

AMERICAN SpiralWeld Pipe Manual

Introduction to AMERICAN SpiralWeld Pipe



AMERICAN
SPIRALWELD PIPE

THE RIGHT WAY



Common Uses

Line Work



AMERICAN SpiralWeld Pipe supplies steel pipe for line work applications in diameters from 24 to 144 inches and joint lengths up to 50 feet. Line work typically includes:

- Water Transmission Mains
- Raw Water Lines
- Sewer Force Mains
- Gravity Sewer Mains
- Penstocks
- Circulating Water Lines
- Aqueducts
- Aerial Pipe Crossings
- Intakes and Outfalls
- Trenchless Installations

AMERICAN steel water pipe is manufactured in accordance with ANSI/AWWA C200 and mortar lined in accordance with ANSI/AWWA C205 for internal corrosion protection. Buried steel water pipe is available with a polyurethane coating (per ANSI/AWWA C222). The typical joint type for both water and wastewater pipe are either a rolled groove O-ring joint or a lap-welded joint where restraint is required. There are also other joint connection alternatives available to suit the application.

Steel wastewater pipe coatings are typically the same as the water pipe coatings stated above. The typical

ID linings of wastewater pipe are either a polyurethane lining (per ANSI/AWWA C222) or an epoxy lining (per ANSI/AWWA C210). Other linings for steel wastewater pipe are also available. Contact an AMERICAN representative for more information on wastewater linings.

Plant



There are thousands of water and wastewater treatment plants in the United States, each of which is designed to remove bacteria, chemicals and suspended particles from water piped in from surface and underground sources. AMERICAN SpiralWeld Pipe's products play a key role in these facilities.

Plant work from AMERICAN typically includes:

- Water Treatment Plants
- Wastewater Treatment Plants
- Special Fabrications
- Tanks
- Bifurcated Wyes
- High Pressure Pumping Stations

AMERICAN manufactures plant piping that is standards-compliant for larger-diameter applications. In addition to pipe, AMERICAN offers a large line of special fabrications and fittings; all manufactured in our United States facilities.



Structural



Spiral welding, the process used by AMERICAN to manufacture AWWA pipe cylinders, can also be used to manufacture steel cylinders for structural applications such as:

- Foundation Piles
- Drilled Shaft Casing Pipe
- Column Casing Pipe
- Aerial Casing Pipe
- Horizontal Bore Casing Pipe
- Well Casing Pipe
- Abrasion-Resistant Slurry Pipe
- Structural Framing Members
- Utility Poles
- Sign Supports

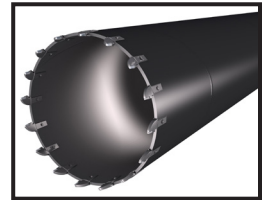
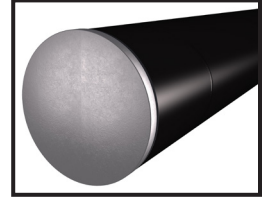
For smaller quantities of structural pipe, AMERICAN can provide rolled-plate pipe. This fabricating capability provides pipe up to 13 feet in diameter and 1.5 inches wall thickness.

AMERICAN typically manufactures structural pipe to ASTM A252, ASTM A139 (with or without factory hydrostatic testing), and ASTM A1097. Occasionally, structural pipe is specified to AWWA C200.

With spiral welding capabilities of outside diameters from 24 to 144 inches, pipe wall thicknesses up to 1 inch, and product lengths up to 80 feet, AMERICAN provides a wide range of structural pipe options.

Additionally, AMERICAN offers the following fabrication options:

- End Bevels
- Sheet Pile Connector Attachment
- Band-Type Reinforcing Bands
- Integral Reinforcing Bands with J-slots and Lifting Holes
- Weld Backing Bars
- Cutting Teeth
- Circular End Plates or Custom End Plates
- Conical Points
- Cutting Shoes
- Grout Ports
- Various Customer Fabrications



Along with AMERICAN's offering of AWWA-related coatings and linings, we offer coal tar epoxy, asphaltic, aluminum epoxy mastic and multi-layer coating systems for our structural pipe.

To complete our service to the customer, AMERICAN can provide transportation of our structural pipe product to the jobsite via common carrier, truck or rail. A combination of land and barge transportation is available as well.

An Introduction to AMERICAN SpiralWeld Pipe



To meet growing demand in the marketplace, AMERICAN Cast Iron Pipe Company expanded its



product line in 2000 to include spiral-welded steel pipe in diameters up to 144 inches (3,600 mm). Made by AMERICAN SpiralWeld Pipe Company, this product line complements AMERICAN's ductile iron pipe and steel pipe product lines.



As the population growth of the United States continues to trend upward, so does the demand for utility infrastructure, including larger pipelines to serve the water, wastewater, hydroelectric and power generation industries. Spiral-welded steel pipe is used as water transmission and distribution lines, outfall lines for wastewater, penstocks for hydroelectric facilities, and cooling water lines by power generation facilities. In addition, spiral-welded steel pipe is used as structural pipe piling and casing pipe by the construction industry.

AMERICAN SpiralWeld has state-of-the-art facilities located across the United States. The facility located in Columbia, South Carolina, encompasses 290,000 square feet (27,000 square m) and is laid out in three contiguous buildings, allowing the pipe to be produced under roof from start to finish. The Flint, Michigan, plant is on an approximate 40-acre parcel, and manufacturing occurs in a single 181,000-square-foot building.

Mission

Our mission is to produce premium quality steel pipe in diameters up to 144 inches (3,600 mm) for the water, wastewater, power, structural and industrial markets.

Strategic Location



AMERICAN SpiralWeld Pipe is located just eight miles (13 km) from downtown Columbia, South Carolina, a major transportation hub for three major interstate highways: I-20, I-77 and I-26. Within a 100-mile (160-km) radius, there is access to other major interstate highways, including I-95 and I-85. In addition, AMERICAN has rail access to CSX and Norfolk-Southern railroads that border its site and can ship from the Port of Charleston to its international customers and others with water access.

Our Flint plant is located two miles from downtown and 65 miles from Detroit at the junction of interstates I-69 and I-75. Access to I-80 is within a 100-mile radius. Flint is served by CSX with rail access onsite.

State of the Art Manufacturing Facility – A Pictorial Tour





Coil Steel

The manufacture of AMERICAN SpiralWeld Pipe begins with high-quality steel received in coils up to 80 inches (2,000 mm) wide and weighing as much as 50 tons.

Spiral-welded Pipe Mills



AMERICAN's spiral mills have the capacity to handle coils of steel from 0.1875 inches (4.8 mm) to 1 inch (25.4 mm) in thickness, with yield strengths up to 70,000 psi (482 MPa), to produce high-quality, spiral-welded steel pipe up to 144 inches (3,600 mm) in diameter. This flexibility offers AMERICAN's customers a wide variety of options.



Pipe forming begins when the coils are loaded into the forming section. The steel coil is unwound and fed through the first of four sets of flattening rolls. The flattened coil continues through the forming section that is set at the required angle, based on the diameter of the finished cylinder, and the coil thickness and width.

The flattened sheet is then reformed by a series of three sets of rollers, welded and becomes a spiral-welded

seamed cylinder. High quality interior and exterior submerged-arc welds, precisely controlled by programmable logic controllers (PLCs), are positioned by the mill operator using remote video monitoring. At the customer's request, these welds may be tested using in-line ultrasonic inspection equipment.

The finished spiral-welded pipe cylinder feeds to the run-out section of the mill where the pipe is cut to length. Steel cylinders fabricated for structural pipe may be cut to standard lengths up to 80 feet (24 m). Cylinders fabricated for either C200 or structural pipe requiring hydrostatic testing may be cut to nominal lengths from 20 (6 m) to 55 feet (17 m).

Material Handling System



Finished pipe cylinders are moved through the production process by an efficient and ergonomically-friendly pipe handling system.

Hydraulic Expander

Formed bell ends require use of a hydraulic expander to accurately expand the bell end of the cylinder. This allows a precision joint fit in the field, which means easier assembly and increased production. The pipe expansion processing area includes a remote-controlled pipe turnstile that allows the operator to expand each end of the cylinder as required.

AMERICAN hydrostatically tests cylinders in accordance with AWWA C200. Structural pipe may also be hydrostatically tested when requested by the customer. The hydrostatic testing machine is designed to accommodate nominal joint lengths from 20 (6 m) to 55 feet (17 m) and pressures up to 3,700 psi (26 MPa). A sequence of pumps efficiently fill then test pipe cylinders



to a pressure that induces a circumferential stress of at least 75 percent of the material's specified minimum yield strength. This testing ensures quality cylinder fabrication.



Cement-Mortar Lining (AWWA C205)



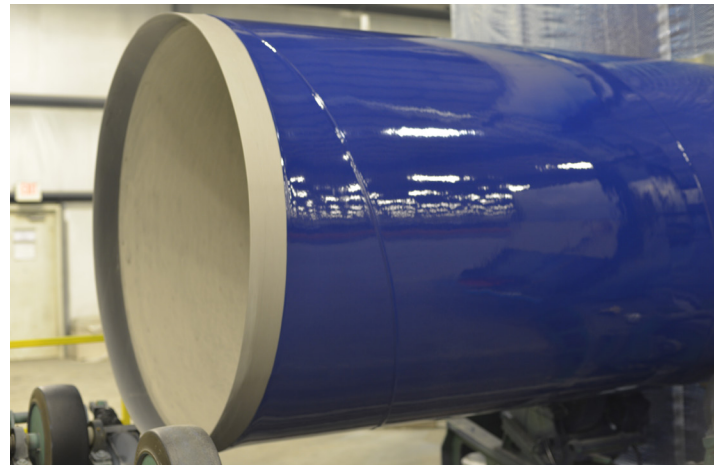
After successful hydrostatic testing, the pipe is moved into the lining preparation area. The approach to the lining processing area is used to prepare the pipe for application of cement mortar. This preparation includes the installation of the rubber dams that are placed in both ends of the pipe to keep the joint areas free of cement mortar. It can also include the application of round-up rings secured to the exterior of the pipe to maintain dimensional stability during application of the lining, which is applied using centrifugal force.

AMERICAN's belt-driven cement-mortar lining machines can process pipe up to 120 inches (3,000 mm) in diameter with cement-mortar linings up to 1-inch (25.4 mm) thick. The belt-driven machines rotate the pipe at high speed to create a centrifugal force equivalent to about 70 Gs on the applied mortar. As the

pipe spins, mortar is poured along the interior of the pipe. Centrifugal force ensures even distribution of the mortar.

After lining, the pipe is moved to the curing area where the ends are capped before curing the lining with steam. The densely compacted cement mortar allows excellent flow through the pipe and provides additional structural rigidity for buried pipe installation. At AMERICAN, the standard for steel pipe with a cement-mortar lining is a finished inside diameter equal to or greater than the nominal pipe diameter.

Polyurethane Coating (AWWA C222)



The polyurethane area includes two parallel pipe translators, or conveyors. The first set of translators move the pipe through a pre-heating cabinet to eliminate any moisture on the pipe and elevate the temperature of the pipe for application of the polyurethane. Immediately after the pipe exits the pre-heating cabinet, the pipe enters the blast cabinet where the surface is prepared for the application process.

The second translator moves the pipe through a second pre-heating cabinet that continues to heat the pipe to the appropriate level for application of the polyurethane. Next, the pipe enters a spray booth where liquid polyurethane is sprayed onto the exterior surface. The pipe temperature, and the temperature and mix ratio of the polyurethane material are monitored during the coating process. Immediately after application, the coating is tested for holidays, or flaws, using a high voltage sensor, followed by in-line thickness verification. The pipe then exits the facility.



Fitting Fabrication



AMERICAN supplies a full line of fittings, including fittings fabricated from spiral-welded pipe cylinders, and/or cylinders rolled and welded from plate steel up to a thickness of 3 inches (76 mm).

Loading and Transportation

After the pipe is manufactured, it is moved to a staging area for delivery to the customer. Here, the pipe will receive a thorough inspection before supports, called "bracing," are installed. The ends of cement-mortar-lined pipe are then sealed to maintain an appropriate moisture level inside the pipe.

When the pipe is ready to be shipped, a Logistics and Shipping Manager at the manufacturing facility, releases the pipe and/or fittings for shipment as determined by the customer.



ASWP Capabilities

AMERICAN SpiralWeld Pipe offers its customers the following capabilities:

Pipe meeting the requirements of AWWA C200, ASTM A139 or ASCE Manual No. 79

- Sizes 24 to 144 inches (600 to 3,600 mm) in diameter
- Wall thickness up to 1 inch (25.4 mm)
- Standard nominal lengths from 20 to 55 feet (6 to 17 m)
- Rubber gasket joints up to 84 inches (2,100 mm) in diameter
- Weld-bell joints up to 144 inches (3,600 mm) in diameter
- Butt-welded joints up to 144 inches (3,600 mm) in diameter
- Steel Lok-Ring Restrained Joint
- Cement-mortar lining meeting the requirements of AWWA C205, including the ability to apply the lining to a thickness exceeding 1 inch (25.4 mm)
- NSF/ANSI Standard 61 Certification
- External polyethylene tape coating meeting the requirements of AWWA C214 (Contact AMERICAN for a complete list of coatings and linings available.)
- Structural pipe or pipe piling in the above dimensions meeting the requirements of ASTM A252

Quality Assurance and Testing



AMERICAN SpiralWeld Pipe is a member of the Steel Tank Institute & Steel Plate Fabricators Association (STI/SPFA), dedicated to the promotion of steel as the choice material for quality piping for the petroleum, chemical, food and water storage industries; steel tanks; pressure vessels; and specialty products. AMERICAN SpiralWeld's



production facilities and the Customer Service Department at AMERICAN's headquarters in Birmingham, Alabama, are quality accredited by the SPFA Quality Certification Program. This accreditation certifies AMERICAN's design and fabrication processes meet the highest standards.

AMERICAN's employees are dedicated to producing the highest quality products. All welders are qualified per ASME Section IX, AWS B2.1, or AWS D1.1. AMERICAN's Quality Assurance Department is staffed with SNT-TC-1A certified NDE Technicians and AWS Certified Weld Inspectors.



AMERICAN Customer Service

866-442-ASWP (2797)

Email: aswp@american-usa.com

AMERICAN's experienced Sales Engineers review initial and final designs to recommend solutions to complex design and specification issues. AMERICAN Sales Engineers, located throughout the United States, along with Customer Service representatives and other support staff, work with contractors, engineers and owners to ensure the sales order is accurately scheduled, properly ordered and delivered on time.

AMERICAN's Chief Engineer, Project Engineer and Customer Service team provide customers with a wealth of product design experience. This translates into customer confidence in AMERICAN's ability to develop and deliver complex steel pipe designs and fitting configurations.

While AMERICAN Customer Service representatives are involved in numerous critical tasks, none is more

important for our customers than the preparation of the project specific submittal package. This submittal includes:

- pipe design calculations, which consist of a thorough analysis of internal pressure and external loading conditions based on the engineer's plans and specifications;
- the pipeline layout drawings, which show the layout of the pipeline in the horizontal and vertical planes, detailing locations of all control points and appurtenances; and
- detailed drawings of all straight pipes, pipe specials, pipe fittings, etc., based on the pipeline layout drawings.

These submittal materials are developed using ANT™, a sophisticated, Windows-based software program. The program takes survey data, in most any format (baseline, offset, centerline, etc.), and provides a three-dimensional rendering with optimized dimensions and details of the pipeline, pipe specials and fittings needed for fabrication.



Field Service

To assist customers in the efficient, economical and quality installation of AMERICAN spiral-welded steel pipe, experienced factory-trained field representatives are on staff.

Field Welding (AWWA C206)

AMERICAN manufactures several joints configured for field welding. Field welding should be completed using qualified welders, following AWWA guidelines, and as required by project specifications or governing codes.



Joints

AMERICAN manufactures several different rubber-gasketed joints to meet our customers' requirements for internal pressure and leak-proof performance while providing quick and efficient assembly. Joints are manufactured per the requirements of the AWWA standards.

Typical ASWP joints include the following:

- Lap Weld Joint
- Rolled Groove O-Ring Joint
- Lok-Ring Joint
- Butt Strap Joint
- Butt Joint
- Flange Joint
- Bolt Sleeve Joint
- Split Sleeve Joint

Steel Pipe Design Overview

(For more information see the ASWP Design Guide)

There is essentially one criterion for the design of a steel pipe: internal pressure. Once the thickness for internal pressure has been determined, analyses are performed to verify the pipe's adequacy with respect to external loads, buckling (or vacuum) and handling. For many projects, the wall thickness recommended to allow reasonable handling of the pipe is adequate for all anticipated loading concerns. AWWA M11 and AISI Volume 3 are excellent sources of information for the design professional.

Handling



The conservative wall thickness recommended for the handling of steel pipe during the manufacturing, shipping and installation phases of a project is dependent on the type of coating and lining specified by the owner or owner's engineer. Steel pipe with flexible coatings and linings (e.g., polyurethanes, epoxies) should have a minimum diameter/wall thickness ratio (D/t) of 288. For conventional cement-mortar-lined steel water pipe, the recommended D/t ratio is no more than 240.

Internal Pressure

Internal pressure is the only condition for which design must be truly performed for buried steel pipe. Design is based on the hoop stress formula $t = PD/2S$, where t is wall thickness, P is internal pressure, D is pipe diameter, and S is the allowable stress. AWWA Manual M11 provides guidelines for the design of pipe subject to various pressure conditions. For operating or working pressures, S is generally 50 percent of the minimum specified yield strength of the steel. For temporary pressures, such as transient or test pressures, S is generally 75 percent of the minimum specified yield strength of the steel.

External Load

After the wall thickness has been calculated to withstand handling and internal pressure conditions, the design should be checked for allowable deflection. A cement-mortar-lined pipe with a flexible coating should not exceed a design deflection of 3 percent. While a compacted soil envelope of approximately 85 percent standard Proctor is adequate for the majority of installations, for deeper covers an improved soil envelope may be warranted. Note: A steel pressure pipe will tend to re-round after being placed in operation.

Buckling

To date, modern steel pipe manufactured to recommended handling thicknesses has not experienced a buckling failure in a compacted soil environment. As with external load, the soil envelope should be designed and relied upon to provide the pipe adequate support to resist buckling. As found in laboratory testing, buried steel pipe must first undergo approximately an 18 percent or greater deflection before it is susceptible to a buckling failure. For an exposed or subaqueous pipe condition, however, design criteria established in AWWA M11 should be followed.



AMERICAN

SPIRALWELD PIPE

THE RIGHT WAY

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