19. 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. (May be used as an alternative to SANS 5772).
20. SO 12944-3: Paint and varnishes – Corrosion protection of steel structures by protective paint systems. Part 3: Design considerations.

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21. ISO 9223: Corrosion of metal and alloys – Corrosivity of atmospheres – Classification.
22. SANS 10064: The preparation of steel surfaces for coating.
23. SANS / ISO 2808: Paints and Varnishes: Determination of film DFTs (Can be used as alternative to ASTM E376).
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. SIS 055900: Swedish Code of Practice - Pictorial surface preparation standard for painted steel surfaces. (Can be used as alternative to ISO 8501 – 1).

Submitted by:



Accepted by:



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