

SPIRAL RIB PIPE

SPIRAL RIB PIPE OFFERS ALL THE ADVANTAGES OF CORRUGATED METAL PIPE PLUS GREATER HYDRAULIC EFFICIENCY. LANE FABRICATES THE GREATEST VARIETY OF SRP PRODUCTS.

SRP is available in round sizes from 15" through 120" and in pipe-arches through 102" equivalent. Intermediate sizes can be fabricated if required by the project. Lane fabricates SRP in steel and aluminum and can supply steel pipe with a variety of coatings for greater service life. Lane is able to fabricate quality fittings to meet project needs.

The many great features of SRP make it especially suited for use as a liner pipe for rehabilitating existing culverts. The flexibility to fabricate SRP in almost any diameter or length enhances its value as a liner pipe.

When combined with Lane's HDPE pipe, SRP becomes part of the most cost-effective pipe package available on the market. Specifying both these materials allows the selection of the most cost-effective combination of materials on any project.



Drain with Lane





LANE SPIRAL RIB PIPE: STRONGER, LIGHTER, MORE DURABLE AND MORE EFFICIENT

LOWER COST SOLUTION WITH INNOVATION

Spiral Rib Pipe (SRP) is unique among corrugated metal pipe products. SRP offers the standard corrugated metal pipe (CMP) features of strength, lighter weight and durability. In addition, it has the advantage of a hydraulic capacity equal to that of concrete, HDPE and PVC pipe. These features make SRP, in either steel or aluminum, the least-cost solution for today's storm-sewers and culverts, and Lane Enterprises offer the greatest variety of SRP products.

The ability to fabricate SRP in most any diameter or length, enhances the uniqueness of this product. If site conditions require a non-standard pipe size, SRP can be made to match those conditions. Lengths can also be varied to suit delivery or site requirements. Only CMP and SRP offer these unique advantages.

MORE EFFICIENT HYDRAULIC DESIGN

Tests at Utah State Water Research Laboratory showed SRP has a Mannings "n" of 0.011. The smooth interior surface of Spiral Rib Pipe is the result of a corrugation



profile in which the square-shaped ribs project to the pipe's exterior.

The lack of projections on the inside surface of the pipe essentially eliminate most of the boundary turbulence common to many other corrugated metal pipe wall corrugations. The helical orientation of the ribs, contributes to the hydraulic efficiency of SRP. Even the flat, non-projecting profile of the lockseam in SRP promotes hydraulic efficiency.

The hydraulic efficiency of SRP has been verified by full-scale flow tests on several sizes of pipe. A number of tests were performed at the Utah State Water Research Laboratory under a variety of conditions. The result is a Manning's "n" that has been accurately determined. Among the tests performed, were tests in which the ribs were filled to determine the impact of the ribs on flows through SRP. The results proved that the open ribs have negligible impact on the hydraulic parameters of SRP.

Table 1: Handling Weight for ALUMINIZED STEEL and GALVANIZED STEEL Spiral Rib Pipe

Pipe Diameter (Inches)	Weight (Pounds/Foot)			
	Thickness and Gage			
	(.064") 16	(.079") 14	(0.109") 12	(0.138") 10
15	12.7	15.6		
18	15.1	18.5	25.5	
21	17.5	21.5	29.6	
24	19.9	24.5	33.6	
27	22.3	27.4	37.7	
30	24.7	30.4	41.7	
33	27.1	33.2	45.8	
36	29.5	36.3	49.9	
42	34.3	42.2	58.0	
48	39.1	48.1	66.1	83.3
54	43.9	54.0	74.2	93.6
60	48.7	59.9	82.3	103.8
66		65.8	90.4	114.0
72		71.7	98.6	124.3
78		77.7	106.7	134.5
84			114.8	144.7
90			122.9	154.9
96			131.0	165.2
102			139.2	175.5
108				185.7
114				195.9
120				206.1

Table 2: Handling Weight for ALUMINUM Spiral Rib Pipe

Pipe Diameter (Inches)	Weight (Pounds/Foot)			
	Thickness and Gage			
	(.060") 16	(.075") 14	(0.105") 12	(0.135") 10
15	4.1	5.1		
18	4.9	6.1		
21	5.7	7.1		
24	6.5	8.0	11.0	
27	7.2	9.0	12.5	
30	8.0	10.0	13.9	
33	8.8	10.9	15.2	
36	9.6	11.9	16.6	
42	11.3	14.0	19.3	
48		15.9	22.0	28.2
54		17.9	24.7	31.7
60			27.4	35.1
66			30.1	38.6
72			32.9	42.0
78				45.4
84				48.6

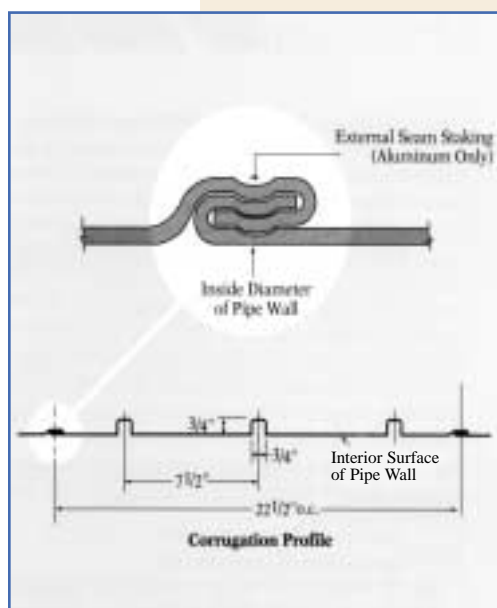


SRP PROVIDES GREATER HYDRAULIC EFFICIENCY

Mannings "n" of less than 0.011 means that the flow through SRP is more efficient than the flow through most other pipe. If the designer establishes Mannings "n" on a project at 0.012, SRP, concrete pipe and HDPE pipe can be used interchangeably without sacrificing flow capacity. It is no longer necessary to think of larger pipe sizes when CMP is specified. When the reduced number of joints typical for CMP installations is considered, the hydraulic efficiency of SRP actually exceeds that of alternate pipe products such as concrete.

BUILT-IN STRUCTURAL STRENGTH

Spiral Rib Pipe, like other corrugated metal pipe products, is a flexible pipe that is dependent upon interaction with the surrounding soil envelope to develop its load-carrying capacity. Earth loads and loads from moving equipment or vehicles are transferred by the pipe to the soil surrounding the pipe. This transfer action takes place as a result of the soil-structure interaction in which the load-carrying capacity of the pipe is significantly increased by composite action with the soil envelope around the pipe.



The ability of CMP to increase its load-carrying capacity by interaction with its bedding and backfill, makes it the most efficient pipe material available. Loads applied to the pipe are distributed uniformly around the circumference of the pipe.



This uniform thrust in the pipe wall avoids the high localized pressures that develop in rigid pipes such as concrete. The parameters and methods used for the structural design of CMP are universally accepted and have remained essentially unchanged for many years. By contrast, the long-standing, widely-accepted methods for the design of concrete pipe, are now being discarded for an unproven

method with the goal of reducing the installed cost of concrete pipe.

The strength of SRP is uniform for its entire length, and is actually stronger at the joints where steel is added as a result of the material in the coupler. The joints in concrete pipe have a reduced cross-section with a resultant loss in load-carrying capacity and loss of continuity.

The section properties of SRP, shown in Tables 3 and 4, have been updated based on the latest manufacturing tolerances. Structural testing, theoretical evaluation and continual monitoring of product quality have resulted in the height of cover data presented in Tables 5 through 8. These tables show minimum and maximum fills for common highway loading conditions.

In cases where greater loads are expected because of heavy equipment passing over the pipe, use Table 9 for guidance in designing the pipe. Contact your Lane sales representative for more information concerning the structural design of SRP.



Table 3: Section Properties of ALUMINIZED STEEL and GALVANIZED STEEL Spiral Rib Pipe

Gage	Coated Thickness In.	Uncoated Thickness (T) In.	Area of Section (A) In. ² /Ft.	Moment of Inertia I x 10 ⁻³ In. ⁴ /In.	Radius of Gyration (r) In.
16	0.064	0.0598	0.509	2.821	0.258
14	0.079	0.0747	0.712	3.701	0.250
12	0.109	0.1046	1.184	5.537	0.237
10	0.138	0.1345	1.717	7.433	0.228

Table 4: Section Properties of ALUMINUM Spiral Rib Pipe

Gage	Sheet Thickness (T) In.	Area of Section (A) In. ² /Ft.	Moment of Inertia I x 10 ⁻³ In. ⁴ /In.	Radius of Gyration (r) In.
16	0.060	0.415	2.558	0.272
14	0.075	0.569	3.372	0.267
12	0.105	0.914	5.073	0.258
10	0.135	1.290	6.826	0.252

Net effective properties at full yield stress (Tables 3 & 4)

**Table 5: Height-of-Cover Limits for ALUMINIZED STEEL
and GALVANIZED STEEL Spiral Rib Pipe**

Diameter Inches	Min. Cover Inches	Maximum Cover Over Pipe (Feet)			
		Thickness and Gage			
		(.064") 16	(.079") 14	(0.109") 12	(0.138") 10
15	12	112	157		
18	12	93	131	217	
21	12	80	112	186	
24	12	70	98	163	
27	12	62	87	145	
30	12	56	78	130	
33	12	51	71	118	
36	12	47	65	108	
42	12	40	56	93	
48	12	35	49	81	
54	18	*	44	72	105
60	18	*	39	65	94
66	18		*	59	86
72	18		*	54	79
78	24		*	50	73
84	24			*	67
90	24			*	63
96	24			*	59
102	30			*	*
108	30				*
114	30				*
120	30				*

Table 6: Height-of-Cover Limits for ALUMINUM Spiral Rib Pipe

Diameter Inches	Min. Cover Inches	Maximum Cover Over Pipe (Feet)			
		Thickness and Gage			
		(.060") 16	(.075") 14	(0.105") 12	(0.135") 10
15	12	66	91		
18	12	55	76		
21	12	47	65		
24	12	41	57	91	
27	18	37	51	81	
30	18	33	45	73	
33	18	30	41	66	
36	18	*	38	61	
42	24	*	*	52	
48	24		*	46	64
54	24		*	41	57
60	24			*	52
66	24			*	47
72	30			*	*
78	30				*
84	30				*

Notes (Tables 5 & 6):

1. Minimum and maximum covers are calculated for H25 loads.
2. For minimum cover under heavy construction loads, refer to Table 9.
3. Height of cover is measured from top of pipe to bottom of flexible pavement or to top of rigid pavement.
4. Backfill density is 120pcf.
5. Installation may be trench or embankment condition and shall be in accordance with ASTM A798 (Table 5) and ASTM B788 (Table 6).
6. * Consult Lane Enterprises for applications involving this size pipe. Requires improved backfill conditions.
7. Height-of-Cover Limits (Table 6) are based on H34 alloy.
8. If H32 alloy is used, cover limits (Table 6) must be adjusted a minimum of 17%, by adding to minimum cover and reducing maximum cover.

Table 7: Height-of-Cover Limits for ALUMINIZED STEEL and GALVANIZED STEEL Spiral Rib Pipe Arch

Equivalent Diameter Inches	Span & Rise Inches	Minimum Thickness Inches (Gage)	Minimum Cover Inches	Maximum Cover Feet
18	20 x 16	0.079 (14)	12	13
21	23 x 19	0.079 (14)	12	14
24	27 x 21	0.079 (14)	12	13
30	33 x 26	0.079 (14)	12	13
36	40 x 31	0.079 (14)	12	13
42	46 x 36	0.079 (14)	12	14
48	53 x 41	0.079 (14)	18	*
54	60 x 46	0.079 (14)	18	20
60	66 x 51	0.079 (14)	18	*
66	73 x 55	0.109 (12)	24	21
72	81 x 59	0.109 (12)	24	*
78	87 x 63	0.138 (10)	24	17
84	95 x 67	0.138 (10)	24	17
90	103 x 71	0.138 (10)	30	*
96	112 x 75	0.138 (10)	30	*
102	117 x 79	0.138 (10)	30	*

Table 8: Height-of-Cover Limits for ALUMINUM Spiral Rib Pipe Arch

Equivalent Diameter Inches	Span & Rise Inches	Minimum Thickness Inches (Gage)	Minimum Cover Inches	Maximum Cover Feet
18	20 x 16	0.075 (14)	12	13
21	23 x 19	0.075 (14)	12	14
24	27 x 21	0.075 (14)	15	13
30	33 x 26	0.075 (14)	18	13
36	40 x 31	0.075 (14)	24	13
42	46 x 36	0.105 (12)	24	14
48	53 x 41	0.105 (12)	24	13
54	60 x 46	0.135 (10)	24	20
60	66 x 51	0.135 (10)	24	21
66	73 x 55	0.135 (10)	30	*
72	81 x 59	0.135 (10)	30	*

Notes (Tables 7 & 8):

1. Minimum covers and maximum covers are calculated for H25 loads.
2. For minimum cover under heavy construction loads, refer to Table 9.
3. Height of cover is measured from top of pipe to bottom of flexible pavement or to top of rigid pavement.
4. Backfill density is 120pcf.
5. Maximum cover over pipe-arch is based on maximum soil bearing pressure (corner) of 2 tons/sq. ft.
6. Backfill around pipe-arch, other than in corners, must be compacted to a minimum density of 90%.
7. Installation may be trench or embankment condition and shall be done in accordance with ASTM A798 (Table 7) and ASTM B788 (Table 8).
8. * Consult Lane Enterprises for applications involving this size pipe. Requires improved backfill conditions.
9. Height-of-cover limits (Table 8) are based on H34 alloy.
10. If H32 alloy is used, cover limits (Table 8) must be adjusted by a minimum of 17% by adding to minimum cover and reducing maximum cover.



PICK THE MATERIAL AND COATING THAT BEST MATCH YOUR SITE

THE RIGHT COMBINATION

Both the base metal and the coating applied over the base metal, contribute to the service life of corrugated metal pipe. Spiral Rib Pipe, like other CMP products, is available in a variety of materials and coatings. Some of these products have been available for over 100 years and others are recent product developments. A variety of combinations of base metal and coating are available to match the pipe product with the site conditions.

GREATER DURABILITY MEANS LONGER SERVICE LIFE

Galvanized steel has been the baseline material for CSP for over 100 years. Ongoing product development efforts have resulted in the addition of aluminum to the base metals available, and several metallic and non-metallic coatings that can be applied to corrugated steel pipe. Since the smooth interior of SRP has high hydraulic efficiency, coatings are used only to extend service life. These new materials and coatings allow the user or designer to select a material and coating that most closely match site conditions. With a great variety of CMP choices, a material can be selected that meets service life requirements without incurring unnecessary expense.

With aluminum as the base metal, SRP can be used in corrosive situations to extend the service life of the pipe beyond that provided by galvanized steel. Aluminum might also be required in areas that require special environmental considerations. The height of cover parameters for aluminum pipe and pipe arch are provided in Tables 6 and 8 respectively.

75 YEAR SERVICE LIFE

For installations where the strength of steel pipe and extended service life are both required, Aluminized Steel Type 2 is the coating to use. This metallic coating is bonded directly to the base steel in lieu of galvanizing. Its pure aluminum coating extends service life well beyond that attainable with a galvanized coating, in most circumstances. Most specifying agencies place considerable value on the contribution of the Aluminized Type 2 coating to the service life of CSP. At a minimum, most DOTs give a Type 2 coating a minimum add-on service life of 25 years beyond that of galvanized. Based on continuous evaluation of pipes with a Type 2 coating, that have been installed for 43 years, the service life of these pipes has been extrapolated to 75 years or more. CSP with a Aluminized Steel Type 2 coating, can satisfy the service life of your project at a cost much lower than that of concrete pipe.

The commonly used non-metallic coatings are bituminous and high-strength concrete. Bituminous coatings and linings are placed in the plant and typically cover all surfaces of the pipe. High-strength concrete coatings or linings are placed only on the interior of the pipe and are placed on-site, after the pipe is installed. If additional abrasion protection is required, the pipe invert may be paved with bituminous or concrete. For more information on the variety of available coatings and the benefits of each, contact your Lane Enterprises representative. Ask for the National Corrugated Steel Pipe Association's *CSP Durability Guide*, a very useful guide for selecting coatings for corrugated steel pipe.



REHABILITATION WITH SRP IS MORE CONVENIENT, EFFICIENT AND COST EFFECTIVE

Many older culverts are in need of replacement or rehabilitation. In most instances, rehabilitation is preferable over replacement because of the higher cost of replacement and the inconvenience to motorists. The hydraulic efficiency, strength, and lighter weight of Spiral Rib Pipe make it the ideal product for relining existing culverts, and storm sewers.

The thin profile of the wall of SRP enables it to more closely match the size of the existing culvert or storm sewer. In fact, SRP can be fabricated to the exact size needed to match site conditions. Elbows, end treatments and other fittings can be fabricated to conform with site requirements.

After pipe installation, the annular space between the existing culvert or storm sewer, and the liner pipe is filled with grout or concrete to create a strong, durable installation. SRP can be supplied with grout fittings, alignment bolts and other hardware needed to achieve the best relining installation.

Learn more about this unique use of SRP by contacting your Lane Sales representative for a copy of *Guidelines For Culvert Relining*.

DETERMINE REINFORCEMENT NEEDS

Many pipe installations involve the use of welded fittings or structures. Fabricating such fittings or structures usually involves removal of part of the wall of the pipe and interrupts the compression ring load distribution. An ASTM Standard (A998) details the method to be used for determining whether a pipe fabrication or fitting requires reinforcing and then determining the details of the reinforcement. All projects that involve fittings on pipe larger than 48-inch, should specify that the pipe fabricator use ASTM A998 to evaluate the need for and to select the proper reinforcing.

SRP fittings have strength equal to or greater than that of the pipe making up the fitting. Similar fittings in concrete pipe are often made by hand with a significant reduction in structural capacity.



LOWER INSTALLED COST

Spiral Rib Pipe is a flexible pipe material and requires a good quality installation to function as designed. It is important that the project specifications for flexible pipe be carefully written and rigidly enforced. Proper installation of SRP will ensure the pipe performs as designed and achieves the durability level intended.

The installed cost of SRP is less than that of concrete pipe. Even with the addition of a premium coating, to enhance its service life, SRP will maintain its cost advantage over concrete pipe. SRP is much lighter than concrete pipe, with unit weights in the range of 4 to 7 percent of concrete pipe (B-wall). A 20-foot piece of SRP will weigh only about 10 percent of an 8-foot piece of concrete pipe. **2.5 TIMES THE LAY LENGTH AT 1/10 THE WEIGHT..**

The standard twenty-foot length of SRP, means SRP installations require only 40 percent of the number of joints in concrete pipe installations. **LESS JOINTS MEAN REDUCED POSSIBILITY FOR PROBLEMS DURING AND AFTER INSTALLATION.** SRP joints have greater strength against differential settlement and pull-apart. The thinner wall profile of SRP reduces the width of trench needed for installation, thereby reducing the cost of excavation and backfill material.



THE INSTALLATION ADVANTAGES OF SRP OVER CONCRETE PIPE ARE:

- **LESS EXCAVATION**
- **LIGHTER WEIGHT**
- **FEWER JOINTS**
- **STRONGER JOINTS**
- **LESS BACKFILL MATERIAL**

SPIRAL RIB AND HDPE PIPE

Lane Enterprises is the only company that manufactures both Spiral Rib Pipe and HDPE Pipe. The hydraulics capability of these products is equal based on a Mannings "n" of 0.012. This means the products are hydraulically interchangeable. If the heights of cover are within the range of these products, and both meet the durability requirements, the project owner is best served by specifying both products and allowing economics to determine the product to be installed.

The availability of both these products from one source, simplifies the purchase and delivery functions for the contractor. Pipe prices will be readily comparable, enabling the contractor to select the most cost-effective product. Delivery coordination is simplified by taking advantage of combined loads for timely availability.



Table 9: Guidelines For Minimum Cover Required for Heavy Off-Road Construction Equipment

Axle Load Pipe Span (In)	Minimum Cover (Feet) for Indicated Axle Load (kips)							
	18 – 50 k		50 – 75 k		75 – 110 k		110 –150 k	
	Steel	Alum	Steel	Alum	Steel	Alum	Steel	Alum
15 – 42	4.0	5.0	4.0	5.0	4.5	6.0	5.0	6.0
48 – 72	4.5	6.0	4.5	6.0	5.0	7.0	6.0	8.0
78 – 120	4.5	6.0	5.0	7.0	6.0	8.0	6.0	8.0

Table 10: Reference Specifications

	Material	ASTM	AASHTO
Sheet	Galvanized Steel	A929	M218
	Aluminized Steel	A929	M274
	Aluminum Alloy	B744	M197
	Polymer Precoat	A742	M246
Pipe	Steel	A760	M36
	Aluminum	B745	M196
	Polymer Precoat	A762	M245
	Asphalt Coated	A849	M190
Design	Steel	A796	Sec. 12
	Aluminum	B790	Sec. 12
Fabrication	Fittings Reinforcement	A998	
Installation	Steel	A798	Sec. 26
	Aluminum	B788	Sec. 26

Table 11: Spiral Rib Pipe vs Concrete Pipe

Dia.	Spiral Rib Pipe (Steel)				Concrete Pipe (B Wall)			
	Gage	Height of Cover (ft)	Unit Weight (lb/ft)	Piece Weight (lb)	Class	Height of Cover	Unit Weight (lb/ft)	Piece Weight (lb)
24	16	70	20	400	IV	29	264	2112
36	16	47	30	600	IV	25	524	4192
48	14	49	48	960	IV	27	867	6936
60	12	65	82	1640	IV	24	1295	10360
72	12	54	99	1980	IV	24	1811	14488
84	12	(46)	115	2300	IV	24	2409	19272
96	12	[41]	131	2620	IV	25	3090	24720
108	10	[52]	186	3720	IV	25	3865	30920
120	10	[43]	206	4120	IV	26	4716	37728



WHAT YOU WANT...WHERE YOU WANT IT...WHEN YOU WANT IT.

From consultation to installation, you can depend on Lane for your drainage product needs. As a full-line manufacturer of metal and HDPE plastic drainage products, Lane is able to provide the right product for your particular need. Regardless of the application, you can be assured a Lane product brings you the best in strength, durability and economy. All Lane products are compliant with applicable ASTM and AASHTO specifications.

Corrugated Metal Pipe ... Lane fabricates and stocks a full range of corrugated metal pipe in a variety of materials, linings and coatings to meet specific durability and hydraulic requirements.



High Density Polyethylene Pipe (HDPE) ... Highly resistant to abrasion, chemical attack, soil and effluent conditions. Lane HDPE pipe has 100% annular corrugations, ensuring greater structural integrity. Lane HDPE is available in single wall, smooth interior, perforated and with a full line of fittings and accessories.

Specialty Fabrications ... Particularly those for storm water retention/detention systems, are all done in-house by experienced craftsmen. These include custom manifolds, control outlets, water quality structures, manholes, storm water management trash racks and risers. End sections in a variety of sizes and materials are available, and all standard connecting bands and fittings are in stock.

Open Top Slotted Drain ... The ability to accept high water volume (1.8" deep flow per 20 ft. section) makes this product perfect for roadside drainage, cross drains of intersections or driveways, interceptor drains at loading docks and interior drains at plants and factories.

Structural Plate Pipe ... Lane manufacturers plate products in five basic shapes—pipe, pipe arches, arches, underpasses and ellipses. They are used in a variety of installations such as stream enclosures, underpasses, conveyor covers, tunnels and mine overcasts.

Low Profile Box Culvert ... Ideal for fast, economical bridge replacement where low headroom presents a problem. Use where opening width exceeds the size of fabricated pipe.

Welded Wire Mesh Gabions ... Engineered for superior erosion control and earth retention in tough, demanding applications. Spiral binders reduce field assembly labor by at least 50%.

Rebar & Custom Powder Coating ... The Lane Technical Coatings Division operates three high volume coating lines that can apply epoxy, polyester or hybrid coating to parts up to 120" high by 48" wide by 100' long.

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