



Nap-Gard®

## PLANT APPLICATION OF SINGLE LAYER NAP-GARD® ON LINE PIPE

Revised: 17 September 2013

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### 1.0 **SYSTEMS: NAP-GARD® 7-2500, 7-2501, 7-2508, 7-2534, 7-2514EN Series, 7-2555**

### 2.0 **GENERAL**

2.1 The following definitions are used to explain the major terms used in this Application Procedure.

- 2.1.1 Applicator - The organization responsible for the application of the coating.
- 2.1.2 Manufacturer - The Producer and Distributor of the Coating Material.
- 2.1.3 Coating Material - Any specified coating material prior to application to the pipe.
- 2.1.4 S.S.P.C. - Steel Structures Painting Council.
- 2.1.5 NACE - National Association of Corrosion Engineers.
- 2.1.6 A.P.I. - American Petroleum Institute.
- 2.1.7 Holiday - A discontinuity of coating that exposes the metal surface to the environment.
- 2.1.8 AAR – American Association of Railroads
- 2.1.9 CSA – Canadian Standards Association
- 2.1.10 ISO – International Standards Organization
- 2.1.11 SIS – Swedish Institute of Standards
- 2.1.12 D.P.S. – Dual Powder Systems

### 3.0 **HANDLING OF BARE PIPE**

- 3.1 Proper equipment for handling, unloading and temporary storage of bare pipe shall be used to avoid any damage to the bare pipe or pipe ends.
- 3.2 Care shall be taken to preclude damage to internal pipe identification markings and or internal coatings during all phases of operation covered by this Application Procedure.

### 4.0 **HANDLING AND STORAGE OF COATING MATERIAL**

- 4.1 The Nap-Gard® Fusion Bonded Epoxy powder coating material shall be packaged in containers adequate to keep the contents clean and dry during handling, shipping and storage. Handling and storage conditions and any temperature-time limitations for each of the coating system components shall be in accordance with the recommendations on the applicable Axalta Technical Data Sheet.
- 4.2 The repair material shall be packaged in containers to give adequate protection during handling, shipping and storage. Handling and storage conditions and any temperature-time limitations on repair materials shall be in accordance with the recommendations on the applicable Axalta Technical Data Sheet.
- 4.3 Adequate precautions shall be taken during handling, shipping and storage to prevent damage to the containers that would result in contamination of the coating material.

## 5.0 SURFACE PREPARATION

- 5.1 All pipe shall be supplied to the coating applicator externally bare and free of chlorides, grease or any type of oil and other contaminants detrimental to the coating's performance.
- 5.2 Applicator shall inspect the pipe surface and clean it according to SSPC Specification SSPC-SP 1 to remove oil, grease and loosely adhering deposits. All foreign material remaining on the external surface of the pipe will be removed by use of a suitable non-oily solvent. Only approved solvents which do not leave a residue shall be used. Neither gasoline nor kerosene shall be used for this purpose. Pipe shall be checked for possible chloride contamination using proper test methods. If chloride levels are above 2 milligrams/m<sup>2</sup>, it shall be cleaned to remove all chloride or to bring it below 2 milligrams/m<sup>2</sup> (Ref: NACE RP0394-02).
- 5.3 Preheat is not required if pipe is visually free of moisture and is 3°C (5°F) above the dew point, otherwise pipe shall be heated in a uniform manner before the final blast cleaning to assure that all moisture is removed. Pipe temperature will be raised to at least 3°C (5°F) above the dew point during blast cleaning. (Ref: NACE RP0394-02).
- 5.4 All external pipe surfaces to be coated shall be cleaned by grit or shot/grit blasting to near-white metal finish in accordance with NACE #2/SSPC-SP10 or Sa 2½ as described in ISO 8501-1/SIS.SS.05 5900. NACE near-white, NACE #2/SSPC-SP10, is interpreted to mean that all metal surfaces shall be grit or shot/grit blasted to remove all dirt, mill scale, rust, corrosion products, oxides, paint and other foreign matter.

Very light shadows, very slight streaks or slight discoloration will be acceptable. However, at least 95% of the surface shall have the uniform gray appearance of a near-white metal blast cleaned surface.

Abrasive taken from the blast unit shall be checked for chloride. A minimum of one test per 8-hour shift is recommended. The concentration shall be below 20 ppm.

The abrasive used shall be continually cleaned and controlled as to particle size distribution by air wash separation. The anchor pattern profile shall have a minimum height of 50µm (2.0 mils) and a maximum height of 115µm (4.5 mils) as measured with X Course Press-o-Film Replication Tape or suitable profilometer.

- 5.5 Any slivers or bristles of steel remaining on a newly blasted surface shall be removed by the use of high speed wire brushes, sanders, files or other approved means. This shall be done after the grit or grit/shot blasting operation but prior to the coating application. Remaining surface imperfections such as slivers, scales, burrs, weld spatter, gouges, etc. shall be removed by grinding. If the grinding results in a surface profile below 50µm (2.0 mils), the surface shall be re-blasted to meet the criterion of 5.4.
- 5.6 Following the acceptance of the blast cleaning and immediately prior to heating, all shot, grit, sand, dust, or other foreign matter remaining on the external and internal surfaces of the pipe shall be thoroughly removed by air blast, water, brush or vacuum type cleaning.
- 5.6.1 If air is used for the cleaning, it shall be dry and free of contaminants and all metal particles removed from the surface shall be extracted or collected in such a manner as to not contaminate cleaned pipe.
- 5.6.2 Should it be determined phosphoric acid washing is required, Applicator shall follow acid manufacturers recommendations for concentration, application, dwell time, rinse water quality and disposal.

Always consult product Material Safety Data (MSDS) prior to handling.

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- 5.7 Blast-cleaned pipe surfaces shall be protected from conditions of high humidity, rainfall, or surface moisture. No pipe shall be allowed to flash rust before coating.
- 5.8 Residual products from blasting shall be suitably removed from the interior and exterior surface of the pipe.

## **6.0 HEATING PRIOR TO COATING APPLICATION**

- 6.1 Pipe that has been blast cleaned, inspected and approved for coating shall be preheated in a continuous, uniform process to a temperature of 232°C (450°F) to 253°C (488°F) or in accordance with the TDS of the selected product.
- 6.2 The pre-heating method shall not leave a residue or contaminant on the pipe surface. Oxidation of the steel in the form of "blueing" or other apparent oxide formation is not acceptable.
- 6.3 Pre-heat temperatures shall be monitored, controlled and recorded. Templstiks<sup>®</sup> or roller contact pyrometers are acceptable methods. Care shall be exercised to minimize contamination of any surfaces to be coated by deposits left by the Templstiks<sup>®</sup>.

## **7.0 APPLICATION OF POWDER**

- 7.1 The Fusion Bonded Epoxy coating shall be applied over a cleaned, preheated surface as described in Sections 5.0 and 6.0 of this Application Procedure.
- 7.2 All air used to fluidize, transport, and apply the powder shall be dry and free of oil. The dry air system shall be capable of delivering air with a dew point of -20°F (-30°C) or lower.
- 7.3 The F.B.E. coating shall be applied to the heated pipe by electrostatic spray in such a manner as to result in a total uniform cured film thickness of 15 mils nominal (380µm) or as per the pipe owner's applicable specification or contract. (Table 1).
- 7.4 The F.B.E. coating shall be applied to the external surface of the full length of each pipe joint except for a "cut back" not less than ½ inch minimum nor more than 2 inches maximum at each end or as per the pipe owner's applicable specification or contract. Coating material on the cut back area and/or the beveled edge will not be acceptable.
- 7.5 The use of recycled coating powder shall be kept to a minimum. At no time shall the ratio of recycled powder to virgin powder exceed 25%. All recycled powder shall be subject to magnetic and particle sizing screening prior to re-use and shall be continuously blended into the virgin material.

## **8.0 CURE**

- 8.1 To insure proper cure, the powder shall be applied according to the time -temperature data provided on the applicable DuPont Technical Data Sheet. Cure shall be checked per Appendix 2B(b) (ii) and Table 1.
- 8.2 After the coating is completely cured, the pipe may be force cooled to facilitate coating inspection and repairs.

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## 9.0 INSPECTION AND TESTING

- 9.1 The Applicator shall have the full responsibility for the coating application quality in accordance with this Application Procedure and or per the pipe owner's applicable specification or contract. The Applicator shall designate the employee or employees who will be available, responsible and authorized for stopping operations when conditions develop which could adversely affect the quality of the completed work.
- 9.2 Tests on the powder as detailed in the Appendix and Table 1 of this Application Procedure during the application process and on the finished coating shall be performed by the authorized laboratory as per the pipe owner's applicable specification or contract.

## 10.0 REPAIRS

- 10.1 Any defects or damage to the external coating found during the inspection shall be repaired. Coating thickness shall be in accordance with the attached Table 1. If repairs are deemed impractical, the Applicator shall re-clean and re-coat the entire pipe joint containing the defects or damaged areas.

### 10.2 Pinhole and Small Area Repair

- 10.2.1 Imperfections such as scales, slivers, burrs, weld spatter, etc. shall be removed by grinding prior to repairs.
- 10.2.2 All repairs shall conform to the requirements of the attached Table 1. Repairs with two component liquid will not be performed when ambient temperature is 13°C (50°F) or below.
- 10.2.3 Completely cured coating repairs shall be inspected with a holiday detector as outlined in the Appendix (Paragraph 2.D.) of this Application Procedure.
- 10.2.4 All two part repairs shall be allowed to cure prior to handling as per recommendations on the applicable Axalta Technical Data Sheet.

### 10.3 Large Area Repair

For larger areas, the following procedures shall be followed:

- 10.3.1 The pipe to be repaired shall be cleaned to remove all dirt, scale, rust, damaged or disbonded coating and other foreign material. Areas repaired before surface oxidation or rusting occurs may be prepared by hand sanding, power tool grinding or other approved and suitable means. The edges of the original coating shall be "feathered out" around the area to be coated and all dust brushed off and or removed by high pressure dry air before applying the two part repair material.
- 10.3.2 The two part repair material shall be in accordance with the attached Table 1.

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- 10.3.3 The two part repair material shall be applied to attain a uniform minimum thickness as required in the attached Table 1.
- 10.3.4 The two part repair material shall completely cover the repaired area.
- 10.3.5 The repaired areas shall be allowed to completely cure prior to handling according per the applicable Axalta Technical Data Sheet.
- 10.3.6 Completely cured coating repairs shall be inspected with the Applicator's holiday detector as outlined in Paragraph 2.D. of the Appendix of this Application Procedure.

## 11.0 HANDLING, TEMPORARY STORAGE, AND LOADING OF COATED PIPE

### 11.1 Handling of Coated Pipe

- 11.1.1 The pipe, after being externally coated and cured, shall be sufficiently cooled for proper handling. Pipe temperature should be 88°C (190°F) or less before handling. All coated pipe shall be rolled or removed so as to prevent damage to the internal and external coating, or to the pipe.
- 11.1.2 When handling the pipe by hook line, only hooks fitted to the curvature of the pipe shall be used. All hooks shall be padded to prevent contact damage to the pipe. Use of brass or copper padding will not be allowed.

### 11.2 Temporary Storage of Coated Pipe

- 11.2.1 Coated pipe to be temporarily stored shall be protected to avoid damage to the coating and the pipe. The coated pipe shall be stacked using separators to avoid contact between joints. The type and number of separators shall be per the pipe owner's applicable specification or contract

### 11.3 Loading for Transportation of Coated Pipe

- 11.3.1 All pipe to be shipped by truck, ship, barge, or rail shall be protected by padding, separators, and dividers before shipment as per the pipe owner's applicable specification or contract.

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## APPENDIX

### 1. **CLEANING AND SURFACE PREPARATION**

#### A. Visual Inspection of Surface Preparation

Test for compliance with cleaning and surface preparation specifications shall be visual.

#### B. Tests for Blast Anchor Pattern

The anchor pattern attained with the particular abrasive and blasting conditions can be determined by any of the following methods:

##### a) Method 1 – Press-O-Film Replica Tape

The profile shall be measured by the Press-O-Film Replica Tape followed by measurement using a micrometer.

##### b) Method 2 – Profilometer

Subject to approval by the Company's inspector, a profilometer or other instrument designed for measuring surface profile may be used.

#### C. Use of Visual Standards

To assist in routine inspection of the surface preparation and anchor pattern, a set of visual standards may be used for comparison. Such a set of standards may be NACE (visual Standard for Surface of New Steel Centrifugally blast Cleaned with Steel Grit and Shot) or ISO 8501-1/SIS.SS.05 5900 (1988) – Pictorial Surface Preparation Standard for Painting Steel Structures.

### 2. **DUAL POWDER SYSTEM**

#### A. Applied Film Thickness

- a) Tests to determine the applied film thickness of the F.B.E. shall be made with an approved magnetic type thickness instrument. The instrument shall be calibrated to certified coating thickness standards, as frequently as necessary to ensure accuracy, but not less than once every four hours.
- b) Thickness tests shall be performed after the pipe has been cooled sufficiently to allow inspection.
- c) The finished applied film shall have an average nominal thickness and minimum thickness as per in the attached Table 1 or the Purchase Order.
- d) Determination shall be made at random points on each joint.

#### B. Cured Coating

- a) Cured coating shall be uniform in color, gloss and thickness and shall be essentially free of blisters, pinholes, fisheyes or sags.

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b) Determination of cure shall be by one or both of the following methods; which shall be agreed to during the pre-job meeting:

i) Method 1 - Bend Test

When directed by the inspector, an 18-inch ring shall be cut from a pipe joint. Two straps, one inch wide cut from the ring shall be subjected to bend tests by the Applicator for cure verification. Pass/Fail shall be as per the attached table 1 and NACE RP-0394-02 and CSA clause 12.11

ii) Method 2 - Thermal Analyzer

Complete cure may be verified by the use of a Thermal Analyzer (DSC) to determine degree of cure. For Non-Slip, remove the top coat and then take samples from the base coat. Test procedure is given in Table 1.

C. Adhesion Test

a) The adhesion of the coating shall be verified periodically on at least one joint from each hour's production.

b) Determination shall be made adjacent to the cutback when the pipe temperature is below 66°C (150°F).

c) The knife test; using a utility knife cut through coating to substrate, creating an X pattern. At the intersection of the X, insert the tip of the blade under the coating. Using a levering action, the coating should demonstrate a definite resistance. The coating shall be fully adhered and shall not strip or peel from the steel.

D. Holiday Inspection

a) Complete holiday inspection shall be carried out on 100% of the coated pipe joint after the coating is cured and sufficiently cooled to allow inspection (below 88°C (190°F). Testing shall be in accordance with the attached Table 1 and NACE RP-0490-01.

b) The audible signal initiated by a holiday in the coating shall be sufficient volume to be detected above maximum background noise.

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**TABLE 1: NAP-GARD® F.B.E. 7-2500, 7-2501, 7-2508,  
7-2534, 7-2514EN Series**

TEST	METHOD	FREQUENCY	LIMITS
ANCHOR PROFILE (for Base Coat)	PRESS-O-FILM REPLICATION METHOD, X- COARSE GRADE TAPE	ONCE PER HOUR	50 µm (2.0 MILS) MINIMUM 115.0 µm (4.5 MILS) MAXIMUM
COATING THICKNESS SERVICE TEMPERATURE UP TO 110°C TO 130°C	MAGNETIC THICKNESS GAUGE	EACH PIPE	NOMINAL 350 MICRONS - 400 MICRONS (14 - 16 MILS) OR PER CUSTOMERS REQUIREMENTS
COATING REPAIR	7-1861, 7-1868, 7-1854, 7-1631S, 7-1677S	AS REQUIRED	635 µm (25 MILS) MINIMUM
HOLIDAY TEST	NACE RP-4090-01	EACH PIPE 100% SURFACE	125 VOLTS PER MIL (Not to exceed 4,000 volts)
ADHESION (DRY)	APPENDIX SECTION 2.C	ON PIPE/ONE/HOUR	APPENDIX SECTION 2.C
BEND TEST	CSA-CLAUSE 12.11	EACH RING SAMPLE	32.5°PD MINIMUM @ -30°C
CATHODIC DISBONDMENT	CSA-CLAUSE 12.8 (24 HRS)	ONCE/SHIFT	6.5 MM MAXIMUM RADIUS (from the edge of holiday)
ADHESION	CSA-CLAUSE 12.14(24 HRS)	ONCE/SHIFT	RATING 3 MAXIMUM
IMPACT RESISTANCE	CSA-CLAUSE 12.12	ONCE/SHIFT	>1.5 JOULES
INTERFACE POROSITY	CSA-CLAUSE 12.10	ONCE/SHIFT	RATING 4 MAXIMUM
CROSS-SECTION POROSITY	CSA-CLAUSE 12.10	ONCE/SHIFT	RATING 4 MAXIMUM
INTERFACE CONTAMINATION	CSA-CLAUSE 12.15	ONCE/SHIFT	30% MAXIMUM
THERMAL ANALYSIS (Top Coat)	CSA-CLAUSE 12.17	ONE PER 8 HOUR SHIFT	ΔTg. -5°C to 4°C

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