

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض</p> <p>خرید پکیج های کمپرسور گاز (رفت و برگشتی) بینک (قرارداد BK-HD-GCS-CO-0008_03)</p>							 	
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طرح نگهداشت و افزایش تولید ۲۷ مخزن

SURFACE PREPARATION AND PAINTING PROCEDURE

نگهداشت و افزایش تولید میدان نفتی بینک

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1.0 INTRODUCTION

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

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

As a part of the Project, a New Gas Compressor Station (adjacent to existing Binak GCS) shall be constructed to gather of 15 MMSCFD (approx.) associated gases and compress & transfer them to Siahmakan GIS.

2.0 GENERAL DEFINITION

The following terms shall be used in this document.

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

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3.0 SCOPE

This Specification covers the general requirements for selection of painting materials, surface preparation, application procedure and inspection for protective, coatings and painting of Reciprocate Compressor to be used for BINK Oilfield Wellhead Facilities and Manifold Extension.

4.0 APPLICABLE STANDARDS

- BK-GNRL-PEDCO-000-PI-SP-0006_D04 Specification for Painting
- **Iranian Petroleum Standard (IPS)**
 - IPS-E-TP-100 Engineering Standard for Paint
 - IPS-C-TP-101 Construction Standard for Surface Preparation
 - IPS-C-TP-102 Construction Standard for Surface Painting
 - IPS-M-TP-130 Material and Equipment Standard for Coloured Alkyd Paint for Top Coat (Finish) Except White
 - PS-M-TP-168 Material standard for Acrylic Silicon Finish Paint for Temperature Application up to 200°C
 - IPS-M-TP-175 Material and Equipment Standard for Silicone Alkyd Paint (White or Coloured) as Top Coat (Finish)
 - IPS-M-TP-205 Material & Equipment Standard for Zinc Rich Epoxy as Primer, Intermediate & Top Coat
 - IPS-M-TP-210 Material & Equipment Standard for Zinc silicate paint As Primer, Intermediate & Top Coat
 - IPS-M-TP-235 Material & Equipment Standard for Two Pack Poly Urethane Paint as Top Coat
 - IPS-M-TP-220 Material & Equipment Standard for Epoxy Polyamide Intermediate Paint
 - IPS-M-TP-225 Material and Equipment Standard for Epoxy Polyamide Paint as Top Coat (Finish)

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- **INTERNATIONAL CODE AND STANDARDS, Steel Structures Painting Council (SSPC)**

- SSPC-P A1 Paint Application Specification No.1: Shop, Field and Maintenance Painting.
- SSPC-PA2 Paint Application Specification No.2: Measurement of Dry Paint Thickness with Magnetic Gauges.
- SSPC-P A3 Paint Application Guide No.3: A Guide to Safety in Paint Application
SSPC-SP COM Surface Preparation Specification Outfaces Preparation Commentary.
- SSPC-SP 3 Surface Preparation Specifications No.3: Power Tool Cleaning

- **American Society of Testing Materials (ASTM)**

- ASTM A153 Specification for zinc coating (hot-dip) on iron and steel
- ASTM A123 Specification for zinc (hot galvanized) coatings on products fabricated from rolled, pressed and forged steel shapes, plates bars and strip
- ASTM D185 Standard Test Methods for Coarse Particles in Pigments, Pastes, and Paints

5.0 EXTENT OF SURFACE TO BE PAINTED

5.1. SURFACE TO BE PAINTED

The following surfaces shall be completely painted.

- ❖ Compressor
- ❖ Pump
- ❖ Baseplate
- ❖ Auxiliary piping (Carbon steel parts) and piping supports
- ❖ Vessel & Heat Exchanger

5.2. SURFACE NOT TO BE PAINTED

Painting shall not be applied on the following surfaces. (If any)

- ❖ Stainless steel,
- ❖ Nickel, aluminium.
- ❖ Galvanized iron
- ❖ Other metals not subject to corrosion, concrete and masonry surfaces.

6.0 SURFACE PREPARATION

- All surfaces to be painted shall be cleaned of oil or grease or other similar materials with solvent and then will be brushed and blasted with air to remove rust or scale.

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- All mill-scale, rust scale, paint marks or foreign matter shall be removed by shot-blasting, grit-blasting, or sandblasting.
- Before shop primer is applied, dust, sand residue, crushed steel shot or any grit and all other contaminants must be removed from the surface using a vacuum cleaner, like air blower.
- For Compressor Body & Snubber & Cooler & Piping (Carbon): A near-white metal blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter. And for Motor, Valves, Pump, Safety valve & Control Panel: Manufacture Standard.
- Surfaces shall be blast cleaned with blasting grade SA 2 ½ in accordance with standard ISO 8501-1 to obtain a roughness 30~100-micron range for Carbon steel surfaces.
- During surface preparation, care shall be taken not to damage or alter identification plates, machined surfaces and parts coated in the factory. These parts shall be properly protected.
- All bolt holes shall be drilled and blunted before blasting.
- Slice shall not be used for blasting. Coper slag size which is used for blasting size is around 2mm.

7.0 PROCEDURE

- All dust, oil, grease, impurities, etc. shall be removed from surface prior to painting.
- After surface treatment all painting work should perform before rust appear on the surface. If signs of rust appear, it should be reworked according to regulated surface treatment procedure.
- The use of diluent materials of paint should be strictly performed according to product data sheet or instruction of paint manufacturer.
- After undercoat painting, topcoat painting should be performed with sufficient time to dry according to instruction of paint manufacturer.
- Paint manufacture shall be select from approved vendor list (AVL). The paint manufacture shall prepare different layer of primer, inter and top coat colour.
- In the colour system, successive layers of colour must be different in terms of shade and hue.
- If painting is done in a closed environment, sufficient ventilation and light must be provided during painting and drying.
- All steel structures or sheets must be lined or coated to protect their surface during transportation, storage, installation, and welding.
- All inaccessible surfaces must be completely painted before installation.
- Special attention should be paid to the colouring of corners, welds, etc., especially to the minimum thickness of the dry film.
- Painting shall be done in following conditions:
 - ❖ Temperature: Min. 5 °C (41°F), Max. 50°C (122 OF)
 - ❖ Humidity : Max 80 %
 - ❖ Drying : Natural drying

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- Paint shall not be applied to surface:

- ❖ During rain, snow, fog or when dust is in suspension in the air, when wind velocity exceeds 7 m/s.
- ❖ In areas where harmful particles are in suspension.
- ❖ When surface temperature is less than 3 °C above the surrounding air's dew point.
- ❖ When relative humidity is greater than 80 %.
- ❖ When temperature is below 5 °C.
- ❖ Outside daylight hours on exterior locations.
- ❖ When suddenly, weather changes occur within two hours after painting.
- ❖ When moisture occurs in the form of rain, condensation, frost, etc. on the surface. It is likely to occur when the humidity is more than 80% and the temperature is less than 15 degrees Celsius.

8.0 APPLICATION DETAILS

8.1 PREPARATION OF PAINTING

Paintings should be prepared for application according to the instructions. Individual components of multi-component paintings must be stirred before mixing. If the thinner is required, only designated thinner should be used and thinning rate may be adjusted according to the job condition.

8.2 APPLICATION METHOD

- Airless spray is the most effective in obtaining specified thickness at once and will be performed for this project.
- The spray gun shall be kept at constant distance and perpendicular to the surfaces.

8.3 APPLICATION WORK

- Welding seams, corners and edges should always receive a stripe coat before full coating in order to obtain adequate film built.
- Bolt jointing surroundings and flange matching faces should be blanked off or otherwise accepted.
- Special care should be taken to gain uniform thickness.
- Each coat should be allowed enough to dry and interval between coats as per manufacture procedure.

8.4 CLEANING OF TOOLS

The application tools and equipment should be cleaned with the thinner immediately after use.

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8.5 MIXING METHODE

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Mixing shall be carried out by powered mixers and/or shakers. Only small quantities shall be mixed by hand mixing. Mixing directions as furnished by the manufacturer shall be followed. Mechanical agitation during application shall be sufficient to keep pigment in solution.

Mixing in open containers shall be done in a well-ventilated area away from sparks or flames. Paints mixed in original container shall not be transferred until all settled pigment is incorporated in the vehicle. Paints shall not be mixed or kept in suspension by using a bubbling air stream.

Paint shall not remain in spray pots or buckets overnight but shall be gathered in a closed container and remixed before use.

When mixing two-component paints, check and remix each component individually. Then blend the two components at low speed until the mixture is completely uniform in colour. Often, the two components are supplied in different colours so that a good mix can be achieved. Do not mix more than a few liters at a time since the exothermic caused by the mixture may be so high as to make the paint solidify in the container.

Hand mixing of paints is allowed for only containers up to 5 liters. All large containers shall be rolled on its side before opening, then mixed by mechanical agitators and brought to a uniform consistency. Where pigment separation readily occurs such as heavy or metallic pigments, prevention shall be made for continuous mixing during application.

Paint shall be thinned in accordance with the manufacturer's instructions. Only thinners of the type recommended by the paint manufacturer shall be used.

9.0 INSPECTION

9.1 visual inspection

after painting, the surfaces shall be inspected visually for wrinkle, swelling and other harmful defects. if repair coating is required, applicable surfaces shall be arranged by sand paper and re-coated with the same paint.

9.2 coating thickness inspection

1-the average of the acceptable spot readings shall be no less than the specified minimum thickness. no single spot reading shall be less than 80% of the specified minimum.

2-the average of the acceptable spot readings shall be no more than the specified maximum thickness. no single spot reading shall be more than 120% of the specified maximum.

9.3 adhesion test

painting adhesion has to be verified according to ASTM D 3359. the obtained values must not be worse than 4a (ASTM d 3359).

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9.4 Roughness and paint thickness shall be measured by surface roughness test and paint thickness gauge. Calibration of mentioned test devices must be submitted before test operation.

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10.0 PAINTING WORK INSTRUCTION FOR BARE BLOCK COMPRESSOR

10.1 SCOPE

This procedure covers the surface preparation and application of protective coating for new construction of compressors and auxiliary equipment's at shop.

10.2 REFERENCES CODE AND STANDARD

ISO 8501-1, Preparation of steel substrates before application of paints and related products.

- Visual assessment of surface cleanliness - Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.

ISO 8502-3, Preparation of steel substrates before application of paints and related products.

- Test for the assessment of surface cleanliness - Part 3: Assessment of dust on steel surfaces prepared for painting - Pressure-sensitive tape method.

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 8502-9, Preparation of steel substrates before application of paints and related products.

- Test for assessment of surface cleanliness - Part 9: Field method for the conductometric determination of water-soluble salts.

ISO 8503-2, Preparation of steel substrates before application of paints and related products.

- Surface roughness characteristics of blast-cleaned steel substrates - Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel - Comparator procedure.

ASTM D4752, Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub.

-SSPC PA2, Measurement of Dry Coating Thickness with Magnetic Gages.

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-SSPC SP1~11, Surface Preparation Specification

10.3 GENERAL

- This painting procedure states the condition and requirements for the surface preparation, shop, field and touch-up painting of the equipment, structures and the requirements for paint material, application, inspection, etc.
- All regulations including storage of paint, handling, surface preparation, paint work, safety, etc. shall be compliance with the painting procedure and paint manufacturer's specifications.
- Shop painting shall comply with product data sheets, painting procedure, and material safety data sheets of paint manufacturer.

10.4 EXTENT OF SURFACE TO BE PAINTED

- Surfaces to be painted:
The following surfaces shall be completely painted.
 - Compressor
 - Pump (Case, Head)
 - Baseplate
 - Epoxy grout contact surface and underside of baseplate
 - Auxiliary piping (Carbon steel parts) and piping supports
 - Vessel & Heat Exchanger
- ※ Below items must be painted with Epoxy primer for primer painting.
- Machining (example: coupling, v-pulley, motor pulley, etc.)
- Main oil pump
- Surfaces not to be painted:
Painting shall not be applied on the following surfaces. (If any)
 - Plastic, rubber, aluminium, copper, brass, Monel, stainless steel
 - Galvanized metal
 - Glass, tile and ceramic surfaces
 - Auxiliary piping (Stainless steel parts)
 - Mechanical seal flange
 - V-Belt guard (Aluminum)
 - Name plates

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10.5 SURFACE PREPARATION

- All rough welds, burrs, weld spatters, indentations, and all other sharp surface projections shall be ground smooth prior to further surface preparation.
- Steel and fabrication defects such as weld spatter, lamination scabs, sharp edges of welds before or after blast cleaning shall be repaired after welding in stage of assembly.
- Soluble salt shall be washed with fresh water when salt contents are measured as above than 100 mg/m² as per ISO 8502-9.
- Any oil and grease on the surface before preparation shall be removed with alkaline detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area using fresh water.
- Surface of carbon steel shall be dry abrasive blast cleaned to Sa 2 1/2 (ISO 8501-1) using abrasive media suitable to achieve a sharp and angular surface profile. Abrasive shall be dry and oil-free. The surface preparation of shop primed area should be followed in painting work instruction.
- Roughness of blasted steel shall be 35~60µm, grade to Medium S (ISO 8503-1).
- At the completion of abrasive blasting the prepared surface shall be cleaned to remove residues of corrosion products and abrasive media, and inspected for surface particulate contamination. Maximum contamination level is rating 2 (ISO 8502-3). Dust size shall be no greater than class 2.
- Blast cleaning shall not be conducted when the temperature of surface is 3°C less than dew point of surrounding air or when the relative humidity of the air is more than 85% (ISO 8502-4).

10.6 PAINT APPLICATION

- All carbon steel shall be treated in accordance with this procedure and the data sheets of the paint manufacturers.
- The surface shall be clean and free from contamination and painting works shall not be applied to the wet surface.
- Painting works shall be applied within 4 hours after the surface have been prepared, but in any event before visible rusting occurs.

• Mixing and thinning:

- All coating material shall be mixed by solvent proof mechanical stirrer for a sufficient time in order to for proper mixing of one or two packs paint and bring the material to a uniform consistency. Sticks shall not be used.

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- Continuous agitation type spray pots shall be used when applying heavily metal pigmented paint such as zinc loaded paint.

- Thinner shall not be added to primer or paints unless necessary for proper application according to the manufacturer's recommendation. The type of thinner used must comply with the manufacturer's recommendation.

- Painting shall be performed when the following temperature and relative humidity limits are satisfied.

■ Minimum temperature	5°C (41°F)
■ Maximum temperature	43°C (109°F)
■ Maximum relative humidity	85%

- No painting shall be applied outdoor when it is foggy, rainy or excessive wind. If chemical contamination occurs in paint, it should be removed by washing with water or solvent before painting.

- If the spraying device are used, the coating manufacturer's instructions are to be observed with regard to the type and dimensions of the spray gun used. Brush or roller may be required to achieve the specified thickness.

- Special care should be taken to gain uniform thickness, and each coat should be allowed enough to dry and interval between coats.

- The application tools and equipment's should be cleaned with the thinner immediately after use.

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10.7 REPAIR AND TOUCH UP

The damaged parts caused by burns, welds, scratches, impact and so on during fabrication, handling, storage, shipping and erection, coating defects such as loss of adhesion, blistering, peel off, crack, running and sagging, over spray etc. must be repaired in accordance with this painting procedure.

- Surface preparation:

- Damages to the coating layers:

1) Prepare the area through sandpapering or grinding, followed by thorough washing. When the surface is dry the coating may be over coated by itself, reference to this procedure in above paragraph.

2) Always observe the maximum over coating intervals. If the maximum over coating interval is exceeded the surface shall be carefully sanded removing the top of surface followed by thorough fresh water washing in order to remove zinc salts. Alternatively, the surface can be abrasive swept.

- Damages exposing bare substrate:

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The type of surface preparation for the damages to the bare substrate shall be determined by the extent of rusting from the damaged area.

- 1) Rusted area and coating defects area shall be prepared by blast. If blast cleaning is impossible, hand/power tool cleaning shall be conducted.
- 2) Non-rusted area and slightly damaged area shall be prepared by hand tool or power tool cleaning.
- 3) Welds and other damage caused by hot work shall be prepared and repaired by power tool cleaning with SSPC SP11.
- 4) Overlapping zone to intact coating shall have feathered back by hand or power tool to establish smooth transition of surrounding coating.

- Coating application

- The coating system for touch up shall be conformed to the painting system indicated of this procedure.
- Coating for touch up shall be done with brush, roller or spray equipment according to circumstance.

10.8 INSPECTION

Visual inspection:

- After painting, the surfaces shall be inspected visually for wrinkle, swelling and other harmful defects.
- The (Munsell / RAL) colour chart or similar paint system may be used for the examination of the finish coating colour of each coat.

Film thickness inspection

Measurement:

- 1) Film thickness shall be measurement of dry paint thickness with magnetic gauges.
- 2) As a rule, film thickness shall be measured at the shop or field for each coat dry film thickness and the record shall be prepared for each coat.

Number of measurements and measured values:

- 1) The number and position of measurements shall be determined with due consideration given to the size and shape of items to be painted.
- 2) Measurements shall be carried out three times at each measuring point. The average of three measurements shall be taken as the measured value for the item concerned.

Rating of measured value:

When the measured values satisfy the following requirements, they shall be deemed acceptable:

- 1) Average of measured film thickness: 90% or prescribed film thickness
- 2) Minimum of measured film thickness: 70% or prescribed film thickness.

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10.9 STORAGE OF PAINT

The storage area should be well ventilated and protected from sparks, flame, direct exposure to sun or excessive heat, preferably located in isolated room.



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شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	SURFACE PREPARATION AND PAINTING PROCEDURE								شماره صفحه : 17 از 18
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Air Cooler (Stainless steel)	N	No Paint									
Air Cooler (Carbon Steel)	N	~120	SA 2 1/2	205	75	220	80	235	50	7047/ Tele gray 4	205
Safety Valve	N	Manufacture Standard									
Motor	N	Manufacture Standard									
Pump	N	Manufacture Standard									
Filter	N	Manufacture Standard									

IPS No. description:

- **205:** Zinc-Rich Epoxy Paint (Organic Zinc-Rich) IPS-M-TP-205
- **220:** Epoxy Polyamide Intermediate Paint IPS-M-TP-220
- **235:** Two Pack Aliphatic Polyurethane Paint IPS-M-TP-235
- **210:** Zinc Silicate (Inorganic Zinc Rich) Paint IPS-M-TP-210
- **168:** Acrylic Silicon Finish Paint for Temperature up to 200°C IPS-M-TP-168
- **DFT: Dry Film Thickness**
- **According to the IPS standard, the ral of each layer is different**





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SURFACE PREPARATION AND PAINTING PROCEDURE				
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BK	GCS	HY	120	QC
نوع مدرک		سریال	نسخه	
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12.0 PAINTING REPORT

Location of Logo's
to be same as
procedure.

Hy Reply: Noted

V01

 HAVAYAR Industrial Group		SAND BLAST & PAINTING INSPECTION REPORT											
Project :				Equipment :				Date :					
Serial No :				Procedure No.:				Report No :					
Type Of surface Prepration: SAND BLAST SA 2 1/2 <input checked="" type="radio"/> SHOT BLAST <input type="radio"/> PICKLING <input type="radio"/>													
Paining Method: Humidity check to be added Hy Reply: Noted				Airless <input type="radio"/> Air Spray <input type="radio"/> Brush <input type="radio"/>				Roughness check to be added Hy Reply: Noted					
Type Of Segment:				Type Of Preparation: SAND BLAST TO NEAR WHITE METAL SA 2 1/2									
Type of Sand: Copper Slag				Degree Of Preparation: ... °C				??? Hy Reply: Noted					
Surface Temperature: °C				Durtion Time Between Blasting And Painting				1 hours					
Painting Manul: Tower A													
LAYER No. :		1			2			3					
NEW/REPAIR		NEW			NEW			NEW					
INTERNAL /EXTERNAL		EXTERNAL			EXTERNAL			EXTERNAL					
MEASSURING POINT		Body (UP)			Body (MEDDLE)			Body (DOWN)					
KIND OF PAINT		ZINC SILICATE (μm)			MODIFIED EPOXY (μm)			POLYURETHANE (μm)					
DRY FILM Thick (μm)		1	2	3	Ave	1	2	3	Ave	1	2	3	Ave
Test Result		Accept <input type="radio"/> Reject <input type="radio"/>			Accept <input type="radio"/> Reject <input type="radio"/>			Accept <input type="radio"/> Reject <input type="radio"/>					
Painting Manul: Tower B													
LAYER No. :		1			2			3					
NEW/REPAIR		NEW			NEW			NEW					
INTERNAL /EXTERNAL LOC		EXTERNAL			EXTERNAL			EXTERNAL					
MEASSURING POINT		Body (UP)			Body (Intermediate Coat)			Body (DOWN)					
KIND OF PAINT		ZINC SILICATE (μm)			MODIFIED EPOXY (μm)			POLYURETHANE (μm)					
DRY FILM Thick (μm)		1	2	3	Ave	1	2	3	Ave	1	2	3	Ave
Test Result		Accept <input type="radio"/> Reject <input type="radio"/>			Accept <input type="radio"/> Reject <input type="radio"/>			Accept <input type="radio"/> Reject <input type="radio"/>					
Classification Of Adhesion Testing: CROSS CUT <input type="radio"/> X-CUT <input checked="" type="radio"/> PULL OFF <input type="radio"/>													
Calssification		5B <input type="radio"/>		4B <input type="radio"/>		3B <input type="radio"/>		2B <input type="radio"/>		1B <input type="radio"/>		0B <input type="radio"/>	
													
Result of adhesion test (Acc/Rej) to be mentioned. Hy Reply: Noted													
Vendor		Third Party Ins.			EPC Contractor			EPD/ EPC Contractor (GC)			Owner		
Name & Sign:		Name & Sign:			Name & Sign:			Name & Sign:			Name & Sign:		
Date:		Date:			Date:			Date:			Date:		