

Corrugated Steel Pipe



RAPID RESPONSE EMERGENCY SOLUTIONS
Ready when you need us most. Just call 1-877-245-7473.



Galvanized



Aluminized Type 2



Polymer-Laminated

CULVERT AND DRAINAGE SOLUTIONS FROM COAST TO COAST.



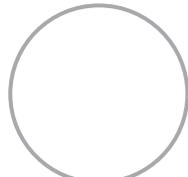
Atlantic Industries Limited
We Support You.

ail.ca

Corrugated Steel Pipe

Available in a variety of sizes, corrugation profiles, thicknesses and coatings to suit virtually any application.

PROFILES

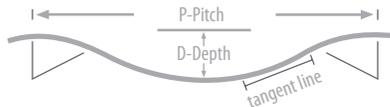


Round



Pipe Arch

CORRUGATIONS



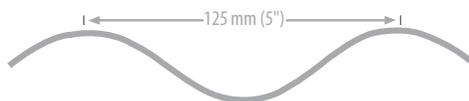
13 mm (.5")



25 mm (1")



25 mm (1")



RECOMMENDED FOR

- ▶ Culverts ▶ Drainage Systems ▶ Stormwater Systems
- ▶ Fish Passages ▶ Conveyor Covers and Overcasts
- ▶ Ventilation Systems ▶ Utilidor Systems ▶ Culvert Relines

AIL's Corrugated Steel Pipe (CSP) is the material of choice because it offers the optimum combination of strength, flexibility and performance.



It will not crack under impact loads or vibrations due to the inherent strength of steel and the flexibility of the corrugated pipe section. The high ring compression of the pipe absorbs and transfers the load to the surrounding soil around the entire circumference. The beam strength maintains the grade and line of the structure by bridging inequalities of the trench bottom and side fill.

These characteristics ensure that the conduit has a superior ability to maintain the hydraulic properties and capacity for which it was designed.

- ▶ Economical, strong, lightweight and easy to install
- ▶ Variety of sizes, thicknesses and materials
- ▶ Complete line of standard and specialized fittings and accessories
- ▶ Available in Round or Pipe Arch Profiles
- ▶ Can be used to reline existing systems
- ▶ Full engineering support and field service
- ▶ Manufactured to CSA Standard G401



***RAPID RESPONSE* EMERGENCY SOLUTIONS**

Ready when you need us most. Just call 1-877-245-7473.

With locations across Canada, available inventories and in-house engineering expertise, AIL is your single source to fast track a wide variety of permanent or temporary solutions.

Designed, fabricated and delivered in five days

Torrential rains had accelerated the inevitable collapse of an older stone culvert on a spur line. Critical rail shipments could have been interrupted without a quick replacement that met current fish passage requirements. AIL came through with a nifty fish passage solution in just five days.



'24-Hour Big Pipe' fixes Cape Breton washout

We received the emergency order one afternoon, reconfigured our mill and produced the pipe early the next morning. It was loaded onto two tractor trailers by noon and made it to Sydney within 6 hours, including special wide load travel permits for 3 m width.



Four-day delivery aids CN washout replacement

The complete washout of an aging single culvert near Sault Ste. Marie, ON had left the rail line suspended above the raging river. An urgent solution was needed. AIL received the go-ahead on Thursday and had all 24 lengths of Corrugated Steel Pipe onsite by Monday. CN Rail got the job done in just four days.



Choose the right coating for the job.

Research shows that coated CSP can provide a service life up to 100 years for a wide range of environments and applications. AIL offers three factory-applied finishes to accommodate the wide variety of performance and hydrology considerations: Galvanized, Aluminized Type 2, and Polymer-Laminated. Soil conditions and a variety of other site/application factors can influence the choice of CSP coatings.¹ As recommended by the Corrugated Steel Pipe Institute, an environmental assessment will help to select the appropriate coating to meet your Design Service Life requirements.¹ Talk to your AIL Technical Representative about making the best performance/value choice for your job.

Galvanized *Standard Service Life*



Z610 Galvanized steel is the standard finish for all CSP and performs well in low-abrasion conditions. This continuous galvanized coating is applied under strict quality control procedures to provide

excellent bonding to the steel. Its hot-dip-zinc coating is reactive to water environments and is positively affected by higher levels of Calcium Carbonate CaCO_3 (hardness) in the water, which can actually increase service life as calcium is attracted to the galvanized surface and forms an additional protective mineral scale. Galvanized coatings have proven their performance through many years of field application. Many Canadian sites have relatively neutral conditions and the galvanized zinc coating is sufficient. An environmental assessment will help to confirm this.

Aluminized Type 2 *75-Year Service Life*



For more corrosive environments, Aluminized Type 2 coating offers the superior corrosion resistance and surface characteristics of aluminum with the strength and economy of steel. In this

process, a commercially pure aluminum coating is uniformly applied to both sides of the steel, forming a strong bond between the metals. A hard aluminum-iron alloy layer, just below the aluminum coating, provides further protection. Aluminized Type 2 CSP can provide a 75-year service life in a low-abrasion environment with pH between 5 and 9 and resistivity above 1,500 ohm-cm. CaCO_3 (hardness) levels do not affect service life.



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BETTER

Galvanized

Aluminized Type 2

Polymer-Laminated *100-Year + Service Life*

Polymer Laminate is a tough, heavy-gauge film that is laminated to both sides of galvanized steel to produce a corrosion and abrasion barrier for the most aggressive environments.

A proven performer with excellent adhesion

Thick Polymer Laminate is engineered to bond chemically and physically to galvanized steel to become an integral part of the galvanized surface that resists delamination, even under harsh conditions. Experienced Polymer laminators have been coating galvanized steel for over 40 years to create CSP that outlasts and outperforms concrete pipe and other materials in test after test.

Resists abrasion and corrosion

Polymer-Laminated CSP will stand up to aggressive conditions with high concentrations of acids and alkalis to extend the environmental limits and life expectancies of where traditional galvanized CSP can be used. It performs well in both corrosive and moderate abrasion environments and provides a service life beyond 100 years, if pH is between 5 and 9 and resistivity is above 1500 ohm-cm.² Service life is not affected by the CaCO₃ (hardness) level of water.



Potential cost savings

Polymer-Laminated CSP can be less expensive across all diameters of concrete pipe. The exceptional durability of Polymer-Laminated CSP provides the potential for reduced lifecycle costs. Plus, CSP can be formed into longer nestable lengths that are substantially lighter than concrete, making it easier to transport and install.

¹ For more information, refer to the Corrugated Steel Pipe Institute's Canadian Performance Guideline for Corrugated Steel Pipe Culverts: http://cspi.ca/sites/default/files/download/cspiECOne_109.pdf

² Service life is reduced to 75 years for pH 4 to 9 and resistivity greater than 750 ohm-cm. In extreme conditions, with pH between 3 and 12 and resistivity above 250 ohm-cm, the service life is reduced to 50 years. 2008 The Dow Chemical Company.

BEST

Polymer-Laminated

Polymer-Laminated Steel: for the performance of a lifetime.

Even in some of the harshest conditions, Polymer-Laminated Corrugated Steel Products will consistently deliver outstanding design service life expectancies. The numbers say it all.*

Service life expectancies of Polymer Coating

Estimated Service Life ⁽³⁾	pH Levels	Resistivity
100 years	5 – 9	> 1500 ohm.cm
75 years	4 – 9	> 750 ohm.cm

⁽³⁾ When installed as recommended.

Physical properties of Polymer Coating

Properties	Test Method	Value ⁽⁴⁾
Color	—	Black
Film Thickness, mm (minimum)	— ASTM D 1005	0.254
Yield Tensile Strength, N/mm ²	MD	10.7
	TD	10.3
Ultimate Tensile Strength, N/mm ²	MD	20.7
	TD	19.3
Ultimate Elongation, %	MD	470
	TD	490
2% Secant Modulus, N/mm ²	MD	160
	TD	165
Elmendorf Tear Strength, g	— ASTM D 1922	2800-3200

⁽⁴⁾ Values are averages of typical film: not to be construed as specifications.

Physical and chemical resistance characteristics of Polymer Coating

Properties	Test Method	Value ⁽⁴⁾
Dielectric Strength, volts/mil	ASTM D 149	2200
Resistance to Acid, 10%, HCl	ASTM D 1308 ⁽⁵⁾	No Change
Resistance to Acid, 10%, HNO ₃	ASTM D 1308 ⁽⁵⁾	No Change
Resistance to Base, 10%, NH ₄ OH	ASTM D 1308 ⁽⁵⁾	No Change
Resistance to Base, 10%, NaOH	ASTM D 1308 ⁽⁵⁾	No Change
Resistance to Acid, 30%, H ₂ SO ₄	ASTM D 543, A 742	No Change
Resistance to Base, 10%, NaOH	ASTM D 543, A 742	No Change
Resistance to Salt, 10%, NaCl	ASTM D 543, A 742	No Change
Resistance to Chloroform ⁽⁶⁾ (trichloromethane)		No Change
Resistance to DMSO ⁽⁶⁾ (dimethylsulfoxide)		No Change
Resistance to Methylene Chloride ⁽⁶⁾ (dichloromethane)		No Change
Resistance to THF ⁽⁶⁾ (tetrahydrofuran)		No Change
Microbial Resistance	AASHTO M 246	No Attack
Adhesion, at 23°C (73°F)	ASTM D 903	Exceeds Tensile Strength of the Film
Imperviousness, 48 Hours Reagent Exposure	ASTM A 742	No Change
Resistance to Moist SO ₂ Attack, 40 cycles	Kesternich Method DIN 50018.2.0L	No Attack or Adhesion Loss
Cleveland Condensing Humidity Cabinet, 6 Months Exposure at 54°C (130°F)	ASTM D 2247-68	No Attack or Adhesion Loss
Weatherability, 3000 Hours	ASTM D 3361	No Cracking or Delamination
Hardness, Shore D, 10 sec	ASTM D 2240	46

⁽⁴⁾ Values are averages of typical film: not to be construed as specifications.

⁽⁵⁾ Exposure to the coated surface for 1400 hours at 23°C (73°F).

⁽⁶⁾ Test method: ISO 175, 28 days exposure at room temperature.

* Chart data from The Dow Chemical Company 2008.

Other Extended Service Solutions

Aluminum Pipe

Superior corrosion/abrasion resistance for harsh environments.

AIL's Corrugated Aluminum Pipe products have a long history of proven performance with predictable service life expectancies of over 75 years when installed in the recommended soil/water environment. It features an aluminum alloy core clad on both sides with alloy 7072 which is anodic to the core alloy – protecting it both physically and electrochemically against corrosion and abrasion. This combination takes full advantage of the protective oxide film that re-forms immediately if the surface is scratched. AIL's Aluminum Corrugated Pipe is available in many of the same profiles, fittings and accessories as our Corrugated Steel Pipe.

Polymer Coating on Structural Steel Plate

Polymer Coating can be used on all or part of many types of plate structures to enhance their performance. The polymer coating is engineered to bond chemically and physically to the steel substrate to become an integral part of the plate surface and resist delamination, even under harsh conditions. Ask your AIL Technical Representative about specialized coatings for our Ultra•Cor®, Super•Cor® and Bolt-A-Plate® structural plate products.

Dur-A-Span® Aluminum Structural Plate

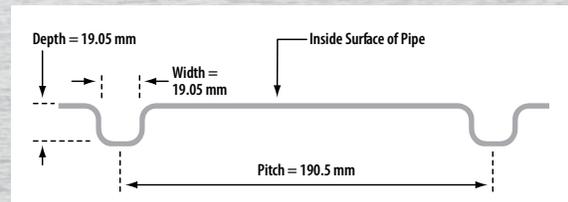
An attractive alternative to coated steel, our corrosion/abrasion-resistant Dur-A-Span® solid aluminum alloy structural plate products are ideal for saltwater and softwater conditions. Dur-A-Span® is not affected by deicing agents that leech into waterways.



Get the improved hydraulics of Hi-Flo™ – the Smoothwall Spiral Rib Pipe System from AIL.

Hi-Flo™ is an innovative flexible metal pipe that combines the proven strength of corrugated metal pipe with the flow capacity of a smooth inner wall. Hi-Flo™ delivers the recommended Manning's 'n' of 0.013 or better and stands up to the most aggressive environments. Look into the many benefits of using Hi-Flo™ for your next project.

- ▶ Smooth interior surface for superior hydraulics
- ▶ Economical, strong, lightweight and easy to install
- ▶ Reduced trench excavation and bed preparation
- ▶ Variety of sizes, thicknesses and materials
- ▶ Full range of fittings and accessories
- ▶ Long design service life expectancies
- ▶ Can be used to reline existing systems
- ▶ Full engineering support and field service
- ▶ Manufactured to CSA Standard G401 and ASTM Standard A760



Standard and Special Fittings

Standard fittings such as tees, elbows, wyes, reducers and saddle branches are offered for the full range of pipe sizes to meet any normal design criteria. In addition to the standard line of fittings, special fittings including manholes and catch basins are also readily available and can be fabricated for special applications.

AIL pipe features universal annular corrugated ends, so a variety of couplings may be used for the Pipe and Pipe-Arch.

Two types of couplers are recommended:

▶ **Standard Annular Corrugated Coupler:**

The standard annular corrugated coupler, fitted with bolt and angle attachments, seats snugly onto the pipe-end corrugations, and is suitable for most general-purpose applications.

▶ **Dimpled Coupling Band:**

This coupler is used where helical and/or annular corrugated pipe ends are to be coupled. Dimpled couplers are available with steel angles.

FOR PROJECT GUIDANCE AND ASSISTANCE, CALL TOLL-FREE 1-877-245-7473, OR EMAIL INFO@AIL.CA

The information and suggested applications in this brochure are accurate and correct to the best of our knowledge, and are intended for general information purposes only. These general guidelines are not intended to be relied upon as final specifications, and we do not guarantee specific results for any particular purpose. We strongly recommend consultation with an Atlantic Industries Limited Technical Sales Representative before making any design and purchasing decisions.



AIL products contain recycled content and are 100% recyclable.



Structural Plate Bridges and Tunnels

PRINTED IN CANADA 04/2017 AIL-723



Prefabricated Bridges



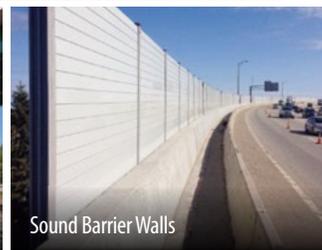
Modular Panel Bridges



Culverts and Drainage



Retaining Walls and Abutments



Sound Barrier Walls

Learn more about all of AIL's innovative engineered solutions at ail.ca



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