Good afternoon and welcome to the CONTECH Engineered Solutions Bridge Presentation. Thanks for taking time out of your busy schedules. We appreciate the opportunity to be here today. We certainly respect your time and to make sure we finish on time we’re going to go ahead and get started as we have a pretty full agenda. Today’s presentation should take about 50 minutes leaving some time at the end for questions. However, I encourage you to ask questions as we go also.

I’d like to thank xxxxxxx for setting this up today. I have a small “thank you” for his efforts (small gift is appropriate).

- Introduce Yourself
- Introduce any CONTECH associates travelling with you
- Housekeeping Items
  - Sign up sheets we would like everyone sign up so we can make sure you are in our database for any future technical updates we may send out (don’t just focus on those needing PDH’s – everyone needs to sign up so as to continue to build your database)
Next Slide
Before we get into our Bridge Presentation, I’d like to take a moment and give you a quick overview of CONTECH’s comprehensive portfolio. From Drainage to Stormwater, Bridges and Hard Armor to Retaining Walls – we have multi-disciplined experience and extensive technical support to assist you in your design.

Our Portfolio includes:
- Stormwater management systems from detention / retention to treatment devices including hydrodynamic separator’s and filtration system – the entire treatment train.
- Full range of pipe products from CMP to PVC. In fact we even have the most advanced drainage system in the market which is a steel reinforced polyethylene pipe. The name of the product is Duromaxx, but again that is a presentation for a different day.
- Hard Armor systems including Armorflex (articulated concrete blocks) and AJAX (a concrete energy dissipator) as well as a complete portfolio of erosion control products.
- Earth retention systems including Keystone and Keysteel Retaining Wall systems.

Next Slide
So let’s review today’s agenda. We will start by summarizing our existing bridge portfolio. Then we will introduce Contech’s recent innovative bridge developments which is really the heart and soul of today’s presentation. And as always we are going to discuss how Contech can support your efforts as you navigate through a project.

**We** like to think of a project as having three phases:

- Planning and Solution Development is the conceptual stage where we assist in evaluating options from structure selection to preliminary engineer’s estimates.
- Once an option is chosen, we then move to Design Support. We can then provide as much, or as little design support as needed.
- Lastly, we will be there to support the contractor during the installation.

By the end of today’s presentation, you will have a better understanding of how our Project Consultant’s will use our innovative bridge systems to support your projects as you search for better more cost effective solutions for your clients.

Next Slide
At first glance, you may be overwhelmed with all of our bridge options. When do I use Plate…When do I use Truss? The type of system will depend on your specific project needs, one place to start is working by with your local Project Consultant, who can help evaluate your site and assist in structure selection.

Here are the span ranges for each bridge type:
- Plate ranges from 5 ft. to 52 ft.
- Precast from 12 to 102 ft.
- Vehicular trusses go up to 150’ and
- Pedestrian trusses will take you to 250 ft using a conventional truss design. For spans longer than 250’, we use a cable stayed design.

These are all single spans – if you have a larger flow or the need a larger span, you can use any of our structures in multiple span arrangements.

Also, notice that we have a lot of overlap with our bridges. Which is why I suggest you work with your local Project Consultant to help identify the best fit for your project.

Next Slide
Our CON/SPAN and BEBO precast bridges have set the standard for modular buried bridge systems. Modular concrete bridges require less material than cast-in-place structures, for a lower initial cost. Additionally, off-site fabrication ensures tight adherence to specs, less on-site work, and a high level of quality control.

Installation is fast, usually within days, compared to weeks or even months required for a cast-in-place bridge minimizing road closures and detours.

Additionally, buried bridges, both plate and precast, eliminate the costly maintenance and deck icing associated with conventional bridge decks. These systems ensure a long life cycle with virtually no maintenance cost.

**BULLETS: (MAKE SURE THESE POINTS ARE DELIVERED)**
- Span range
- Strength and durability
- Quality control/plant production
- Speed of installation
- Reduced maintenance

Next Slide
As with plate we have shape options designed to address particular site challenges. All handle hydraulics well. Additionally:

- Arch-box is The Con/span shape and is ideally suited to vehicular or pedestrian underpasses
- Elliptical-arch is our E-Series BEBO and handles high fills
- Circular-arch is our C-Series BEBO and is well suited for high live load applications such as rail and aircraft and the...
- Top-arch is our T-Series BEBO and is ideal for applications needing a Long span and low rise such as wetland crossings

All of our precast bridges utilize precast headwalls and wingwalls for a complete set in place system.

Next Slide
The third industry trend that we would like to discuss is the FHWA Accelerated Bridge Program.
The Goal of the ABC program is to use innovative means and methods to address our nations infrastructure needs.

Our goal is to ensure that Our innovative Bridge systems:
- Are Built off site
- Can Reduce onsite construction time
- And minimize Mobility impacts

And that our Systems are in alignment with the Federal Highway prefabricated bridge elements and systems goals.

Next Slide
In March of 2009, FHWA published “Connection Details for Prefabricated Bridge Elements and Systems”. Their goal was to promote the use of prefabricated bridge elements and systems and described the connections associated with them. This is a comprehensive document describing a variety of systems and connection methods. CON/SPAN is described by name as an example with several photos and drawings of the systems. Here is a sample from page 2-181. Does this look familiar? You receive a very similar drawing when you use our DYOB tool.

To quote the abstract, “Prefabricated elements of a bridge produced off-site can be assembled quickly, and can reduce design time and cost, minimize forming, minimize lane closure time and/or possibly eliminate the need for a temporary bridge.”

I think that pretty well sums up how FHWA views these systems and why CONTECH continues to strive to develop ideas and innovations to meet FHWA goals and solve project challenges.
Thanks John,
John did a really nice job giving you a comprehensive overview of our extensive civil infrastructure portfolio. He discussed substantial history as well as our... He discussed where we’ve been and where we are. What I’d like to do is discuss where we are HEADED.

We have three innovations that will change the way you design and specify buried bridges.

1. **CON/SPAN Optimized Series** is the most efficient three-sided structure in the industry. It features over 20% concrete reduction compared to our original CON/SPAN shape and over 40% compared to traditional three-sided flat tops.

2. **BridgeCor** offers the longest deep corrugation plate lay length the industry. (Feedback from Brian)

3. **Express Foundations** is a perfect blend of precast concrete speed and efficiency and the economy of cast in place

Taking a closer look at each, we will start with...

Next Slide
The CON/SPAN Optimized Series.

Quick piece of housekeeping. The original CON/SPAN shape is still in our portfolio, but will now be known as the B-Series for Basic.

The new optimized the shape will be known as the O-Series.

Next Slide
CON/SPAN has been designed by, specified by and installed by more DOT’s than any other three sided structure. CON/SPAN has been the most successful brand in the industry, so why optimize?

I think we can best answer that question by first going back to the beginning, in the early 1960’s, the precast arch was developed. In the 1970’s, the three-sided flat top was developed. These were two very good technologies on their own. In the early 1980’s The CON/SPAN shape blended the hydraulic efficiency of the box and the structural capacity. But CONTECH didn’t stop there, in 1989 the system was complete with the first precast headwalls and wingwalls. The system gained in usage through the 1990’s to the point that the Corps of Engineers integrated CON/SPAN into HEC-RAS by name. From 1995 to 2005 spans increased from 36’ to 60’. Throughout this time CONTECH’s engineer’s worked on the design economy of the existing shape by improving concrete design strengths and steel efficiencies.

Hence...

Next slide....
The Optimized shape. As the name implies, the shape has been optimized to increase the span and waterway area of the basic series. Just to clarify, the basic elements of the “bridge in a day” system has not changed. We still have precast headwalls and wingwalls.

Looking at the drawing you will notice that the basic arched top is retained while gaining the span and waterway increases by rotating the legs outward. This simple manipulation mobilizes more of the arch action compared to the Basic Series. This reduces the stress in the haunch which results in significantly thinner concrete sections and reduced steel areas.

Next slide...
The CON/SPAN Optimized Series.

Quick piece of housekeeping. The original CON/SPAN shape is still in our portfolio, but will now be known as the B-Series for Basic.

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Next Slide
O-Series Moment Reduction

- Moment Diagram for HS25 Live Load, 2'-0" Cover
- O-Series results in:
  - Maximum positive and negative moment reduced
  - Required A1 and A3 steel areas reduced
Here is another way to understand it. We started with the structural capacity of the arch shape in the 60’s and the hydraulic efficiency of the flat top shape in the 70’s. These shapes were then blended to form the CON/SPAN in the 80’s.

(This would be a good slide to get up into the screen or utilize a laser pointer and walk through our advancements)

I said it was a simple manipulation on the last slide, but we are excited to say we now can offer the most optimized shape in the industry. It may sound simple, but it took us 32 years to get here.

Next slide.....
So where does the new optimized shape fit? Everywhere.

You can use the O-Series anywhere you would have used the CON/SPAN shape in the past, just more efficiently.

Remember, the optimization results in a 20% concrete saving.

Next slide.....
Design Challenges

**CLEAR SPANNING**
- Clear span required = 25’
- Required rise = 4’ min / 10’ max
- Structure length = 24’
- No hydraulic ramps, clear span only

**HYDRAULICS**
- Clear span required = 25’
- Waterway required = 190 sf
- Structure length = 72’
- Roadway to stream invert = 13’

<table>
<thead>
<tr>
<th>Design Challenges</th>
<th>O-Series</th>
<th>B-Series</th>
<th>% Diff</th>
<th>O-Series</th>
<th>B-Series</th>
<th>% Diff</th>
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<td>-</td>
<td></td>
<td>0327</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Span (ft)</td>
<td>25</td>
<td>28</td>
<td>-11%</td>
<td>27</td>
<td>28</td>
<td>-4%</td>
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<tr>
<td>Rise (ft)</td>
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<td>6</td>
<td>-17%</td>
<td>9.4</td>
<td>8</td>
<td>18%</td>
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<tr>
<td>W/W Area (sf)</td>
<td>-</td>
<td>-</td>
<td></td>
<td>194</td>
<td>195</td>
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<tr>
<td>Concrete (tons/ft)</td>
<td>1.96</td>
<td>2.84</td>
<td>-31%</td>
<td>2.46</td>
<td>3.14</td>
<td>-22%</td>
</tr>
<tr>
<td>Steel (lbs/ft)</td>
<td>108</td>
<td>211</td>
<td>-49%</td>
<td>137</td>
<td>227</td>
<td>-40%</td>
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<tr>
<td>Piece lay length (ft)</td>
<td>8</td>
<td>6</td>
<td>33%</td>
<td>8</td>
<td>6</td>
<td>33%</td>
</tr>
<tr>
<td>Trucks loads (total pieces)</td>
<td>3</td>
<td>4</td>
<td>-25%</td>
<td>9</td>
<td>12</td>
<td>-25%</td>
</tr>
<tr>
<td>Weight (tons/unit)</td>
<td>15.68</td>
<td>17.04</td>
<td>-8%</td>
<td>21.12</td>
<td>18.84</td>
<td>12%</td>
</tr>
</tbody>
</table>

www.ContechES.com
So let’s talk about how we can work with you. The best time to get us involved is in the early stages of the project. Your local Project Consultant can meet with you to gather some preliminary information about your site. We have a Project Data Worksheet that helps us organize details that we will use to begin developing options.

As a result of the Optimized Series, we now have 95 spans versus 12 for the Basic Series.

With preliminary info on the waterway need, roadway profiles, wetlands limits, etc…. We can begin to layout the structure.

Next slide....
Why have contractors historically used Precast Foundations?
• Speed
• Tight Working Conditions
• Dewatering Issues

Traditionally precast foundations for buried bridges were simply precast versions of the poured in place foundation design. These tend to be difficult to handle and transport due to their weight and are costly compared to field poured concrete.

Making Precast foundations a viable option for most or all projects has been a CONTECH goal for over 10 years.

The Express Foundation System blends the speed of precast concrete with the economy of poured in place concrete.

Next slide...
Let’s take a quick look at the evolution of spread foundations for buried bridges. The conventional approach is to pour everything in place.

- The photo in the upper left shows the typical cast in place foundation. This type requires extensive formwork, labor intensive rebar placement and costly concrete finish work. Not to mention the potential for formwork to be washed out due to weather. What we like about poured in place foundations is that they provide structural continuity.
- First generation precast foundations are full depth, full width concrete sections requiring a secondary means of establishing continuity. Typically this requires some type of strap plate, ship-lap joint, or closure pour. The closure pour option in the lower left is the only precast system to date that establishes full continuity.
- Until now....

Next Slide
EXPRESS™ Foundations

A precast foundation system that blends the speed of precast with the economy of cast-in-place
Our Express foundation system combines the speed of precast with the economy of cast-in-place. The precast basically provides a structural shell for the cast in place component (point out parts and pieces). This results in:

- Faster installation which....
- Reduces potential for stream impacts and
- Exposure to high or fluctuating water tables
- Minimizes field formwork and reinforcing steel placement

All of which results in a precast foundation much more viable and more cost-effective than traditional precast foundations.

Why do we make a big deal out of continuous foundations? Think about some of the problems associated with precast box culverts:

- Differential settlement which leads to a number of issues like:
  - Joint separation
  - Loss of fill around structure
  - End treatment separation
  - Stress cracking in units due to differential loading.

The Express systems provides continuity eliminating these issues.
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  • Loss of fill around structure
  • End treatment separation
  • Stress cracking in units due to differential loading.

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Next slide....
So let’s look at the typical Construction Process:

- Excavate and prepare foundation subgrade
- Unload and place precast elements
- Place minimal reinforcing at joints to provide foundation continuity
- Set precast bridge units, headwalls and wingwalls
- Pour cast-in-place concrete
- Seal joints, grout wingwalls and backfill.

Remember the continuity issues with other precast footings? The steel placed across the joints coupled with the cast in place concrete pour, provides the foundation continuity in the Express system.

So again what is the benefit?

- The major structural element, the shell, is manufactured in a controlled environment.
- All components of the bridge are designed by and provided by a
single source.
• The contractor has reduce exposure to the elements and potential delays.
• Reduced section weights allow for longer precast sections eliminating joints.
• Trapezoidal wingwall foundation reduces foundation concrete quantities
• Keyway grouting eliminated.

• Next slide...

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• Seal joints and backfill

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• Next slide...
Near East Greenwich, the 57-year-old highway bridge was in need of replacement. This project was funded through the “Highways for Life” program by the Federal Highway Administration (FHWA), which advances highway infrastructure service life through use of innovation to meet Accelerated Bridge Construction (ABC) goals when building safe roads and bridges. For the Rhode Island Department of Transportation (RIDOT), the Frenchtown Brook Bridge project was allotted just 65 days for the entire demolition through project completion. Minimizing traffic disruption was critical to the success of this project. RIDOT wanted a low maintenance, economical and durable concrete bridge that would utilize precast elements and be installed in days rather than months.
Gordon Archibald and Aetna Bridge Company, the project’s engineer and contractor, worked with Contech Engineered Solutions in order to determine the best, ABC solution for this project to directly align with the FHWA innovation goals. Contech’s precast CON/SPAN B-Series Bridge System with EXPRESS Foundations, offered the most advantages, including the speed of precast, the strength of arch action, low maintenance and economic efficiency. Further, the arch shape improved aesthetics.

In all, 25 CON/SPAN arches, headwalls and precast wingwalls were installed and placed on 16 EXPRESS Foundations that were integrated together to provide continuity throughout the structure length. EXPRESS Foundations lived up to its name. The contractor completed all project phases, from demolition to installation of the new structure and roadway reopening, in 33 days — just half of the allotted project time!

With the speed of installation on this project and completion one month early, the contractor was even awarded $90,000, the maximum possible amount from RIDOT’s $3,000-per-day incentive clause in the contract.

The Frenchtown Brook Bridge replacement project was one of the first of its kind in Rhode Island, since this project received nearly one-third of the contract costs from federal accelerated construction funding through the “Highways for LIFE” program.
Owner:
Rhode Island DOT

Engineer:
Gordon Archibald Inc.

Contractor:
Aetna Bridge Company

Technical Description:
EXPRESS™ Foundations: 16 units
CON/SPAN® B-Series Bridge System: 28’ Span x 7’ Rise x 150’ Length

Installation Date: August 2012

Near East Greenwich, the 57-year-old highway bridge was in need of replacement. This project was funded through the “Highways for Life” program by the Federal Highway Administration (FHWA), which advances highway infrastructure service life through use of innovation to meet Accelerated Bridge Construction (ABC) goals when building safe roads and bridges. For the Rhode Island Department of Transportation (RIDOT), the Frenchtown Brook Bridge project was allotted just 65 days for the entire demolition through project completion.

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Why have contractors historically used Precast Foundations?
• Speed
• Tight Working Conditions
• Dewatering Issues

Traditionally precast foundations for buried bridges were simply precast versions of the poured in place foundation design. These tend to be difficult to handle and transport due to their weight and are costly compared to field poured concrete.

Making Precast foundations a viable option for most or all projects has been a CONTECH goal for over 10 years.

The Express Foundation System blends the speed of precast concrete with the economy of poured in place concrete.

Next slide...
Section 723 – REINFORCED CONCRETE
THREE SIDED STRUCTURES

723.09

723.09 Footings

All footings shall be given a smooth float finish. Footing concrete shall reach a
compressive strength of 2,000 psi or flexural strength in accordance with 702.24(c)
prior to placement of the structure sections or wingwalls. The surface shall not vary
more than 1/4 in. in 10 ft when tested with 10 ft straightedge.

Where a precast footing is utilized, a 4 in. layer of coarse aggregate No. 53 in
accordance with 301 shall be placed under the full width of the footing. Precast
footings shall be made into a continuous strip footing by the use of closure pours
between the precast units. Closure pours shall be as detailed in the working drawings
and shall be designed to accommodate the design loads.
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Next slide...
<table>
<thead>
<tr>
<th>Arch (single radius)</th>
<th>6' x 1'10&quot; to 54'-4&quot; x 27'-2&quot;</th>
<th>Low clearance, large waterway opening. Aesthetic shapes and open natural bottoms for environmentally-friendly crossings.</th>
<th>x</th>
<th>BridgeCor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch (2-radii)</td>
<td>18'-5&quot; x 8'-4&quot; to 50'-7&quot; x 19'-11&quot;</td>
<td>Low clearance, large waterway opening. Aesthetic shapes and open natural bottoms for environmentally-friendly crossings.</td>
<td>x</td>
<td>BridgeCor</td>
</tr>
<tr>
<td>Low-Profile Arch*</td>
<td>20'-1&quot; x 7'-6&quot; to 45'-0&quot; x 18'-8&quot;</td>
<td>Culverts, storm sewers, low headroom and large opening. Bridge structures, stream enclosures. Aesthetic shapes and open natural bottoms for environmentally-friendly crossings.</td>
<td>x</td>
<td>BridgeCor</td>
</tr>
<tr>
<td>High-Profile *</td>
<td>20'-1&quot; x 9'-1&quot; to 35'-6&quot; x 20'-0&quot;</td>
<td>Culverts, storm sewers, bridges. Higher rise, large area opening. Open natural bottoms for environmentally-friendly crossings.</td>
<td>x</td>
<td>BridgeCor</td>
</tr>
<tr>
<td>Pear-Arch</td>
<td>20'-4&quot; x 25'-10&quot; to 20'-4&quot; x 25'-10&quot;</td>
<td>Railroad underpasses or large clearance areas.</td>
<td>x</td>
<td>BridgeCor</td>
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<tr>
<td>Pear</td>
<td>23'-8&quot; x 25'-5&quot; to 29'-11&quot; x 31'-3&quot;</td>
<td>Railroad underpasses or large clearance areas.</td>
<td>x</td>
<td>BridgeCor</td>
</tr>
<tr>
<td>Horizontal Ellipse</td>
<td>19'-4&quot; x 12'-9&quot; to 37'-2&quot; x 22'-2&quot;</td>
<td>Larger culverts and bridges. Low headroom, wide-centered flow, good choice when poor foundations are encountered.</td>
<td>x</td>
<td>BridgeCor</td>
</tr>
<tr>
<td>Box Culvert</td>
<td>8'-9&quot; x 2'-8&quot; to 35'-3&quot; x 13'-7&quot;</td>
<td>Very low, wide bridges, culverts and stream enclosures, with limited headroom. Functions well as a fast small-open bridge replacement.</td>
<td>x</td>
<td>BridgeCor</td>
</tr>
</tbody>
</table>
Just to close out on the O-Series.
All the great tools are still available to support you and your clients including the photo simulation. We can quickly insert one of our projects into your site photo so you have a nice rendering tool at your disposal. Many public reviewers may not necessarily be Engineers and a visual can go a long way.

Again,
We are very excited about the innovation and efficiencies associated with the Optimized CONSPAN series and look forward to assisting you on your next project.

Next Slide
One of the ways that we are frequently seeing projects start is on our website with this DYOB®. You can go to CONTECH’s website and hit DYOB® which is “design your own bridge.” You can put in some of the basic information on a project.

**From the cost standpoint, once you do one of these DYOBs, it doesn’t take a whole lot to put in a little bit of information, which will be followed by some basic parameters of what you are thinking of. Again, this is very early stages of your project. What the span and rise may be,
And then in about 2-5 minutes, we will come back with our electronic understanding of what you have asked for. And this is what we think you are looking for your job specific application. Your local representative will also receive this via email and, if you would like, can put together a price in 24 hours based on exactly what you believe your client’s needs are. Then you can quickly compare: Does BEBO® make sense in this application versus whatever else I might be thinking of? This is typically still at a concept stage.

**but with a little bit of information you can begin to get an electronic version of what the thoughts are for that particular bridge crossing. And our commitment to you is within 24-48 hours one of our project consultants can get back to you with some sort of engineers estimate and I suspect that he will come back with some other options.**
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Now I’d like to open it up for questions.