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
Clear Span Bridges
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

Summary from Federal Highway Administration:
“This rulemaking will provide greater flexibility to States to use proprietary or patented materials...”
Contech Structural Plate

BridgeCor / MULTI-PLATE

Aluminum Structural Plate
Soil Structure Interaction
PLATE CORRUGATIONS & THICKNESS – STRUCTURAL VERSATILITY

<table>
<thead>
<tr>
<th>STEEL</th>
<th>CMP Gages</th>
<th>Structural Plate Gages</th>
<th>Structural Plate Gages</th>
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<tbody>
<tr>
<td>16.064</td>
<td>14.079</td>
<td>0.111</td>
<td>0.188</td>
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<tr>
<td>14.064</td>
<td>14.079</td>
<td>0.140</td>
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<td>0.380</td>
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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

Recommended Environmental Ranges

**STEEL**

6.0 ≤ pH ≤ 10.0
Resistivity > 2,500 ohm-cm

**ALUMINUM**

4.0 ≤ pH ≤ 9.0
Resistivity > 500 ohm-cm

Abrasian Levels

<table>
<thead>
<tr>
<th>Abrasion Level</th>
<th>Abrasion Condition</th>
<th>Bed Load</th>
<th>Flow Velocity (fps)</th>
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<tbody>
<tr>
<td>1</td>
<td>Non-Abrasive</td>
<td>None</td>
<td>Minimal</td>
</tr>
<tr>
<td>2</td>
<td>Low Abrasion</td>
<td>Minor</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>3</td>
<td>Moderate Abrasion</td>
<td>Moderate</td>
<td>5 - 15</td>
</tr>
<tr>
<td>4</td>
<td>Severe Abrasion</td>
<td>Heavy</td>
<td>&gt; 15</td>
</tr>
</tbody>
</table>
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
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

Distance between footings is maximized
**CANDE**, a Culvert Analysis and Design computer program for the design of a soil structure system.

**History of CANDE development**
- Before 1970’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)
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

Bridge Type Comparison Chart

<table>
<thead>
<tr>
<th>Traffic Disruption*</th>
<th>CONVENTIONAL</th>
<th>BURIED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Time*</td>
<td>2 YEARS</td>
<td>5 MONTHS</td>
</tr>
<tr>
<td>Initial Cost*</td>
<td>$2 M</td>
<td>$5.5 M</td>
</tr>
<tr>
<td>Typical Maintenance*</td>
<td>Deck Overlay every 15-18 years, Total Deck Replacement every 30-35 years.</td>
<td>Periodic Asphalt replacement.</td>
</tr>
</tbody>
</table>

*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
CON/SPAN O-Series- Bridge Replacement

Madison, AL
Blake Bottom Road
Madison, AL
Blake Bottom Road
Truss Bridges – Pedestrian and Vehicular

© 2021 Contech Engineered Solutions LLC
• Connector® Style Pedestrian Truss
• Weathering Steel Finish
• Horizontal Safety Rail System

**DESIGNED IN ACCORDANCE WITH AASHTO LRFD**

<table>
<thead>
<tr>
<th>Clear Width</th>
<th>6’</th>
<th>8’</th>
<th>10’</th>
<th>12’</th>
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<tbody>
<tr>
<td>Length</td>
<td>40’</td>
<td>50’</td>
<td>60’</td>
<td>70’</td>
</tr>
<tr>
<td></td>
<td>110’</td>
<td>120’</td>
<td>130’</td>
<td>140’</td>
</tr>
<tr>
<td></td>
<td>180’</td>
<td><strong>6’ width only available with 40’ – 80’ lengths</strong></td>
<td></td>
<td></td>
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</table>

Deck:  
- Pressure Treated Wood
- Cost-in-Place Concrete
  (by Others)

**1. SELECT**

**2. SPECIFY**

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

**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*

#### RAIL
- Cable
- Mesh Panels
- Safety Rail/Wood Rub Rail
- Vertical Picket/Pipe Handrail

*Exclusive 35-year galvanized rust free warranty for vehicular truss.
Freight Economy / Simple Installation
Bessemer Pedestrian Bridge over Highway 150
Bessemer Pedestrian Bridge over Highway 150
Vehicular Truss Bridges
Big R Modular 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
A precast foundation system that blends the speed of precast with the economy of cast-in-place

STEEL EXPRESS™ Foundations

[Image of a metal structure being installed in the ground with construction equipment nearby.]
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

- 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

Closed-Cell Block

Open-Cell Block
Armortec Hard Armor Erosion Systems

**PERMANENT**

**PROVEN**

**ABILITY TO VEGETATE**

**EFFICIENT**
Larkwood Drive Road and Slope Protection
Cullman, AL
Larkwood Drive Slope Protection

Cullman, AL
Larkwood Drive Slope Protection
Cullman, AL
Larkwood Drive Slope Protection
Cullman, AL
A-Jacks
Concrete Armor Units

SCOUR PROTECTION
PIER SCOUR PROTECTION
TOE STABILIZATION
OUTLET PROTECTION

A-Jacks Unit
Working with Contech
DYOB - Building Blocks to a Successful Project

Solution Development

Design Support

Installation

 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®

www.ContechES.com/DYOB
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

www.ContechES.com/DYOB
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
Photo Site Simulation
Building Blocks to a Successful Project

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

Solution Development

Design Support

Installation
Building Blocks to a Successful Project

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

CROSSINGS. CULVERTS. BRIDGES. CONTECH.

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