



## CUSTOM LININGS POLYUREA FOR APPLICATION ON OFFSHORE RIGS and PLATFORMS

EXAMPLE ONLY – See Disclaimer

### **General Parameters, Conditions and Comments**

Custom Linings Polymer Products are commonly used in waterproofing, anti-corrosion, anti-abrasion and chemical resistance applications where protection for steel substrates on offshore rig structures is critical to the design life of the platform. In these applications, the product specified and correct methods of application are integral with critical design details requiring complete clarification prior to preparation of final specification submittals to a specific client.

This application method statement is provided as a preliminary guide in the determination and selection of a specific protective system to be utilized for applications on off shore oil equipment and platforms and is not intended for use as a complete technical specification. Critical design and/or structure details (including specific use and abuse levels of each area) must be provided, and a final specification submitted, reviewed and approved by the clients specific design and/or management team prior to the start of coating process.

The following application method statement is generic in nature. A project specific application method statement can be provided after provision of the key information summarized below:

- Area types to be coated including desired design life requirements for each area
- Abuse level expected by specific area type
- Submersion level expected by specific area type (full, partial, intermittent, etc)
- Chemical resistance level expected by specific area type (chemical concentrations)
- Clarification of works type (new construction or offshore works)
- Period of Works (time frame for application desired)
- Location of Works (country, region, including location off-shore if applicable)
- Warranty Period Required
- Project Design Life Required

A final application method statement would be provided in conjunction with the key information defined above. Final primer and polyurea product selection, specific dry film thicknesses, specific surface preparation requirements, etc., will be provided for each specific area type based upon the detailed information provided in direct conjunction with the key information requirements listed directly above.

It is impossible to provide a detailed specific statement for any project prior to provision of complete details. The following method statement would be applicable in many application types for most projects, however there will be revisions based on project specifics and any assumptions made from the review of this document are those of the reader, not the author.

### **Application Method Summary**

This application method statement is provided for construction methodology where offshore rigs are utilized for drilling, processing and storage of oil and gas products in a constant marine environment. The complexity of the designs and the variety of options for these rigs make provision of specific methods difficult for this application type. In most cases the design will incorporate; waterproofing, anticorrosion, chemical resistance and abrasion resistance properties for coatings and/or membranes utilized on all substrates and surfaces. Bearing these features in mind, a list of specific area types and the initial polyurea product specification list including dft levels is provided in Table 1 as below:

**TABLE 1: AREA AND PRODUCT SPECIFICATION DETAILS**

Description	Environmental Weather Conditions	Product Specified	Warranty Period	Surface Preparation Required	Coating DFTmm	Coating Waste Factor
Jack up barge external shell surfaces	Seawater Immersion High Impacts	911 + Primer	10-Years	SA 2.5	2	120%
Jack up barge internal shell surfaces	Seawater Immersion High Impacts	911 + Primer	10-Years	SA 2.5	1.5	120%
Jack up barge slot area surfaces	Seawater Immersion High Impacts	911 + Primer	10-Years	SA 2.5	2	120%
Jack up barge platform external hull surface	Seawater Immersion Med Impacts	911 + Primer	10-Years	SA 2.5	1.5	120%
Jack up barge bottom keel plate external surface	Seawater Immersion Med Impacts	911 + Primer	10-Years	SA 2.5	1.5	120%
Jack up barge platform area surfaces	Seawater Immersion Med Impacts	911 + Primer	10-Years	SA 2.5	1.5	120%
Leg external surfaces including splash zone areas	Seawater Immersion Heavy Impacts	911 + Primer	10-Years	SA 2.5	2	120%
Helideck top decking (requires non-slip texture)	Exterior Ambient Ocean Exposures Temp 55 C light to Medium Impact	711 or 911 + Primer + 1110-AR w/aggregate	10-Years	SA 2.5	2	120%
Helideck underside including stiffeners	Exterior Ambient Ocean Exposures Temp 55 C light to Medium Impact	711 or 911 + Primer	10-Years	SA 2.5	1.5	120%
Helideck structure overall	Exterior Ambient Ocean Exposures Temp 55 C light to Medium Impact	711 or 911 + Primer	10-Years	SA 2.5	1.5	120%
Helideck line markings	Exterior Ambient Ocean Exposures Temp 55 C light to Medium Impact	1110-AR	5-Years	-	0.25	120%
Accommodations external shell	Exterior Ambient Ocean Exposures Temp 55 C light to Medium Impact	911 + Primer	10-Years	SA 2.5	1.5	120%
Accommodations internal shell	Inside Controlled environment	711 or 911 + Primer	10-Years	SA 2.5	1	120%
Accommodation internal machinery areas	Inside Controlled environment	711 or 911 + Primer	10-Years	SA 2.5	1	120%
Control house topdeck internal surfaces	Environmental weather conditions	711 or 911 + Primer	10-Years	SA 2.5	1	120%
Emergency generator house internal surfaces	Exterior Ambient Ocean Exposures Temp 55 C	711 or 911 + Primer	10-Years	SA 2.5	1	120%
Leg well internal areas in jack houses & hull	Seawater immersion - lower & upper guide areas high impact	911 + Primer	10-Years	SA 2.5	2	120%
Top house deck area	Medium impact & Environmental weather conditions	911 + Primer	10-Years	SA 2.5	1	120%
Main deck area	High impact & Environmental weather conditions	911 + Primer	10-Years	SA 2.5	2	120%
Machinery space deck area	Medium impact & inside ventilation	911 + Primer	10-Years	SA 2.5	1.5	120%
Mud pit room internal surfaces	Inside Controlled environment - Ventilated-ambient temp 55 deg C	911 + Primer	10-Years	SA 2.5	0.7	110%
Mud pits internal surfaces	Inside Controlled environment - Ventilated-ambient temp 55 deg C	911 + Primer	10-Years	SA 2.5	0.7	110%
Slug pit (within mud pits)	Inside Controlled environment - Ventilated-ambient temp 55 deg C	911 + Primer	10-Years	SA 2.5	1	110%
Mud pit decking (wooden sleepers)	Inside Controlled environment - Ventilated-ambient temp 55 deg C	911 + Primer	10-Years	SA 2.5	1	110%
Mud pump room & SW/DW pumps/manifolds	Inside Controlled environment - Ventilated-ambient temp 55 deg C	911 + Primer	10-Years	SA 2.5	1	120%
Engine rooms internal surfaces	Medium impact - Inside area ambient temperature to 55 deg C	911 + Primer	10-Years	SA 2.5	1.5	120%
Tank rooms internal surfaces	Inside Controlled environment - Ventilated-ambient temp 38 deg C	711 or 911 + Primer	10-Years	SA 2.5	1	120%
Tanks external surfaces	Inside Controlled environment - Ventilated-ambient temp 38 deg C	711 or 911 + Primer	10-Years	SA 2.5	0.7	120%

**TABLE 1: AREA AND PRODUCT SPECIFICATION DETAILS (CONTINUED)**

Description	Environmental Weather Conditions	Product Specified	Warranty Period	Surface Preparation Required	Coating DFTmm	Coating Waste Factor
Platform Portable water tanks	Portable water immersion	711 or 911 + Primer	10-Years	SA 2.5	1	110%
Platform Salt water tanks	Seawater water immersion	711 or 911 + Primer	10-Years	SA 2.5	1	110%
Platform Void tanks	High Humid stale environment	711 or 911 + Primer	10-Years	SA 2.5	1	110%
Platform Fuel oil tanks	Diesel fuel immersion	911 + Primer	10-Years	SA 2.5	0.5	110%
Platform drill floor drain tanks	Brackish water immersion	711 or 911 + Primer	10-Years	SA 2.5	1	110%
Platform Waste oil tanks	oil immersion	911 + Primer	10-Years	SA 2.5	0.5	110%
Platform Sump tanks	Seawater water immersion	711 or 911 + Primer	10-Years	SA 2.5	1	110%
Platform shell bottoms under mud pump/engine rooms	Seawater water immersion	711 or 911 + Primer	10-Years	SA 2.5	1	110%
Permanently flooded tanks	Total Seawater water immersion	711 or 911 + Primer	10-Years	SA 2.5	1	110%
Prmanently buoyant tanks	Total Seawater water immersion	711 or 911 + Primer	10-Years	SA 2.5	1	110%
Keel cooling tanks	Total Seawater water immersion	711 or 911 + Primer	10-Years	SA 2.5	1	110%
Handrails outside areas	Outside environmental conditions -ambient temperature to 55 deg C	1110-AL + Primer	10-Years	SA 2.5	0.25	110%
Handrails inside areas	Inside environment - ventilated - ambient temperature 38 deg C	1110-AL + Primer	10-Years	SA 2.5	0.25	110%
Walkways & stairways outside deck areas + non-slip top coat)	Outside environment - ambient temperature to 55 deg C high impact	911 + Primer + 1110-AL w/ Aggregate	10-Years	SA 2.5	2	110%
Walkways & stairways inside + non-slip top coat)	Inside controlled environment - ventilated - ambient temp 38 deg C	711 or 911 + Primer + 1110-AL w/Aggregate	10-Years	SA 2.5	2	110%
External piping & other structures - outside areas	Outside environment - ambient temperature to 55 deg C - high impact	911 + Primer	10-Years	SA 2.5	1.5	110%
External piping & other structures - inside areas	Inside environment - ventilated- ambient temperature 38 deg C	911 + Primer	10-Years	SA 2.5	1.5	110%

Note that specific primer selections will be made based upon the actual conditions of each specific project and site. Primer tack free times and other features including potentially bonding to previously applied coatings must be considered prior to specification. Custom Linings manufacturers a wide variety of primers for any application type and condition. Primers are therefore not specifically identified in the above table but are simply referred to as Primers.

### **General Parameters**

Custom Linings Polyureas are commonly used in anti-corrosion, anti-abrasion, chemical resistance and waterproofing applications for steel surfaces and structures. Common applications for offshore rigs include external and internal pipe coatings, internal and external tank coatings, internal and external structure coatings, internal accommodations coatings (including floors-walls-etc.), platform deck coatings, storage room, equipment rooms and pit coatings, handrail coatings, heli-pad coatings and all other areas where protection is required including legs and their related splash zone areas.

The formulation of Custom Linings Polyurea utilized, the formulation of Custom Linings Primer utilized and the requisite dry film thickness levels (DFT) are specified for each project individually dependent on the specific project use, abuse levels, erosion requirements, submersion levels, ultraviolet exposure levels, etc. A generic specification which is generally suitable for the specific areas is included above in Table 1. Each project will be analyzed for its specific requirements and the corresponding details may change dependent on the clients requirements and environmental and workplace conditions.



**Surface Preparation**

Surface preparation requirements vary dependent on the application. In some cases only minimal surface preparation is possible due to specifics for the projects. In most cases basic surface preparation includes abrasive blasting to and SA 2.5 anchor profile. The selection of which preparation method to use is determined by the applicator or contractor, with their determination based on the relevant site conditions. A common rule of thumb we use to determine the requirement for abrasive blasting on steel surfaces is as follows:

There are three common bonding methods for Custom Linings Polyurea Coatings, those being encapsulation, chemical bonds and surface profile bonds. Ideally all three will be used providing the best adhesion levels possible. In most cases we can accept and warranty a project if two of the three criteria are met. For instance with land-based external pipeline coatings if we have encapsulation and surface profile then we do not require a primer, or if we have a primer and encapsulation we do not require a surface profile. Specifications vary and there are issues of existing oxidation that need to be addressed so each project needs to be evaluated dependent on its specific conditions. In direct submersion applications a primer and surface profile is always required.

Abrasive blasting can be achieved using automated equipment or portable equipment. For steel substrates the objective is to remove all surface oxidation and reach a minimum profile of SA 2.5 or a profile of 67.5 microns minimum. The higher the profile the better adhesion levels which can be achieved. The applicator should determine each projects requirement for abrasive blasting including shot types that are acceptable, chloride content levels that are acceptable and any safety and equipment restrictions imposed. In some cases, specifically those related to Zone 1 high fire hazard environments which are typical for offshore rig applications, abrasive blasting has severe restrictions and care should be taken in the estimation and specification process. In these application types the typical method is high-pressure water blasting in combination with hand tool preparation methods.

Upon completion of the surface preparation a near white finish should be achieved with all oxidation removed. After blasting a chemical wipe should be applied prior to coating to remove all dust and contaminants. In all cases surface preparation must be completed within 4-hours of application of Custom Linings Primers or the surface preparation process must be repeated.

Note that in offshore applications, any surface preparation must include a final step of medium water pressure washing using a chloride removal agent in the water solution sprayed to remove impregnated chlorides to acceptable levels. Failure to proceed with this step may result in disbondment due to chloride migration from the substrate to the bonding layer.

Note that in some applications removal of all existing coatings is impractical. In these situations, and with previous written approval of the Client and/or Contractor, special primers may be utilized following aggressive hand surface preparation which removes all loose coatings and oxidations. These primers provide excellent bonding to existing coatings and stop continuing oxidation of remaining rust residues. The caveat with the use of these primers over existing and remaining coatings is that the adhesion levels achieved will be limited to the adhesion value of the coatings remaining prior to priming.

**Primer Application**

The selection of primer types are determined by the applications intended use, its submersion levels, abuse levels, the presence of chemicals, etc. In all cases with this application type a primer is required. The determination of which primer to use should always be based on the desired adhesion levels upon completion. In some cases primer applications are impractical and are not utilized but in all cases the use of a primer will enhance adhesion and performance of the product over time. The ideal primer selection should provide complete adhesion to the substrate with adhesion tests clearly indicating that adhesion failure levels meet the owner's requirements. These levels will vary dependent on the surface profile (if abrasive or water blasting is used) and the primer utilized.

Adhesion levels will be indicated in a common pull test using approved equipment. Common adhesion levels for Custom Linings Polyureas to steel surfaces can be summarized as follows:

- Adhesion to bare steel with primer ..... ≥1050 psi
- Adhesion to SA 2.5 steel with primer ..... ≥2000 psi

A wide variety of primers are available in the market that will work with Custom Linings Polyureas. The primer selection is based upon its intended use, cost and availability. Custom Linings manufactures a wide range of primers for steel applications including solvent free primers, zinc based primers and primers designed for use in damp and/or cold ambient temperature applications and special primers for adhesion to stainless steel, aluminum and other hard to bond to metallic surfaces.

Under normal conditions, the primer selected should be applied to a point where the substrate is wet without pooling or puddling. When primers that utilize solvents are applied it is critical to assure that all solvents are evaporated and the product has reached 100% tack free status prior to the application of the coating. In all cases the applicator must follow the manufacturer's directions for mixing, application and coating window time frames. Note that when following surface preparation the primer must be applied within 4-hours of completion.

Specific primer application requirements are included on each Custom Linings Product Data Sheet, or those provided by other primer manufacturers.

### ***Polyurea Coating Application***

Once the primer has reached tack-free status, the polyurea coating can be applied immediately. Note that the entire primed surface must be coated within the manufacturer's recommended coating window.

Custom Linings Polyurea formulations include; high-pressure, low-pressure and brush grade formulations. High and low pressure formulations require the use of special equipment systems, the requirements of each system are clearly indicated on each individual Custom Linings Product Data Sheet. Brush grade formulations are mixed and applied using various methods including rollers, brushes, squeegees and trowels and the options for each formulation are again included on each individual Custom Linings Product Data Sheet. Note that high-pressure formulations provide the highest physical properties and allow for the highest application speeds.

Both high and low pressure Custom Linings Polyurea formulations are applied in the same manner. Once the primer has reached tack-free status application of the polyurea coating can commence. The product is spray applied using a standard cross-hatch pattern (alternate directional passes) with normal dry film thickness (dft) levels of 250 microns achieved in a single pass using standard spray guns and tips. An integral pass would include this bi-directional application with a completed dft of 500 microns. 500 microns is the minimal dft recommended by Custom Linings to achieve an integral coating system. Note that each project requires varying completed dft levels, dependent on the project application and projected life expectancy of the coating system. Generic dft levels for this application type are included in Table 1 of this document.

Custom Linings Polyureas allow for a single monolithic application to any desired dft level. In ambient temperatures of 24 degrees centigrade recoating can be performed within 12-hours of the layer being top-coated. Recoating within this window will provide a monolithic (non-layered) finished system. When recoating beyond the allowable period of 12-hours, either an inter-coat adhesion primer or a chemical wipe using MEK must be accomplished. When using an inter-coat adhesion primer, simply spray apply the primer to the base coat to a wet finish of approximately 40 microns and wait for a minimum of 2-hours before application of the secondary coat (to allow primer solvents to evaporate completely). When using MEK, simply apply the MEK to complete saturation of the surface and allow drying prior to application of the secondary coat. Note that these same methods are utilized when beginning work a day following previous application work. Overlap areas from the previous days work must use the same inter-coat primer or MEK wipe to a minimum overlap of 300mm onto the previous days work.

In this application type a variety of Custom Linings Polyureas may be utilized based on specific needs or requirements. including aromatic and aliphatic polyurea formulations manufactured by Custom Linings. This application type may require the use of other formulations that include low pressure or brush grade materials, all of which are included in Custom Linings product range, but none of which are included in this specification as high-pressure materials are the formulation of choice due to the higher levels of properties exhibited by this formulation type.

Final coating dft levels are determined by the projects specific requirements including any provision of warranty by Custom Linings for the project.



**Metalshield Coating Application**

Custom Linings Metalshield is specified for this application type where constant contact with petroleum byproducts is existent. Metalshield is an advanced polymer that contains both ceramics and metals in solution and provides both high temperature and high chemical resistance levels including high concentrations of sulphur.

Custom Linings Metalshield is self-priming and thus requires no primer step. The product is applied by brush, roller or common single component air-less spray equipment (after mixing). The product will be applied as a common paint material, within 4-hours of surface preparation, in layers from 150-250 microns per coat until the specified dft level is achieved. Subsequent coats do not require chemical wipes if recoating takes place within 72-hours unless significant chlorides levels have contaminated the previous application. In these cases pressure washing at light levels, with anti-chloride additives is required, followed by an MEK chemical wipe, prior to recoating.

**Back in Service Time**

Custom Linings High-pressure polyurea formulations will allow light use of the area coated within 1-hour of the completed application and heavy use within 24-hours of the application. After 24-hours the product will reach full cure and can be subjected to the use for which it was intended.

Custom Linings Brush grade and low-pressure formulations require much longer cure times than those provided by high-pressure applications. These formulations, when and if utilized, would normally not be applied to decking areas and other work surface locations where return to service times are critical (substructures, stiffeners, etc).

**Warranties**

Custom Linings Coating Systems provides complete warranties for projects regardless of location. This specification defines warranty periods for specific applications that are linked to the specified product and its relevant DFT. This warranty covers the product and the application, when the applicator is a qualified applicator or distributor of Custom Linings Products. Warranties are issued by the contractor with approval of Custom Linings, Industrial Coatings Division providing materials support and are written to specification on a project by project basis. Warranty durations and intended use will determine the required dft level, primer and surface preparation required for each warranty. Contact your nearest Custom Linings Industrial Coatings Contractor for details.

The following tables include product data sheets for two of our most popular coatings referenced above.

**Table II: Properties of Custom Linings 911**

<b>TECHNICAL DATA</b> (Based on compressed film)	
Flash Point .....	>200°F
Density .....	8.9 lb/gal
Viscosity at 80°F (24°C), Brookfield,	
Part-A .....	800 ± 200 cps
Part-B .....	400 ± 100 cps
Spray Temperature .....	150-160°F
Mix Ratio, by volume .....	1A:1B
Pot Life, 160°F @ 50% R.H. ....	2-4 seconds
Hardness, ASTM D-2240 .....	50 ± 5 Shore D
Tack Free Time, 160°F .....	30-50 seconds
Tensile, ASTM 412-C .....	3200 ± 200 psi
Elongation, ASTM 412-C .....	500%
Tear, ASTM 624-C .....	250 ± 20 pli
Abrasion Resistance,	
H-18, 1000 Cycles, 1 Kg.....	76 mg

**Table III: Properties of Custom Linings 711**

<b>TECHNICAL DATA</b> (Based on compressed film)	
Flash Point .....	>200°F
Density .....	8.9 lb/gal
Viscosity at 80°F (24°C), Brookfield,	
Part-A.....	700 ± 200 cps
Part-B .....	300 ± 100 cps
Spray Temperature .....	130-140°F
Mix Ratio, by volume .....	1A:1B
Pot Life, 135°F @ 50% R.H. ....	2-5 seconds
Hardness, ASTM D-2240 .....	45 ± 5 Shore D
Tack Free Time, 135°F .....	30-50 seconds
Tensile, ASTM 412-C .....	2900 ± 300 psi
Elongation, ASTM 412-C .....	250 ± 20%
Tear, ASTM 624-C .....	375 ± 40 pli
Abrasion Resistance,	
H-18, 1000 Cycles, 1 Kg	100 ± 25 mg

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Disclaimer  
 This method statement is provided as a guideline and basic tool for the understanding of common polyurea application methodology. This statement is not intended for use as a project specification. Every project has variables in climate, surface contaminants, substrate quality and construction schedules, which must be identified and addressed within a formal technical specification, prepared specifically for each individual project. Project specifications are provided to our distributors and affiliates or clients on a case-by-case basis and only after provision of complete details from the end-user, which are incorporated into each individual technical specification we write.