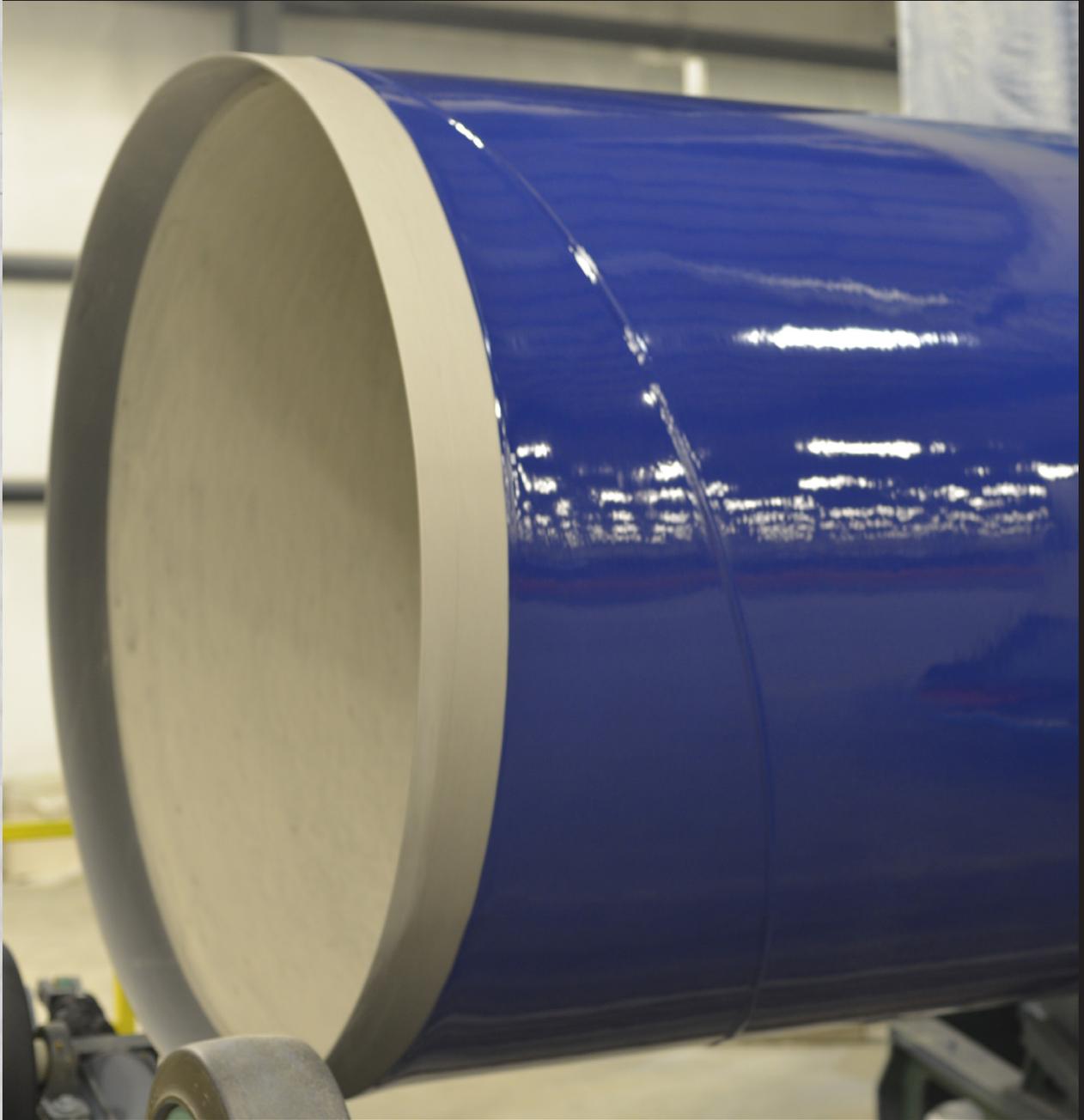


AMERICAN SpiralWeld Pipe Manual

Section Four: Linings and Coatings



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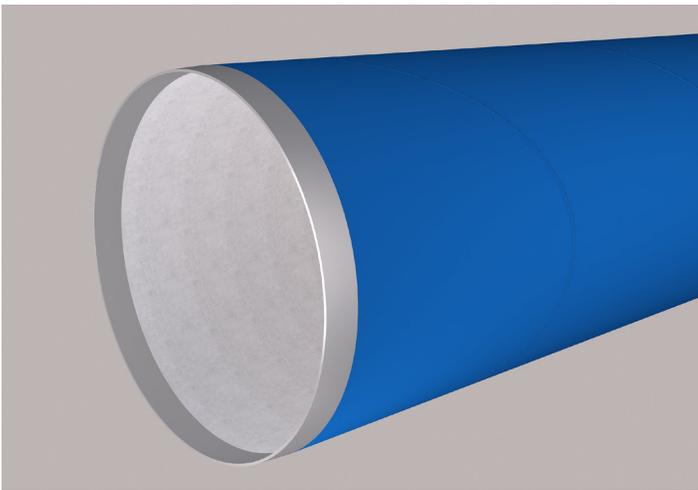


Linings and Coatings

The majority of steel water pipe furnished today is specified with an interior lining and an exterior coating. AMERICAN offers a wide variety of linings and coatings to meet project specifications and national American Water Works Association (AWWA) standards. The following is a listing of available lining and coating systems along with a brief description of each.

LININGS

Cement-Mortar Lining



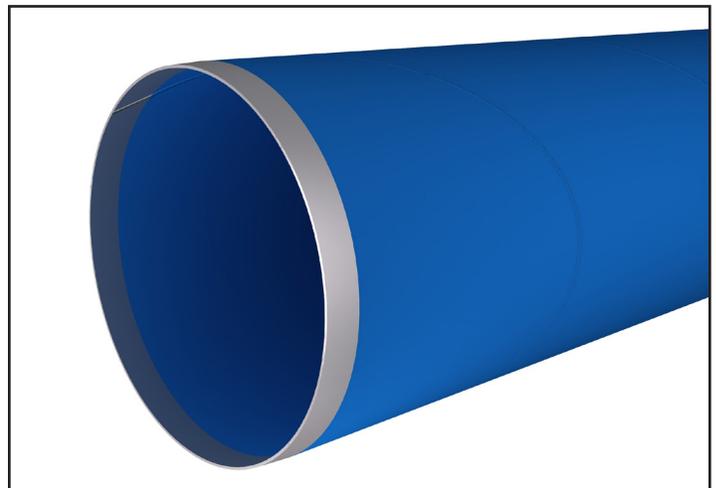
Cement-mortar lining has a successful service history dating back to the late 1800s. It is the most common lining specified for steel pipe and fittings in the water transmission market and is applied in accordance with ANSI/AWWA C205. Virtually all steel pipes carrying potable water have a cement-mortar lining, and a significant portion of piping for other services such as raw water, non-septic sewage, salt water, and cooling water has a cement-mortar lining. Cement-mortar lining applied by AMERICAN is certified in accordance with NSF/ANSI Standard 61.

Standard thicknesses for cement-mortar lining are defined in C205, but thicker lining is available from AMERICAN when needed. Be aware that increased lining thickness may affect the resulting pipe length or shipping costs due to the increased weight. Due to equipment limitations, shipment weight restrictions, and handling issues, factory applied cement-mortar lining is typically

provided in nominal pipe diameters up to 120 inches. Cement-mortar lining for larger diameter pipe can be field applied in accordance with ANSI/AWWA C602.

The factory-applied lining is placed by pumping a high slump cement-mortar mixture into a rotating pipe. Once the lining is placed along the full length of the pipe, the rotational speed is increased to consolidate the cement-mortar mixture and evacuate excess water. This process yields a dense mortar lining with a smooth surface. After the rotational application is complete, the lining is cured to achieve its required compressive strength.

Polyurethane Lining



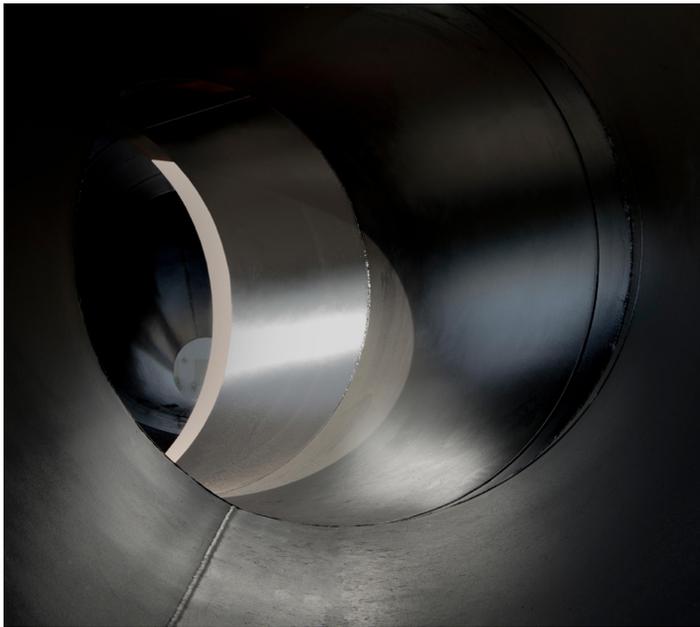
For service conditions where cement mortar is not appropriate, AMERICAN can provide a polyurethane lining in accordance with ANSI/AWWA C222. Polyurethane linings are typically applied at 20 mils minimum dry film thickness (DFT), but thicker lining is possible. Contact an AMERICAN representative regarding the feasibility of increased polyurethane lining thickness. Typical uses for polyurethane lining include septic sewers and industrial waste applications. Polyurethane lining certified in accordance with ANSI/NSF Standard 61 is available in limited colors.

Polyurethane lining is applied in accordance with ANSI/AWWA C222 and the polyurethane manufacturer's recommendations. It is spray-applied to



the interior of the pipe after cleaning and blasting have been performed to achieve a properly prepared surface. Curing time and temperature are a function of the specific polyurethane type and formulation. After the lining has adequately cured, it is tested for conformance to the standard. These tests include verification of thickness, electrical holiday inspection to verify dielectric integrity, and pull-off testing to verify adhesion strength.

Epoxy Lining



Epoxy lining meeting the requirements of ANSI/AWWA C210 is available from AMERICAN. This lining is commonly used for conditions similar to those for polyurethane lining. Another use for epoxy lining is to supplement a factory applied cement-mortar lining system for irregular shapes such as blind flanges, formed pipe ends, or appurtenant items such as compression couplings. Epoxy lining is generally applied at 16 mils minimum DFT. Contact an AMERICAN representative regarding the feasibility of increased epoxy lining thickness. Epoxy lining meeting the requirements of NSF Standard 61 is available in white, along with a limited palette of special order colors.

Epoxy lining is applied in accordance with ANSI/AWWA C210 and the epoxy manufacturer's recommendations. It is spray-applied to the interior of the pipe after cleaning and blasting have been performed to achieve a properly prepared surface.

Curing time and temperature are a function of the specific epoxy type and formulation. After the lining has adequately cured, it is tested for conformance to the standard. These tests include verification of thickness, electrical holiday inspection to verify dielectric integrity, and pull-off testing to verify adhesion strength.

COATINGS FOR BURIED SERVICE

Polyurethane Coating



Polyurethane coating meeting the requirements of ANSI/AWWA C222 is available from AMERICAN. Polyurethane coating is typically applied at 25 mils minimum DFT, but thicker coating is possible. Contact an AMERICAN representative regarding increased coating thickness. The coating is applied and tested for conformance as described previously for polyurethane lining.

Tape Coating

AMERICAN's tape coating meets the requirements of either ANSI/AWWA C214 (pipe) or ANSI/AWWA C209 (fittings and specials). Tape coating machine-applied to straight pipe is generally a four-layer system consisting of a liquid adhesive, a 20-mil corrosion protection layer, and two 30-mil mechanical protection layers, for a total system nominal thickness of 80 mils. Tape coating hand-applied to fittings and specials is a three-layer system consisting of a liquid adhesive and two 35-mil



layers of backed butyl adhesive, for a total system nominal thickness of 70 mils.

The application process for machine-applied tape coating consists of proper surface cleaning and blasting, application of liquid adhesive, and the sequential application of the inner layer corrosion protection tape and generally two outer layers of mechanical protection tape. Following application of the inner layer, but prior to the application of the mechanical layers, the inner layer tape is subjected to an electrical holiday inspection to verify dielectric integrity. Following the application of all tape layers, the system is subjected to pull-off tests to verify adhesion strength.

The process for hand applying tape coating on fittings and specials is similar to the machine-applied process, but using two layers of equal thickness tape.

Epoxy Coating



Epoxy coating meeting the requirements of ANSI/AWWA C210 is available from AMERICAN. The most common use for epoxy coating is to supplement a factory-applied tape coating system to coat irregular shapes such as blind flanges, formed pipe ends, reinforcing plates, harness ring assemblies, and thrust collars. Epoxy coatings are applied at 16 mils minimum DFT. Contact an AMERICAN representative regarding the feasibility of increased epoxy coating thickness. The coating is applied and tested for conformance as described previously for epoxy lining.

COATINGS FOR EXPOSED SERVICE

Polyurethane Coating

Polyurethane coating meeting ANSI/AWWA C222, typically used for buried service (see COATINGS FOR BURIED SERVICE), also may be used for exposed service. When polyurethane coatings are used outdoors, it is common to apply the coating at an increased thickness or to apply a thin topcoat of aliphatic polyurethane. The coating is applied and tested for conformance as described previously for polyurethane lining.

Epoxy Coating

Epoxy coating meeting ANSI/AWWA C210, typically used for buried service (see COATINGS FOR BURIED SERVICE), also may be used for exposed service. Due to chalking of epoxies in outdoor exposed service, it may not be desirable to use an ANSI/AWWA C210 epoxy without a topcoat when the pipeline is in an area where aesthetics are important (see Other Coating Systems below). The coating is applied and tested for conformance as described previously for epoxy lining.

Other Coating Systems



Several coating systems meeting the requirements of ANSI/AWWA C218 are available from AMERICAN. These systems include various alkyd, epoxy, and urethane coatings, some including zinc when specified. Contact an AMERICAN representative for availability of a particular coating.



SPECIAL LININGS AND COATINGS

Special order linings and coatings are available and are applied at AMERICAN's Columbia, South Carolina, plant or by a specialty coater. Contact an AMERICAN representative for availability of a particular special lining or coating.

HDD Coating

Polyurethane coating meeting ANSI/AWWA C222, typically used for buried service (see COATINGS FOR BURIED SERVICE), also may be used for HDD applications. Polyurethane's high rate of abrasion resistance, combined with high impact resistance make it ideal to protect the pipe from damage during the HDD installation process. When polyurethane coatings are used for HDD service, it is common to apply the coating at an increased thickness or to apply a compatible Abrasion Resistant Overcoat (ARO) in addition to the standard polyurethane coating. The coating is applied and tested for conformance as described previously for polyurethane coating. Contact an AMERICAN representative for more information on HDD coatings.

HDD Lining

HDD steel pipe typically uses flexible spray-applied linings in lieu of the more common cement-mortar lining. The linings for water or wastewater transmission in HDD pipe are most commonly specified as polyurethane per ANSI/AWWA C222 or liquid epoxy per ANSI/AWWA C210. For more information on polyurethane and epoxy linings, please refer to page two of Section Four.

FIELD JOINT LININGS

Cement-Mortar Joint Lining

Joints for cement-mortar-lined pipe are typically field grouted with cement mortar per the requirements of ANSI/AWWA C205 and the recommendations of the AMERICAN Field Service guide.

Other Linings

For other linings, the insides of joints are generally coated with the same or similar material as applied to the rest of the pipe. Contact an AMERICAN representative or the lining material manufacturer for specific recommendations.

FIELD JOINT COATINGS



Shrink Sleeve

The most common coating for buried steel pipe joints is a heat-shrinkable, cross-linked polyolefin coating per ANSI/AWWA C216, also known as a "shrink sleeve." As the name implies, these coatings are positioned loosely on the joint, and with applied heat they shrink to adhere to the outside of the pipe. Application is governed by the guidelines of ANSI/AWWA C216 and the manufacturer's recommendations.

Other Coatings

For other coatings, most exposed steel pipe joints are coated with the same or similar material as applied to the rest of the pipe. UV-resistant shrink sleeves are available and may offer advantages in some instances. Contact an AMERICAN representative or the coating material manufacturer for specific recommendations.

SUMMARY

The systems outlined above represent the standard systems offered by AMERICAN SpiralWeld Pipe. Other specialty systems may be available subject to review of the specific material and application requirements. Contact an AMERICAN representative regarding specialty linings or coatings not identified above.



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