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Bottomless Culverts 101

Presented By:
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Bridge Consultant
Alabama/Florida panhandle

CONTECH ENGINEERED SOLUTIONS

Agenda

- Introduction
- Types of Bottomless Culverts
- Applications & Uses
- Siting Considerations
- Case Studies/Project Examples
- Questions/Open Discussion

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Contech Engineered Site Solutions

Bridges & Structures, Stormwater Management, Pipe,
Erosion Control and Retaining Walls

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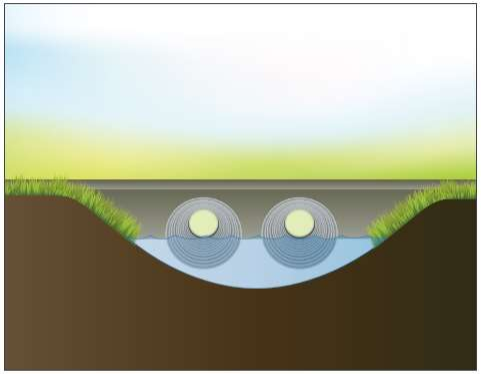
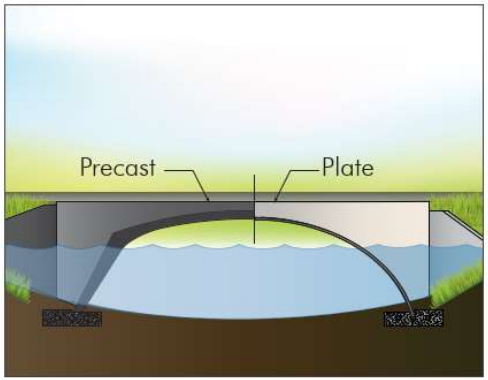
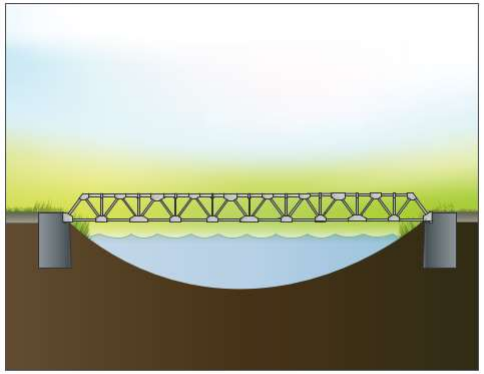
Common Types of Structure



CULVERT





BRIDGE AT-GRADE

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What is a "Bottomless Culvert"?

"Bottomless Culverts are three-sided structures that use the natural channel for the bottom. These structures could be used to convey flows from one side of a highway to the other. As such, they are an environmentally attractive alternative to box, pipe, and pipe arch culvert designs." - FHWA

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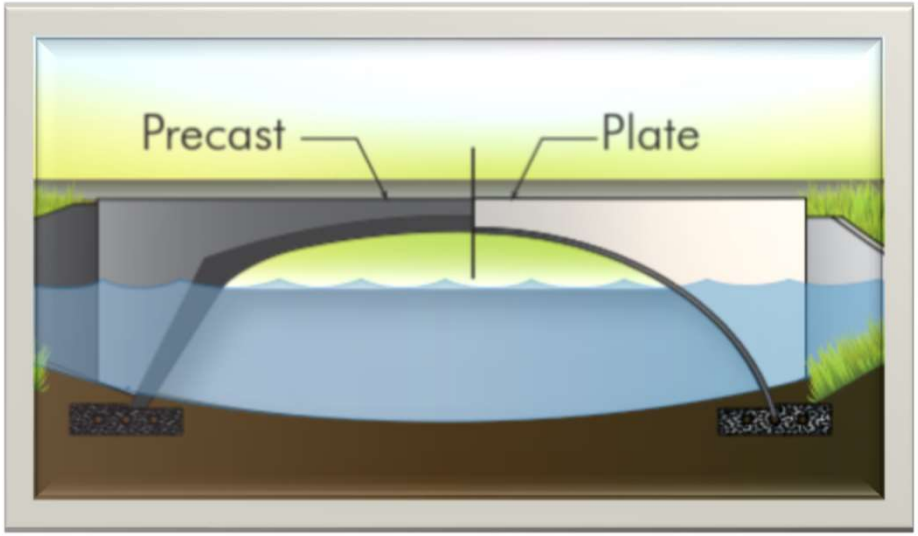
Types of "Bottomless Culvert"

- **Concrete**
- **Structural Plate (Aluminum & Steel)**



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Structural Plate

CONTECH®
STRUCTURAL PLATE

BridgeCor®

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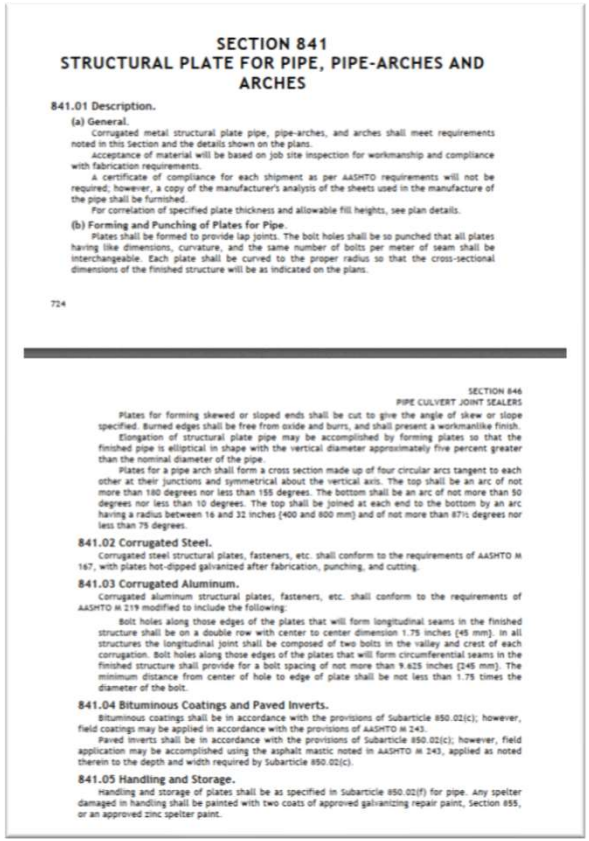
ALDOT Approved



SECTION 841
STRUCTURAL PLATE FOR PIPE, PIPE-ARCHES AND ARCHES

841.01 Description.

(a) General.

Corrugated metal structural plate pipe, pipe-arches, and arches shall meet requirements noted in this Section and the details shown on the plans.

Acceptance of material will be based on job site inspection for workmanship and compliance with fabrication requirements.

A certificate of compliance for each shipment as per AASHTO requirements will not be required; however, a copy of the manufacturer's analysis of the sheets used in the manufacture of the pipe shall be furnished.

For correlation of specified plate thickness and allowable fill heights, see plan details.

(b) Forming and Punching of Plates for Pipe.

Plates shall be formed to provide lap joints. The bolt holes shall be so punched that all plates having like dimensions, curvature, and the same number of bolts per meter of seam shall be interchangeable. Each plate shall be curved to the proper radius so that the cross-sectional dimensions of the finished structure will be as indicated on the plans.

724

SECTION 846
PIPE CULVERT JOINT SEALERS

Plates for forming skewed or sloped ends shall be cut to give the angle of skew or slope specified. Burned edges shall be free from oxide and burrs, and shall present a workmanlike finish.

Elongation of structural plate pipe may be accomplished by forming plates so that the finished pipe is elliptical in shape with the vertical diameter approximately five percent greater than the nominal diameter of the pipe.

Plates for a pipe arch shall form a cross section made up of four circular arcs tangent to each other at their junctions and symmetrical about the vertical axis. The top shall be an arc of not more than 180 degrees nor less than 155 degrees. The bottom shall be an arc of not more than 50 degrees nor less than 10 degrees. The top shall be joined at each end to the bottom by an arc having a radius between 16 and 32 inches (400 and 800 mm) and of not more than 87½ degrees nor less than 75 degrees.

841.02 Corrugated Steel.

Corrugated steel structural plates, fasteners, etc. shall conform to the requirements of AASHTO M 167, with plates hot-dipped galvanized after fabrication, punching, and cutting.

841.03 Corrugated Aluminum.

Corrugated aluminum structural plates, fasteners, etc. shall conform to the requirements of AASHTO M 219 modified to include the following:

Bolt holes along those edges of the plates that will form longitudinal seams in the finished structure shall be on a double row with center to center dimension 1.75 inches (45 mm). In all structures the longitudinal joint shall be composed of two bolts in the valley and crest of each corrugation. Bolt holes along those edges of the plates that will form circumferential seams in the finished structure shall provide for a bolt spacing of not more than 9.625 inches (245 mm). The minimum distance from center of hole to edge of plate shall be not less than 1.75 times the diameter of the bolt.

841.04 Bituminous Coatings and Paved Inverts.

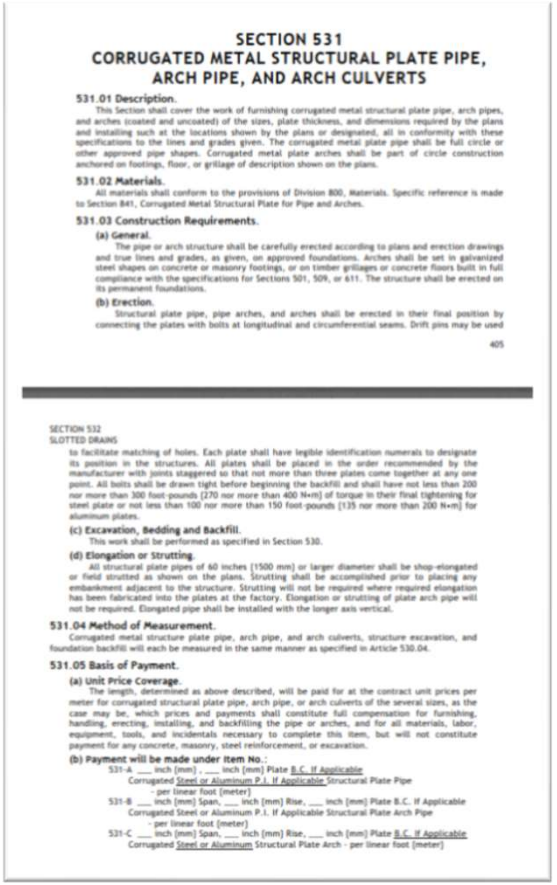
Bituminous coatings shall be in accordance with the provisions of Subarticle 850.02(c); however, field coatings may be applied in accordance with the provisions of AASHTO M 243.

Paved inverts shall be in accordance with the provisions of Subarticle 850.02(c); however, field application may be accomplished using the asphalt mastic noted in AASHTO M 243, applied as noted therein to the depth and width required by Subarticle 850.02(c).

841.05 Handling and Storage.

Handling and storage of plates shall be as specified in Subarticle 850.02(f) for pipe. Any spelter damaged in handling shall be painted with two coats of approved galvanizing repair paint, Section 855, or an approved zinc spelter paint.

SECTION 841 – STRUCTURAL PLATE FOR PIPE, PIPE-ARCHES AND ARCHES



SECTION 531
CORRUGATED METAL STRUCTURAL PLATE PIPE, ARCH PIPE, AND ARCH CULVERTS

531.01 Description.

This Section shall cover the work of furnishing corrugated metal structural plate pipe, arch pipes, and arches (coated and uncoated) of the sizes, plate thickness, and dimensions required by the plans and installing such at the locations shown by the plans or designated, all in conformity with these specifications to the lines and grades given. The corrugated metal plate pipe shall be full circle or other approved pipe shapes. Corrugated metal plate arches shall be part of circle construction anchored on footings, floor, or grillage of description shown on the plans.

531.02 Materials.

All materials shall conform to the provisions of Division 800, Materials. Specific reference is made to Section 841, Corrugated Metal Structural Plate for Pipe and Arches.

531.03 Construction Requirements.

(a) General.

The pipe or arch structure shall be carefully erected according to plans and erection drawings and true lines and grades, as given, on approved foundations. Arches shall be set in galvanized steel shapes on concrete or masonry footings, or on timber grillages or concrete floors built in full compliance with the specifications for Sections 501, 509, or 611. The structure shall be erected on its permanent foundations.

(b) Erection.

Structural plate pipe, pipe arches, and arches shall be erected in their final position by connecting the plates with bolts at longitudinal and circumferential seams. Drift pins may be used

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SECTION 532
SLOTTED DRAINS

to facilitate matching of holes. Each plate shall have legible identification numerals to designate its position in the structures. All plates shall be placed in the order recommended by the manufacturer with joints staggered so that not more than three plates come together at any one point. All bolts shall be drawn tight before beginning the backfill and shall have not less than 200 nor more than 300 foot-pounds (270 nor more than 400 N•m) of torque in their final tightening for steel plate or not less than 100 nor more than 150 foot-pounds (135 nor more than 200 N•m) for aluminum plates.

(c) Excavation, Bedding and Backfill.

This work shall be performed as specified in Section 530.

(d) Elongation or Strutting.

All structural plate pipes of 60 inches (1500 mm) or larger diameter shall be shop-elongated or field strutted as shown on the plans. Strutting shall be accomplished prior to placing any embankment adjacent to the structure. Strutting will not be required where required elongation has been fabricated into the plates at the factory. Elongation or strutting of plate arch pipe will not be required. Elongated pipe shall be installed with the longer axis vertical.

531.04 Method of Measurement.

Corrugated metal structure plate pipe, arch pipe, and arch culverts, structure excavation, and foundation backfill will each be measured in the same manner as specified in Article 530.04.

531.05 Basis of Payment.

(a) Unit Price Coverage.

The length, determined as above described, will be paid for at the contract unit prices per meter for corrugated structural plate pipe, arch pipe, or arch culverts of the several sizes, as the case may be, which prices and payments shall constitute full compensation for furnishing, handling, erecting, installing, and backfilling the pipe or arches, and for all materials, labor, equipment, tools, and incidentals necessary to complete this item, but will not constitute payment for any concrete, masonry, steel reinforcement, or excavation.

(b) Payment will be made under Item No.:

531-A ___ inch (mm) , ___ inch (mm) Plate B.C. If Applicable
Corrugated Steel or Aluminum P.I. If Applicable Structural Plate Pipe
- per linear foot (meter)

531-B ___ inch (mm) Span, ___ inch (mm) Rise, ___ inch (mm) Plate B.C. If Applicable
Corrugated Steel or Aluminum P.I. If Applicable Structural Plate Arch Pipe
- per linear foot (meter)

531-C ___ inch (mm) Span, ___ inch (mm) Rise, ___ inch (mm) Plate B.C. If Applicable
Corrugated Steel or Aluminum Structural Plate Arch - per linear foot (meter)

SECTION 531 – CORRUGATED METAL STRUCTURAL PLATE PIPE, ARCH PIPE, AND ARCH CULVERTS

CONTECH ENGINEERED SOLUTIONS

Lightweight, Bolted Plate Construction

Freight economy

Efficient assembly

Lift and set in place

Handles highway loading

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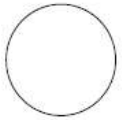
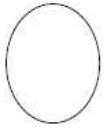
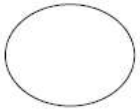
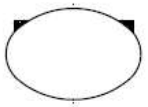
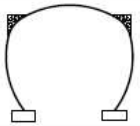
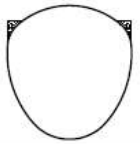
Structural Plate Shapes

Shapes		Sizes=Span x Rise
Round		5′ to 50′-6″
Vertical Ellipse		4′-8″ x 5′-2″ to 25′ x 27′-8″
Underpass		12′-2″ x 11′-0″ to 20′-4″ x 17′-9″
Pipe-Arch		6′-1″ x 4′-7″ to 20′-7″ x 13′-2″
Horizontal Ellipse		7′-4″ x 5′-6″ to 14′-11″ x 11′-2″
Arch (single radius)		6′ x 1′-10″ to 54′-4" x 27′-2″
Arch (2-radius)		18′-5″ x 8′-4″ to 50′-7″ x 19′-11″
Low-Profile Arch*		19′-5″ x 6′-9″ to 45′-0″ x 18′-8″

High-Profile *		20′-1″ x 9′-1″ to 35′-4″ x 20′-0″
Horizontal Ellipse		19′-4″ x 12′-9″ to 37′-2″ x 22′-2″
Pear- Arch		23′-11″ x 23′-4″ to 30′-4" x 25′-10"
Pear		23′-8″ x 25′-5″ to 29′-11" x 31′-3"
Box Culvert		8′-9″ x 2′-6″ to 35′-3″ x 13′-7″
Elliptical/Circular Arch **		12′ to 102′
H-20 Bridge ** Pedestrian **		spans up to 300′ spans up to 300′

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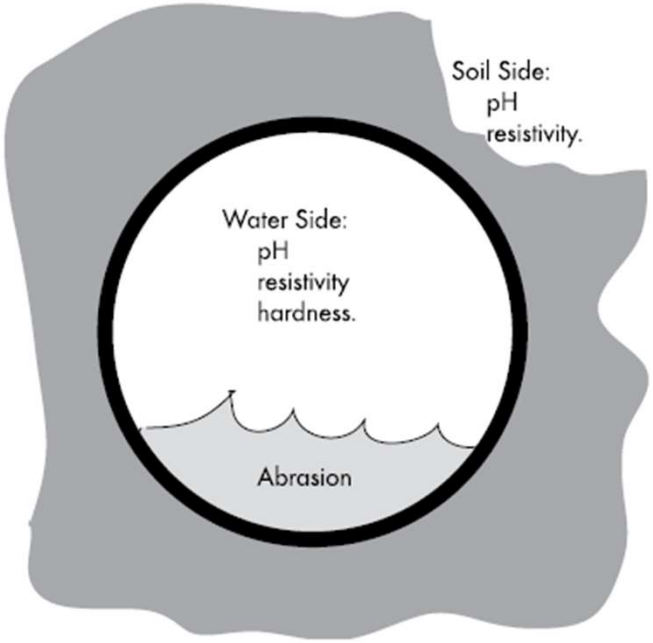
Structural Plate Durability



Controlling Factors

- pH
- Resistivity
- Hardness

When to Use Steel or Aluminum?

STEEL:
$6.0 \leq pH \leq 10.0$
Resistivity > 2,500 ohm-cm
Hardness > 300 mg/L

ALUMINUM:
$4.0 \leq pH \leq 9.0$
Resistivity > 500 ohm-cm
Hardness < 300 mg/L

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Structural Plate Durability – Galvanized Steel

NCSPA
STEEL: PROVEN 100-YEARS STRONG

SERVICE LIFE CALCULATOR

Service Life Calculator (Plate) – Beta Version

Gage: 12	N/A
Gage: 10	N/A
Gage: 8	N/A
Gage: 7	**89 Years**
Gage: 5	99 Years
Gage: 3	100 Years
Gage: 1	100 Years
Gage: 5/16	100 Years
Gage: 3/8	100 Years

Desired Service Life (Years)	75
Resistivity (Ohm-cm)	2000
pH	6
Abrasion Level	Level 3: Moderate Abrasion

Plate and CSP estimator on website

Based on CALTRANS/AISI studies of CSP

Buried bridges designed without inverts
- Improves overall durability
- Eliminates potential invert corrosion
- Quality backfill aids in durability

Steel structural plate – 50% more galvanized coating

Post applied coatings aid in extending service life
- Polymers, Asphalt, Concrete Paving, etc.

Impermeable membranes over structure
- Minimize water migration
- Shed de-icing chemicals

NCSPA.org for Service Life Calculator

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CONCRETE – CON/SPAN and BEBO Concrete Arches

CON SPAN® -SERIES®

CON SPAN® BRIDGE SYSTEMS

BEBO® Arch Systems

CONTECH ENGINEERED SOLUTIONS

Modular Components

PRECAST FOUNDATION

PRECAST ARCH UNIT

PRECAST HEADWALL

PRECAST WINGWALL

TWIN LEAF CONSTRUCTION

CURVED ALIGNMENT

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Applications for a Bottomless Culvert

- Stream Crossings
- Environmental/Wetland Crossings
- Highway
- Airport
- Railroad
- Pedestrian Crossings
- Golf Cart Underpasses
- Mining
- Relining Existing Bridges and Culverts
- Commercial Applications

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Why Use a Bottomless Culvert?

- Hydraulic Advantage: Single Span vs Multiple Barrels
- Environmental: Clear Span, Zero to Temporary Impact
- Stream Ecology: Aquatic organism passage (AOP), Fish Passage
- Maintenance

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"I need to span a stream and use a bottomless culvert in order to avoid a Corp permit. The stream is 10 ft wide. I need a 10 ft span bottomless culvert."

NOT SO FAST…

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You must determine what regulatory agency is driving the permitting? (US Army Corps of Engineers, US Fish & Wildlife, etc.) What are their requirements?

US Army Corps of Engineers

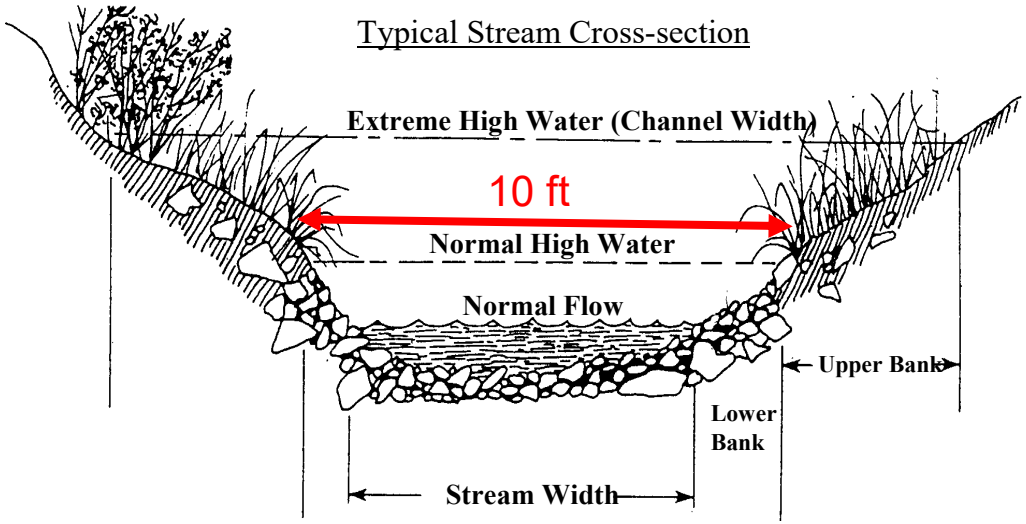
Nationwide Permit

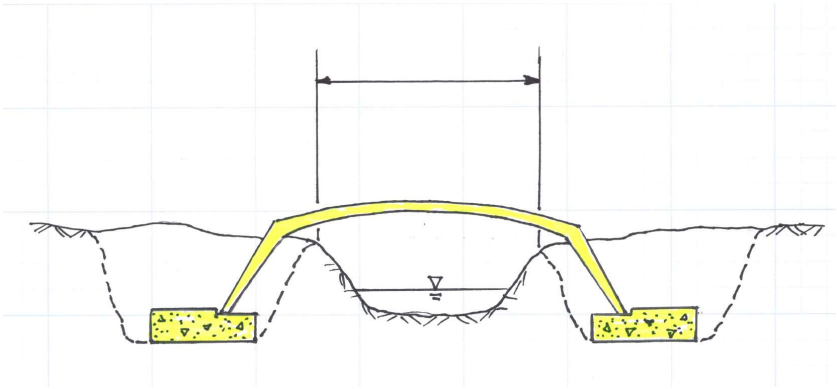
Individual Permit

U.S. Fish & Wildlife Service
Endangered Species

Threatened & Endangered Species

Typical Stream Cross-section





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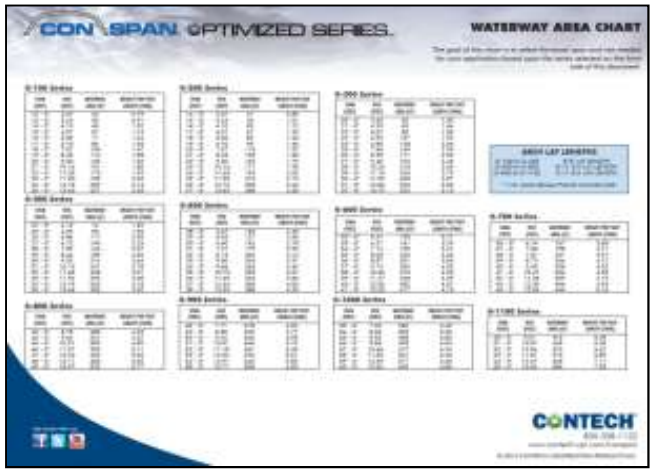
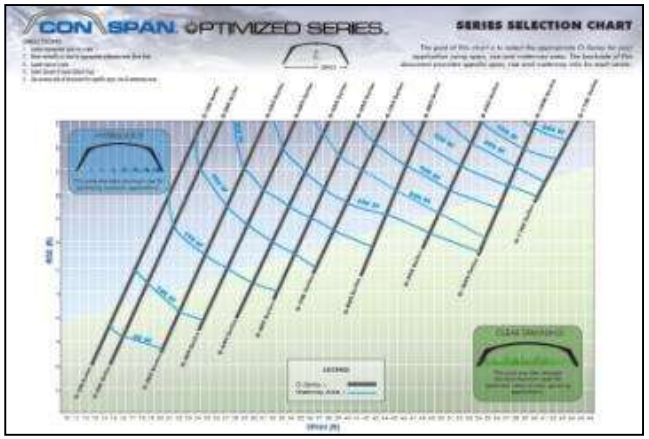
Information Available on our Website

- Waterway Area Charts for all Plate & Precast Structures
- Hydraulic Coordinates for all Plate & Precast Structures
- DYOB (Design Your Own Bridge) Tool
- Links to HEC-RAS & FHWA's HY8
- Hydraulic Tools Program
- Case Studies
- Brochures
- Standard Details
- Specifications





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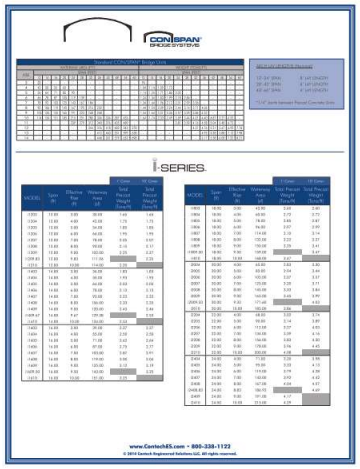

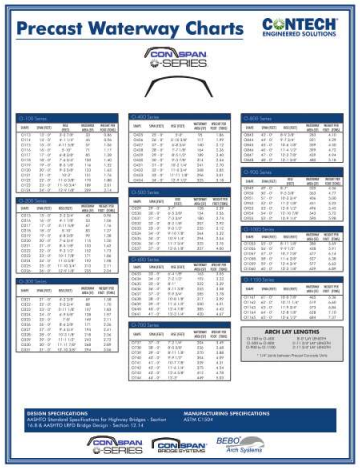

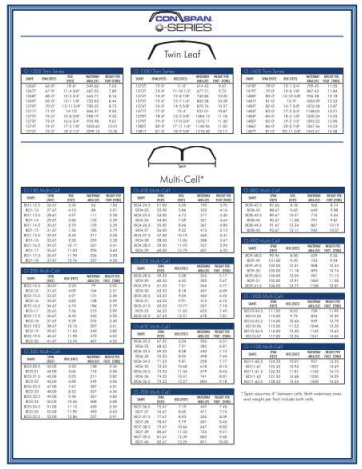

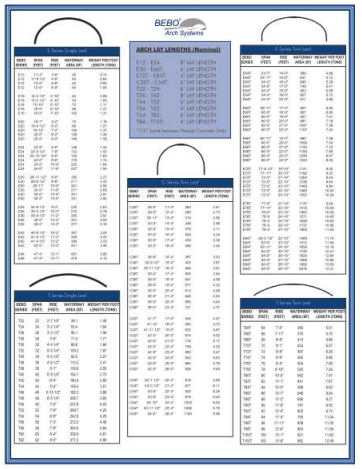

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Building Blocks to a successful Project

Solution Development | Design Support | Installation

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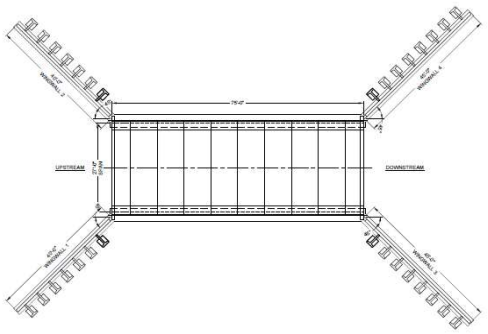
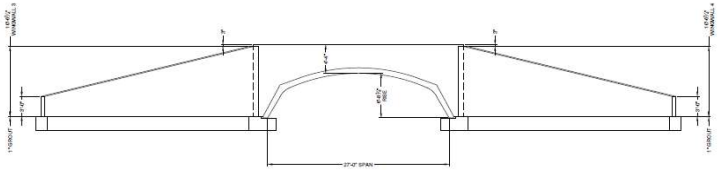
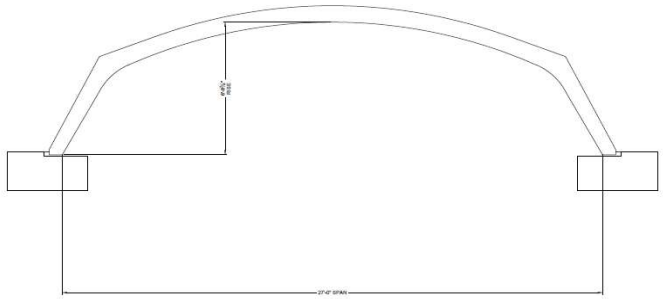


BRIDGE PLAN



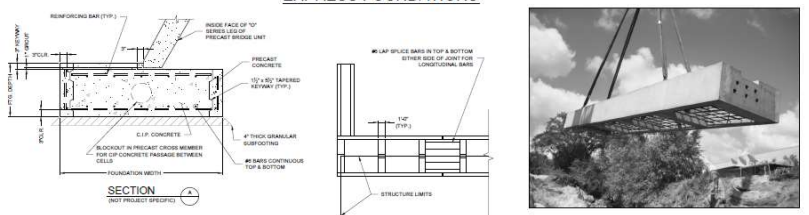
DOWNSTREAM END ELEVATION



CROSS SECTION

SAMPLE DRAWING ONLY

EXPRESS FOUNDATIONS



EXPRESS FOUNDATIONS

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 Fax

CON/SPAN O-SERIES
DESIGN BY: DYOB

Lakemont Business Park - Infrastructure
CON/SPAN O-Series O427 27'-0" Span x 6'-8 3/4" Rise
1 Cell - 75' Long
Fort Mill, South Carolina

PROJECT No.	REV. No.	DATE
200837		6/17/2013
DESIGNED	DRAWN	
DYOB	DYOB	
CHECKED	APPROVED	
DYOB	DYOB	
SHEET NO.		
1 OF 5		
2 OF 5		
4 OF 5		
5 OF 5		

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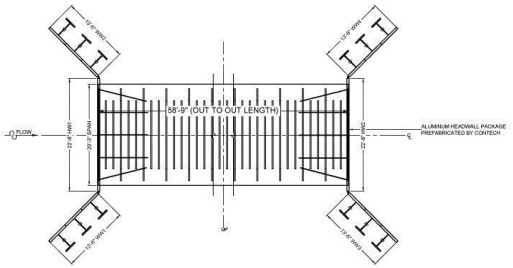
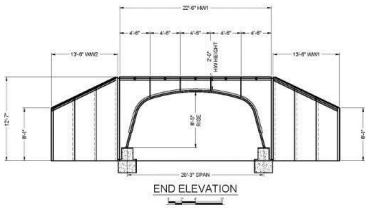


BRIDGE PLAN

PRELIMINARY

Kidder Brook ALBC Option
Aluminum Box Culvert
20'-3" Span x 8'-5" Rise (Structure Number 46)
Stratton, Vermont



END ELEVATION

PRELIMINARY

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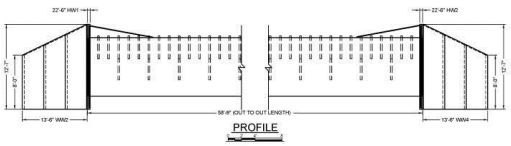
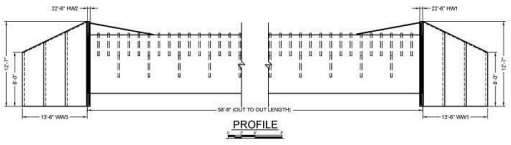
Aluminum Box Culvert
20'-3" Span x 8'-5" Rise (Structure Number 46)
Stratton, Vermont



PROFILE



PROFILE

PRELIMINARY

Kidder Brook ALBC Option
Aluminum Box Culvert
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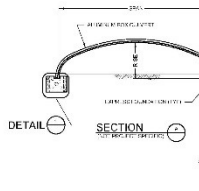
Stratton, Vermont

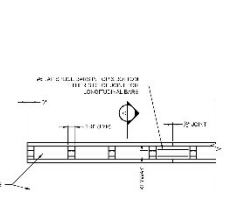
SAMPLE DRAWING ONLY

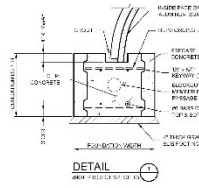
EXPRESS FOUNDATIONS



DETAIL

SECTION





DETAIL

SAMPLE PARTIAL FOUNDATION PLAN

PRELIMINARY

Senior Design
Aluminum Box Culvert
23'-0" Span x 9'-8" Rise (Structure Number 67)
sioux city, Iowa

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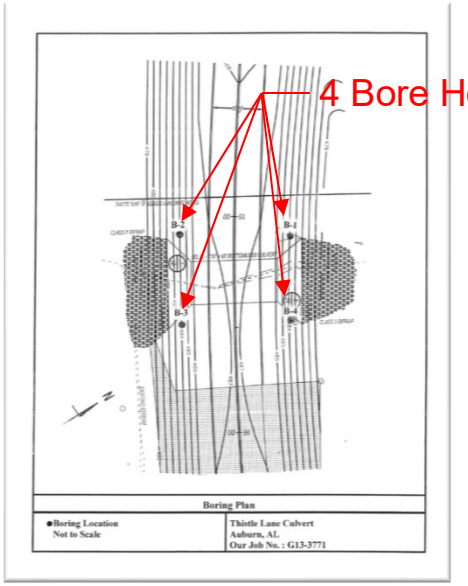
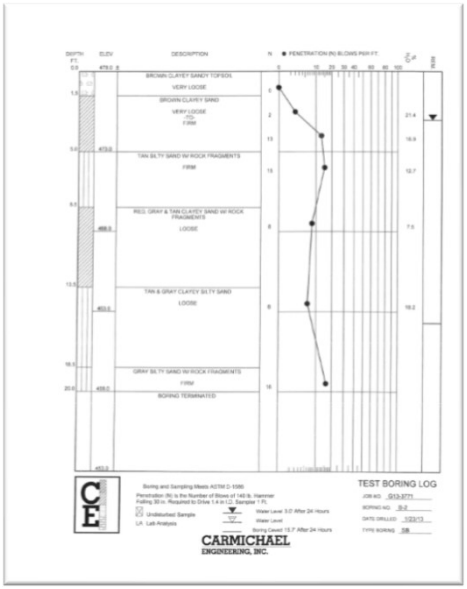
Photo Simulation

- Great tool to help promote your project.
- Need several high resolution photos for the site taken from multiple angles.
- Allow 2 week turnaround
- Plate, Precast & Truss solutions available





Geotechnical Investigation

- Geotechnical investigation is required for a foundation design on all bottomless culverts.
- Get the Geotechnical Investigation/Report done early!
- The geotechnical engineer shall determine the number and location of the borings required.
- For Conventional Spread Footing, we would like to see the Nominal Bearing Resistance per LRFD, or at a minimum, the Allowable Bearing Capacity (must specify if bearing is net or gross). We will also like to see the coefficient of friction between the footing and subgrade listed in the report.
- For Pile Foundations, we will require a recommendation from the geotechnical engineer for the pile type and size. (e.g Steel H-Pile HP 14x73, 90 tons/pile) We will also require the vertical and lateral capacities of the piles.
- In the geotechnical report, include the elevations on the boring logs. Include the water table elevation and bearing strata elevation..
- Generally, for our structures, we allow up to 1" max settlement or ½" differential settlement.
- If our plate structure is to be used, we recommend the geotech provide the pH and Resistivity of the soil and water if spanning a stream.

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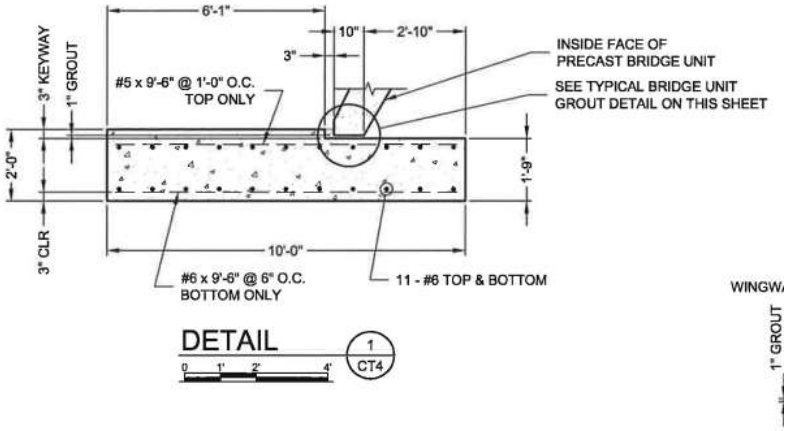
Foundations

Conventional Spread Footings

- Cast-In-Place Concrete



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Foundations

Conventional Spread Footings

- Express Foundations

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MidCity Huntsville – Top Golf
Huntsville, AL

Mid City HUNTSVILLE

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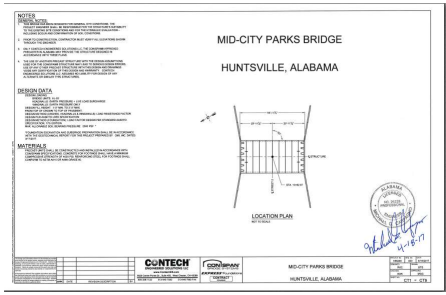
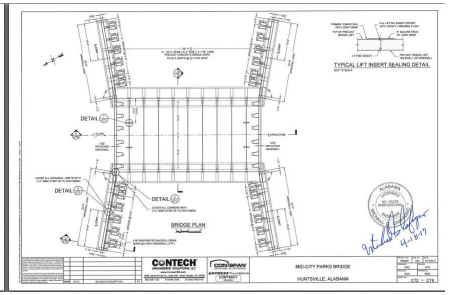
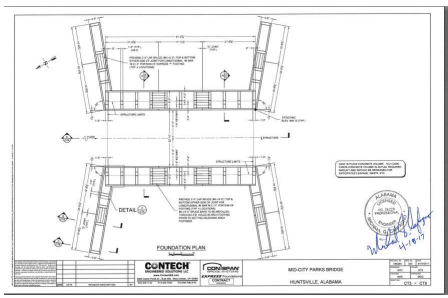
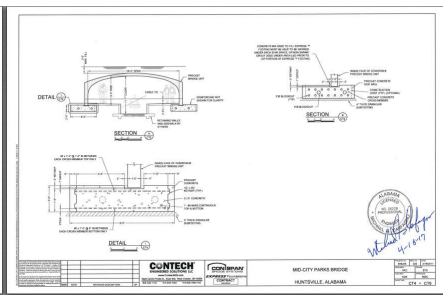
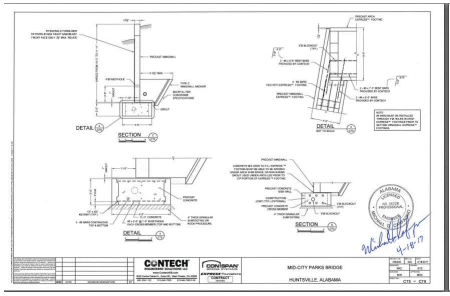
MIDCITY HUNTSVILLE – TOP GOLF
CONSPAN – 28’-0” Span x 9’-0” Rise
Express Foundations: 8’ x 2’ units, 4’-6” x 2’ wings

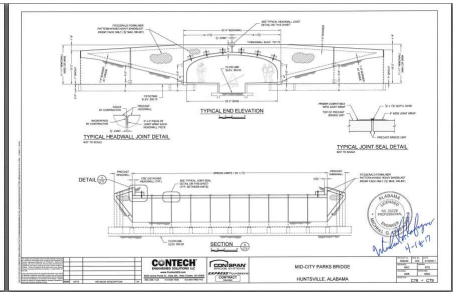


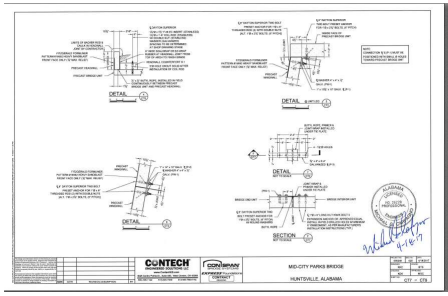


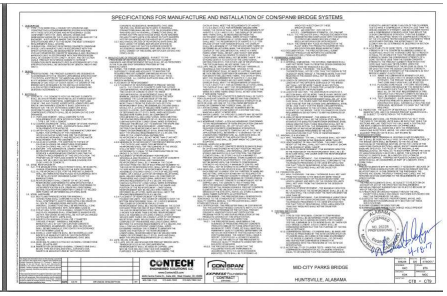












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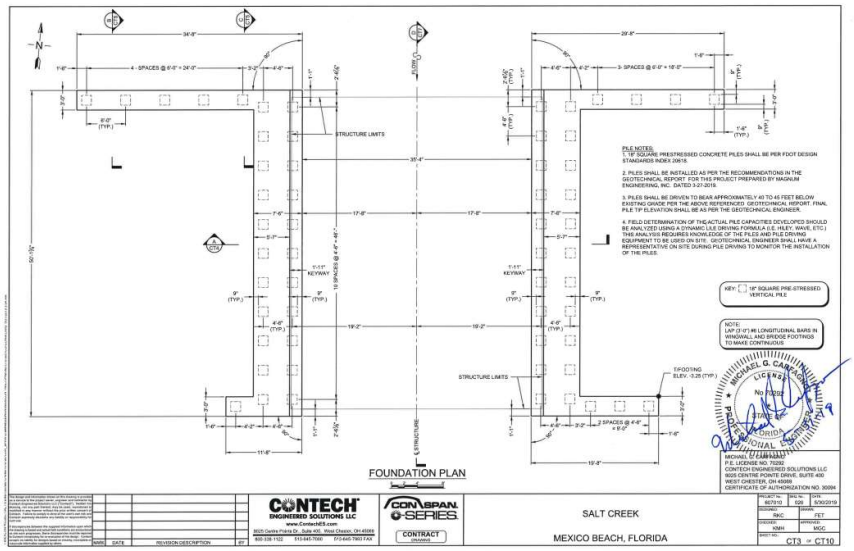
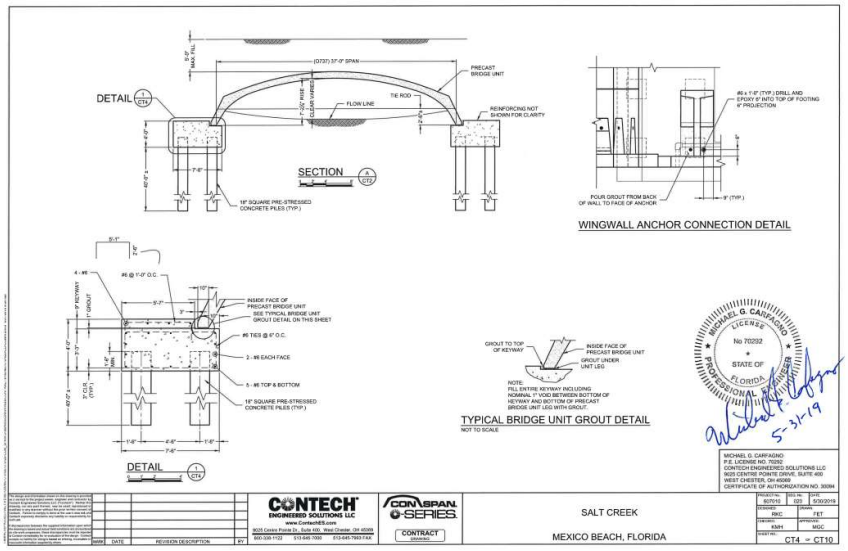
Foundations

Deep Foundations

- Piles, Drilled Shafts, Etc





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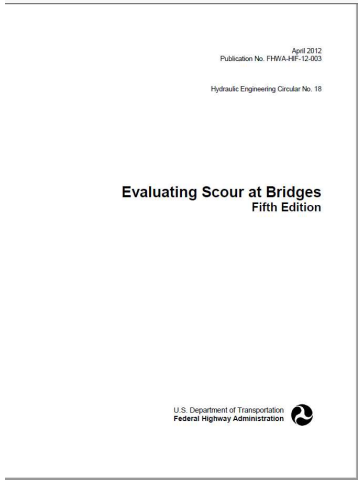
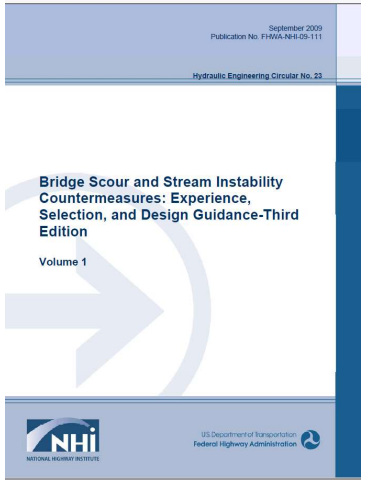


FHWA HEC-18



FHWA HEC- 23

Scour Analysis

- The project engineer (engineer of record) is responsible for performing a scour analysis.
- Methods of evaluating scour:
  - HEC 18 – Evaluating Scour at Bridges
  - HEC 20 – Stream Stability at Highway Structures
- Methods of scour countermeasures:
  - HEC 23 – Countermeasure Design for Bridge Scour and Stream Instability
  - ArmorFlex, Ajacks, Rip-Rap, Sheeting, etc.

6.9 SCOUR AT OPEN-BOTTOM CULVERTS

Open-bottom (bottomless or three-sided) culverts are structures that have natural channel materials as the bottom. Figure 6.13 shows a common type of open-bottom culvert that is over 10 feet (3 m) high and over 40 feet (12 m) wide. These cast-in-place, precast, or prefabricated structures may be rectangular in shape or have a more rounded top. They are typically founded on spread footings although pile foundations and pedestal walls are also used. Regardless of the foundation type, the structure may be highly susceptible to scour. Open-bottom culverts on spread footings are best suited for non-erodible rock but with caution and with scour protection can be used for other soils (see HEC-23 Design Guideline 18, FHWA 2009). Open-bottom culverts have several advantages over other crossing structures. The natural bottom material is more environmentally attractive than a traditional closed culvert, particularly where fish passage is a concern. They are also considered by many highway agencies to be economical alternatives to short bridges. They are more easily constructed than conventional bridges because they are commonly prefabricated.

Scour is greatest at the upstream corners of the culvert entrance. Pressure flow can greatly increase scour potential although pressure flow scour is not addressed in this section. The

closed culvert, particularly where fish passage is a concern. They are also considered by many highway agencies to be economical alternatives to short bridges. They are more easily constructed than conventional bridges because they are commonly prefabricated.

Scour is greatest at the upstream corners of the culvert entrance. Pressure flow can greatly increase scour potential although pressure flow scour is not addressed in this section. The scour approach presented in this section accounts for combined contraction plus local scour at the upstream corners of the open-bottom culvert. Degradation is the only other scour component that may contribute to total scour. If dual open-bottom culverts (side-by-side) are used then the center foundation acts as a pier and must be designed to be stable for the total scour depth (degradation, contraction and pier scour) without a countermeasure.

FHWA HEC-18, Section 6.9

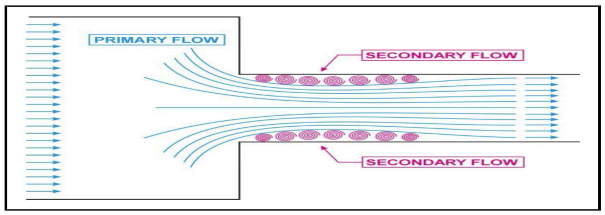


Figure 6.14. Flow concentration and separation zone (FHWA 2007).

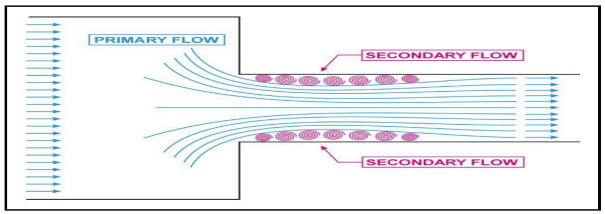


Figure 6.14. Flow concentration and separation zone (FHWA 2007).

FHWA HEC-18, Figure 6.14

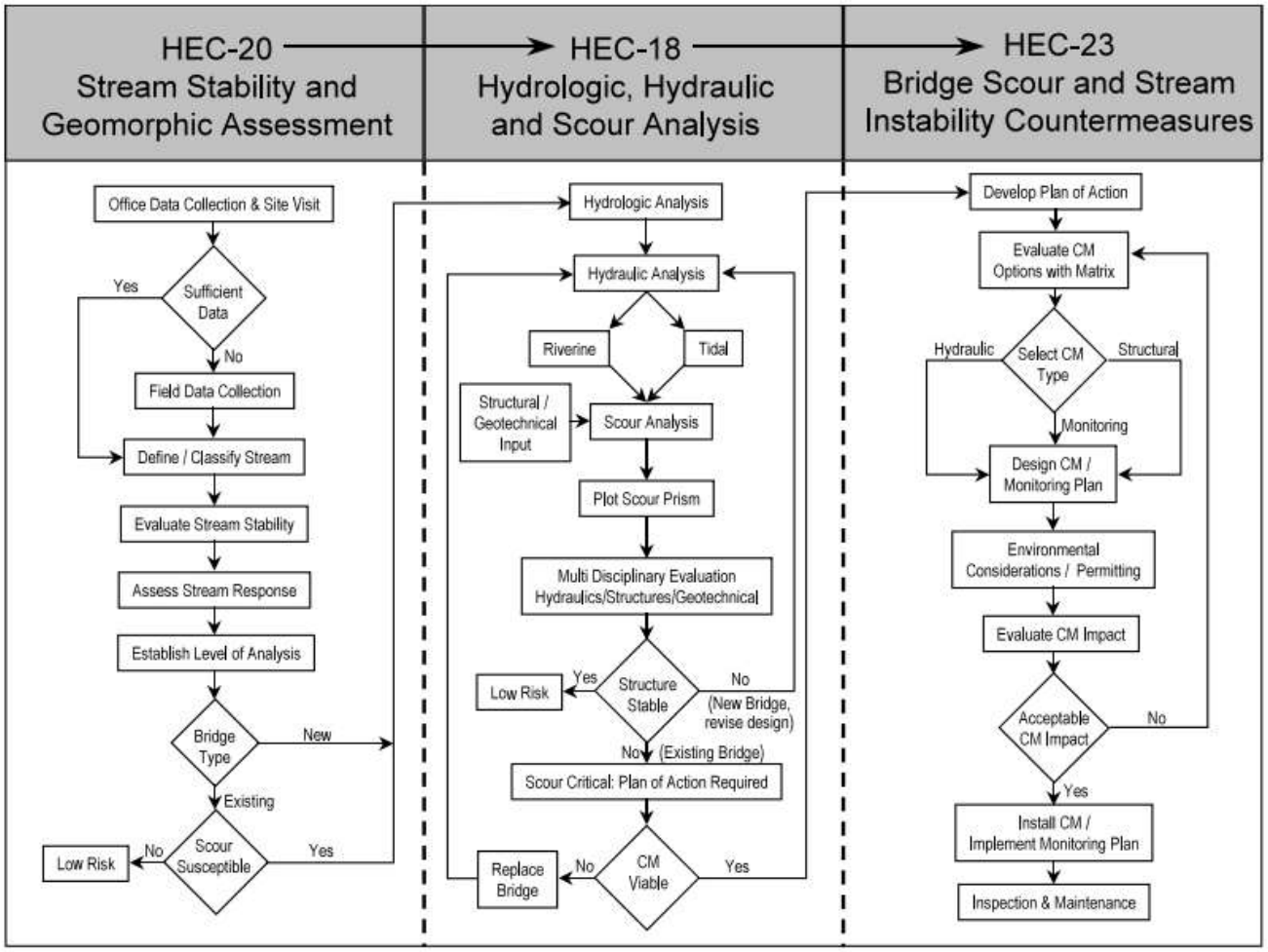


Figure 1.1. Flow chart for scour and stream stability analysis and evaluation.

FHWA HEC- 20 Figure 1.1

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Scour Countermeasures

- Rip Rap

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Scour Countermeasures

- AmorFlex

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Scour Countermeasures

- AJacks

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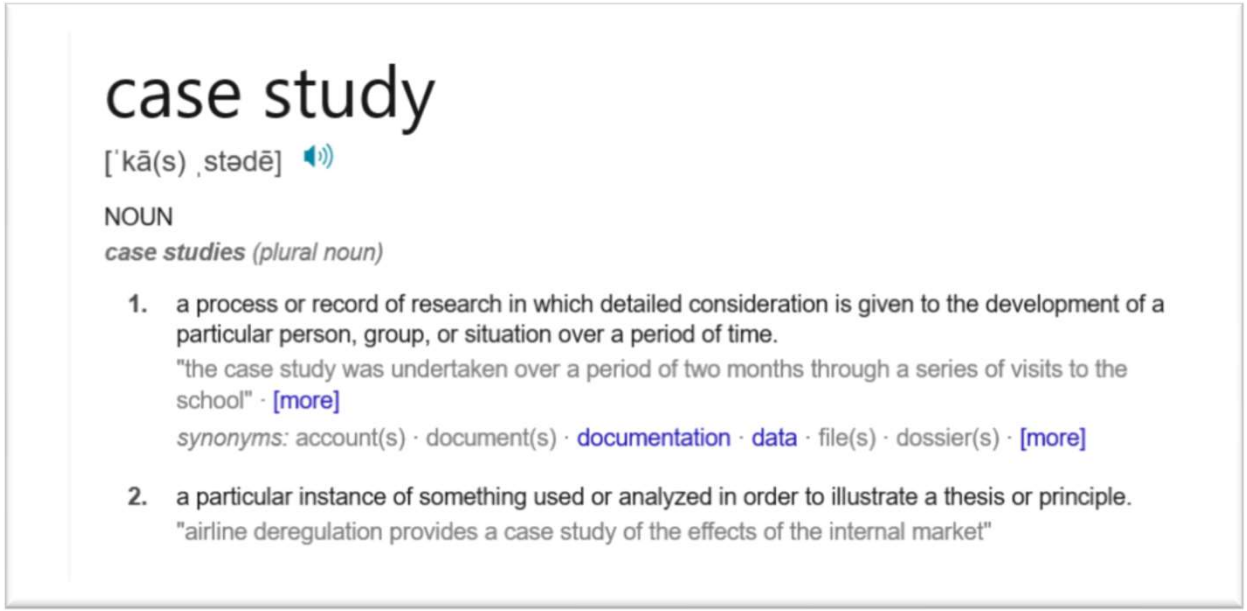
CASE STUDIES



case study

[ˈkā(s) ˌstədē]

NOUN

case studies *(plural noun)*

1. a process or record of research in which detailed consideration is given to the development of a particular person, group, or situation over a period of time.
   "the case study was undertaken over a period of two months through a series of visits to the school" · [more]
   synonyms: account(s) · document(s) · documentation · data · file(s) · dossier(s) · [more]
2. a particular instance of something used or analyzed in order to illustrate a thesis or principle.
   "airline deregulation provides a case study of the effects of the internal market"

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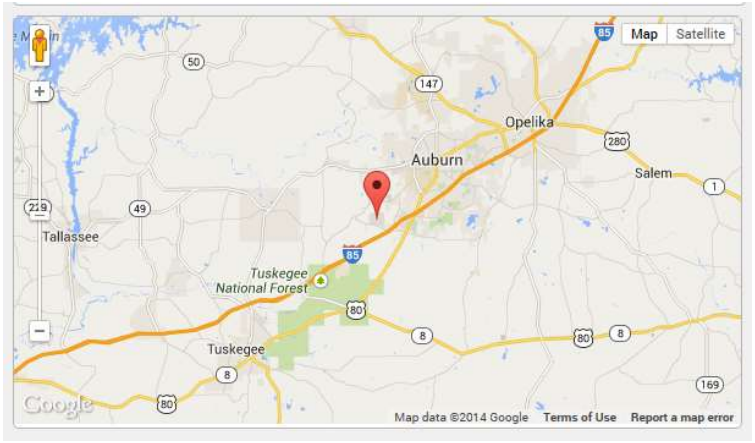
Project Case Study
Auburn Technology Parkway – Thistle LN to Riley ST
Auburn, AL

CONTECH ENGINEERED SOLUTIONS

PROJECT INFORMATION

- **Owner** – City of Auburn
- **Project Engineer** – City of Auburn Engineering Department (Patrick Slaughter)
- **Geotechnical Engineer** – Carmicheal Engineering
- **Contractor** – D&J Enterprises
- **Funding** – City
- **Construction**: June 2013
- **Product**: Contech ConSpan 0740 (54 LF of ConSpan 40’ x 10’)



Auburn Technology Park West
Auburn, AL

Design Challenges

- The City of Auburn was under a deadline to get the new roadway completed in their industrial park.
- A creek crossing was required. Original plan was to use box culverts. It was later determined the stream was a Jurisdictional Stream. Permitting could possibly prevent the City from meeting a completion date.
- Funding for the project was through an ALDOT Industrial Grant.

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CONSTRUCTION PHASE

"*We, along with the Contractor, were impressed with the quick, one day installation time of the precast CON/SPAN structure*," stated **Jeff Ramsey, City Engineer/Public Works Director with the City**. "*The Contractor had a significant amount of fill material to move from one side of the stream to the other, but due to stream and wetland impacts, could not accomplish this work until the precast structure was installed. Once installed, the Contractor was able to complete the remaining earthwork on the project very quickly.*"

Contractor Information

- D&J Enterprises Inc.
  Auburn, AL
    - First ConSpan installation
- Contractor chose to go with cast-in-place foundations instead of our Express Foundations.
- The Contractor had allocated five days for the installation of the bridge in their bid, but much to their surprise, it was completed in just one day! All nine precast arch units were set in place via crane by noon. After lunch, two headwalls and four wingwalls were installed, the joints were sealed and the keyway was grouted. The installation was completed in full by 5:45 pm.

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Project Case Study
Rivercrest Drive over Logan Martin Lake in St. Clair Co. - ACBRZ59784-ATRP(012)

CONTECH ENGINEERED SOLUTIONS

PROJECT INFORMATION

- **Owner** – St. Clair County (Dan Dahlke, County Engineer)
- **Project Engineer** – CDG Engineers (Marc Thompson, PE)
- **Geotechnical Engineer** - CDG Engineers (Allen Yates, PE)
- **Contractor** – Winston Contracting (Benjy Reeves, Superintendent)
- **Plate Assembly** – Plate Erectors (Bob Wright)
- **Plate Structure** – Contech Engineered Solutions (Tod Green, PE - Bridge Consultant)
- **Funding** – ALDOT ATRIP
- **Construction**: January 2016 – April 2016
- **Product**: Contech BridgeCor 36S (26’ Span x 14’-11” Rise), 8 Ga

CONTECH ENGINEERED SOLUTIONS

Existing Bridge on Rivercrest Dr.

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CONTECH® STRUCTURAL PLATE

St Clair County – Pier 59/Rivercrest Drive (ALDOT Project)
Cropwell, AL

CONTECH®
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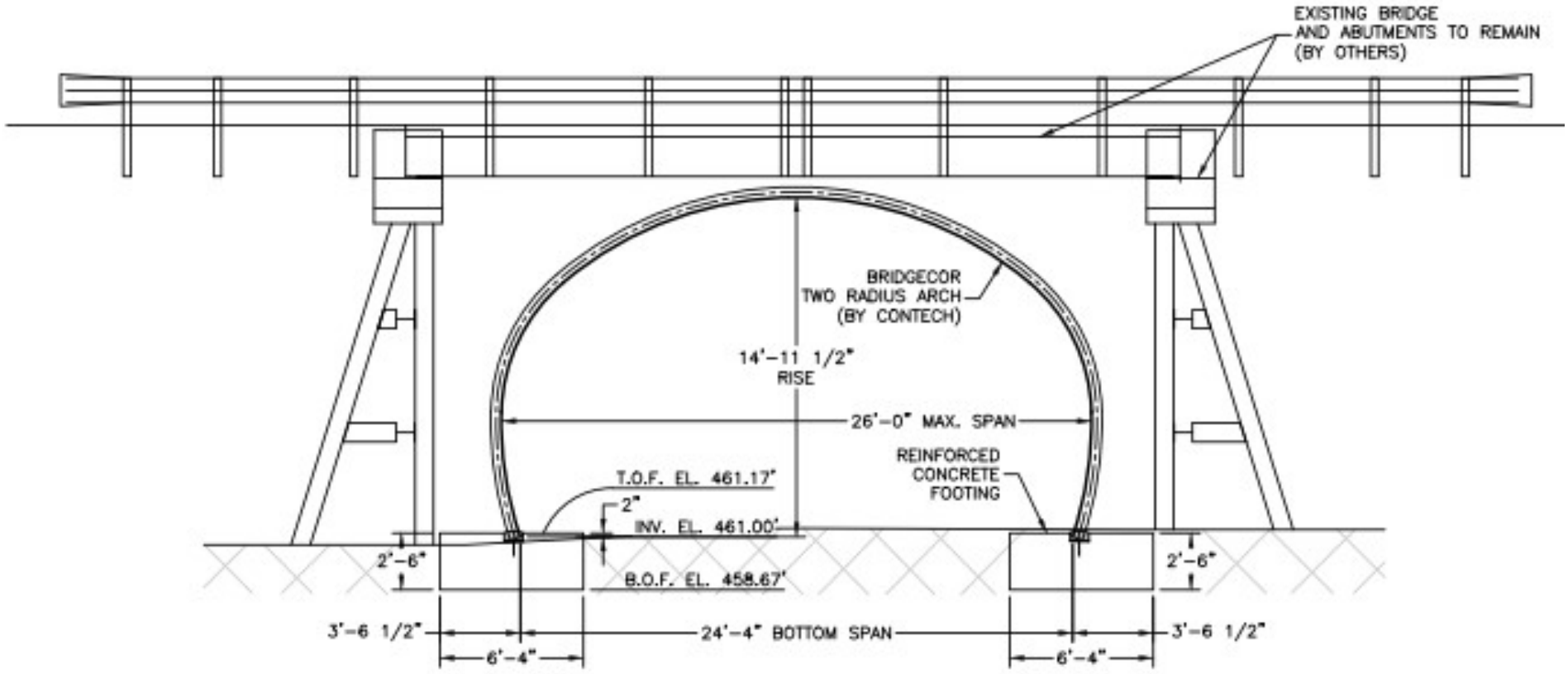


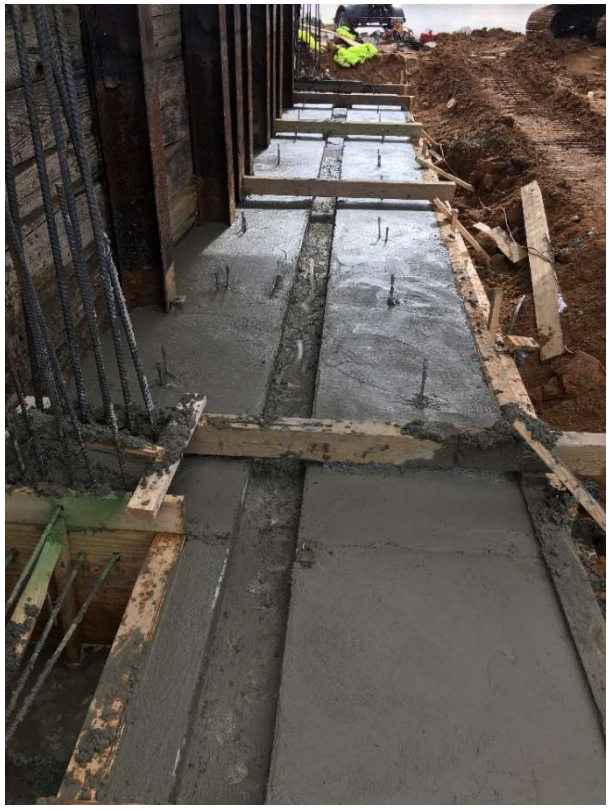
Contech BridgeCor 36S Structure
(26' Span x 14'-11" Rise),
8 Ga, 40'-3" Total Length

CONTECH®
STRUCTURAL PLATE

St Clair County – Pier 59/Rivercrest Drive
Cropwell, AL

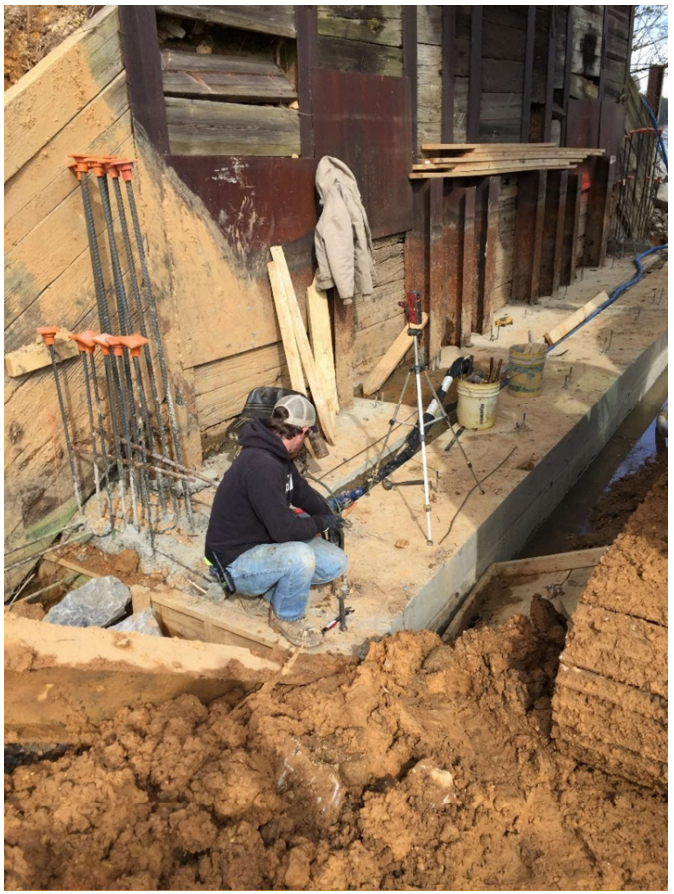
CONTECH ENGINEERED SOLUTIONS

- FOUNDATIONS INSTALLED IN DRY CONDITIONS
  - Cast-In Place Concrete Foundations
    - 6’-4” wide x 2’-6” deep
    - Based on 3000 psf Allowable Soil Bearing Capacity



CONTECH ENGINEERED SOLUTIONS

- SOIL IMPROVEMENTS REQUIRED
  - Low-consistency fill and Alluvium soils present to a depth of 3 ft. to 8 ft. below proposed bottom of footings.
  - Over-Excavation not allowed by ALDOT.
  - Helical Piles or HDP Injection recommended
  - Contractor chose to use High Density Polyurethane Injection to improve bearing capacity
    - Rapid cure time.
    - Can support full loads after 15-minutes,
    - Achieves full strength after 24-hours



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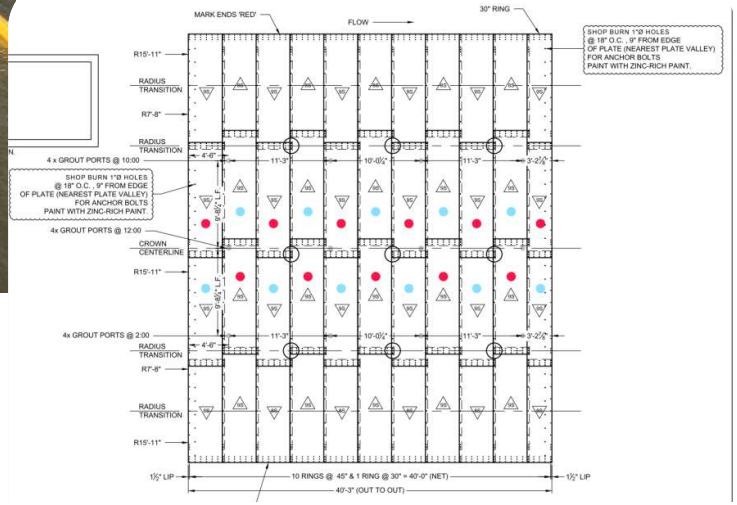
- Plate Assembly
  - 1 ½ days to assemble and slide into place
  - Plate Erectors assembled the plates and Winston Contracting pulled the plate structure into place.



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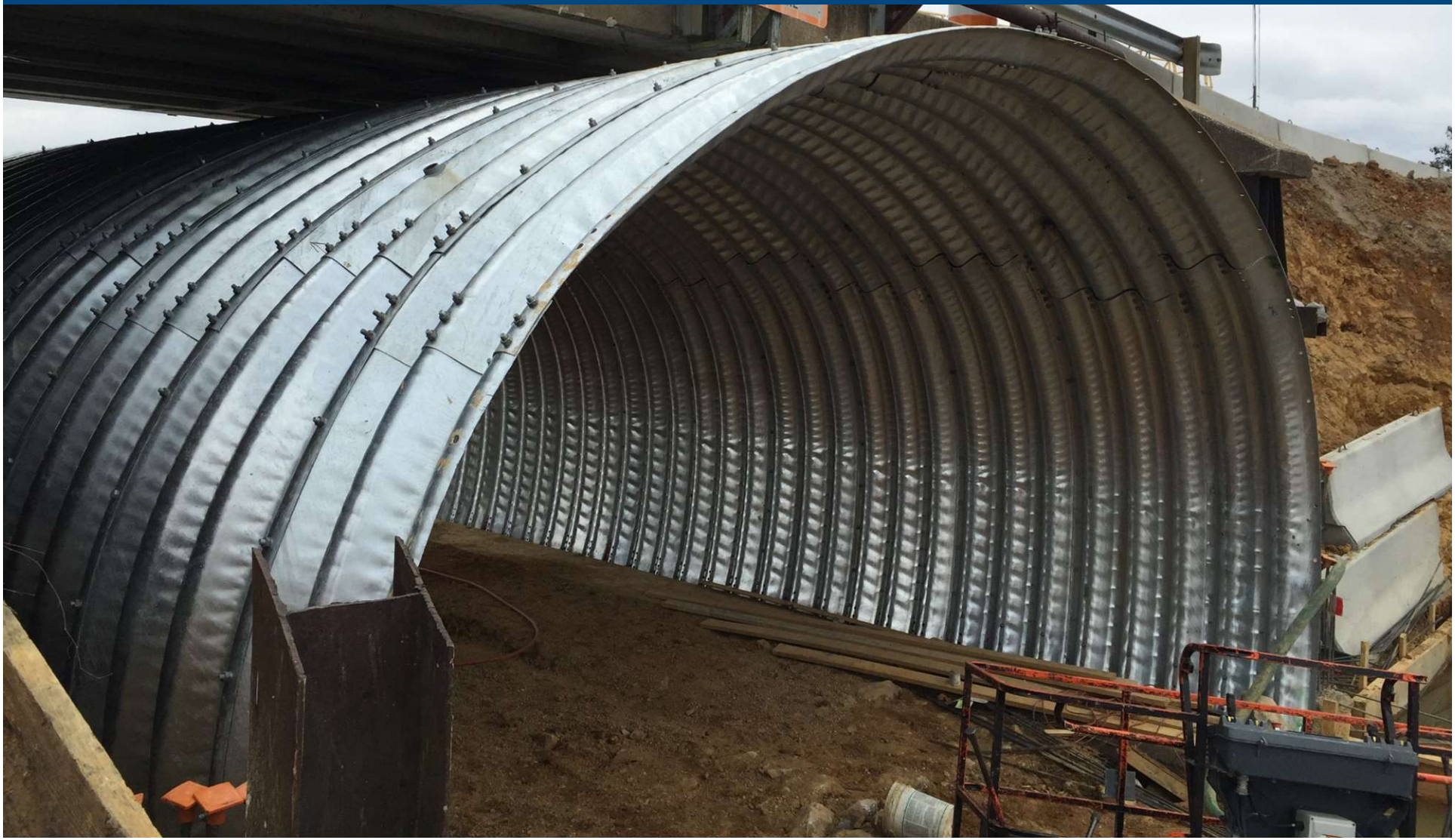
BridgeCor 26’ Span x 14’ – 11” Rise



CONTECH STRUCTURAL PLATE

St Clair County – Pier 59/Rivercrest Drive
Cropwell, AL

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St Clair County – Pier 59/Rivercrest Drive
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Questions?

Tod A. Green, PE
Bridge Consultant
Tel: (205) 306-3277
Email: Tgreen@conteches.com