



A division of  
**WGI** Westman Group Inc.



# UltraFlo

Corrugated steel storm sewer pipe delivering superior hydraulic performance.



Ultra Flo spiral rib pipe is an innovative, flexible metal pipe, which has been proven as a highly reliable product in thousands of installations. Ultra Flo pipe is produced by a continuous spiral seam method. Stiffness is provided by external box-shaped ribs, 19mm x 19mm, at 190mm centres. The rib is a continuous spiral. This configuration produces a hydraulically smooth inside wall, with a Mannings “n” of approximately 0.013, comparable to concrete pipe.

### PROVEN STRENGTH

Armtec Ultra Flo spiral rib pipe has the same strength advantages as corrugated steel pipe, a product that has been in use for over 100 years. Ultra Flo performs as a flexible compression ring under load, redistributing pressure radially into the surrounding high density soil. The unit pressure at the pipe invert can be as little as one third of the unit pressure under a rigid pipe under identical loading conditions. This feature results in savings for the extensive base improvement that is generally required for rigid types of pipe.

Ultra Flo has been thoroughly tested and analyzed structurally to confirm the sectional properties. The height of cover table for the selection of a wall thickness for a particular diameter is shown in the table on the following page.

### DURABILITY

#### Choose a material to suit the environmental conditions:

Galvanized Steel, Aluminized Steel, Polymer Laminated Steel

### TYPICAL APPLICATIONS

- Municipal storm sewers, especially in large diameter and long runs
- Highway median drainage
- Industrial storm sewers
- Large diameter culvert slip-lines
- Stormwater detention tanks



ULTRA FLO STEEL PIPE



ULTRA FLO STEEL PIPE ARCH IS IDEAL FOR LOW HEADROOM APPLICATIONS

## STORM SEWER DESIGN AND ACCESSORIES

### Economical Storm Sewer Designs

Armtec Ultra Flo is very competitive with other types of storm sewer pipe. Total cost savings are significant when consideration is given to the installation advantages offered by Ultra Flo.

Handling and laying costs are lower than for concrete pipe. Ultra Flo has one-tenth the weight of concrete pipe and is available in longer lengths resulting in fewer connections. Ultra Flo is manufactured in various lengths up to 12 metres and couplers are easy to install. Handling weights for Ultra Flo are shown in the table below.

Ultra Flo has a smaller outside diameter than thick-walled concrete pipe. By using Ultra Flo pipe there is a reduction in trench width and depth, thus providing time and cost savings during excavation and backfilling. These important installation cost saving advantages should be considered by the owner or designer when comparing Ultra Flo with other types of storm sewer pipe options.

### Couplers

Ultra Flo pipe is manufactured with plain or reformed corrugated ends to connect the pipe lengths. Various types of couplers are available. Band type couplers are used to connect pipes. Gaskets, if specified, are supplied with these couplers to meet most infiltration and exfiltration requirements for storm sewers.

### Fittings

Armtec manufactures a complete line of fittings for storm sewers:

- Manholes c/w ladders and safety grates
- Elbows
- Catch basins
- Tees
- Y's
- Stubs
- Tapered sections

They have a relatively low cost and are economical to install because of their lighter weight compared to competitive pipe fittings.



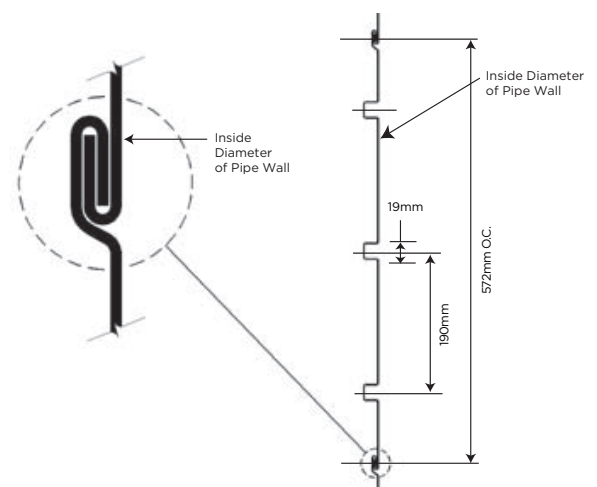
A BAND TYPE COUPLER IS TIGHTENED AROUND PIPE ENDS

### Handling Weight for Aluminized Steel Type 2 or Galvanized Steel Ultra Flo

Diameter	Mass (Kg/m) Thickness		
	1.6	2.0	2.8
mm			
450	21.9	26.8	-
525	25.6	31.3	42.6
600	29.2	35.8	48.6
750	36.5	44.7	60.8
900	43.8	53.6	72.9
1050	51.1	62.6	85.1
1200	58.4	71.5	97.3
1350	-	80.5	109.4
1500	-	89.4	121.6
1650	-	98.3	133.7
1800	-	107.3	145.9
2100	-	125.2	170.2
2400	-	-	194.5
2600	-	-	210.7

### Section Properties

Specified	Design	Area	Moment of Inertia	Section Modulus	Radius of Gyration
T	T	A	I	I	I
mm	mm	mm <sup>2</sup> /mm	mm <sup>4</sup> /mm	mm <sup>3</sup> /mm	mm
1.6	1.519	1.082	58.829	4.016	7.375
2.0	1.897	1.513	77.674	5.054	7.164
2.8	2.657	2.523	117.167	7.129	6.815





## INSTALLATION GUIDELINES

### 1. Bedding

Bedding preparation is critical to both pipe performance and service life. A good bedding will help to maintain the proper pipe elevation, eliminate undesirable stresses in the pipe, and ensure good hydraulic performance. The bedding should be free of rock formations, protruding stones, frozen lumps, roots, or other foreign matter that may cause unequal settlement.

It is recommended that the bedding be stable, well-graded granular material. Placing the pipe on the bedding surface is generally accomplished by two methods to ensure satisfactory compaction beneath the haunches. One method is shaping the bedding surface to conform to the lower section of the pipe. The other method is to carefully tamp a granular or select material beneath the haunches to achieve a well-compacted condition.

A qualified civil engineer should be engaged to design a proper foundation, adequate bedding and backfill.

### 2. Backfill

Satisfactory backfill material, proper placement and compaction are key factors in obtaining maximum strength and stability. Typical Ultra Flo installation requirements are the same as for any other corrugated steel pipe installed in a trench. Bedding and backfill materials follow the requirements of the Corrugated Steel Pipe (CSP) installation specification outlined in ASTM A798; and must be free from stones, frozen lumps and other debris. When installations are for size and gauge combinations noted with an asterisk (\*) in the Height of Cover tables, require special attention to backfill material and construction methods.

#### NOTE:

Backfilling is an important element of the structural design. Material placement and compaction must be completed in accordance with the installation guidelines.



ULTRA FLO STEEL PIPE - BACKFILLING



A TEE IS SHOWN COMBINING A STANDARD HEL-COR STUB WITH AN ULTRA FLO STORM SEWER PIPE



LONG LENGTHS AND POSITIVE JOINTS ASSURE GOOD ALIGNMENT AND LEAK RESISTANT PERFORMANCE

## EMBANKMENT CONDITIONS

Ultra Flo is a superior CSP storm sewer product that is normally installed in a trench condition. In those unusual circumstances where installation in an embankment is required, pipe sizes and gauges may be restricted. An Armtec representative can provide you with further guidance.

### Simple shape monitoring

Measuring the rise and span at several points in the run is recommended in all types of installation. It provides a check on proper backfill placement and compaction materials. Use soil placement and compaction methods which will ensure that the vertical pipe dimension (rise) does not increase in excess of 5% of the nominal diameter.

Use methods which will ensure that the horizontal pipe dimension (span) does not increase in excess of 3% of the nominal diameter. These guidelines will help ensure that the final deflections are within normal limits.

### Multiple runs of large-diameter Ultra Flo

Ample spacing should be used between runs to allow proper sidefill placement and compaction. Pipe spacing will change depending upon pipe diameter, backfill material and compaction methods. General guidelines for spacing between runs of pipe are:

#### Diameters

- Up to 600mm – 300mm
- 600mm to 1,800mm - 1/2 pipe diameter
- 1,800mm and over – 900mm

### Relining

Restoration of failed or deteriorating rigid pipe can be accomplished by relining with Ultra Flo. Ultra Flo's profile allows the end area of the reline to be maximized. The hydraulic capacity may be improved over the existing deteriorated storm sewer.

Ultra Flo's light weight makes the lining process easier. Ultra Flo can be provided in various lengths to meet individual site conditions.

For additional information, contact your nearest Armtec sales office.



PIPE ARCH SHAPES CAN BE SUPPLIED WHERE THERE IS LOW HEADROOM



ULTRA FLO PIPE CAN BE INSTALLED IN TIGHT CONSTRUCTION ZONES



## Height of Cover Table - Ultra Flo Round Pipe

Diameter	Area	Minimum Height of Fill	Metal Thickness (mm) Maximum Height of Fill (m)		
			1.6	2.0	2.8
mm	m <sup>2</sup>	mm			
450	0.16	300	22.7	22.7	-
525	0.22	300	19.4	28.8	50.6
600	0.28	300	17.0	25.2	44.3
750	0.44	300	13.6	20.2	35.4
900	0.64	300	11.3	16.8	29.5
1050	0.87	300	9.7	14.4	25.3
1200	1.13	300	8.5*	12.6	22.1
1350	1.43	340	7.5*	11.2	19.7
1500	1.77	380	6.8*	10.1*	17.7
1650	2.14	410	-	9.1*	16.1
1800	2.54	450	-	8.4*	14.7
2100	3.46	530	-	-	12.6*
2400	4.52	600	-	-	11.0*
2600	5.31	650	-	-	9.0*

### NOTES:

**1.** Allowable minimum cover is measured from the top of pipe to the bottom of a flexible pavement or top of a rigid pavement. Minimum cover in unpaved areas must be maintained. Backfill is assumed to be compacted to a minimum of 95% Standard Proctor Dry Density

**2.** All heights of cover are based on installation in a trench. If embankment conditions exist, there may be restrictions on gauges for large diameters. Your Armtec Sales Team can provide you with further guidance.

**3.** Tables are for CL-625 loading only. For heavy construction loads, higher minimum covers may be required. Your Armtec Sales Team can provide you with further guidance.

\*These sizes and gauges require special attention to backfill material and construction methods.

## Height of Cover Table - Ultra Flo Pipe Arches

Span	Rise	Equivalent Diameter	Area	Minimum Height of Fill	Maximum Height of Fill (m) to Limit Corner Bearing Pressure to a Maximum of 200 kPa Metal Thickness (mm)		
					1.6	2.0	2.8
mm	mm	mm	m <sup>2</sup>	mm			
500	410	450	0.15	300	4.0	4.0	-
580	490	525	0.21	300	5.2	5.2	5.2
680	540	600	0.27	300	5.2	5.2	5.2
830	660	750	0.43	300	5.2	5.2	5.2
1010	790	900	0.62	300	4.4	4.4	4.4
1160	920	1050	0.85	300	5.1	5.1	5.1
1340	1050	1200	1.12	300	-	4.4	4.4
1520	1200	1350	1.44	340	-	5.3*	5.3
1670	1300	1500	1.79	380	-	5.1*	5.1
1850	1400	1650	2.15	410	-	4.7*	4.7



Armtec is a leading national manufacturer of a comprehensive range of infrastructure products and engineered construction solutions for customers in a diverse cross-section of industries. With operations coast to coast, we are a trusted partner for transportation, public works, forestry, oil and gas, and mining operations throughout the country and abroad. Since 1908 our commitment to quality, customer service and innovation has set the benchmark in the Canadian drainage and bridge landscape.

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