ACEC/NCDOT Spliced Girder Workshop
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Spliced Girder Bridges

- Fabricate girders in pieces shorter than final structure
  - For fabrication, handling or transportation
  - Partial or full span segments
- Assembled at site to obtain final structure
- Cast-in-place concrete at splices
- Post-tensioning is typically used to join the pieces
Spliced Concrete Girders

Makes long-span concrete solutions viable

• Provides a new design alternate that leads to improved economy

Not a new concept

• Built in US as early as 1954

Can lead to dramatic span increases

Details are very important
Overview

- Introduction
- Reasons to use spliced girders
- Typical applications
- Basic concepts and special issues
- Examples of spliced girder bridges
- NCHRP Report 517
Reasons to Use Spliced Concrete Girders

• Design Issues
• Construction Issues
• Economical Issues
Design Issues

Provide longer spans

- Avoid placing piers in water
- Avoid other obstacles
- Eliminate piers for safety
- Reduce number of substructure units
- Minimize structure depth
- Reduce number of girder lines
- Eliminate joints
- Improve aesthetics
- Continuity for seismic or impact loads
Construction Issues

Full-span girders are too large
  • Fabrication and handling
  • Transportation
  • Erection

Depends on
  • Fabricator’s facility and equipment
  • Access to the site
  • Contractor’s preferences and equipment
Economical Issues

Generally requires a compelling issue

- Reduced construction costs
- Reduced fabrication time
- Increased costs for PT
- Increased costs for temporary supports

New approaches to contracts where Contractors are lead party

- Design/Build
- Value Engineering
Typical Applications

- Simple Spans
- Continuous Spans
- Seismic Applications
Simple Spans

- Very long spans
  - Single Point Urban Interchanges (SPUIs)
- Remote sites
- Sites with limited access
- Limitations of fabricator’s or contractor’s equipment
Continuous Spans

• Very long spans
  - Intracoastal Waterway
  - Other waterways
  - Viaducts

• Minimum depth or fewer girders

• Limited substructure locations
Seismic Applications

- Continuity
- Integral connection to substructure (integral caps)
- Compared to cast-in-place construction
  - Eliminate or reduce falsework
  - More rapid construction
Basic Concepts & Design Issues

- Design issues
- Fabrication details
- Erection details
- Splice details
- Post-tensioning and grouting
Design Issues

- Post-tensioning
- Post-tensioned in the field for splicing, often staged
- Losses
- Secondary moments
- Deformations during PT

Stage 2 Tendons – after deck cast

Stage 1 Tendons

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Design Issues

Restrained deformations
- Time-dependent effect may become significant
- More refined analysis

Cross-section types
- I- or Bulb Tee girders
- Open-topped boxes
Fabrication Issues

Post-tensioning ducts

End blocks and anchorages

Haunched pier segments

More intensive fabrication effort
Erection Issues

Temporary towers
Strong-backs
Launching
Splicing before placement
Splice Details

Duct splicing

Wet joints

Match-cast or machined forms

Shear keys
Post-Tensioning & Grouting

Details

Procedures

Specifications

Inspection
  • Construction
  • Long-term
Examples of Spliced Girder Bridges
Examples of Spliced Girder Bridges

Simple Spans
- Remote Site
- Urban Site

Continuous Spans
- Urban Site
- Interstate Crossing
- Rivers & Coastal
- Seismic
Spliced Concrete Girder Projects

Simple Spans

- Klickitat County, WA
- Rock Cut Bridge, WA
- I-15 Reconstruction, Salt Lake City, UT