

~~Specification Changes and Their Effect on Plans~~

Bridge Construction Issues

BRG VTC April, 2010

Brian D. Merrill, P.E.

BRG Construction & Maintenance Branch

Also: Common Plan Review Items

- Revised Specifications
 - Where to find the Special Provisions
 - Hierarchy of Plans and Specs
 - List of design related changes to common items
- Plan review items
 - Common notes
 - Geometry
 - AGC issues

Where to Find Special Provisions

Texas Department of Transportation
Providing safe, effective, and efficient movement of people and goods.

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How Do I... Search TxDOT

Transportation Planning
Wants Your Input
Submit Comments Online or By Mail.

Go TxDOT Go!
PROPOSITION 12
New Funds Build New Projects

Topical Resources

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Modes of Travel

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Quick Links

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- 12-09 Vehicle Registration
- Commission Information
- Hearings & Meetings
- Road Conditions
- Consumer Protection
- Project Tracker
- Results NEXT STEP FY 2010 Planned Projects
- 100 Congested Roadways

What's New

- 2010-11 Proposed General Revenue Reduction Plan
- Transportation Finance Challenges - Testimony
- Texas Awarded \$11 Million for High-Speed Rail
- Regional Leaders Meet to Discuss I-35 Corridor Improvements
- TxDOT Responds to Citizen Comments on TTC-35
- TxDOT Launches Online Tools Highlighting Most Congested Roadways
- Expenditures by County (DISCOS)

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Business with TxDOT

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Business with TxDOT

Note: Effective November 1, 2009, the Department of Motor Vehicles (DMV), opened for business. [Several TxDOT divisions and their functions](#) were transferred to the TxDMV.

Below is a list of services and information frequently requested by contractors, consultants and businesses. If you need more help, please refer to our [site map](#) or [contact us](#).

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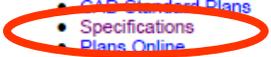
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- [Electronic Lien and Title](#)

Public-Private Partnerships



TxDOT Specifications

Specification Database Search

- Search
 - [Search for a Special Provision/Special Specification by Assigned Number](#)
 - [Search for a Special Provision/Special Specification by CCSJ](#)
 - [Search for a Standard Specification](#)
 - [Advanced Search](#)

Specification Lists

- **2004 English Specifications Book**
 - [2004 Sample General Notes \(view PDF | download Text\)](#)
 - [2004 English Specifications Book PDF version](#)
 - [2004 Special Provisions \(All\)](#)
 - [2004 Special Provisions \(Statewide and Districtwide, Current\)](#)
 - [2004 Special Provisions by District \(All\)](#)
 - [2004 Special Provisions Required Check Lists](#)
 - [2004 Special Provisions Special Case Report](#)
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 - [2004 Special Specifications by District \(All\)](#)
 - [2004 English Description Codes \(view | download Text\)](#)
 - [2004 Specification Guidelines for the 2004 Standard Specification Book and 2004 Statewide Special Specifications](#)
 - [Style Guide for the 2004 Specifications Book](#)
- **2004 Specifications Book -- Additional Information**
- **2004 Specifications Seminar Presentations**
- **1993 English Specifications Book**
- **1995 Metric Specifications Book**
- **Special Specification/Provision Change Memo**
- **Departmental Material Specifications (DMS)**
- **Miscellaneous Specification Information**
 - [Field Performance of Erosion Control Products](#)
 - [Recycled Materials Specifications](#)
 - [Bid Item Code Description Abbreviations](#)
 - [Templates and Helpful Computer Hints](#)
- **Standard Specifications for Purchasing Goods, Materials and Services**
 - [Supplemental Specifications and Attachments - Special Bid Items](#)

2004 English Special Provisions Table of Contents By Item (Statewide & Districtwide, Current)

[2004 English Special Provisions By District \(Statewide & Districtwide, Current\) Specification Information](#)

[Form FHWA-1273 - Required Contract Provisions. All Federal-Aid Projects \(Rev. 3-94\)](#)

Items 000 - 009, General Requirements and Covenants

- [000. Triple Zeros](#)
- [001. Definiton of Terms](#)
- [002. Instructions to Bidders](#)
- [003. Award and Execution of Contract](#)
- [004. Scope of Work](#)
- [005. Control of the Work](#)
- [006. Control of Materials](#)
- [007. Legal Relations and Responsibilities](#)
- [008. Prosecution and Progress](#)
- [009. Measurement and Payment](#)

Items 100 - 199, Earth Work and Landscape

- [100. Preparing Right of Way](#)
- [103. Disposal of Wells](#)
- [104. Removing Concrete](#)
- [105. Removing Stabilized Base and Asphalt Pavement](#)
- [106. Obliterating Abandoned Road](#)
- [110. Excavation](#)
- [112. Subgrade Widening](#)
- [132. Embankment](#)
- [134. Backfilling Pavement Edges](#)
- [150. Blading](#)
- [152. Road Grader Work](#)
- [154. Scraper Work](#)
- [156. Bulldozer Work](#)
- [158. Specialized Excavation Work](#)
- [160. Topsoil](#)
- [161. Compost](#)
- [162. Sodding for Erosion Control](#)
- [164. Seeding for Erosion Control](#)
- [166. Fertilizer](#)
- [168. Vegetative Watering](#)
- [169. Soil Retention Blankets](#)
- [170. Irrigation System](#)
- [180. Wildflower Seeding](#)
- [192. Landscape Planting](#)
- [193. Landscape Establishment](#)

2004 English Special Provisions to Item 421 - Hydraulic Cement Concrete (Statewide & Districtwide, Current)

SP421-035 [PDF](#) [RTF](#) - Raises the 5-cycle Magnesium Sulfate Soundness loss for coarse and intermediate aggregates when air entrainment in the concrete has been waived. *Required for all projects using Item 421, beginning with the November 2009 letting.*
Replaces [SP421-034](#) . (Change Memo: [de-43-09](#)). **Statewide Use.**

[FORT WORTH - DISTRICT 2](#)

SP421-013 [PDF](#) [RTF](#) - Hydraulic Cement Concrete. Amended. Districtwide Use.

[HOUSTON - DISTRICT 12](#)

SP421-002 [PDF](#) [RTF](#) - Improve performance and quality of bonded concrete overlay. Districtwide Use.

[2004 English Special Provisions by Item \(Statewide & Districtwide, Current\)](#)

[Specification Information](#)

[Search For a Special Provision or Specification](#)

Hierarchy of Plans and Specs

1. Special Provisions
2. Plans (Including Gen Notes)
 - A. Job-Specific Plans
 - B. Standards
3. Specifications (Std or Special)

Note: General Notes cannot be used to modify the measurement and payment articles of a specification unless allowed by the spec.

“Recently” Revised Specifications

- 416, “Drilled Shafts”: Added more types of shafts that we will pay for: non-reinforced, sign mounts, high mast pole, roadway illumination pole, traffic sign pole.
- 420, “Concrete Structures”: changed saw-cut groove requirements (see Plan Review Items)

“Recently” Revised Specifications

- 421, “Hydraulic Cement Concrete”:
 - 421.4.A.3 - added wording about corrosion inhibitors (CaNO_2) and the plans need a dosage rate – usually 3.0 gal/cy
 - 421.4.A.4 – changed the entrained air requirements, no air table anymore– see Plan Review Items
 - 421.4.A.6 – Mix design options for ASR have been modified

“Recently” Revised Specifications

- 424, Precast Concrete Structures (Fabrication)
 - Min 25% Class F Flyash required for Opt 1
 - Options 6-8 not allowed
- 425, Precast PS Concrete Str Members
 - Allows optional designs for old shapes when new TxGirders are in plans

“Recently” Revised Specifications

➤ 429, Concrete Structure Repair

➤ Complete revision of Material requirements to work with DMS-4655

➤ Complete revision to Payment Article to pay for repairs by:

➤ Vertical/Overhead

➤ Horizontal

➤ Bridge Deck (Partial Depth)

➤ Bridge Deck (Full Depth)

➤ Remove and Replace

➤ No more depth-related pay items

“Recently” Revised Specifications

- 434, “Elastomeric Bridge Bearings”
 - Now covers sliding elastomeric bearings
- 439, “Concrete Overlays”
 - Removed deck repairs from this item – use 429
- 442, “Metal for Structures”
 - Adds pay items for RR Thru-Girder, RR Deck Girder, Misc Bridge, and Misc Non-Bridge items
 - Misc Bridge: retrofits, braces,... structural items
 - Misc Non-Bridge: sign mounts, brackets, sidewalk plates,...

“Recently” Revised Specifications

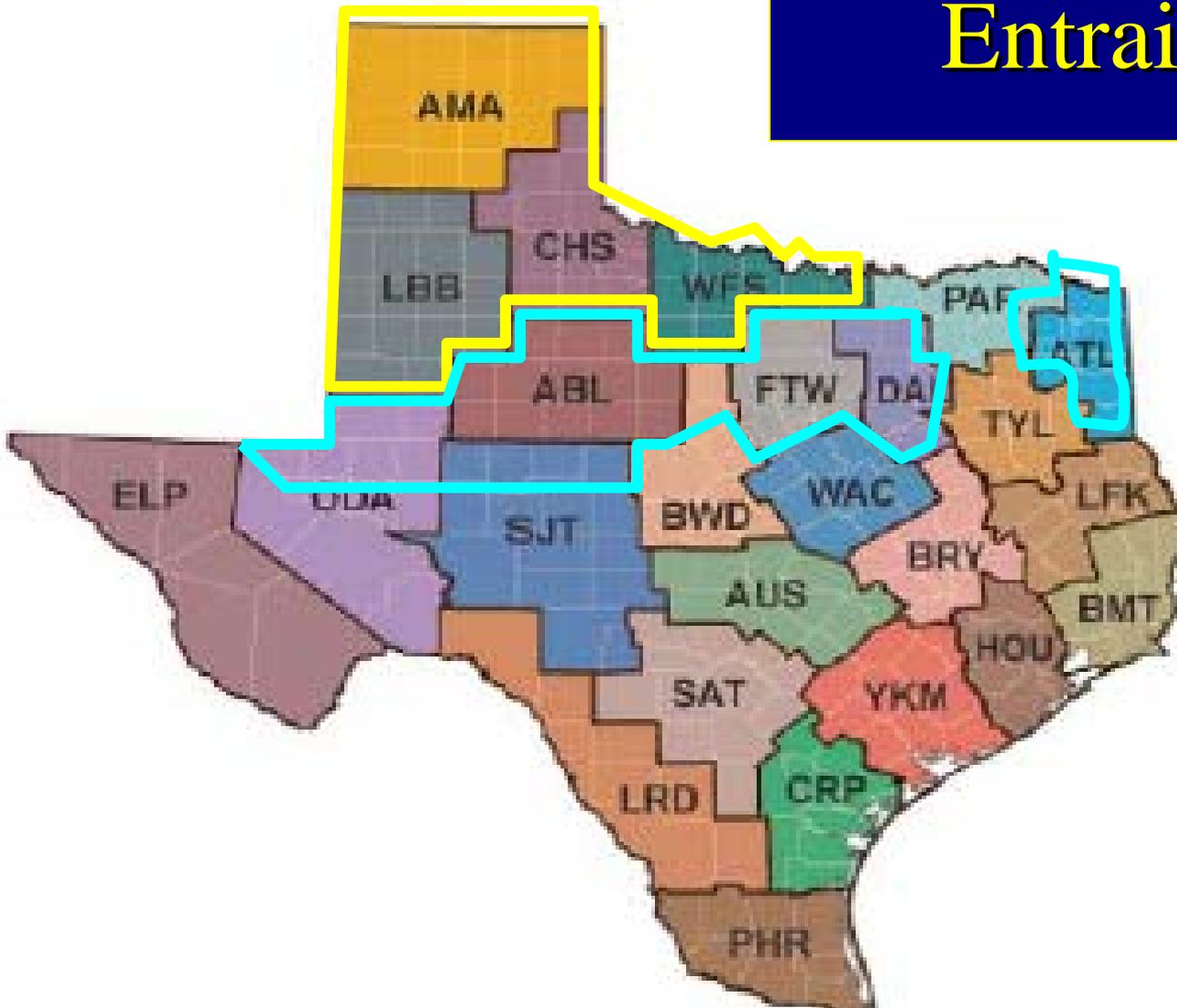
- 450, “Railing”

- Covers testing requirements for epoxy or grouted anchors

Plan Review Items

- General Notes
 - Entrained air
 - Deck Grooves
 - Material lists
- Phased construction details
- Misc stuff

Entrained air



Default: All concrete to have entrained air

No notes required – covered by the Special Provision

Entrained air is required in all bridge deck and slip formed concrete (bridge rail, concrete traffic barrier, pavement, etc.). Adjust the dosage of air entraining agent for low air contents as directed or allowed by the Engineer. If entrained air is provided where not required, only the upper limits of the Special Provision will be enforced.

Entrained air is required in all slip formed concrete (bridge rail, concrete traffic barrier, pavement, etc.) Adjust the dosage of air entraining agent for low air content as directed or allowed by the Engineer. If entrained air is provided where not required, only the upper limits of the Special Provision will be enforced.

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Public-Private Partnerships

Bridge Information

TxDOT provides assistance at the local and regional levels in all aspects of planning, design, construction and maintenance of bridges. The Department also develops policies for a safe and comprehensive state bridge system.

Note: The link to the [Shop Drawings](#) page has changed. Please update your bookmarks.

Construction and Maintenance

- [Bridge Specifications](#)
- [Shop Drawings](#)
- [Proprietary Concrete Repair Materials](#)
- [Curing Mats for Concrete Structures](#)
- [Construction Tips](#)
- [Welding Certifications](#)

Geotechnical Services

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- [Retaining Wall Information](#)
- [Soil and Bedrock Information](#)
- [Geotechnical Design Examples](#)

Design

- [Bridge Standards](#)
- [Superstructure Design Information](#)
- [Substructure Design Information](#)
- [Other Design Information](#)
- [Steel Bridge Design Preferred Practices](#)
- [LFRD Bridge Design FAQs](#)

Project Development

- [Railroad Information](#)
- [Bridge Unit Cost Tables](#)
- [Participation-Waived/Equivalent-Match Project Program \(PWP/EMP\)](#)
- [Report on Texas Bridges](#)

Superstructure Design Information

This page provides guidance and recommendations on Load and Resistance Factor Design (LRFD) of specific bridge superstructure components.

- [General Recommendations](#)
- [Deck Surface Texture Requirements](#)
- ▼ [Corrosion Protection Measures](#)



In areas of the state where de-icing agents are frequently used during winter storms, it is recommended that **additional corrosion protection measures** be incorporated into the bridge design and details.

District-specific requirements are available for review.

- [Concrete Deck Slabs on Stringers](#)
- [Concrete Deck Slabs on U Beams \(U40 and U54\)](#)
- [Prestressed Concrete I Beams and I Girders](#)
- [Prestressed Concrete U Beams \(Types U40 and U54\)](#)
- [Prestressed Slab Beams](#)
- [Prestressed Concrete Double-Tee Beams](#)
- [Prestressed Concrete Box Beams \(B20, B28, B34, and B40\)](#)
- [Design Resources](#)
- [Design Examples and Spreadsheets](#)

RECOMMENDED CORROSION PROTECTION MEASURES

For areas of the state where deicing agents are frequently used during winter storms.
Refer to Corrosion Protection Measures on the TxDOT web site for additional information.

District Name	HPC Bridge Slabs & Rails	HPC Sub-structure	Epoxy Coated Reinf. Bridge Slabs & Rails	Epoxy Coated Reinf. Sub-structure	Increased clear cover for bridge slabs	Increased clear cover for sub-structure	Class II (Penetrating) Concrete Surface Treatment	Waive Air Entrainment? (Bridge Slab & Rails)	Waive Air Entrainment? (Sub-structure)	Corrosion Inhibiting Admixtures (Prestressed only)
ABL	Y	Y	Y	Y	Y	See note A	Y	N	Y	N
AMA	Y	Y	Y	Y	Y	See note A	Y	N	N	Y
ATL	Y	Y	Y	Y	Y	See note A	Y	N	Y	N
AUS	N	N	N	N	N	See note A	Y	Y	Y	N
BMT	N	N	N	N	N	See note A	Y	Y	Y	N
BRY	N	N	N	N	N	See note A	Y	Y	Y	N
BWD	Eastland and Stephens counties only.	Eastland and Stephens counties only.	Eastland and Stephens counties only.	Eastland and Stephens counties only.	Eastland and Stephens counties only.	See note A	Y	N	Y	N
CHS	Y	Y	Y	Y	Y	See note A	Y	N	N	Y
CRP	N	N	N	N	N	See note A	Y	Y	Y	N
DAL	Y	Y	Y	Y	Y	See note A	Y	N	Y	N
ELP	Y	Y	N	N	Y	See note A	Y	Y	Y	N
FTW	Y	Y	Y	N	Y	See note A	Y	N	Y	N
HOU	N	N	N	N	N	See note A	See Note C	Y	Y	N
^a LBB	Y	Y	Y	Y	Y	See note A	Y	N	N	Y
LFK	N	N	N	N	N	See note A	Y	Y	Y	N
LRD	N	N	N	N	N	See note A	Y	Y	Y	N

Deck Grooves

If posted speed is <45 mph, saw-cut grooves are not required.

Add GN 420: “Saw-cut grooves are not required”

Superstructure Design Information

This page provides guidance and recommendations on Load and Resistance Factor Design (LRFD) of specific bridge superstructure components.

- [General Recommendations](#)
- ▼ [Deck Surface Texture Requirements](#)

The proper surface texture of a roadway will prevent vehicles from hydroplaning during wet weather. The surface texture of roadways typically consists of microtexture and macrotexture. Microtexture in concrete pavement is provided by the fine aggregates. Macrotexture is provided through broom finishing, burlap dragging, carpet dragging or saw cut grooving. The broom finish, burlap dragging, and carpet dragging all provide a texture that creates friction with the vehicles wheels. Saw cut grooving of the deck further improves upon roadway safety by improving water flow off the structure.

Concrete Structures

Item 420, "Concrete Structures", requires a broom, carpet drag, or burlap drag finish on all bridge slabs during deck placement followed by saw cut grooving of the bridge deck once the deck has hardened. Current research indicates that saw cut grooving of bridge decks is not always necessary and is typically noisier than other methods of surface texturing. The method of macrotexture recommended is dependent on the posted speed limit and the roadway geometry.

PCC Pavements and Bridge Decks

TxDOT requirements for the surface texture for PCC pavements and bridge decks was modified in 2004 by Amadeo Saenz Jr., P.E. in his memorandum "Texture Requirements for Pavement Structures with Design Speeds of 45 Miles per Hour or Less". Saenz recommended the following:
For roadways and structures with a posted speed limit less than or equal to 45 miles per hour, the concrete surface may be finished with a broom or carpet drag. Structures with a posted speed limit greater than 45 miles per hour require a saw cut grooving finish.

Additionally, the FHWA has published a Technical Advisory that suggests that for roadway geometries consisting of a radius of curvature less than 1640 feet saw cut grooving should be required.

Overall, removing the saw cut grooving requirement for roadways with lower posted speed limits and greater radii will result in a cost savings and noise reduction.

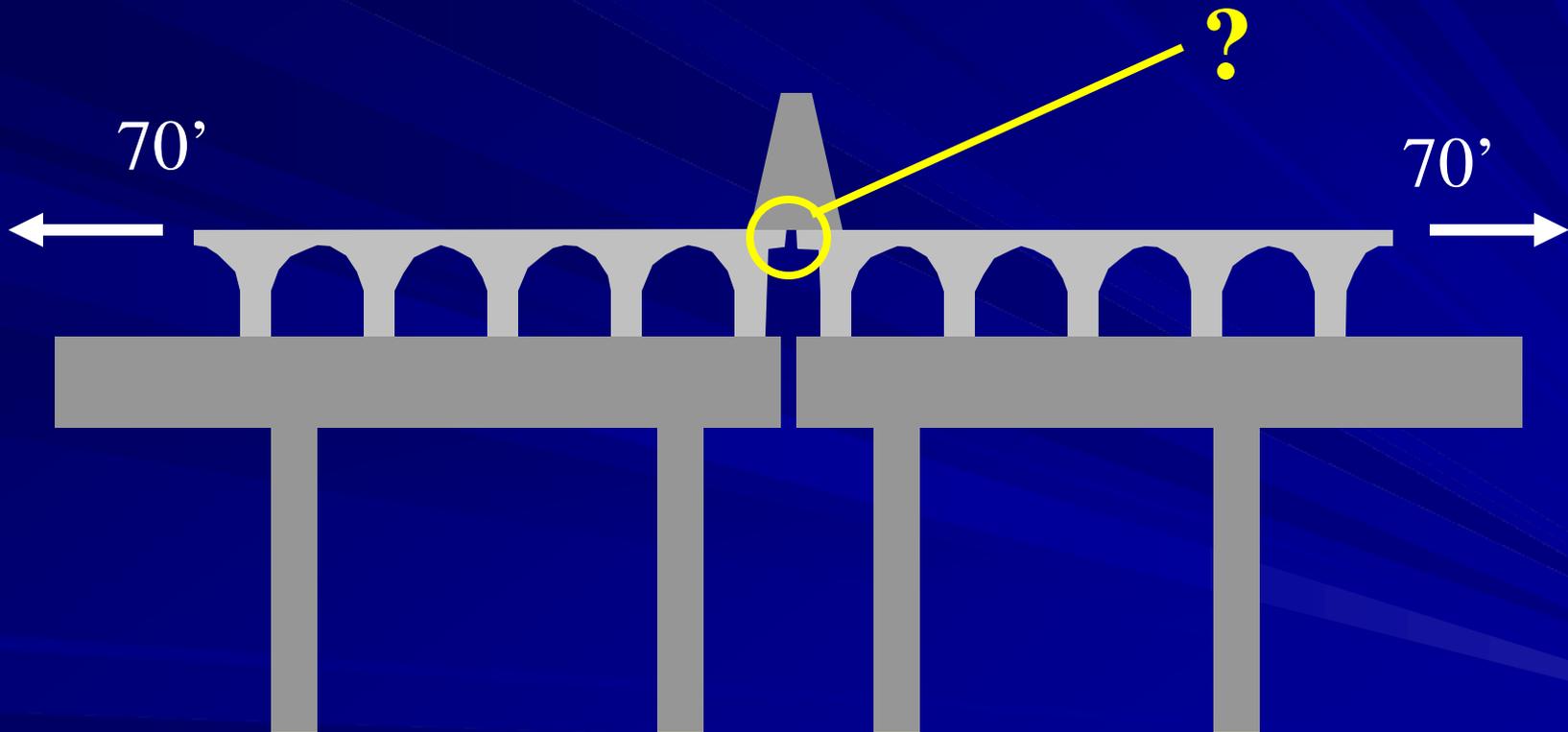
Material Lists

- Header Joints
- Asphalt Plug Joints
- MSE or other wall systems

See BRG website for lists

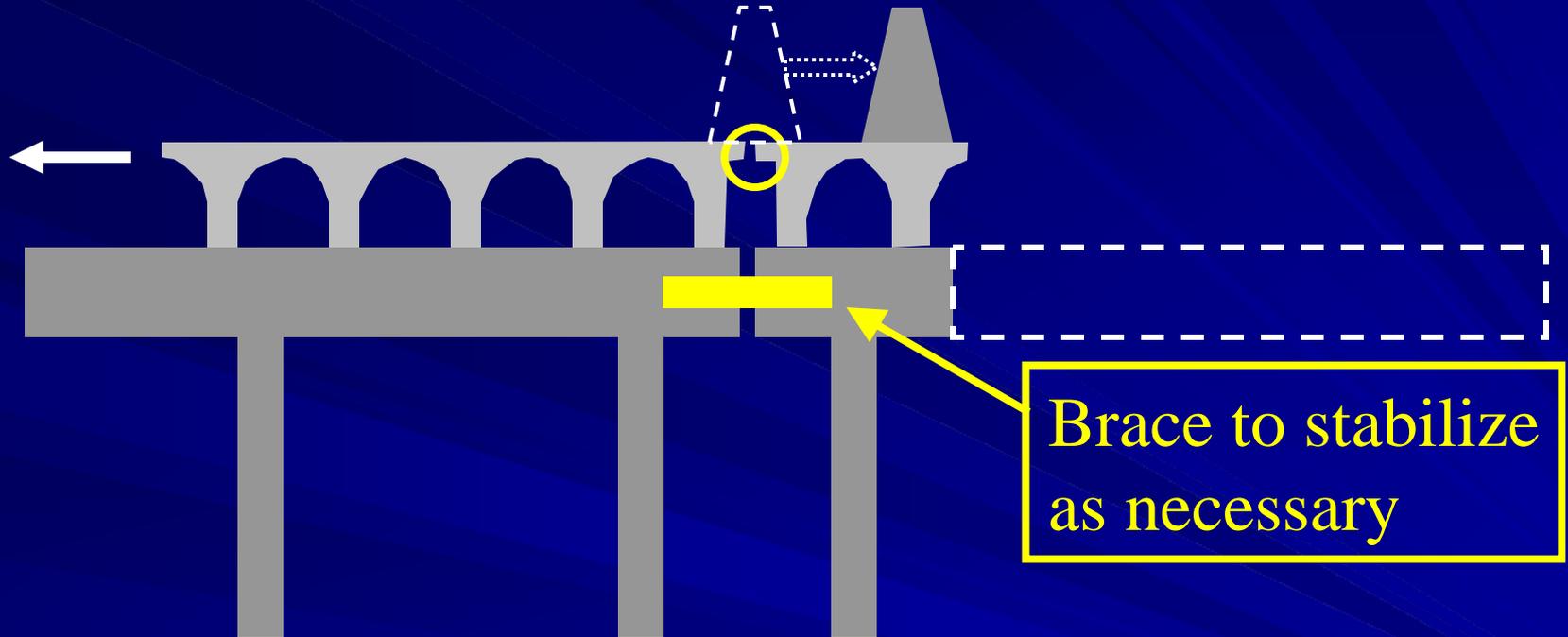
- Most others have a Material Producer List associated with a DMS

Phased Construction Details



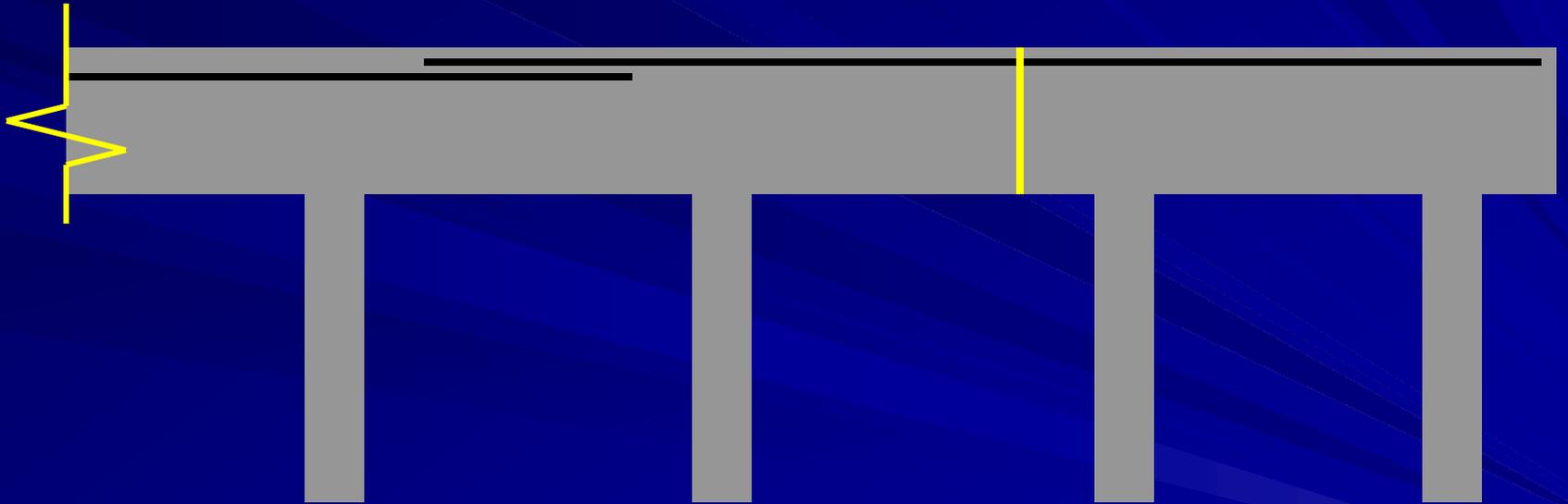
Existing Structure – Typ Section

Phased Construction Details

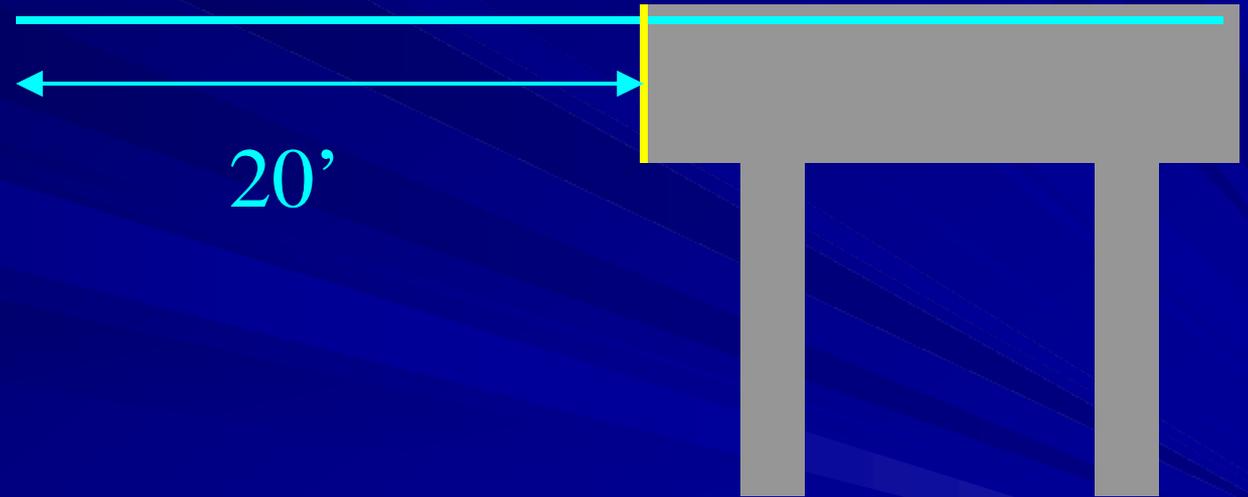


1. What do they brace for? Loads?
2. Who determines if it is “necessary”?
3. “Open” Joint treatment?

Phased Construction Details



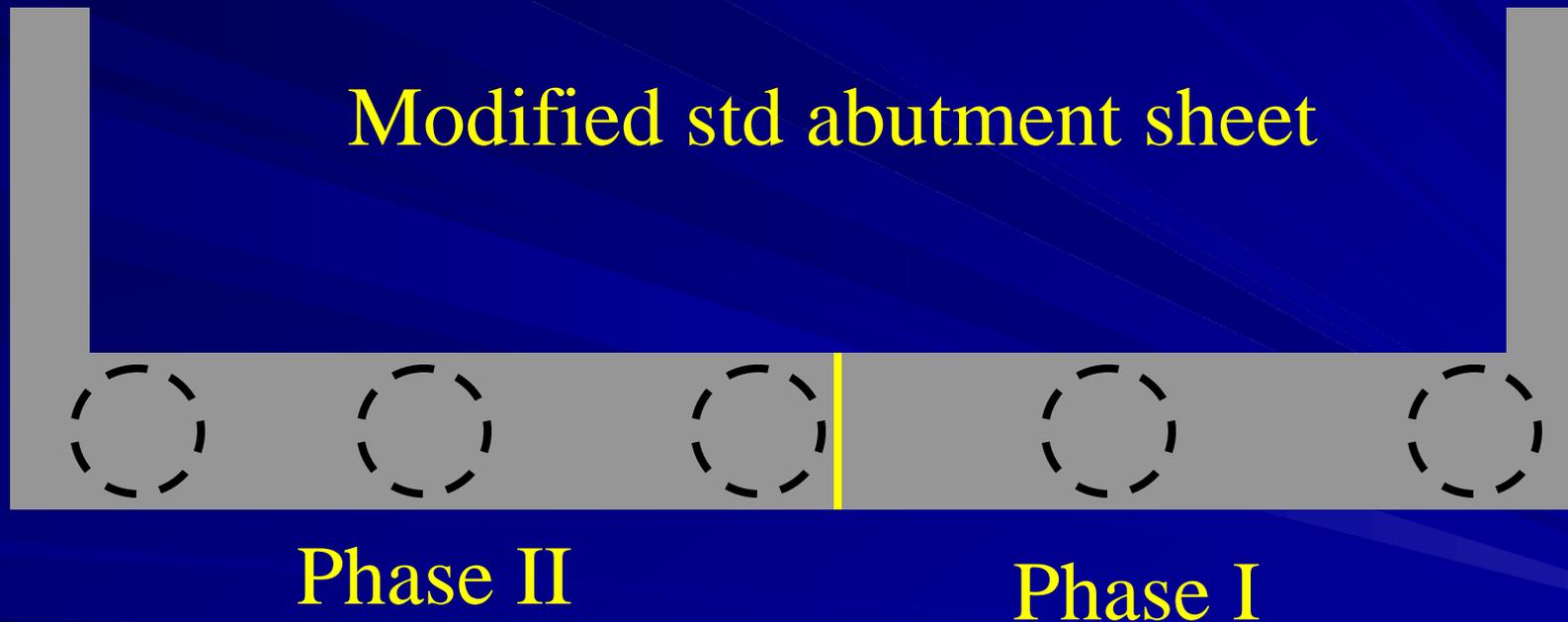
Phased Construction Details



20'

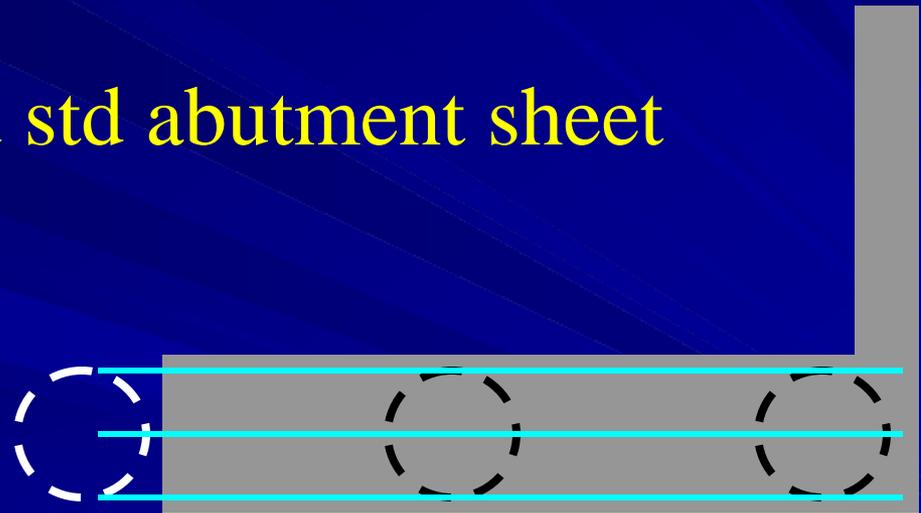
Phase I

Phased Construction Details

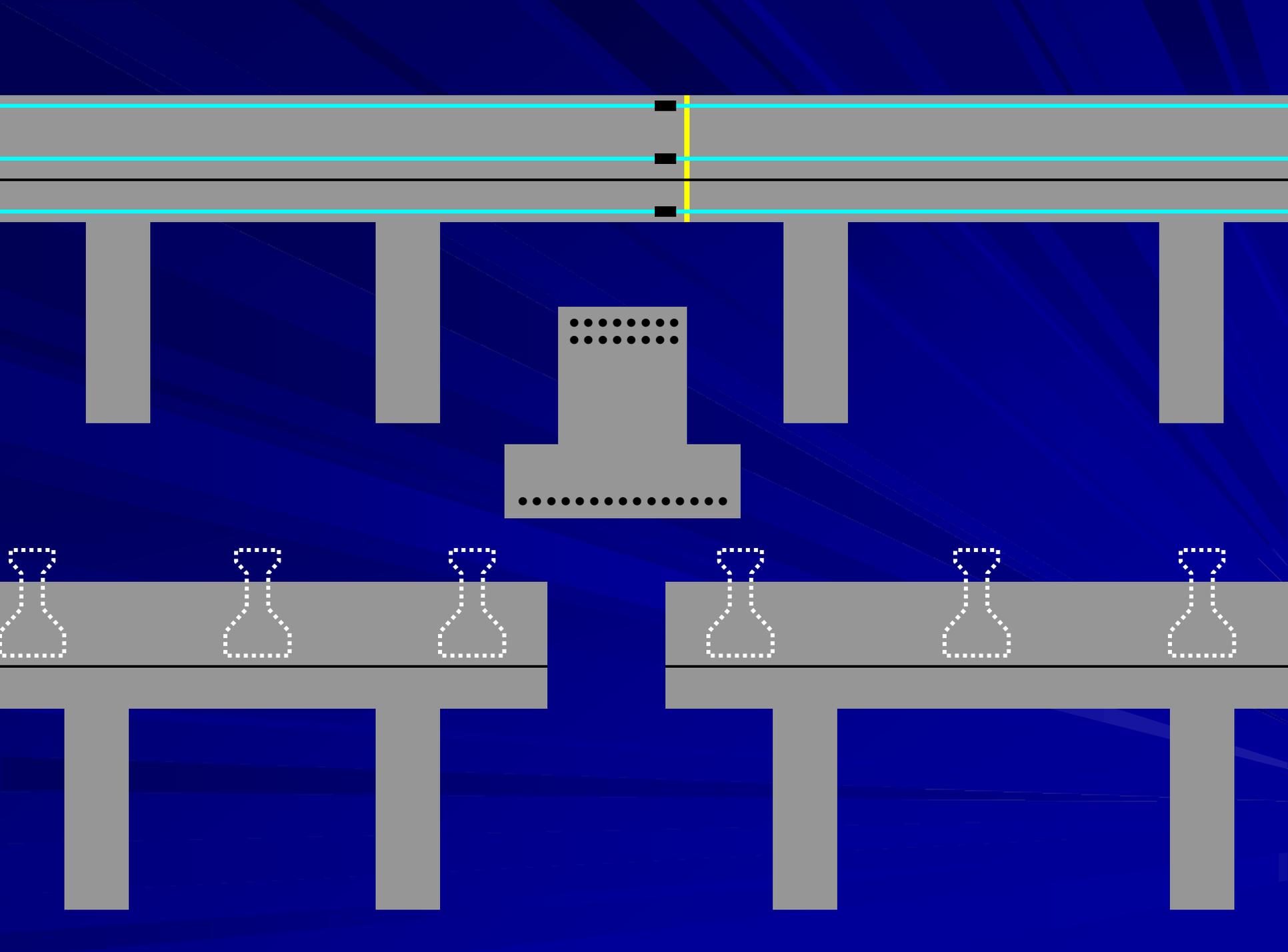


Phased Construction Details

Modified std abutment sheet



Phase I



Shoring for Phased Substructure Demo



Temp Shoring: Factored loads = _____

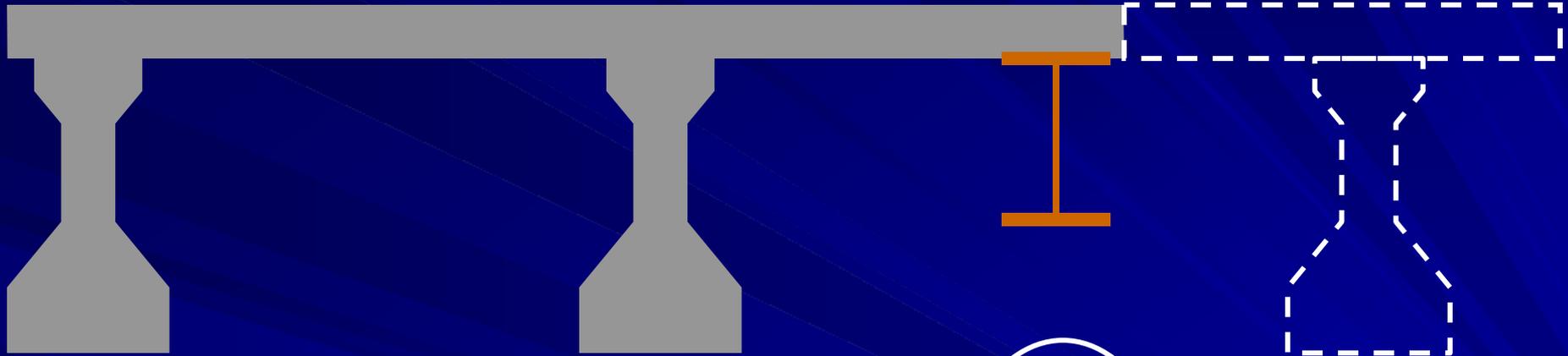
Assumed allowable soil pressure is: _____

Payment ?

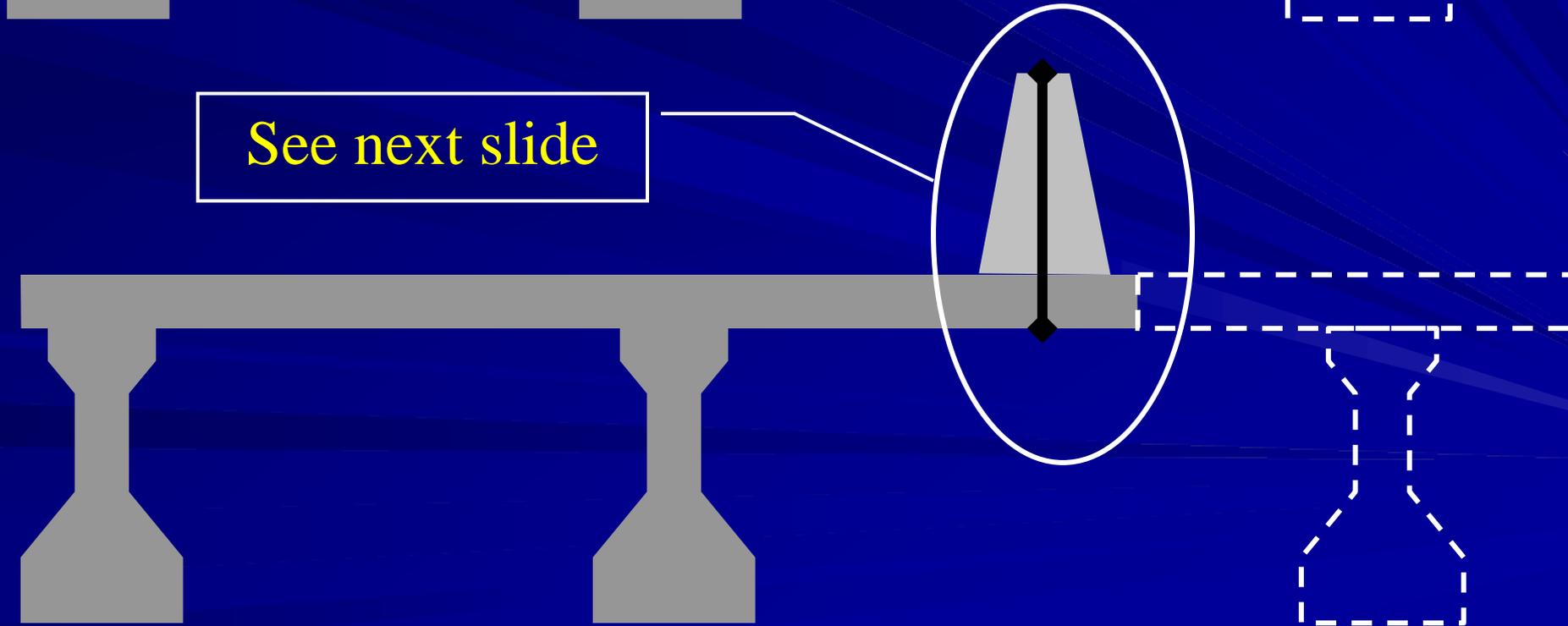
Shoring

- Provide design in plans and/or
- Provide loads for Contractor Alt Design
- Address payment (can be subsidiary)
 - Subsidiary to Items 430 or 496
 - Build using 420 or 441/442 and removed under 496

Shoring for Superstructure



See next slide

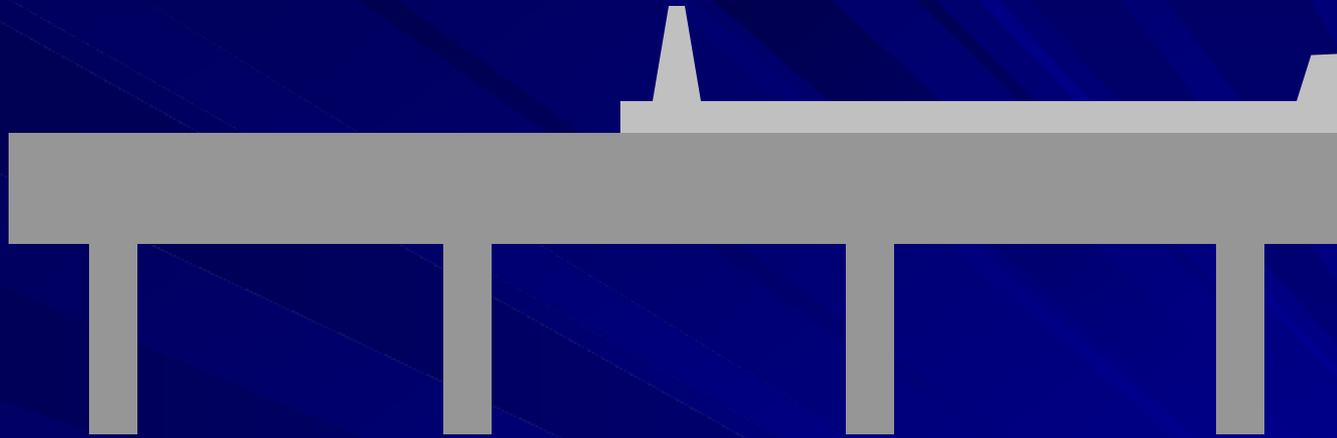


Shoring for Superstructure



AGC Issues

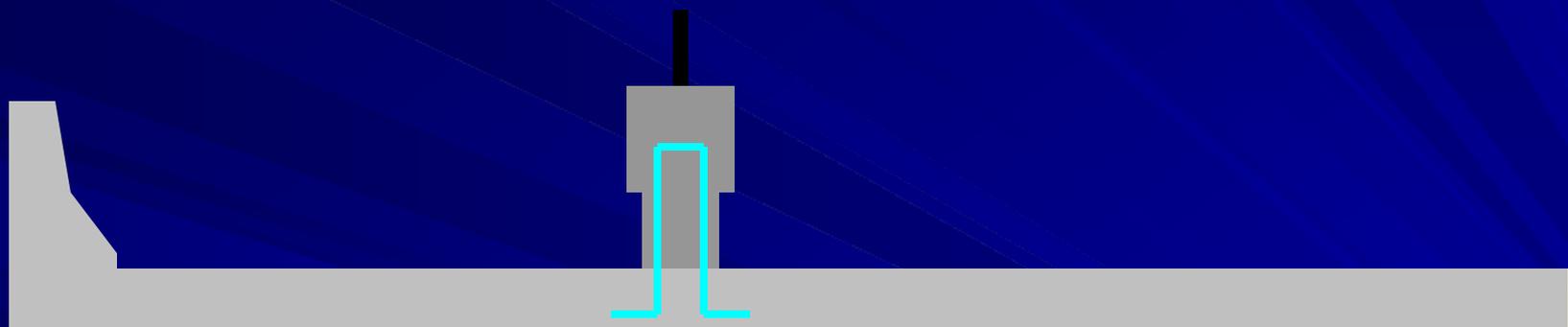
1. Responsibility for stability during phased construction
2. Rail, sidewalk, or median anchorage steel in slabs
3. Geometry
4. Need description of type of str to be removed



“Contractor to submit a bracing and/or strengthening plan(s) for the deteriorated portion of the existing bridge that will remain in place during Phase I construction for review and approval.”

Shoring, Bracing, or Strengthening

- 2 options:
 1. Design in plans
 2. Give design criteria: loads, locations,...
- Include payment – can be subsidiary but must mention it in GN's
- Contractor should not be responsible for stability if they are following the plans



Geometry

- Complex geometry for Off-system bridges
- Complex bearings for curved units
- Dimensions in degrees

Complex Geometry: Off-system

- Vertical curve
- 45° skew
- dirt road
- 15 mph design speed
- decked slab beams

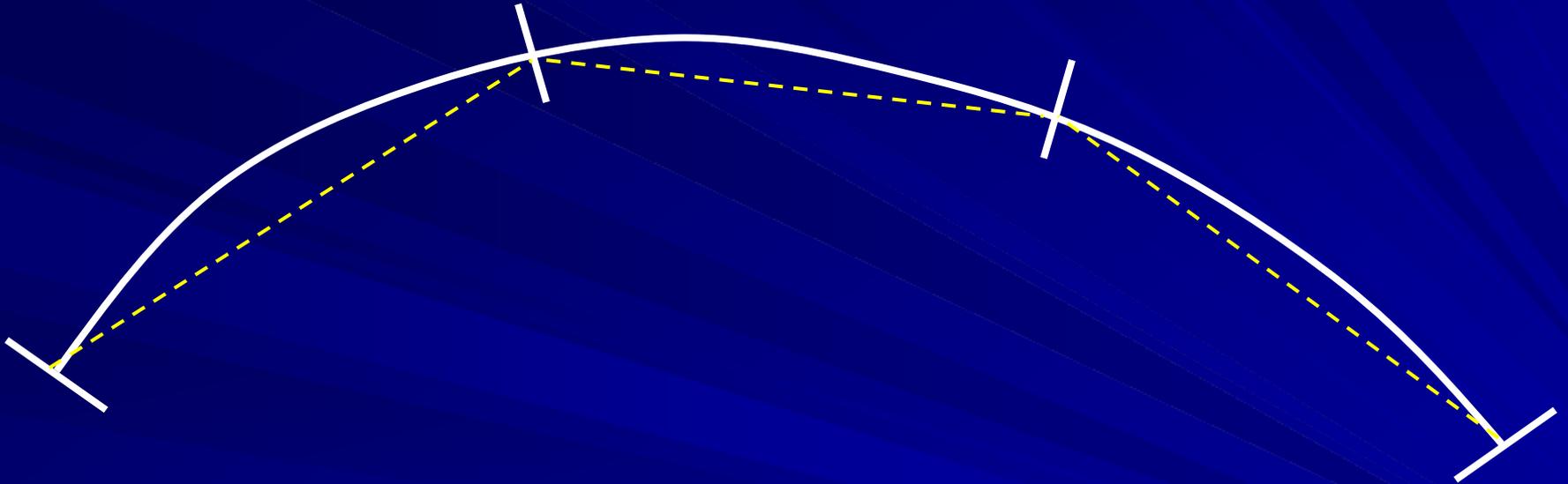
Solution: make bridge flat and have no VC
Give simple grading off ends of bridge.

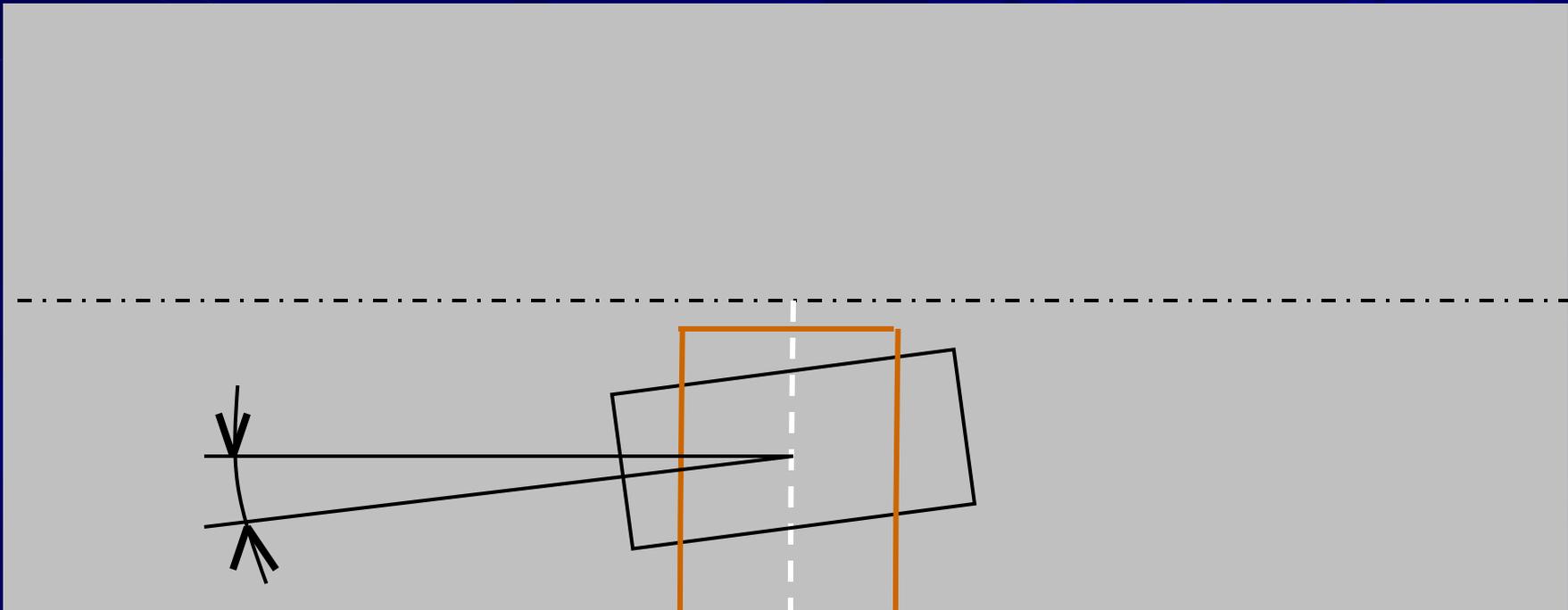
Complex Geometry: Off-system

- Horizontal curve w/ 1700' radius
- slab beams with deck
- 30 mph speed
- bent skew angle: $0^{\circ}30'27''$

Solution: use square bridge

Geometry: bearing details



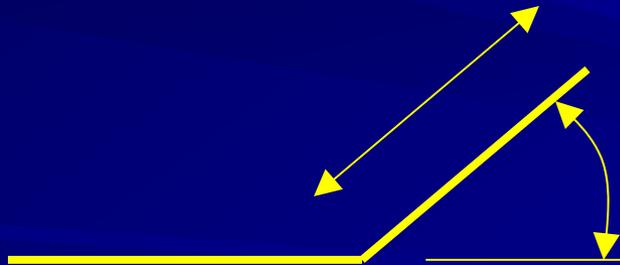




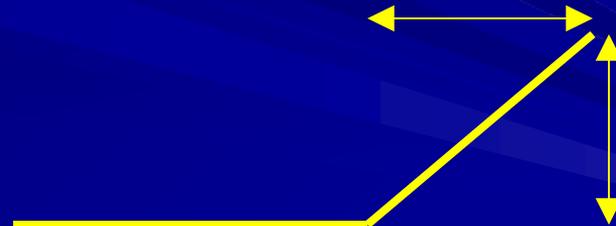
Preference: align bearings with girders

Angle Dimensions

- Global: use degrees (layouts or alignments)
- Local: use X & Y dim



Global



Local

Structures to be removed

- “121.33’ four span (30.33’) Pan Formed structure with concrete caps and timber piling”
- “Five 40’ long simple steel I-beam spans on concrete caps and steel H-piles”
- “Two span 60’ (30-30) continuous flat slab on concrete piling”
- “Simple span 60’ prestressed concrete beam span on concrete caps and columns”

