ANNEXURE A – QUESTIONNAIRE FOR THE SELECTION OF SUITABLE ORGANIC LINING SYSTEM/RUBBER LINING FOR THE INTERNAL CORROSION PROTECTION OF WATER SYSTEMS, CHEMICAL TANKS AND VESSELS AND ASSOCIATED PIPING

The selection of the required organic lining system or rubber lining compound for immersed service is directly dependent upon the properties of the liquid being contained. Each specific liquid will require a specific organic lining or lining compound and it must never be assumed that similar liquids are in fact the same. In the case of rubber lining SANS 1198 'The manufacture of rubber sheeting for rubber lining' covers the requirements for the manufacture of rubber sheeting of soft and hard (ebonite) rubber for lining of pipes and pipe fittings of diameter at least 25 mm, and other metal or concrete equipment. It includes a classification of the linings that enables the requirements to be specified by a line call-out.

The following information is required by the paint applicator/rubber lining applicator to select the suitable lining or compile the required line call-out for the rubber compound to be used.

1.0 LOCATION OF COMPONENT	
1.1 Name of power station	Camden Power Station
1.2 Component Identification i.e. Plant Code	Ash Water Return Dam Pipeline
2.0 COMPONENT DETAILS	
2.1 Capacity of Component	
2.2 Dimensions	
2.3 No of access man-holes	
2.4 Size of access man-holes	
2.5 Location of access man-holes	
2.6 Diameter and length of pipework	
2.7 Material of construction (mild steel etc.)	Mild Steel
2.8 Please provide A4 drawing of component with this questionnaire	
3.0 ACCESS COMPONENT	
3.1 Is access available to locate compressors and equipment next to the component?	Yes
3.2 If adjacent access is not available how long will air and spray hoses need to be?	
4.0 TYPE OF WORK	
4.1 New works – clean original steel	Installation of Ash Water Return Dam Pipeline
4.2 Maintenance work – previously lined	
4.3 Concrete i.e. Water retaining structures 4.3.1 Are surfaces new, dry, cured, post	

service? 4.3.2 Is there spalling, cracking, exposed rebar? 4.3.2 What is allowable duration for lining activity?	7 days
4.4 Type and age of previous lining	Assumed galvanised steel
4.5 Condition of the previous lining	Pipelines are showing signs of corrosion both internally and externally
4.6 Total surface area to be lined (m^2)	
5.0 SURFACE PREPARATION	
5.1 Can abrasive blast cleaning be carried out inside the component/vessel/tank with consideration of access/confined space, ventilation etc.	
6.0 PROPERTIES OF LIQUID CONTAINED IN OR IN CONTACT WITH THE COMPONENT	
6.1 Acids/alkalis	
6.1.1 Type of acid/alkali	N/A
6.1.2 pH of acid/alkali	
6.1.3 Concentration of acid/alkali	
6.2 Organic liquids – organic acids, fats oils or solvents	
6.2.1 Type of organic liquid	N/A
6.2.2 pH of organic liquid	
6.3.3 Concentration of organic liquid	
6.3 Petroleum products – petrol, diesel etc	
6.3.1 Type of petroleum product	N/A
6.4 Water – type of water	
6.4.1 Potable water 6.4.2 Cooling Water 6.4.3 Raw water (with micro-organisms?) X	In all cases a water analysis is required and shall contain the following parameters as a minimum; pH, Turbidity (FTUs), Conductivity ($\mu S.cm^{-1}$), Total aerobic bacteria (CFUs/ml), Total anaerobic bacteria (CFUs/ml), Chlorides ($mg.kg^{-1}$), Sulphate ($mg.kg^{-1}$). A range of analysis (min, max, average) is required for each of the parameters.
6.4.4 Water treatment process waters (provide specific composition/concentration) i.e. % hydrochloric acid, sulphuric acid, caustic soda, ammonia, etc.)	
6.4.5 Distilled/demineralised/de-ionised 6.4.6 Condensate	
6.5 Temperature & Pressure of liquid	

6.5.1 Normal operating temperature	Ambient = approx. 14 deg C
6.5.2 Maximum or peak temperatures	40 deg C
6.5.3 Minimum temperatures	-4 deg C
6.5.4 Pressure of Liquid	600 - 800kPa
6.5.5 Maximum pressure of liquid	800 kPa
6.5.6 Flow rate of liquid	
6.5.7 Will vacuum conditions occur?	No
6.7 If applicable, abrasion characteristics of the liquid	
6.7.1 Provide information of content, particle size, and physical characteristics of abrasive suspended matter likely to be present	• Raw Water Quality: o pH - 7 - 11.5 o K25 - 500 o Na - 50ppm o SiO2 - 20ppm o Mg - 20 - 100ppm o Cl - 20 - 100ppm o SO4 - 100 - 400ppm
7.0 OPERATION OF COMPONENT	
7.1 Is the component operated on a continuous or batch process basis	Continuous
7.2 Ion exchange vessels	Specifics to be provided as per points 6.4 and 6.5 above for both the process condition as well as the regen condition in the same vessel.
7.3 Will the applied lining be subjected to any thermal shock, if so describe the operation.	No
8.0 GENERAL	
8.1 Provide any further information considered relevant to ensure the selection of the most appropriate organic lining/rubber lining material i.e. photographs of previous components/coating condition	
8.2 In the case of refurbishment work what is the shut-down period during which this lining work mast be carried out (number of days)	
8.3 Provide information and details of whether corrosion protection by lining will interface with areas such as flanges, crevices and transition areas to other protective lining systems which would necessitate specific consideration. Schematics, photographs or appropriate drawings will be required to provide specific recommendations.	

Note: In the case of refurbished components all mechanical and welding repairs must be carried out before any lining applications are started.

ANNEXURE B: RTD/MAT/21/038: PROTECTIVE COATING SPECIFICATION – CAMDEN POWER STATION: Ash Water Return Pipeline PIPING (100NB – 800NB)

To be considered as Annexure D of 240-101712128 and 240-106365693: Specifications for the Internal & External Corrosion Protection of Water Systems, Chemical Tanks and Vessels and Associated Piping with Coatings	
Component/s	Piping, Associated Pumps, Valves and Flanged surfaces. All piping and associated piping fittings (i.e. as spool pieces, T-pieces, bends, end caps and etc.) in the range from 100NB – 800NB. Multiple straight lengths up to 6 metres. Typically new piping will be corrosion protected off site..
Internal Immersed (Material/Substrate)	New carbon steel (mill scale). For new steel there is a high probability of oil contamination due to the manufacturing process. (Refer to relevant sections below)
Internal Immersed (Environment)	• Operating Temperature: -4°C – 40°C • Pressure: 600 – 800 kPa • Flow rates of up to 0.1m^3/s. • pH: 7 to 11.5 • Medium: Cooling Water (CW) • Conductivity (K) < 500 µS • Chloride 20 - 100 mg.kg^{-1} as Cl • Magnesium 20 – 100 mg.kg^{-1} as Mg • Sodium < 500 mg.kg^{-1} as Na • Sulphate 100 - 400 mg.kg^{-1} • SiO_2 20 mg.kg^{-1} •
Internal Immersed (Surface Preparation and coating)	Abrasive blast clean to **Grade Sa 3** (ISO 8501-1). The surface profile as specified by the coating manufacturer.

Generic System	Solvent Free Epoxy
First Coat	Apply by airless spray/pipe coater; one coat Two Component Solvent Free Amine Cured Epoxy coating from 350 - 450 **micron.** Thinning in excess of 5% shall not be permitted.
Stripe Coat	After allowing sufficient time (as recommended by coating manufacturer) for the first coat to cure, all accessible edges, weld seams, bolt holes and other crucial areas shall be given an additional stripe coat by brush.
Final Coat	After allowing sufficient time for the first coat and stripe coating to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by airless spray/pipe coater; one coat Two Component Solvent Free Amine Cured Epoxy coating from 350 - 450 **micron.** **Total System Minimum Dry Film Thickness (DFT) = 700 microns.**
External (Material/Substrate)	New carbon steel (mill scale) OR previously epoxy/urethane coated. For new steel there is a high probability of oil contamination due to the manufacturing process. (Refer to relevant sections below).
External (Environment)	• Non-Aggressive Indoors/Outdoors • Ambient Temperature
External (Surface Preparation and coating)	Abrasive blast-clean to Grade **Sa 2.5** (ISO 8501-1). The surface profile as specified by the coating manufacturer.

Generic System	Primer and intermediate coats = Twin Pack Polyamide Cured Epoxy. Finishing coat = High Build Re-coatable Polyurethane Acrylic.
Primer Coat	Apply by spray, one coat Twin Pack Polyamide Cured Epoxy Primer from 60 to 80 microns.
Stripe Coat	After allowing sufficient time (as recommended by coating manufacturer) 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 following coat.
Intermediate Coat	Allowing sufficient time for the primer coat and stripe coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by spray, one coat Twin Pack, High Build Polyamide Cured Epoxy Intermediate Coat from 120 to 150 microns.
Final Coat	Allowing sufficient time for the intermediate coat to cure, the manufacturer's recommendations shall be adhered to in this regard, apply by spray, one coat Twin Pack, High Build Recoatable Polyurethane Acrylic Finish from 50 to 60 microns. **Total System Minimum DFT = 230 to 290 microns.** The colour of the final/finishing coat shall be as per the requirements of 240-145581571: Standard for the Identification of the Contents of Pipelines and Vessels.
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.	

This specification caters for, and is applicable to new pipe, old pipe, off-site, on-site, in-situ corrosion protection by coatings of piping 100NB – 800NB. The applicable requirements for each of the above cases as included in this shall apply.

Specific Project Requirements:

1. The piping is new carbon steel. Corrosion protection shall be by abrasive grit blasting (surface preparation) followed by coating.
2. 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.
3. 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.
4. 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 must not be added to the paint for dilution purposes.
5. The method of surface preparation and coating application shall be by either (1) centrifugal spinning or by (2) "Pipe blaster" and "Pipe coater" as detailed further below. The centrifugal spinning technique is a technique whereby a spinning disc, brush or other device is used to firstly abrasive blast the substrate and secondly to atomise and coat the pipe internal surface. In both cases the blast and coating heads are attached to a retractable lance/boom that is fed all the way through the length of the pipe and then pulled back out of the pipe at a predetermined speed.
6. The selection of techniques/methods depends on the length and diameter range, new or old pipe, location of works i.e. on-site (possibly existing/in-situ) or at the contractors works/shop/yard. Typically the first technique is used where there are multiple lengths

of piping in excess of 6 metres.

7. The second technique is used for limited quantities and/or shorter lengths and smaller diameters for in-situ pipe and/or piping fittings. Furthermore the selection may be a combination of either technique/method depending, on geometries and diameters and whether either straight piping or fittings.

8. The technique/method shall be agreed between the contractor and coating manufacturer and presented in the Method Statement as required further below. The Method Statement shall be reviewed by Eskom for acceptance prior to commencement of any work.

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. Prior to any surface preparation all surfaces that are, or are likely to be contaminated with oil or grease as a result of the service conditions or fabrication/manufacturing process (new pipe) shall be solvent cleaned with a suitable water-soluble biodegradable alkaline cleaner/detergent or with appropriate organic solvents.

11. Cleaning may be performed by using rags (for small areas), an immersion tank (for small items) 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.

12. Degreased and water washed surfaces shall be checked for residual oil and grease using the atomized water spray test and further degreasing shall be carried out if residual oil or grease is found to be present.

13. 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.

14. Internal surface preparation by abrasive blasting shall be performed by means of a "pipe blaster" i.e. a self-centralising device with a hollow tipped blasting nozzle capable of removing mill scale, old coating, rust and suitably preparing the substrate to the required cleanliness of Grade Sa 3. Blasting nozzles with only forwards blasting characteristics shall not be permitted.
15. The contractor shall consider the means of ensuring that the device/mechanism as above is capable of manoeuvring around at least half of the bend radius. The blasting process shall be performed from both ends of the component.
16. Removal of dust and debris from the internal surfaces shall be performed by using dry, clean and oil free compressed air. The same method described above shall be used with a suitable nozzle capable of providing a forward angular air flow pattern uniformly around the entire circumference of the component.
17. The dust and debris removal process shall be performed from both ends of the component. The process shall be repeated until the required level of dust and debris removal is achieved.
18. Assessment of the blast cleanliness shall be by visual means as far as is accessible in the component end AND then by suitable length borescope/fiberscope to assess the cleanliness up to and including the bend.
19. Freedom of dust and debris shall be checked from both component ends as far as is accessible to perform the test. The level of cleanliness required shall be less than "dust quality rating" 2 when tested in accordance with ISO 8502-3.
20. Coating application by airless spray shall be performed by means of a "pipe coater" i.e. a self-centralising device with a fan spray tip/nozzle capable of providing a forward angular spray pattern uniformly around the entire circumference of the component. The process shall be performed from both ends of the component. Spray tips/nozzles with only forward spray characteristics shall not be permitted.
21. The contractor shall consider the means of ensuring that the device/mechanism as above is capable of manoeuvring around at least half of the bend radius.

22. Defects and pinholes (discussed later in greater detail) shall be recorded and the length where such defects are detected or observed shall be measured from the pipe end. An additional coat shall be applied in this area. Wherever possible and achievable the pinhole detection and general patch repairs shall be performed before final cure of the coating system. Repair of pinholes and coating damage after full cure will require surface preparation i.e. sanding/abrasion to provide a mechanical key for the repair. This would not be possible in piping where access is not possible.

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 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 DFTs on sharp edges, refer to ISO 12944-3 should more detail be required. All sharp edges from the original fabrication 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 3mm or more.
3. All sharp edges from the original fabrication 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 3mm or more
4. Weld beads with a surface irregularity exceeding 3mm or with sharp crests having a radius less than 3mm shall be ground.
5. Power and hand tool cleaning is only applicable to localised touch ups or patch repairs. Specific requirements for patch repairing a coating system are defined in section 4.8.6 of 240-101712128.
6. 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 the required surface profile.
7. 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 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.

8. 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.
9. 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.
10. Burnishing of the surface shall not be permitted.
11. In all cases, after wire brushing or grinding, all traces of loose material shall be removed from the surface by compressed air (internally) and vacuum cleaning (externally). Cleaned surfaces shall not be contaminated with oil, grease, rust or other deposits before coating.
12. 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.
13. Only inert mineral grit or steel grit abrasives shall be used. Only steel grit may be used in sensitive plant areas such as Water Treatment Plants in order to ensure no contamination of plant processes due to excessive dust.
14. Sand or silica based abrasives shall not be used. Abrasive material for blast cleaning shall be used in line with local environmental regulations.
15. The abrasive shall be used in accordance to 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.
16. The use of re-cycled blasting media for the final blast is strictly prohibited.

17. All abrasive media shall be stored in an area that is completely dry, covered and protected from weather.

18. 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.

19. 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.

20. 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.

21. The requirement for surface preparation of all metallic surfaces for immersion conditions or internal 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.

22. 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.

23. 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.

24. After external surface preparation, all dust, grit blasting media or any other deleterious matter shall be removed from the surfaces by vacuuming. In the case of small

components and small bore piping compressed air shall be used to blow all dust/debris out of the pipe. 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.

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

26. Immediately before coating, blast cleaned steel shall not exhibit more than "dust quantity rating" 2 when tested in accordance with ISO 8502-3.

27. 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.

28. 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.

29. 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.

30. 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.

31. 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.

32. 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. Should the use of a primer be omitted, stripe coating shall be carried out between applications of the first coat and the subsequent coat.

33. Multiple coats shall be applied as per the table at the top of this specification. Single coat systems are not permissible.

34. 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.

35. 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.

36. Where more than one coat is being 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 surface shall be prepared by light sanding, scrubbing with potable water using a bristle brush and drying before over-coating.

37. 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.

38. The number of coats and DFT per coat required to achieve the total film DFT shall be agreed between the contractor and coating manufacturer and will be dependent upon the method of application chosen.

39. 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.

40. 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.

41. 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.

42. Unless otherwise instructed by the Eskom engineer for flange surfaces at least one 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.

43. The contractor shall perform pinhole detection using appropriate "spark" testing equipment at a voltage setting as per the coating manufacturer's requirements. Wet sponge testing shall not be acceptable.

44. It is imperative that wherever possible pinhole detection and general patch repairs are to be performed before final cure of the coating system.

45. With the exception of access limitations or as instructed by the Eskom engineer all areas of coating damage shall be patch repaired 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 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.

46. 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.

47. 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.

48. 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.

49. 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 surface preparation.

50. 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.

51. 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.

Safety Requirements and Considerations:

1. During the application of all coatings/linings, 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. 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.
3. 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.
4. The contractor shall ensure that the abrasive materials used conform to all National Health and Safety Standards.
5. 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.
6. 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.
7. The contractor shall provide for all necessary safety precautions and risk assessments.
8. The contractor shall advise Eskom of all hazardous materials to be brought on site.
9. 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.
10. 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 manufacturers 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.

Pre-job Method Statement and Quality Documentation review and acceptance:

1. The coating manufacturer/contractor shall supply individual product data sheet for all products, comprising the system which shall contain the following as a minimum:
   - A description of the generic type of paint.
   - Confirmation that the coating is suitable for the intended method of application.
   - Recommended and non-recommended uses.
   - **Maximum recommended service temperature which shall be a minimum of 30% greater than the maximum temperatures** as is indicated in the table at the top of this specification. The coating rating shall consider the above temperatures as continuous service i.e. not intermittently.
   - Chemical resistance limits.
   - Surface preparation.
2. Application conditions and details including but not limited to: application temperatures, dilutions, pot-life, application techniques and DFT for the particular application method, over-coating intervals, and curing times required before immersion.
3. Prior to the application of any of the corrosion protection systems, the Product Data Sheet/s shall be signed by the manufacturer and contractor. This is to ensure that the manufacturer is aware of this specification, the conditions under which it will be applied and to allow for technical back-up where required.
4. The signed Product Data Sheet/s shall be deemed to be a binding reference document (as part of the QCP). It shall be specific to this project any further/other subsequent revisions of the Product Data Sheet/s shall be submitted to Eskom for reacceptance clearly stating the variations/deviations. No further use/application of the related product, for this project, is permitted until acceptance is granted by Eskom.
5. A detailed Method Statement explaining all required steps as specified in this specification shall be provided at the time of tender. The steps to be considered includes:
   - Grease decontamination and washing.

- Soluble salt decontamination.
- The reason for selection and then parameter setup for blasting and coating techniques i.e. conventional airless spray, dual/plural spray, "Pipe blaster, Pipe Coater", flow coating, pigging etc. shall also be included in the Method Statement.
- Methods for dust and debris removal, maintaining and ensuring cleanliness between coats shall be described.
- The Method Statement shall detail the precise sequence and breakdown of work areas/activities in order to apply the system with due consideration of dust contamination, and possible overspray onto adjacent surfaces still requiring additional coats.
- The Method Statement shall also consider the most efficient methods and sequencing to avoid unnecessary delays between coats that may have an impact i.e. time required for removal of spent abrasive grit and dust/debris, delay due to material handling, time required to handle, rig and move the component etc.
- All inspection interventions during and after completion of final coats shall be considered and included.
- The detailed Method Statement shall be submitted to Eskom for review and acceptance/rejection prior to the commencement of any work. Eskom reserves the right to request further revision, clarification or additions in accordance with or as required by this specification.

6. The contractor shall submit a detailed, project specific QCP. The QCP shall be based on the detailed Method Statement and shall contain all intervention points and relevant criteria as per the information as described in the Product Data Sheet/s and this specification. Eskom reserves the right to request further revision, clarification or additions in accordance with or as required by this specification.
7. Under no circumstances shall any work be performed until the QCP and Method Statement have been accepted by the Eskom engineer.
8. The coating manufacturer shall provide technical surveys during the execution of the project. The contractor shall commit to this requirement in the Method Statement.

Reference Documents:

The Eskom Standards 240-106365693: Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings and 240-101712128: Standard for the internal corrosion protection of water systems, Chemical Tanks and Vessels and Associated Piping with Coatings were compiled in 2016 and are due for revision in 2020. Since 2016 there have been changes in terms of the referenced documents i.e. some documents have been withdrawn, replaced or superseded. 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. BS EN ISO 16961: Petroleum, petrochemical and natural gas industries — Internal coating and coating of steel storage tanks.
5. 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."
6. ASTM D4414: Standard practice for measurement of wet film DFT by notch gauges.
7. ASTM D4541: Standard Method for Pull-off Strength of Coatings using Portable Adhesion Testers.
8. ASTM D5162: Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates.
9. ASTM E376: Measuring coating DFT by magnetic field or eddy current electro-

magnetic test Methods.

10. ASTM F21: Standard Test Method for Hydrophobic Surface Films by the Atomizer Test.
11. ISO 2409: Paints and varnishes – Cross cut test.
12. ISO 4624: Paints and varnishes – Pull-off test for adhesion.
13. 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.
14. 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.
15. 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.
16. 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).
17. 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.
18. ISO 8503-4: Preparation of steel substrates before application of paint and related products – Surface roughness characteristics of blast-cleaned steel substrates.
19. 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. ISO 12944-3: Paint and varnishes – Corrosion protection of steel structures by protective paint systems. Part 3: Design considerations.
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 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).
25. SIS 055900: Swedish Code of Practice - Pictorial surface preparation standard for painted steel surfaces. (Can be used as alternative to ISO 8501 – 1).