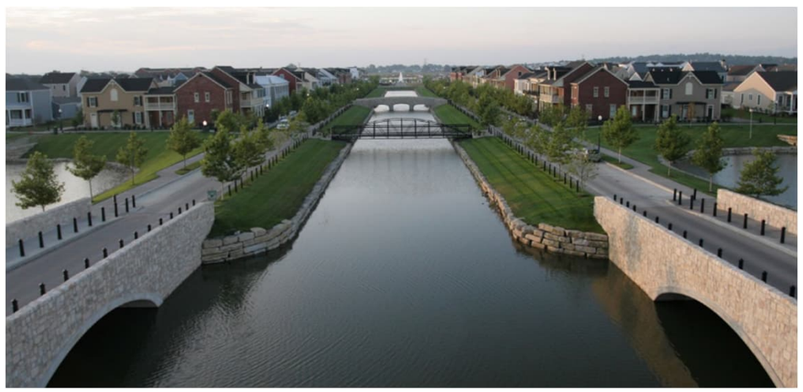
CONTECH® ENGINEERED SOLUTIONS
A QUIKRETE® COMPANY

Structures Technical Seminar

Jennifer McIntire, P.E.- Bridge Consultant, AL & FL Panhandle



UAB ASCE Gulf Coast Symposium 2024

UAB ASCE Gulf Coast Symposium 2024

UAB ASCE Roundtable Event 2024

Agenda

- Structures Overview
- Accelerated Bridge Construction
- Foundation Discussion
- Scour Considerations
- Applications
- Partnering With Contech

Options & Support Specific to Your Project Needs

Solution Development

- Project Design Worksheet
- Structure Selection
- Silting & Layout
- DYOB
- Engineer Estimate
- Site Simulation
- Proposal Preparation
- Design Build Support

Design Support

- Specifications
- Contract Drawings
- Permitting
- Structural/Fabrication Drawings
- Approval Assistance
- Custom Shape Development
- Horizontal/Vertical Alignment
- Hydraulics & Scour Support
- Foundations and Load Ratings

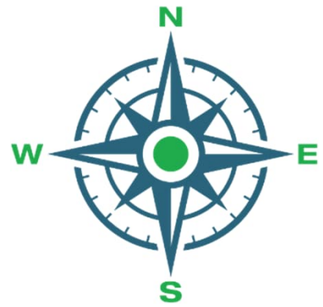
Installation Support

- Preconstruction Meeting
- On-Site Installation Assistance
- Logistics Coordination

Contech Engineered Site Solutions

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

Contech:
Your Project Partner

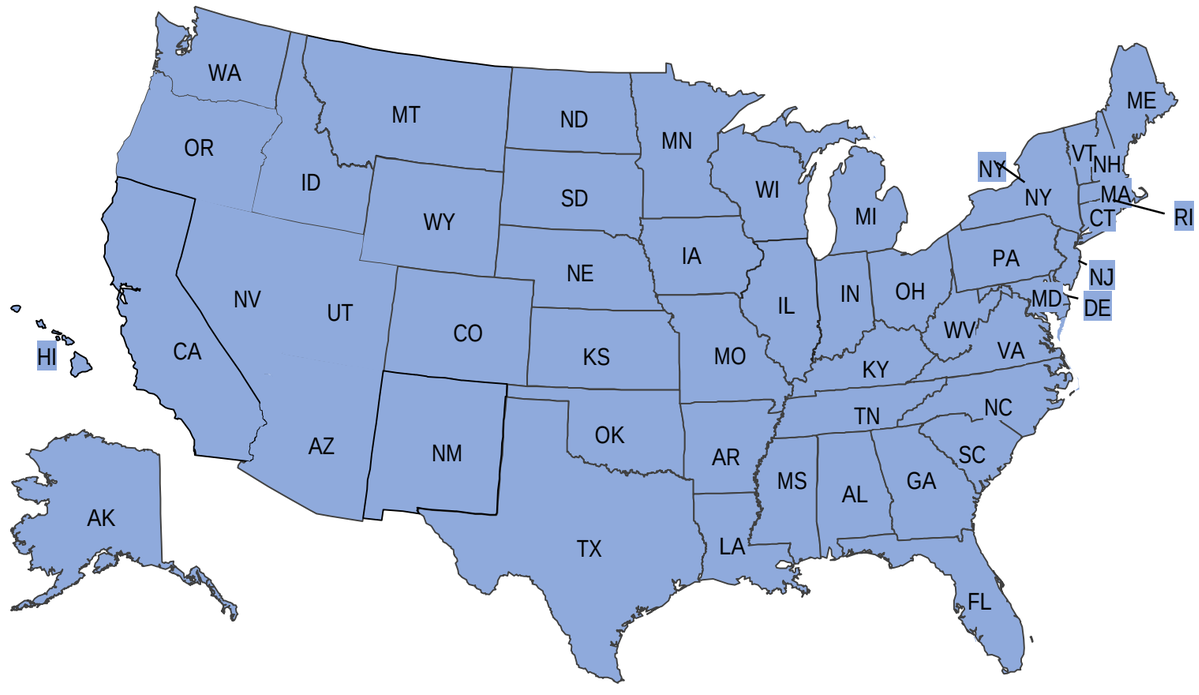


Full Design Support

- 100 Year Experience
- All 50 DOTs
- Local Representation

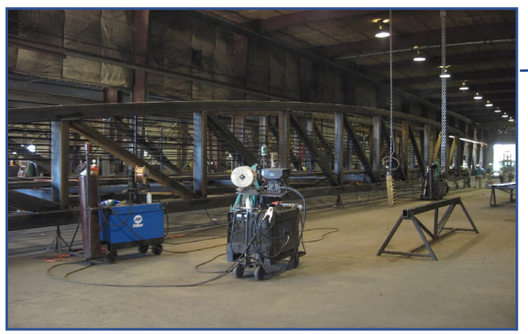
Full Installation Support

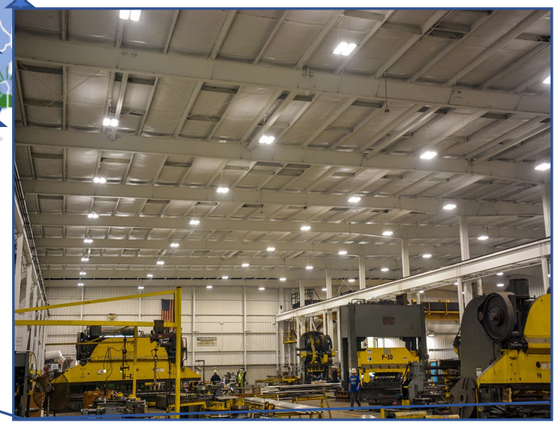
- Over 90,000 Installations
- Pre-Con Support
- On-Site Representation Available



https://www.conteches.com/connect

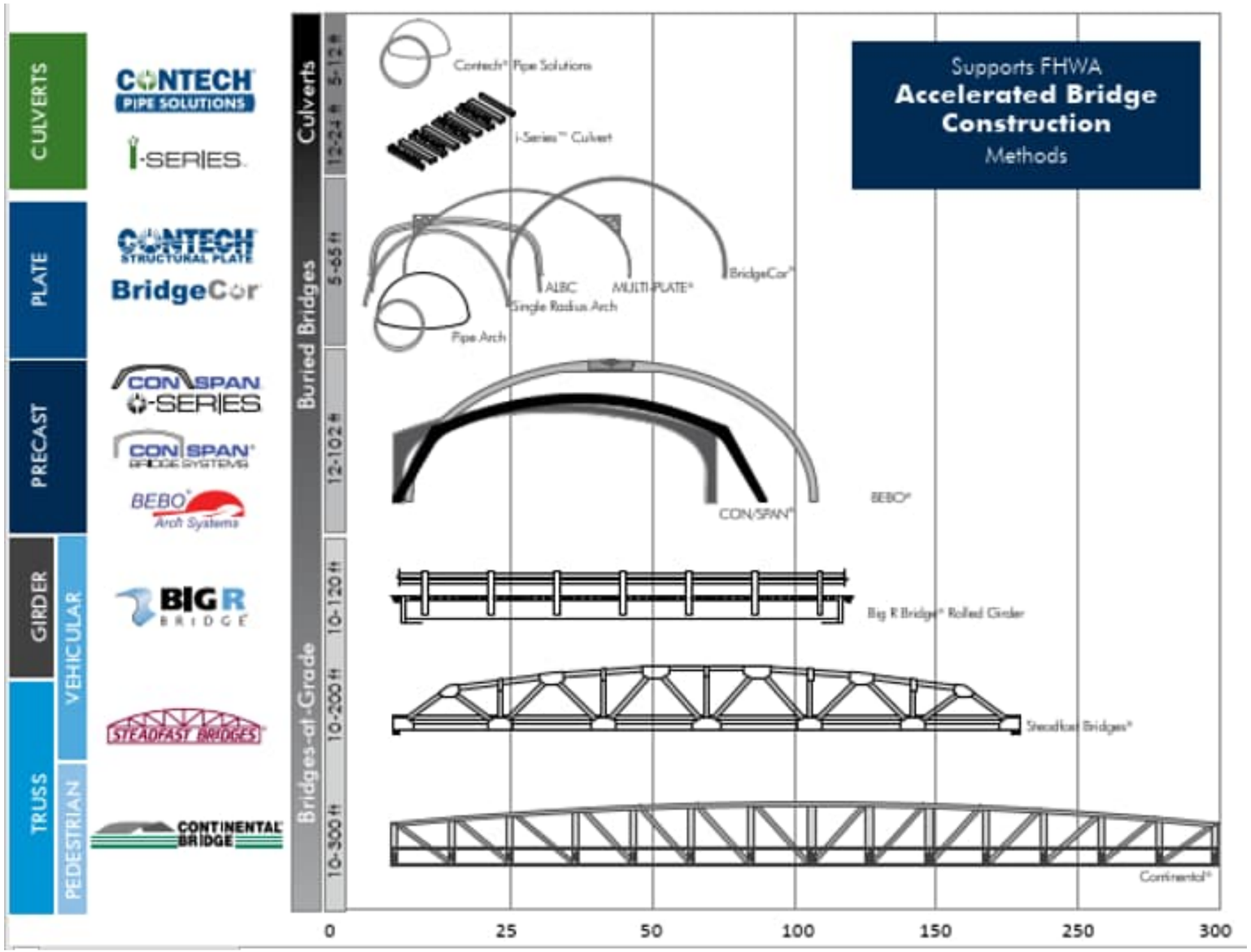
Manufacturing Capabilities





LEGEND	
	Contech Manufacturing
	Partner Manufacturing

Clear Span Bridges



Accelerated Bridge Construction

U.S. Department of Transportation
Federal Highway Administration

FHWA Accelerated Bridge Program: Industry Trend

***Accelerated Bridge Construction (ABC)*:**

- ABC is bridge construction that uses innovative planning, design, materials, and construction methods in a safe and cost-effective manner to reduce the onsite construction time that occurs when building new bridges or replacing and rehabilitating existing bridges

Prefabricated Bridge Elements and Systems

- PBES are structural components of a bridge that are built offsite, or near-site of a bridge and include features that reduce the onsite construction time and the mobility impact time that occurs when building new bridges or rehabilitating or replacing existing bridges relative to conventional construction methods.

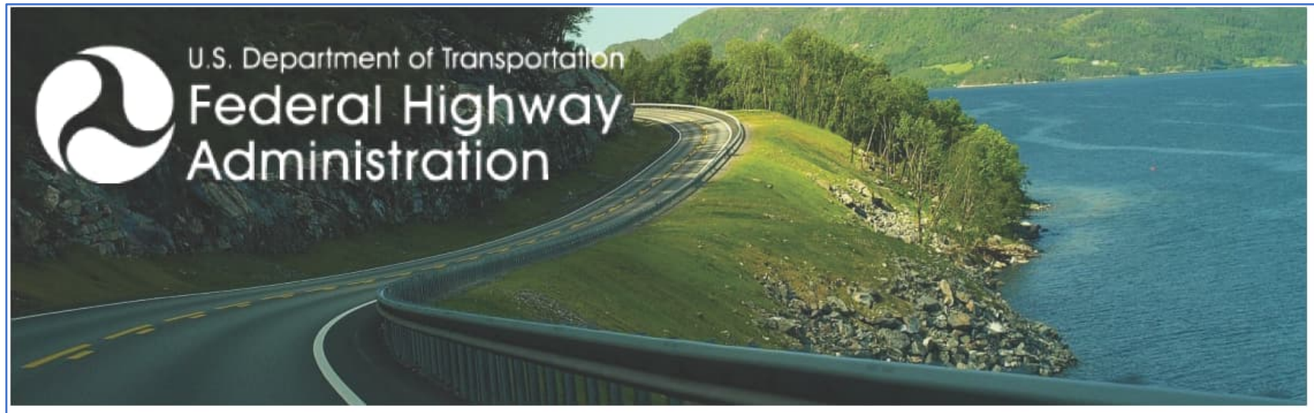
Accelerated Bridge Construction Process

Efficient Logistics and Assembly

Backfill and Completion

Federal Highway Administration
Promoting Innovation in Use of Patented and Proprietary Products

- FHWA allows for proprietary materials, specifications, or processes
- Encourages innovation in transportation technology and methods
- Effective October 28, 2019



Construction and Maintenance – Promoting Innovation in Use of Patented and Proprietary Products

AGENCY: Federal Highway Administration (FHWA), U.S. Department of Transportation (DOT).
ACTION: Final rule.
EFFECTIVE: October 28, 2019

SUMMARY: The FHWA revised its regulations to provide greater flexibility for States to use proprietary or patented materials in Federal-aid highway projects. This final rule rescinds the requirements limiting the use of Federal funds in paying for patented or proprietary materials, specifications, or processes specified in project plans and specifications, thus encouraging innovation in transportation technology and methods.

Executive Summary

The FHWA is revising its regulations at 23 CFR 635.411 to provide greater flexibility for States to use patented or proprietary materials in Federal-aid highway projects. Based on a century- old Federal requirement, the outdated requirements in 23 CFR 635.411(a)–(e) are being rescinded to encourage innovation in the development of highway transportation technology and methods. *As a result, State Departments of Transportation (State DOTs) will no longer be required to provide certifications, make public interest findings, or develop research or experimental work plans to use patented or proprietary products in Federal-aid projects. Federal funds participation will no longer be restricted when State DOTs specify a trade name for approval in Federal-aid contracts.* In addition, Federal-aid participation will no longer be restricted when a State DOT specifies patented or proprietary materials in design-build Request-for- Proposal documents.

Summary from Federal Highway Administration:
"This rulemaking will provide greater flexibility to States to use proprietary or patented materials…"

Contech Structural Plate

CONTECH® STRUCTURAL PLATE

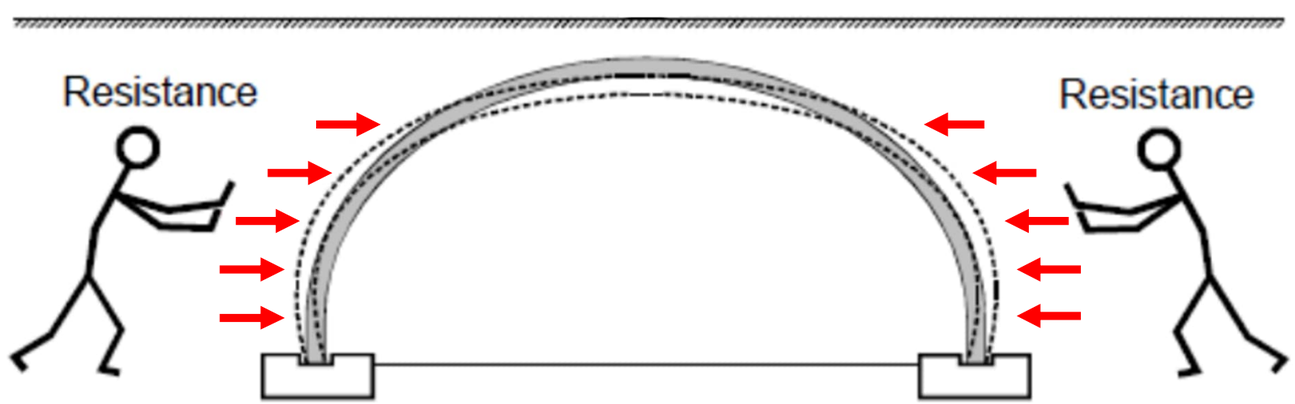
BridgeCor®

Contech Structural Plate

BridgeCor / MULTI-PLATE

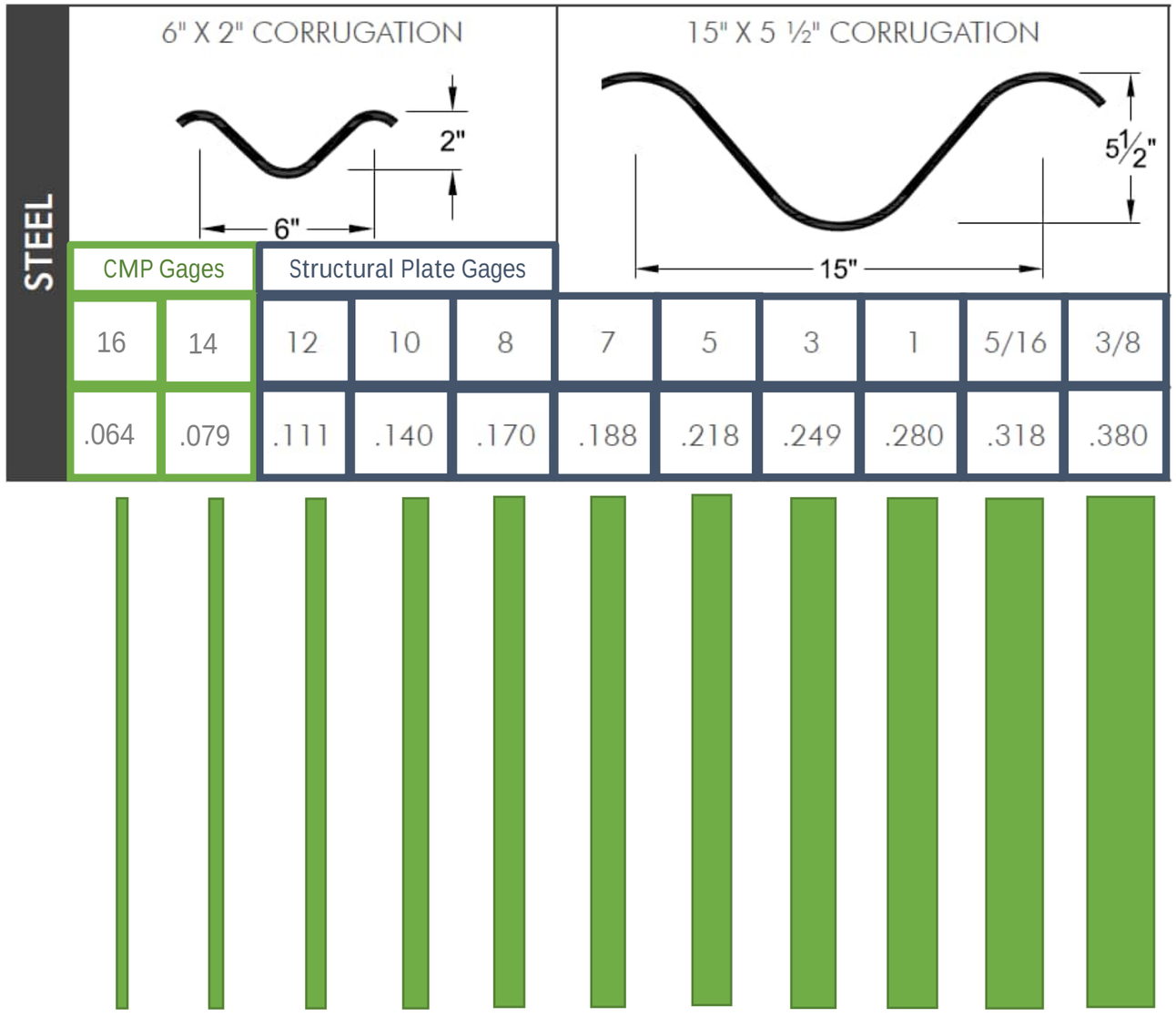
Aluminum Structural Plate

Soil Structure Interaction



Soil-Structure-Interaction

Plate Corrugations & Thickness – Structural Versatility



Structural Plate has 50% more galvanized coating than Corrugated Metal Pipe

Structural Plate Durability

Contributing Factors of Long-Term Durability

- pH
- Resistivity
- Hardness
- External contaminants
  - Deicing salts
  - Agricultural chemicals
- Abrasion Levels

Installed 1966 Bay of Fundy, ME

Recommended Environmental Ranges

STEEL
$6.0 \leq pH \leq 10.0$
Resistivity > 2,500 ohm-cm

ALUMINUM
$4.0 \leq pH \leq 9.0$
Resistivity > 500 ohm-cm

Abrasion Levels

Table 2 — FHWA Abrasion Guidelines

Abrasion Level	Abrasion Condition	Bed Load	Flow Velocity (fps)
1	Non-Abrasive	None	Minimal
2	Low Abrasion	Minor	< 5
3	Moderate Abrasion	Moderate	5 - 15
4	Severe Abrasion	Heavy	> 15

Lightweight, Bolted Plate Construction

FREIGHT ECONOMY

EFFICIENT ASSEMBLY

LIFT AND SET IN PLACE

HANDLES HIGHWAY LOADING

Structural Plate – Private Driveway Project

- 2022- Springville, AL with US Fish

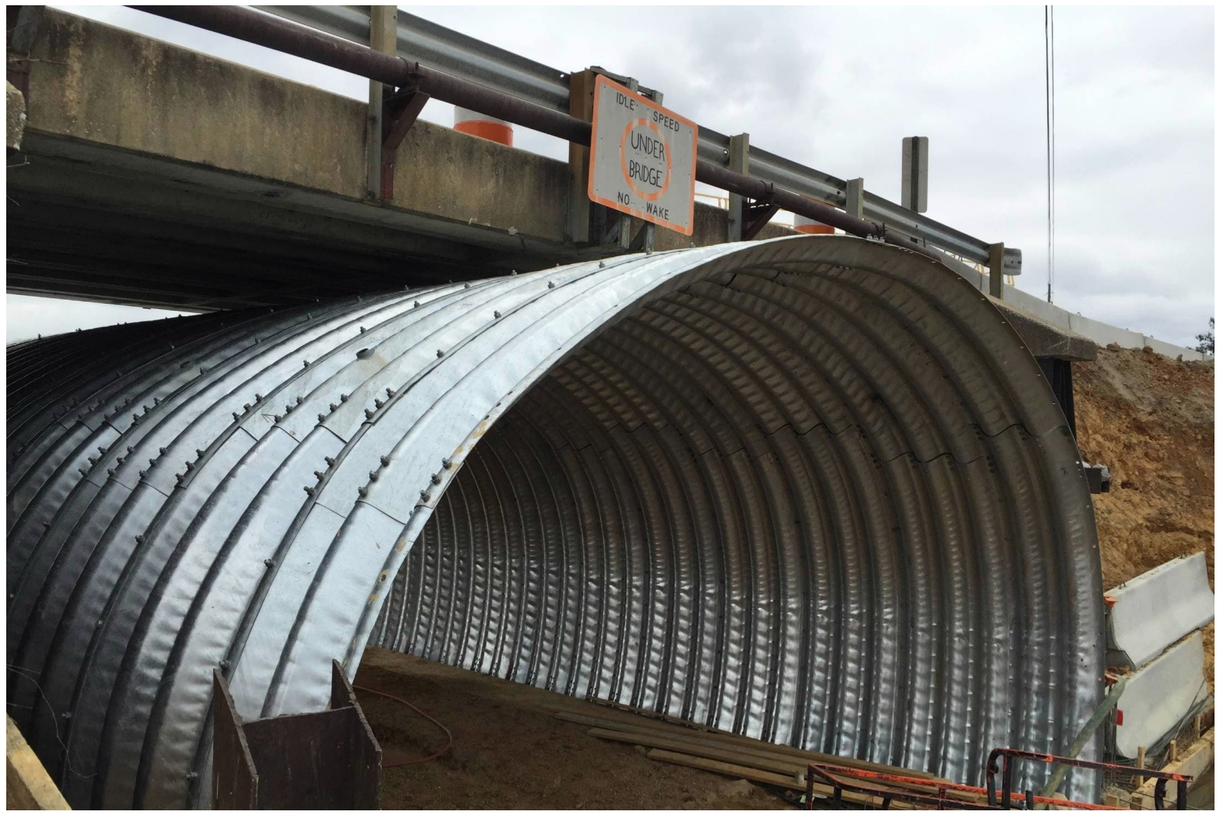
Structural Plate – In-Situ Rehabilitation

Outstanding features:

- In-situ rehabilitation

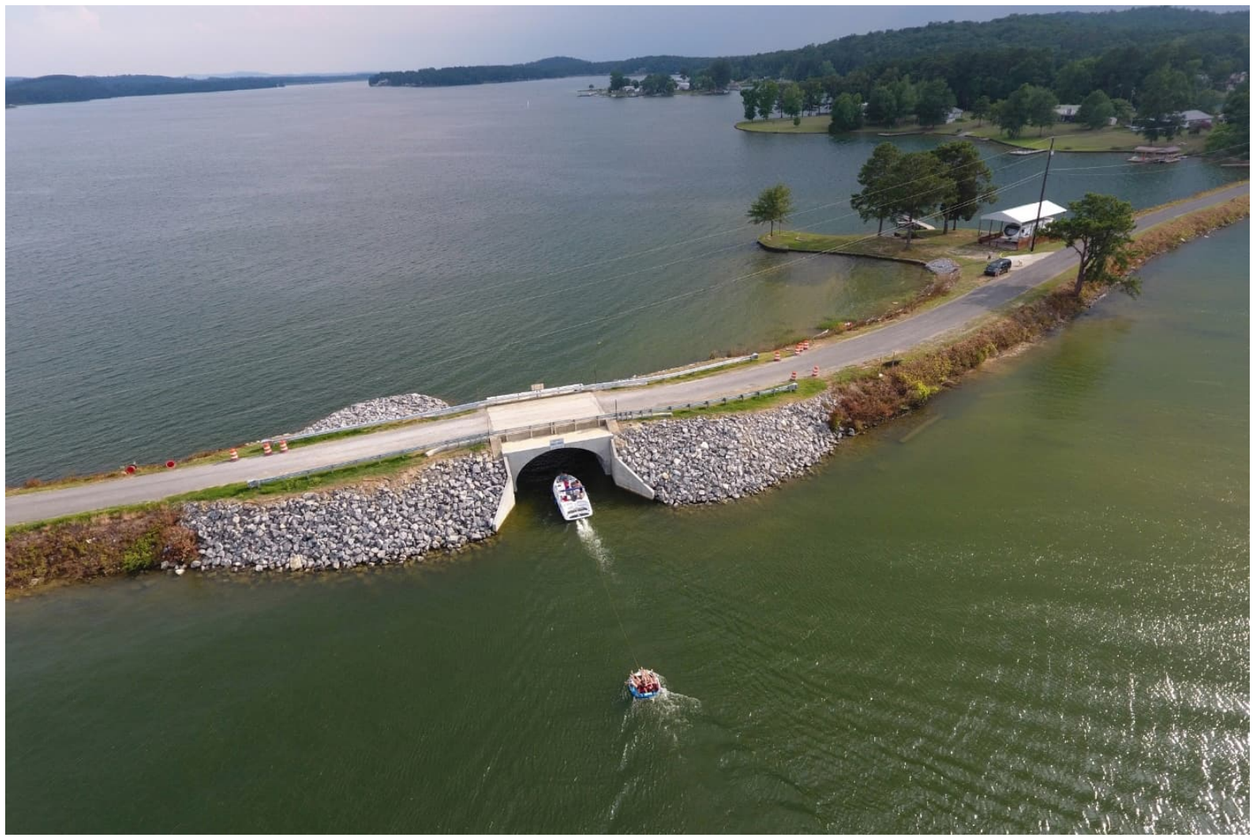
Structural Plate – In-Situ Rehabilitation

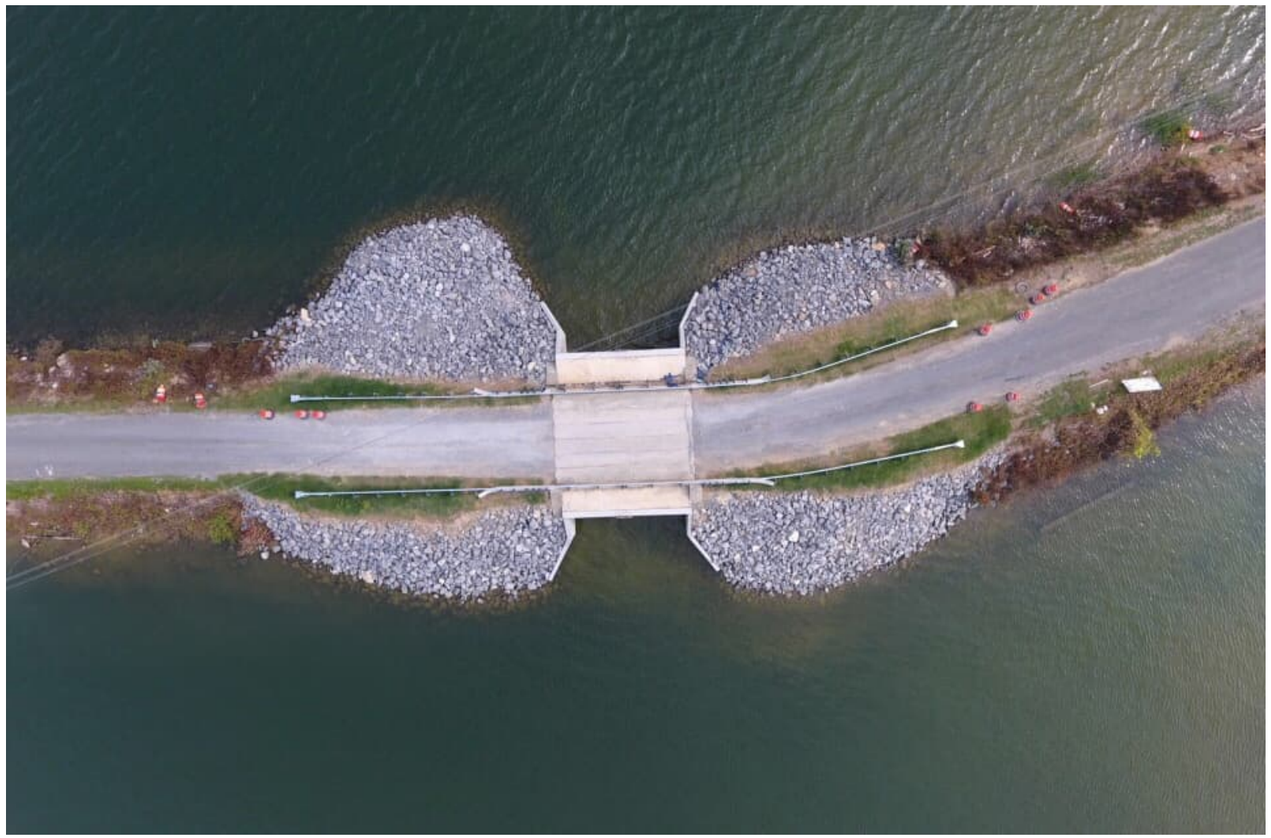
Rivercrest Drive over St. Clair County, AL Engineer: CDG Engineers Logan Martin Lake



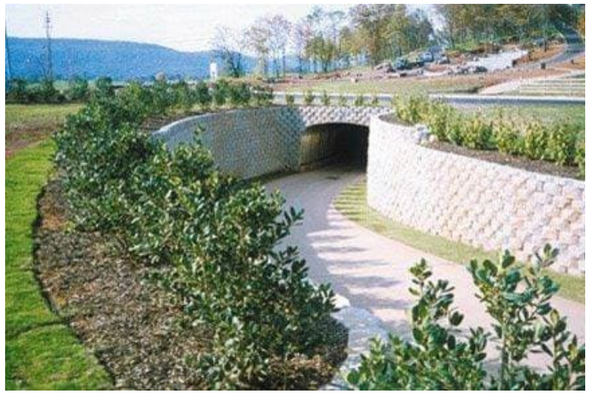
Structural Plate – In-Situ Rehabilitation

Rivercrest Drive over Logan Martin Lake St. Clair County, AL Engineer: CDG Engineers





End Treatments



KEYSTONE®

CONCRETE HEADWALL

ALUMINUM HEADWALL

VIST-A-WALL®

STEP-BEVELED END

STEP-BEVELED END WITH CONCRETE

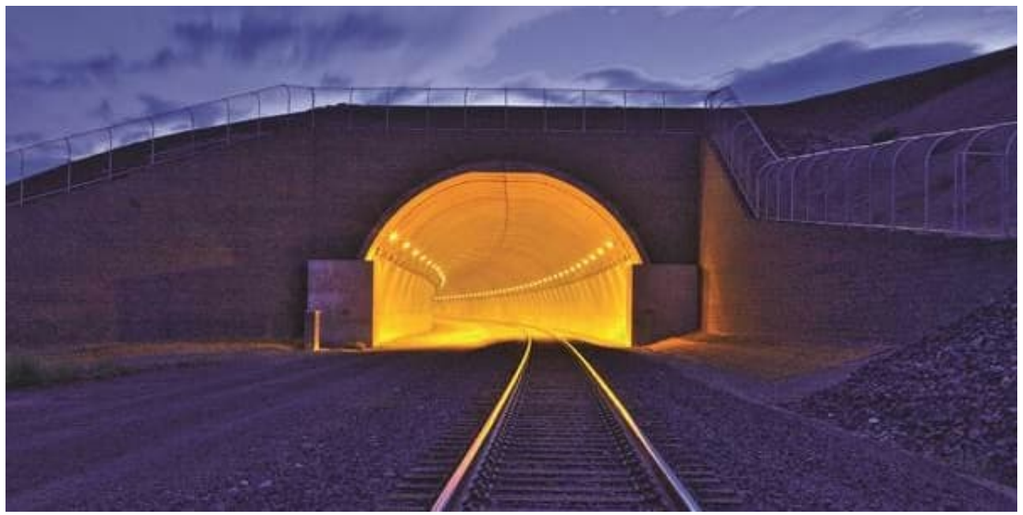
Precast – CON/SPAN and BEBO Concrete Arches

CON SPAN® -SERIES®

BEBO® Arch Systems

CON/SPAN

BEBO Arch Systems



Modular Components / Accelerated Installation

PRECAST FOUNDATION

PRECAST ARCH UNIT

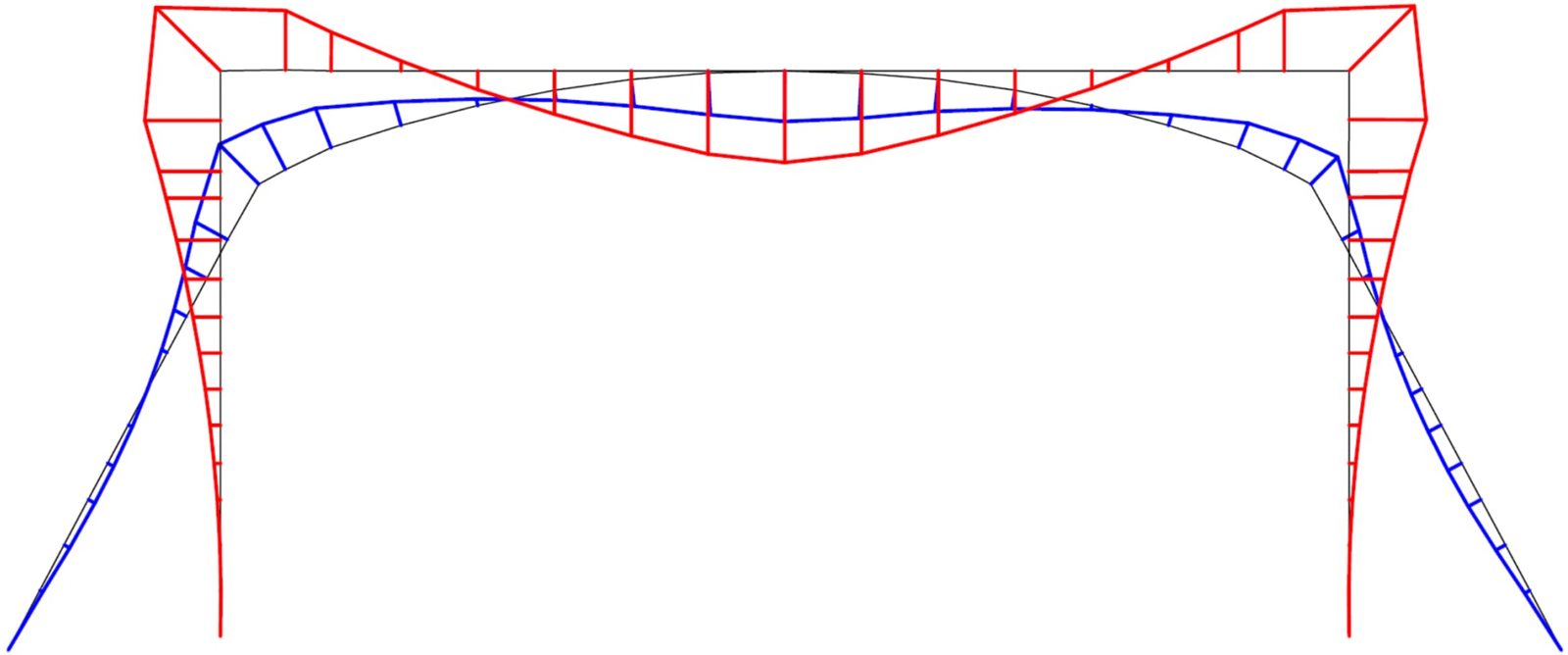
PRECAST HEADWALL

PRECAST WINGWALL

TWIN LEAF CONSTRUCTION

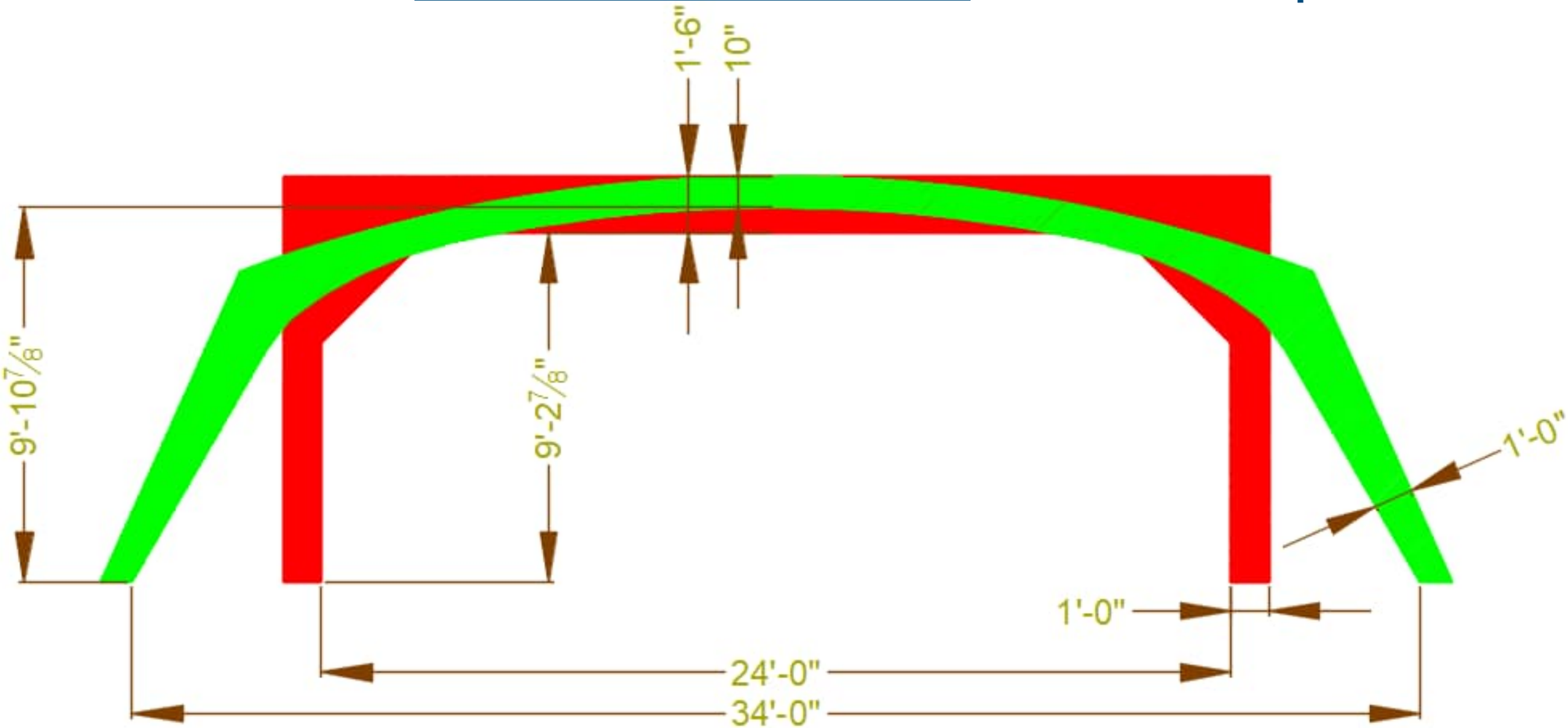
CURVED ALIGNMENT

O-Series Moment Reduction over Flat Top



- Moment Diagram for O-Series results in:
  - Maximum positive and negative moment reduced
  - Required A1 and A3 steel areas *reduced*

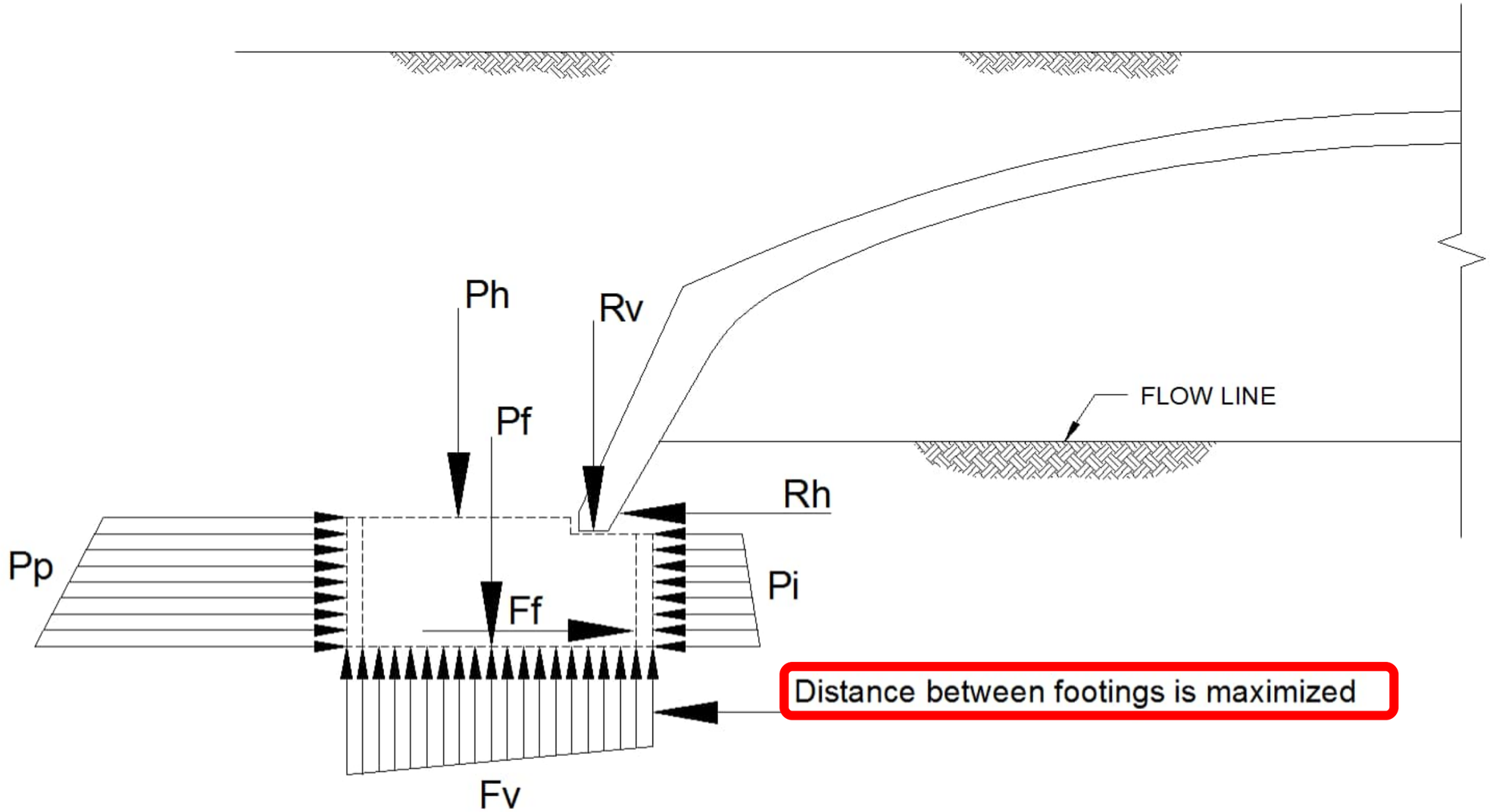
O-Series Moment Reduction over Flat Top



O-Series results in:

- Reduction in Concrete and Steel (up to 40%)
- Longer Lay Lengths (less picks, less installation time) due to reduced weights

O-Series Footing Reactions Minimize Stream Disturbance



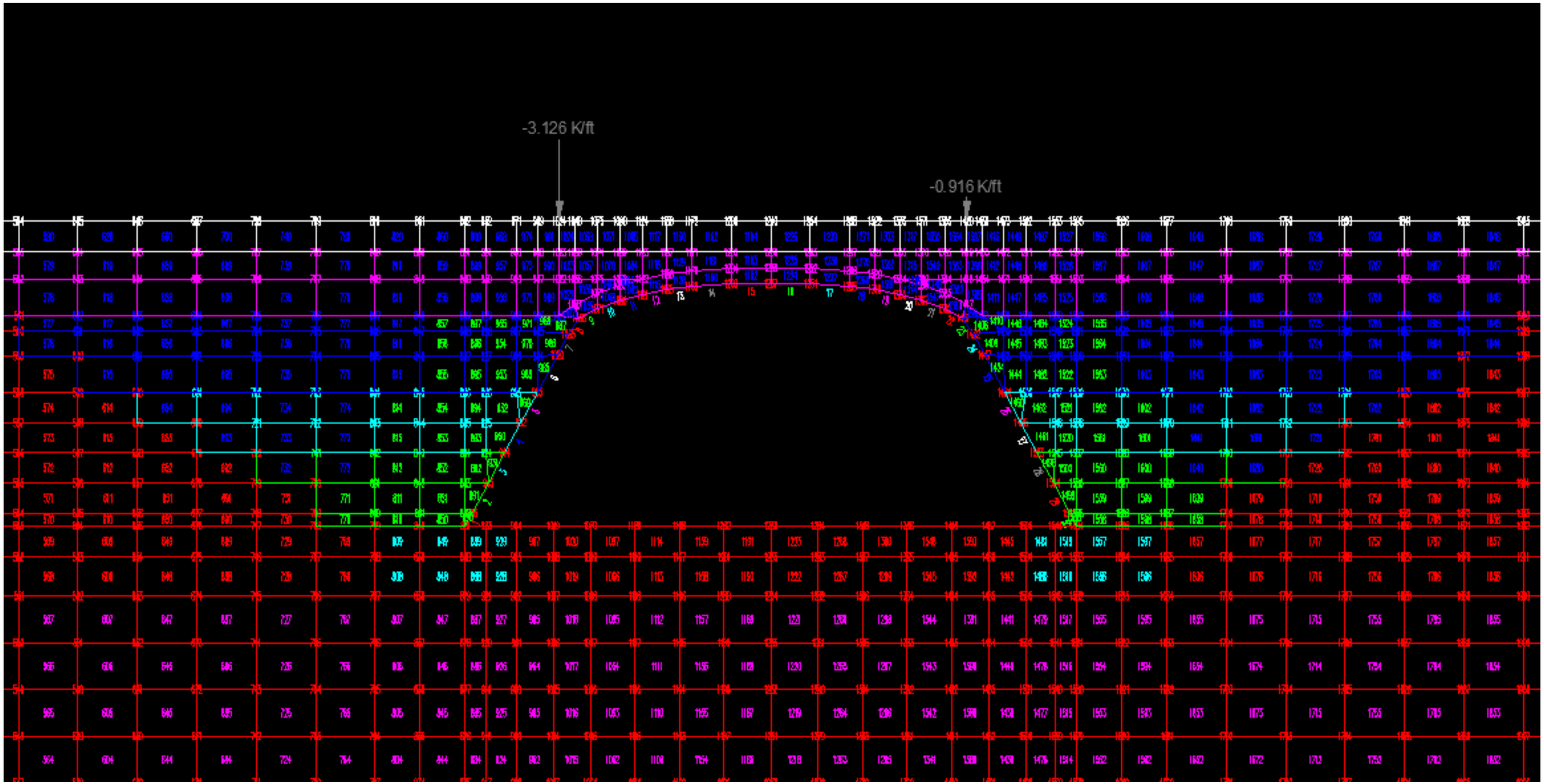
- **CANDE**, a Culvert Analysis and Design computer program for the design of a soil structure system.

- **History of CANDE development**
  - Before1970's - traditional methods dating back to 1930's, where soil loading on the culvert is presumed (guessed)
  - In 1972, the Federal Highway Administration (FHWA) began research program
  - 1976 – First version of CANDE
  - 1989 – DOS Based
  - 2007 – Windows Based
  - 2015 – Newest version

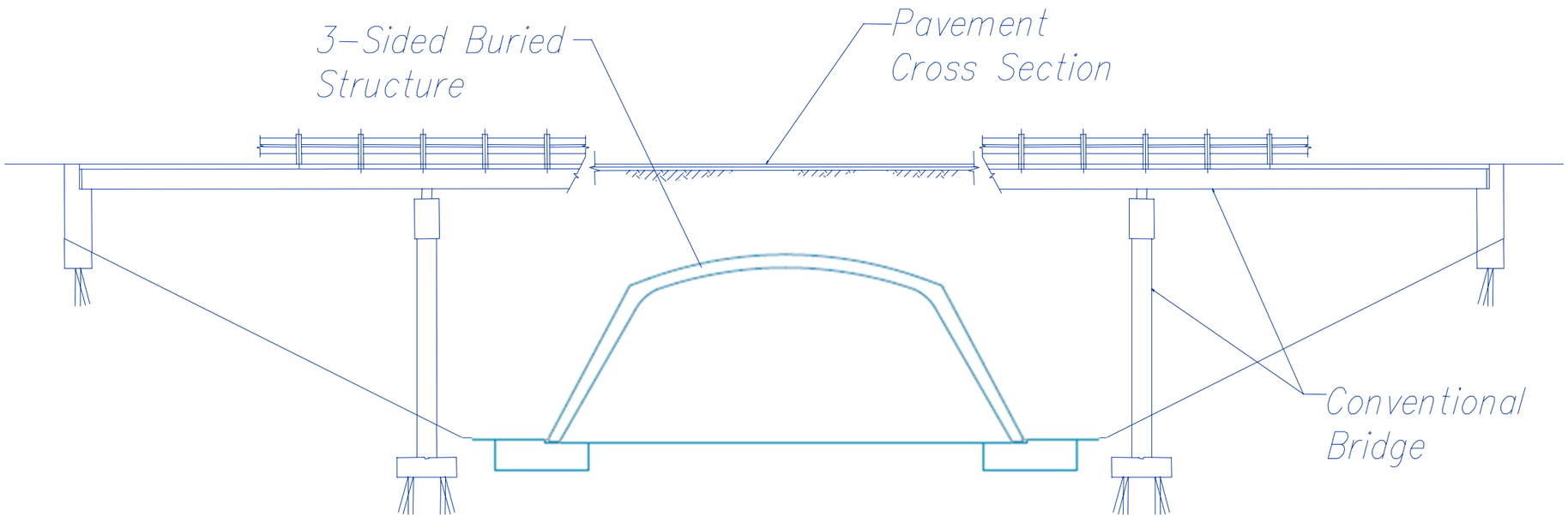
- **How does CANDE differ from the older traditional methods**
  - FEM that takes into account Soil Structure Interaction

Free Download link to TRB at http://www.candeforculverts.com

O-Series modeled in CANDE (Culvert ANalysis and DEsign)



Buried Bridge vs. Bridge At-Grade

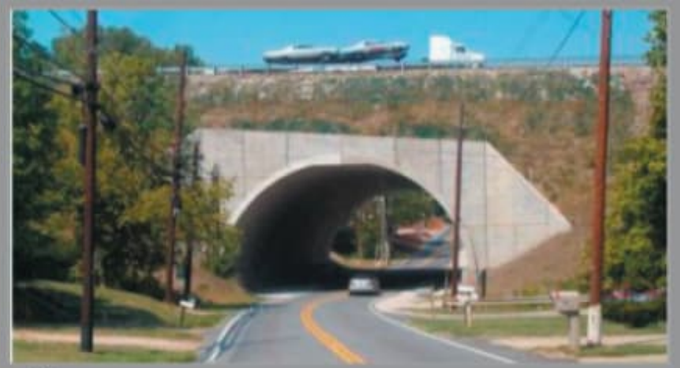


At-Grade Bridges compared to Buried Bridges:

- Shorter construction time/phasing means lower initial cost
- Minimal/no long-term maintenance lowers overall life cycle cost
- Shorter construction time minimizes traffic disruption
- Bury utilities in backfill over structure
- Increased safety with limited/no freeze concerns,
  & no deck maintenance

Buried Bridge vs. Bridge At-Grade

Before



After

During

Bridge Type Comparison Chart

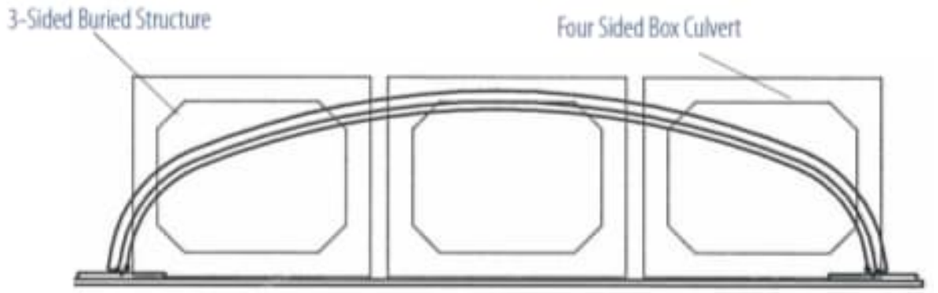
	CONVENTIONAL	BURIED
Traffic Disruption*	2 YEARS	5 MONTHS
Construction Time*	2 YEARS	1 YEAR
Initial Cost*	$8 M	$5.5 M
Typical Maintenance*	Deck Overlay every 15-18 years. Total Deck Replacement every 30-35 years.	Periodic Asphalt replacement.

*Estimated

Project – I-64
Huntington, WV
Owner - WVDOH

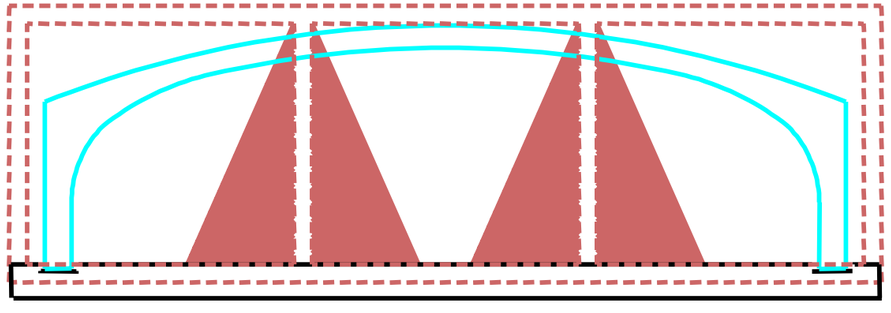
Engineer – Modjeski & Masters
Contractor - Ahearn and Associates

Buried Bridge vs. Culverts



CULVERTS CONVERT TO BURIED BRIDGES

- Complete system with headwalls, wingwalls and foundations
- Bottomless structure promotes natural aquatic habitat and fish/wildlife passage
- Maintenance-free structure lowers overall life cycle cost
- Project specific design to handle all loading requirements
- Long clear spans promote improved hydraulics while minimizing pier blockage



East Valley Water District
Highland, California

East Valley Water District
Highland, California

East Valley Water District
Highland, California

CON/SPAN O-Series- Bridge Replacement

Madison, AL
Blake Bottom Road

Madison, AL
Blake Bottom Road

Truss Bridges – Pedestrian and Vehicular

CONTINENTAL® BRIDGE

EXPRESS® TRUSS
CONTINENTAL® BRIDGE

STEADFAST BRIDGES®

EXPRESS® TRUSS

CONTINENTAL® BRIDGE

1. SELECT

- Connector® Style Pedestrian Truss
- Weathering Steel Finish
- Horizontal Safety Rail System

DESIGNED IN ACCORDANCE WITH AASHTO LRFD*

Clear Width: ☐ 6′ ☐ 8′ ☐ 10′ ☐ 12′

Length: ☐ 40′ ☐ 50′ ☐ 60′ ☐ 70′ ☐ 80′ ☐ 90′ ☐ 100′
☐ 110′ ☐ 120′ ☐ 130′ ☐ 140′ ☐ 150′ ☐ 160′ ☐ 170′
☐ 180′ ** 6′ width only available with 40′ – 80′ lengths

Deck: ☐ Pressure Treated Wood

☐ Cast-in-Place Concrete (by Others)

2. SPECIFY

- Bid Drawings
- Specification
- 10-Year Limited Warranty
- Estimate

SPECIAL SPECIFICATIONS FOR PREFABRICATED BRIDGE

CONTECH ENGINEERED SOLUTIONS

Steadfast Express Pedestrian Bridges

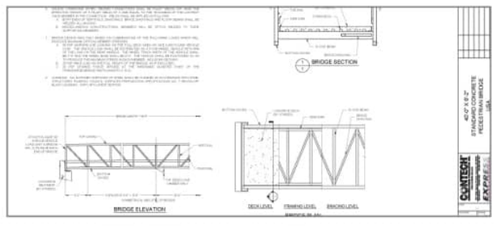
INTRODUCTION

This Specification is to be used as a guide in developing appropriate final specifications suited to the purchaser's particular needs. The two primary objectives of these Special Specifications are:

I. To provide assurance that the submittals and structures provided in response to the award of performance-specified, prefabricated, steel bridges will completely conform to the desires and expectations of the Specifier and Owner without surprises.

II. To limit the liability of Specifiers and Owners through following a comprehensive specification process utilizing a well researched published source backed up with an authoritative, technical, specification commentary documenting a full design example. Public safety is thereby assured.

The most critical guarantees for both objectives above are the comprehensive, non-proprietary format of the specifications and the specification checklist. When the entire specification is published, proposals received and compliance enforced at the time of award and submittal approval, Specifiers and Owners will get what they expect and reduce their liability for the bridge and other structures.



BRIDGE SECTION

BRIDGE ELEVATION

DECK LEVEL FRAMING LEVEL BRACING LEVEL

3. SATISFY

- Stamped Drawings in One Week
- Bridge Delivery in 6-8 Weeks of Approved Drawings
- Bridge Installation Support
- Cost-Effective Solution

*IBC & AISC designed EXPRESS Structures also available in 20' - 100' lengths.

Custom Designs & Options

OPTIONS

DECK


Wood


Steel Grate


Concrete


Asphalt

FINISH

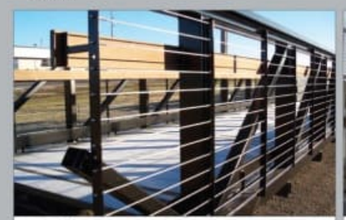

Weathering Steel


Painted Steel


Galvanized Steel*

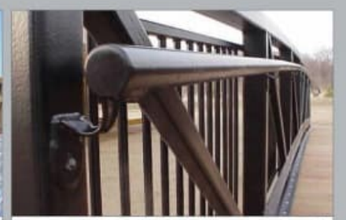
CONTECH RUST-FREE GUARANTEE 35 YEARS GALVANIZED BRIDGES

RAIL


Cable


Mesh Panels


Safety Rail/Wood Rail


Vertical Picket/Pipe Handrail

*Exclusive 35-year galvanized rust free warranty for vehicular truss.

CONTINENTAL BRIDGE®

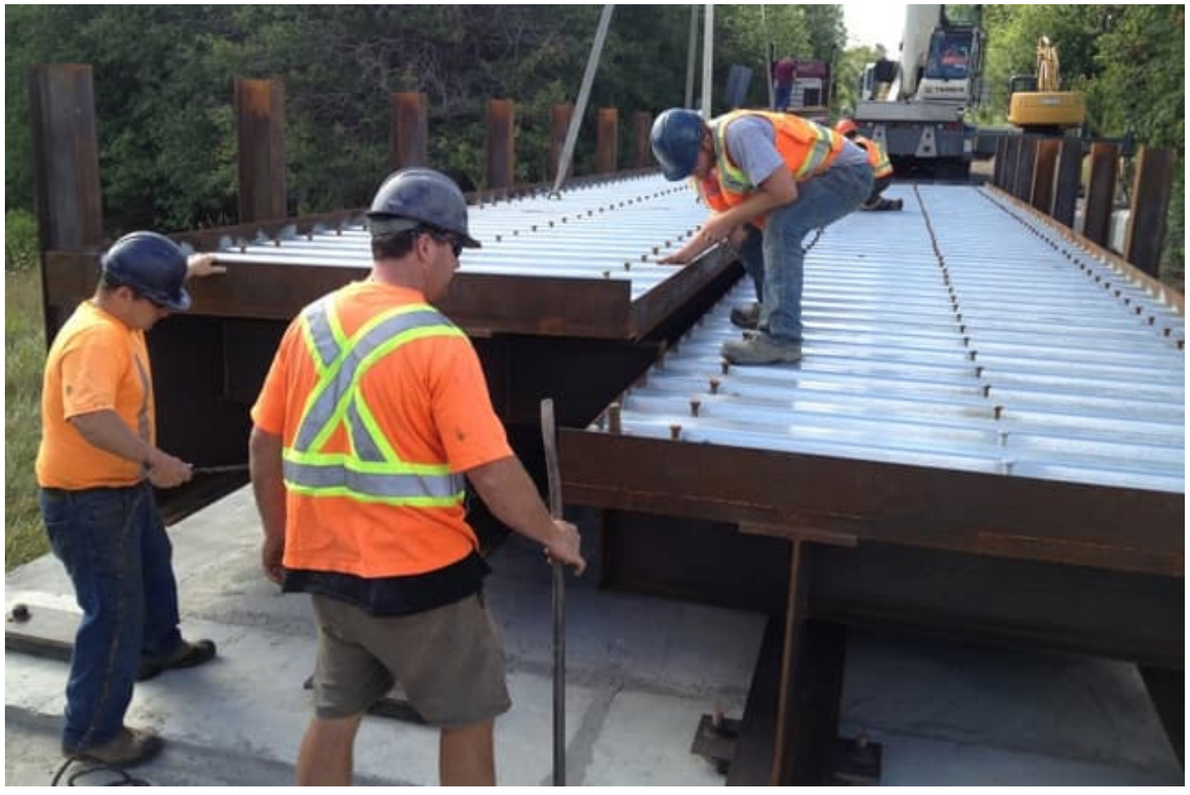
Freight Economy / Simple Installation

Bessemer Pedestrian Bridge over Highway 150

Bessemer Pedestrian Bridge over Highway 150

Vehicular Truss Bridges

Big R Modular Rolled Girder

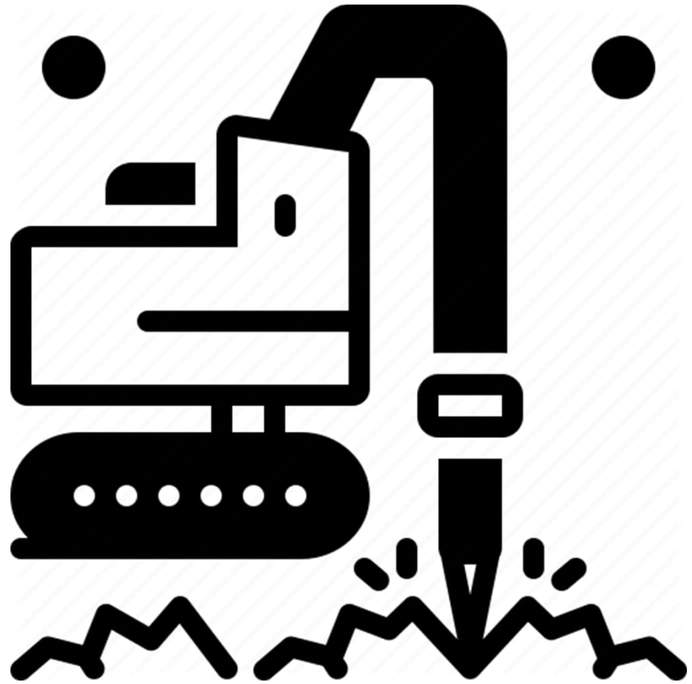


Big R Custom Rolled Girder

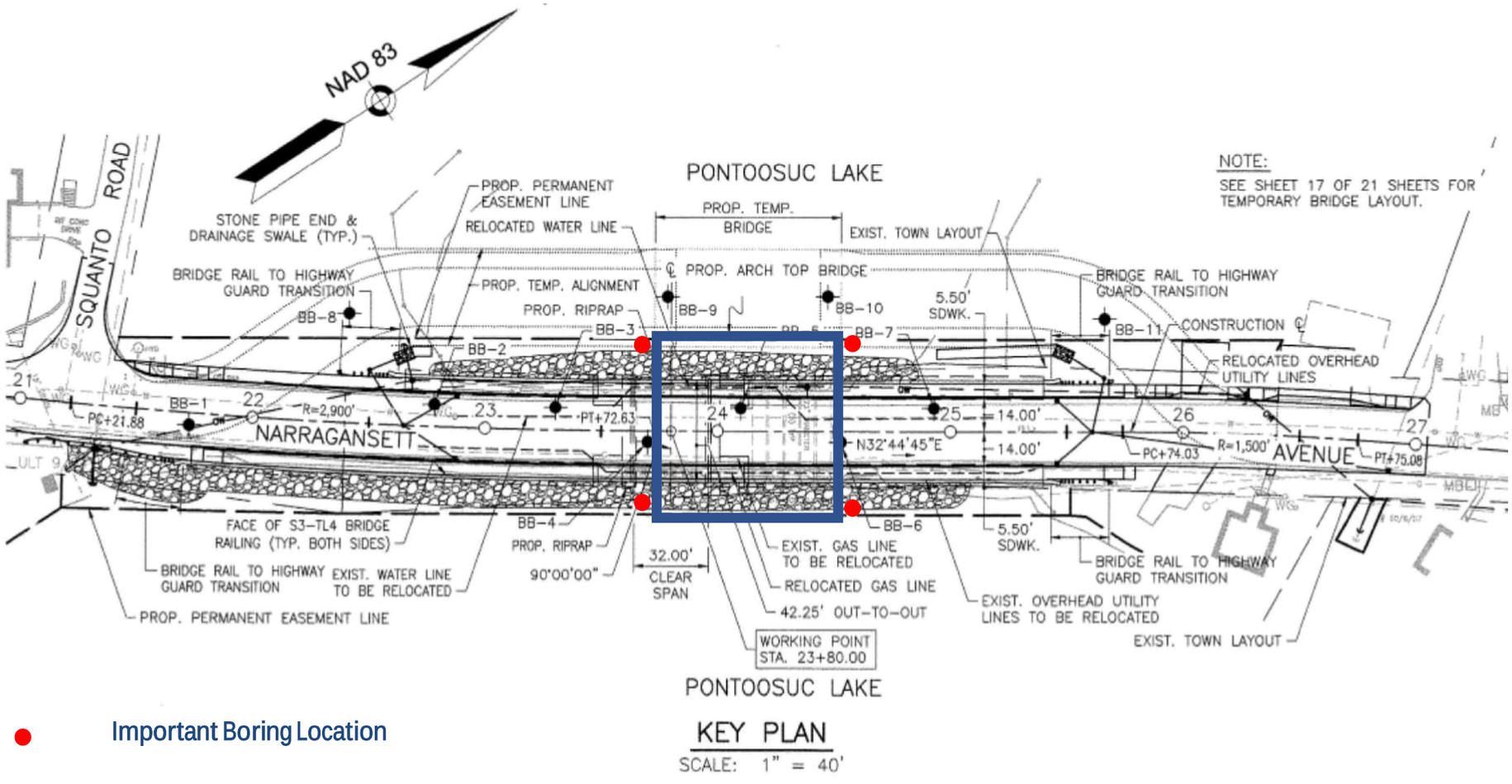
Foundation Discussion

Geotechnical Information Required

- Early Information = Most Efficient Design
- Include Boring Elevation
- Recommended Soil Bearing Capacity
  - Factored Bearing Resistance (LRFD)
  - Allowable Bearing Capacity (ASD/LFD)
  - Must Specify if Bearing is Net or Gross
- Bearing Strata/Water Table Elevation
- Recommendation of Foundation Type
- Pile Type and Axial/Lateral Capacity (if applicable)
- Structural Settlement Tolerances 1” Total and 1/2” Differential



Geotechnical Information Required



● Important Boring Location

EXPRESS™ Foundations

A precast foundation system that blends the speed of precast with the economy of cast-in-place

EXPRESS® Foundations

Speed of precast. Economy of cast-in-place.

STEEL EXPRESS® Foundations

Efficiencies of steel. Economy of cast-in-place.

CONTECH® ENGINEERED SOLUTIONS

STEEL EXPRESS™ Foundations

CONTECH ENGINEERED SOLUTIONS

CIP FILL PROCESS

Blount County Cleveland Project

- 2022- Cleveland, AL (Installation December 8, 2022)- ALBC on Steel Express Foundations

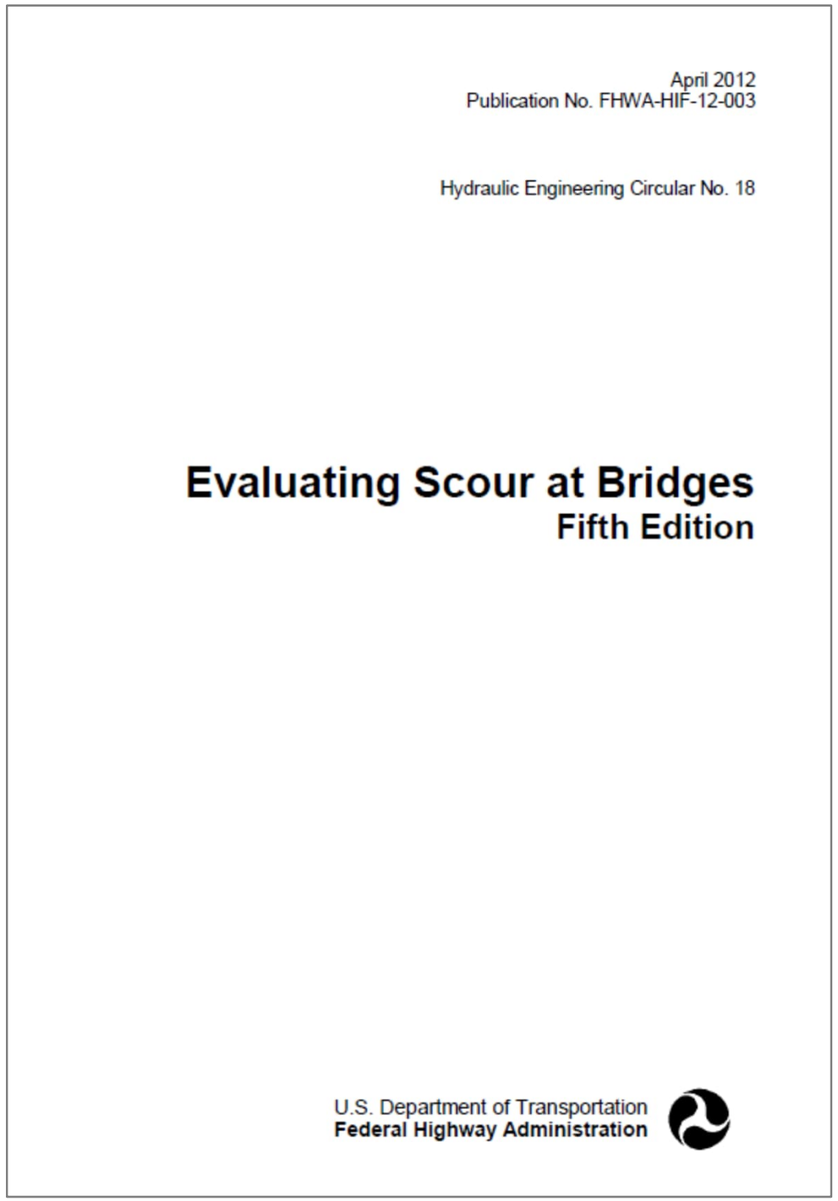
  Structure #34: 16’ span x 4’-3” rise, 40 LF

Blount County Cleveland Project

- 2022- Cleveland, AL: ALBC on Steel Express Foundations, 16’-0” span x 4’-3” rise, 40LF

Scour Considerations

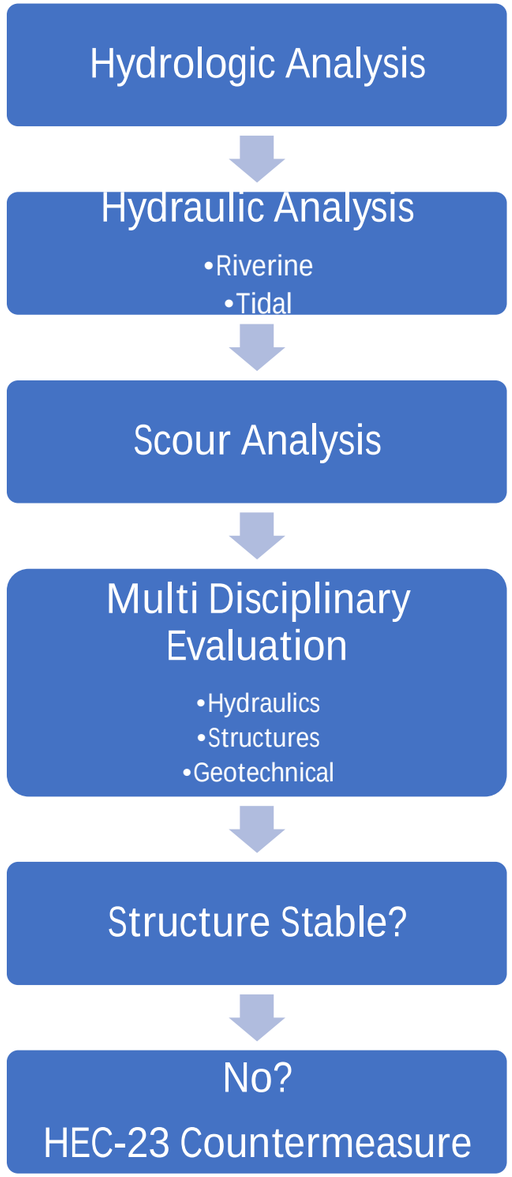
Scour


April 2012
Publication No. FHWA-HIF-12-003

Hydraulic Engineering Circular No. 18

Evaluating Scour at Bridges
Fifth Edition

U.S. Department of Transportation
Federal Highway Administration



HEC No. 18

- Evaluate Scour Potential

HEC No.23

- Design Guideline 8: Articulating Concrete Block Systems
- Design Guideline 19: Concrete Armor Units

ArmorFlex
Articulating Concrete Block System

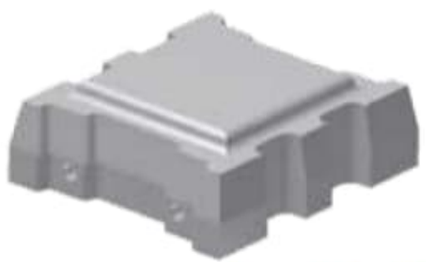
INVERT PROTECTION

SCOUR PROTECTION

DAM OVERTOPPING

CHANNEL LINING

ARMORTEC
Erosion Control Solutions



Closed-Cell Block

Open-Cell Block

CONTECH ENGINEERED SOLUTIONS

Armortec Hard Armor Erosion Systems

PERMANENT

PROVEN

ABILITY TO VEGETATE

EFFICIENT

ARMORTEC
Erosion Control Solutions

CONTECH
ENGINEERED SOLUTIONS

Larkwood Drive Road and Slope Protection

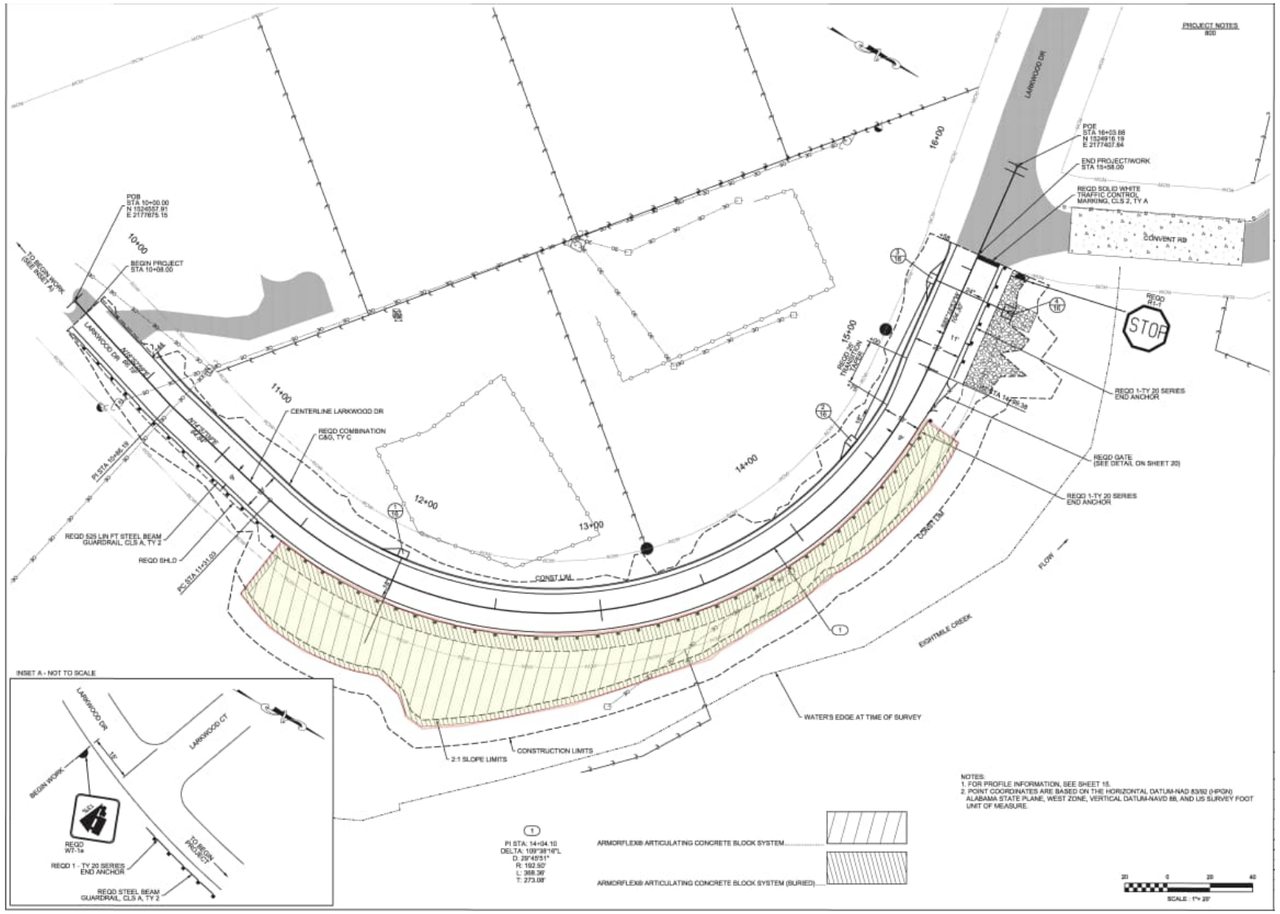
Cullman, AL

Larkwood Drive Slope Protection

Cullman, AL

Larkwood Drive Slope Protection

Cullman, AL



CONTECH ENGINEERED SOLUTIONS

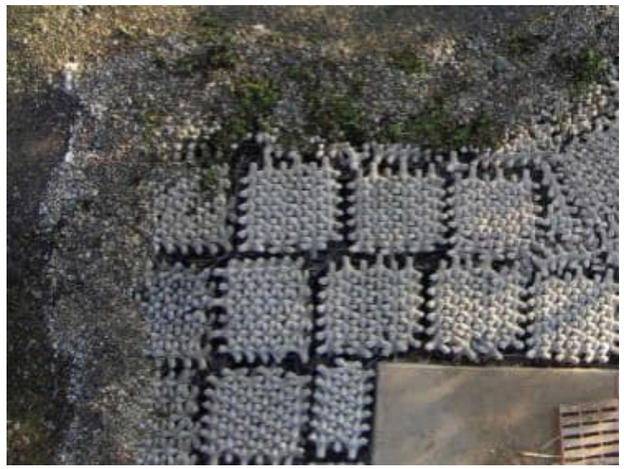
Larkwood Drive Slope Protection

Cullman, AL

CONTECH ENGINEERED SOLUTIONS

A-Jacks
Concrete Armor Units

SCOUR PROTECTION



PIER SCOUR PROTECTION

TOE STABLIZATION

OUTLET PROTECTION

ARMORTEC™
Erosion Control Solutions

A-Jacks Unit

CONTECH® ENGINEERED SOLUTIONS

Working with Contech

DYOB - Building Blocks to a Successful Project

Solution Development | Design Support | Installation

CONTECH® DESIGNCENTER

DYOB® | Structural Plate

Design Your Own Structural Plate solutions.

Current product options include: Aluminum Box Culvert, BridgeCor®

DYOB® | Precast

Design Your Own Precast solutions.

Current product options include: CON/SPAN® & BEBO®

DYOB® | Modular Rolled Girder

Design Your Own Modular Rolled Girder solutions.

Current product options include: Big R EXPRESS Modular Rolled Girder

DYOB® | Truss

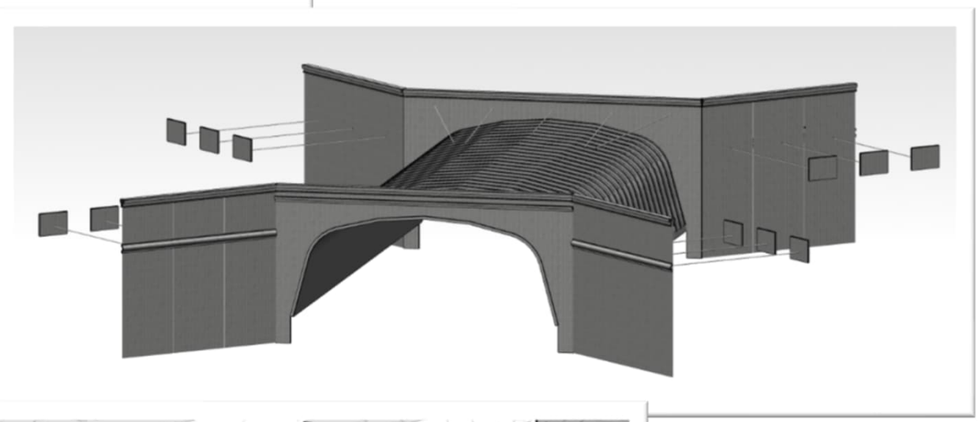
Design Your Own Truss solutions.

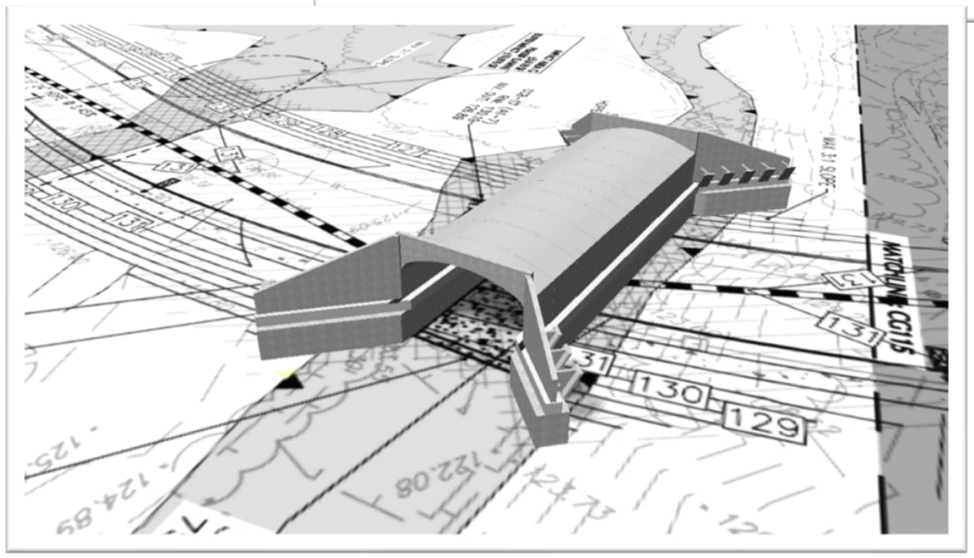
Current product options include: Continental Bridge® & Steadfast Bridges®

CONTECH®
DESIGNCENTER

Contech Design Center | Design Made Easy

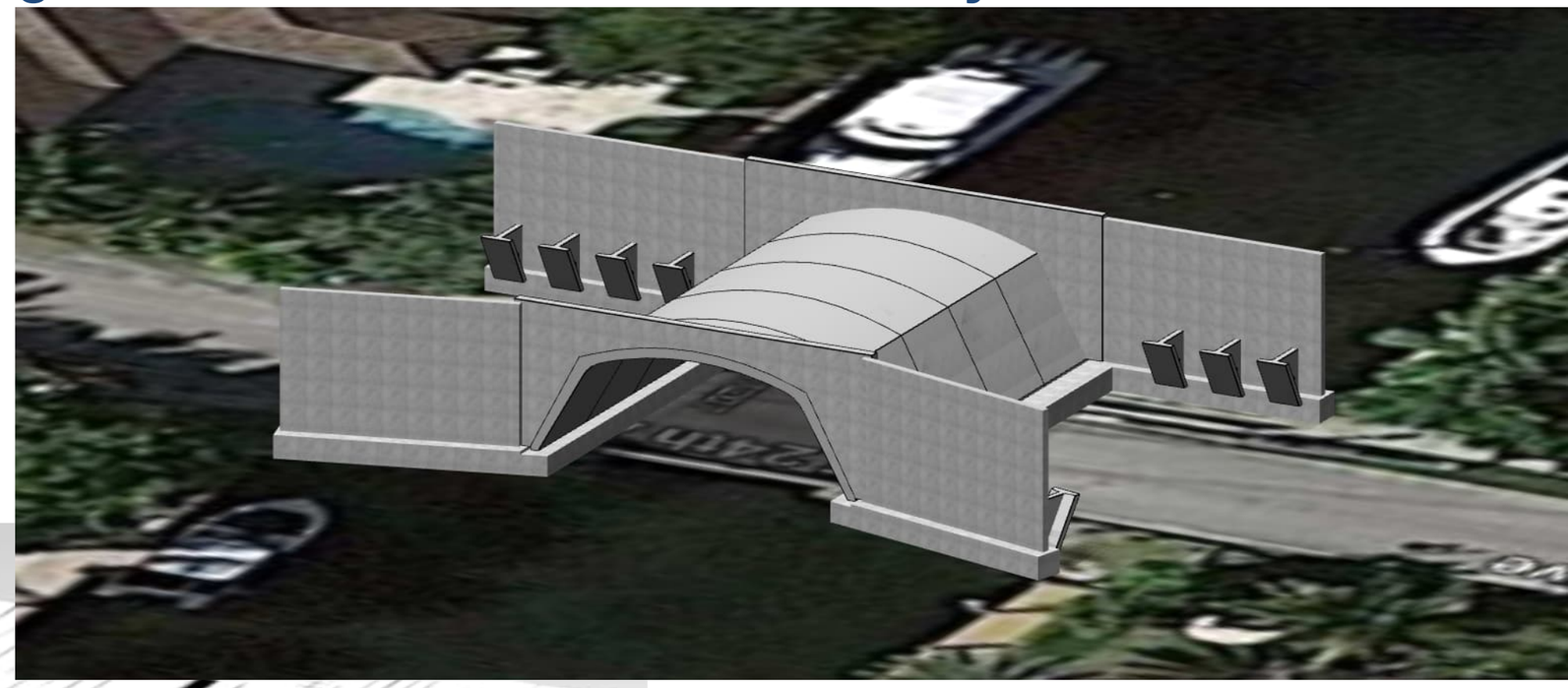
Save time by using our interactive design tools that enable you to create customized, project-specific drawings and support documentation for estimates and project meetings.

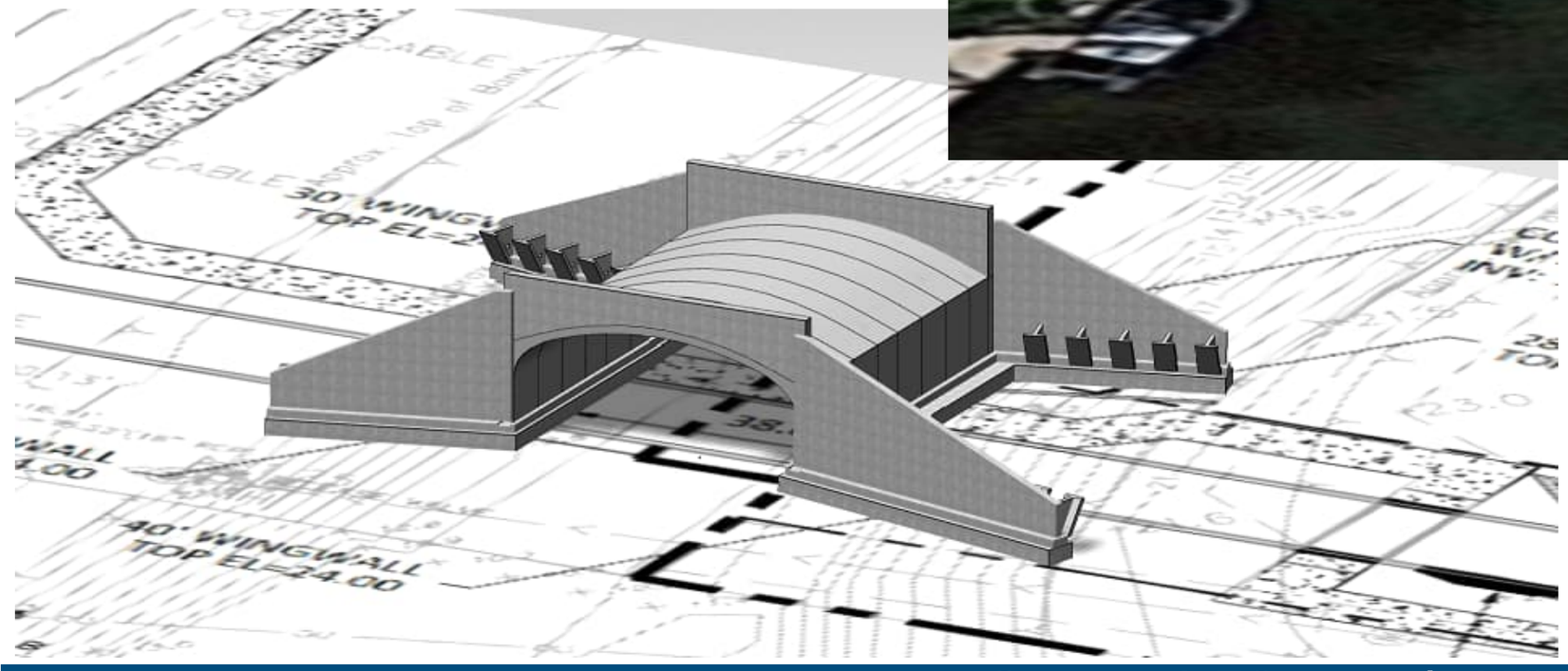




DYOB - Building Blocks to a Successful Project

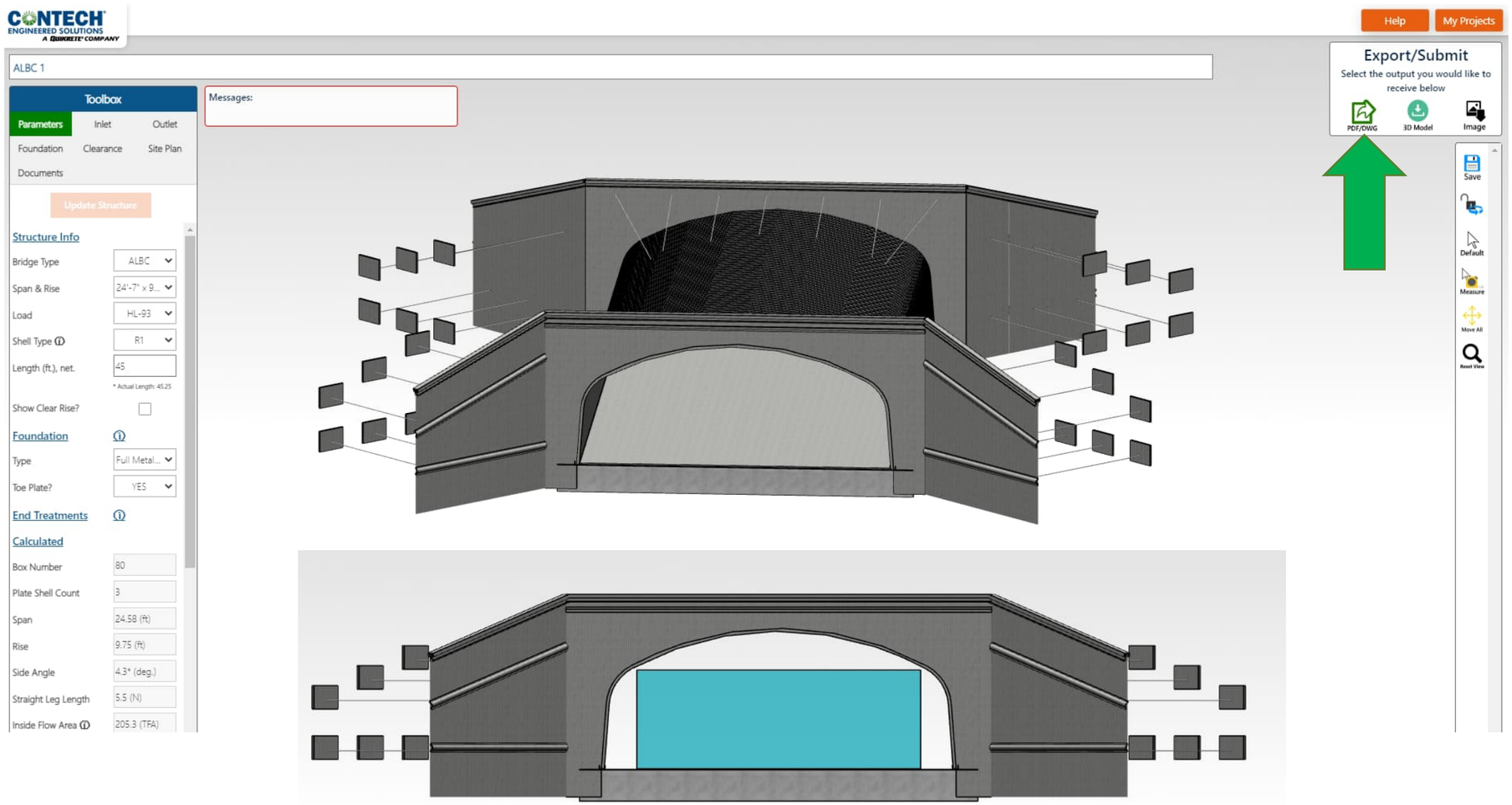
Solution Development

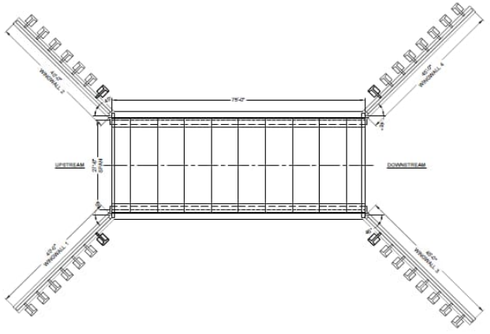




Contech Design Center Interface

- Model features
  - Clear rise
  - Calculated values
  - Foundation options
  - Clearance box
- Site Plan Demo
- Export/Submit
- Save functionality
- Documents
- Deliverables
  - PDF
  - Image
  - BIM Model





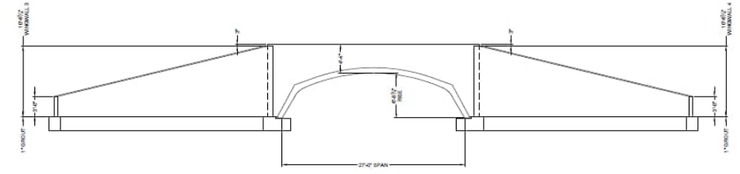
BRIDGE PLAN

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 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		8/17/2021
DESIGNED: DYOB	DRAWN: DYOB	
CHECKED: DYOB	APPROVED: DYOB	
SHEET NO: 1 OF 5		



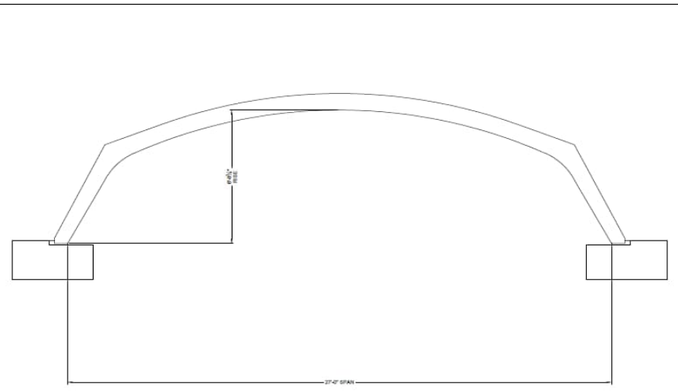
DOWNSTREAM END ELEVATION

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 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		8/17/2021
DESIGNED: DYOB	DRAWN: DYOB	
CHECKED: DYOB	APPROVED: DYOB	
SHEET NO: 4 OF 5		



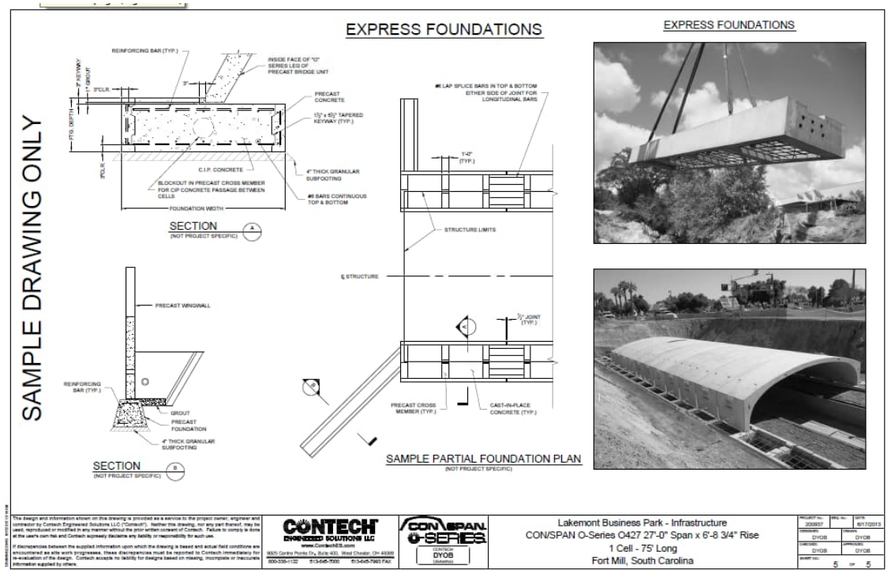
CROSS SECTION

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 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		8/17/2021
DESIGNED: DYOB	DRAWN: DYOB	
CHECKED: DYOB	APPROVED: DYOB	
SHEET NO: 2 OF 5		



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 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		8/17/2021
DESIGNED: DYOB	DRAWN: DYOB	
CHECKED: DYOB	APPROVED: DYOB	
SHEET NO: 5 OF 5		

DYOB® at www.conteches.com

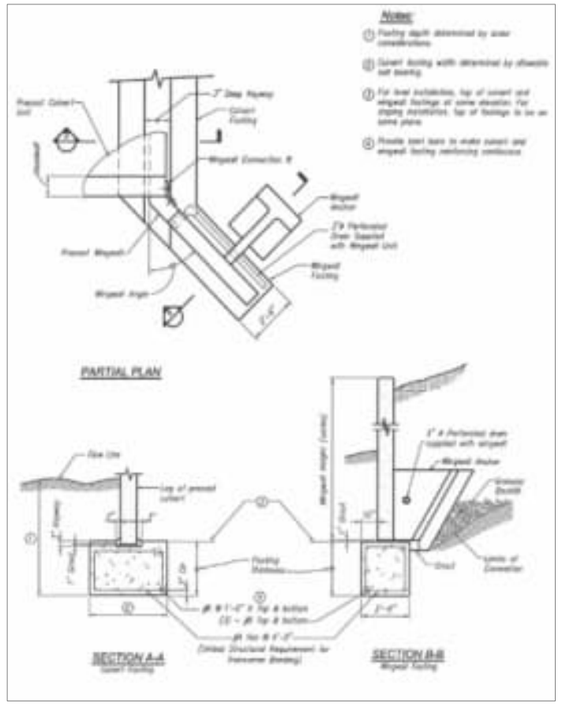
CONTECH ENGINEERED SOLUTIONS

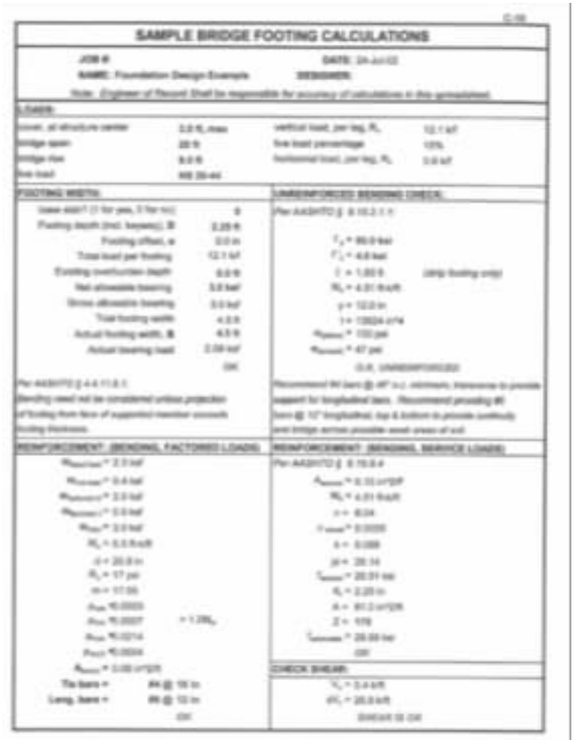
Photo Site Simulation

Building Blocks to a Successful Project

Solution Development | **Design Support** | Installation

- Structure selection
- Engineering Estimates
- Signed and sealed drawings
  - Contract drawings
  - Foundation design





CONTECH ENGINEERED SOLUTIONS

Building Blocks to a Successful Project

Solution Development | *Design Support* | **Installation**

- Attending Pre-Bid Meetings
- Holding Preconstruction Meeting
- Technical Support Available (Field Consultant on all Precast Installations)

Questions?

CROSSINGS. CULVERTS. BRIDGES. CONTECH.

Jennifer McIntire, P.E.
(205) 306-3277
Jennifer.Mcintire@ContechES.com