



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



	Contract No.	Specification for Painting						Class	1
	5365	Pr. Code	Area	Disc.	Type	Seq.	Rev.	Page 1 of 10	
		LRSL	000	MW	SP	673	01		

Specification for Painting

REV.	Date	Purpose of Issue	ORIG.	BY	PREP'D	CHECK'D	APP'D	COMPANY APP'D
					<i>H.N</i>	<i>0.0</i>	<i>M.A.</i>	
01	20-Jun-21	Issued for Approval	IOEC	-	H.N	O.O	M.A	
00	06-Dec-20	Issued for Comment	IOEC	-	H.N	O.O	M.A	-



**Resalat Oil Field Development Project
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	Contract No.	Specification for Painting						Class	1
	5365	Pr. Code	Area	Disc.	Type	Seq.	Rev.	Page 3 of 10	
		LRSL	000	MW	SP	673	01		

REVISION RECORD SHEET

REV. NO.	PURPOSE	LIST OF UPDATED MODIFIED SECTIONS IF ANY
01	IFA	Page 6-Section 1.3-Modified. Page 10-Section 6.8-Clarification of paint systems added




**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



	Contract No.	Specification for Painting						Class	1
	5365	Pr. Code	Area	Disc.	Type	Seq.	Rev.	Page 4 of 10	
		LRSL	000	MW	SP	673	01		

Table of Contents

1. INTRODUCTION	5
1.1. Development Overview.....	5
1.2. Purpose of Scope	6
1.3. Definition.....	6
2. CODES AND STANDARDS	6
3. REFERENCE DOCUMENTS.....	6
4. ABBREVIATIONS	6
5. GENERAL STATEMENT	7
6. ADDITION/MODIFICATION/DELETION	7
6.1. Section 6.1 Items not to be painted	7
6.2. Section 10.1 Preparation Before Blast Cleaning.....	7
6.3. Section 10.5 Grit Blasting.....	7
6.4. Section 11.1 Storage Conditions.....	8
6.5. Section 11.3 Thinning	8
6.6. Section 12.1 General	8
6.7. Section 14 Quality Control & testing.....	9
6.8. Section 17-Coating System.....	10

	Contract No.	Specification for Painting					Class	1
	5365	Pr. Code	Area	Disc.	Type	Seq.	Rev.	Page 5 of 10
	LRS�	000	MW	SP	673	01		

1. INTRODUCTION

1.1. Development Overview

The Resalat Field previously known as Rakhsh Field, is located in the Persian Gulf, some 80 km to the South of Lavan Island, in water depth of 65-75 meters. The facilities which were originally developed in 1968 have sustained some damage due to the Iran/Iraq war and adverse climate conditions thereafter.

To increase oil production capacity from this field (adding 12,000 stock barrels per day to current production), Iranian Offshore Oil Company (IOOC) has defined new project which includes Engineering, Drilling, Procurement, Construction for following items:

- New satellite Wellhead Platform (WHP1) with totally nine (9) conductor slots.
- Development and renovation of Existing offshore complex consist of new power generation, control system, HVAC, Electrical /control room, electrical panels(LV &MV),process & utility piping, and all necessary activities which shall be done for connection to existing facilities(Tie in requirements)
- Drilling of two new production wells in R1 and two wells in WHP1 platform and Re-entry and work-over of two existing well in R1 platform.
- One 10” productions submarine pipeline from WHP1 to PP and a single submarine cable (power and data) from SP to WHP1.
- Inspection, Strengthening, Modification and Repair of existing R1 complex Jackets and topsides and replacement of boatlanding and Barge Bumpers.

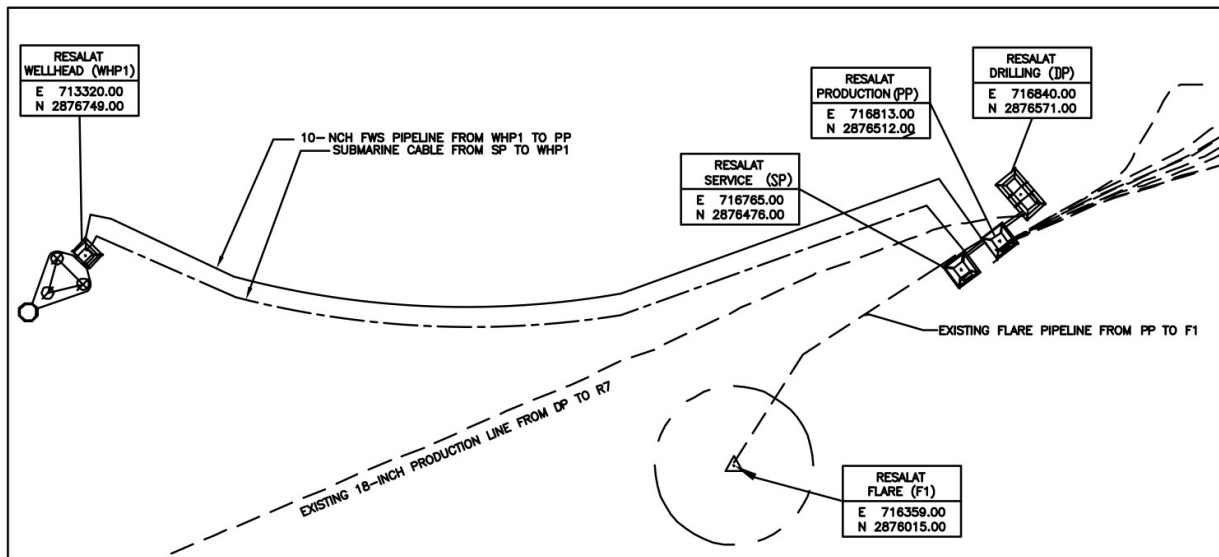


Figure 1: Resalat Development Field Layout (Datum ED 77, Zone 39, Cent. Meridian 51° East)



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



	Contract No.	Specification for Painting						Class	1
	5365	Pr. Code	Area	Disc.	Type	Seq.	Rev.	Page 6 of 10	
	LRS�	000	MW	SP	673	01			

1.2. Purpose of Scope

Refer to Surface Preparation and Coating Specification “SPC-SP-IOOC-TP-Rev 01”

1.3. Definition

PROJECT	Resalat Oil Field Development – Phase 1
COMPANY	Iranian Offshore Oil Company (IOOC)
CONTRACTOR	Consortium of Iranian Offshore Engineering and Construction Company (IOEC) and Intelligent Solutions Inc. (ISI)
SUB - CONTRACTOR	Tehran Raymand Consulting Engineers (TRCE)
PURCHASER	Any firm who buy services, material and/or equipment for execution of the project within a dedicated contract.
SUPPLIER	Any vendor, manufacturer who supply any Service, Material or Equipment for the project
SHALL	Refer to a mandatory requirement
SHOULD	Refer to a recommendation
MAY	Refer to one acceptable course of action

2. CODES AND STANDARDS

Refer to Surface Preparation and Coating Specification “SPC-SP-IOOC-TP-Rev 01”

3. REFERENCE DOCUMENTS

List of applicable code and standard: LRS�-000-PM-LI-743

4. ABBREVIATIONS

Refer to Surface Preparation and Coating Specification “SPC-SP-IOOC-TP-Rev 01”



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



	Contract No.	Specification for Painting						Class	1
	5365	Pr. Code	Area	Disc.	Type	Seq.	Rev.	Page 7 of 10	
		LRSL	000	MW	SP	673	01		

5. GENERAL STATEMENT

The attached Specification for Surface Preparation and Coating Specification “SPC-SP-IOOC-TP-Rev.01” is confirmed, except as added/modified/deleted herein, and renumbered/reissued as Specification for Specification for Painting “LRSL-000-MW-SP-673-Rev.00” for “Resalat Oil Field Development Project” Project.

6. ADDITION/MODIFICATION/DELETION

The following items refer to the attached S Specification for Surface Preparation and Coating Specification “SPC-SP-IOOC-TP-Rev.01” the clauses set out below modify or replace the clauses in the original specification as noted.

6.1. Section 6.1 Items not to be painted	
Addition	<ul style="list-style-type: none"> • Nameplates, code stampings and pushbuttons

6.2. Section 10.1 Preparation Before Blast Cleaning	
Modification	Sharp edges, particularly those of corners, or on rough cut plate shall be rounded (minimum radius > 2 mm).

6.3. Section 10.5 Grit Blasting	
Addition	Use of silica sand is strictly prohibited.
Modification	The air’s relative humidity is greater than 80% (90% for inorganic zinc silicates).



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



	Contract No.	Specification for Painting					Class	1
	5365	Pr. Code	Area	Disc.	Type	Seq.	Rev.	Page 8 of 10
LRSL	000	MW	SP	673	01			

6.4. Section 11.1 Storage Conditions

Addition	<ul style="list-style-type: none"> - Paints shall not be stored in open containers, even for a short time. - Thinners, solvents, etc. shall be stored in a suitably ventilated fireproofed building, separate from other painting consumables. - The settlement of heavy paints shall be lessened by rolling the drums in which they are stored every six weeks. - If paint has thickened to such an extent that more than 5% by volume (10% by volume for priming paints) of the correct thinners is required to bring it to brushing consistency. - The oldest paint of each kind shall be used first.
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6.5. Section 11.3 Thinning

Addition	<ul style="list-style-type: none"> -If the paint is cold, do not add thinner to make application easier. Instead, heat the paint to 10-32°C. Paint heaters can be used to reduce viscosity for spray application, thus avoiding the addition of thinners. Do not apply warm paint to cold steel. Results are best if both are similar in temperature.
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6.6. Section 12.1 General

Addition	<p>Moreover in case of following conditions painting to be avoided:</p> <ul style="list-style-type: none"> - When the temperature is below 4°C; but the minimum temperature of epoxy paint application is 10°C. - When the surface temperature is higher than 35°C; as recommended by manufacturer. <p>-Each layer of paint shall be allowed to dry for a period of time within the limits prescribed by the paint manufacturer, before the next layer is applied.</p> <p>Brush application may be used under the following circumstances:</p> <ul style="list-style-type: none"> •When area cannot be properly coated by spray application for any reason. •For repair to localized damaged paint. •Where SUPPLIER considers the coating material suitable for brush application.
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**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



	Contract No.	Specification for Painting					Class	1
	5365	Pr. Code	Area	Disc.	Type	Seq.	Rev.	Page 9 of 10
LRSL	000	MW	SP	673	01			

	<ul style="list-style-type: none"> •For applying the initial coat of paint (primer) to corners, crevices or other irregular surfaces prior to spray application. •For pipelines, to protect applied paint at the time of welding both sides of weld seam shall be covered by proper means.
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6.7. Section 14 Quality Control & testing

Addition	<p>Throughout the duration of the work, Contractor's Quality Control department shall check the points listed in Table 2 of C-TP-102 and following items and record the results in its daily quality control report.</p> <ul style="list-style-type: none"> •Contamination including chlorides: according to ISO 8502-6 and 9, 30 mg/m² maximum. •Climatic conditions for application all measured before the work commences and twice per shift and when the ambient conditions are obviously changing): temperature of substrate at least 3°C above dew point, maximum humidity 80% RH (90% for inorganic zinc silicates), ambient temperature (> 10°C for epoxy, > 5°C for polyurethane), weather conditions. •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 D4752. •Interval between coats (in accordance with Supplier product datasheets). •Wet film thickness for each coat immediately after application. •Dry Film Thickness (DFT) •Number of coats, DFT of each coat and of the final system according to ISO 19840. •Adherence <p>The tests shall be carried out only when the system is completely dry and fully cured.</p> <ul style="list-style-type: none"> -Systems with DFT less than 200 µm: cross-cut test class 0 according to ISO 16276-2 -Pinhole and holiday detection
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Resalat Oil Field Development Project
Phase 1 (EPC-EPD)



Contract
No.

Specification for Painting

Class

1

5365

Pr. Code

Area

Disc.

Type

Seq.

Rev.

LRSL

000

MW

SP

673

01

Page 10 of 10

6.8. Section 17-Coating System

Modification

1. Paint sub-system 1 shall be followed for CN-1 and CN-2.
2. Insulated Carbon Steel: Paint sub-system 1 shall be followed for CN-3.
3. Insulated Stainless Steels: Paint sub-system 2 shall be followed for CN-3.
4. For temp. range between 120-150 C and uninsulated stainless steel, sub-system 1 of SN-2 shall be followed.

Document No:
SPC-SP-IOOC-TP
Rev: 01
June 2014
Page 1 of 77

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



IOOC

IRANIAN OFFSHORE OIL COMPANY (I.O.O.C)

Corrosion Engineering Department

Surface Preparation and Coating Specification

Prepared by H.Golmakani and approved by Ghadimi (Head of corrosion Engineering Department)

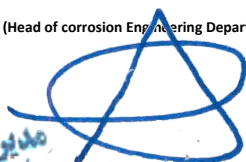


خوانده شد و مورد تایید است

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Contents	Page
1- Introduction	5
2- Scope	6
3- Definition	7
4- Abbreviation& Specification	9
5- Codes& References	11
6- Surface to be painted	15
6.1. Items not to be painted	15
6.2. Case of stainless steels	15
6.3. Painting of fastenings	16
7- Order of Precedence	16
8- Safety Requirements	16
9- General	17
10- Surface Preparation	17
10.1. Preparation Before Blast Cleaning	17
10.2. Blast cleaning equipments	19
10.3. Required cleanliness	19
10.4. Required Roughness	19
10.5. Grit Blast	19
10.6. Precautions	20
10.7. Description of Blasted Surfaces	21
10.8. Surface preparation by hand and power tools	21
10.9. Stainless Steel Surface Preparation	22
10.10. Galvanized Surface Preparation	22



Surface Preparation and Coating Specification for Iranian Offshore Oil Company



11-	Storage, Mixing and thinning products	22
	11.1. Storage Condition	22
	11.2. Mixing	22
	11.3. Thinning	23
12-	Application of Paint	23
	12.1. General	23
	12.2. Priming of Ferrous Metals	24
	12.3. Shop Painting Steel	25
	12.4. Field and touch-up Painting of Steel	26
	12.5. Coating of Specific Surfaces	27
13-	Application of Thermally Sprayed Coating	28
14-	Quality Control and Testing	28
	14.1 Humidity check	28
	14.2 Roughness check	28
	14.3 Water Jetting and Cleaning	29
	14.4 Surface Contamination	29
	14.5 Thickness check	30
	14.6 Adherence check	31
	14.7 Visual inspection	31
	14.8 Extent of inspection	31
	14.9 Inspection result	32
	14.10 Repair of defect or damage	32
15-	Qualification Testing of Coating System	34

Document No:
SPC-SP-IOOC-TP
Rev: 01
June 2014
Page 4 of 77

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



16-	Inspection	34
17-	Coating System	36
18-	Qualification of Blasters and Painters	70
19-	Finish Colour Of Coating	72

Prepared by H.Golmakani and approved by  Ghadimi (Head of corrosion Engineering Department)



خوانده شد و مورد تایید است

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



1. Introduction

After the victory of the Islamic Revolution of Iran, upon the decree of the Supreme Council of Revolution in 1979, all partnership contracts with the aforementioned companies were cancelled and one year after the abolishment, the Iranian Offshore Oil company (IOOC) was established by combining those companies. The objective underlying establishment of IOOC was to render an optimized production and safeguarding oil and gas reservoirs in the Persian Gulf along with preventing an increase in the production rate, prevention of oil and gas migration in the common fields, ... And in one word, to administer the entire oil and gas fields in Persian Gulf where the American and European companies had previously carried out the operations.

The incidents during imposed war and considerable damages to the marine and onshore facilities, which were aimed, to an inefficiency and stop in production placed a great challenge before this Company in achieving its most important goal; that is, oil production. Facing this challenge required self – sacrifice and industrious efforts of all personnel. Concerned the today's conspicuous record of the Company despite all ups and downs is the best evidence for this accomplishment.

Operational Regions of IOOC:

- **Bahregan** District is located near Imam Hassan Town, a district of Bushehr province located between Genaveh and Deylam seaports (at 40 Kilometers northwest of Genaveh and 28 kilometers from Deylam port)
The oil production activities in this district started in mid 1951 after exploration of oil in the Persian Gulf area and activities of *Sirip joint venture oil . Bahregan District manages four oil fields which consist of 1-bahreghansar , 2-hendijan , 3-Nowrooz and 4- Soroosh
- **Kharg Island**, a 35 square kilometer coral island, is situated at 57 kilometers in the North West of Bushehr Seaport and is located 28 kilometers from Genaveh Port. The oil production activities came into operation in this district upon exploration of oil in the Persian Gulf area by the ex-Iran Pan American Oil Company (IPAC) in 1959. Kharg Island district manages the following fields and perspective plants:

- 1- Foroozan
- 2- Aboozar
- 3- Dorood (1, 2& 3)

- **Sirri Island** is situated 72 kilometers from Iranian coastal line in south of Bandar Lengeh and 40 Kilometer west of Abu Musa Island. The area of this Island is about 18 Square kilometer. The length of the island is almost 5.6 kilometers and its width is about 3 kilometers. The oil exploration in this region became operational by oil exploration in Persian Gulf and activation of Sofiran Company in the Island. Sirri Island district manages the following fields and perspective plants:

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



- 1- Sirri C (Sivand)
- 2- Sirri D (Dena)
- 3- Sirri E (Esfand)
- 4- Sirri A (Alvand)
- 5- Nosrat

- **Lavan Island** is situated 18 kilometers from Iranian coasts in Persian Gulf. The area of the island is approximately 75.6 Square kilometers with an approximate 25 kilometers length and maximum 5 kilometers width. The oil exploration in this field commenced upon activities of LAPCO in the Persian Gulf in 1967. Lavan Island district manages the following fields and perspective plants:

- 1- Salman
- 2- Reshadat
- 3- Resalat
- 4- Balal

The Iranian Offshore Oil Company (IOOC) Paint specification is developed for the Onshore and Offshore facilities of Iranian Offshore Oil Company. This painting specification dictates the scope of painting operations, surface preparation, painting systems to be utilized, paint system application and inspection, and specific paint manufacturer's products to be used. This specification also is based on recognized international petroleum industry practices, and shall be adhered to completely.

2. Scope

This specification covers the minimum requirements for the protection by painting of metal structures, piping, and equipment of facilities including carbon steel, low grade stainless steel, galvanized and concrete.

This specification is applicable to facilities located offshore; jackets, all structures, internal and external surfaces of plant and process equipment, electrical equipment and instrumentation and costal facilities.

This specification is applicable to submerged structures, below the splash zone.

Equipments supplied by vendor such as valves, pumps, etc. will be coated in accordance to supplier's standard subject to approval from COMPANY. As such they are not covered under this publication.

Detailed specifications and/or equipment shop drawings, when submitted shall be used in conjunction with this specification.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



If conflicts occur between this specification, the coating MANUFACTURERE's recommendations and the referenced standards, COMPANY shall be contacted for clarification.

This document is intended to be applied to the coating of new work and the repair and maintenance of existing coating system in service.

This specification gives the requirements for the selection of coating materials, surface preparation, application procedures and inspection for protective coatings to be applied during the construction and installation of steel piles.

The aim of this specification is to obtain a coating system, which ensures:

- Optimal protection of the installation with a minimum need for maintenance.
- That the coating system is maintenance friendly.
- That the coating system is application friendly.

3. Definition

Wherever the word "**shall**" has been used, its meaning is to be understood as mandatory.

Wherever the word "**should**" have been used, its meaning is to be understood as recommended or advised.

Wherever the word "**maybe**" has been used, its meaning is to be understood as a freedom of choice.

The following words and expressions shall have the meanings hereby assigned to them except where the context of this document otherwise requires:

■ **Approved, approve, approval**

Means approved, approve, approval in writing by PURCHASER.

■ **Purchase Order**

Shall mean the written Purchase Order agreed between PURCHASER and VENDOR together with any appendices or attachments there to.

■ **Goods**

Shall mean any and all of the design, engineering, services, warranty related services, labor, assistance, articles, materials, equipment, spare parts, other supplies including but not limited to manuals, operating instructions, report and drawings and all other documents to be supplied or performed by VENDOR as described in (or to be inferred from) the PURCHASE ORDER.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



■ Paint Contractor

The person, firm or company identified as the party which supply and be responsible for surface preparation and apply coating on the structural parts, decks, piping, equipment, tanks and etc.

■ VENDOR

VENDOR shall mean the person or PURCHASER identified on the Purchase Order as the VENDOR of the GOODS.

■ Sub supplier

Shall mean any person or PURCHASER (other than PURCHASER) having a contract with VENDOR for the manufacturer and/or supply of the GOODS or a part of the GOODS.

■ OWNER

IRANIAN OFFSHORE OIL COMPANY. (I.O.O.C)

■ Paint supplier

The manufacture or supplier of the paint and coatings describe in this document.

■ EXECUTOR

Means the party which carries out all or part of construction for the project.

■ Inspector

Inspector of contractor or any organization authorized to perform inspection of the work.

■ ENGINEER

Means a person or persons appointed and approved in writing by the OWNER.

■ Amplitude

Peak to valley height in a steel surface profile following surface preparation, expressed in microns.

■ Coatings

Any system applied in accordance with this document and shall include, but not be restricted to, painting, metallic and non-metallic coatings, anti-fouling products etc.

■ Dry Film Thickness

Thickness, in microns, of the dried or cured paint or coating film.

■ Pigment

Solid coloring agent in paint.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



■ Pot life

Time interval, after mixing of paint or coating materials, during which the mixture can be applied without difficulty.

■ Profile

Cross-section of steel surface contour.

■ Substrate

Surface to be coated.

■ Coating System

A term which refers to the applied and cured multilayer film or to the components of a system based on non-paint type coating.

■ Initial painting

Painting of new construction projects or complete recoating of existing facilities during major maintenance.

■ "Ideal/Optimum" service life

The time until initial breakdown (3-5%) of the top-coats occurs, before 1% rusting begins, and ASTM D610, Rust Grade 6 is present, when first maintenance painting takes place.

■ "Practical" service life

The time until 10% through thickness coating breakdown occur, active rusting of the substrate occurs, and ASTM D610, Rust Grade 4 is present.

■ Maintenance Painting

Periodic painting (repair/touch up of corroded areas or deteriorated paint work) after initial painting.

4. Abbreviation & Specific Definitions

ASTM	American Standard Test System
ANSI	American National Standard Institute
NACE	National Association Corrosion Engineering
SSPC	Steel Structure Painting Council
BS	British Standard Institute
SIS	Swedish International Standard
DIN	Deutsches Institut für Normung

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



COSHH	Control Of Substances Hazardous to Health
CS	Carbon Steel
SS	Stainless Steel
CU	Copper
AL	Aluminum
DFT	Dry Film Thickness
TDFT	Total Dry Film Thickness
WFT	Wet Film Thickness
RH	Relative Humidity
DP	Dew Point
ST	Surface Temperature

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



5. Codes and References

The standard referenced in this specification shall form part of this specification. The latest issue, revision, or amendments of the reference standards shall govern unless otherwise specified. In the event of any conflict between this specification and the requirements of any of the standards and/or publication referred, the requirements of this specification shall prevail.

Table 1

NACE No. 2/SSPC-SP 10	Near- White Metal Blast Cleaning
NACE No. 3/SSPC-SP 6	Commercial Blast Cleaning
NACE No. 5/SSPC-SP 12	Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh- Pressure water jetting prior to Recoating
NACE Publication 6G 186	Surface Preparation of Contaminated Steel Surfaces
NACE RP 0181- 94	Liquid- Applied Internal Protective Coatings for Oil Field Production Equipment
NACE Publication 6A 192	Dehumidification Equipment in Lining Application
NACE SP0108-2008	Standard Practice Corrosion of Offshore Structures by Protective Coatings
SSPC- Guide to Vis 1- 89	Visual Standard for Abrasive Blast Cleaned Steel
SSPC- SP 1	Solvent Cleaning
SSPC- SP 11	Power Tool Cleaning to Bare Metal
SSPC- AB 1	Mineral and Slag Abrasives
SSPC- PA 2	Measurement of Dry Paint Thickness With Magnetic Gauge
SSPC- PS Guide 8	Guide to Top Coating Zinc- Rich Primers
SSPC- QP 1	Standard Procedure for Evaluating The Qualifications of Painting (Field Application to Complex Structures)
SSPC- QP 2	Standard Procedure for Evaluating The Qualifications of Painting Contractors To Remove Hazardous Paint
SSPC- Paint 20	Zinc Rich Primer, Type I Inorganic' and type 'Organic'
ASTM C 868	Test method for chemical resistance of protective linings
ASTM D 4285	Standard Test Method for Indicating Oil or Water in Compressed Air
ASTM E 337	Standard Test Method for Measuring Humidity with a Psychomotor (the Measurement of Wet- and Dry- Bulb Temperature)
ASTM D 4417	Standard Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D 869	Standard Test Method for Evaluating Degree of Settling of Paint
ASTM D 3359	Standard Test Method for measuring Adhesion by Tape Test

Surface Preparation and Coating Specification for Iranian Offshore Oil Company

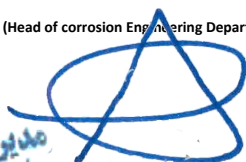


ASTM D 4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D 4752	Standard Test Method for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
ASTM D 4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gauges
ASTM D 610	Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
ASTM D 4214	Standard Test Method for Evaluating Degree of Chalking of Exterior Paint Films
ASTM D 523	Standard Test Method for Specular Gloss
ASTM D 870	Standard Practice for Testing Water Resistance of Coatings Using Water Immersion
ASTM D 2485	Standard Test Method for Evaluating Coatings for High Temperature Service
ASTM D 3276	Standard Guide for Painting Inspectors (Metal Substrates)
ASTM D 4940	Standard test method for conductivity analyses of water soluble contamination of blasting abrasives
ASTM D 5064	Standard Guide for Conducting a Patch Test Assess Coating Compatibility
ASTM D 5162	Standard Practice for Discontinuity (Holiday) Testing of Non-conductive Protective Coating on Metallic Substrates
ASTM E 96	Standard test method for water vapor transmission of materials
ASTM G 8	Standard Test Method for Cathodic Disbonding of Pipeline Coatings
ASTM G 42	Standard Test Method for Cathodic Disbonding of Pipeline Coatings Subjected to elevated temperatures
ASTM B 449	Method Of Adhesion Testing
ASTM A 123	Standard Specification for zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM D 5402	Standard Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs
ISO 209-1	Wrought aluminum and aluminum alloys- Chemical composition and forms of products. Part 1: Chemical composition
ISO 1461	Hot dip Galvanized Coating of fabricated Iron and steel articles. Specification and test methods.
ISO 1512	Paints and Varnishes- sampling of Products in Liquid or Paste Form
ISO 2063	Metallic and Other Inorganic Coatings- Thermal Spraying- Zinc, Aluminum and Their Alloys
ISO 2431	Paints and Varnishes- Determination of Flow Time by Use of Flow Cups
ISO 2808	Paints and Varnishes- Determination of Film Thickness
ISO 2811-1	Paints and Varnishes- Determination of Density
ISO 3248	Paints and varnishes- Determination of the effect of heat

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



ISO 3549	Zinc dust Pigment for paints. Specification and test methods
ISO 4624	Paints and Varnishes- Pull Tests for Adhesion
ISO 4628-1,2,3,4	Paints and Varnishes- Evaluation of degradation of paint coatings
ISO 6272	Paints and varnishes- Falling weight resistance (impact)
ISO 7253	Paints and Varnishes- Determination of the Resistance to Neutral Salt Spray
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 steel substrates after overall removal of previous coatings
ISO 8502-1	Preparation of steel substrates before application of paints and related products- test for assessment of surface cleanliness Part 1: Field test for soluble iron corrosion products
ISO 8502-2	Preparation of steel substrates before application of paints and related products- test for assessment of surface cleanliness Part 2: Laboratory determination of chloride on cleaned surfaces
ISO 8502-3	Preparation of steel substrates before application of paints and related products- test for assessment of surface cleanliness Part 3: Assessment of dust on steel surfaces prepared for painting (pressure- sensitive tape method)
ISO 8502-4	Preparation of steel substrates before application of paints and related products- test for assessment of surface cleanliness Part 4: Guidance on the estimation of the probability of condensation prior to paint application
ISO 8502-6	Preparation of steel substrates before application of paints and related products- test for assessment of surface cleanliness Part 6: Sampling of soluble impurities on surface to be painted- The Bresle method
ISO 8502-9	Preparation of steel substrates before application of paints and related products- test for assessment of surface cleanliness Part 9: Field method for the conduct metric determination of water soluble salts
ISO 8503-1	Preparation of steel substrates before application of paints and related products. Surface roughness characteristics of blast steel substrates – Part 1: Specifications and definition for ISO surface profile comparators for the assessment of abrasive blast cleaned surfaces
ISO 8503-2	Preparation of steel substrates before application of paints and related products. Surface roughness characteristics of blast steel substrates – Part 2: Method for the grading of surface profile of abrasive blast cleaned steel- comparator procedure



Surface Preparation and Coating Specification for Iranian Offshore Oil Company



ISO 8504-1	Preparation of steel substrates before application of paints and related products. Surface Preparation Methods – Part 1: General Principles
ISO 8504-2	Preparation of steel substrates before application of paints and related products. Surface Preparation Methods – Part 2: Abrasive blast cleaning
ISO 8504-3	Preparation of steel substrates before application of paints and related products. Surface Preparation methods- Part 3: Hand and Power tool cleaning
ISO 10005	Quality management: guideline for quality plans
ISO 14918	Thermal Spraying- Approval testing of thermal sprayers
ISO 14922-2	Thermal Spraying- Quality requirement of thermally sprayed structures
ISO 11124-2	Preparation of steel substrates before application of paints and related products. Specification for Metallic blast cleaning abrasives Chilled iron grit
ISO 11124-3	Preparation of steel substrates before application of paints and related products. Specification for Metallic blast cleaning abrasives High carbon cast steel and grit
ISO 11126-3	Preparation of steel substrates before application of paints and related products. Specification for Metallic blast cleaning abrasives Copper refinery slag
ISO 11126-7	Preparation of steel substrates before application of paints and related products. Specification for Metallic blast cleaning abrasives Fused aluminum oxide
ISO 11126-10	Preparation of steel substrates before application of paints and related products. Specification for Metallic blast cleaning abrasives Garnet
ISO 11127-1	Preparation of steel substrates before application of paints and related products. Test methods for non- metallic blast cleaning abrasives- Part 1: Sampling
ISO 11127-2	Preparation of steel substrates before application of paints and related products. Test methods for non- metallic blast cleaning abrasives- Part 2: Determination of particle size distribution
ISO 11127-3	Preparation of steel substrates before application of paints and related products. Test methods for non- metallic blast cleaning abrasives- Part 3: Determination of apparent density
ISO 11127-4	Preparation of steel substrates before application of paints and related products. Test methods for non- metallic blast cleaning abrasives- Part 4: Assessment of hardness by a glass slide test
ISO 11127-5	Preparation of steel substrates before application of paints and related products. Test methods for non- metallic blast

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



	cleaning abrasives- Part 5: Determination of moisture
ISO 11127-6	Preparation of steel substrates before application of paints and related products. Test methods for non- metallic blast cleaning abrasives- Part 6: Determination of Water soluble contaminants by conductive measurement
ISO 11127-7	Preparation of steel substrates before application of paints and related products. Test methods for non- metallic blast cleaning abrasives- Part 7: Determination of particle size distribution
ISO 19840	Paint and varnishes- corrosion protection of steel structures by protective paint systems. Measurements of, and acceptance criteria for, the thickness of dry films on rough surfaces
SIS 05 5900	Swedish Standard: Rust Levels Of Steel Structure And Quality Levels for Preparation Of Surface For Rust Protecting Paints
BS 381C	Specification For Colors For Identification, Coding And Special Purposes
BS 4232	Surface Finish Of Blast Cleaned Steel For Painting
NORSOK M-501	Surface preparation and protective coating

6. Surface to be painted

All surfaces shall be painted using the relevant specified system, except when otherwise stipulated hereafter.

6.1 Items not to be painted

Unless otherwise specified, the following surfaces shall not be painted:

- Galvanized steel gratings
- Concrete structures
- Plastic and plastic coated materials provided their resistance to UV has been demonstrated, and colour coding is not necessary.
- Non ferrous materials such as 90-10 and 70-30 copper nickel alloys, monel, aluminum bronze, and nickel alloys when not thermally insulated.
- Machined surfaces

To be added:

- Nameplates, code stampings and pushbuttons

6.2 Case of stainless steels

When painting is requested as specified hereunder; only piping, pipelines and vessels or other pressure containing equipment are concerned.

6.2.1 Under thermal insulation

For temperature ranging from 120 to 150°C (maximum operating temperature), coating system **CN-3** shall be used, whatever the stainless steel type.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



6.2.2 Without thermal insulation

The following applies:

Stainless steel type	Persian Gulf	Coating system
AISI 304, 304L and 321	Painted in all cases	SN-1/SM-1 T<120 °C SN-2/SM-2 120 °C < T < 150 °C
AISI 316 316 and 316L	Painted in all cases	SN-1/SM-1 T<120 °C SN-2/SM-2 120 °C < T < 150 °C
AISI 904, duplex and super duplex	Painted for T > 100 °C	SN-2/SM-2 T < 150 °C

In all cases, and if necessary, coating system **SN-3/SM3** shall be applied for 450 °C >T> 150 °C.

TSA (Thermally Sprayed Aluminum) can be also used as an alternative.

Zinc containing paints are prohibited on stainless steel.

All stainless steels shall be painted on areas facing carbon steel pipe supports.

6.3 Painting of fastenings

For bolting, the following applies:

- Stainless steel: not painted
- Carbon steel: primer of coating system **CN-7/CM-7** shall be applied before installation and the remaining layers (intermediate and finish coat) applied after installation.

For dudgeons, painting (coating system **CN-7/CM-7**) will be done after installation.

7. Order of precedence

THE CONTRACTOR shall be prepared Procedure, QCP and ITP according this specification minimum 60 days before starting job.

8. Safety Requirements

The CONTRACTOR shall comply with the safe working practices and procedures of the COMPANY and local legislation covering working conditions, fire and explosion hazards, scaffolding, personal protective Equipment, safety equipment, earthlings of equipment, lighting and forced ventilation and etc.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



9. General

All paints and paint materials shall be selected of COMPANY 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 COMPANY at any time. Should a sample fail 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.

10. SURFACE PREPARATION

For optimum paint performance surfaces to be painted or coated shall be completely dry and free from burrs, weld spatter, flux, rust, loose scale, dirt dust, grease, oil and other foreign matter before any paint is applied. If the surface has been exposed to a polluted, e.g. salt-laden, atmosphere, it shall be washed down with clean, fresh water prior to blasting or power tool cleaning.

After preparation of the substrate surface, any grit, dust etc. shall be removed and a layer of primer applied before any corrosion or recontamination occurs. The table here below gives the maximum time between painting application and surface preparation.

Time (hr)	Relative Humidity
2	80% < R.H < 90%
3	70% < R.H < 80%
4	R.H < 70%

10.1 PREPARATION BEFORE BLAST CLEANING

Many structures are not designed with the coating process in mind. Design flaws and fabrication faults can easily complicate the procedures used to achieve a successful coating system. The applicator or the inspector or even the coatings used cannot be held responsible for problems arising out of the work of designers, engineers, and/or fabricators. However, the inspector may be able to provide a valuable service by helping to identify problem areas resulting from a particular design and/or fabrication of the work piece and by providing assistance in solving some of the problems.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Some common design defects that affect the coating process include mentioned following shall be repair before blasting and painting jobs:

- Hard-to-reach or inaccessible areas
- Rivets, bolts or other connectors
- Welds
- Gaps (particularly skip welds or surfaces close together)
- Overlapping surfaces (e.g. roof plates in water tanks)
- Angle iron badly orientated or in complex arrangements
- Threaded areas
- Dissimilar metals
- Sharp edges, particularly those of corners, or on rough cut plate **shall be rounded (minimum radius > 2 mm).**
- Construction aids

All rough edged cuts and welds, weld spatters, indentations and protrusions shall be ground to smooth out contour before the surface is prepared for painting according ISO 8501-3 Grade P3. Any grinding performed after blast cleaning, must be reblasted to required roughness.

The IOOC inspector may be responsible for looking for and documenting fabrication defects. If the coating specification calls for repair of these defects, then repairs should be completed by CONTRACTOR before further work proceeds.

- All bolt holes shall be drilled and blunted before blasting.
- Prior to surface preparation, the surface shall be inspected for spotting oil and grease deposits or pollution on the surface. If any, the deposits of oil or grease shall be removed from the surface by solvent cleaning prior to further surface preparation.
- Before abrasive blast cleaning, all equipment that could be damaged by blast, dust or particulate matter shall be suitably protected by masking, wrapping, taping, or other means to prevent damage. This equipment shall include, but not necessarily be limited to, the following:

Bearings
Control panels
Control valves
Conduit
Instrument dials
Expansion joint bellows
Machined surfaces
Shafts
Push buttons
Tags
Screws
Exposed moving parts

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



10.2 BLAST CLEANING EQUIPMENT

The compressed air supplier shall be free from water and oil. Adequate separators and traps shall be provided, installed in the coolest part of the system. They shall be emptied regularly to prevent carryover of water and oil. Accumulations of oil and moisture shall be removed from the air receiver by regular purging. The air shall be checked daily in accordance with ASTM D 4285. Blast cleaning shall be a dry process. Air compressors shall not be allowed to deliver air at a temperature above 110°C. The air pressure to be adequate to obtain required surface preparation grade and profile but not less than 7 bar. Abrasive blast cleaning equipment shall be an intrinsically safe construction and equipped with a remote shut-off valve triggered by the release of a dead man's handle at the blasting nozzle. Where air operated equipment is used, the operator's hood or head gear shall be ventilated by clean, cool air served through a regulator filter, to prevent blast cleaning residues from being inhaled.

10.3 REQUIRED CLEANLINESS

All surfaces prepared for coating shall be either white metal finish or near white finish as the case may be in the specification. The required surface finish shall be in accordance with the last version of following international standards:

- ISO standard 8501-1 or
- Swedish standard SIS-05-5900
- NACE standard TM-01-70
- SSPC- specification of the steel structure painting council

10.4 REQUIRED ROUGHNESS

All surfaces shall be blast cleaned to obtain a total angular roughness Rt 50 to 85 Microns and total angular roughness shall be reconfirmed by painting MANUFACTURER.

10.5 GRIT BLASTING

Blast cleaning by suitable and approved abrasives (Garnet or copper slag with Garnet) is generally the method used for surface preparation for painting. Small areas can be cleaned by suction blasting or bristle blasting as a spot job.

Abrasives shall be:

- Chilled iron grit accordance with ISO 11124-2
- Coal furnace slag in accordance with ISO 11126-4
- Steel grit in accordance with ISO 11124-3

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



- Non-metallic abrasives in accordance with ISO 11126-7
- Copper slag in accordance with ISO 11126-7
- Garnet in accordance with ISO 11126-10
- Hardness shall be more than 7 Mohs
- Reuse of abrasive is not acceptable without recycling.
- Sand is not acceptable in any cases.
- Copper slag is not acceptable without Garnet (sweep Blast).

To be added:

Use of silica sand is strictly prohibited.

The best way for surface preparation is blasting with copper slag and sweep blast with Garnet to remove all slag traces.

Other means of surface preparation may be permitted under certain circumstances as determined by the COMPANY INSPECTOR. The blasting grits shall be kept dry and clean. The grain size for non-metallic shall be 0.5 to 1.68 mm for producing the correct range of the maximum and minimum specified anchor profile for each paint system in accordance with the paint manufacturer recommendations.

Prior to blasting, visual inspection shall be conducted to observe the smoothness of the surface; all welds shall be relatively smooth, without sharp edges and free of weld spatter. The paint APLICATOR shall notify the CONTRACTOR/ COMPANY inspector of such defects for corrective action before proceeding with the work. (Note: Neither welding nor grinding, including cosmetic grinding, is permitted on the pressure resisting components and welds of pressure vessels and piping after hydrostatic testing, unless approved in writing by the COMPANY inspection department). Prior to blasting, the paint INSPECTOR shall determine whether the surface requires solvent cleaning to remove grease and oil deposits.

10.6 Precautions

10.6.1 Surface preparation by dry blasting techniques shall not be performed if

- The surface likely to be humid after surface preparation and before painting,
- The surface temperature is less than 3°C above the surrounding air's dew point,
- The air's relative humidity is greater than 80% (90% for inorganic zinc silicates).
- Sand storms
- Wind speed more than 7 M/s

If the air's relative humidity exceeds 80%, the applicator must obtain permission from the Company to proceed with or continue with surface preparation. The Applicator must provide a hygrometer to measure the air's relative humidity 6 times per day.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



10.7 DESCRIPTION OF BLASTED SURFACES

After blasting, the following degrees of cleaning (According to Steel Structure Painting Council – SSPC classification) are required in the project:

▪ **SSPC – SP5 White metal blast cleaning:**

Described as the removal of all mill scale, rust, paint and foreign matter by the use of abrasives propelled through nozzles. The cleaned surface is defined as a surface with a grey- white, uniform metallic color, slightly roughened to form a suitable anchor pattern for coatings. The surface when viewed without magnification shall be free of all oil, grease, dirt, visible mill scale, rust, corrosion products, oxides, paint or any other foreign matter. The equivalent surface finish in the standards is Sa3 in the Swedish standard and NACE1 in NACE classifications. This preparation is required for immersion coatings such as drums and tanks interior surfaces specified to be coated in the project using Ethyl Silicate primer, glass flake epoxy and glass flake vinyl ester internal lining.

▪ **SSPC – SP-10 near- White Blast Cleaning:**

Described as the removal of all mill scale, rust, paint and foreign matter by the use of abrasives propelled through nozzles to the degree hereafter specified. A near- White Blast Cleaned Surface Finish is defined as one from which all oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint or other foreign matter have completely removed from the surface except for very light shadow, very slight streaks or slight discolorations caused by rust stain, mill scale oxides or light, tight residues of paint or coating that may remain. At least 95% of each square inch of surface area shall be free of all visible residues, and the remainder shall be limited to the light discoloration mentioned above. The equivalent surface finish in the standards is Sa2-1/2 in the Swedish standard and NACE 2 in NACE classifications. This preparation is required for external painting with inorganic zinc or epoxy primers.

Surface preparation shall be subjected to inspection before the prime coat is applied to ensure all traces of dust and foreign matter have been removed by brushing, blowing with dry clean compressed air, or vacuum cleaning.

Note: The degree of contamination shall be assessed in accordance with procedures described in ISO 8502-3 and Min. grade 2 or less is acceptable.

10.8 SURFACE PREPARATION BY HAND AND POWER TOOLS

Manual & mechanical cleaning tools using to remove mill scale, rust, paints and other visible contamination according to ISO 8504-3, should not be used for new construction and may be used only if approved by the COMPANY. Surface preparation by hand or

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



power tools cleaning shall only be considered for limited area inaccessible or while blasting is not possible.

Minimum cleanliness degree is ST3 according SIS 05 5900.

10.9 STAINLESS STEEL SURFACE PREPARATION

Stainless steel: surface preparation shall be achieved by sweep blast (nozzle pressure 4 bars and angle 45° or less, depend on surface) with fused Aluminum oxide or garnet (free from any chlorides or iron/steel contamination). Size of abrasive shall be less than 0.5 mm. the required anchor pattern should not be more than 50 microns. When coatings or solvent are specified for stainless steel, they shall be free of chlorides, sulphur and metallic zinc pigments.

10.10 GALVANIZED SURFACE PREPARATION

Galvanized: surface preparation shall be achieved by sweep blast (nozzle pressure 4 bars and angle 45° or less, depend on surface) with fused Aluminum oxide or garnet (free from any chlorides or iron/steel contamination). Size of abrasive shall be less than 0.5 mm. the required anchor pattern should not be more than 50 microns.

11 STORAGE, MIXING AND THINNING PRODUCTS

11.1 Storage Conditions

- All paint and thinner containers shall be kept before use and stored in cold room (under shelter and ~~with maximum~~ 25° C and out of direct sun light).
- All paint shall be used only in valid time and expired paint shall not be kept, stored or used.
- Contractor shall be
- Any paint which has

between 4°C and

11.2 Mixing

- All the ingredients are stored every six weeks.
- Mechanical mixing during application.
- Paint mixed in the c
been remixed with
medium to facilitate mixing.
- Paint shall not be mixed or held in solution with air bubbles.
- If a skin has formed in the container and the skin is thicker than 1 mm or more than 2% of paint volume, the paint shall not be used.

To be added:
- Paints shall not be stored in open containers, even for a short time.
- Thinners, solvents, etc. shall be stored in a suitably ventilated fireproofed building, separate from other painting consumables.
- The settlement of heavy paints shall be lessened by rolling the drums in which they
- If paint has thickened to such an extent that more than 5% by volume (10% by volume for priming paints) of the correct thinners is required to bring it to brushing consistency.
- The oldest paint of each kind shall be used first.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



- All pigmented products shall be strained after mixing unless applicator equipment is provided with adequate strainers. Strainers must allow all pigments to pass through, but not any skin.
- Products with unlimited pot life or which do not alter on standing may be mixed at any time; however, if they have set, they must be mixed immediately before use. Paint shall not be kept in the spray equipment pots overnight, but shall be put back into a closed container and remixed before re-use. Containers must be marked with the involved paint's pot life.

11.3 Thinning

- No thinners are never exceed Ma
- Thinners used sh
- When use of thin

To be added:

If the paint is cold, do not add thinner to make application easier. Instead, heat the paint to 10-32°C. Paint heaters can be used to reduce viscosity for spray application, thus avoiding the addition of thinners. Do not apply warm paint to cold steel. Results are best if both are similar in temperature.

Applicators shall not add thinner after paint has been thinned to the proper consistency. Thinners must be added up with the quantity and type of

To be added:

Moreover in case of following conditions painting to be avoided:

- when the temperature is below 4°C; but the minimum temperature of epoxy paint application is 10°C.
- When the surface temperature is higher than 35°C; as recommended by manufacturer.

12. Application of Pa

12.1 GENERAL

Paints shall be applied in accordance with this Specification and good industrial practice. Manufacture instruction shall also be considered.

Paint shall not be applied under the conditions as described in 10.6.4. The paint film shall not be exposed to moisture and contamination before it has dried. Priming and painting under con

Each layer of paint shall be allowed to dry for a period of time within the limits prescribed by the paint manufacturer, before the next layer is applied.

The degree paint system.

The number of coats applied after priming and the total dry film thickness of paint will be determined by the requirement in respect to paint system and conditions with reference to table2. By no means shall the total dry film thickness of paint not be less than 125 microns for moderate exterior environments; severe environment needs higher film thickness.

Airless spray application is the only method of application and brush shall be used in inaccessible area, small job and for touch up.

The correct spray tips, air pressure etc. shall be used as per paint manufacture data sheet.



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May be added:

Brush application may be used under the following circumstances:

- When area cannot be properly coated by spray application for any reason.
- For repair to localized damaged paint.
- Where SUPPLIER considers the coating material suitable for brush application.
- For applying the initial coat of paint (primer) to corners, crevices or other irregular surfaces prior to spray application.
- For pipelines, to protect applied paint at the time of welding both sides of weld seam shall be covered by proper means.

Each coat shall be applied uniformly and completely over the entire surface. All runs and sags shall be brushed out immediately.

Roller shall not be used without COMPANY approval.

Paint Manufacture representative shall be inspected all surface preparation and coating activities and if quality is according this specification, then sign daily reports.

Paint manufacture shall be guarantee painting quality for 10 years after his representative sign daily reports and approved final reports.

12.2 PRIMING OF FERROUS METALS

12.2.1 General

Prepared surfaces should be primed generally within four hours or before visible re-rusting occurs.

Blast cleaned surfaces may be protected for short periods by thin coat of pre-treatment primer. Such primers shall be applied as a continuous coating in an even manner to achieve a minimum film thickness of 20 microns. Such primers do not replace the full thickness of permanent primer.

The priming coat or coats on steel shall be as specified by table2 but in no case shall have a total dry film thickness less than 30 microns. When applied in two coats, a shade contrast between coats is recommended.

In order to minimize contamination between successive coats of paint, over coating of the preceding coat shall be done within the period of time recommended by the manufacturer and shall not delayed beyond the period specified. When delays are unavoidable, the painted surface shall be thoroughly cleaned and dried to the satisfaction of the IOOC before over coating may take place.

The primer is applied by spray, except when the IOOC prefers another method of application or required by the job and/or material.

Primed steelwork, especially if it has been exposed for a lengthy period, shall be examined carefully before further coats of paint are applied. If the primer has been deteriorated, e.g. is perished, eroded or poorly adhering, or has been damaged, so allowing corrosion to develop, the affected areas shall be re-prepared and primed. If there is evidence of widespread corrosion beneath the primer, it shall be removed and the surface again prepared and primed.

Removal of salt deposits by washing from surfaces primed with zinc-rich primers is especially important as the corrosion products formed by reaction between the salts and the zinc can affect the performance of subsequent coats.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



With a single coat of primer, it is difficult to obtain films of uniform thickness and free from pinholes, the points at which corrosion starts. In all but 'mild' interior environments, application of two coats of primer is suitable. If application of two coats cannot extend to the whole of the surface, a second coat shall be applied to vulnerable points, e.g. along external angles and to bolts and rivet heads.

12.2.2 Priming of steel prepared by blasting

Blast cleaned steel prepared to SIS Grade Sa3 or Sa 2½ shall frequently be coated either in the shop or on site with a pre-treatment or pre-fabrication primer or with original primer.

For further priming over the pre-fabrication primers or for direct application to blast cleaned steel, the priming paint shall be in accordance with relevant Material Specification for paints.

Unless otherwise specified in this document, it is essential that the total film thickness of the priming coats (blast or pre-fabrication primer plus second primer) shall meet the prescribed thickness of 75 micron minimum in all area.

12.3 SHOP PAINTING STEEL

Full protection applies in the shop immediately after fabrication normally results in a longer life of the protective system. However, damage during transportation and erection may subsequently necessitate widespread repair or touch-up of coating, so the structural steelwork, surface pipe work, towers, vessels, heat-exchanger shells and similar containers which will not be lagged can be treated in the shop, subject to mutual agreement.

The shop treatments will be determined by requirements in respect to paint system and conditions such as type of environment transportation, economic, etc.

Handling and storage of shop treated items shall be so that to prevent damage to the treated surfaces.

Damage resulting from handling in the shop following painting, such as during storage or loading, is to be repaired as a part of the field painting operations. If the shop coat is damaged in fabrication, it shall be repaired before leaving the shop.

Contact surfaces shall be painted or left unpainted as specified in the procurement documents. When painted, at least the first coat shall be applied in the shop, with subsequent coats being applied in the field while the surfaces are still accessible, unless otherwise specified.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



If the paint specified is harmful to the welding operator or is detrimental to the welding operation or the finished welds, the steel shall not be painted within 100 mm of the areas to be welded.

12.4 FIELD AND TOUCH-UP PAINTING OF STEEL

Previously applied shop coating must be dry and free of dirt, oil, or other contaminants. The manufacturer's instructions shall be followed if special surface preparation procedures are required before application of the field coats.

All shop coated items which have deteriorated as a result of transshipment to the extent that either crumbling or white staining of the coating is evident shall receive. A superficial sweep blast cleaning sufficient to remove the degradation and to re-prepare exposed degraded metal substrate and dust.

Shop coated steel members shall preferably be field painted after erection of such members is completed. Steel members may be field painted on the ground before erection, provided such painting is touched-up where damaged with the same number of coats and kinds of paints after erection. However, the last complete coat of paint shall be applied after erection.

The first field coat of paint shall be applied within a reasonable period after the shop coat (s), and in any event before the weathering (and required touch-up) of the shop coat becomes excessive.

When the type of paint for field coats is not specified, it shall be determined that the paint to be used is compatible with the shop applied coats(s). Paint used in the first field coat over shop painted surfaces shall not cause wrinkling, lifting, or other damage to the underlying paint.

Contact surfaces shall be painted or left unpainted as specified in the procurement documents or required by the job.

Surfaces (other than contact surfaces) of fabricated assemblies those are accessible before erection but which will not be accessible after erection shall receive all field coats of paint before erection.

All cracks and crevices shall be filled with paint if practical.

Wet paint shall be protected against damage from dust or other detrimental foreign matter as much as is practical.

Steel stored pending erection shall be kept free from contact with the ground and so positioned as to minimize water-holding pockets, soiling, contamination, and deterioration of the paint film. Such steel shall be cleaned and repainted or touched-up with the specified paint whenever it becomes necessary to maintain the integrity of the film.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



All field welds and all areas within 100 mm of welds shall be cleaned before painting, using surface preparation methods at least as effective as those specified for the structure itself; all welds shall either be blast cleaned, thoroughly power wire brushed, chemically scrubbed, or water scrubbed of all detrimental welding deposits as required.

12.5 COATING OF SPECIFIC SURFACES

12.5.1 Contact surfaces

There is no mentioned sections in this spec.

Unless otherwise specified in these documents, the following practice shall be followed regarding painting of contact surfaces:

The areas of steel surfaces to be encased or embedded in concrete shall not be painted.

Steel to be completely enclosed in brick or other masonry shall be given at least one coat of shop paint.

The areas of steel surfaces to be in contact with wood shall be painted as indicated in 11.5.1.5

Surfaces to be in contact only after field erection shall be painted as provided in 11.5.1.5, except where the paint interferes with assembly or where indicated in 11.5.1.7.

Steel surfaces not in direct bonded contact, but inaccessible after assembly shall receive the full specified paint system before assembly.

Bearing-type joints may be painted if required.

Contact surfaces of members to be joined by high strength bolts in friction-type joints are a special case. Unless specifically authorized to the contrary, they shall be left unpainted and free of oil, grease, and coatings.

12.5.2 Edges

All sharp edges shall be coated to the same film thickness as the adjacent steelwork to prevent premature breakdown from this area. Corners, services, bolt heads and rivet heads require similar attention. Where there is any doubt that these areas have received adequate film thickness the IOOC may direct that an additional strip coat of paint, be applied to ensure the full film thickness, without any additional cost to the IOOC.

12.5.3 Welds

As rolled steel may be blast-cleaned and protected with blast primer before fabrication and welding. This prevents the serious development of rust, which would be difficult to remove after fabrication. The use of steel that has rusted heavily during storage should be avoided for the same reason. When welding metal coated or zinc-dust painted steel, it



May be added/replaced:

Throughout the duration of the work, Contractor's Quality Control department shall check the points listed in Table 2 of C-TP-102 and following items and record the results in its daily quality control report.

- Contamination including chlorides: according to ISO 8502-6 and 9, 30 mg/m² maximum.
- Climatic conditions for application all measured before the work commences and twice per shift and when the ambient conditions are obviously changing): temperature of substrate at least 3°C above dew point, maximum humidity 80% RH (90% for inorganic zinc silicates), ambient temperature (> 10°C for epoxy, > 5°C for polyurethane), weather conditions.
- 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 D4752.
- Interval between coats (in accordance with Supplier product datasheets).
- Wet film thickness for each coat immediately after application.
- Dry Film Thickness (DFT)
- Number of coats, DFT of each coat and of the final system according to ISO 19840.
- Adherence

The tests shall be carried out only when the system is completely dry and fully cured.

- Systems with DFT less than 200 µm: cross-cut test class 0 according to ISO 16276-2
- Pinhole and holiday detection

Each coat shall be applied uniformly over the entire surface. The coat shall be applied in multiple layers and shall overlap on each pass of the gun. Equipment for application should follow guidelines given in DIN 32521. The coating shall be firmly adherent. The surface after spraying shall be uniform and free of lumps, loosely adherent spattered metal, bubbles, ash formation, defects and uncoated spots. Before application of any further coat, any damage to the previous coat shall be repaired.

14. QUALITY CONTROL AND TESTING

Manufactures of all materials shall supply test certificates of all tests performed and a certificate of compliance stating that the material meets the requirements of the applicable specifications.

Test shall ensure that the quality of the surface coating is in accordance with that specified and shall include, but shall not be limited to, thickness testing, adhesion testing, holiday testing, abrasion testing, solvent testing, etc. Requested tests should be carried out in accordance with ASTM standards as specified in SSPC (good painting practice) volume 1 page 217 & 218.

14.1 Humidity check

The air's relative humidity shall be measured with a psychomotor. Surface preparation and/or paint application operations shall not commence until relative humidity is less than the limits set in paragraphs 8.3. Relative humidity shall be measured and recorded a minimum of six (6) times a day whence two (2) times before commencement of work. Moisture on the surface being prepared or painted shall be measured every day with a surface moisture indicator before beginning surface preparation operations or applying a coat of paint.

14.2 Roughness check

A Rugotest No.3, Keane-Tator and ISO8503 comparator shall be used in determining anchor pattern of blasted surfaces, when a fixed anchor pattern rang is required by a specific painting system. Replica tape also is a proper technique for roughness measurement.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



14.3 Water Jetting and Cleaning

Water jetting is the use of clean, potable quality water at high or ultra-high pressures (above 10,000 psi [70 Mpa]) to prepare a surface for recoating. Water cleaning also uses clean potable quality water at lower pressures (below 10,000 psi [70Mpa]), primarily as a pre-cursor to other forms of surface preparation.

A specification for surface preparation with water jetting should use one of the visual surface preparation definitions (WJ- 1 to WJ-4) and one of the non-visual surface preparation definitions (SCI to SC-3) to specify the surface condition required.

"All surfaces to be recoated shall be cleaned in accordance with NACE 5/SSPC 12 to standards WJ-2 and SC-1; the method of Water Jetting used shall be selected by the contractor to achieve the specified surface condition.

Recommended test procedures for extracting and analyzing soluble ferrous salts, chlorides, and sulfate contaminants of surfaces to be cleaned and/or coated have been defined by ISO.

The coating manufacturer should always be consulted to determine the tolerance of specific coatings to the surface conditions after water jetting, and to the anticipated in-service conditions.

The importance of proper surface preparation and the failure rate due to inadequate or improper surface preparation. Poor surface preparation and the presence of contaminants such as soluble salts, condensation, mill-scale, oxides, or other surface-related problems directly affect the life of the coating.

After water jet cleaning surface shall be minimum grade WJ-2 according mentioned following table definition:

Condition	Description (when viewed without magnification)
WJ-1	A WJ-1 surface shall be free of all previously existing visible rust, coatings, mill scale, and foreign matter and have a matte metal finish.
WJ-2	A WJ-2 surface shall be cleaned to a matte finish with at least 95% of the surface area free of all previously existing visible residues and the remaining 5% containing only randomly dispersed stains of rust, coatings, and foreign matter.
WJ-3	A WJ-3 surface shall be cleaned to a matte finish with at least two-thirds of the surface area free of all visible residues (except mill scale) and the remaining one-third containing only randomly dispersed stains of rust, coatings, and foreign matter.
WJ-4	A WJ-4 surface shall have all loose rust, loose mill scale, and loose coatings uniformly removed.

14.4 Surface Contamination

After surface preparation by water jet, contamination shall be according mentioned following table description:

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Condition	Description
SC-1	An SC-1 surface is free of all detectable levels of contaminants as determined using available field test equipment whose sensitivity approximates laboratory equipment. Contaminants for purposes of this standard are chlorides, iron-soluble salts, and sulfates.
SC2	An SC-2 surface has less than 7 $\mu\text{g}/\text{cm}^2$ chloride contaminants, less than 10 $\mu\text{g}/\text{cm}^2$ of soluble ferrous ion levels, and less than 17 $\mu\text{g}/\text{cm}^2$ sulfate contaminants as verified by field or laboratory analysis using reliable, reproducible test equipment.
SC-3	An SC-3 surface has less than 50 $\mu\text{g}/\text{cm}^2$ chloride and sulfate contaminants as verified by field or laboratory analysis using reliable, reproducible test equipment.

14.5 Thickness check

Dry paint thickness shall be measured as per SSPC PA2 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 spot measurement. For each successive coat, the minimal allowable thickness shall be 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 150% of the specified thickness unless the paint remained soft or shows mud crack or orange skin or wrinkling pinhole and intercoat delamination which cause rejection of the paint. Surfaces with coat thickness out of tolerance shall:

- Be blasted if too thick and repainted.
- Receive and additional paint coat to obtain specified thickness.

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.

In the event of the film thickness not meeting the specified requirements, additional coat (s) of the paint concerned shall be applied in compliance with the specified requirements.

The degree of curing of epoxy resin based paint systems shall be checked by the determination of the resistance of the coating to methyl ethyl ketone (MEK). After rubbing the coating for one minute with a rag soaked in MEK, the coating shall not be softened and shall resist scraping with a fingernail.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



14.6 Adherence check

Paint adherence shall be checked as per ASTM method D3359. 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.

Test method A:

An X-cut is made in the film to the substrate; pressure-sensitive tape is applied over the cut and then removed. Acceptable rating are 5A (No peeling or removal) or 4A (Trace peeling or removal along incisions or at their intersections).

Test method B:

A lattice pattern with either six or eleven cuts in each direction) cross is made in the film to the substrate, pressure-sensitive tape is applied over the lattice and then removed, and adhesion is evaluated by comparison with descriptions and illustrations. Spacing between the cut lines shall be 1 mm for film thickness up to 50 microns and 2mm for film thickness from 50 to 125 microns. Acceptable results are rate 5B (the edges of the cuts are completely smooth, none of the squares of the lattice is detached) or 4B (Small flakes of the coating are detached at intersections, if the test is unsatisfactory, the entire surface shall be blast cleaned and repainted.

Recoating after this destructive test is at the Applicator's expense.

Pull off test:

Paint system adherence shall be checked as per ASTM method D4541 and minimum requirements is 9 Mpa for Thermally spray aluminum and 5 Mpa for other systems.

14.7 Visual inspection

Coating film should be inspected visually after each application and before application of the next coat in order to verify that the whole surface is free of defects as:

- Mud-cracking
- Inclusion and cleanliness
- Holidays
- Bubble
- Mechanical damage
- Runs/sags
- Over spray and ...

14.8 Extent of inspection

In view of the final acceptance, the extension of the inspection shall be as hereinafter indicated and shall be referred to the following steps of work:

- Primed surfaces
- Complete painted surfaces.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



- Paint application shall not be started before previous coat/preparation is inspected and approved.

14.9 Inspection results

All quality control results shall be written up into reports. All reports shall be submitted to the IOOC during provisional acceptance of the paint.

14.10 Repair of defect or damage

Any defect or damage that may occur shall be repaired before the application of further coats and where necessary the particular surface (s) made paint free. Remedial work shall be carried out prior to packing for shipment.

Areas where due to inadequately prepared surfaces, solvent entrapment, excessive application of prime and/or finish coats, etc, the tested paint system consistently fails to meet the required test standards for adhesion/ cohesion, the contractor shall remove the affected area by blast cleaning and shall reapply the full paint system to meet the required standard.

Areas which are to be over coated shall be thoroughly cleaned free from grease, oil and other foreign matter and shall be dry. The surfaces shall then be prepared to the standard as originally specified (for large damaged areas), or prepared to the highest possible standard using mechanically operated tools (for small local damaged spots up to 1 m²). Subsequently additional compatible coats shall be applied, until they meet the specification. These additional coats shall blend in with the final coating on adjoining area. During the agreed maintenance period, any observed defective coatings, rusted areas or failures developing in the paint systems, shall be repaired to the satisfaction of the IOOC inspector.

When factory painted or painted surfaces have been marked in handling, the damaged paint and non-adherent paint shall be removed and the surface thoroughly cleaned.

The edges on the damaged area shall be smoothed. Surface preparation shall extend approximately 5 cm into the sound coat. The primer and finishing coats shall be applied in accordance with Article 9. Where touch up of a shop applied inorganic zinc silicate primer is involved, the type of paint employed for touch up shall be two pack zinc rich polyamide cured epoxy primer for temperatures up to 120°C and ethyl silicate based inorganic zinc primer for temperatures in excess of 120°C.

Note:

If blasting is not applicable for any reason to be agreed upon by IOOC or inspector, zinc silicate primer shall not be used for touch up repairs. Zinc rich epoxy primer or an approved epoxy primer formulated for application on hand or mechanically brushed surfaces should be used instead. The touch up primer shall be compatible with the paint system and temperature shall be considered.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Manufacturer's shop or field applicator shall submit check certified for the following point:

- a) Surface profile check
- b) Verification of paint documentation
- c) Environmental conditions during application
- d) Curing check
- e) Appearance film check
- f) Adhesiveness cross-out check

Note:

- 1) Acceptable surface profile shall be in accordance to the technical data sheet of the product.
- 2) Adhesion degree of each product shall be as for ASTM D-3359 and shall be specified by the paint manufacturer and approved by IOOC. After the test, the surface shall be restored in accordance with the system applied.

IOOC reserves the right to witnessed at manufacture's shop in spot for type/lot the following inspections and test.

1) Blasting and primer system:

- a) Surface profile
- b) Verification of primer documentation
- c) Verification of paints maturity
- d) Appearance film check
- e) Adhesiveness cross-cut check

2) Painting complete system

- a) Verification of paint documentation
- b) Verification of paint maturity
- c) Appearance film check

If during the above mentioned inspection, painting defects (such as dripping, blistering, mud- cracking, over thickness and dry spray) or conditions of preparation, thickness, bond etc, should be found not to be conforming to the requirements, the manufacturer's shop or field applicator at his own expense restore the faulty surfaces to an acceptable degree.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



15. Qualification Testing of Coating System

Coating system shall be tested and pass all the acceptance criteria in according NACE SP0108-2008. An independent laboratory qualified by the facility owner shall carry out the qualification testing.

additional testing may not be required for a coating system on stainless steel if the proposed coating system on carbon steel panels has been approved by the facility owner.

If the coating formulation is changed after the qualification, the coating system shall be requalified by an independent laboratory.

16. Inspection

Test and inspection shall be carried out in accordance with Table 6. Surface shall be accessible until final inspection is carried out.

Repair and Remedial Coating Work

The specification may identify procedures for repair work.

The specification should require the contractor to repair any damage to the coating work and may describe the procedure to use. Consider, for example:

Contractor shall identify damage to the coating and shall feather-edge the coating around the damaged area a minimum of three (3) inches (75 mm) from the damaged area in all directions. Contractor shall use 80 grit abrasive-coated paper to expose each coat of the coating system, including the primer. Using the finish coating material as the repair material, the contractor shall apply, by brush, the same number of coats as is found in the repair area. Total thickness of the repair shall be no less than 90% of the total thickness of the adjacent undamaged coating."


Document No: SPC-SP-IOOC-TP Rev: 01 June 2014 Page 35 of 77	<h2 style="margin: 0;">Surface Preparation and Coating Specification for Iranian Offshore Oil Company</h2>	
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Table2. Inspection and testing

Test Type	Method	Frequency	Acceptance Criteria	Consequence
Environmental condition	Ambient and steel temperature. Relative humidity. Dew Point	Ambient start of each shift+ minimum twice per shift	In accordance with specified requirements	No blasting or coating
Visual examination	Visual for sharp edges weld spatter slivers, rust grade, etc.	100% of all surfaces	No defects, see specified requirements	Defects to be repaired
cleanliness	a) ISO 8501-1 b) ISO 8502-3	a)100% visual of all surfaces b)Spot checks	a)In accordance with specified requirements b)Maximum quantity and size rating 2	a) Reblasting b)Recleaning and retesting until acceptable
Salt Test	ISO 8502-6 and ISO 8502-9	Spot checks	Maximum conductivity corresponding to 20 mg/m ² NaCl	Repeated washing with potable water and retesting until acceptable
Roughness	Comparator or stylus instrument (see ISO 8503)	Each component or once per 10m ²	As specified	Reblasting
Curing test (for Zn silicate)	ASTM D4752	Each component or once per 100m ²	Rating 4-5	Allow to cure
Visual examination of coating	Visual to determine curing, contamination, pinholes/popping, sagging and surface defects	100% of surface after each coat	According to specified requirements	Repair of defects
Holiday detection	Nace RP0188 voltage, see table1	As per coating system specified	No holidays	Repair and retesting
Film thickness	ISO 19840, Calibration on a smooth surface	ISO 19840	ISO 19840, and coating system data sheet	Repair, additional coats or recoating as appropriate
Adhesion	ISO 4624 using equipment with an automatic centered pulling force, and carried out when coating system are fully cured	Spot checks	See notes below	Coating to be rejected

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Surface Preparation and Coating Specification for Iranian Offshore Oil Company



17. COATING SYSTEMS

Row	System	Description	Page
1	CN-1	Atmospheric Zone -50 to 120 °C Without Insulation New	38
2	CN-2	Atmospheric Zone 120 to 150 °C Without Insulation New	39
3	CN-3	Atmospheric Zone 120 to 150 °C With Insulation New	40
4	CN-4	Atmospheric Zone 150 to 400 °C With/Without Insulation New	41
5	CN-5	Decks & floors light and normal duty New	42
6	CN-6	Decks & floors heavy duty and helidecks New	43
7	CN-7/CM-7	Indoor -50 to 120 °C Carbon Steel(New/Maintenance)	44
8	CN-8	Atmospheric Zone up to 600 °C	45
9	CN-9	Exterior Submerged New	46
10	CN-10	Splash Zone New	47
11	CN-11	Epoxy based fire protection	48
12	CN-12	Cement based fire protection	49
13	CM-1	Atmospheric Zone -50 to 120 °C with/without insulation Maintenance	50
14	CM-2	Atmospheric Zone 120 to 150 °C With/ Without Insulation Maintenance	51
15	CM-3	Atmospheric Zone 150 to 400 °C With/Without Insulation Maintenance	52
16	CM-4	Decks & floors heavy duty and helidecks Maintenance	53
17	CM-5	Water Condensing Pipes Maintenance	54
18	CM-6	Splash Zone Maintenance	55
19	SN-1/SM-1	Atmospheric Zone -50 to 120 °C Stainless Steel (New/Maintenance)	56
20	SN-2/SM-2	Atmospheric Zone 120 to 150 °C Stainless Steel (New/Maintenance)	57
21	SN-3/SM-3	Atmospheric Zone 150 to 400 °C Stainless Steel (New/Maintenance)	58
22	SM-4	Water condensing pipes for maintenance only Stainless Steel Maintenance	59
23	ON-1/OM-1	Hot-dip galvanized coatings Atmospheric Zone -50 to 120 °C (New/Maintenance)	60
24	ON-2/OM-2	Aluminum helidecks antiskid (New/Maintenance)	61
25	I-1	Internal coating for potable water	62
26	I-2	Internal coating for sea water	63
27	I-3	Internal coating for stabilized crude, diesel and condensate	64
28	I-4	Internal coating for process vessels P <0.3 MPa T < 75°C	65
29	I-5	Internal coating for process vessels P <7 MPa T < 80°C	66
30	I-6	Internal coating for process vessels P <3 MPa T < 130°C	67
31	I-7	Internal coating for methanol, mono ethyl glycol etc.	68
34	CO-1	Atmospheric Zone on Concrete -50 to 120 °C	69

Surface Preparation and Coating Specification for Iranian Offshore Oil Company

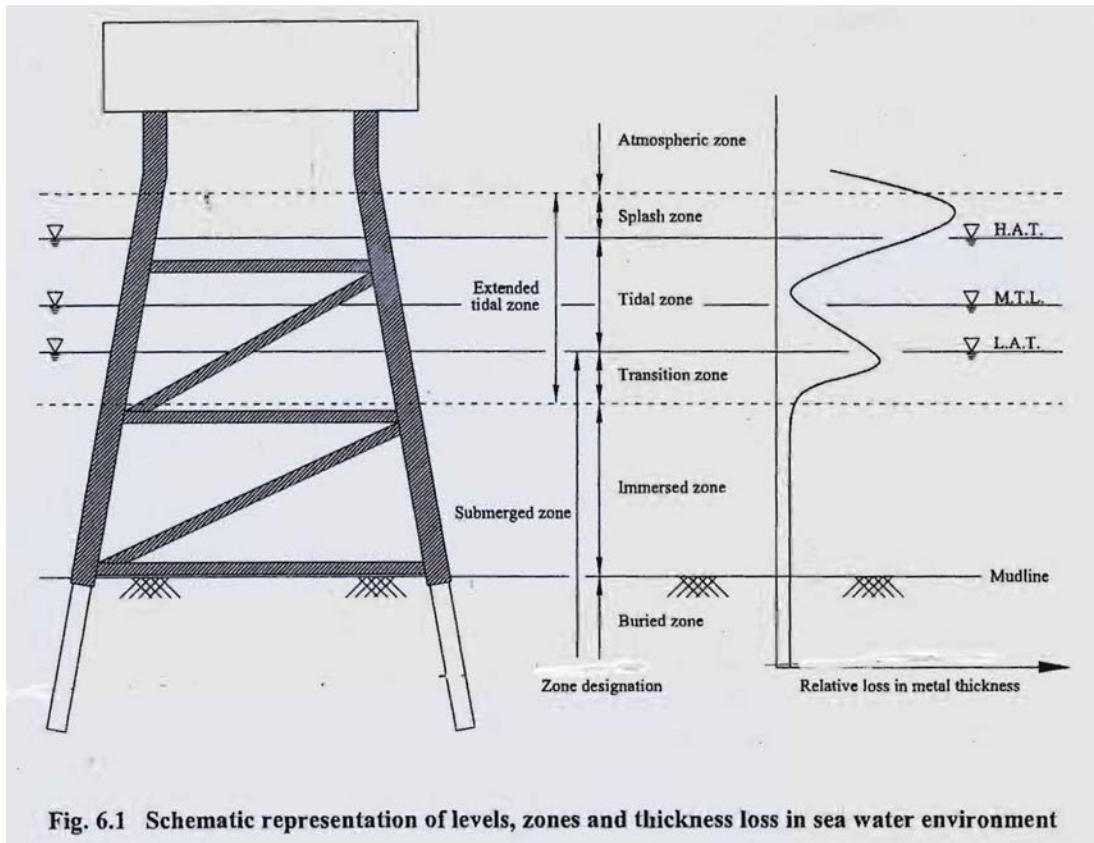


Fig. 6.1 Schematic representation of levels, zones and thickness loss in sea water environment

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System CN-1

All steel structures located above the first decks, decks, tanks, piping and fittings, valves, instruments, heat exchangers with/without thermal insulation on carbon steel for New construction jobs.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone -50 to 120 °C Without Insulation	1	Sa 3	50- 85	1	Inorganic Zinc Rich	1*75	350
				2	MIO Epoxy H.B	2*100	
				3	Polyurethane	1*75	
	2	Sa 2.1/2	50- 85	1	Thermal spray aluminum	375	375
				2	Thinned sealer (epoxy)		
				3	Sealer (epoxy)		

- Zinc rich primer shall pass requirements in ISO 12944-5 and Table1 of SSPC-Paint 20.
- Zinc Ethyl Silicate shall be applied in humid condition (90 %> Relative Humidity> 50%). If Humidity is not present after paint application, surface shall be wet by spray fresh water.
- If Inorganic zinc rich is not applicable, zinc rich epoxy shall be applied by IOOC approval.
- After Zinc ethyl silicate one layer MIO epoxy 30 to 50 Microns shall be applied as a mist coat to prevent popping.

Coating System CN-2

All steel structures located above the first decks, tanks, piping and fittings, valves, instruments, heat exchangers without thermal insulation on carbon steel for New construction job.

Service Category	System	Surface Cleaness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone 120 to 150 °C Without Insulation	1	Sa 3	50- 85	1	Inorganic Zinc Rich	1*75	125
				2	Silicone Acrylic	2*25	
	2	Sa 2.1/2	50- 85	1	Thermal spray aluminum	375	375
2	Thinned sealer (epoxy Phenolic/ acrylic silicone)	3	Sealer (epoxy Phenolic/ acrylic silicone)				
3							

- Zinc rich primer shall pass requirements in ISO 12944-5 and Table1 of SSPC-Paint 20.
- Zinc Ethyl Silicate shall be applied in humid condition (90 %> Relative Humidity> 50%). If Humidity is not present after paint application, surface shall be wet by spray fresh water.

Coating System CN-3

All steel structures located above the first decks, decks, tanks, piping and fittings, valves, instruments, heat exchangers with/without thermal insulation on carbon steel for New construction jobs.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone -50 to 150 °C With Insulation	1	Sa 2.1/2	50- 85	1	Epoxy Phenolic	1*125	250
				2	Epoxy Phenolic	1*125	
	2	Sa 2.1/2	50- 85	1	Thermal spray aluminum (TSA)	375	375
				2	Thinned sealer (epoxy Phenolic/ acrylic silicone)		
3	Sealer (epoxy Phenolic/ acrylic silicone)						

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System CN-4

- All steel structures located above the first decks, decks, tanks, piping and fittings, valves, instruments, heat exchangers with/without thermal insulation on carbon steel for New construction.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone 150 to 400 °C With/Without Insulation	1	Sa 3	50- 85	1	Inorganic zinc rich primer	1*75	175
				2	Silicone	1*25	
				3	Silicone	1*25	
	2	Sa 2.1/2	50- 85	1	Thermal Spray Aluminum	375	+375
				2	Thinned sealer (silicone)	M.R	
				3	Sealer (silicone)	M.R	

- Zinc rich primer shall pass requirements in ISO 12944-5 and Table1 of SSPC- Paint 20.
- Zinc Ethyl Silicate shall be applied in humid condition (90 %> Relative Humidity> 50%). If Humidity is not present after paint application, surface shall be wet by spray fresh water.
- All paints shall be ambient temperature curable.
- M.R is Manufacturer Recommendation with approval of IOOC.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System CN-5

Non-skid surfaces, floors, decks, walkways, escape routes etc on carbon steel and new construction.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Decks & floors light and normal duty	1	Sa 2.1/2	50-85	1	Zinc-rich primer	1*75	500
				2	High- solids epoxy	1*175	
				3	Antiskid epoxy	1*175	
				4	Polyurethane	1*75	
	2	Sa 2.1/2	50-85	1	Epoxy primer	1*175	600
				2	High- solids epoxy	1*175	
				3	Antiskid epoxy	1*175	
				4	Polyurethane	1*75	
	3	Sa 2.1/2	50-85	1	Thermal Spray Aluminum	375	+375
				2	Sealer (Polyurethane)	M.R	
	4	Sa 2.1/2	50-85	1	Antiskid high-build (HB) epoxy	M.R	M.R

- Zinc rich primer shall pass requirements in ISO 12944-5 and Table1 of SSPC- Paint 20.
- If Inorganic zinc rich is not applicable, zinc rich epoxy shall be applied by IOOC approval.
- After Zinc ethyl silicate one layer MIO epoxy 30 to 50 Microns shall be applied as a mist coat to prevent popping.
- After application of intermediate coat, aggregates shall be immediately applied for nonskid surfaces.
- Aggregates size shall be more than 5mm or as per vendor recommendation.
- M.R is Manufacturer Recommendation with approval of IOOC.
- In system 3, gun parameters and gun hardware should be adjusted so that the finished TSA coating has an antiskid profile set at a desired coarseness specification. Although TSA coatings inherently contain hard, wear-resistant aluminum oxide particles that are part of the TSA matrix, prealloyed TSA wire, which is 90% aluminum/10% aluminum oxide, or its equivalent with even greater amounts of aluminum oxide.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company




Coating System CN-6

Non-skid surfaces walk ways, escape routes, decks & floors etc on carbon steel and new construction.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Decks & floors heavy duty and helidecks	1	Sa 2.1/2	50-85	1	Zinc-rich primer	1*75	750
				2	High- solids epoxy	2*150	
				3	Antiskid epoxy	2*150	
				4	Polyurethane safety marking	1*75	
	2	Sa 2.1/2	50-85	1	Epoxy primer	1*175	850
				2	High- solids epoxy	2*150	
				3	Antiskid epoxy	2*150	
				4	Polyurethane safety marking	1*75	
	3	Sa 2.1/2	50-85	1	Prealloyed aluminum/aluminum oxide Thermal Spray Aluminum	400	+375
				2	Sealer (polyurethane)	M.R	
	4	Sa 2.1/2	50-85	1	Antiskid high-build (HB) epoxy	M.R	M.R

- Zinc rich primer shall pass requirements in ISO 12944-5 and Table1 of SSPC- Paint 20.
- If Inorganic zinc rich is not applicable, zinc rich epoxy shall be applied by IOOC approval.
- After Zinc ethyl silicate one layer MIO epoxy 30 to 50 Microns shall be applied as a mist coat to prevent popping.
- After application of intermediate coat, aggregates shall be immediately applied for nonskid surfaces.
- Aggregates size shall be more than 5mm or as per vendor recommendation.
- M.R is Manufacturer Recommendation with approval of IOOC.
- In system 3, gun parameters and gun hardware should be adjusted so that the finished TSA coating has an antiskid profile set at a desired coarseness specification. Although TSA coatings inherently contain hard, wear-resistant aluminum oxide particles that are part of the TSA matrix, prealloyed TSA wire, which is 90% aluminum/10% aluminum oxide, or its equivalent with even greater amounts of aluminum oxide.

Document No: SPC-SP-IOOC-TP Rev: 01 June 2014 Page 44 of 77	<h2 style="margin: 0;">Surface Preparation and Coating Specification for Iranian Offshore Oil Company</h2>	
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Coating System CN-7/CM-7

Indoor structures, tanks, piping, vessels, rotating equipments on carbon steel for new construction or Maintenance.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Indoor -50 to 120 °C	1	Sa 2.1/2	50- 85	1	Zinc Rich epoxy	1*75	225
				2	Epoxy	1*100	
				3	Epoxy Top coat	1*50	
<ul style="list-style-type: none"> Zinc rich primer shall pass requirements in ISO 12944-5 and table1 of SSPC- Paint 20. For condition under isolated wall, final coat is not required. 							

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Coating System CN-8

Flare boom

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone 400 to 600 °C	1	Sa3	30	1	Pure Silicone	1*30	60
				2	Pure Silicone	1*30	
	2	Sa2.1/2	30- 50	1	M.R	M.R	M.R
				2			

- All paints shall be ambient temperature curable.
- M.R is Manufacturer Recommendation with approval of IOOC.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company




Coating System CN-9

Tidal Zone steel parts of the jacket, conductors, raisers, casing (if required), excluding the splash zone on carbon steel for new construction jobs.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT	Total DFT μm
Exterior Tidal Zone up to 60°C	1	Sa 2.1/2	50- 85	1	Glass Flake Epoxy/ Polyester	1*400	800
				2	Glass Flake Epoxy/ Polyester	1*400	
	2	Sa 2.1/2	50- 85	1	Thermal Spray Aluminum	300	300
				2	Thinned Sealer Epoxy	M.R	M.R
				3	Sealer Epoxy	M.R	M.R
	Exterior Tidal Zone 60°C<T<130°C	1	Sa 2.1/2	50- 85	1	Primer	1*25
2					Bonding agent	1*50	
3					Polychloroperene	2*6000	

- When solvent based coating is used, the maximum coating thickness given on the paint manufacturer's technical data sheet shall not be exceeded.
- Volume solid for glass flake epoxy shall be minimum 82%.
- M.R is Manufacturer Recommendation with approval of IOOC.
- Polychloroperene shall be vulcanized.
- The coating system shall always be used in combination with cathodic protection.

Document No: SPC-SP-IOOC-TP Rev: 01 June 2014 Page 47 of 77	<h2 style="margin: 0;">Surface Preparation and Coating Specification for Iranian Offshore Oil Company</h2>	
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Coating System CN-10

Steel parts of the jacket, conductors, raisers, casing (if required), in splash zone up to and included the under face of the first main deck on carbon steel for new construction jobs.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Splash Zone T < 60 °C	1	Sa 2.1/2	50- 85	1	Glass Flake Epoxy/ Polyester	1*500	1075
				2	Glass Flake Epoxy/ Polyester	1*500	
				3	Aliphatic Polyurethane	1*75	
	2	Sa 2.1/2	50- 85	1	Thermal Spray Aluminum	300	300
				2	Thinned Sealer Epoxy	M.R	M.R
				3	Sealer Epoxy	M.R	M.R
Splash Zone T < 130 °C	3	Sa 2.1/2	50- 85	1	Primer	1*25	13mm
				2	Bonding agent	1*50	
				3	Polychloroperene	2*6000	

- Glass Flake shall have more than 82% Volume Solid.
- M.R is Manufacturer Recommendation with approval of IOOC.
- Anti-fouling may be required.

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Coating System CN-11

Epoxy based Passive fire protection paints.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Epoxy based fire protection	1	Sa2.1/2	50-85	1	Zinc Rich Primer	1*75	M.R
				2	MIO Epoxy (Mist coat)	1*30	
				3	Intumescent	M.R	
	2	Sa2.1/2	50-85	M.	Intumescent	M.R	M.R

- Stud welding shall be done before final blast cleaning.
- If Inorganic zinc rich is not applicable, zinc rich epoxy shall be applied by IOOC approval.
- M.R manufacturer recommendation and IOOC approval.
- Top coating on top of the passive fire protection shall be in accordance with the passive fire protection manufacturer's recommendation.
- The coating system and products shall be recommended by the manufacturer of the passive fire protection coating and approved by IOOC.

Document No: SPC-SP-IOOC-TP Rev: 01 June 2014 Page 49 of 77	<h2 style="margin: 0;">Surface Preparation and Coating Specification for Iranian Offshore Oil Company</h2>	
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Coating System CN-12

Cement based Passive fire protection.


Service Category	System	Surface Cleaness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Cement based fire protection	1	Sa2.1/2	50-85	1	Zinc Rich Primer	1*75	+275
				2	Epoxy	2*100	
3				Cement based fire protection	M.R		
	2	Sa2.1/2	50-85	M.	Cement based fire protection	M.R	M.R

- If Inorganic zinc rich is not applicable, zinc rich epoxy shall be applied by IOOC approval.
- Stud welding shall be done before final blast cleaning.
- M.R is Manufacturer Recommendation with approval of IOOC.
- Top coating on top of the passive fire protection shall be in accordance with the passive fire protection manufacturer's recommendation.
- The coating system2 and products shall be recommended by the manufacturer of the passive fire protection and IOOC approval.

Prepared by H.Golmakani and approved by  Ghadimi (Head of corrosion Engineering Department)



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Document No: SPC-SP-IOOC-TP Rev: 01 June 2014 Page 50 of 77	<h2 style="margin: 0;">Surface Preparation and Coating Specification for Iranian Offshore Oil Company</h2>	
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Coating System CM-1

All steel structures located above the first decks, decks, tanks, piping and fittings, valves, instruments, heat exchangers with/without thermal insulation on carbon steel for maintenance.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone -50 to 120 °C without insulation	1	Sa 3	50- 85	1	Inorganic Zinc Rich	1*75	350
				2	MIO Epoxy H.B	2*100	
				3	Polyurethane	1*75	
	2	Sa 2.1/2	50- 85	1	Glass Flake Epoxy	1*300	375
2	Poly urethane	1*75					

- Volume solid for glass flake epoxy shall be minimum 82%.
- Zinc rich primer shall pass requirements in ISO 12944-5 and table 1 of SSPC- Paint 20.
- If Inorganic zinc rich is not applicable, zinc rich epoxy shall be applied by IOOC approval.
- Zinc Ethyl Silicate shall be applied in humid condition (90 %> Relative Humidity> 50%). If Humidity is not present after paint application, surface shall be wet by spray fresh water.
- After Zinc ethyl silicate one layer MIO epoxy 20 to 40 Microns shall be applied as a mist coat to prevent popping.

Prepared by H.Golmakani and approved by  Ghadimi (Head of corrosion Engineering Department)



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Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System CM-2

- All steel structures located above the first decks, decks, tanks, piping and fittings, valves, instruments, heat exchangers with/without thermal insulation on carbon steel for Maintenance.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone 120 to 150 °C With/ Without Insulation	1	Sa 2.1/2	50- 85	1	Epoxy phenolic	1*125	250
				2	Epoxy phenolic	1*125	
	2	Sa 2.1/2	50- 85	1	Silicon-based HB coating	1*200	400
				2	Silicon-based HB coating	1*200	

- Epoxy phenolic shall have resistance to design temperature.
- Silicon-based HB coating is a recently developed high-temperature coating material to be used as a maintenance coating under insulation. This coating material contains silicon, but is not classified as a silicon coating. Its qualification requirement shall be mutually agreed to by the IOOC.
- All paints shall be ambient temperature curable.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System CM-3

- All tanks, piping and fittings, valves, instruments, heat exchangers with/without thermal insulation on carbon steel for Maintenance.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone 150 to 400 °C With/Without Insulation	1	Sa 3	20- 25	1	Silicone	1*25	50
				2	Silicone	1*25	
	2	Sa 2.1/2	50- 85	1	Silicon-based HB coating	1*200	400
				2	Silicon-based HB coating	1*200	

- Silicon-based HB coating is a recently developed high-temperature coating material to be used as a maintenance coating under insulation. This coating material contains silicon, but is not classified as a silicon coating. Its qualification requirement shall be mutually agreed to by the IOOC.
- All paints shall be ambient temperature curable.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System CM-4

Non-skid surfaces walk ways; escape routes, decks & floors etc on carbon steel and Maintenance.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Decks & floors heavy duty and helidecks	1	Sa 2.1/2	50-85	1	Epoxy primer	1*175	600
				2	High- solids epoxy	1*175	
				3	Antiskid epoxy	1*175	
				4	Polyurethane safety marking	1*75	
	2	Sa 2.1/2	50-85	1	Antiskid high-build (HB) epoxy	M.R	M.R
	3	Sa 2.1/2	50-85	1	Epoxy primer	2*125	575
				2	Antiskid epoxy	1*250	
				3	Polyurethane safety marking	1*75	

- After application of intermediate coat, aggregates shall be immediately applied for nonskid surfaces.
- Aggregates size shall be more than 5mm or as per vendor recommendation.
- M.R is Manufacturer Recommendation with approval of IOOC.
- DFT of the applied coating shall be calculated prior to the addition of antiskid grits.
- Grits shall be applied according Manufacturer recommendation.

Document No:
SPC-SP-IOOC-TP
Rev: 01
June 2014
Page 54 of 77

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System CM-5

Typical atmospheric zone coating systems on carbon steel Maintenance.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Water Condensing Pipes	1	Sa 2.1/2	50- 85	1	Underwater-curable epoxy	6000	6000

Prepared by H.Golmakani and approved by Ghadimi (Head of corrosion Engineering Department)



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Coating System CM-6

Typical Tidal & Splash Zone areas, jacket, conductors, raisers, casing (if required), on carbon steel for maintenance jobs.

Service Category	System	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Tidal & Splash Zone $T < 60^\circ\text{C}$	1	Sa 2.1/2	50- 85	1	Two pack hand apply Underwater curable epoxy	6000	6000
Tidal & Splash Zone $T < 130^\circ\text{C}$	2	Sa 2.1/2	50- 85	1 2 3	M.R	M.R M.R M.R	M.R

- The coating system shall always be used in combination with cathodic protection.
- M.R is Manufacturer Recommendation with approval of IOOC.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System SN-1/SM-1

Typical atmospheric zone coating systems on stainless steels (new construction and maintenance).

Service Category	Surface Preparation	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone -50 to 120 °C Without Insulation	Sweep blasting with non-metallic and chloride free grit to obtain anchor profile of approximately 25 to 50 μm	1	Epoxy	2*100	275
		2	Polyurethane	1*75	
<ul style="list-style-type: none"> Coating shall not contain metallic zinc. 					

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System SN-2/SM-2

Typical atmospheric zone coating systems on stainless steels (new construction and maintenance).

Service Category	System	Surface Preparation	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone 120 to 150 °C	1	Sweep blasting with non-metallic and chloride free grit to obtain anchor profile of approximately 25 to 50 μm	1	Epoxy Phenolic	1*125	250
			2	Epoxy Phenolic	1*125	
	2	Sweep blasting with non-metallic and chloride free grit to obtain anchor profile of approximately 25 to 50 μm	1	Silicone- based HB coating	1*200	400
			2	Silicone- based HB coating	1*200	

- Coating shall not contain metallic zinc.
- All paints shall be ambient temperature curable.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System SN-3/SM-3

Typical atmospheric zone coating systems on stainless steels(New construction and Maintenance).

Service Category	System	Surface Preparation	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone 150 to 400 °C	1	Sweep blasting with non-metallic and chloride free grit to obtain anchor profile of approximately 25 to 50 μm	1	Silicone	1*25	50
			2	Silicone	1*25	
	2	Sweep blasting with non-metallic and chloride free grit to obtain anchor profile of approximately 25 to 50 μm	1	Thermal Spray Aluminum	100	+100
	3	Sweep blasting with non-metallic and chloride free grit to obtain anchor profile of approximately 25 to 50 μm	1	Silicone- based HB coating	1*200	400
			2	Silicone- based HB coating	1*200	
	<ul style="list-style-type: none"> Coating shall not contain metallic zinc. All paints shall be ambient temperature curable. M.R is Manufacturer Recommendation with approval of IOOC. 					

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System SM-4

Typical atmospheric zone coating systems on stainless steels Maintenance.

Service Category	Surface Preparation	Coat	Coating System	DFT μm	Total DFT μm
Water condensing pipes for maintenance only	Sweep blasting with non-metallic and chloride free grit to obtain anchor profile of approximately 25 to 50 μm	1	Underwater-curable epoxy	1*500	500
<ul style="list-style-type: none"> Coating shall not contain metallic zinc. For wet pipes, underwater-curable epoxy coating should be brush- applied. Wax or petrolatum tapes of 1.1 mm minimum thickness may also be used. 					

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System ON-1/OM-1

Typical atmospheric zone coating systems for Nonferrous metals (New construction and Maintenance).

Service Category	System	Surface Preparation	Coat	Coating System	DFT μm	Total DFT μm
Hot-dip galvanized coatings Atmospheric Zone -50 to 120 °C	1	Sweep blasting with non-metallic and chloride free grit to obtain anchor profile of approximately 25 to 50 μm	1 2	Epoxy Primer Polyurethane	2*100 1*75	225
	2	M.R	M.	Powder Epoxy	M.R	M.R

- Coating shall not contain metallic zinc.
- For maintenance, surface preparation will be changed to solvent cleaning and shall be approved by IOOC.
- M.R is Manufacturer Recommendation with approval of IOOC.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System ON-2/OM-2

Typical atmospheric zone coating systems for Nonferrous Metals (New construction and maintenance).

Service Category	System	Surface preparation	Coat	Coating System	DFT μm	Total DFT μm
Aluminum helidecks antiskid	1	Sweep blasting with non-metallic and chloride free grit to obtain anchor profile of approximately 25 to 50 μm	1	Epoxy primer	1*175	450
			2	Antiskid epoxy	2*100	
3			Polyurethane	1*75		
	2	M.R	M.R	Antiskid tile system(1)	M.R	M.R

- After application of intermediate coat, aggregates shall be immediately applied for nonskid surfaces.
 - Aggregates size shall be more than 5mm or as per vendor recommendation.
 - For maintenance surface preparation shall be solvent cleaning.
 - M.R is Manufacturer Recommendation with approval of IOOC.
- 1- Aluminum helidecks deflect a relatively large amount. More flexible coating systems shall be used.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System I-1

Internal surface of carbon steel tanks, vessels and etc. for potable water or Fresh water.

Service Category	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Internal coating for potable water	Sa2.1/2	Grade medium G (50 to 85 μm)	1	Solvent free epoxy	1*400	800
			2	Solvent free epoxy	1*400	
Internal coating for potable water	Sa2.1/2	Grade medium G (50 to 85 μm)	1	Solvent free epoxy	M.R	M.R
			2	Solvent free epoxy	M.R	

- 100% holiday inspection in accordance with ISO29601 (Table1) is required.
- Adhesion test shall be carried out on separate test panels, minimum adhesion values in accordance with ISO 4624 shall be more than 5,0 Mpa when using automatically centered test equipment.
- External of lined vessel shall be marked clearly in black letters: LINED VESSEL, NO HOT WORK.
- All products used internally in potable water tanks and fresh water tanks shall have NSF or FDA certificate of DNV.
- Each layer shall have different rall and shall be light color.
- For better result blasting should be done by Garnet.
- M.R is Manufacturer Recommendation with approval of IOOC.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System I-2

Internal coating in carbon steel tanks, vessels and etc. ballast water tanks/ internal seawater filled compartments.

Service Category	Surface Cleaness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Internal coating for sea water	Sa2.1/2	Grade medium G (25 to 85 μm)	1	Zinc phosphate	1*30	1030
			2	Glass Flake epoxy	1*500	
			3	Glass Flake epoxy	1*500	

- 100% holiday inspection in accordance with ISO29601 (Table1) is required.
- Adhesion test shall be carried out on separate test panels, minimum adhesion values in accordance with ISO 4624 shall be more than 5,0 MPa when using automatically centered test equipment.
- External of lined vessel shall be marked clearly in black letters: LINED VESSEL, NO HOT WORK.
- Each layer shall have different rall and shall be light color.
- For better result blasting should be done by Garnet.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System I-3

Internal surface of carbon steel tanks, vessels and etc. for stabilized crude, diesel and condensate.

Service Category	System	Surface Cleaness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Internal coating for stabilized crude, diesel and condensate	1	Sa2.1/2	Grade medium G (25 to 50 μm)	1	Zinc Phosphate	1*30	1030
				2	Glass Flake Epoxy	1*500	
				3	Glass Flake Epoxy	1*500	
	2	Sa2.1/2	Grade medium G (50 to 85 μm)	1	Phenolic Epoxy	1*150	450
				2	Phenolic Epoxy	1*150	
				3	Phenolic Epoxy	1*150	

- System to be applied to the flat bottoms and lower 1 m of walls, and to the roofs and upper 1 m of walls.
- 100% holiday inspection in accordance with ISO29601 (Table1) is required.
- Adhesion test shall be carried out on separate test panels, minimum adhesion values in accordance with ISO 4624 shall be more than 5,0 MPa when using automatically centered test equipment.
- External of lined vessel shall be marked clearly in black letters: LINED VESSEL, NO HOT WORK.
- Each layer shall have different ral and shall be light color.
- For better result blasting should be done by Garnet.
- Glass flake epoxy shall be used in internal condition up to 60°C.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System I-4

Internal surface for process vessels.

Service Category	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Internal coating for process vessels P < 0.3 MPa T < 75°C	Sa2.1/2	Grade medium G (50 to 85 μm)	1 2	Two component solvent free or solvent based epoxy is recommended.	M.R	M.R

- The coating should be cured as close as to operating temperature as possible.
- 100% holiday inspection in accordance with ISO29601 (Table1) is required.
- Adhesion test shall be carried out on separate test panels, minimum adhesion values in accordance with ISO 4624 shall be more than 5,0 MPa when using automatically centered test equipment.
- External of lined vessel shall be marked clearly in black letters: LINED VESSEL, NO HOT WORK.
- Each layer shall have different ralt and shall be light color.
- For better result blasting should be done by Garnet.
- M.R is Manufacturer Recommendation with approval of IOOC.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System I-5

Internal surface for process vessels.

Service Category	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Internal coating for process vessels P < 7 MPa T < 80°C	Sa2.1/2	Grade medium G (50 to 85 μm)	1 2	Two component solvent free or solvent based epoxy or modified novalac epoxy is recommended.	M.R	M.R

- The coating should be cured as close as to operating temperature as possible.
- 100% holiday inspection in accordance with ISO29601 (Table1) is required.
- Adhesion test shall be carried out on separate test panels, minimum adhesion values in accordance with ISO 4624 shall be more than 5,0 MPa when using automatically centered test equipment.
- External of lined vessel shall be marked clearly in black letters: LINED VESSEL, NO HOT WORK.
- Each layer shall have different ralt and shall be light color.
- For better result blasting should be done by Garnet.
- M.R is Manufacturer Recommendation with approval of IOOC.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System I-6

Internal surface for process vessels.

Service Category	Surface Cleaness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Internal coating for process vessels P < 3 MPa T < 130°C	Sa2.1/2	Grade medium G (50 to 85 μm)	1 2	Two components solvent free novalac epoxy is recommended.	M.R	M.R

- The coating should be cured as close as to operating temperature as possible.
- 100% holiday inspection in accordance with ISO29601 (Table1) is required.
- Adhesion test shall be carried out on separate test panels, minimum adhesion values in accordance with ISO 4624 shall be more than 5,0 MPa when using automatically centered test equipment.
- External of lined vessel shall be marked clearly in black letters: LINED VESSEL, NO HOT WORK.
- Each layer shall have different rall and shall be light color.
- For better result blasting should be done by Garnet.
- M.R is Manufacturer Recommendation with approval of IOOC.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System I-7

Internal coating of Vessels for storage of methanol, mono ethyl glycol etc.

Service Category	Surface Cleanness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Internal coating for methanol, mono ethyl glycol etc.	Sa2.1/2	Grade medium G (50 to 85 μm)	1 2	Zinc ethyl silicate to be used DFT 50 μm to DFT 90 μm , or in accordance with manufacturer's technical data sheet.	M.R	M.R

- The coating should be cured as close as to operating temperature as possible.
- 100% holiday inspection in accordance with ISO29601 (Table1) is required.
- Adhesion test shall be carried out on separate test panels, minimum adhesion values in accordance with ISO 4624 shall be more than 5,0 MPa when using automatically centered test equipment.
- External of lined vessel shall be marked clearly in black letters: LINED VESSEL, NO HOT WORK.
- For better result blasting should be done by Garnet.
- M.R is Manufacturer Recommendation with approval of IOOC.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Coating System CO-1

All Concrete surfaces located above the first decks, decks, tanks, for new construction and maintenance jobs.

Service Category	System	Surface Cleaness	Surface Profile μm	Coat	Coating System	DFT μm	Total DFT μm
Atmospheric Zone -50 to 120 °C	1	M.R	M.R	1	Sealer	M.R	N.A
				2	MIO Epoxy	M.R	
				3	Polyurethane	1*75	
	2	M.R	M.R	1	Sealer	M.R	N.A
				2	Glass Flake Epoxy	M.R	
				3	Polyurethane	1*50	

- Surface preparation and painting shall be according Manufacturer recommendation and IOOC approval.
- All activities shall be according to SSPC-Volume 2- Guide No.11& TU2/NACE 6 G 197
- Volume solid for glass flake epoxy shall be minimum 82%.

Approved Paint Manufacturers in IOOC for 2013 are:

Mentioned following manufacturer are approved for:

Offshore: Ameron, International, KCC, Carboline, Hempel, Jotun, Giti KCC, Iambus

In IOOC projects.

Note: contractor shall prepared 15 pieces steel test panel according ASTM A 569 (75*150*1.6 mm) or greater. This test panel shall be blasted and coated with the same paint as used in project. After full curing, test panel shall be send to IOOC for any requirement tests.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



18. Qualification of Blasters and Painters

18.1. Blasters shall have minimum 5 years experience in blasting job. He shall understand abrasive types, size and know Nuzzle size, angle according surface and distance of surface also. He shall understand minimum and maximum pressure of Nuzzle and hand signs.

18.2. Helper shall have minimum 2 years experience in this job and understand hand signs.

18.3. Blasters shall be tested by QC& Paint Inspector and certified by following test format:

Front of Card:

Photo	Contractor Logo	Company Logo
	Contractor Name	
	<i>Blaster Qualification Card</i>	
Blaster Name: Blaster ID: Date of Issue:		
blasting Type: St.Str: Piping : Tank:	Project: Off shore/ Onshore	Grade: A+: A: B+:

A+: He knows all types abrasives and cleaning and roughness meaning, Procedures, repairs and etc. He can be as a blasting Forman.

A: He knows most types of abrasives and application cleaning and roughness meaning, repairs and etc.

B+: He knows just abrasive that are used in site and application, and repairs.

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Behind of Card:

Approved By: Company QC
Paint Manufacturer Representative
Inspector Code& sign:

18.4. Painters shall have minimum 8 years experience in painting job. He shall understand paint types, Nuzzle size, Pump pressure, mixing and thinning of paint, interval time and etc. He shall understand meaning of paint data sheet and application procedures.

18.5. Painters shall be tested by QC& Paint Inspector and certified by following test format:

Photo	Contractor Logo	Company Logo
	Contractor Name	
	Painter Qualification Card	
Painter Name: Painter ID: Date of Issue:		
Painting Type: St.Str: Piping : Tank:	Project: Off shore/ Onshore	Grade: A+: A: B+:

A+: He knows all paints and application, Procedures, touch up and etc. He can used of W.F.T gage properly and capable to be as a Forman.

A: He knows most types of paints and application touch up and etc. He can use of W.F.T gage properly.

B+: He knows just paints that are used in site and application, touch up and etc. He can use of W.F.T gage properly.



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Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Behind of Card :

Approved By: Company QC

Paint Manufacturer Representative

Inspector Code& sign:

19. Finish Colour of Coating

19.1. Final Colors

1. Fire and safety equipment including fire fighting and sprinkler system pipe work shall have a final colour safety red (RAL 3024) in accordance with ANSI Z53.1.
2. All other piping shall have a final colour of light grey (RAL 7035) in accordance with ANSI .61.
3. Life saving equipment shall have a final colour of safety orange (RAL 2004) in accordance with ANSI Z53.1.
4. The interior of potable water storage tanks shall have a white topcoat.
5. Equipment colour codes

Prepared by H.Golmakani and approved by  Ghadimi (Head of corrosion Engineering Department)



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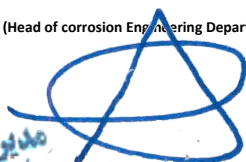


A. Vessels/Storage Tanks/ Heat Exchangers (exterior)	Pure White (RAL 9010)
Vessels/Storage Tanks/Heat Exchangers (Interior locations)	Pure White (RAL 9010)
Pumps and Motors (Interior & Exterior locations)	Light Blue (RAL 5012)
B. HVAC	White (RAL 9010)
C. Cranes:	
Pedestal and Cabin	Yellow (RAL 1007)
Crane Boom and Counter Weight	Yellow and Black Stripe (RAL 1007 + RAL 9005)
D. Electrical Switch gear Panels/UPS/ Transformer	Light Grey (RAL 7032)
E. All equipment and packages in the Module support frame	Melon Yellow (RAL 1028)
Skid for packages (Interior locations) Package (Interior locations)	Black (RAL 9005) Light blue (RAL 5012)
Skid mounted for packages (Exterior locations)	Melon Yellow (RAL 1028)
F. Control Panels (interior / exterior)	Light Grey (RAL 7035)
G. Main Generator Package (interior)	Light Grey (RAL 7032)
H. Emergency generator Package/ Diesel Engine (interior)	Red (RAL 3000)
Compressor Enclosure (interior)	Yellow (RAL 1007)
I. Switch Gear/ Transformers (interior)	Light Grey (RAL 7032)
J. First aid box (interior)	Pure White (RAL 9010)
K. Instruments (interior)	Manufacturers standard colour
L. Motor Operated valves	See note 2 below

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



M. Control Valves	See note 3 below
N. Actuated Valves	See note 4 below
6. Structures and Buildings	
(All structural steel above tidal range including steel for Heli-deck, bridge, stairways, hand rails)	Melon Yellow (RAL 1028)
Pipe supports	Melon Yellow (RAL 1028)
Jackets and other structures in splash Zone	Black (RAL 9005)
flare bridge up to 90°	Melon Yellow (RAL 1028)
Flare bridge above 90°C	Melon Yellow (heat resistant) (RAL 1028)
Boat landing and barge bumper	Olive Brown (RAL 8007)
Runway beams (External/internal)	Yellow and Black Stripes (RAL 1016 + RAL 9005)
Escape routes (External/internal)	Green / Yellow stripes (RL 6018 + RAL 1016)
Floors, decks and walkways	Oxide Red (RAL 3009)
Floors (interiors)	Light Green
Heli- deck surface	Leaf Green (RAL 6002)
Heli deck markings	Pure White (RAL 9010)
Buildings	Pure White (RAL 9010)
Doors (interior/ exterior)	Light blue RAL 5012)
Moving and overhead obstructions (interior & exterior locations)	Red /White stripes. (RAL 3000+ RAL 9010)
Gratings	Window Grey (Ral 7040)



Surface Preparation and Coating Specification for Iranian Offshore Oil Company



7. The identification color band shall be applied by spray of width as shown in the table around the pipe at a maximum of 3 m intervals and on either side of each valve, fitting, wall penetration and any other places where identification of the fluid is necessary. Flow direction shall be shown by arrow in black colour.

PIPE NPS RANGE (Inches)	“X” BAND WIDTH (millimeters)
NPS from 0 to 6	100
NPS from 6 to 12	150
NPS from 12 to 24	200
NPS larger than 24	250

The piping identification colors shall be generally in accordance with ASME A13.1/ BS 4800.
The following identification colors shall be used:

Gas Lines	Yellow (RAL 1007)
Rich Glycol Lines	Deep Purple (RAL 4007)
Lean Glycol Lines	Light Purple (RAL 4006)
Sea Water Lines	White (RAL 9010)
Injection Water	Dark Green (RAL 6005)
Service Water	Dark Green (RAL 6005)
Sanitary Water	Dark Green (RAL 6005)
Produced Water Lines	Light Green (RAL 6024)
Condensate Gas Lines	Light blue / Violet (RAL 5012/4006)
Electrical Conduit	Black (RAL 9005)
Plant Air	Violet (RAL 4006)
Instrument Air	Auxiliary Blue (RAL 5017)
Diesel Oil/ Fuel Lines	Brown/white(RAL 8024 / 9010)

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



Domestic Drains	Dark Brown (RAL 8011)
Potable Water / Drinking Water	Dark Blue (RAL 5003)
Crude Oil	Orange (RAL 2003)
Waste Oil/ Drains (Closed Drain)	Violet (RAL 4006)
Waste /Sewage (Open Drain)	Dark blue (RAL 5003)
Helicopter Fuel	Brown with Red Stripe (RAL 8003 + RAL 3002)
Hydraulic Oil	Brown / Red (RAL 8024/ 3000)
Lube Oil / Seal Oil	Brown / Green (RAL 8024/6018)
Hydraulic Fuel	Green (RAL 6018)
CO2 Gas	Light blue/ Green (RAL 5012 / 6018)
Fire Water	Red (RAL 3000)
Utility Water	Light Blue / White (RAL 5012 / 9010)
Chemical Injection	Black (RAL 9005)

Notes:

1. Insulated Lines

1.1 all insulated lines 3" and above shall be stenciled in accordance with the paint legend. The legend shall be applied to the colour band or a complete colour cover shall be used with black lettering superimposed on white background.

1.2 All insulated lines 2 1/4" and below shall be identified by the attachment of aluminum tags, stenciled with raised lettering.

2. All Motor Operated valve bodies shall be painted light grey (RAL 7032). All actuators shall be painted blue (BS code 18 E 53 as per BS4800 or RAL code equivalent).

3. All Control valve actuators shall be painted green (BS code 14 E 51 as per BS4800 or RAL code equivalent) for fail open valves, red (BS code 04 E 53 as per BS4800 or RAL code equivalent) for fail close valves and white (BS code 00 E 55 as per BS4800 or RAL code equivalent) for Choke Valves and Self Actuated Pressure Control Valves.

Document No:
SPC-SP-IOOC-TP
Rev: 01
June 2014
Page 77 of 77

Surface Preparation and Coating Specification for Iranian Offshore Oil Company



- All ESDV/BDV/XV bodies shall be painted light grey (RAL 7032). Actuators shall be painted green (BS code 14 E 51 as per BS4800 or RAL code equivalent) for fail open valves and red (BS code 04 E 53 as per BS4800 or RAL code equivalent) for fail close valves.

Prepared by H.Golmakani and approved by  Ghadimi (Head of corrosion Engineering Department)



خوانده شد و مورد تایید است