Accelerated Precast Construction
The use of innovative scheduling, delivery, design, manufacturing and construction methods to reduce onsite construction time and costs, while improving safety and reducing road user impacts.
Focus of Accelerated Precast Construction

Replacing/Repairing Aging State, City and County Short Span Bridges and Culverts across our Nation’s Waterways
Accelerated Precast Construction

*Fundamentals Attributes*

**Reduce**
- Reduce Road User Impacts
- Reduce Costs
- Reduce Construction Time
- Reduce Weather Related Time Delays

**Improve**
- Improve Durability/Quality
- Improve Work Zone Safety

**Minimize**
- Minimize Environmental Impact
- Minimize Impact to Existing Roadway Alignment
Reduce Road User Impacts/Traffic Impacts

- Minimizes Traffic Delays
  - Reduce Construction Equipment Distraction
- Minimizes Community Disruption
  - Reduced Detours, Closures
  - Reduced Narrow Lanes
- Shorten Project Duration

Bridge Replacement - Missouri

Bridge Widening - Arkansas
Reduce Costs to Society

- Actual Costs
  - Reduced Costs through Repetitive Use
  - Shift from Dangerous to Safe Area

- Costs Due to Delays
  - Reduce Construction Time
  - Reduce Delays in Construction Zone

Penetrations Eliminate CIP Structures

I-20 Bridge Replacement – GDOT
Quad 12’x10’ Bridge Replacement
Reduce Onsite Construction Time

- Cast in Place vs Precast
- Critical Path
  - Simultaneous Construction
- Safety
  - Worker Safety
  - Motorists Safety

Multi-Barrel 8’x3’ RCB
Reduces onsite time

Precast Concrete Beam
(Remove from Critical Path)
Reduce Weather-Related Time Delays

- **Wet/Cold Weather Delay**
  - Manufacture in Controlled Environment

- **Predictable Schedule**
  - Simultaneous Actions
Improve Quality

- Prefabricated in a Controlled Environment
  - Temperature, Humidity, Rain and Wind
- Increased Quality Control
  - Inspect Prior to Installation
- Crew Tenure
  - Quality/Durability/Consistency
Minimize Impact to Roadway Alignment

- **Reduced MOT**
  - Minimize Amount of Displacement
  - Increased Safety

- **Temporary Alignment**

- **Trenchless Installation**
Improve Work Zone Safety

- **Motorist Safety**
  - Minimize Amount of Labor at Site
  - Reduced Construction Presence

- **Construction Worker Safety**
  - Reduced Time on Job Site
  - Construction w/out Traffic

Quad 12’x10’ RCB - Oxford, AL
Minimize Environmental Impact

- Permitting
  - Reduced Impact on Waterways
- ROW Take
  - Reduced Construction Limits
- Reduced Utility Relocation
  - Possibly Eliminated
Empower DOT/Public Works/Contractors

Stretch Budget Dollars
Replace Bridges/Failed Culverts
Provide Cost Saving Options
Increased Number of Projects
Innovative/Competitive Options
Provide Practical Options
Value Engineering
Empower DOTD

Logan Canyon Irrigation - Utah
Following a curved alignment
with Beveled Box Culvert

Installation average of
18 pieces per day

4,296 feet of
6’ x 5’ Box Culvert

Special equipment allows
bevels from 1/2” to 8”

Watertight Joints -
Mastic plus interior joint sealant

20 curves with radii
as low as 65 feet
Empower DOTD

Curved Alignment

Single 6’ x 5’ Curved Alignment

Shop Drawing/Plan View
Empower DOTD
Curved Alignment

Single 6’ x 5’ Curved Alignment
Empower DOTD/Contractors

TENBUSCH

Equipment for Jacking Concrete Pipe

Tenbusch Inc. designs and manufactures tunneling equipment that can be used with existing boring equipment to complete tunneling applications. Tenbusch Inc. provides tunneling systems consisting of the following components:

- Tunnel Shields
- Excavators
- Conveyors
- Push Adapters
- Muck Cart and Track
- Lubrication Systems
- Hydraulic Power Units (HPUs)
- Backstops.

Tenbusch Inc. can provide pipe adapters specifically suited for the make and model of the customer’s boring machine, and compatible with the pipe product being installed, including:

- Steel Casing
- Reinforced Concrete Pipe
- Pre-Cast Box Culverts.
Empower DOTD/Contractors
The First Use of Tunneling Method with Reinforced Concrete Jacking Pipe in DelDOT’s History

54-inch diameter reinforced concrete pipe jacked under Route 4. Photos: Tenbusch, Inc.

54 inch reinforced concrete pipe culvert under Route 4

Rinker Material Concrete Pipe with steel bands and grouting ports to withstand the anticipated 400,000 lb. jacking load.
Empower DOTD/Contractors

Trenchless Installation
Empower DOTD/Contractors

Trenchless Installation

- Minimize Impact to Drivers
- Increase Safety of Contractors
- Reduce Construction Time
Value Engineering Proposal

Submitted by Contractor

Jack & Tunnel Proposed In Lieu of Open Cut

Advantages

- Cost Savings - $126,330
- Reduced M.O.T. and No Lane Shifts
- Increased Work Zone Safety
- No Supporting of Existing Utilities Required
Pipe Jacking
Reduce
Reduce Road User Impacts
Reduce Costs
Reduce Construction Time
Reduce Weather Related Time Delays

Improve
Improve Durability/Quality
Improve Work Zone Safety

Minimize
Minimize Environmental Impact
Minimize Impact to Existing Roadway Alignment
Factors
1. Nature of soil, water table & effects of dewatering
2. Jacking/Receiving Pit
3. Length, alignment and outside dimension of pipeline
4. Jacking Forces
5. Pipe Joints
6. Loads on shield and pipe
7. Size of overbore
8. Lubrication
9. Grouting
10. Spoils Removal

Empower DOTD/Contractor
Precast Empowers Pulaski County Public Works

**Mission Statement:**
To improve and maintain the safety, mobility and quality of life of the citizens of Pulaski County by providing services which include: planning and development management; road, bridge and drainage maintenance, emergency planning and coordinating response to emergency situation, county wide communications, planning and maintenance of radio and electronic equipment, timely maintenance of vehicle and equipment fleet, and solid waste management.

Precast Concrete Products lie at the heart of Accelerated Precast Construction. The Pulaski County Public Works Department in Central Arkansas uses precast to replace bridges economically and quickly.
Empower Public Works Dept

**Multi-Cell**
Reduces Installation Time
Requires Greater Lift Capability
Precast Headwall Attached
Empower Public Works Department

Large Box Culverts
- Allowed per Special Design
- Up to 24’ Span (Wet Cast)
- Requires Greater Lift Capability

23’ x 8’ Reducer
Empower Contractors

Features
Triple Barrel CMP
Vertical Curve with Highpoint
Roadway Washes Away Each Event
Empower Contractors

**Features**
Seven Barrel RCB Low Water Crossing
Replaced Triple Barrel CMP
Concrete Driving Surface with Curb
Rock Face Aesthetic Look
Empower Contractors

Features
Seven Barrel RCB Low Water Crossing
Replaced Triple Barrel CMP
Concrete Driving Surface with Curb
Rock Face Aesthetic Look
Empower Contractors (6x5/8x5/75’ fill)

Deep Bury of Box Structures Along Major Canadian Highway

The Crowsnest Highway (Highway 3) in British Columbia Canada is an east-west highway that connects southern regions in British Columbia and Alberta. The Ministry of Transportation and Infrastructure is completing an improvement project on the highway near Princeton, B.C.

The project involves re-alignment of the highway to remove a dangerous downhill S-curve to improve safety.

Precast box structures and headwalls were specified in the design process to maintain the flow of existing creeks at locations where significant fill is required to cross a ravine.

**Project Highlights:**
- Creek Crossing One - 330 feet of 6-foot x 5-foot box structures.
- Creek Crossing Two - 310 feet of 8-foot x 5-foot box structures.
- Creek Crossing Three - 250 feet of 8-foot x 5-foot box structures.

Maximum earth cover applied to the structures is 72 feet.

Gasketed joints were factory installed for a soil and water tight joint to 13 psi of water pressure.

The Langley Concrete Group acted as the Engineer of Record for the structures providing installation inspection and certification for the structures.

All pre-cast products were produced in a Q-Cast Certified Plant.
Empower Contractors

**Innovations**
Precast Fitting Saves Money + Time  
Versus Cast in Place
Accelerated Precast Construction
“Self Consolidating Concrete is a highly flowable, non-segregating concrete that can flow into place, fill the formwork, and encapsulate the reinforcement without any mechanical consolidation.”

ACI International, Committee 237 SCC
SCC fills the formwork without vibration and with a significant reduction in labor.

What this means is that SCC is much more than flowable concrete.
Key Properties of SCC

Thixotrophic
Semi solid at rest/fluid in motion

Viscosity
Material property that resist change in shape/arrangement of elements during flow

Dynamic Stability
Characteristic that ensures uniform distribution during transport.

Static Stability
Characteristic that ensures uniform distribution at rest

Admixtures
HRWR Polycarboxylate Superplasticizer
VMA
Key Properties of SCC

**Filling ability** - The ability of the concrete to flow freely under its own weight, and to completely fill formwork of any dimension and shape without leaving voids.
Key Properties of SCC

Passing Ability – The ability of concrete to flow freely in and around dense reinforcement without blocking
Key Properties of SCC

**Resistance to Segregation** – During placement and while flowing, the concrete should retain its stability. There should be no separation of aggregate from paste or water from solids and no tendency for coarse aggregate to sink downwards through the fresh concrete mass under gravity.
Quality Control

- Make a commitment to QC
- Train key personnel in the “look and feel” of good SCC
- Continually evaluate stability
- Maintain control charts to establish materials and process control
- Test as required for your materials and process control
PRECAST PROJECTS
Fredericksburg, VA

2001
SCC Arch Bridge (45’)
5,000 psi

Comp. Strength (psi)
7,390/7,670/8,020
Drilled Shafts

• Route 28 over the Broad Run
• Two Bridges, 2006-2007
• Each bridge has two abutments, two piers for a total of 24 drilled shafts.
• In one bridge, 12 drilled shafts has SCC
Drilled Shaft – Route 28
REPAIR (Piles/Substructure)

Colonial Parkway
Route 712
REPAIR - Pile

Colonial Parkway, Jamestown (VDOT)

October 2009
Barge Damaged Pile
REPAIR - Pile

Colonial Parkway, Jamestown (VDOT)

October 2009
Barge Damaged Pile Repaired w/SCC
REPAIR - Substructure

Route 712 over Route 29 Bypass

Cap Needs Repair
Pile Needs Repair
REPAIR - Substructure

Route 712 over Route 29 Bypass

Formwork Tightness
Formwork Strength
REPAIR - Substructure

Route 712 over Route 29 Bypass

Placed from Bridge Funnel/Flexible Pipe
REPAIR - Substructure
Route 712 over Route 29 Bypass

Clean Smooth Finish Matches Existing
SCC WORKS BECAUSE...

- Faster Placement
- Safety – Fewer People on scaffolds and forms for placement
- Better Consolidation & Finish
- Little or No Vibration
- Early Strength
- Increased Productivity
Reduced Labor  
Decreased Time  
Improved Quality  
Productivity Gains  
Higher Quality
Make it Fast... Make it Last... Make it PRECAST
# Training

**American Concrete Pipe Association**

**VDOT - Lynchburg District**

**Installation Seminar (19 March 2015)**

ACPA brings training your way this year. We have put together an agenda to both challenge and inform you. Plan on participating in practical exercises, group discussions and a little competition. We hope you can join us for this training. Lunch and refreshments provided.

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>8:30</td>
<td>PROPER BOX CULVERT INSTALLATION - Walt Calliet, P.E. (ACPA)</td>
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<tr>
<td>11:00</td>
<td>BOTTOM-LESS CULVERT INSTALLATION - Ed Page, P.E. (CPSP)</td>
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<td>12:00</td>
<td>LUNCH AND JEOPARDY - Windy Cline (Prendick)</td>
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<tr>
<td>1:00</td>
<td>PRECAST DRAINAGE STRUCTURE INSTALLATION - Hank Gottschalk (CPSP)</td>
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<tr>
<td>2:15</td>
<td>JACKING CONCRETE PIPE - Almie Conkran (Riser Materials)</td>
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Proper training educates accurate construction, therefore reducing costs. This book of training offers a reader knowledge about Concrete Products but a skillful use of life-harmonizing tools as a basic knowledge. The book of training provides an alternative: reading through related problems. This is the training that will make a difference in the lives of all.

For more information, please visit our website at [American Concrete Pipe Association](http://www.acpa.org).
Concrete Pipe Week
Plant Tours
Why Consider Accelerated Precast Construction?

The traveling public deserves it.
FHWA is promoting it.
ACPA wants to team with FHWA.
Our Industry Provides it.