طرح نگهداشت و افزایش تولید ۲۷ مخزن

SPECIFICATION FOR LINING
(INTERNAL PROTECTION OF EQUIPMENT BY PAINTING)

نگهداشت و افزایش تولید میدان نفتی بینک

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

REVISION RECORD SHEET

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1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields CLIENT (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD/EPC CONTRACTOR:	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPC CONTRACTOR and approved by GC & CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

This document defines the technical requirements for the execution of painting works for high durability internal protection of equipment against corrosion and/or of products against pollution or contamination. It is supplementary to the relevant design codes, international standards and project specifications for any pressure-retaining components.

3.0 NORMATIVE REFERENCES

3.1 Local Codes and Standards

- GS-EP-COR-352 — Internal protection of equipment by painting
- IPS-E-TP-350 — Construction Standard for Lining
- IPS-E-TP-350 — Engineering Standard for Lining
- IPS-C-TP-101 — Construction Standard for Surface Preparation
- IPS-C-TP-352 — Construction Standard for Lining
- IPS-E-TP-760 — Engineering Standard for Corrosion Consideration in Design

3.2 International Codes and Standards

- ISO 8501 — Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness - (Parts 1; 2; 3)
- ISO 8502 (Parts 1; 2; 3; 4; 6; 9) — Preparation of steel substrates before application of paints and related products. Tests for the assessment of surface cleanliness - (Parts 1; 2; 3; 4; 6; 9)
- ISO 8503 (Parts 1; 2; 3; 4) — Preparation of steel substrates before application of paints and related products. Surface profile of abrasive blast-cleaned steel - (Parts 1; 2; 3; 4)
- ASTM D 4940 — Standard test method for conduct metric

	analysis of water soluble ionic contamination of Blasting abrasives
• ASTM D 3359	Standard Test Methods for Measuring Adhesion by Tape Test
• ISO 19840	Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces
• ISO 16276 (Parts 1; 2)	Corrosion protection of steel structures by protective paint systems - Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength)
• ASTM D 4752	Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub1
• ISO 8504	Preparation of steel substrates before application of paints and related products — Surface preparation methods-Part 2: Abrasive blast-cleaning
• ISO 21809-3	Internal coating and lining of steel storage tanks
D02 • ISO16961	Internal coating and lining of steel storage tanks
•	
• ASTM-A-106	Specification for Seamless Carbon Steel Pipe for High Temperature Service
• ASTM-A-240	Specification for Heat Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
• ASTM-A-262	Practices for Detecting Susceptibility to Intergranular Attack in Austenitic
• ASME-SA-263	Specification for Corrosion Resisting Chromium-Steel Clad Plate
• ASME-SA-264	Specification for Stainless Chromium

	Nickel Steel Clad-Plate, Sheet
• ASME-SA-265	pecification for Nickel and Nickel –Base Alloy-Clad Steel Plate
• ASTM-A-285	Specification for Pressure Vessel Plates Carbon Steel, Low and Intermediate Tensile Strength
• ASTM-A-516	Specification for Pressure Vessel Plates, Carbon Steel, for Moderate and Lower-Temperature Service
• ASME-Sec.II Part C	Material Specifications for Welding Rods, Electrodes and Filler Metals
• ASME-Sec. V	Nondestructive Examination
• ASME-Sec.VIII.D.1-APP.6	Methods for Magnetic Particle Examination (MT)
• ASME-Sec.VIII.D.1-APP.8	Methods for Liquid Penetrate Examination (MT)
• AWWA-C-210	Liquid- Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
• BS 6374	Lining of Equipment with Polymeric Materials for The Process Industries
• NORSOK M501	Surface preparation and protective coating

3.3 The Project Documents

• BK-GNRAL-PEDCO-000-PI-SP-0006	Specification for Painting
• BK-GCS-PEDCO-120-PI-RT-0001	Corrosion Study & Material Selection Report

3.4 Environmental Data

Refer to "Process Basis of Design; Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001".

4.0 TECHNICAL SPECIFICATION

All paints and paint materials shall be selected of CLIENT vendor list.

All material shall be supplied in the Manufacturer's original containers, durably and legibly marked with the description of the contents. This shall include the specification number, the color reference number, the method of application for which it is Intended, the batch number, thinner number, mixing ratio, flash point, safety recommendation, date of manufacturer, the shelf-life expiry date and the Manufacturer's name or recognized trade mark.

Different brands or types of paints shall not be inter-mixed.

Samples for testing the paint being used may be taken by the CLIENT at any time. If a sample fails to meet the required specification, the paint contractor or equipment vendor shall remove this paint from areas and recoat them with another paint that meets the specification.

4.1 Certification of personnel

Operators shall be individually certified by an approved organization (ACQPA, FROSIO, etc.).

Inspectors shall be individually certified by an approved organization (ACQPA, FROSIO, NACE international minimum level 3, etc.).

5.0 SURFACE PREPARATION

5.1 Design and preparation before blasting of surfaces to be painted

The design of the item to be painted shall be such that it creates no interstice and inaccessible area. All Sharp edges shall be rounded (minimum radius> 2 mm).

All oil or grease shall be removed by washing the item to be painted with appropriate solvents or any other suitable means before beginning blast-cleaning operations. This includes bolt holes in piping assemblies.

Weld spatter and remains of temporary welds, deposits or surface defects shall be eliminated by appropriate means; removal by deep grinding is subject to CLIENT approval.

All mating surfaces of equipment shall be coated with the full coating system prior to assembly (base plates, bolted components, flanges, etc.).

Contractor shall protect all equipment that is not to be painted or may be affected by the presence of abrasives or paint. Special attention shall be paid to avoid splashes of zinc paint on equipment made of austenitic steels.

5.2 Quality of abrasives

Abrasives shall be sealed in watertight packaging. Any product delivered in defective packaging shall be rejected. Products must be stored sheltered from the elements. Conductivity of abrasives shall be less than 150.10-6 Siemens/cm as per ASTM D 4940.

The use of copper slag or silica sand is strictly prohibited.

5.3 Blast cleaning of carbon steel

All surfaces to be coated shall be blast-cleaned (ISO 8504) according to:

- The grade of cleanliness (ISO 8501 standard)
- The surface profile Ra (ISO 8503 standard: roughness meter with adapted cut-off or visio tactile surface profile comparator)

After blast-cleaning, all dust must be removed using a vacuum cleaner before application of the paint in order to achieve the maximum dust level specified for each system (ISO 8502-3).

All blast-cleaned surfaces shall be coated before the deterioration of the "grade of cleanliness".

In any case, any surface that has been blast-cleaned shall be coated on the same day.

Before painting works commence, checks for the contamination of the surface by salts shall be carried out (ISO 8502-6 & ISO 8502-9).

6.0 PROCUREMENT AND STORAGE

The quantities of paint and thinners required to perform the entire job shall be procured before the work commences, except in cases where the shelf life of the product is less than the anticipated duration of the work.

Thinners, solvents, etc. shall be stored in a suitably ventilated fireproofed building, separate from other painting consumables.

The products shall be delivered in their original sealed packaging and stored in such conditions as to avoid their degradation (controlled temperature, etc.). The packaging shall be clearly marked with the product description, the batch number, the fabrication date and the expiry date.

The shelf life from the fabrication dates are:

- For zinc ethyl silicate: 6 months
- For other products: 1 year
- Specific cases: according to Manufacturer's recommendation with CLIENT approval.

7.0 PAINT APPLICATION

Paint shall always be applied to surfaces that are dry, clean and degreased, for both coating on substrate and previous coat.

Painting works shall not proceed if:

- Temperature of the substrate is less than 3°C above the dew point
- The relative humidity is more than 85% RH (90% RH for inorganic zinc silicates)
- The weather is rainy or foggy, except under shelter, and subject to verification of the atmospheric conditions
- The minimum and maximum temperature of the ambient atmosphere and the substrate are out with the limits given in the product datasheets. Minimum application temperature is usually 10°C.

The thickness of each coat, including frequency and tolerance shall be checked by the Contractor according to ISO 19840. The values shall be recorded and made available to CLIENT.

8.0 CHECKS, INSPECTION AND ACCEPTANCE

8.1 Checks

Throughout the duration of the work, Contractor's Quality Control department shall check the following points and record the results in its daily quality control report.

- Construction quality:

  - Rounding of corners, sharp edges to 2 mm radius minimum

  - Form, quality and continuity of welds.

- Surface preparation quality:

  - Grade of cleanliness: Sa 3 according to ISO 8501

  - Cleanliness: no grease or oil, dust level 2 maximum according to ISO 8502-3

  - Anchoring profile: G medium according to ISO 8503.

- Contamination including chlorides: according to ISO 8502-6 and ISO 8502-9, 30 mg/m² maximum.

- Climatic conditions for application (all measured before the work commences and twice per shift and when ambient conditions are obviously changing): temperature of substrate at least 3°C above dew point, maximum humidity 85% RH (90% for inorganic zinc silicates), ambient temperature (>10°C for epoxy, >5°C for polyurethane), weather conditions.

- State of curing of primer and of each coat.

- For inorganic zinc silicate: record of spraying with fresh water to enhance hydrolysis (if relevant) and results of MEK test: Level 5 according to ASTM D 4752.

- Interval between coats (in accordance with Supplier product datasheets).

- Wet film thickness for each coat immediately after application.

- Number of coats, DFT of each coat and of the final system:

Dry paint thickness shall be measured with a magnetic probe, such as Micro test or Elcometer or equivalent. It is imperative that the magnetic probe be calibrated for each thickness of coating steel support with a non-magnetic block whose thickness is as close as possible to the coating being checked. Each coat's thickness and total thickness shall be checked. Make five (5) separate spot measurements spaced evenly over each section of the structure 10 square meters in area (divide the entire surface in 10 square meter areas). On each spot, make 3 readings by moving the probe a short distance for each new gage reading.

Discard any unusually high or low gage reading that cannot be repeated consistently. Take the average of the three (3) gage readings as the spot measurement.

For each successive coat, the minimal allowable thickness shall be at least 80 % of the specified thickness; the maximum thickness shall not exceed 150 % of the specified thickness.

For the total system, the minimal allowable thickness shall be at least 80 % of the specified thickness, the maximum thickness shall not exceed 200 % of the specified thickness unless the paint remains soft or shows mud crack or orange skin or wrinkling which cause rejection of the paint.

Surfaces with out of tolerance coating thicknesses shall:

- be sand blasted if too thick and repainted,

- receive an additional paint coat to obtain specified thickness.

- Adherence Check, Paint adherence shall be checked as per ASTM method D 3359. Method A (X cut) shall be used for paint film thicker than 125 microns, Method B (lattice pattern) shall be used for paint films up to 125 microns.

- Appearance and colour.

- Porosity (ASTM D 5762)

Coating integrity shall be checked with a direct current holiday detector. The electrode shall consist of an eighty (80) cm^2 cellulose sponge soaked in a 1 % detergent solution in potable water. The instrument shall be calibrated and checked every hour to indicate a coating porosity of 80,000 ohms under a voltage of 67.5 volts between the ground and wet sponge. A resistance of 90,000 ohms indicates no porosity.

Sponge displacement speed on the surface shall not exceed 0.3 meters per second (18 meters per minute). The sponge shall be moved back and forth so that it passes over the same area twice. The measurement is taken on the second pass. A minimum of ten percent of the painted surface shall be examined. If there is any porosity, the Inspector or the Owner representative shall have the entire painted surface inspected.

An alternating current holiday detector may be used. In this case, the voltage between the painted steel surface and the test electrode shall be 5 volts per micron of paint coat thickness.

The inspector shall mark defective areas for repair.

Any porous area shall be repaired in accordance with paragraph 10.4. When the number of pores is greater than 3 per square meter, the entire area shall be blast cleaned and repainted as per this specification.

8.2 Inspection test plan

An inspection test plan including all the points in section 8.1 shall be prepared and submitted to CLIENT. The Inspection Plan shall clearly indicate frequency of testing for each check.

8.3 CLIENT inspection

CLIENT Inspector shall have free access to storage areas, workshops, yards where the works will be performed. Contractor shall also provide CLIENT Inspector with all office facilities necessary for the execution of his work (telephone, fax, handling equipment, measuring instruments with valid calibration certificates, etc.).

Upon arrival of CLIENT Inspector on site, Contractor shall supply him with all relevant documentation regarding the works to be carried out.

D02

Coating material must be evaluated in a valid third party laboratory in accordance with approved ITP and under supervision of CLIENT's representative.

9.0 GUARANTEE COVERAGE

The Contractor and/or the paint Manufacturer and/or the Applicator shall commit themselves to retouching any or all paint-work if it does not satisfy the aforementioned requirements at any time during the guarantee period.

By retouching, is meant surface preparation, procurement and application of the paint, as per this specification, at the work site and at the expense of the Contractor and/or the paint Manufacturer and/or the Applicator.

The Owner should not be billed for any service, procurement or labor appertaining to retouching/repainting.

10.0 PAINTING SYSTEMS

Painting systems are defined according to the following parameters:

- Type of substrate
- Minimum and maximum operating temperatures
- Nature of the product in contact with the coating and type of equipment.

Internal painting (lining) system number for each equipment is specified in related data sheet.

10.1 System No. P1

D02 Operating temperature resistance: less than 130°C

1. Surface preparation

Grade of cleanliness	Sa 3 (ISO 8501-1:1988)
Roughness	Grit – coarse (C) (ISO 8503-2)

2. Coating system (NORSOK M-501)

PRIMER	INTERMEDIATE	FINAL COAT
-	1000 microns PHENOLIC EPOXY	-

10.2 System No. P2

D02 Operating temperature resistance: less than 130°C

1. Surface preparation

Grade of cleanliness	Sa 3 (ISO 8501-1:1988)
Roughness	Grit - medium (G) (ISO 8503-2:1988)

Coating system (NORSOK M-501)

PRIMER	INTERMEDIATE	FINAL COAT
150 microns PHENOLIC EPOXY	150 microns PHENOLIC EPOXY	150 microns PHENOLIC EPOXY

10.3 System No. P3

D02 Operating temperature resistance: less than 60°C

1. Surface preparation

Grade of cleanliness Sa 3 (ISO 8501-1:1988)

Roughness Grit – coarse (C) (ISO 8503-2)

2. Coating system (NORSOK M-501)

PRIMER	INTERMEDIATE	FINAL COAT
-	500 microns SOLVENT FREE GLASS FLAKE EPOXY	500 microns SOLVENT FREE GLASS FLAKE EPOXY

10.4 System No. P4

D02

Operating temperature resistance: less than 50°C

1. Surface preparation

Grade of cleanliness Sa 3 (ISO 8501-1:1988)

Roughness Grit – coarse (C) (ISO 8503-2)

2. Coating system (IPS-M-TP-190)

PRIMER	INTERMEDIATE	FINAL COAT
150 microns COAL TAR EPOXY	150 microns COAL TAR EPOXY	150 microns COAL TAR EPOXY

10.5 System No. P5

D02

Health and safety report no. AWWA C210.

Operating temperature resistance: less than 50°C

1. Surface preparation

Grade of cleanliness Sa 3 (ISO 8501-1:1988)

Roughness Grit - medium (G) (ISO 8503-2:1988)

2. Coating system (IPS-M-TP-202)

PRIMER	INTERMEDIATE	FINAL COAT
125 microns AMINE ADUCT EPOXY (food grade)	125 microns AMINE ADUCT EPOXY (food grade)	125 microns AMINE ADUCT EPOXY (food grade)

Note: Food grade epoxy shall have approval from health ministry of IRAN.

10.6 System No. P6

D02 Operating temperature resistance: less than 50°C

1. Surface preparation

Grade of cleanliness	Sa 3 (ISO 8501-1:1988)
Roughness	Grit - medium (G) (ISO 8503-2:1988)

2. Coating system (NORSOK M-501)

PRIMER	INTERMEDIATE	FINAL COAT
60 microns ZINC ETHYL SILICATE	-	-

11.0 COATING CODE FOR PROJECT EQUIPMENT

TAG No.	Item Description	Operating Temp (°C)	Operating Pressure (Bara)	Internal Coating System No.	Remark
V-2101A/B/C	1ST Stage Gas Compression Suction Drum	19.02 ~ 36.92	**5.1 barg**	P3	
V-2104	Slug Catcher Drum	15.5 ~ 32	5.5 barg	P3	
V-2105	Inlet Gas K.O. Drum	19.23 - 37.17	5.3 barg	P3	
V-2107	Glycol Sump Drum	AMB	0.1barg	P2	
V-2201	LP Flare K.O. Drum	32	0.5 barg	P2	
V-2202	Closed drain drum	AMB	0.5 barg	P2	
V-2203	Instrument Air Receiver	65	8 barg	P2	
V-2204	Nitrogen Receiver Drum	60	8 barg	P2	
V-2205	Fuel Gas K.O. Drum	18.88 - 36.78	4.9 barg	P2	
V-2206 B	Diesel Oil Drum	AMB	ATM	P4	
TK-2102	Lean Glycol Storage Tank	AMB	0.1	P6	
TK-2301 A/B	Fire Water Storage Tank	AMB	ATM	P4	
TK-2209	Elevated Potable Water Tank	AMB	ATM	P5	