ASCE Montgomery, Alabama Branch

Innovations in the Prestressed Concrete Industry

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Concrete Technology
Innovations in Concrete Technology in the Prestressed Concrete Industry:

- Advancements in Concrete Mixer Technology
- Improvements to Chemical Admixtures
- Batch Control Systems (Moisture Probes)
- These Technologies Allow Self-Consolidating Concrete Production
Concrete Technology

- Twin Shaft Mixer
- Fast, Thorough Mixing Action
Pelham, AL Bridge Plant
Twin Shaft Mixer
Twin Shaft Mixer
Self-Consolidating Concrete

- Flowing Concrete
- Allows Placement Without Vibration
- Safer Working Environment
- Enhanced Surface Finish on Products
Self-Consolidating Concrete
Self-Consolidating Concrete
Self-Consolidating Concrete

- Product has been Thoroughly Researched by ALDOT
- Full Scale Prestressed Concrete Girders have been Produced and are in Service
- Definite Benefits for the Precast Concrete Industry
- ALDOT has Special Provision Implemented
- Pelham, AL Bridge Plant is Producing Bridge Beams w/SCC
Products
Precast Substructure Components
Scope Of Precast Substructure Components

Precast Columns- (42” x 42”); Avg. Length Approx. 26 ft.

Precast Caps- (48” Wide x 48” min., Depth); Max Length 35’-6”

Column Sleeves- NMB #14 Sleeves for #11 Footing Dowels. Total of 12 Sleeves per Column. Footing Dowels Positive Projection from Cast-In-Place Footing, Set with a Template.

Cap Sleeves- NMB #14 Sleeves for #11 Column Bars. Total of 24 Sleeves Installed in Bottom of Caps (12 per Column).

These Products have been Produced at our Pelham, AL Yard.
**TABLE OF DIMENSIONS**

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<td>CL-676-12</td>
<td>23'-10 15/16&quot;</td>
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**SPECIAL NOTES:**

1. Concrete strength shall be 4,500 psi @ 28 days.
2. Concrete strength shall be 4,000 psi @ 28 days.
3. See Sheet 10 of 11 for proper orientation of group tubes.
4. Group tubes shall be full length for smooth finish when loops are cut after direction. See Sheet 10 of 11 for details.
5. For steel reinforcement details, see Sheet 11 of 11.
Column Fabrication
Fabrication-Columns
Fabrication-Columns
Fabrication-Columns
Fabrication-Columns
Cap Fabrication
Fabrication-Caps
Fabrication-Caps
Yard Storage Columns & Caps
Yard Storage-Columns
Yard Storage-Caps
Precast Substructure Erection
Field Erection-Columns
Field Erection-Columns
Field Erection-Columns
Field Erection-Caps
Field Erection-Caps
Completed Substructure
ALDOT Testing
Test Results

Grout Cube Breaks @ 21 Days:
- 11,080 psi
- 11,370 psi
- 12,050 psi
- 12,830 psi

Splice Testing Results:
Required Load @ 125 % fy for #11 Bar = 117,000 lbs.

Test Specimen #1 Max Load = 152,200 lbs. Failure Mode Broke Bar.
Test Specimen #2 Max Load = 145,200 lbs. Failure Mode Broke Bar.
Test Specimen #3 Max Load = 145,700 lbs. Failure Mode Bar Slipped.

Test Result = Pass.
Spliced Precast U-Girders
Spliced Precast U-Girder Bridges
Spliced Precast Concrete U-Girder Bridges

- New Design Option for Urban Interchanges
- Aesthetically Pleasing Structures
- Combines Spliced Const. with U Beam Cross Sect.
- Locally Manufactured Precast Using Conventional Means and Methods
Precast Concrete U-Girders-Typical Section
Interior Cap Reinforcing

- Composite Cap with 2 Rows of 4 @ 1 3/8” PT Bars
- Lower Section of Cap Supports Diaphragm Casting
Expansion Pier Cap Reinforcement

- 8’-0” Wide x 7’-0” Deep
- Post-Tensioning 7 @ 1 3/8” Diam. PT Bars
Post Tensioning Details at Expansion Piers

- Diaphragms Designed to Allow Double End Stressing
Fabrication
Fabrication-Curved Casting Bed
Fabrication
Fabrication-Yard Storage
Construction Sequence
Substructure

- Flexible Piers and Foundations
- Integral Pier Caps at Interior Piers
- Expansion Joints at 600’-800’
- Bearings Eliminated Where Possible
Girder Erection

- Erected with Conventional Cranes (240 to 300t)
- Set on Falsework Towers at Splices
Girder Erection

- SH58 Ramp A
- Temporary Shoring Towers Spaced at 100’ (+/-)
At Shoring Towers, Double Angle Braces Installed as Girders are Erected, Prior to Releasing Cranes
Girder Erection

- Similar Bracing is Used at Abutments
Girder Erection

- Girders Supported on Straddle Bents at Skewed Traffic Opening. Special Shoring Condition.
Girder Erection

- When Shoring Towers are not an Option, Strong-Back Hanger Systems may be Utilized
Girder Erection

- Another Example of Strong-Back Hanger System
Closure Pours

- After Girder are Erected, Closure Pours are Cast
Post-Tensioning
Prior to Post-Tensioning, CIP Lid Slabs Installed to Close the U-Girders.
This Work is Performed on Curved Sections
Post-Tensioning

- Expansion Diaphragm at Abut. w/ PT Anchorages
Post-Tensioning

- Expansion Pier with Access for Post-Tensioning Equipment
Post-Tensioning

- Longitudinal Post-Tensioning Operation at Exp. Pier
Deck Pour

- After Post-Tensioning, Shoring is Removed
- Deck is Formed and Poured Using Conventional Methods
Completed Structures
Completed Structures

Recap:
- U-Girder Cross Section Makes Casting Curved Girders Possible
- Using Straight and Curved Sections Creates Unified Aesthetics
Completed Structures

IH 25 over Platte River (Bronco Bridge)
Completed Structures

Bijou Street Bridge
Completed Structures

Austin Bluffs Overpass
Completed Structures

SH 58 Ramp A
Additional Information

PCI Zone 6 Web Site http://www.gcpci.org
Standard Drawings for U-Girders
Select:
- Bridge Resources
- Bridge Products
- PCI Zone 6 (SE Region) Curved Spliced U-Girders
NEXT Beam
(Northeast Extreme Tee)
NEXT Beam-Typical Section

Project: Decatur County, Georgia
SR 97 over Big Slough
4 Spans @ 70 feet

36" NEXT F-BEAM
TYPICAL SECTION - 40 ft CLEAR ROADWAY
AREA = 1.413 in
(1.483 lbs/ft)
NEXT Beam Form
NEXT Beam-Storage
NEXT Beam-Jobsite
Transportation
Transportation

- Product Innovation has Driven the Requirement for Improved Hauling Equipment.

- Products Continue to Increase in Weight as Production Capabilities Improve.

- As Discussed, Product Weights in some States Approaching 250,000 lbs.

- In the Prestressed Concrete Industry, if you can’t Ship It, You can’t Make It.

- The Trailer Manufacturing Industry has Responded with Increased Weight Capacity Equipment.
Transportation

- Transporting 200 ft. Long Girder
- Girder Depth 8’-4”
- Approximate Weight 250,000 lbs.
Transportation

- Steerable Trailer 250,000 lb. Max Haul Weight
- Supported for Stability During Hauling
Transportation

- Equipment must be able to Maneuver at Job Site
Transportation

- 19 Axle Rig for Hauling U-Girders
Conclusion

- Innovation is Alive and Well in the Prestressed Concrete Industry
- Today We’ve Covered Developments in Concrete Technology, Product Production and Transportation
- We Expect to see Continued Research and Improvement in these Areas
- Acknowledgement: Mr. Gregg Reese, P.E.
  Summit Engineering
  Denver, Colorado
- Thank You for Your Time!