Precast Girder and Integral Bent Cap
for
the Sunset Blvd and Skirball Center Drive
Overcrossing Bridges

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WESTERN BRIDGE ENGINEERS SEMINAR 2013
Outline

• Project overview
• Criteria for new bridges
• Benefits
  } of Precast girder + Integral bent cap
• Complexities
• Q & A
Project Overview

- 10 Miles HOV Lane
- 26 Bridges
- Rebuild 28 ramps
- Build 18 miles of retaining walls
Project Overview
Project Overview
Quarter million vehicles daily!
Criteria for New Bridges

• Longer Span
• Vertical Clearance
• Vertical Profile
• Limit Disruption to Traffic
Criteria for New Sunset Blvd Bridge

- 346 ft Total length
- 126 ft Total width
- 3 Spans
- 2 Multi-column bents
Sunset Blvd Bridge
Criteria for New Skirball Center Drive Bridge

- 266 ft total length
- 90 ft total width
- 3 Spans
- 2 Multi-column bents
Criteria for New Bridges

Vertical Profile of Existing Road Above

Available Structure Depth
Falsework

Available Structure Depth

Vertical Clearance Above I-405
## Criteria for New Bridges

<table>
<thead>
<tr>
<th>Bridges</th>
<th>Side Span (ft)</th>
<th>Main Span (ft)</th>
<th>Side Span (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunset Blvd</td>
<td>127</td>
<td>128</td>
<td>91</td>
</tr>
<tr>
<td>Skirball Center Drive</td>
<td>118</td>
<td>102</td>
<td>45</td>
</tr>
</tbody>
</table>

### Girder Type

<table>
<thead>
<tr>
<th>Girder Type</th>
<th>Possible Span Length</th>
<th>Preferred Span Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>California I-Girder</td>
<td>50’ to 125’</td>
<td>50’ to 95’</td>
</tr>
<tr>
<td>California Bulb-Tee Girder</td>
<td>80’ to 150’</td>
<td>95’ to 150’</td>
</tr>
<tr>
<td>California Bath-Tub Girder</td>
<td>80’ to 150’</td>
<td>80’ to 120’</td>
</tr>
</tbody>
</table>
Precast Girder Features

- Eliminate falsework over traffic
- Construction speed
- Structure depth
- Maintain vertical clearance
Options Considered

- **Drop Cap**
- **Inverted Tee Cap**
Options Considered
Drop Cap & Inverted Tee Cap

• Pros:
  – Easy to construct
  – No temporary support at Bents

• Cons:
  – No longitudinal continuity
  – Column pinned at top, fixed at base
Integral Bent Cap

**Pros:** Longitudinal continuity

- Gravity/Live Load - Continuous spans
- Seismic - resist column plastic hinge
- Foundation - Column pinned bottom

**Cons:**

- Added complexities
Resist Column Plastic Hinge

- CIP Concrete Box Girder

- Precast Girder + Integral Bent Cap

Cast-in-place concrete deck
Resist Column Plastic Hinge

• Longitudinal continuity

Plan View

Elevation View

\[ B_{\text{eff}} = D_c + D_s \]
Foundation Benefit

Pinned Column Base

Spread Footing Plan View

Fixed Column Base

Pile Foundation Plan View
Complexities of Precast Girder + Integral Bent Cap

- Bent cap details
- Falsework
- Deck pour sequence
Bent Cap Details

Plan View

Section View
Bent Cap Details

Section View

Plan View
Falsework

- Settlement monitoring
- Vertical clearance
- Final deck surface
Deck Pour Sequence

Things to consider

• Monolithic bent cap and deck
• Deck cracking

Diagram showing pour sequence and spans.
Results

- Sunset Blvd Bridge opened to traffic on Sep. 24, 2012
- Skirball Center Drive Bridge phase 2 nears completion

Precast girder + Integral Bent cap

- Pros:
  - No falsework over traffic
  - Resist column plastic hinge moment
  - Spread footing saves foundation cost

- Cons:
  - Complex bent cap details
  - Falsework settlement at bents
  - Deck pouring sequence
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Questions?

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