PCI Gulf South

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Bridging the Future

PCI Precast/Prestressed Concrete Institute

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- Became a chapter of PCI in May 2016
- 12 Precast producers
- Covers 3 states, AL, MS, & LA
- Work with DOT's on Transportation related products, beams, columns, piles, NEXT beam, pile caps
- Newly formed Transportation Committee working specifically with DOT and their design teams
- 14 years in the industry, formally with a precaster
- Design/Build Contractor
- Commercial/industrial sector

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Precast Concrete Bridges

Walnut Lane Memorial Bridge

The single most important event that led to the dramatic launch of the precast prestressed concrete industry in North America was the construction of the technically innovative, historically fascinating Walnut Lane Memorial Bridge in Fairmont Park in Philadelphia, Pennsylvania in 1949 and 1950.

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Precast Concrete Bridges

At that time, manufacturers had no experience with linear prestressing, and little published information was available. This prestressed concrete bridge became a reality because of the vision, persistence and courage of a few extraordinary individuals.

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Precast Concrete Bridges

One was Professor Gustav Mangel from the University of Ghent in Belgium.

He described the concept of pre-compressed concrete to his students using his well-known illustration of a stack of books.

The books on the bottom are like pre-compressed concrete: using a compressive force, they support their own weight… plus significant superimposed loads, represented by the books on top.

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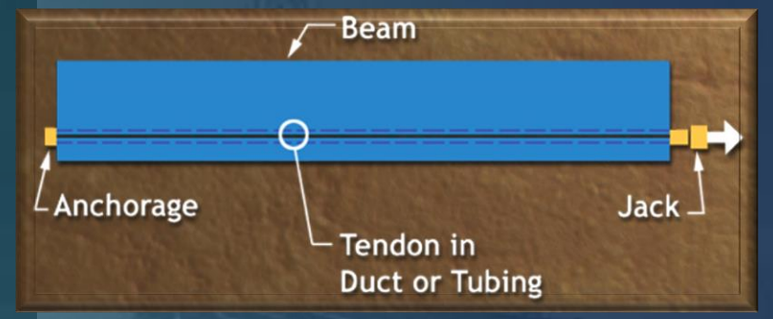
Precast Concrete Bridges

- The combination of high strength steel – to resist tensile stress – and concrete – to provide compressive strength and durability – make this composite material adaptable to many situations, especially the design and construction of bridges.



- A number of technological innovations followed the success of the Walnut Lane Bridge, including the establishment of precasting plants and in-plant pretensioning…

… and the development of 7-wire strand to replace individual wires.

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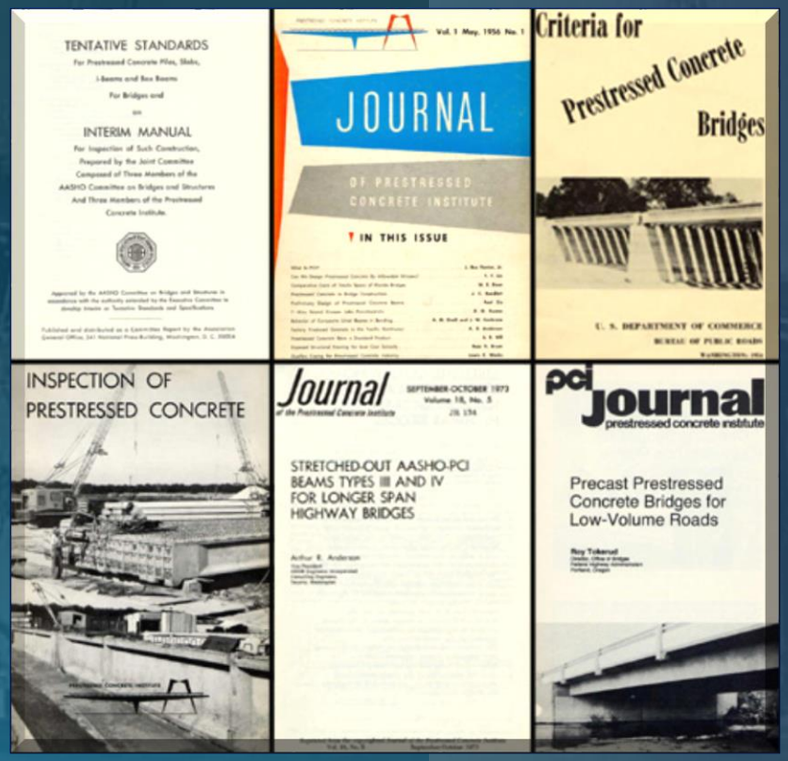
Precast Concrete Bridges

Other Early Innovations Included:

- Long-Line Casting Beds
- Permanent Steel Forms
- Admixtures
- High Early-Strength Concrete
- Accelerated Curing



These developments received technical and logistical support from the Prestressed Concrete Institute, PCI, chartered in 1954. From the start, PCI served as a forum for precasters and design professionals, thus spurring the rapid growth of the entire precast and prestressed concrete industry.

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PCI™
Precast/Prestressed
Concrete Institute

PCI's Plant Certification program quickly became an integral part of plant operations because, from the very beginning, the industry recognized the need for quality above all else. As a result, precast, prestressed concrete products have an excellent reputation for quality and are equated with state-of-the-art engineering standards and techniques.

PCI Plant Certification assures specifiers that a manufacturing plant has been audited for its capability to produce quality products on an ongoing basis

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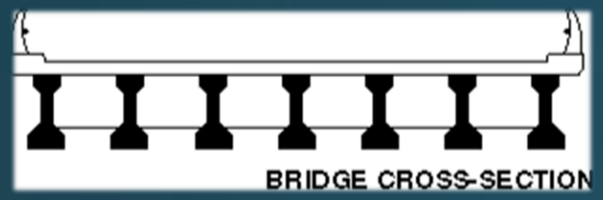
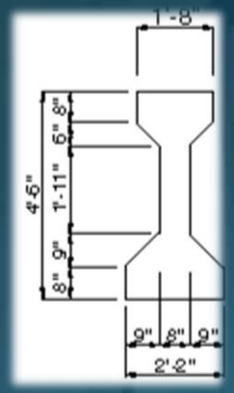
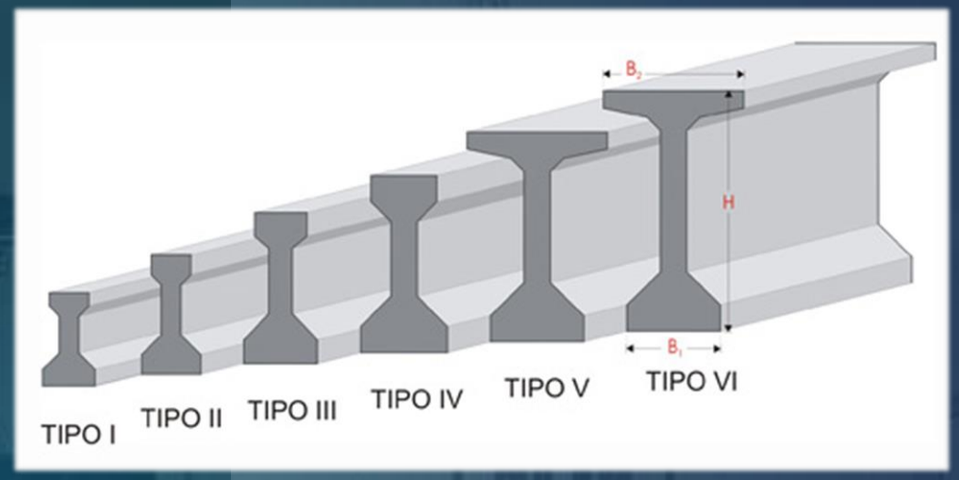
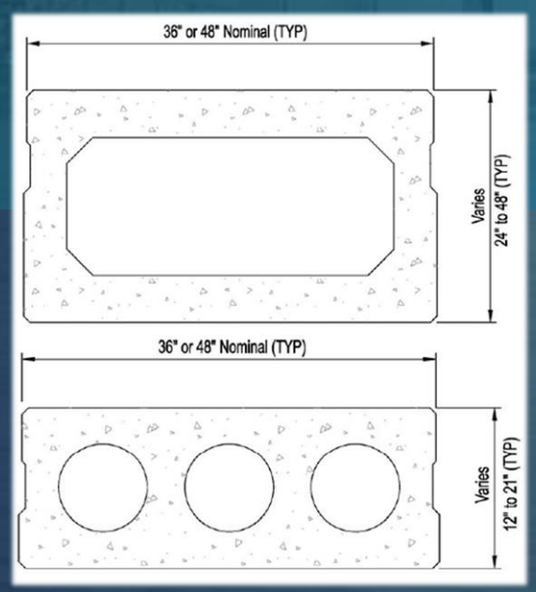
Precast Concrete Bridges





AASHTO Beams
Box Shapes
Deck Bulb-Tees
Double Tee Bridge Beams
NEXT Beams
Sound Walls/Noise Barriers
Flat Slabs





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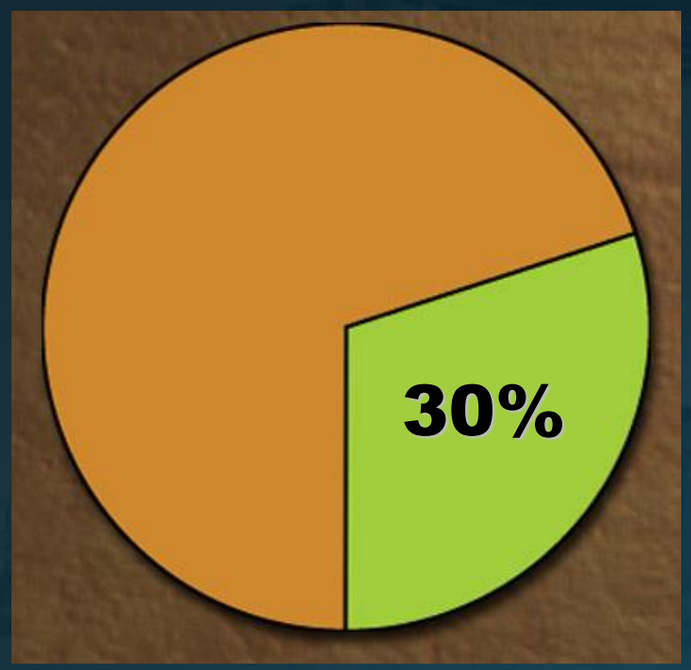
Precast Concrete Bridges

Total Bridges Built
1950 - Present



108,000
Prestressed
Bridges

Since 1950, some 108,000 prestressed concrete bridges have been built.

This represents 30% of all bridges built during the period.

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Precast Concrete Bridges

Bridge Construction Between the years of 1990 -1999

Prestressed Concrete:

48% of all bridges

60% of state highway bridges

62% of numbered highway bridges

48% of all bridges built have used prestressed concrete. Even more notable, prestressed construction represents 60% of all state highway bridges and 62% of bridges on numbered U.S. highways.

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Precast Concrete Bridges

Deck Surface Area

Prestressed Concrete:

60% of deck area of all bridges

62% of area of city bridges

53% of area of county bridges

55% of area of interstate bridges

59% of area of U.S. numbered bridges

60% of the area of bridge decks were built on prestressed concrete superstructures.
A further breakdown of deck area built on prestressed concrete superstructures shows 62% of bridges on city streets, 53% of county highway bridges, 55% of interstate highway bridges, 66% of bridges on state highways, and 59% on U.S. numbered highways.

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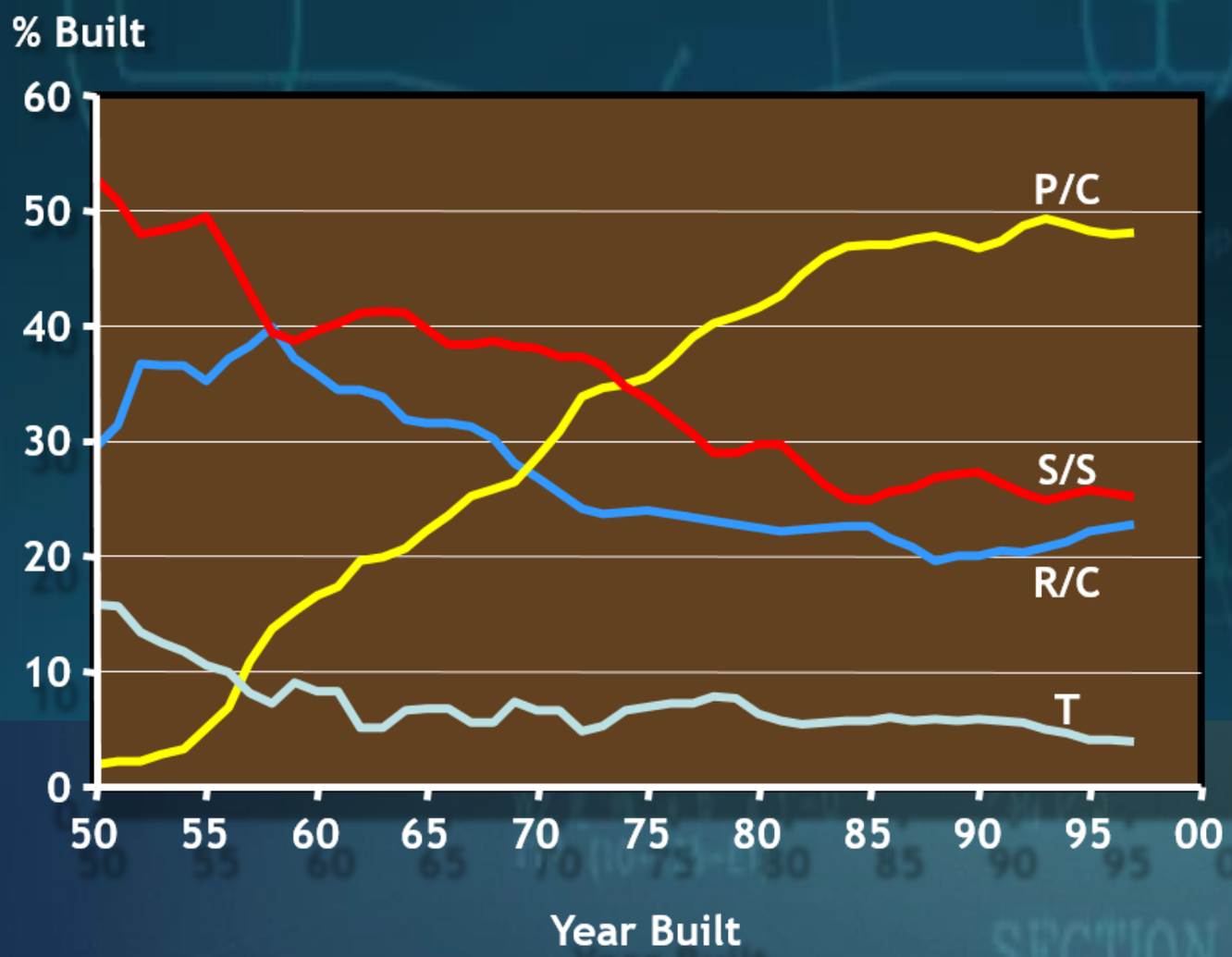
Precast Concrete Bridges

Bridges Built



P/C = Precast Concrete

S/S = Structural Steel

R/C = = Reinforced Concrete

T = Timber Construction

Source: National Bridge Inventory Data

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I 85 Bridge Collapse Atlanta, GA

- GDOT Emergency Accelerated Construction
- Contractor-C. W. Matthews
- Precaster-Standard Concrete Columbus, GA
- Fire March 30 2017
- Traffic Flowing Week of May 22nd
- 6 weeks from start to finish (43 days)
- Serves 243,000 cars per day
- $ 16.6 Million

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I 85 Bridge Collapse Atlanta, GA

- 13 columns
- 61 Girders (49 made in Atlanta, remaining coming from Standards Savannah's plant)
- Approximately 80,000 lbs. each
- 4 Caps
- Opened 6 weeks early
- 2,103 CY of Concrete
- 54,000 Manhours

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The Future

Material properties, such as corrosion resistance, fire resistance and durability are being continuously improved and exploited. Continued advancement of **admixtures** achieving higher strengths, **lower W/C ratio's** and **increased durability characteristics**. **Example SCC**

These inherent qualities of precast prestressed concrete and its considerable design flexibility also make it ideal for a wide variety of other applications: **poles, piles, culverts, storage tanks, retaining walls, sound barriers and even railroad ties**.

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The Future

Larger diameter strands(0.6 inch and over) plus higher concrete strengths are yielding longer girder spans which effect the economics of bridge building.

Hot dipped galvanized strand addressing long term durability issues.

Corrosion-resistant coatings

Stainless-clad

Corrosion-resistant steel increasing durability

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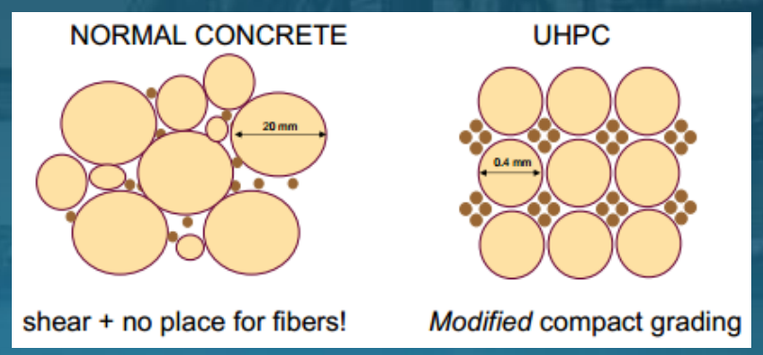
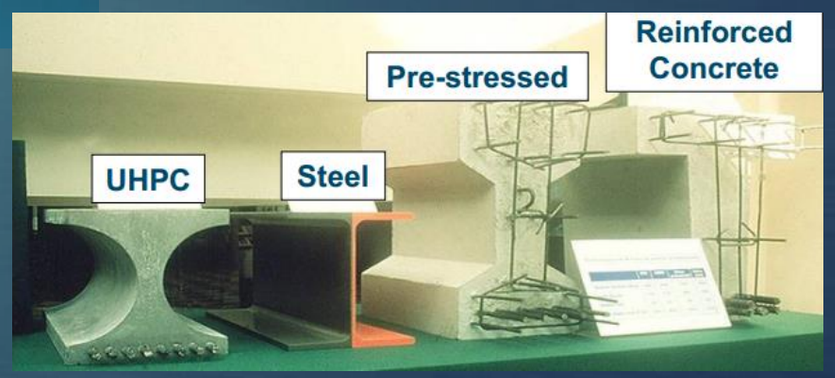
The Future

Inclusion of secondary reinforcement materials such as glass, carbon, synthetic and steel fibers have been shown to improve toughness and shrinkage cracking.

UHPC



Recent developments in high performance fiber-reinforced concrete hold promise in terms of performance and cost-effectiveness.



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The Future

Maximize design, alternate designs redesign and **optimization of structural elements**

The high compressive and tensile strengths allowing for **wider girder spacing** and **longer spans** reducing initial construction costs

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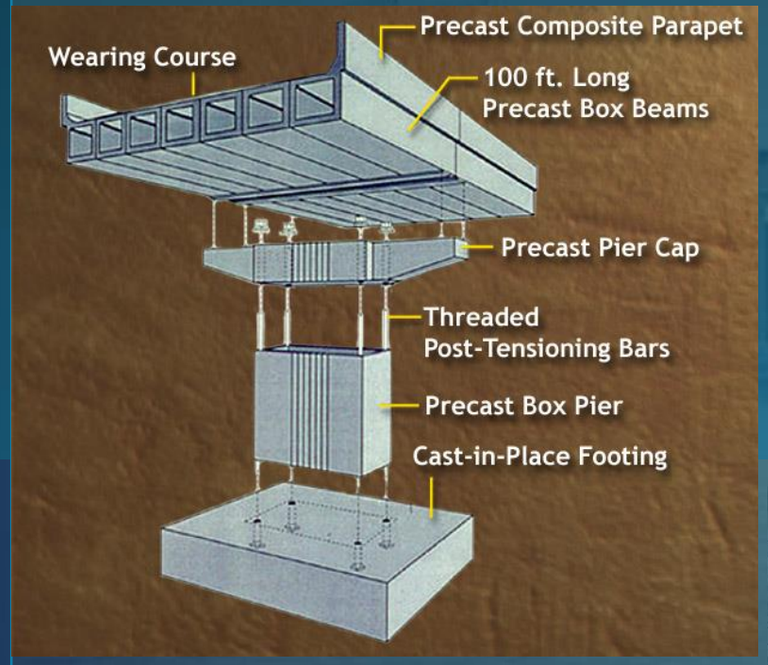
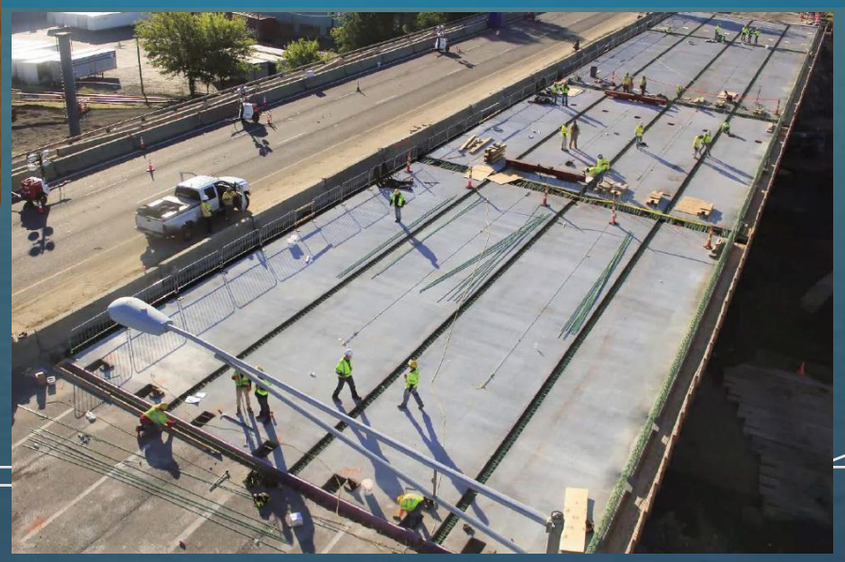
The Future

Accelerated Bridge Construction

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.





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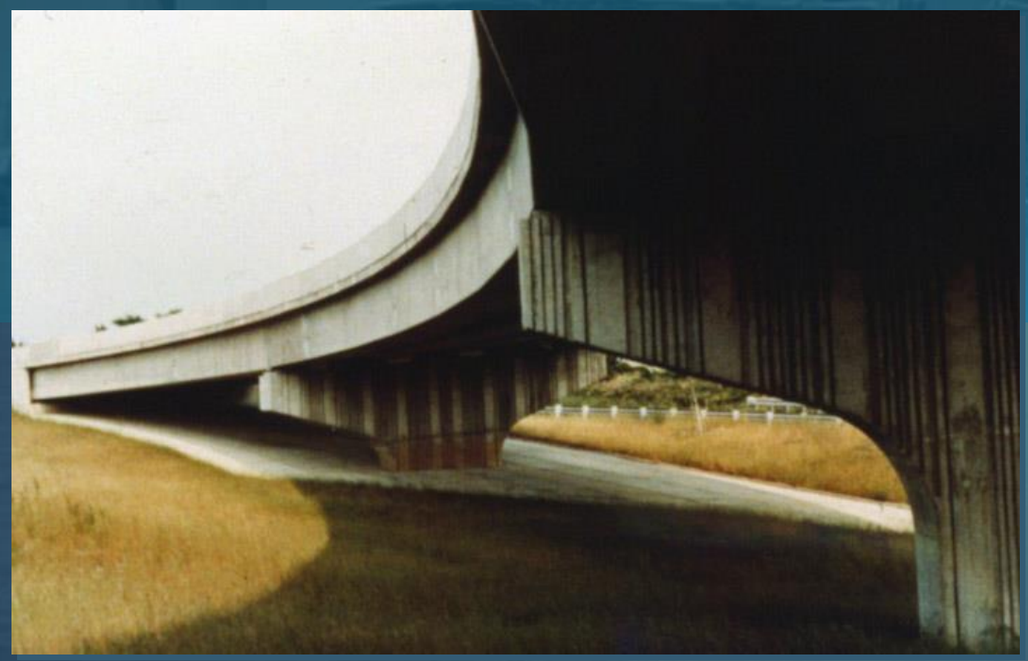
The Future



Curved precast concrete bridges which is creating exciting new options in contemporary bridge designs. This technique involves **post-tensioning precast elements** together in the plants before shipment or in the field after erection.

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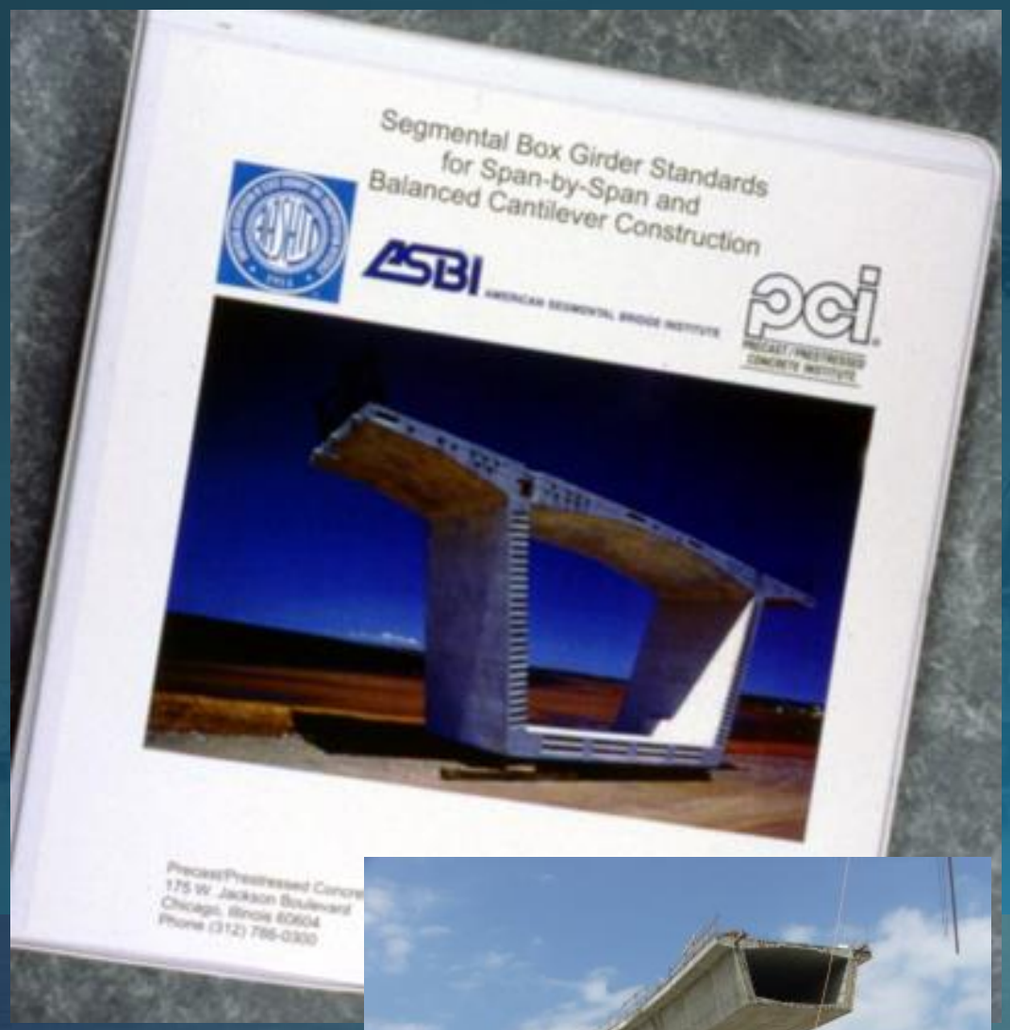

And yet another solution for curved structures is segmental construction. Working together with the American Segmental Bridge Institute (ASBI) and the AASHTO Bridge Subcommittee, PCI has endorsed a family of standard shapes for segmental bridges that is intended to reduce the cost of segmental bridges for smaller structures such as urban grade separations.

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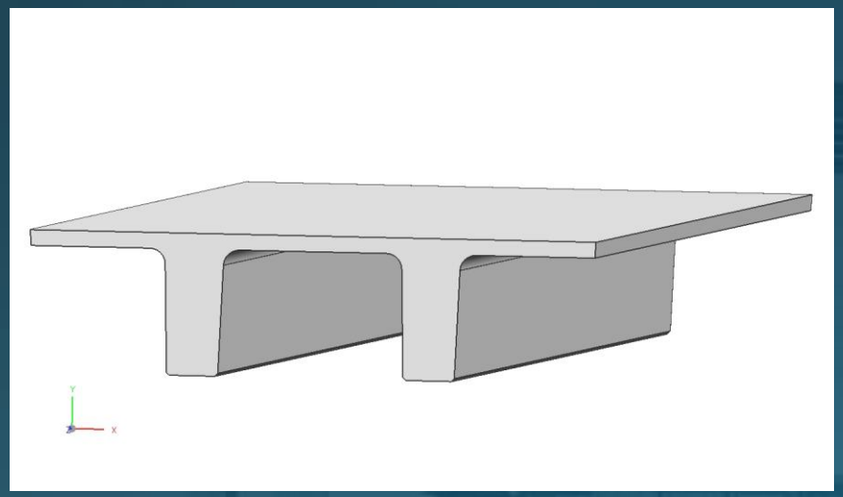
NEXT Beam (Northeast Extreme Tee Beam)



Benefits

- Minimal deck formwork
- Ease of erection
- Reduced construction time
- Increased jobsite safety
- Spans between 50’ & 90’

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Questions

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