



CONTECH[®]
ENGINEERED SOLUTIONS

Contech CMP Headwalls

CONTECH[®]
PIPE SOLUTIONS

Contech CMP Headwalls

MEETING THE TEST OF TIME

Contech has over 100 years of experience manufacturing Corrugated Metal Pipe (CMP) for culverts and other drainage structures.

PROTECTION

CMP Headwalls reduce the potential for scour and the undermining of a culvert during flow events, including a major storm for all types of basins.

EFFICIENT INLET FLOW DESIGN

CMP Headwalls can more efficiently direct flows into culvert, decreasing entrance losses when compared to other entrance conditions.

DURABILITY

CMP Headwalls are available in different metal protective coatings to meet specific site requirements, including; galvanized, aluminized steel type 2 (ALT2), polymer-coated, and aluminum alloy.

PROJECT COST & TIME SAVINGS

Designing with CMP Headwalls can save thousands of dollars versus conventional concrete headwalls. CMP Headwalls provide immediate material savings and construction savings. Crane rental is typically not required when installing CMP Headwalls versus heavy concrete sections.

CMP Headwalls can save substantial construction time versus conventional concrete headwalls.



HYDRAULIC FLOW CONDITIONS

Conventional culverts are considered round pipes and pipe-arches with uniform barrel cross-section throughout. There are six major types of culvert flow governed by one of two conditions, inlet control or outlet control.

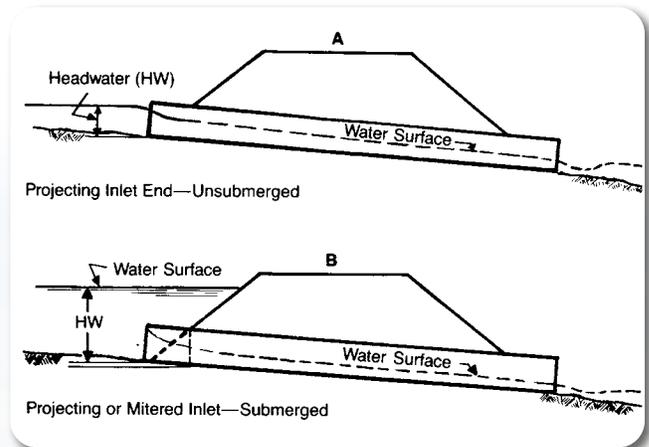
Inlet Control – Under inlet control, the cross-sectional area of the pipe, the inlet configuration (geometry), and amount of headwater (inlet ponding) are the primary factors.

Outlet Control – Under outlet control there are additional considerations including tail water conditions, slope and culvert length.

HYDRAULICS OF CULVERT IN INLET CONTROL

Inlet control means the culvert’s discharge capacity is controlled at the entrance of the pipe. The three factors that govern discharge capacity are headwater depth, cross-sectional area of the pipe, and entrance conditions. (The pipe roughness, pipe length, and outlet conditions are not factors in determining the culvert capacity of an inlet-controlled pipe.)

Details A and B to the right show unsubmerged and submerged projecting inlets. Inlet control performance is classified by these two conditions (unsubmerged flow and submerged flow). Entrance loss depends upon the geometry of the inlet and is expressed as a fraction of the velocity head. CMP Headwalls help to reduce entrance losses for Corrugated Metal Pipe and Pipe-Arch, in many cases by over 40%, resulting in a greater hydraulic capacity.



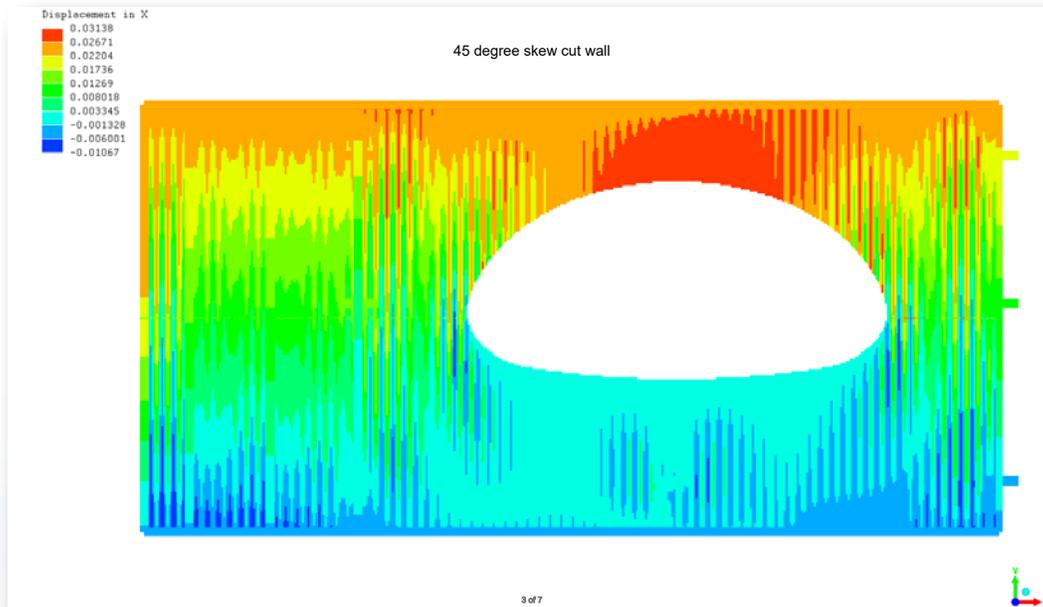
ENTRANCE LOSS COEFFICIENTS FOR CORRUGATED METAL PIPE (ROUND AND PIPE ARCH)

Inlet End of Culvert	Coefficient (k_e)
Project from fill (no headwall)	0.9
Mitered (beveled) to conform to fill slope	0.7
Metal End Section conforming to fill slope	0.5
Headwall with square edge	0.5
Headwall with rounded edge	0.2
Beveled Ring	0.25

Custom Design Options

Contech CMP Headwalls can be designed to meet direct highway loading as well as standard embankment loads. Headwalls can be designed for round and pipe arch shapes. Options including square ends, skewed ends, wing walls, and dead man anchors are available to meet specific site requirements.

Contech can assist you in the design or provide a stamped and sealed design for highway loads on the headwall.



A load displacement test should be conducted to ensure the structural design and expected service life of the culvert.



Custom Designs » Triple CMP Headwalls on Skew



Ohiowa, Nebraska: Triple 71" X 47" Corrugated Steel Pipe Arch on 20 degree skew cut. Headwall reinforced with steel channel and dead man anchors.



Ohiowa, Nebraska: Triple 71" X 47" Corrugated Steel Pipe Arch on 45 degree skew cut. Headwall reinforced with steel channel and dead man anchors.

Installation of Contech CMP Headwalls

BEDDING MATERIAL

All pipes must be placed on a granular foundation. Do not install pipe on sod, frozen earth or on a bed that contains large boulders or solid rock. Foundation material must provide an allowable minimum bearing capacity designed by the engineer. When soft, unstable material is encountered at the foundation level, it must be excavated below the flow line grade and backfilled to grade with sand, gravel, or crushed stone material.

BACKFILL MATERIAL

Backfill material shall be a clean, graded, granular and porous material free from frozen material, sod, cinders or organic matter. Backfill material must be free from rocks larger than two inches. Material shall meet AASHTO M-145, table 61 - A-1, A-2-4, or A-2-5 classification.

GROUP CLASSIFICATION

Group Classification	A-1-a	A-1-b	A-2-4	A-2-5
No. 10 (2.00 mm)	50 Max.	-	-	-
No. 40 (0.425 mm)	30 Max	50 Max.	-	-
No. 100 (0.150 mm)	-	-	50 Max.	50 Max.
No. 200 (0.075 mm)	15 Max.	25 Max.	20 Max.	20 Max.
Liquid Limit	-	-	40 Max.	41 Min.
Plasticity Index	6 Max.	6 Max.	10 Max.	10 Max.

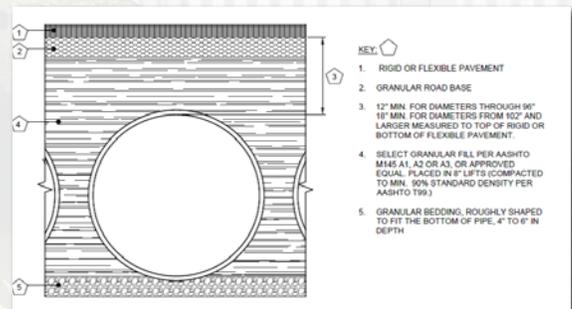
BACKFILL PLACEMENT

The backfill should be carefully compacted under the haunches of the pipe. Continue placing the backfill equally on both sides of the pipe in 8" to 10" loose lifts thoroughly compacting each layer to a minimum of 90% Standard Proctor density (AASHTO T99) all the way to the top of grade. The backfill lifts shall be balanced between the pipes. At no time should there be more than a 2' lift differential between neighboring pipe barrels and side compaction fill area.

Backfill must be placed and fully compacted to the minimum cover level over the structure before the pipe is subjected to legal design loads. Keep heavy construction equipment that exceeds legal highway loads off the pipe. Light construction equipment on tracks such as a D-3 (or lighter) dozer may cross over the pipe when a minimum of one foot of compacted backfill is over pipe.

LOADING

Backfill must be placed and fully compacted to the minimum cover level over the structure before the pipe is subjected to design loads. When construction equipment that exceeds the legal highway loads will cross the pipe, an extra thickness of compacted fill, beyond that required for planned cover, may be required. Contact the design engineer or manufacturer's representative if there is any question as to minimum covers required for specific equipment.



Additional End Treatments

Contech End Sections provide a practical, economical, and hydraulically superior method of finishing a variety of culvert materials. The lightweight, flexible metal construction of Contech End Sections creates an attractive, durable and erosion-preventing treatment for all sizes of culvert inlets and outlets. Headwalls can be used with corrugated metal pipe with either annular or helical corrugations, and both reinforced concrete and plastic pipes. End Sections can be salvaged when lengthening or relocating the culvert.

FEATURES & BENEFITS

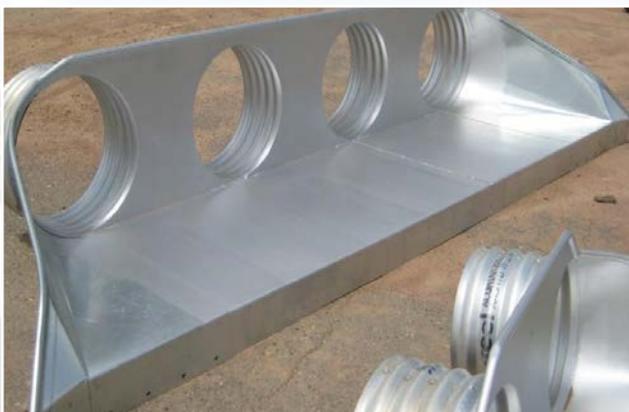
- Improved hydraulics with better scour and sedimentation conditions.
- Improved finished appearance that blends well with slope design.
- Reduction of unsightly weeds and debris.
- Reduced maintenance expense from easier mowing and snow removal.



Flared End Sections



Aluminum Structural Plate with Headwall



Multiple End Sections



Step Bevel Cut End Treatment



Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.



STORMWATER SOLUTIONS



PIPE SOLUTIONS



STRUCTURE SOLUTIONS

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