

POR-15® - Industrial Applications

POR-15® As A COST SAVING, VERSATILE STRUCTURAL STEEL COATING

INDUSTRIAL BUSINESS GROUP

PRODUCT BULLETIN

ABSTRACT: Corrosion dramatically affects structural steel, resulting in a shortened life span and a weakened structure that compromises safety. Most coatings, because of their porous composition, allow moisture penetration and absorption and initiate corrosion rather than prevent it.

Structural steel maintenance historically has not been based on life-cycle considerations. Now, owners or maintenance professionals must have an understanding of the life-cycle costs so they can maximize their return on the large investment. Life-cycle cost should be used to compare coating options. Porous coatings that encourage corrosion do not offer a return on a large investment.

POR-15® is a non-porous coating that does not allow penetration of water and chemicals thus extending the life of the structure it is applied to making it a best practice corrosion control technology.



TABLE OF CONTENTS

Table of Contents.....	2
BACKGROUND	3
Key Product Differentiator.....	3
Why Structural Steel Coatings Fail Prematurely.....	3
POR-15® Can Prevent The Three Predominant Types of Structural steel Coating Failure.....	4
Undercutting.....	5
Macro environment suitability Of POR-15®	5
POR-15® TEST RESULTS: ABRASION RESISTANCE, ASTM B-117, CHEMICAL RESISTANCE, AND WEATHEROMETER.....	6
Lifecycle Considerations and conclusions.....	7
POR-15® Characteristics.....	7

BACKGROUND

Corrosion dramatically affects structural steel, resulting in a shortened life span and a weakened structure that compromises safety. Corrosion control is normally attempted by applying a coating to the structural steel. Most coatings, because of their porous composition, allow moisture penetration and ultimately initiate corrosion rather than prevent it.

POR-15 is a non-porous moisture cured urethane coating that offers total water and weather resistance, ease of application, excellent adhesion, and abrasion resistance. It dramatically improves the life cycle of any structure it is applied to therefore reducing long-term capital costs.

KEY PRODUCT DIFFERENTIATOR

POR-15® is a high performance, non-porous versatile aromatic polyurethane coating designed for application directly on structural steel. It dries to an incredibly hard finish that will not chip, crack, or peel. Because POR-15 is non-porous, it is an excellent sealer for all porous substrates because it completely protects from water, chemicals, salt, and mineral oils by creating a total corrosion protection barrier.

WHY STRUCTURAL STEEL COATINGS FAIL PREMATURELY

A protective coating's function is to prevent corrosive environments from contacting the underlying steel and/or concrete and initiating corrosion. The coatings typically used on structural steel, do not completely protect and have limited durability. Penetration of moisture, chemicals and salts cause coatings to fail prematurely and allow corrosion to occur.

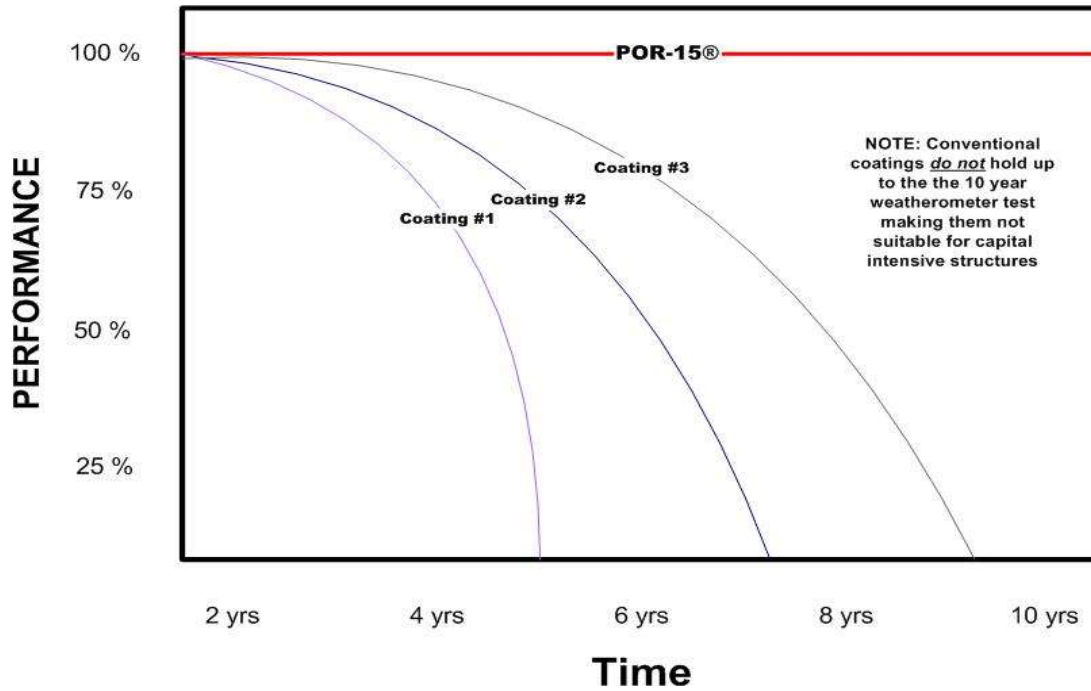
The performance and durability of structural steel coatings are evaluated by accelerated tests, such as the Weatherometer¹. Because long-term data is difficult to obtain for all structural coatings, the Weatherometer is perhaps the best predictor of how a coating will last long-term.

The following diagram demonstrates that POR-15® is extremely weather resistant and no breakdown or changes occurred in the 2000-hour weatherometer test which is the equivalent of approximately 10 years of extreme exposure. While other coatings break down in the weatherometer, a panel coated with POR-15® remained unchanged.

¹ *Weatherometer* - a tool for testing the weather resistance of coatings. It recreates the harsh climactic conditions of the Rocky Mountains (USA) where the desert starts by repeating a cycle of 160 minutes of sunlight, 18 minutes of rain and 18 minutes of wind. 200 hours is regarded as about one year.

DIAGRAM 1

POR-15® In A 10-Year Simulated Extreme Environment



POR-15® CAN PREVENT THE THREE PREDOMINANT TYPES OF STRUCTURAL STEEL COATING FAILURE

Most coating systems do not offer the necessary level of protection and fail prematurely. Though coatings on structural steel can fail in many ways, the three most frequent causes of failure are: undercutting, cracking, and holidays.

	CONVENTIONAL COATINGS	POR-15®
UNDERCUTTING	<ul style="list-style-type: none"> ▪ Porous coatings allow moisture and chemical penetration and initiates failure of the coating. 	<ul style="list-style-type: none"> ▪ POR-15® is non-porous - no moisture penetration ▪ There was no breakdown during a 10-year exposure test in the Weatherometer. ▪ During the ASTM B-117 test, it was proven that POR-15® is not affected in up to 1000 hours of salt spray at 98 degrees F with no undercutting or pitting reported. ▪ POR-15® is resistant to most acids and alkalis (see table on following page).
CRACKING	<ul style="list-style-type: none"> ▪ Cracking, or breaks in the coating are caused by stresses and results in corrosion of the steel. Conventional coatings offer no measures of protection when cracking or breaks occur. 	<ul style="list-style-type: none"> ▪ POR-15® has a 79% elongation rate and passed a 1000 cycles with a 1000 gram weight in the Taber Abraser. POR-15® is resistant to cracks, abrasions and breaks – it is both hard and flexible.
HOLIDAYS	<ul style="list-style-type: none"> ▪ Holidays are bare or thin areas of the coated surface where a reduced barrier protection can lead to a concentration of the corrosive environment and accelerate corrosion. Holidays are frequent with conventional coatings 	<ul style="list-style-type: none"> ▪ Even in thin areas, POR-15® offers a superior level of protection and will not accelerate corrosion.

MACRO ENVIRONMENT SUITABILITY OF POR-15®

A Macro environment indicates the prevailing atmospheric conditions that are appropriate for application. POR-15® is suitable in the following macro environments:

ENVIRONMENT	SUITABILITY
<i>MILD</i> - Areas with little to no industrial pollution.	Yes
<i>MODERATE</i> - Areas with light industrial pollution or light marine influence.	Yes
<i>INDUSTRIAL</i> - Heavy industrial activity, atmospheric pollution and chemical fallout,	Yes
<i>MARINE</i> – Coastal settings	Yes

POR-15® TEST RESULTS: ABRASION RESISTANCE, ASTM B-117, CHEMICAL RESISTANCE, AND WEATHEROMETER

USING POR-15® AS A BEST PRACTICE CORROSION CONTROL TECHNOLOGY

A Multicenter Corrosion Control Analysis

Korea Chemical Testing Laboratory - Seoul, South Korea & ABIC Testing Laboratory - Fairfield, New Jersey

INTRODUCTION

- Annually, the cost of corrosion is nearly \$300 billion. It impacts every sector of business as well as utilities, maritime industries, aircraft, motor vehicles and household assets.
- The most cost effective and successful method of corrosion control is through protective coatings such as corrosion inhibitors. Corrosion inhibitors reduce the rate of deterioration of exposed metal and concrete.
- Most protective coatings used today for corrosion control are porous in composition. Porous coatings are soft which allows abrasions and also moisture and chemicals to penetrate which initiates corrosion rather than protect from it.
- The following test results demonstrate that POR-15® is highly resistant to abrasions, harsh climatic conditions and chemical penetration and is a best practice corrosion control method.

METHODS

The following test methods were used to evaluate the effectiveness of POR-15® in various real life industrial conditions:

- Taber Abraser** - the industry standard for determining the durability of coatings
- ASTM B-117**: a controlled corrosive environment representing accelerated marine type atmospheric conditions
- Chemical resistance test**: panels coated with POR-15® soaked for 168 hours in various acids and alkalis
- Weatherometer**: a tool for testing the weather resistance of coatings in a simulated 10 year environment.

TEST RESULTS

ABRASION RESISTANCE

Abrasion resistance is determined by using the Taber Abraser. The Taber Abraser is the industry standard and is one of the worlds most widely used test instruments for determining the durability of coatings. The following test results demonstrate that POR-15® is highly abrasion resistant with little to no weight change in panels with up to 1000 cycles on the Taber Abraser.

TABLE 1

US Test Site
ASTM C-501

Panel number	Weight (grams)	Weight (grams) after 200 cycles
1	345.6	345.6
2	347.8	347.8
3	347.9	347.9

Korean Test Site
ASTM C5-10

Panel number	Load (grams)	Number of cycles	Weight change
1	1000	1000	0.005g

ASTM B-117 SALT SPRAY TESTING

The ASTM B-117 test provides a controlled corrosive environment representing accelerated marine type atmospheric conditions. This test is considered to be one of the most effective ways to determine relative corrosion resistance. The following test results demonstrate that POR-15® ,on both new and rusted steel, is not affected in up to 1000 hours of salt spray at 98 degrees Fahrenheit.

TABLE 2

New Steel Painted Panel Test

Panel number	Panel appearance after 168 hours @ 98 degrees F
1	No visible pitting or rusting
2	No visible pitting or rusting
3	No visible pitting or rusting

Rusted Steel Painted Panel Test (2-3 mm coating)

Panel number	Panel appearance after 1000 hours @ 98 degrees F
1	No undercutting in scribed area
2	No undercutting in scribed area
3	No undercutting in scribed area

TEST RESULTS

CHEMICAL RESISTANCE

Most metal or concrete coatings are porous and are dramatically affected by acids and alkali. The following test results demonstrate that panels coated with POR-15® were unaffected while soaked in a bath with various acids and alkali.

TABLE 3

Solution	Results after 168 hour soaking
10% hydrochloric acid	No change
50% sulphuric acid	No change
55% chromate	No change
85% phosphoric acid	No change
10% sodium hydroxide	No change
98% methanol	No change

WEATHEROMETER TEST

A weatherometer is a tool for testing the weather resistance of coatings. It recreates the harsh climatic conditions of the Rocky Mountains (USA) where the desert starts by repeating a cycle of 160 minutes of sunlight, 18 minutes of rain and 18 minutes of wind. 2000 hours is regarded as about ten years. The following test results demonstrates that POR-15® can withstand 10 years of harsh climatic conditions with no change.

TABLE 4

Panel number	Panel appearance after 2000 hours in weatherometer test
1	No undercutting in scribed area
2	No undercutting in scribed area
3	No undercutting in scribed area

CONCLUSIONS

- Most coatings intended to prolong the lifespan of metal or concrete structures do not offer long-term protection from abrasions, harsh climatic conditions and penetration of moisture and chemicals.
- Based on extensive studies, POR-15® offers superior corrosion and abrasion resistance and can dramatically increase the life of metal and concrete structures.

LIFECYCLE CONSIDERATIONS AND CONCLUSIONS

Structural steel maintenance historically has not been based on life-cycle considerations. Now, owners and maintenance professionals must have an understanding of the life-cycle costs so they can maximize their return on investment. Life-cycle cost should be used to compare coating options. Porous coatings that encourage corrosion do not offer a return on a large investment.

POR-15® is a non-porous coating that does not allow penetration of water and chemicals thus extending the life of the structure it is applied to making it a best practice corrosion control technology.

POR-15® CHARACTERISTICS

- **Appearance:** Glossy or Semi-gloss (black only) finish.
- **Application:** Brush, roller, spray
- **Spreadability:** 96 sq. ft. per quart, 384 so. ft. per gallon.
- **Recommended Temperature Application:** 45°F - 95°F
- **Drying Time:** Varies according to humidity; average is 4.5 hours.
- **Shelf Life:** Unopened can - 2 years or more. Opened can - up to 6 months.
- **Solubility:** POR-15 is readily soluble in esters, ketones, and aromatic solvents.
- **Drying Time:** Depends on ambient humidity. The more humid the area, the faster the dry time, which usually varies from 3 to 6 hours.
- **Boiling Point:** 232°F
- **Percent volatile by Volume:** 25%
- **Solids:** 75%
- **Vapor Pressure:** 38mm
- **Specific Gravity:** 1.05
- **Solubility in water:** Insoluble

October 2003

8

This product bulletin is for informational purposes only.

POR-15® is a trademark of RestoMotive Labs.

Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products.

©Copyright 2003 RestoMotive Labs. All rights reserved. Reproduction in any manner whatsoever without the express written permission of RestoMotive Labs is strictly forbidden. For more information, contact RestoMotive Labs. Information in this document is subject to change without notice.

