



Nap-Gard®

7-2555 & 7-2675 PLANT APPLICATION OF NAP-GARD® ORANGE HIGH TEMP DUAL POWDER SYSTEM ON LINE PIPE

Revised: 17 September 2013

1.0 **SYSTEM: NAP-GARD® ORANGE HIGH TEMP DUAL POWDER 7-2555 & 7-2675**

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 SYSTEM 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. If identified, all foreign material remaining on the external surface of the pipe will be removed by use of a suitable method. If solvents are used, only client approved solvents which do not leave a residue shall be used. Neither gasoline nor kerosene shall be used for this purpose.
- 5.3 Pipe shall be checked for possible chloride contamination using proper test methods. If the chloride level is above 2 milligrams/m², it shall be cleaned to remove all chloride or to bring it below 2 milligrams/m² (Ref: NACE RP0394-02).
- 5.4 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).
- 5.5 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.

- 5.6 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 shot/grit blasting operation and 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 5.5.
- 5.7 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 or vacuum type cleaning.

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

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- 5.7.1 If air is used for the cleaning, it shall be dry and free of contaminants. All metal particles removed from the surface shall be extracted or collected in such a manner as to not contaminate cleaned pipe.
- 5.7.2 Should it be determined phosphoric acid washing is required, Applicator shall follow acid manufacturer's recommendations for concentration, application, dwell time, rinse water quality and disposal.
- 5.8 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.
- 5.9 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 239°C (463°F) or in accordance with the TDS of the selected Axalta product (Nap-Gard® Orange High Temp).
- 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® 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®.
- 6.4 Follow the cure schedule of the base coat. However, a minimum 90 seconds at 425F or higher is needed for proper cure. See the 7-2555 Technical Information Sheet for more information.

7.0 APPLICATION OF DUAL POWDER SYSTEM

- 7.1

<u>Base Coat</u>	<u>Top Coat</u>
7-2555	7-2675
- 7.2 The Dual Powder System shall be applied over cleaned, preheated surface as covered by Sections 5.0 and 6.0 of this Application Procedure.
- 7.3 Both coatings are spray applied to the heated pipe using electrostatic spray guns. Apply the specified base coating followed by the Nap-Gard® Orange High Temp in a continuous process providing the base coat enough time to gel but not fully cure. Ensure that interlayer bonding is taking place by carefully checking for lamination or interlayer bonding issues using the adhesion test method described in section C of the attached Appendix. Any sign of lamination or interlayer bonding problems will require shortening the distance between the base coat application and the Nap-Gard® Orange High Temp application.
- 7.4 The preferred equipment to apply the Dual Powder System is in separate powder systems for each coating material, with reclaim powder being applied as an intermediate layer between virgin base coat and virgin top coat. The intermediate layer can comprise 25% of total film thickness.

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- 7.5 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.
- 7.6 All reclaim will go to the top coat fluidized bed if a single powder recovery system is used.
- 7.7 Nap-Gard® Orange High Temp's dual coating thickness can be inspected and verified by the use of a Tooke gauge. This gauge scribes a small cut in the coating. Under magnification, the scale measures the thickness of both the base coat and topcoat.
- 7.8 Once the thickness of the respective layers (base / top coat) are established and meet the specified requirements a magnetic gauge can be used for overall coating thickness readings.
- 7.9 Use the Tooke gauge at the start of production as much as is necessary to confirm that the specified thicknesses are being obtained. Thereafter it is recommended to confirm each layers thickness with the Tooke gauge once every AM and PM of each shift to make sure the base coat / topcoat coating thicknesses are being maintained as outlined in Table 1 of this Application Procedure or as per the applicable customer specification or contract. If any coating parameters are changed such as line speed, number of guns used, application temperature or the magnetic gauge readings change by more than 15%, confirm that the specified thicknesses are being maintained as you did at the start of production with the Tooke gauge. Closely monitor over all thickness readings for each pipe with the magnetic gauge for any changes.

Alternatively you can sand down through the Nap Nap-Gard® Orange High Temp top layer until you reach the underlying corrosion coating. Use a magnetic thickness gauge to read and calculate the thickness of each layer.

8.0 CURE

- 8.1 To insure proper cure, the D.P.S. shall be applied according to the time -temperature data on the TDS of the selected base coat. The top coat cure shall be checked for Nap-Gard® Orange High Temp per Appendix 2B(b) (ii) and Table 1 of this Application Procedure.
- 8.2 After the coating is completely cured, the pipe may be force cooled to facilitate coating inspection and repairs.

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. 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 Testing 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 applicator and/or 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. Repair with Nap-Gard® 7-1854 two part liquid or other Axalta approved system. Patch sticks are not allowed for the Nap-Gard® Orange High Temp. 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.

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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 part epoxy material will not be performed when the ambient temperature is below 13°C (50°F).
- 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 epoxy repairs shall be allowed to cure prior to handling as per the applicable Axalta Technical Data Sheet.

10.3 Large Area Repair

For larger areas, the following procedures shall be followed:

- 10.3.1 The areas to be repaired shall be cleaned to remove all dirt, scale, rust and damaged or disbanded coating. Damaged areas 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 or blown off before applying the two part repair material. If air is used to remove dust and debris insure that it is free of oil and moisture.
- 10.3.2 The two part epoxy repair material shall be in accordance with the attached Table 1.
- 10.3.3 The two part epoxy repair material shall be applied to attain a uniform minimum thickness per in the attached Table 1.
- 10.3.4 The two part epoxy repair material shall completely cover the repaired area.
- 10.3.5 The repaired areas shall be allowed to completely cure prior to handling according to the recommendations on the applicable DuPont 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.

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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 agreed between Company and Applicator or as per the applicable specification or contract.

11.3 Transportation of Coated Pipe

11.3.1 Coated pipe to be shipped 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 agreed between Company and Applicator or as per the applicable specification or contract.

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APPENDIX

1. CLEANING AND SURFACE PREPARATION

A. Visual Inspection of Surface Preparation

Tests 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 3 - 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 epoxy Dual Powder System shall be made with an approved magnetic type thickness instrument which 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 specified 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.

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

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- 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.
- ii) Method 2 - Thermal Analyzer
Complete cure may be verified by the use of a Thermal Analyzer (DSC). Shavings of the top coat shall be tested with 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 of sufficient volume to be detected above maximum background noise.

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TABLE 1: NAP-GARD® ORANGE HIGH TEMP 7-2555 & 7-2675

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 TOOKE GAUGE	EACH PIPE AS REQUIRED PER SECTION 7.8	<i>BASECOAT</i> 7-2555 250-400 µm (10 - 16 MILS) <i>TOPCOAT</i> 7-2675 500 – 600 µm (10 MILS – 16 MILS) 7-2617 500 - 600 µm minimum (20 MILS - 24 MILS) 810 µm minimum (32 MILS) See TDS
COATING REPAIR	7-1854 TWO PART EPOXY REPAIR MATERIAL	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	3.0%PD MINIMUM @ -30°C WITH 30 MILS TOTAL THICKNESS
CATHODIC DISBONDMENT	CSA-CLAUSE 12.8 (24 HRS)	ONCE/SHIFT	6MM MAXIMUM (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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