



# POLYARMOR Modified Epoxy Resin Coating System

## 1. Introduction

Combined with extended periods in the marine environment, heavy rainfall, humidity, high concentrations of chloride ions in the atmosphere are normal Ocean Characteristics.

The life of Ocean Buoys and equipment experience high levels of Marine erosion of the characteristics of the waves to take enhanced anti-corrosion coating program. The paints and coatings available today do not hold up well in these environments. The need exists for specially developed coatings which can manage these adverse environments.

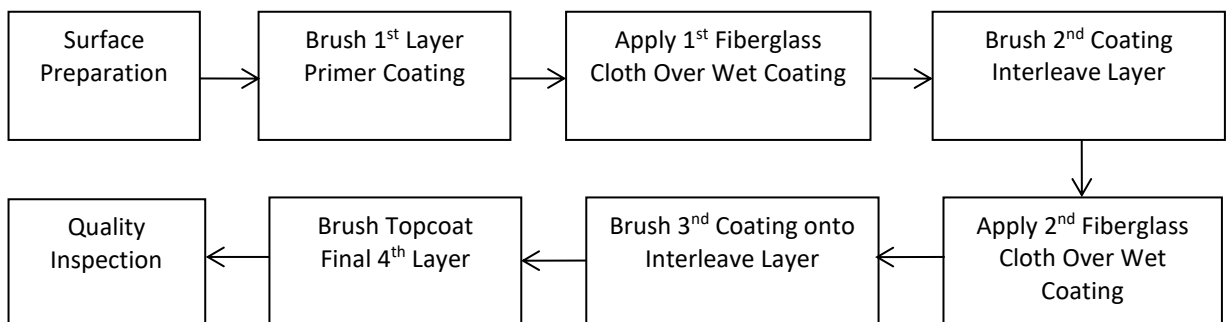
Practice to date use a high build epoxy system to provide corrosion protection comprising two component polyurethane coating. However there are serious concerns regarding the safety of the isocyanate components of these paints. There have been developments in modified epoxy systems which have similar gloss retention performances. (Abstract from IALA Guideline 1015 Painting Aid to Navigational Buoys).

Herein, Central Products describes our program to deliver a Coating system capable of protecting Ocean Buoys and equipment for extended operational life. Central Products recommends a 4-Tier Coating (2 layers glass cloth and 3 layers of Modified Epoxy Resins) and Topcoat providing Fluorescent Gloss Colorants and UV resistance.

**Table 1 - Coating System Layers - For Buoy Main Body**

Coating Layer	Coating Name	Dry Film Thickness
Primer Layer 1	POLYARMOR (Modified Epoxy Resin)	250 µm
Fiberglas Cloth	Elastic glass Fiber Cloth	-
Middle Layer 2	POLYARMOR (Modified Epoxy Resin)	400 µm
Fiberglas Cloth	Elastic Glass Fiber Cloth	-
Middle Layer 3	POLYARMOR (Modified Epoxy Resin)	400 µm
Topcoat Layer 4	POLYARMOR (Modified Epoxy Resin ) Topcoat	70 µm

**Figure 1 - Construction Method Flow Chart**



## 2.0 Material Performance Specifications

**Figure 2 – POLYARMOR (Modified Epoxy Resin) Properties**

Item	Testing Standard	Test Results	Testing Procedure
1	Density, g/cm	1.49	GB/T 6750
2	Wear Resistance (500g, 1000rpm)	≤20 mg	GB/T 1768
3	Alkali Resistance (10% NaOH, 7d)	Pass	GB/T 9274
4	Salt Water Resistance (10% NaCl, 7d)	Pass	GB/T 9274
5	Artificial Accelerated Aging (1000h)	No Bubbles, no cracking, no delamination	GB/T 1865
6	Artificial Accelerated Aging (2000h) (w/Topcoat)*	No Bubbles, no cracking, no delamination	GB/T 1865
7	Salt Spray Resistance (1000h)	No Bubbles on coating	GB/T 1771
8	Curing Time, hr	6h	GB/T 1728
9	Hygienic Inspection	Pass	GB/T 17219

**\*note:** POLYARMOR Topcoat is a special formulation of POLYARMOR which includes increased UV Resistant formulations and fluorescent Colorants. POLYARMOR Topcoat is often used for Splash Zone Marine and Above Water Protection

**Figure 3 – Accelerating Aging in Equivalent Years**

Coating Area	Item	Design to protect 10 year	Design to protect 20 year
Air	UV resistance	≥ 1000h	≥ 3000h
	Salt mist resistance	≥ 3000h	≥ 4000h
	Hot and humidity resistance	≥ 3000h	≥ 4000h
	Adhesion strength	≥ 5Mpa	≥ 5MPa
Splash zone & Under water zone	Salt mist resistance	≥ 3000h	≥ 4000h
	Hot and humidity resistance	≥ 3000h	≥ 4000h
	Adhesion strength	≥ 5Mpa	≥ 5MPa

**Figure 4 – POLYARMOR and POLYARMOR Topcoat Curing Times**

Environmental Temperatures →	5 C	15 C	25 C	40 C
POLYARMOR “Pot Life” Application Time (hours)	>3.0hr	>2.0hr	>1.0hr	<0.5hr
POLYARMOR Surface Curing Time (hours)	30hr	8hr	4hr	2hr
POLYARMOR Complete Curing Time (hours)	50hr	20hr	6hr	4hr
Structure Full Handling/Maintenance (days)	15day	7day	5day	3day

### **3. Installation Method and Procedures**

#### **1. Construction Environment**

For Surface Preparation and Application of Coatings

- 1.1. Apply Indoors with good ventilation and lighting.
- 1.2. Keep relative humidity of the air below 85%.
- 1.3. Substrate temperature should be higher than the dew point temperature by at least 3 °C.
- 1.4. Keep the coating application area clean and dust-free. Minimize the amount of dust that goes airborne during the coating process.
- 1.5. Apply in isolation zones and equip safety warning signs.
- 1.6. Prepare a separate sand blasting room, relatively closed off, ventilated, and well lit.

#### **2. Surface Preparation and Treatment**

For Steel Surface Preparation

- 2.1. Pretreat steel surface: removing burrs, sharp edges and corners, etc. Complete pretreatment, before blasting.
  - 2.1.1 Treat sharp edges by edge grinding to  $R \geq 2\text{mm}$ .
  - 2.1.2 Remove all the welding spatter and welding slag.
- 2.2. Sandblast in the prepared blasting room with adequate ventilation and lighting.
  - 2.2.1 Profiled steel surface should reach Sa2.5 level or other relevant international standard, ideally in the range 75-150 microns.
  - 2.2.2 Recover blast material debris and dispose properly.
  - 2.2.3 Operators need to wear safety equipment and protective suits, with air supply and ventilation, compliant with all local safety and plant regulations.

#### **3. Application of Coatings**

Primer Layer 1, Coatings application

- 3.1 Coating process must be carried out inside the factory; a dedicated indoor operating area, plenty of open space, good air circulation and ventilation, and well lit.
- 3.2. Apply coating using trowel, brush, or spraying, without leakage coating, no sagging.
- 3.3. Inspect to ensure that the edge, welding, and corners achieve the required film thickness; for each coating construction.

#### **4. Fiberglass resin composite material construction**

- 4.1. Fiberglass reinforced plastic composite material is made of POLYARMOR as a binder and flexible fiberglass resin as a reinforced material, to provide anti-corrosion protection structure.
- 4.2. Before the bottom coating is totally cured (within 6 hours after application) spiral wrap a single layer of elastic fiberglass cloth. Keep proper tension on the elastic fiberglass cloth during winding process. Then apply a layer of POLYARMOR coating over it.
- 4.3. Every time a layer of fiberglass reinforced plastic composite materials is finished; check its quality. Remove or repair any burrs, flows, bubbles and/or other defects.
- 4.4. When applying multiple layers of fiberglass reinforced plastic composite materials, the second layer need to be applied within 6 hours the previous layer is finished.

#### **5. Top/Surface coating construction**

- 5.1. Apply the surface coating before the middle layer fully cures (within 4 hours), apply the coating using brush or spray. No leakage coating, no sagging.
- 5.2. Use POLYARMOR Topcoat for the top coating, film thickness about 70um.

#### **6. Above Water Structure/Internal Surface**

- 6.1. For structure above water attached to the buoy, a 2 layer system with the primer coating of 250 micron and a topcoat layer of 70 micron would be recommended.
- 6.2. For internal surfaces of the chamber, a single layer of primer coating of 250 micron will apply

#### **7. Coating repair**

- 7.1. If any of the following circumstances occur, you will need to repair the coating in the field:
  - 7.1.1. If the anti-corrosion coating thickness does not meet the standard.
  - 7.1.2. If there is coating damage (film damage, cracks, etc.,) caused by transportation, lifting or stock storage process that could affect the performance of the coating.
  - 7.1.3. If the coating was damaged during installation.
- 7.2. Coating repair methods and measures: pretreat the surface before the repair process. Clean the surface; remove water, oils and other foreign materials to reach St3.0 level, then use the same anti-corrosion coating materials for makeup.

## **4. Inspection and acceptance criteria**

### **1. Inspections Methods**

1.1. Surface treatment inspection: surface cleanliness and surface roughness should meet the requirements of this program.

1.2. Dry Film Thickness (DFT) inspection: before you start the test, the coating should be dry, clean and no dry spray. The number of test points should be in accordance with ISO 19840. Determination of dry film thickness criteria:

The arithmetic mean of all detected values should be greater than or equal to NDFT.

All detections should be greater than or equal to 90% of NDFT.

1.3. Adhesion Detection: coating adhesion use sampling inspection, sampling ratio of 10%, each sampling object measured 3 points, the arithmetic value of the detection value should meet the product performance requirements in accordance with GB / T 5210 relevant provisions. All coating areas that are damaged by adhesion test should be repaired in accordance with prescribed procedures. In order not to damage the coating, it is recommended to do the adhesion test in a special plate. (Adhesion test plate: The sample size of the adhesion test was 150 mm \* 250 mm and completed with the product coating process, and the adhesion test was carried out on this plate.)

### **2. Storage and transportation**

2.1 Storage site should be completely flat, well ventilated, and include drainage equipment. Buoy stacking should be safe and reliable. Keep in mind the foundation bearing capacity. Mat and stacking stability should meet the stacking requirements.

2.2. Buoy stacking should take anti-rain, sun and anti-corrosion measures into consideration.

### **3. Health, safety and the environment**

"Safety" is the prerequisite for all construction. During the construction process, always implement the "safety first" approach; including the establishment of a safety management and assurance measures system.

3.1. Painting Construction Personnel Requirements: they will need to have passed a physical examination to determine that they are healthy; they will need to have completed safety training; have mastered the safety knowledge and skills of the work, and have received an assessment of qualified certificates. They should also have a basic understanding of the performance and safety measures of the coatings.

3.2. Material requirements: the health performance of materials used in the construction must meet the relevant national regulatory requirements.

3.3. Environmental safety

3.3.1 The sandblasting and spray paint rooms should be equipped with filter and ventilation equipment, in order to keep the area dust-free and well ventilated.



3.3.2 During the construction period, the designated person should do a good job of sanitary work; making sure that waste, garbage, and unnecessary temporary facilities and equipment be promptly removed.

3.3.3 Communicate with local environmental protection departments.

#### **4 Personal safety requirements**

4.1. For surface treatment and painting, the operator must wear anti-static labor insurance shoes, special work clothes, special gloves, protective glasses and protective masks, at all times.

4.2. While operating in the indoor construction areas, if the operator feels dizziness, or nausea, they should immediately stop the operation, and go outdoors away from any ventilations systems, any more serious symptoms and they should be immediately sent to hospital for examination.

#### **Your partner:**

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