Preparing Activity: NAVFAC Superseding
UFGS-09 97 13.28 (August 2009)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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02/10

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SECTION 09 97 13.28

PROTECTION OF BURIED STEEL PIPING AND STEEL BULKHEAD TIE RODS
02/10

NOTE: This guide specification covers the requirements for exterior protection tape wrapping systems.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

NOTE: This guide specification covers the requirements and application methods for tape wrapping systems that establish exterior protection of buried steel piping and steel bulkhead tie rods which rest above the reference level, 600 mm 2 feet below Mean Low Water (M.L.W) or Mean Lower Low Water (M.L.L.W.), and for tape coating of buried steel pipe covered with an adhesive thermoplastic resin coating system, a thermosetting epoxy coating system, or a polyethylene-butyl adhesive system. These protective systems are suitable for steel surfaces which have continuous operating temperatures not exceeding 60 degrees C 140 degrees F. An adhesive thermoplastic resin coating system is available in a high temperature system capable of service up to 88 degrees C 190 degrees F (see

paragraph entitled "Adhesive-Thermoplastic Resin Coating System").
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PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C209	(2019) Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections and Fitting for Steel Water Pipelines
AWWA C213	(2022) Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
AWWA C214	(2020) Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C215	(2022) Extruded Polyolefin Coatings for Steel Water Pipe

NACE INTERNATIONAL (NACE)

NACE SP0274	(1974; R 2011) High Voltage Electrical Inspection of Pipeline Coatings

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-I-631	(1961; Rev D; Am 6 1987; Notice 1 2021) Insulation, Electrical, Synthetic-Resin Composition, Nonrigid

1.2 DEFINITIONS

1.2.1 Coating

A continuous, uniformly thick layer formed on a surface by the mechanical application of a liquid, mastic, powdered, or extruded film material. Some types of application require elevated temperatures.

1.2.2 Coating System

One or more coatings applied to a properly prepared steel surface. If only one coating, that coating is applied directly to the steel surface; if more than one coating, each coating is applied in one operation over the previously applied and cured coating. For some applications, the first coating is a primer. Coatings of a particular system function together as a collective entity to protect the steel surface from corrosion. Coating system may be either liquid or tape applied.

1.2.3 Tape

Prefabricated laminate of plastic film backing with a homogeneous sealant layer or a pressure-sensitive adhesive layer produced in sheets, pads, or rolls wound on hollow cores. Tape applications do not require elevated temperatures.

1.2.4 Tape Coating System

One or more layers of tape applied cold over a properly prepared and primed steel surface. Tape on the primed surface protects the steel surface from corrosion.

1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Factory-applied Coating System

Field-applied Epoxy Coating system

Thermosetting epoxy coating system

Polyethylene-Butyl Adhesive Coating System

Adhesive Thermoplastic Resin Coating System

Tape Coating System

Electrical-flaw Detector

[Mastics

][Rock Shield]

[SD-06 Test Reports

Inspector's Certificate

Submit for each inspection and test.

Field-applied Epoxy Coating

] SD-08 Manufacturer's Instructions

Field-applied Epoxy Coating system

Thermosetting Epoxy Coating System

Electrical-flaw Detector

[Mastics

][Rock Shield

]PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Tape Coating System (TCS)

****
NOTE: Use of M.L.W. or M.L.L.W. should be based upon the usage by a particular Activity. Selection may be based on the datum for each Activity contained in Table 1-4, "Tide Data for Naval Activities"; of DM-26.1 "Harbor and Coastal Facilities." If the design does not include tie rods, delete those portions of the first sentences that refer to tie rods, M.L.W., and M.L.L.W.
****

****
NOTE: Factory-applied coating with field machine-applied coatings at joints and damaged areas is the preferred method. If the work is a small retrofit or repair, factory applied coatings may be too restrictive. Irregular surfaces such as tees, valve bodies, and flanges are done by hand.
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NOTE: The thicknesses of inner and combined tape are designed for moderately, and severely corrosive soil environments. For lightly corrosive soil environment use thickness specified for moderately corrosive soil environment.
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NOTE: Tape applied at a temperature below 10 degrees C 50 degrees F should be suitable for cold weather application down to minus 12 degrees C 10 degrees F. Delete if application is going to be above 10 degrees C 50 degrees F.
****

Prefabricated tape with adhesive primer [for bulkhead tie rods and turnbuckles][and][for use on [pipe,]couplings, damaged areas and fittings]. The tape wrapping system shall conform to AWWA C209 and to MIL-I-631, Class I for fungus resistance, except that the fungus rating shall lie between zero and one for all specimens. The overall thickness of the tape wrap protection shall be not less than [0.75] [1.12] [_____] mm [30] [45] [_____] mils.[The tape system shall be suitable to be applied at temperatures below 10 degrees C 50 degrees F and above minus 12 degrees C 10 degrees F.]

2.1.2 Adhesive Thermoplastic Resin Coating System (ATRCS)

Steel pipe factory-applied coating system conforming to AWWA C215 and coating manufacturer's instructions shall consist of a continuously extruded polyethylene coating[, capable of withstanding operating temperatures up to 88 degrees C 190 degrees F,] applied on an adhesive undercoat.

2.1.3 Thermosetting Epoxy Coating System (TECS)

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NOTE: Use only epoxy coatings where petroleum fuels are expected.
****

Factory-applied steel pipe system conforming to AWWA C213. Provide field-applied epoxy coating in accordance with manufacturer's recommendations and AWWA C213.

2.1.4 Polyethylene-Butyl Adhesive Coating System (PBACS)

Factory-applied steel pipe system of extruded butyl adhesive compound, 0.18 mm 7 mils minimum thickness, covered with overlapping layers of extruded polyethylene wrapping, one mm 38 mils minimum thickness, in accordance with AWWA C214.

[2.1.5 Mastics

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NOTE: Mastic coatings are brush applied. Mastics are used on irregular surfaces such as bolted flanges and valve bodies where the tape will not directly contact exposed surfaces. Show surfaces that will require mastic coatings on drawings. Delete if surfaces are smooth and round.
****

Apply a coating of manufacturer approved mastic protection to irregular surfaces. Mastic shall be compatible with coating system.[Apply the tape system over mastic.] Mastic layer thickness shall conform to coating manufacturer's recommendation.

][2.1.6 Rock Shield

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NOTE: Rock shields are used where coarse rock backfill or rocky soil conditions may damage the tape coating.
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Provide rock shield over completed coating system as recommended by coating manufacturer.

]PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 TCS

3.1.1.1 Surface Preparation

Surfaces shall be clean and dry. Wire brush weld beads, and remove weld spatters. Remove heavy rust or mill scale with wire brush.

3.1.1.2 Application

Remove paper from Kraft paper-protected material before placing in final position. Reinforce coating at sling points with roofing felt or other approved heavy shielding material, or handle with nylon or canvas slings. Apply polyvinylchloride-butyl rubber laminated tape or pressure-sensitive organic plastic tape and its adhesive primer by single machine operation.

a. Pipe: Spirally wrap straight runs in one layer, lapping the tape as applied. Overlap shall conform to recommendations of the tape manufacturer. When an outerwrap is used, overlap of outerwrap shall bridge joints of the tape. Apply at each end of straight runs a double wrap of one full width of tape at right angles to the axis in such a manner so as to seal ends of spiral wrapping.

b. Pipe Joints and Couplings and Damaged Areas of Coatings: Clean joint areas which are to be taped, of burrs and rust. Smooth down or cut away damaged coating when not firmly bonded to pipe. Spirally wrap with a two-layer wrapping system, overlapping coating surface at least 75 mm 3 inches. Initially stretch tape sufficiently to conform to the surface to which it is applied, using one layer half-lapped for tape 50 mm 2 inches or less in width or one layer lapped at least 25 mm one inch for tape more than 50 mm 2 inches wide. Apply a second layer, lapped as above, with tension as tape comes off roll, and press to conform to shape of component. For other irregular surfaces such as bolted flanges valve bodies where tape coating system containing mastics is to be provided, apply with brush.

c. Tie Rods and Tie Rod Fittings: Spirally wrap with a two-layer coating system. Apply tape to tie rods by lapping each layer of tape using a half-lap for tape 50 mm 2 inches or less in width or at least a 25 mm one inchlap for tape more than 50 mm 2 inches wide. For tie rod fittings, initially stretch tape sufficiently to conform to the surface to which it is applied, using one layer half-lapped for tape 50 mm 2 inches or less in width or one layer lapped at least 25 mm one inch for tape more than 50 mm 2 inches wide. Apply a second layer, lapped as before, with a tension as tape comes off the roll, and press to conform to the shape of component.

3.1.2 Joints, and Other Irregular Surfaces For ATRCS

Prepare surface as described in paragraph entitled "TCS." Wrap tape as specified in paragraph entitled "TCS"; except, apply the tape half-lapped, and prime extruded polyethylene coating and adhesive undercoat surfaces to be tape wrapped with a compatible primer as recommended by the tape manufacturer and approved by the extruded polyethylene coating applicator for use on the polyethylene coating.

3.1.2.1 Damaged Areas

Repair damaged areas of the extruded polyethylene coating by tape wrapping as specified under the paragraph, entitled "Tape Coating System" except press residual material from the extruded polyethylene coating into the break, or trim off. Prime areas to be taped prior to applying half-lapped tape.

3.1.3 TECS

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NOTE: Use only epoxy coatings where petroleum products are expected.
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Install in accordance with the manufacturer's instructions and AWWA C213.

3.1.3.1 Joints

Clean both sides of weld area by wire brushing, and remove dust, moisture, and other contaminants. Apply primer recommended by coating manufacturer after cleaning of joints.

3.1.3.2 Damaged Areas

Remove damaged coating by abrading, filing, or wire brushing. Clean area to be repaired free of dust, moisture, and other contaminants. Cover with a primer and a coating recommended by coating manufacturer. Apply coating over cleaned surface, and extend approximately 75 mm 3 inches beyond damaged area.

3.1.4 Joints and Other Irregular Surfaces For PBACS

Clean both sides of weld area by wire brushing, and remove dust, moisture, and other contaminants. Apply primer recommended by tape manufacturer and acceptable to coating manufacturer on cleaned area. Apply tape spirally with a 50-percent overlap in accordance with the tape manufacturer's instructions.

3.1.4.1 Damaged Areas

Remove rough or protruding polyethylene from damaged area by abrading, filing, or cutting the material. Clean area to be repaired free of dust, moisture, and other contaminants. Cover with tape recommended by coating manufacturer and primer recommended by tape manufacturer. Apply primer over cleaned surface, and extend approximately 75 mm 3 inches beyond damaged area. Apply tape over primer, and extend 25 mm one inch beyond damaged area. Apply additional primer over tape patch. Spirally wrap additional tape around pipe with a 50-percent overlap to cover tape patch, and extend a minimum of 50 mm 2 inches beyond the edge of the patch.

3.2 FIELD QUALITY CONTROL

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NOTE: Require a certified inspector where the scope and cost of the project warrants. When editing Section 01 45 00 01 45 00.00 40 QUALITY CONTROL, ensure that the qualification of inspector required below is coordinated.
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Conform to AWWA C214[and AWWA C213].[Inspection shall be performed by a National Association of Corrosion Engineers (NACE) certified inspector.]

3.2.1 Field Inspection

Examine material surface preparation and application proceduresperformed in the field.

3.2.2 Field Test

Test the protective system for holes, voids, cracks, and other visually undetectable damage that may occur during handling and installation in accordance with NACE Standard NACE SP0274. In critical applications no holidays will be permitted. In non critical applications up to 10 holidays per meter 3 holidays per linear feet of the pipe may be accepted. Test with an approved electrical-flaw detector in accordance with the detector manufacturer's printed instructions. Prepare inspector's certificate for each inspection and test. Repair areas where arcing occurs and retest.

-- End of Section --