


 NISOC	Development Plan of 28 Reservoirs / BIBI HAKIMEH Oilfield (EPC)								 ماشین سازی اراک MACHINE SAZI ARAK	 SeaLand ENGINEERING AND WELL SERVICES
	Specification for Painting								 شرکت مهندسی دریای کالا	
Contract No.: 053-073-9189	Project	Package	Contractor	Fac.	Disc.	Doc. Type	Ser. No.	Rev.	Page 1 of 26	
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Specification for Painting

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Class: A

Status:

IDC: Inter-Discipline Check
IFC: Issued For Comment
IFA: Issued For Approval
IFR: Issued for Review
AFD: Approved For Design
AFC: Approved For Construction
AFP: Approved For Purchase
IFI: Issued For Information
AB-R: As-Built for COMPANY Review
AB-A: As-Built –Approved


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1. INTRODUCTION

National Iranian South Oil Company (NISOC) plans to conduct an integrated project includes several sub-projects to preserve and increase production of Gachsaran oil fields located in south of Iran Khuzestan and Bushehr provinces as follow:

- 1) Revamping of Production and Desalting Units of Bibi Hakimeh 1&2
- 2) Fabrication & Installation a Preheater, Stripping Column and Related Equipment for Nargesi Production Unit

The purposes of first sub-project are equipping and extension of Bibihakime-2 desalting unit to achieve 110,000 SBPD desalted crude oil, and necessary modifications in Bibihakime-2 desalting & production units and Bibihakime-1 production unit so that the new plants will be able to process crude oil with 22% water cut and transfer waste water from Bibihakime-1 production unit to waste water treatment facilities in Bibihakime-1 desalting unit via installation of a none-metal pipe. Therefore, National Iranian South Oil Company (NISOC) has announced this project.

The purpose of second sub-project is crude oil sweetening in Nargesi plant by new design and necessary modifications in existing facilities. National Iranian South Oil Company (NISOC), on behalf of the National Iranian Oil Company (NIOC) is responsible to exploit oil and gas from onshore fields in the south district of Iran. According to management of planning & international affairs of National Iranian Oil Company (NIOC) pronouncement, H₂S content and RVP specification of exported oil shall be in the specified allowable range; Accordingly, NISOC has decided to fulfil a project, investigating and probing required equipment and operational conditions to meet the desired crude oil specifications of sulphur content and RVP for Nargesi production units.





2. SCOPE

Revamping of Production and Desalting Units of Bibi Hakimeh 1&2 and Fabrication & Installation a Preheater, Stripping Column and Related Equipment for Nargesi Production Unit sub-projects.

3. DEFINITIONS

Within the context of this document, the following definitions are applicable

Owner/Client	: National Iranian south oil company (NISOC)
Title	: Development Plan of 28 Reservoirs/ BIBI HAKIMEH Oilfield (EPC)
Contractor	: Mashin Sazi Arak/ Sealand Engineering and Well Services JV
Consultant	: Daryapala Engineering Company

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Will: Is normally used in connection with the action by the “Company” rather than by a contractor, supplier or vendor.

May: Is used where a provision is completely discretionary

Should: Is used where a provision is advisory only.

Shall: Is used where a provision is mandatory.

4. CODES AND STANDARDS

The painting system of above ground piping systems will be designed, applied, inspected and tested in accordance with the requirements of this specification, the data sheets, the referenced project documents and other documents referenced therein. The latest revisions available at the date of issue of the enquiry shall apply.

The Codes, Standards and Regulations which follow are the industry codes and standards normally referenced for this type of materials.

The VENDOR/BIDDER shall obtain his own copies of the Codes, Standards and Regulations referenced herein. Failure to do so does not relieve the VENDOR/BIDDER of his obligation to offer equipment and materials in accordance with the Requisition and its attachments.





Where “in-house” standards have either been developed or are based on recognized National, International or industry standards these may be offered as an alternative, provided adequate detail is contained within the VENDOR/BIDDER's bid.

• Iranian Petroleum Standards

IPS-C-TP-102(1)	Construction Standard For Painting
IPS-E-TP-100(1)	Engineering Standard For Paint
IPS-C-TP-101(1)	Construction Standard For Surface Preparation
IPS-M-TP-215	Epoxy Polyamide Primer
IPS-M-TP-220	Epoxy Polyamide as Intermediate Paint
IPS-M-TP-225	Epoxy Polyamide as Top Coat
IPS-M-TP-235	Two Pack Aliphatic Polyurethane Paint as Top Coat
IPS-M-TP-210	Zinc Silicate Paint as Primer and Top Coat
IPS-M-TP-205	Zing-Rich Epoxy Paint As Primer, Intermediate And Top Coat(Finish)
IPS-M-TP-168(1)	Acrylic Silicon Finish Paint For Temperature Applications Up To 200°C
IPS-M-TP-790	Petroleum, petrochemical and natural gas industries Internal coating and lining of steel storage tanks
IPS-E-TP-350	ENGINEERING STANDARD FOR LININGS
IPS-C-TP-352	CONSTRUCTION STANDARD FOR LINING

• International Codes, Standards and Regulations

ASTM A385-2001	Standard Practice for Providing High-quality Zinc Coating (Hot-Dip)
ASTM D 520	Standard Specification for Zinc Dust Pigment
ASTM D4285-83	Test Method for Indicating Oil or Water in Compressed Air
ASTM D3359	Standard test method for measuring adhesion by tape test

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ASTM D4752	Standard Test Method for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
ASTM D4752	Standard Test Method for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
ASTM D2370	Test Method for Tensile Properties of Organic Coatings
A 123-2002	Specification for Zinc (Hot Galvanized) Coatings on Iron and Steel products
A 153-2001	Specification for Zinc Coating (Hot Dipped) on iron and steel hardware
SSPC SP COM	Surface Preparation Specification, Surface Preparation Commentary
SSPC 1to 10	Steel Structures Painting Council (surface cleaning)
SSPC Paint 20	Zinc Rich Primers
SSPC Paint 22	Epoxy polyamide
SSPC AB1-2000	Mineral and Slag Abrasive
SSPC PA1-2000	Shop, Field and Maintenance Painting
SSPC PA2-2002	Measurement of Dry Paint Film Thickness with Magnetic Gages
SSPC PA3	Guide to Safety and Painting Application
SSPC VIS 1	Visual Standard for Abrasive Blast Cleaned Steel
BS 3900	Methods of Testing for Paints
BS 7079(ISO 8501)	Preparation of Steel Substrates before Application of Paints and Related Products
BS 5493	Protective Coating of Iron and Steel Structures Against Corrosion 1977 Edition
BS 5750	Quality Systems
SIS-055900	Preparation of Steel Substrates before Application of Paints and Related Products Visual Assessment of Surface Cleanliness
NACE SP0198	Control of Corrosion Under Thermal Insulation and Fireproofing Materials
NORSOK M501	Surface preparation and protective coating
ISO 16961	Petroleum, petrochemical and natural gas industries — Internal coating and lining of steel storage tanks
ISO 8502-3	Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness Part 3: Assessment of dust on steel surfaces prepared for painting (pressure sensitive tape method)

5. REFERENCE DOCUMENTS

Not Applicable

6. ABBREVIATIONS

DFT	Dry Film Thickness
OD	Outside Diameter

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7. CONFLICTS AND DEVIATIONS

Any conflicts between this specification and other applicable specifications, engineering standards, industry standards, codes, etc., shall be resolved in writing by the Owner or Owner's Representative.

8. ORDER OF PRECEDENCE

The following order of precedence shall apply:

- Iranian Regulations, Codes and Standards
- The Requisition and Data Sheets
- This Specification
- Other Referenced Project Specifications
- Other International Codes, Standards and Regulations

9. UNITS

This specification is based on international system of units (SI).





10. GENERAL REQUIREMENTS

10.1 The normal method of application shall be airless spraying method.





- The gun shall be at right angles to the surface and 20 cm to 25 cm from the surface. Each pass of the gun shall overlap by 50%.
- No spraying shall be done within 15 cm of unprepared surfaces.
- All the Buried and insulated metallic surfaces shall be coated.

10.2 The Following Items Shall Generally Not be painted:

- Brickwork, concrete fireproofing and pavement not subjected to any attack from corrosion substances.
- Stainless steel, Aluminium, Nickel, Brass, Copper, Glass.
- Any equipment furnished completely primed and finish painted by the Manufacturer (e.g. instruments, instrument boards, motors) unless specifically required to repair paint damage or to match a color scheme.
- Surfaces to be protected by wrapping.
- Surfaces to be galvanized.

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- 10.3 Machined and treated surfaces shall be protected with a temporary rust preventive before apply the painting.
- 10.4 All un-insulated portions of insulated equipment comprising vessel nozzles, man way covers, valves, relief valves, etc., shall be painted to suit temperature conditions involved.
- 10.5 All un-insulated portions of insulated equipment comprising vessel nozzles, man way covers, valves, relief valves, etc., shall be painted to suit temperature conditions involved.
- 10.6 The painting system for external application to internally lined items shall be based on the outside wall temperature.
- 10.7 All supports, including skirts, legs, saddles, etc., shall be coated with the paint system for un-insulated surfaces as appropriate to the metal temperature of the equipment or piping being supported.
- 10.8 The paint system shall generally be based on the maximum operating temperature of the equipment and pipe work, this being with the exception of items where higher temperatures are involved in cyclic or intermittent operation including steam out, start up, regeneration and etc.
- 10.9 Where indicated on piping, exchanger, vessel or any other relevant data sheets that piping or items or equipment's are to be subjected to a Pre-commissioning steam cleaning process, the paint system employed shall take into account the designated steam out temperature and shall be suitable for temperature range 94°C to 200°C.
- 10.10 In the event of a field directive being issued to extend steam cleaning to other items of equipment and Pipework, the paint system shall, where necessary, be upgraded to reflect the requirements of 10.9.
- 10.11 Where field shop priming of straight pipe lengths or pipe spools is required, the priming coat may be either applied overall or omitted at each pipe end by the employment of 50 mm wide masking tape; this being applied immediately following blast cleaning operations. The tape shall be sufficiently durable to remain in position during transit and storage.
- 10.12 The applicator may be required, under a contract, to provide, erect and move scaffolding. Scaffolding shall be subject to the approval of the EPC contractor. Where n





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applicator shall provide the required illumination of an appropriate type, to meet the electrical classification for work area.

- 10.13 On completion of the works, the applicator shall without delay clear away and removal surplus materials, scaffolding, plant and equipment, and leave all areas in a clean and tidy condition to the satisfaction of the EPC contractor.
- 10.14 Manufacturer proposal shall specify the limits of his guarantees concerning the performance and characteristics.
- 10.15 The manufacturer shall assume the complete responsibility of the equipment included in the scope of supply and of the technical documentation.
- 10.16 The manufacturer shall be responsible for the conformity to all codes, standards, and recommendations referred in this specification. Any special certification requirements or inspections by other authorities shall be arranged by the EPC contractor.
- 10.17 If any mal-performance or defects occur during the guarantee period, (minimum 12 months after commissioning, including a 7 days continuous working) manufacturer shall make available repaired, altered or replacement parts free of any charges whatever direct on the purchaser's job site. Manufacturer shall make available free of charge to the purchaser qualified supervise the removal, repair manner that the guarantee be maintained.
- 10.18 All goods of project including abrasive & paint shall be selected from NISOC approved vendor list & shall be approved by technical inspection & corrosion affairs. Before utilization.
- 10.19 Preparation of metal surfaces shall be done with none-metal abrasive (copper slag) with a size of 0.5 to 1.68 mm.

11. APPLICATION PROCEDURES





- 11.1 The normal method of application shall be airless spraying method.
- 11.2 The gun shall be at right angles to the surface and 20 cm to 25 cm from the surface. Each pass of the gun shall overlap by 50%.
- 11.3 When a pause in spraying occurs, the material shall be blown back into the pot.
- 11.4 Any material not used in its pot life shall be destroyed and the containers used thoroughly cleaned.
- 11.5 No spraying shall be done within 15 cm of unprepared surfaces.

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- 11.6 Painting shall be applied soon after preparation - before flash rusting occurs.
- 11.7 The Manufacturer shall be responsible to provide values for all the basic properties of the material as specified in this specification.
- 11.8 All identification and markings whether internal or external to the pipe, shall be carefully recorded before surface preparation begins.
- 11.9 The date of painting finish and the Manufacturer marking, including pipe identification shall be legibly marked on painting surface of each length of pipe.
- 11.10 The painting process shall comply with the procedure established in the relevant painting procedures in this specification.
- 11.11 Rejected painting shall be removed only by the procedures specified by the Manufacturer. The process shall cause no mechanical damage to the pipe.
- 11.12 Manufacturer instruction shall be considered for painting surfaces whose recent intervals have passed.
- 11.13 For all equipment painting by the manufacturer the third party inspection certificate & ITP documents shall be issued & approved by NISOC.





12. MATERIAL HANDLING AND USE

- 12.1 All coating material shall be delivered to the shop or jobsite in original, unopened containers with labels intact. Minor damage to containers is acceptable provided the container has not been punctured or the lid seal broken.
- 12.2 Each container of coating material shall be clearly marked or labeled to show paint identification, date of Manufacturer, batch number, analysis of contents, identification of all toxic substances, and special instructions.
- 12.3 All containers of coating material shall remain unopened until required for use. Those containers, which have been previously opened, shall be used first. The label information shall be legible and checked at the time of use.
- 12.4 Coating material, which has livened, gelled, or otherwise deteriorated during storage, shall not be used; however, thixotropic materials which can be stirred to attain normal consistency may be used.
- 12.5 The oldest paint of each kind shall be used first in every case; paint is to be used before its shelf life has expired. In order to use paints which have exceeded their shelf life or have no stated shelf life and are more than one year old, the specified Manufacturer shall certify that it is still suitable for use.

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13. SURFACE PREPARATION

- 13.1 Surface preparation and primer, intermediate painting and final coating on piping, equipment and structural steel will be done in shop, and touch-up and coating repair will be done in the field.
- 13.2 Surface preparation shall not take place in the following conditions:
- At temperatures below 5°C (41°F).
 - When relative humidity is greater than 80%.
 - When mean surface temperature is less than 3°C (5°F) above the ambient dew point.
 - Outside day light hours on exterior locations.
- 13.3 Surface preparations may also be suspended at the direction of the EPC contractor's inspector, when adverse weather conditions are likely to develop before painting could be carried out.
- 13.4 Surface preparation of new steel surfaces shall remove all surface irregularities and mill scale, together with all rust and surface contaminants, such as grease, dirt and solid pollution.
- 13.5 Surface irregularities including weld spatter, rough capping, undercut and slag together with sharp or rough edges and burrs, surface laminations and laps shall be removed or made smooth prior to commencement of surface preparation. Such irregularities which become apparent after surface preparation by blast cleaning or hot acid pickling shall be similarly treated.
- 13.6 Grease or oil contamination shall be removed by either wiping or scrubbing the surface with rags or brushes wetted with spirit and then wiping down with clean dry cloths. Alternatively proprietary emulsifying agents may be used for this purpose and the surface then washed down with clean water. The surface shall be allowed to dry out before proceeding with further preparation and painting.
- 13.7 Selection of abrasives for blast cleaning shall be in accordance with the recommendations given in IPS-E-TP-100 or SSPC-SP COM and the recommendations agreed with the individual paint Manufacturer for each type of paint used. Generally, this shall give a surface profile or anchor pattern within the range 50-75 microns with rogue peaks of maximum amplitude 100 microns. Spent abrasives shall be completely removed from the prepared surface by either vacuum cleaning or stiff brushing. For inorganic zinc primed surfaces the abrasive shall be ha





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and angular, for which reason shot shall not be acceptable. The surface profile shall be checked in conjunction with an approved roughens comparator.

- 13.8 All abrasives shall be free of all dust, dirt and other foreign matter. They shall be kept dry at all times and shall not be recycled specifically permitted by the EPC contractor.
- 13.9 The pressure and volume of the compressed air supply for blast cleaning shall meet the work requirement and shall be sufficiently free from oil and water contamination to ensure that the cleaning process is not impaired. Traps, separators and filters shall be emptied and cleaned regularly.
- 13.10 Chipping, scraping and steel wire brushing using manual or power driven tools cannot remove firmly adherent mill scale and shall only be used where blast cleaning is impractical and with the approval of the EPC contractor 's inspector. Such preparation shall be in accordance with the photographic illustrations in SSPC 1991 grade SP 2 or 3 as specified in the schedule.
- 13.11 All bolt holes shall be drilled and smoothed before blast cleaning.
- 13.12 Cleaning shall be discontinued each day in sufficient time to permit the cleaned surfaces to be primed before the end of the working day.
- 13.13 Extreme care shall be exercised to prevent damage when blasting near instruments, nameplates, machined surface and factory coated items. These priming shall be carried out within 4 hours of blasting and before any visible deterioration of the surface occurs.
- 13.14 The surface shall be cleaned as specified in the documents. In the event that no cleaning method has been specified, the surface preparation shall not be less than the paint Manufacturer's recommendations for the intended service environment.

14. MIXING, THINNING AND STORAGE





- 14.1 All ingredients in any container shall be thoroughly mixed before use and shall be agitated often enough during application to keep the paint uniform. Paint shall be carefully examined after mixing for uniformity and to verify that no unmixed pigment remains in the bottom of the container.
- 14.2 All containers of coating material shall remain unopened until required for use.

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- 14.3 Coating material mixed in container shall not be transferred until all settled pigment is incorporated in the vehicle. This does not imply that part of the vehicle may not be poured off temporarily to simplify the mixing.
- 14.4 Mixing in open containers shall be done in a well-ventilated area away from sparks or flames.
- 14.5 Coating material shall not be mixed or kept in suspension by means of an air stream bubbling under the paint surfaces.
- 14.6 Where a skin has formed in the container, the skin shall be cut loose from the sides of the container removed and discarded. If the volume of such skins is more than 2% of the remaining paint, the paint shall not be used.
- 14.7 All pigmented paint shall be strained after mixing except where application equipment is provided with strainers. Strainers shall be of a type to remove only skins and undesirable matter but not to remove the pigment.
- 14.8 Material which does not have a limited pot life, or does not deteriorate on standing may be mixed immediately before using. Coating material shall not remain in spray pots or buckets overnight but shall be gathered into a closed container and remixed before use.
- 14.9 No thinner shall be added unless necessary for proper application. Thinning shall not exceed the limitations established by manufacturer & approved by the EPC contractor.
- 14.10 Type of thinner shall comply with manufacturer's instruction.
- 14.11 When use of thinner is permissible, it shall be added during the mixing process. Painters shall not add thinner after it has been thinned to the proper consistency. All thinning shall be done under supervision.

15. APPLICATION

- 15.1 All coating shall be carried out in conformity both with this specification and with the coat Manufacturer's recommendation. Coat application shall also follow the procedures covered in IPS-E-TP-100, field and maintenance painting.
- 15.2 Surfaces shall not be coated in rain, dusty wind, fog, mist or in areas where injurious air burned elements exist; when the steel surface temperature is less than 3°C (5°F) above dew point, when





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the relative humidity is greater than 80% or when the temperature is below 5°C (41°F) or temperature above 40°C.

- 15.3 Blast cleaned surfaces shall be coated with a complete application of primer as soon as practicable but in no case later than the same day as sandblasting in order for the blasted area not to be affected by weathering.
- 15.4 To the maximum extent practicable, each coat of material shall be applied as a continuous film of uniform thickness free of pores. Any thin spots or areas missed in the application shall be re-coated and permitted to dry before the next coat is applied.
- 15.5 Each coat shall be in a proper state of cure or dryness before the application of the succeeding coat. Material shall be considered dry for re-coating when an additional coat can be applied without the development of any detrimental film, irregularities, such as lifting blistering, crocodilian, paint running, sagging, etc. or loss of adhesion of the undercoat. The time interval between coating applications shall be in compliance with manufacturer's instructions.
- 15.6 When successive coats of the same color have been specified, alternate coats shall be tinted, when practical, sufficiently to produce enough contrast to indicate complete coverage of the surface. When the paint is of the color of the steel, the first coat to be applied shall be tinted. The tinting material shall be compatible with the paint and not detrimental to its service life.
- 15.7 All nameplates, manufacturer's identification tags, machined surfaces, instrument glass, finished flange faces, control valve stems and similar items shall be marked to prohibit coating deposition. If these surfaces are coated, the component shall be cleaned and restored to its original condition. Edges of structural shapes and irregular surfaces shall be coated first and an extra pass made later. Contact surfaces for components (bottom of skid mounting surfaces of equipment... etc.) are included in the scope of work to be coated. Wet paint shall be protected against contamination from dust or other foreign matter.
- 15.8 Skill assessment of persons in charge of application of coating shall be done before starting of project and in presence of client representative of metal corrosion office.

16.GALVANIZING

- 16.1 Galvanizing shall be in accordance with ASTM A-123 on products fabricated from rolled, pressed and forged steel snaps, plates, bars and strips except those pipes for hand railing shall





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meet ASTM A-153. The weight of zinc coating shall be average not less than 765 gr per square meter (average thickness of zinc 107 microns). Galvanized surfaces shall not be painted.

- 16.2 Galvanized members other than grating which are to be permanently fixed to the structure by welding shall be attached after the supporting members are primed, but before top coats are applied.
- 16.3 The heat-affected area shall be cleaned of all welding flux, sandblasted, and primed with the same coating.
- 16.4 All grating support members shall be finish coated before securing the grating, and then those weld areas shall be white metal blasted and coated. New or untreated galvanized surfaces that require painting shall be pretreated with a phosphoric acid base - wash coat.
- 16.5 Degrease according to IPS-C-TP-101(1) solvent cleaning, ensure the surface is clean, dry and free from contamination and zinc salts, and abrade if necessary to remove passive surfaces. Brush applies the phosphoric acid based wash coat in an even flowing coat and allows drying. The surface should turn dark grey, any area which fails to turn dark grey should be recleaned and abraded and a further coat of etch solution applied. Alternatively, galvanized surfaces shall be prepared by sweep blasting with fine sand in lieu of phosphoric acid base coat.
- 16.6 Small areas of galvanized coating damaged by welding, cutting... etc., shall be repaired by using low melting point zinc alloy repair rods or powders made specific any for this purpose. The repair procedure shall be submitted to the EPC contractor for approval. The use of other methods shall be subject to approval by the EPC contractor. Sufficient thickness material shall be applied to provide a zinc coating at least equal to the galvanized layer, major areas of damage shall be re-galvanized.

17.REPAIR OF DAMAGED PAINT SURFACES

- 17.1 When factory painted surfaces has been marred in handling, transportation or storing, the damaged paint and non-adherent paint shall be removed and the surface thoroughly cleaned in accordance with EPC contractor instruction.
- 17.2 The edges of the damaged area shall be smoothed. Surface preparation shall extend approximately 5 cm into the second coat. The primer and finishing coats shall be applied in accordance with paragraph 9.0

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17.3 Coated surface within the scope of this Specification that is damaged during assembly or handling shall be repaired in accordance with procedures accepted by Buyer.

17.4 The surface profile shall be restored to meet the specified surface treatment requirements. The periphery of a damaged area shall be polished prior to coating application.

17.5 Inorganic zinc primer shall be touched up with organic zinc epoxy for temperature no more than 121°C.

Note: If grit blasting is not applicable for any reason to be agreed upon by EPC contractor or inspector, zinc silicate primer shall not be used for touch up repairs. Zinc rich 2 components epoxy primer or an approved epoxy primer formulated for application by hand or mechanically brushed surfaces should be used instead. The touch-up primer shall be compatible with the paint system.

18. PREPARATION OF SHOP PRIMED SURFACES FOR OVERCOATING

18.1 Any primed surface which has been exposed for more than a few days will have become contaminated and should be cleaned down with fresh water and allowed to dry before over coating application.

18.2 Primed and painted surfaces which have been exposed to marine conditions, including shipment overseas, will be contaminated with salt and shall be lightly wire brushed, then washed with fresh water, before over coating application.

➤ Although zinc rich primers are very effective in preventing rusting, extended exposure develops a surface contamination of zinc corrosion products which may impair the adhesion of subsequent coats- Zinc rich primers, both organic and inorganic staining, should be prepared for over coating application by one of the following methods:





- Light blast cleaning and dust removal.
- Wire-brushing, followed by water washing.
- Scrubbing with fresh water, using bristle brushes.

17.1 The time interval between coating steps shall be according to the vendor comments.

19. MATERIALS

Coating materials shall be in accordance with related IPS-M-TP standards as mentioned in Reference standard in clause 3 of this specification as below:


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19.1 Epoxy polyamide intermediate coat

The paint material composition shall meet IPS- M- TP- 220.

19.2 Aliphatic polyurethane

The paint material shall meet the requirements of IPS- M- TP- 235.

19.3 Zinc rich epoxy

The paint shall meet the qualitative requirements of IPS- M- TP- 205.

19.4 Inorganic zinc-rich





The paint shall meet the requirements of IPS- M- TP- 210.

Note: All paint materials for different layers should be from same manufacturer.

All test for each type of paint material shall be done at presence of third party inspector and client representative according to relevant standard.

20. INSPECTION AND TESTING

- 20.1 All work and materials applied under this specification shall be subject to inspection by the CLIENT.
- 20.2 All parts of the work shall be readily accessible to the inspector.
- 20.3 The inspector or resident engineer shall approve all surface preparation prior to application of any coating.
- 20.4 Each coat shall be inspected prior to application of the next coat. Areas found to contain runs, over spray, roughness, pin holes or other signs of improper application shall be repaired in accordance with the manufacturer's recommendations at EPC contractor's expense.
- 20.5 All surfaces to which coatings are applied shall be free of dirt, grease, chemicals and other contamination. The CLIENT representative shall have the formal determination on suitability of the surface for coating.
- 20.6 The completed coating shall be inspected for runs for wet and dry film thickness, over spray and roughness and any signs found to show these or other signs of improper application shall be repaired or recoated in accordance with the manufacturer's recommendations at the EPC contractor's expense.
- 20.7 All inspection facilities and equipment's shall be provided by EPC contractor.
- 20.8 The Manufacturer shall communicate with the purchaser regarding fabrication schedule within max one month from the reception of the order, so that CLIENT and EPC CONTRACTOR

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representatives can follow up the execution of the various elements and witness all tests and inspections performed by manufacturer.

- 20.9 Inspecting and testing shall usually be carried out during manufacture at the manufacture's work. CLIENT or the EPC CONTRACTOR or their representative reserves the right to witness the normal process of fabrication.
- 20.10 In case of unsatisfactory results during the test, CLIENT and EPC CONTRACTOR shall have the right to proceed with any usual cross-test. The additional test should be carried out at the expense of the manufacturer.
- 20.11 All tests shall be carried out as per approved Inspection & Test Procedure Forms (ITP forms). Third Party inspector (from an approved list offered by CLIENT) which is nominated by EPC contractor shall inspect the material and equipment at different stages of manufacturing, testing and packing for shipment.
- 20.12 Client representatives reserve the right for witness and they shall be notified at least 3 working weeks before proposed A/M scheduled date. All ITP forms shall be prepared and attached to fabrication documents and shall be approved by client, before final inspection.

20.13 Surface preparation

Comparison of cleaned surfaces by visual check with relevant specified photographic standard IPS-C-TP-101(1) will be done.





20.14 Adhesion

Verification of paint adhesion shall be done according to the relevant method indicating in each coating standards. For internal system (Glass flake, Novalak epoxy) Pull off test shall be done.

20.15 Film thickness measurement

In order to achieve the specified dry film thickness frequent checks of wet film thickness shall be carried out during the paint application with film thickness gauges such as the elcometer wheel or comb type.

Dry Film Thickness (DFT) determinations shall be performed as specified in IPS-C-TP-100(1) or SSPC-PA2"MEASUREMENT OF DRY PAINT THICKNESS WITH MAGNETIC GAUGES".

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20.16 The assessment of dust and dirt retained shall be done on blast surfaces according to the BS EN ISO 8502-3 with maximum class 2 ratings.

20.17 Holiday testing shall be done for internal coating of vessel in case of client request





21. MANUFACTURER'S STANDARDS

- 21.1 Pumps, Motors, compressors, heat exchangers, fired heaters and other specified items shall be painted per Manufacturer's standard. Vessels and Tanks shall receive one prime coat prior to delivery.
- 21.2 The protection time of items delivered only with the prime coat shall be guaranteed for a period of at least 2 years in an industrial environment, provided roofed storage area or packing in waterproof foil is assured.
- 21.3 The coating shall be suitable for the involved design temperature.
- 21.4 Manufacturer standard painting shall be of the same or higher quality level than provided in this specification. Painting system selected will be communicated to EPC contractor for approval before starting of work.
- 21.5 The Manufacturer shall be in a position to submit to the EPC contractor, his proposed quality control and testing procedures covering all phases of surface preparation and shop paint application and associated procedures which define how control is established and maintained.
- 21.6 Any defect or damage that may occur shall be repaired before the application of further coats and where necessary the particular surface made paint free. During the agreed maintenance period, any observed defective coatings, rusted areas or failures, shall be repaired to the satisfaction of the EPC contractor.

22. PAINTING SYSTEM

- 22.1 Unless otherwise noted, surface preparation and priming on piping will be done in the shop, and only touch-up and finish painting will be required in the field. surface preparation and painting on valves, vessels, exchangers, air cooler, pump and other equipment and structural steel shall be by vendor, and only touch-up will be required in the field (Table II). Field painting systems shall be executed in accordance with this specification (Table I). It is to be noted:

- Painting systems are referred to the operating temperature.

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23.INTERNAL COATING





Internal coating shall only be selected for vessels and tanks where coating can be inspected during shut down periods and readily repaired, and where the application of internal metallic cladding with corrosion resistance alloys imposes a sever cost penalty.

Service experience with internal coating systems is somewhat chequered and there remain numerous concerns over the use of such coatings in process vessels. These include following which shall be taken into account when selecting an internal coating:

- Resistance to blowdown and explosive decompression, coating therefore are limited to lower pressure systems.
- Temperature limits, therefore it is recommended they are limited to a maximum operating temperature guaranteed by the manufacturer.
- Abrasion resistance they are easily damaged and degraded.
- Impact resistance they are easily damaged and degraded.
- Application and the ability to achieve a defect free coating. Experience has indicated that workmanship has been a significant contributing factor in the premature failure of vessels internally coated. Therefore the vessel shall be constructed in such a way that the internal design and finish permits proper surface preparation and adequate access to properly apply to coating system.
- Service life, once in use, frequent inspection is required to check on coating condition and if necessary repairs shall be carried out in a timely manner to prevent accelerated corrosion of the base metal, therefore, it is required that the design of the vessel and the overall plant layout allow for such inspection and repair.

Selection of the correct coating for a specific application requires that all available details are concerning the vessel to be lined and the process to be contained, be itemized for coating manufacture. Some of the essential data follow:

- Type of process stream contained in the vessel and their concentration and the amount of impurities, if any
- Temperature maximum, minimum and operating temperature, severity and spread of temperature change, temperature cycle time.
- Pressure, maximum and minimum, and operating pressure or vacuum, pressure cycle time.

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- Equipment complete description to be coated including physical design, dimension and information on whether it is stationary or portable
- Past experience under similar condition such as coating compound used and length of previous service life
- Abrasive particle types, weight, and size, velocity of particle movement, properties of solids, nature of abrasive action (sliding or impinging)

Armed with this information the coating manufacture should be evaluated the various type of products that could satisfy application requirements. Each of the parameters shall be analysed separately so that the final coating selection takes into account all of the specific needs of application. The manufacturer of the coating selected must confirm in writing before it can be used, that the coating can withstand the proposed process conditions and can withstand steam out condition in the vessel of 120°C. Coating of internal parts shall be carried out as per IPS-E-TP-350 and IPS-C-TP-352 and **IPS-M-TP-790**.

The principle of Glass Flake coating system lies in providing laminar glass fillers with tortuous path through the resin binder so that the corrosive ions traveling through the binder have to travel a much longer distance. The distance traveled will depend upon the thickness of the flakes and the number of layers of glass flakes in a given coating. Glass flakes are offered in a number of compositions, each with individual functionality suitable for various applications.

Where a coating are considered suitable for use, the type of coating, method of applying the coating and the thickness of the coating will be determined as part of the detailed design, and also as per IPS-E-TP-350, IPS-C-TP-352 and manufacturer's recommendations.










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TABLE 1 - PAINTING SYSTEM





Item	Operating Temp. (°C)	Paint Sys. No.	Surface Preparation Grade IPS-C-TP-101	Layer	Paint	Minimum Dry Film Thickness (microns)	
						DFT per Coat	Total DFT
STRUCTURE STEELS							
Un-fireproofed Structural Steel (Structural and Steel Supports for Equipment)	n/a	A	Sa 2-1/2	Primer	Zinc-Rich Epoxy IPS-M-TP-205	75	205
				Intermediate	Epoxy Polyamide IPS-M-TP-220	80	
				Topcoat	Two Pack Polyurethane IPS-M-TP-235	50	
Platforms, Ladders, Cages, Handrails and Stairways	n/a	A	Sa 2-1/2	Primer	Zinc-Rich Epoxy IPS-M-TP-205	75	205
				Intermediate	Epoxy Polyamide IPS-M-TP-220	80	
				Topcoat	Two Pack Polyurethane IPS-M-TP-235	50	
PIPING SYSTEMS							
Un-insulated Pipe Fittings and Flanges (and also Un-insulated Insulated Valves)	Up to 120	A	Sa 2-1/2	Primer	Zinc-Rich Epoxy IPS-M-TP-205	75	205
				Intermediate	Epoxy Polyamide IPS-M-TP-220	80	
				Topcoat	Two Pack Polyurethane IPS-M-TP-235	50	
Insulated Pipe Fittings and Flanges	Up to 120	C	Sa 2-1/2	Primer	Zinc-Rich Epoxy IPS-M-TP-205	50	250
				Intermediate	Epoxy Polyamide IPS-M-TP-220	100	
				Topcoat	Epoxy Polyamide IPS-M-TP-220	100	
Pipe Supports	n/a	A	Sa 2-1/2	Primer	Zinc-Rich Epoxy IPS-M-TP-205	75	205
				Intermediate	Epoxy Polyamide IPS-M-TP-220	80	

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Item	Operating Temp. (°C)	Paint Sys. No.	Surface Preparation Grade IPS-C-TP-101	Layer	Paint	Minimum Dry Film Thickness (microns)	
						DFT per Coat	Total DFT
				Topcoat	Two Pack Polyurethane IPS-M-TP-235	50	
Un-buried UG Pipe Fittings and Flanges and Valves	Up to 120	A	Sa 2-1/2	Primer/ Intermediate	Solvent Free Epoxy NORSOK M501	1000	1050
				Topcoat	Epoxy Polyamide IPS-M-TP-220	50	
EXTERNAL COATING SYSTEMS FOR EQUIPMENTS							
Un-insulated Tanks, Vessels (External)	Up to 120	A	Sa 2-1/2	Primer	Zinc-Rich Epoxy IPS-M-TP-205	75	205
				Intermediate	Epoxy Polyamide IPS-M-TP-220	80	
				Topcoat	Two Pack Polyurethane IPS-M-TP-235	50	
Insulated Tanks, Vessels (External)	Up to 120	C	Sa 2-1/2	Primer	Zinc-Rich Epoxy IPS-M-TP-205	50	250
				Intermediate	Epoxy Polyamide IPS-M-TP-220	100	
				Topcoat	Epoxy Polyamide IPS-M-TP-220	100	
INTERNAL COATING SYSTEMS FOR EQUIPMENTS							
Nut Shell Filters, Hydro cyclone, IGF Vessel, Separator's Internal Surfaces, Desalter's Internal Surfaces (The Bottom Half)	Up to 120	D	Sa 2-1/2	Flake Resin (1st Layer)	Glass Flake Epoxy IPS-E-TP-350 IPS-M-TP-790	500	1000
				Flake Resin 2nd Layer	Glass Flake Epoxy IPS-E-TP-350 IPS-M-TP-790	500	
Flare K.O Drum, H.C Closed Drain Drum, Free Water Surge Drum,	Up to 120	E	Sa 2-1/2	Primer	The type and thickness of paint and coating shall be solvent free epoxy/ novolac epoxy according to NORSOK M501 IPS-M-TP-790		
				Intermediate			
				Topcoat			



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Item	Operating Temp. (°C)	Paint Sys. No.	Surface Preparation Grade IPS-C-TP-101	Layer	Paint	Minimum Dry Film Thickness (microns)	
						DFT per Coat	Total DFT
Indirect Fired Heater Internal Surface, Desalter's Internal Surfaces (The Upper Half)							
Fire water tank			Sa 2-1/2	Primer	COAL TAR IPS-M-TP-190	150	450
				Intermediate	COAL TAR IPS-M-TP-190	200	
				Topcoat	COAL TAR IPS-M-TP-190	200	
Aire Receiver	Up to 120	J	Sa 2-1/2	Primer	Epoxy Polyamide IPS-M-TP-220	125	375
				Intermediate	Epoxy Polyamide IPS-M-TP-220	125	
				Topcoat	Epoxy Polyamide IPS-M-TP-220	125	
Indirect Fired Heater Stack	201°C TO 400°C	F	SA 3	Primer	Zinc-Silicate Paint IPS-M-TP-210	75	125
				Intermediate	Heat Resistance Silicon Aluminium	25	
				Topcoat	Heat Resistance Silicon Aluminium	25	
<div>1. For suitable primers/topcoats, consult Protective Coatings Manufacturer.</div> <div>2. Thickness of solvent free epoxy shall be approved by vendor.</div> <div>3. For solvent free epoxy paint, the laboratory test report according to IPS-M-TP-790 shall be considered according to the client request before purchase order complete.</div> <div>4. The RAL of each layer external system paint shall be different.</div>							





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TABLE 2- SPLIT OF PAINTING WORK





Item		At Vendor Shop	At Construction	
			At Field Shop	At Field
Piping	Pipe, Fitting, Flange	Rust Prevention	Up to Primer	Intermediate & Topcoat
	Valve	Up to Primer	-	Intermediate & Topcoat
Structural Steel		Up to Primer	-	Intermediate & Topcoat
Equipment/Heat Exchanger and Air Cooler and Heater	External	Complete Painting System	-	Touch up
	Internal	Complete Painting System	-	-
Tanks	External	Pre-fabrication primer	-	Complete painting system
	Internal	Complete Painting System	-	Touch up
Ducts and Stacks – Flare and Blow downs		Complete Painting System	-	Touch up
Pumps, Compressors and Drivers		Complete Painting System	-	Touch up
Electrical and Instrumentation		Complete Painting System	-	Touch up
Fire Equipment – Hydrants, Fire Hose Boxes, etc.		Complete Painting System	-	Touch up

Paint color RAL for piping, vessels and equipments shall be 7047 (except for firefighting piping). Painted bands shall be compatible with the underlying paint system or insulation jacketing and shall be provided at the following significant points of plant:

- Every 20 meter intervals of the straight runs.
- Commencement and termination of pipe run.
- Branches.
- On either side of each wall penetration, fitting & valve.
- 1.5 m away from connection to equipment.

The width of the basic color band shall be 2 x 120 mm and marked on two opposite sides of piping. The code color band shall be positioned in the center of the basic color and shall be of the following widths:

- Pipes up to NPS 8": 50 mm wide.

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- Pipes NPS 10" and above: 100 mm wide.

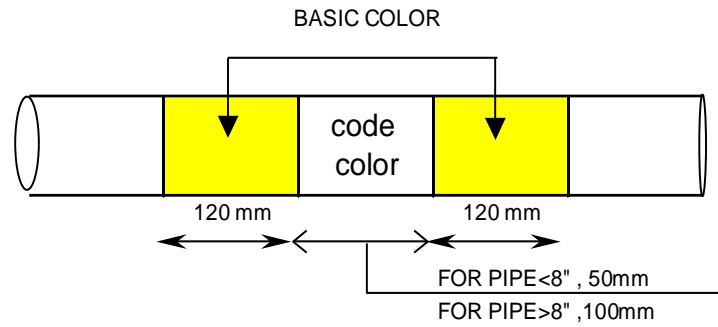


Figure 1 - BASIC COLOUR