

Stake-Lok

# SOLID Corrugated Aluminum Alloy Culvert Pipe



Due to the growing demands in the drainage industry, Cherokee Culvert Company has added corrugated aluminum alloy culvert pipe to our production inventory. This corrosionresistant material is fabricated from two separate alloyed layers, providing solid aluminum protection in extreme environments. Now a metal drainage pipe can have the durability comparable to reinforced concrete pipe, while exploiting the benefits of a flexible conduit.



The durability and long service life predictions of corrugated aluminum alloy culvert pipe gives the user an alternate to reinforced concrete pipe

Aluminum is a unique metal. In the presence of oxygen, it forms a tough oxide film. This film protects the material against both corrosive and erosive elements. If this film is scratched, or otherwise damaged, it reforms quickly to provide continued protection of the underlying aluminum for the life of the structure. As a result of this constant protection, numerous studies have predicted a service life of 16 gauge Alclad aluminum to be well over 100 years when installed within recommended parameters.

Constructed from Alclad 3004-H34, aluminum culvert pipe is comprised of two metalurgically bonded alloys. The core alloy is 3004 aluminum. This by itself is highly corrosion-resistant. However, both sides of the core alloy are clad with alloy 7072 aluminum. This layer is anodic to the core alloy protecting it physically and chemically against corrosion and abrasion. If attack should occur, the cladding layer galvanically expends itself laterally across the surface of the pipe. Only after a large portion of the cladding has been removed can attack of the core occur. This protective action, combined with the presence of the oxide film offers a durable drainage material for almost any situation.



Larger amounts of material can be shipped per truck preventing needless down time due to manufacturers delays.

Aluminum is lightweight. In fact, it weighs approximately 1/35 the weight of reinforced concrete in comparable diameters. This allows for more material to be delivered to the jobsite quicker. Project down time due to material shortages should be all but eliminated. This light weight also allows for longer sections to be installed without the use of heavy lifting equipment. Small diameter pipe can be handled by just two men. This makes for quicker and easier installations, leading to overall job savings. Produced in the same fashion as corrugated steel pipe, corrugated aluminum is offered in 1-1/2"x1/4", 2-2/3"x1/2", and 3"x1" corrugation profiles in diameters ranging from 6" to 120". Also, aluminum pipe can be arched to standard specifications to meet limited headroom situations. All material is helically corrugated from a continuous strip of aluminum and joined by lock-seam fabrication. The lockseam is staked, or indented, at intervals to prevent any seam slippage. This also increases the seam strength to make it integral with the pipe. Corrugated aluminum pipe meets AASHTO M196 and M197 specifications.



Helically formed corrugated aluminum pipe is formed from a continuous strip of aluminum



Cherokee Culvert Company has based its structural requirements for corrugated aluminum pipe on the corrugated steel pipe industry. This is a formula that has been successful for over 100 years, and the design for aluminum should remain in these same parameters. This results in differing gauge requirements and corrugation profiles for some diameters of aluminum pipe, but the designer can be assured that all steel pipe structural design criteria is satisfied in the aluminum recommendations. By doing this, minimum requirements will be applicable to the majority of site installations.



Solid aluminum pipe can take the forming stresses of the metal pipe industry. Forming and reforming causes no separation between the alloy layers. With a solid aluminum product, there is no coating to flake off or damage during manufacturing.

Corrugated aluminum culvert pipe is a solid aluminum drainage product meeting all applicable specifications. There is no base metal to rust. The composite alloys are hardened to be able to resist the abrasive action of sand or rock flows. Aluminized Type 2 steel is coated in a commercially pure aluminum which does not have the same ability to resist erosion. Once this pure aluminum is removed, the bare steel substrate is left exposed, and the corrosive and erosive processes are accelerated. The choice is clear. Aluminum is a strong, durable pipe material that offers the designer assurances of a virtually maintenance-free storm sewer system.

# Minimum Gauge Requirements For Corrugated Aluminum Pipe For Various Heights Of Fill Highways and Streets Loading (HS-20)

				Minimun HS-20	n Cover Const						
Diameter	Corr 1	Co	rr 2	Veh.	Veh.	1-10	11	10-15	15-20	20-25	25-30
				12 G.S.							
12"	 х			1.0	2.0	.060		.060	.060	.060	.075
15"	х			1.0	2.0	.060		.060	.060	.060	.075
18"	 х			1.0	2.0	 .060		.060	.060	.060	.075
_21"	х			1.0	2.0	.060		.060	.060	.075	.075
24"	 x			1.0	2.0	 .060		.060	.060	.075	.075
_27"	х			1.0	2.0	.060		.060	.075	.075	.075
30"	 х			1.0	2.0	.075		.075	.075	.075	.075
36"	 х			1.0	2.0	 .075		.105	.105	.105	.105
			х	1.0	2.0	.060		.060	.060	.060	.075
42"	х			1.0	2.0	 .105		.105	.135	.135	.164
			х	1.0	2.5	.060		.060	.060	.075	.075
48"	х			1.0	2.0	.105		.105	.135	.164	.164
			х	1.0	2.5	.060		.060	.060	.075	.075
54"	х			1.0	2.0	.105		.105	.135	.164	.164
			х	1.0	3.0	.060		.060	.060	.075	.075
60"	 х			1.0	2.0	.135		.135	.164	.164	.164
200			x	1.0	3.0	.060		.060	.075	.105	.105
66"	 х			1.0	2.0	.164		.164	.164	.164	.164
	 		х	1.0	3.0	.075		.075	.105	.105	.135
72"	х			1.25	2.0	.164		.164	.164	.164	.164
			x	1.25	3.0	.075		.075	.105	.105	.135
78"			x	1.25	3.0	.075		.075	.105	.105	.135
84"			x	1.5	3.0	.105		.105	.105	.135	.135
90"			x	1.5	3.0	.105		.105	.135	.135	.164
96"			x	1.5	3.0	.105		.105	.135	.135	.164
102"			x	1.75	3.5	.135		.164	.164		
108"			x	1.75	3.5	.135		.164	<u></u>	· · · · · ·	
114"			x	2.0	4.0	.164		.164			
120"			x	2.0	4.0	.164		.164			

Corr 1 denotes 2-2/3"x1/2" corrugation Corr 2 denotes 3"x1" corrugation

Corrugated Aluminum Thickness	Equivalent Gauge

.060	16
.075	14
.105	12
.135	10
.164	8

Note: Maximum fill heights are for helically fabricated pipe. Minimum Construction Vehicle cover is based on the load bearing capacity of a 44 cubic yard scraper. Minimum fill heights can be adjusted if equipment is smaller.

### Minimum Thickness of Corrugated Aluminum Pipe Arch

Diameter	1	Span	Rise	1	Gauge	Ĩ	Minimur	n Cover	Maximum Cover
						1	HS-20	Const.	
			2-2/	3"x	1/2" Cor	ruç	gation		
15"	I	17"	13"		.060		1.0	2.0	15
18"	Ι	21"	15"		.060		1.0	2.0	15
21"	1	24"	18"		.060		1.0	2.0	14
24"	1	28"	20"		.075		1.0	2.0	14
30"	I.	35"	24"		.075		1.0	2.0	13
36"	L.	42"	29"		.105		1.0	2.0	13
42"	L	49"	33"		.105		1.0	2.5	12
48"	Ĭ.	57"	38"		.135		1.0	3.0	12
54"	I.	64"	43"		.135		1.0	3.0	11
60"	Ľ.	71"	47"		.164		1.0	3.5	11
66"	1	77"	52"		.164		1.25	4.0	10
72"	Ĺ	83"	57"		.164		1.25	4.0	10
			3	"x1	" Corrug	ati	on		
54"	ĺ.	60"	46"		.075		1.0	2.5	29
60"	I.	66"	51"		.075		1.0	2.5	25
66"	1	73"	55"		.075		1.25	3.0	22
72"	1	81"	59"		.105		1.5	3.0	29
78"	1	87"	63"		.105		1.5	3.0	26
84"	1	95"	67"		.105		1.5	3.5	24
90"	L	103"	71"		.135		1.75	3.0	34
96"	L	112"	75"		.135		2.0	3.5	31

Notes: Maximum fill heights are given to reflect the overall strength of arched culvert under optimal backfill situations. Arched pipe is designed for limited headroom situations and round pipe should always be used if it is an option.

Minimum cover is for a construction loading equal to a 44 cubic yard loaded scraper.

Corrugated aluminum pipe requires no special backfill provisions other than those used in the corrugated steel pipe industry. Backfill material is usually available on the job site provided it is suitable soil to ensure adequate support for the pipe. Structural design is based on a compaction density of 85 percent, and the material used in backfill should be able to attain a minimum of the specified density. Shaping of the bedding to conform to the lower section of the conduit is an installation option, but is not necessary as long as well placed soil is tamped under the haunches of the pipe to create a well compacted condition.



No special backfilling material or installation procedure is necessary to maintain the structural integrity of corrugated aluminum pipe.

Aluminum pipe is joined in the same fashion as steel pipe. The ends of the pipe are reformed to annular corrugations to allow the use of fully corrugated connecting bands. The benefit of this type of band is to prevent displacement of the joints of pipe during backfilling. This "positive" joint will not allow separation of the joints due to traverse pressure or steep slope installations. Also, by fully engaging the corrugations of both joints, infiltration or exfiltration is minimized. Connecting bands are constructed of the same alloy used in the production of the pipe, and are connected by welded aluminum angles and 1/2" galvanized steel nuts, bolts, and washers.



An annular connecting band ready to be slipped over the joint and tightened.

Where field cuts are necessary, or a new line is being added to an existing line, a dimple band can be supplied. These are made from flat aluminum sheets, and are connected in the same manner as corrugated bands. Where the engineer recommends that the storm line have water-tight connections, a gasket can be utilized under either type of band.

Cherokee Culvert Company can supply end treatments necessary for any culvert application. For cross drain applications, aluminum pipe can be beveled and/or skewed to match the embankment slope. This is especially economical for larger diameters of pipe. Also, aluminum flared end sections can be supplied for round or arched pipe to provide channel flow efficiency and prevent undercutting from high velocity entrance, or discharge, water. These are attached to aluminum pipe with rerolled ends by means of a connecting strap.

Corrugated Aluminum Pipe is as versatile as it is durable. Fabricated fittings can be produced to eliminate expensive concrete structures. Directional or diameter changes can be incorporated into the storm line reducing junction loss and speeding overall installation. Because it is a solid aluminum product, welds are clean and need no applied protective coating; therefore, fabrications do not diminish the service life of aluminum pipe. The oxide film continues to form on the welds as well. Examples of fittings are elbows, reducers, drop inlets, manholes, riser structures, and the manifolds of underground detention/retention systems. Details of these structures can be supplied by your Cherokee Culvert representative.

Some recharge storm sewer systems are required not only to store water during peak rainfall, but to allow some of it to slowly percolate back into the surrounding soil at a predetermined rate. This is accomplished through the use of perforated corrugated aluminum alloy culvert pipe. Perforated 360 degrees, these systems allow for either

infiltration, or exfiltration, depending on the requirements of the site conditions. Perforations in aluminum pipe do not inhibit its ability to withstand aggressive environments. Aluminum pipe for these systems can be manufactured in any diameter, gauge, or corrugation profile offered in the industry.



**Recommended Parameters of Acceptability:** 

- 1. Soil and water pH between 4 and 9
- 2. Soil and water resisitivities greater than 500 ohms/cm. However, aluminum pipe performs exceptionally well in sea water (about 35 ohms/cm) provided the backfill material is clean, granular material.
- Where aluminum pipe is to be joined to steel structures (i.e. existing steel pipe lines or precast headwalls with a steel pipe stub), an asphalt coated connecting band should be used to avoid bonding of dissimiliar metals.

Exfiltration Area of Cherokee Culvert Standard Perforation Pattern

	Area of Holes
Pipe Diameter	Per Lineal Foot
12"	12.27
15"	15.33
18"	18.40
21"	21.47
24"	24.54
30"	30.67
36"	31.70
42"	37.00
48"	42.28
54"	47.57
60"	52.85
66"	58.14
72"	63.42
78"	68.71
84"	74.00
90"	79.28
96"	84.57

# All holes are 3/8" diameter, punched on 2.05" diagonal centers



Aluminum pipe is accepted in a wide range of environmental parameters. This means that corrugated aluminum alloy culvert pipe is right for your project.

Corrugated aluminum alloy culvert pipe is covered in the State of Georgia in the 1030D (Standard Pipe Culverts) for use on State Highway projects, The American Association of State Highway Transportation Officials (AASHTO), and Federal Projects.

Cherokee Culvert Company has been a manufacturer of quality drainage material in the State of Georgia for over thirty years. We feel with the addition of corrugated aluminum culvert pipe we can service a larger area of the drainage market, and meet the ever increasing demands of durability and longevity of a drainage system. Designers and engineers can feel confident in specifying a material that has proven itself in over thirty-five years of installations while offering a cost-effective alternate to other materials. We hope that you will contact your Cherokee Culvert sales representative if you should have any questions or require additional information. Specifications For Corrugated Aluminum Alloy Culvert Pipe

This specification covers the furnishing and installation of helical corrugated aluminum pipe for use as a culvert, underdrain, conduit or sewers, buried or exposed.

#### Standard Specifications:

a. The pipe shall meet the applicable requirements of current AASHTO Specification M-196 or Federal Specification WW-P-402 when used as a culvert or underdrain.

NOTE: For most installations, aluminum pipe and connecting bands should be furnished uncoated. Where a bituminous coating requirement is designated, the pipe shall conform to the applicable requirements of current AASHTO M-190.

#### Materials:

a. The pipe shall be formed from sheet conforming to the requirements of AASHTO M-197 Alloy Alclad 3004-H34.

b. Field joints of corrugated aluminum pipe shall be made with aluminum band couplers of the same alloy as that used in the pipe. Band couplers shall be 7" wide for diameters 6" to 30", 12" wide for diameters 36" to 60", and 18" wide for diameters 66" and larger.

Connecting bands may be two gages lighter than that of the pipe with the exception of 18 gage (.048) pipe.

If a one piece band is used, it shall be fastened with two galvanized steel bolts on a 7" band, and three bolts on a 12" and 18" band. Two piece bands (12" and 18"), when used, shall be fastened with 6 galvanized steel bolts.

- c. Aluminum alloy angles on connecting bands shall be 7" wide on 7" bands and 12" wide on 12" and 18" bands.
- d. 1/2" diameter galvanized steel nuts and bolts shall be used on aluminum alloy connecting bands for sizes 12" and larger.
- e. 3/8" diameter galvanized steel nuts and bolts shall be used on aluminum alloy connecting bands for sizes 6",8", and 10".
- f. Helical pipe 15" and larger, deformed to the conventional pipe arch shape, shall be furnished where designated.

#### Perforations:

Perforations, where specified, shall be arranged in two longitudinal rows placed symmetrically on either side of an unperforated segment corresponding to the flow line of the pipe. Within each group, the rows of perforations shall be spaced circumferentially approximately 1" center to center and in each row the perforations shall be located either on the inside crests or on the neutral axes of all corrugations, except that perforations are not required within 4" of each end of each length of pipe or in the corrugations where the seams are located. The perforations shall have a diameter of not less than 1/4" and more than 3/8". Fully perforated material shall meet the same requirements except that the perforations shall cover the entire periphecy of the pipe. The spacing of these perforations is approximately 2" on center.

#### Installation:

a. Trenching - Culvert pipe shall be placed a depth of not less than \_\_\_\_\_ from the finished grade surface.

The width of the trench in which the culvert pipe is placed shall be \_\_\_\_\_ greater than the diameter of the pipe, placement of fill free from rocks and debris, and to permit adequate tamping.

All rock shall be removed from the culvert trench and the trench filled with compacted earth for a distance of \_\_\_\_\_ beneath the pipe. Tamping and compacting shall be done to an adequate denseness to support the design load.

b. Placement of the Pipe - Where necessary, proper facilities shall be provided for lowering the pipe into the trench. Pipe shall not be thrown from the truck or into the trench. Pipe shall be laid carefully and true to lines and grade as given.

One piece connecting bands shall be placed with the clamping angles and bolts at the tops of the culvert pipe. Two-piece bands shall have the clamping angles on each side of the culvert pipe. A gap greater than \_\_\_\_\_ shall not be permitted between ends of the pipe at clamping points. Where aluminum pipe is to come into contact with steel structures or components, contact areas shall be given a heavy bituminous coating, inside and out, for a distance of \_\_\_\_\_ beyond the contact, or bituminous coated bands shall be used.

c. Backfilling - Fill material shall be deposited evenly on both sides of the pipe in tamped layers not exceeding 6" in depth until at least three-fourths the depth of the pipe has been reached. For wide trenches, tamping shall be done for a distance on each side of the pipe equal to at least the diameter of the pipe. Tamping and compacting shall be done to an adequate denseness to support the design load.

Heavy Equipment shall not be allowed to pass over the culvert pipe until a fill of at least \_\_\_\_\_ depth has been placed over the pipe.



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