3M™ Scotchkote™ Liquid Epoxy Coating 323+

Application Guide August 2017

3M™ Scotchkote™ Liquid Epoxy Coating 323+

Plural Component Spray Application:

1.0 Scope

1.1 This guide defines the application requirements of Scotchkote™ coating 323+ applied to steel substrates for buried service.

1.2 The coating material described in this guide can be applied in either a shop or a field environment.

- Spray grade material is suggested for plural component spray systems.
- Brush grade material is suggested for hand application with brush or rollers.

The below grade parts to be considered are as follows:

- Piping and Components such as elbows and tees
- Girth welds/field joints
- Valves
- Steel sump tanks
- Slip bore/directional piping
- Other parts as directed by the end user
- This coating can be used above grade if over coated with an ultraviolet resistant top coating

2.0 Definitions

2.1 PART – All below grade service steel that is to be coated under the direction of this guide.

2.2 APPLICATOR – the Company selected by the END USER to apply multi-component coatings to the internal and external surfaces of PARTS.

2.3 MANUFACTURER – the Company responsible for the chemical formulation and characteristics of the multi- component coatings applied to PARTS.

2.4 INSPECTOR – The company or person selected by the END USER to ensure quality control of the work and adherence to this guide, where applicable.

2.5 END USER – Pipeline, part owner, or their representative.

3.0 Additional Requirements

3.1 All specifications and standards mentioned in this document form part of this guide. The applicator shall ensure that a copy of this guide is kept at the coating site and shall ensure that his/her workers fully understand each specification and standard listed.

3.2 The following standards (latest issue) shall be a part of this guide:

Society of Protective Coatings (SSPC)	
SSPC-SP1	Solvent Cleaning
NACE No. 2	Near-white metal blast cleaning
SSPC-SP10	Near-white metal blast cleaning
SSPC-VIS-1-89	Pictorial surface preparation Std.

NACE International	
RP02787	NACE Standard recommended proactive for field measurement of abrasive blast cleaned surfaces using replica tape (Latest Version)
SP0188-2006	Discontinuity (Holiday) testing of new protective coatings on conductive substrates

4.0 Surface Preparation

4.1 Prior to commencement of work, all parts shall be visually inspected.

4.2 Rough welds and other sharp projections shall be ground smooth by the end user or as designated by the inspector.

4.3 All surfaces to be coated shall be abrasive blast cleaned. Prior to abrasive blast cleaning, remove all contaminants such as salt, dirt, and accumulations of grease and oil in accordance with SSPC-SP1 using cleaning agents approved by the end user.

4.3.1 Applicator shall perform tests to determine existence of salts.

4.4 Prior to abrasive blasting, the steel surface shall be dry and warmed to a temperature at least 3° C (5°F) above the dew point to prevent oxidation of the part after cleaning. The applicator shall use a contact thermometer, psychrometer, and psychrometric charts, or equipment that provides equivalent accuracy, to monitor these environmental requirements.

4.5 Nameplates, valve stems, rotating equipment, threads, bolts, adjacent coatings etc., shall be protected from blasting and coating by suitable masking materials.

4.6 All coating compressor units shall have adequate separators, filters, and drains to ensure contaminants such as oil and water are not deposited onto the steel surface. Accumulations of oil and moisture shall be removed by regular purging.

4.7 For bare steel application, the abrasive blast medium shall be selected on the basis of cleanliness, hardness and the ability to produce an angular anchor pattern profile averaging 0.05 mm (2.0

mils) – 0.10 mm (4.0 mils). Profile measurements shall be taken with replica tape and spring micrometer in accordance with NACE RP0287 (Latest Version).

4.8 The part shall be abrasive blasted in accordance with the NACE No. 2 or SSPC-SP10 specification, and the applicator shall ensure this surface finish is attained by regular checks with the SSPC-VIS-1-89 Standard.

4.9 When over-coating existing coating material, such as fusion bond epoxy in such applications as field joint or abrasion resistant overcoat work, the existing coating shall be sweep blasted to remove the gloss and provide a roughened surface suitable for over-coating. This process should remove approximately 1 mil of coating.

4.10 Existing coating shall be feathered 4 cm (1.5 in.) to 8 cm (3 in.) when coating adjacent bare steel, such as girth welds.

4.11 Profile measurements shall be taken, as a minimum, at the start of each shift, after a shutdown to refill blasting pots, after every hour of continuous blasting.

Cleaned surfaces shall be dry air blasted to remove dust and debris, and shall be coated before any rust blooming occurs, and prior to the end of the working day. Any cleaned steel showing rust stains or left uncoated overnight shall be re-blasted prior to coating.

5.0 Coating Application

5.1 Thinning is not allowed. The coating thickness shall be as specified in Appendix 1. The applicator shall measure and record coating thickness using a thickness gauge that is acceptable to the end user/inspector.

5.2 The steel surface temperature shall be at least 3°C (5°F) higher than the dew point temperature of the ambient environment. The relative humidity shall be less than 90% and the steel surface temperature shall be between 41°F/5°C and 200°F/93°C. The applicator shall use a contact thermometer, a psychrometer, and psychrometric charts, or equipment that provides equivalent accuracy to monitor these environmental requirements.

5.3 Application shall be done in such a manner so as to keep sags and runs to a minimum, provide adequate cover in angles and crevices, and to provide a smooth uniform coat.

5.4 If several coats are required to achieve the specified coating thickness, a maximum of 3 hours are suggested in between applying each additional coat. If the recommended maximum recoat time has been exceeded, each coat shall be abraded prior to applying an additional coat.

6.0 Quality Control, Inspection and Testing, Acceptance

6.1 Coating Thickness

6.1.1 The coating thickness shall be measured using a wet film thickness gauge. As a minimum, the applicator shall obtain readings according to the following schedule:

- Piping – at four quadrants (i.e. 12, 3, 6 and 9 o'clock positions) at approximately 1 – 1.5m (3.3 - 5ft) intervals along each pipe length.
- Girth welds – at four quadrants at each girth weld.

- Valves and tanks – at ten representative, random locations.
- Other parts – as determined by the end user so as to obtain representative thickness data.

6.2 Visual

6.2.1 The coating shall be inspected for, and be free of, the following conditions:
- Pinholes
- Missed or skipped areas
- Roughness
- Blistering, cracking, delamination

6.2.2 Runs and sags shall be kept to a minimum.

6.3 Holiday Inspection

6.3.1 The applicator shall test each part completely for coating integrity per SP0188-2006 based on the minimum measured acceptable thickness. A low voltage (60 to 100 volts) wet sponge holiday detector may be used on nuts and bolts and restricted areas. Holiday detection equipment shall be checked and calibrated before production begins and recalibrated at the start of each shift. Operations of the holiday detector shall be controlled so that the travel rate does not exceed 300mm per second (1 foot per second). The equipment shall not remain stationary on the coating while the power is on.

6.3.2 Holiday testing shall take place after the coating has exceeded 80% of its hardness value.

6.3.3 All holidays and defects shall be plainly marked immediately after detection and shall be repaired in accordance with this guide.

6.3.4 To minimize possible coating damage due to repeated holiday testing, APPLICATOR shall limit the number of passes over a coated area with the holiday detector.

7.0 Coating Repairs

7.1 Use either the spray grade material that the part was coated with or the patch/brush grade materials to make the repair.

7.2 Remove the defect, or defective coating, to sound coating or to bare steel by abrading the repair area with coarse sandpaper or a power sander.

7.4 If, after defect removal, more than 160 cm^2 (25 $in.^2$) of bare steel is exposed, prepare entire exposed surface as per Section 4.0 of this guide. Abrade the surrounding coating for a distance of 4 cm (1.5 in.) radially to ensure proper inter-coat adhesion. Except for microscopic holidays, feather the edges of the original coating.

7.5 Prior to patching, remove all loose particles and dust with dry compressed air or a clean, dry cloth.

7.6 Recoat the prepared surfaces to the specified dry film thickness, lapping at least 2.5 cm (1 in.) over the surrounding coating.

7.6.1 Holiday testing shall take place after the coating has exceeded 80% of its hardness value.

7.7 Holiday test the repair at the same voltage as used for the original coating.

8.0 Handling

8.1 Parts shall be handled at all times in such a manner to help prevent damage to the coating or the part.

8.2 Transporting vehicles shall be free from debris, nail heads, or any other protrusions that may damage the part. The applicator shall ensure sufficient and proper dunnage is used to protect the coated part.

Appendix 1: Minimum Thickness

Product	Thickness
3M™ Scotchkote™ 323+ Spray Grade	25 mil minimum
3M™ Scotchkote™ 323+ Brush Grade	25 mil minimum

Appendix 2:

3M™ Scotchkote™ Coating 323+ Spray Application

- Plural component spray setup of 2:1 by volume for Part A: Part B
- Whip hose of 10-25 feet x ¼" diameter
- Recommended tip size of 427or a tip size appropriate for your application
- Fluid pressures of 2,500-3,500 psi with Part A and Part B within 250 psi of each other
- Preheat Part A to approximately 110°F/43°C. This may be changed to get acceptable spray pattern.
- Preheat Part B to approximately 90°F/32°C. This may be changed to get acceptable spray pattern.
- Heated hose bundle set at 100°F/38°C to 120°F/49°C

Hand Application:

1.0 Scope

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1.1.1. Spray grade material is suggestion for plural component spray systems.

1.1.2. Brush grade material is suggested for hand application with brush or rollers.

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4.0 Material Handling and Mixing

4.1. Open the containers and while the material is still in the original shipping container mix part A and B separately.

4.2. Pour part B into Part A completely. Use a mixing stick to wipe the side walls and bottom of the container.

4.3. Thoroughly mix part A and B with a mixing stick until color consistency is achieved.

4.3.1. It is acceptable to use paint mixers when mixing larger volumes of material.

4.3.2. Prepare only the quantity of material that can be applied within a given pot life.

4.3.3. The container used to mix the materials may become hot during mixing. The larger the volume mixed the greater the reaction and subsequent heat generated. Mixing large volumes will shorten the pot life of the material.

Pot Life (7 Ounces/200 gram sample)	
70°F/20°C	28 minutes
100°F/38°C	8 minutes

5.0 Recommendations

5.1. Use of a ¼ inch (6mm) nap, lint free roller is suggested.

5.2. For speed of application, and to extend the working time of the product, pour mixed product directly onto substrate/pipe surface then pull the mixture down around the substrate/pipe with a brush roller.

5.3. Because of the high viscosity inherent to this product, we suggesting mixing parts A&B together when the material temperatures are above 60°F/15°C.

5.4. Coating thickness

5.4.1. Single layer or patch apply the material to minimum thickness of 25mils/625µm.

5.4.2. ARO or dual layer applications apply the material to a minimum thickness of 40mils/1000µm.

5.5. Coating overlap no less than 1 inch / 25mm.

6.0 General Application Steps (Joint Coating, refurbishing coating, or new coating application)

6.1. Remove oil, grease, and loosely adhering deposits.

6.2. Verify the air temperature is 5°F/3°C above the dew point.

6.3. Abrasive blast clean surface to NACE #2/SSPC-SP10, ISO 8501:1 SA-2 1/2 near white metal.

6.4. Verify the blasted steel anchor profile is 2-4 mils/50-100 microns.

6.5. Cleaned surfaces shall be dry air blasted to remove dust and debris, and shall be coated before any rust blooming occurs, and prior to the end of the working day. Any cleaned steel showing rust stains or left uncoated overnight shall be re-blasted prior to coating.

6.5.1. Blasted surfaces should be coated as soon as possible after blasting. All blasted surfaces will be coated no more than four hours after blasting or re-blasting is required.

6.6. With relative humidity below 90%, the substrate temperature between 41°F/5°C to 200°F/93°C, and the substrate dew point 5°F/3°C below air temperature, apply Scotchkote™ coating 323+ at a minimum film thickness of 25 mil/ 625 microns.

6.7. Allow the coating to cure per time & temperature chart.

6.7.1. Validate cure using Shore D hardness measurement.

6.8. Visually or electrically, inspect the coating for defects after the coating has reached a minimum of 80% of cured hardness.

6.8.1. Holiday test per NACE SP0188 latest revision.

6.9. Repair all defects using Scotchkote coating 323+ as repair material.

7.0 Repair Process

7.1. Remove oil, grease, and loosely adhering deposits.

7.2. Abrade the coating surface with medium grit sandpaper (80 grit). Ensure that the surrounding coating is abraded on all sides of the holiday.

7.3. Clean any debris from the repair area with air blast or clean lint free cloth.

7.4. With the substrate between 41°F/5°C and 200°F/93°C dew point 5°F/3°C below air temperature, apply Scotchkote™ coating 323+ at minimum film of 25 mil/ 625 microns.

8.0 Cold Weather Repair Process

8.1. Follow steps 7.1 - 7.3 from “Repair Process” above.

8.2. Using a butane torch or forced hot air heat gun heat the surface to be repaired.

8.3. *CAUTION*: Do not make contact with flame to coating or allow existing coating to brown.

8.4. Apply 3M™ Scotchkote™ Liquid Epoxy Coating 323+ to the damaged area at minimum of 25 mils/625 microns.

8.5. Using the butane torch or forced hot air heat gun, apply heat to the patch to accelerate cure process.

8.6. *CAUTION*: Do not make contact with flame to coating or allow existing coating to brown.

Product Handling Properties at Time* and Temperature			
Product Temperature	Pot Life	Dry To Touch Time	Back Fill Time
41°F (5°C)	40 minutes	2-3 hours	11-13 hours
59°F (15°C)	22 minutes	1-2 hours	5-7 hours
77°F (25°C)	15 minutes	45-105 minutes	3.5-4.5 hours
95°F (35°C)	11 minutes	30-50 minutes	2-3 hours
113°F (45°C)	8 minutes	20-40 minutes	90-150 hours

*The times listed above are approximations and will vary due to the temperature of the product, ambient conditions and substrate temperature.

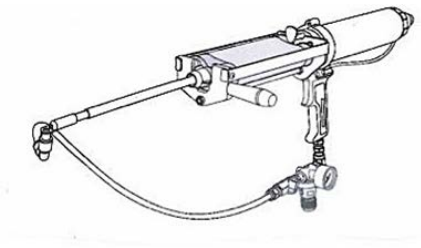
Kit	Pounds of Material	Theoretical Coverage in square feet @ mils		
		@ 25 mils	@ 30 mils	@ 35 mils
50 mL	0.16	0.85	0.71	0.61
450 mL	1.4	7.6	6.4	5.4
900 mL	2.9	15.3	12.7	10.9
1 L	3.2	17.0	14.1	12.1
3 L	9.5	50.9	42.4	36.3
17 L x 3	162	865	720	618
190 L Drum x 3	1827	9764	8136	6974

*Assumes no waste.
**For dimensional computations, please see our coverage calculator on our website (www.3M.com/corrosion).

HSS Spray Application

3M™ Scotchkote™ Spray System HSS-450

The application of 3M™ Scotchkote™ Liquid Epoxy Coating 323+ has been simplified using 3M™ Scotchkote™ Spray System HSS-450. The Scotchkote HSS-450 system utilizes a dual-cartridge setup along with unique application equipment designed specifically to spray apply Scotchkote coating 323+.



For more information and additional literature on the 3M™ Scotchkote™ Spray System HSS-450 system, please visit our web site at www.3M.com/corrosion or contact our Customer Service Center at 1-800-722-6721.

450ml Cartridge Heating Process

This process makes use of microwave oven or a heated box to heat the 450 ml cartridges. Do not open cartridge at any time during this process. Proper PPE is recommended which includes but not limited to safety glasses, coverall, and chemical resistance gloves.

1. Verify power output of microwave or heated box.
   1.1. Higher output microwaves will heat the cartridge faster.

2. Place the spray cartridge in the heating apparatus.

3. When using the microwave heat source, heat the cartridges in 30-second intervals to avoid overheating.
   3.1. After a heating time is established, you can heat the cartridge in one cycle.
   3.2. ***CAUTION*:** Contents in cartridge will be hot. Avoid direct contact with contents.

4. Heat the cartridge to a temperature of 120°F-140°F.

5. Use a pyrometer to verify that the outside of the cartridge has reached the desired temperature.

6. ***CAUTION*:** Do not allow cartridge temperature to exceed 140°F. In doing so the plungers will soften and material will leak.

Equipment Clean-up

MEK or toluene may be used to clean spray equipment, rollers, and brushes. Utilize proper safety guidelines when working with solvent.

Multiple Coats:

Scotchkote™ coating 323+ has been formulated to achieve a coating thickness of 45mils/1150µm in one coat. If additional thickness is required, apply the additional coats within 4 hours of the initial coat at temperature of 60°F/15°C. Refer to the recoat window below.

3M™ Scotchkote™ Liquid Epoxy Coating 323+	
Recoat Window	
Air Temperature	Recoat Time
60°F/15°C	4 hours
75°F/23°C	3 hours
85°F/28°C	2 hours
100°F/36°C	1 hour

Handling and Safety Precautions	Read all Health Hazard, Precautionary and First Aid, Safety Data Sheets, and/or product label prior to handling or use.

Ordering Information/ Customer Service	For ordering technical or product information, or a copy of the Safety Data Sheet call 800.722.6721 or fax 877.601.1305

Important Notice	All statements, technical information, and recommendations related to 3M's products are based on information believed to be reliable, but the accuracy or completeness is not guaranteed. Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use. Any statements related to the product, which are not contained in 3M's current publications, or any contrary statements contained on your purchase order, shall have no force or effect unless expressly agreed upon, in writing, by an authorized officer of 3M.
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