

# Bridge Design for Constructability and Ease of Maintenance

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August, 2007

# Constructability

- Geometry
- Design/Detailing
- General Notes & Plan Notes

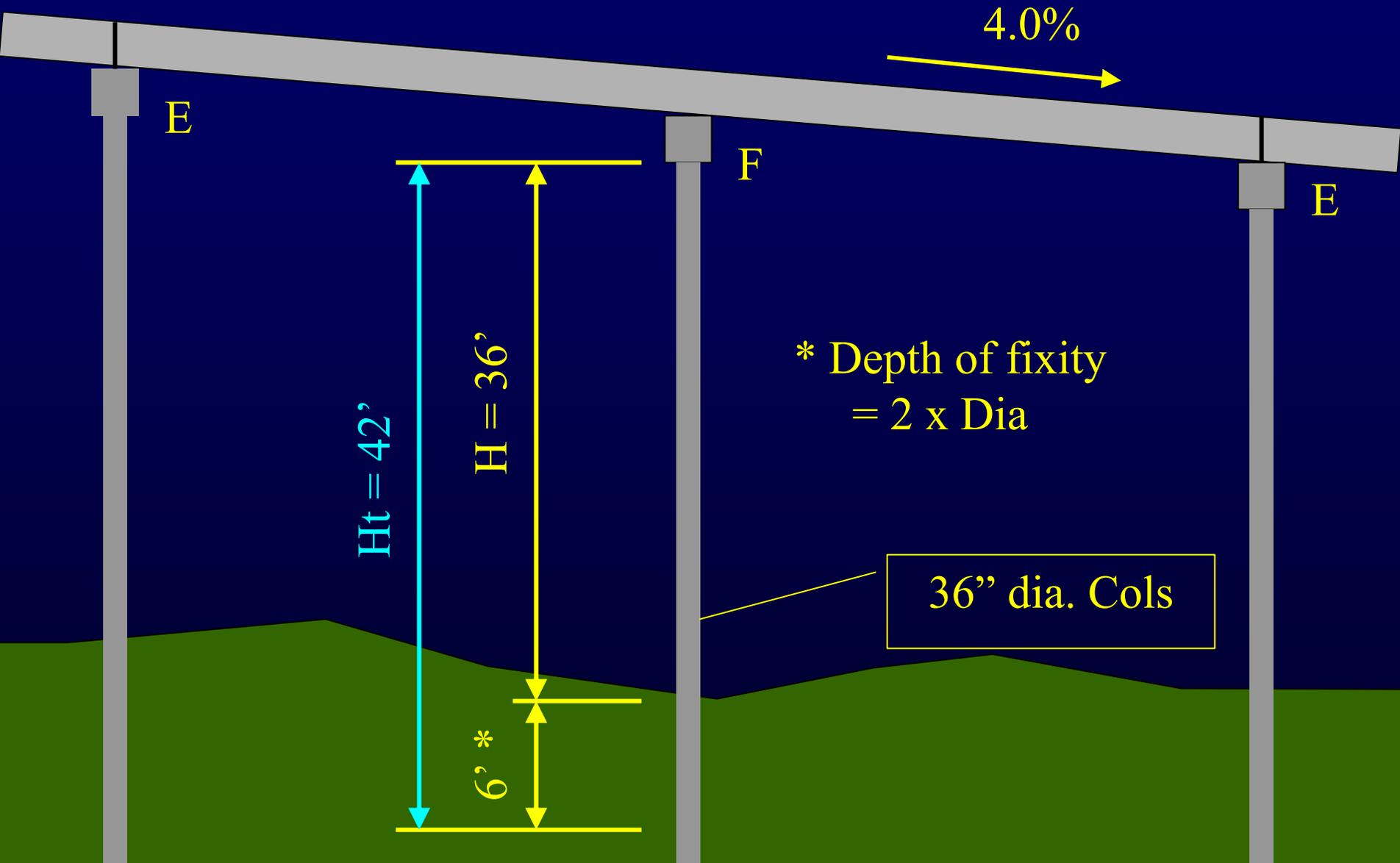
We only hear about “problems”

Most of the following examples are BRG  
projects

# Geometry

- List super-elevation transitions by type:  
Type I (Linear) or Type III (Parabolic)
- Practical limit for hauling: 150' (steel or PS beams)
- Watch F-E conditions – is it really “fixed”?
- Elevated Intersections
- OSB's >20'

# F-E Conditions



4.0%

E

F

E

Ht = 42'

H = 36'

6' \*

\* Depth of fixity  
= 2 x Dia

36'' dia. Cols



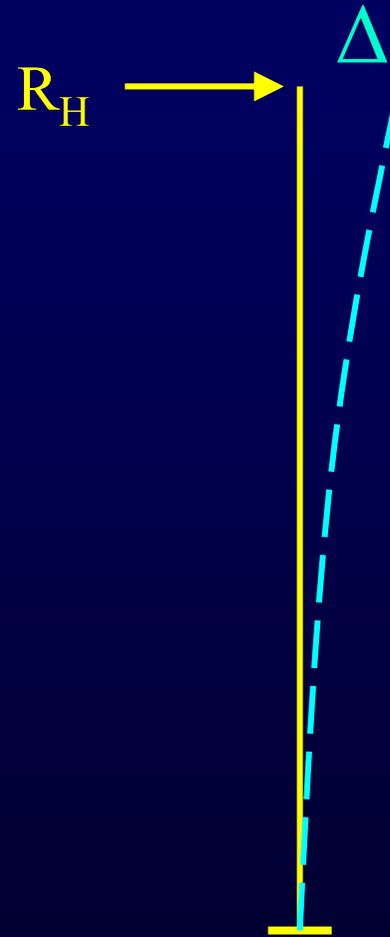
# F – E Conditions, cont'd

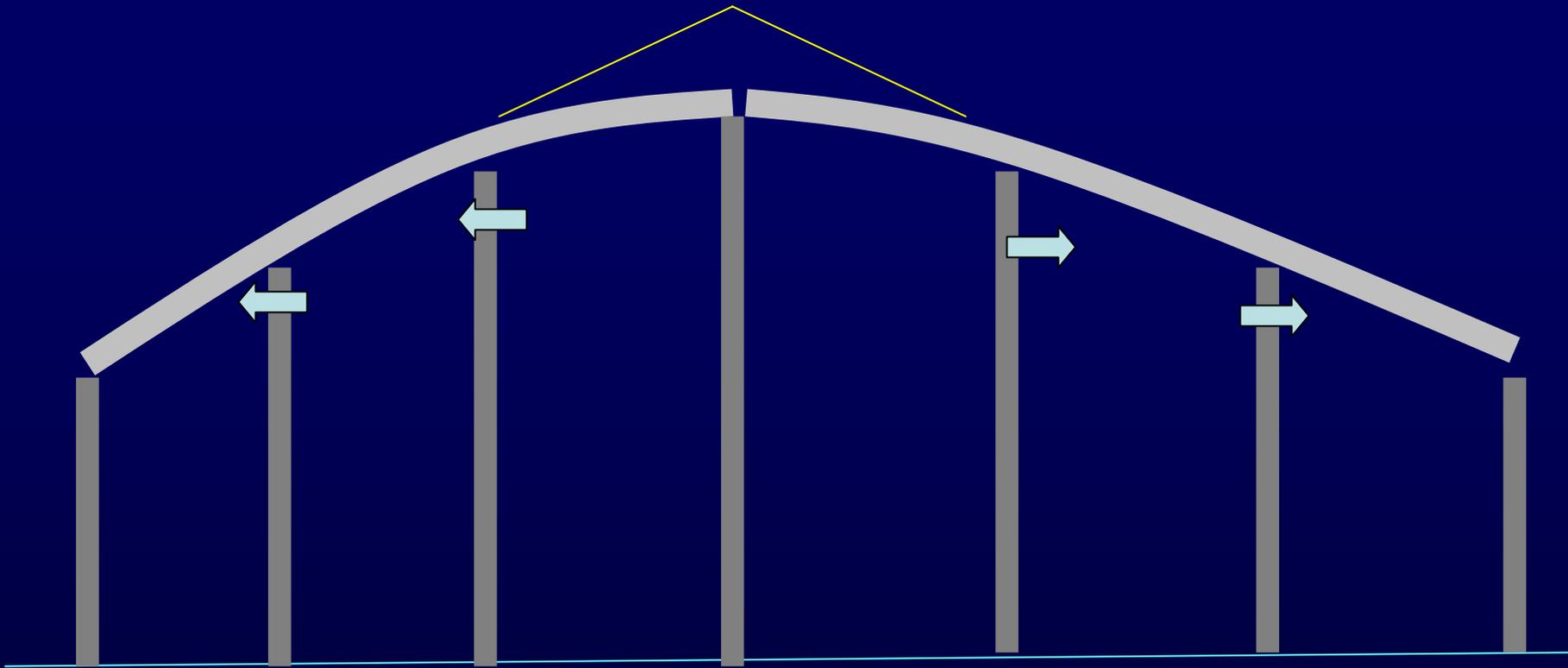
$$R_{DL} = 172 \text{ k/col}$$

$$R_H = 0.04 \times R_{DL} = 6.9 \text{ k}$$

$$Ht = 42'$$

$$\Delta = 1.0''$$





Joint "growth" on direct connectors  
Measured over 3" of movement



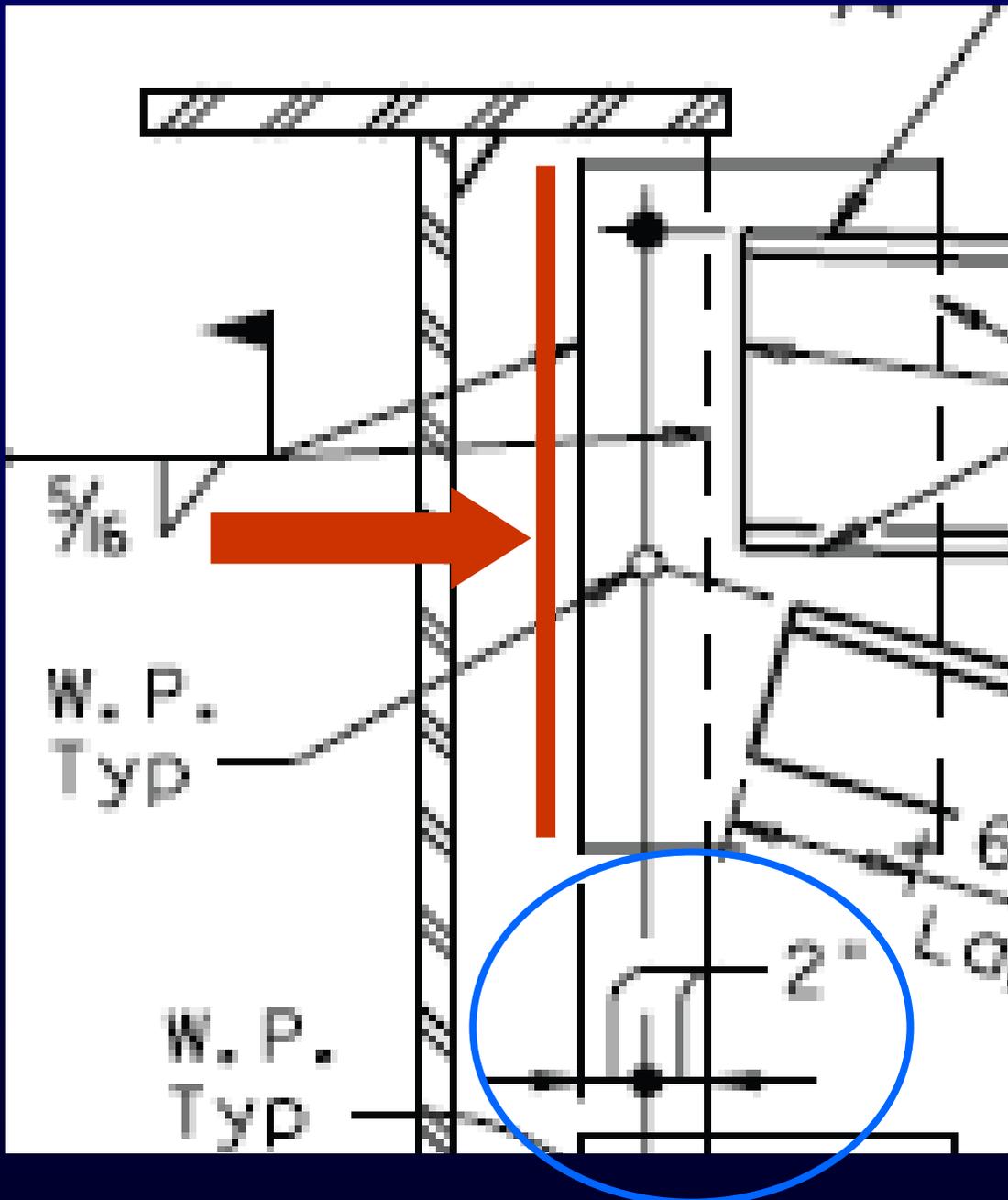
# Overhead Sign Bridges >20'



80,000+ OD Permits each year

# Design/Detailing

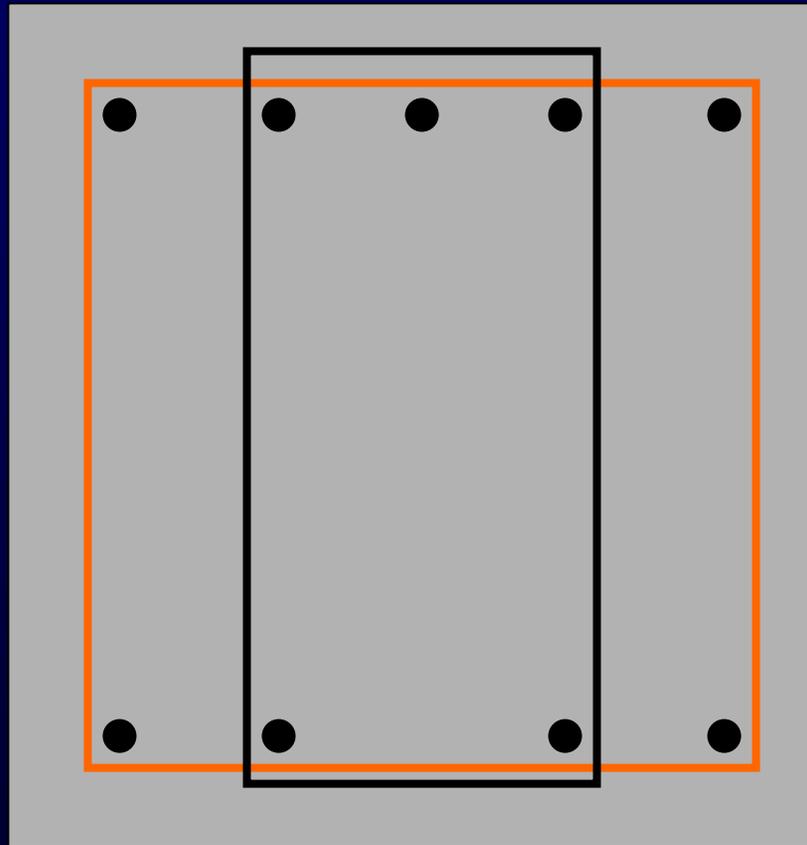
- Diaphragm conn. plates for plate girders
- Double Stirrups
- Cap-Column Connections
- Rehabilitation notes
- General/Plan Notes



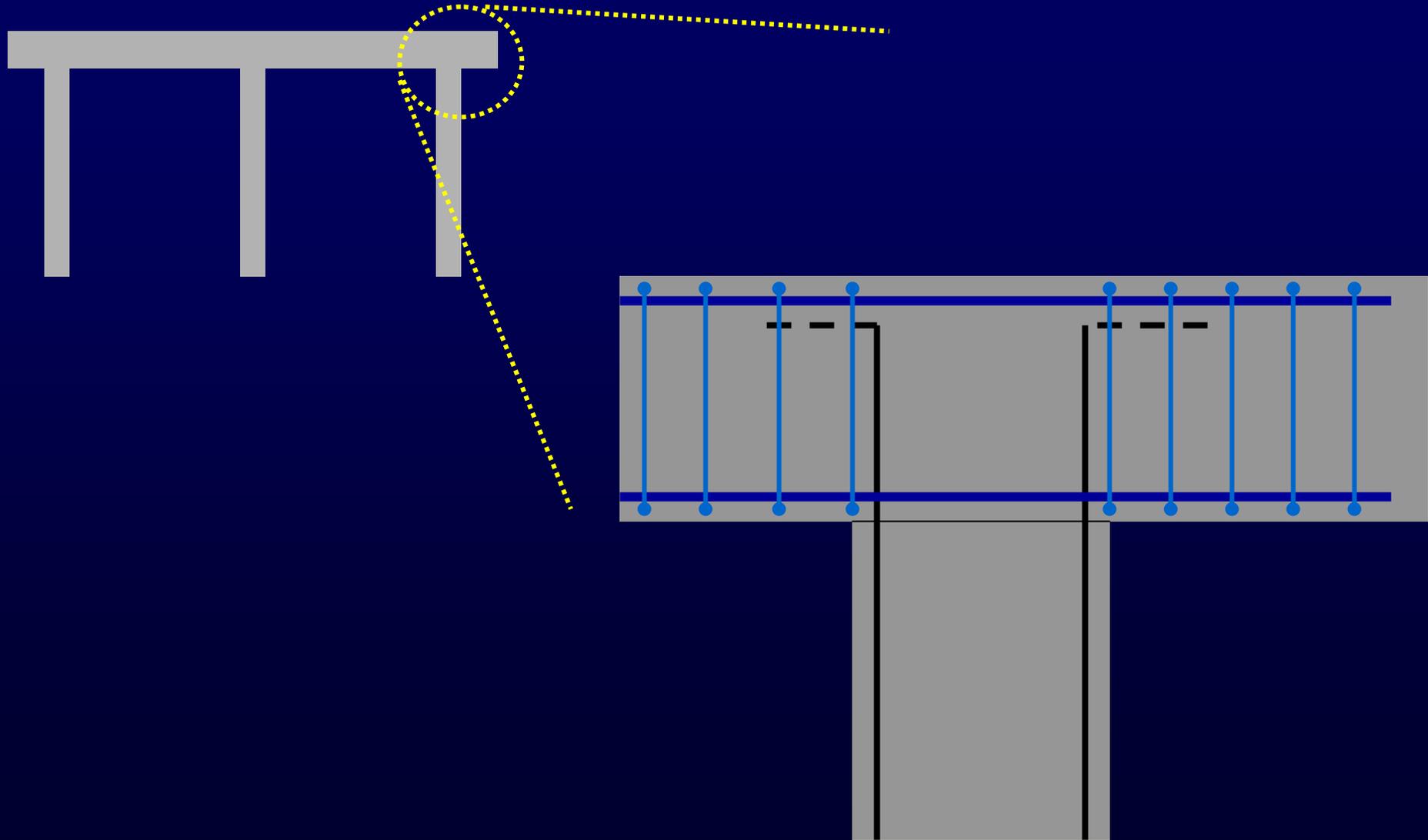
## Diaphragm Conn. Plate

Must have at  
least 7" wide  
plate for  
welding

# Double Stirrups

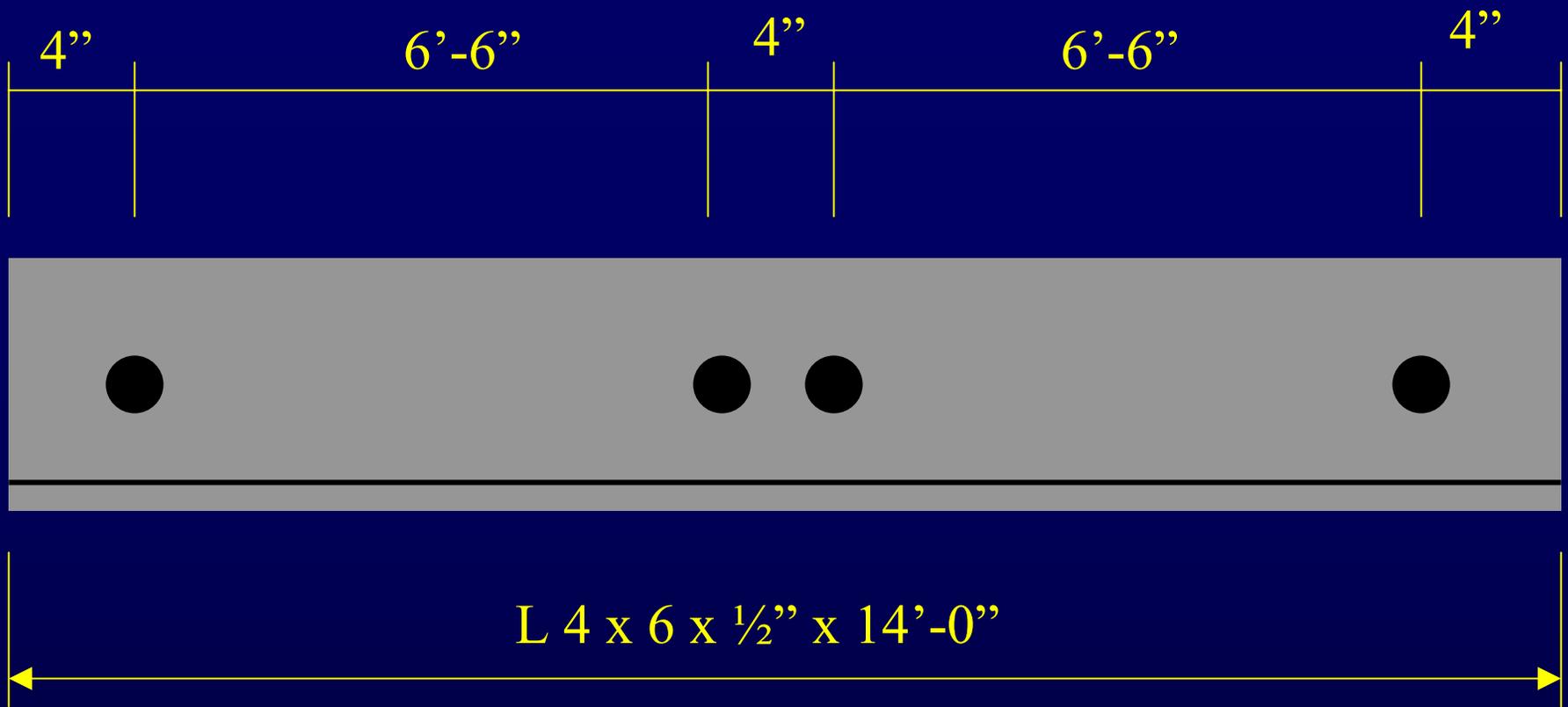


# Cap to Column Connections





# Rehabilitation Notes

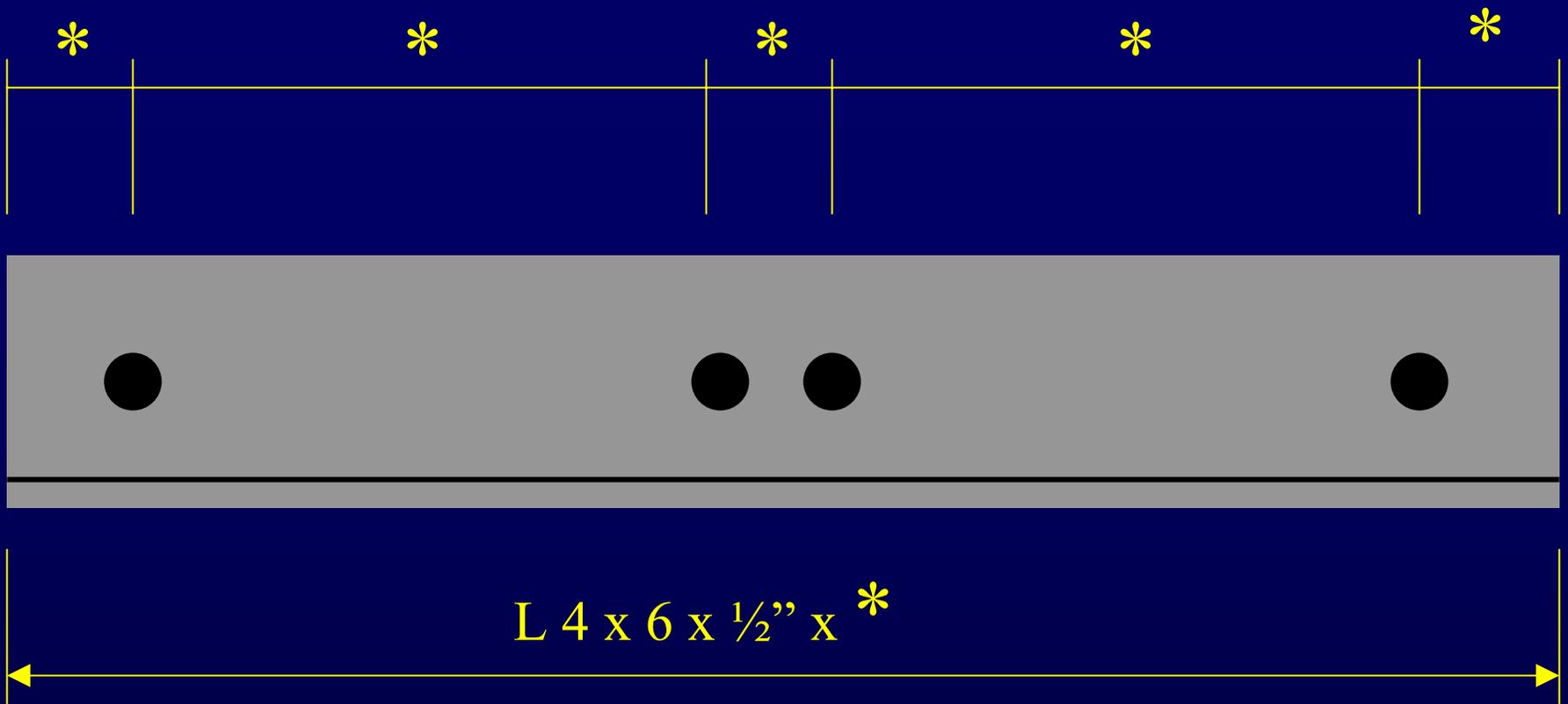


*“Note: Field verify all measurements before ordering new materials”*

*“Contractor shall verify all elevations and dimensions in the field”*







\* Determine in field

# General Notes/Plan Notes

- Still seeing portions of specs repeated in notes (usually for “emphasis”)
- Check TxDOT web site for plan requirements for various specs
- Make sure notes are in correct location

# Notes for Drilled Shafts

Don't put a note stating that slurry methods or casing are required – let the specs handle that

There are rare exceptions to this

# Misc

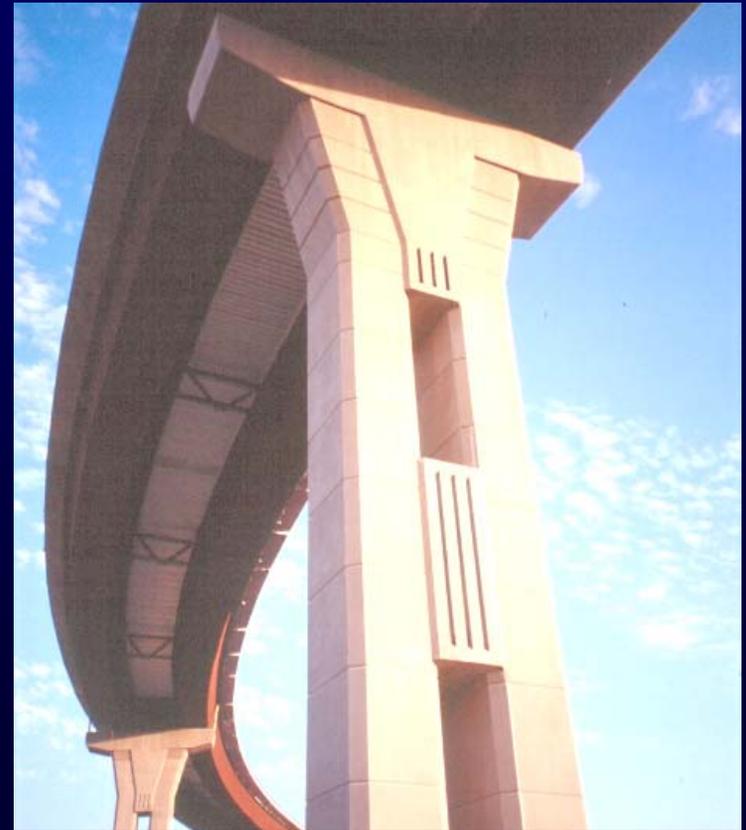
- Lightweight Aggregate Concrete
- Special Surfaces Finishes for Concrete

# LWA (light weight aggregate) Concrete

- No specs for LWA at this time
- SP would be required
- Few sources in Tx
- No real structural need for it
- Handling issues in field
- Performance issues

# Special Surface Finishes – Item 427

- Blast Finish
  - Difficult to perform this operation in some cities
  - depends on lots of factors
- Rub Finish (and Two Rub finish)
  - Very time consuming and expensive – save for small areas with close pedestrian access



# Ease of Maintenance

- Enemy #1: WATER
  - Joints
  - Drain systems
  - Riprap/Channel protection

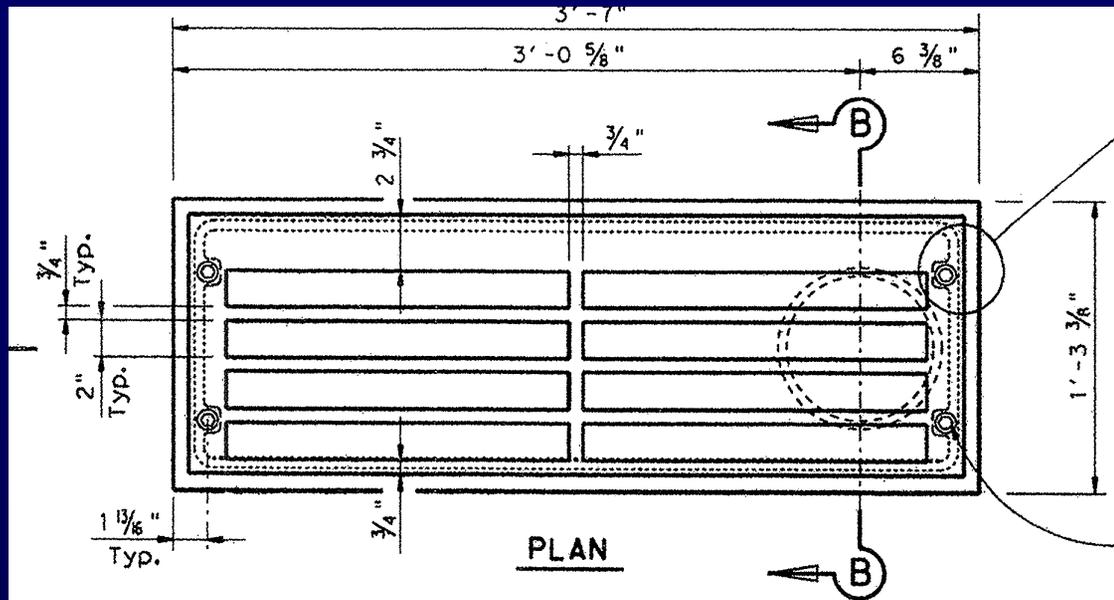
# Joints

- Minimize # of Joints but don't go jointless
- No perfect joints
  1. SEJ Up to 5" 
  2. Armor Joint
  3. Header Joint
  4. Asphalt Plug
  
- 1. Finger joints (un-sealed)
- 2. Modular

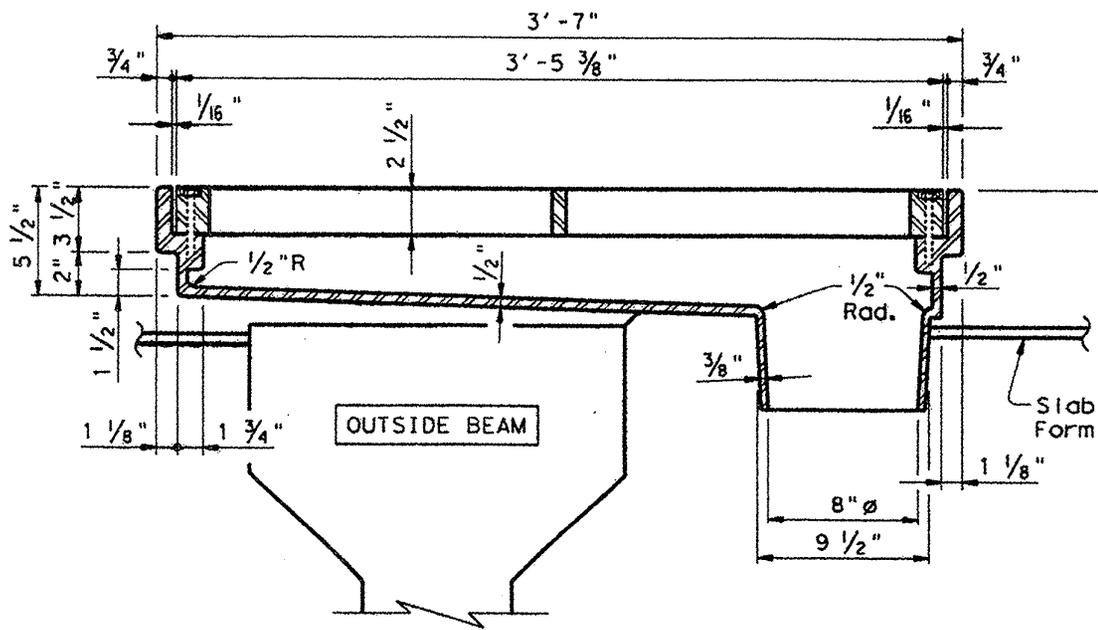


# Drain Systems

- Simple, Simple, Simple
- Avoid running pipes in concrete
- Drain locations



**PLAN**



**SECTION A-A**







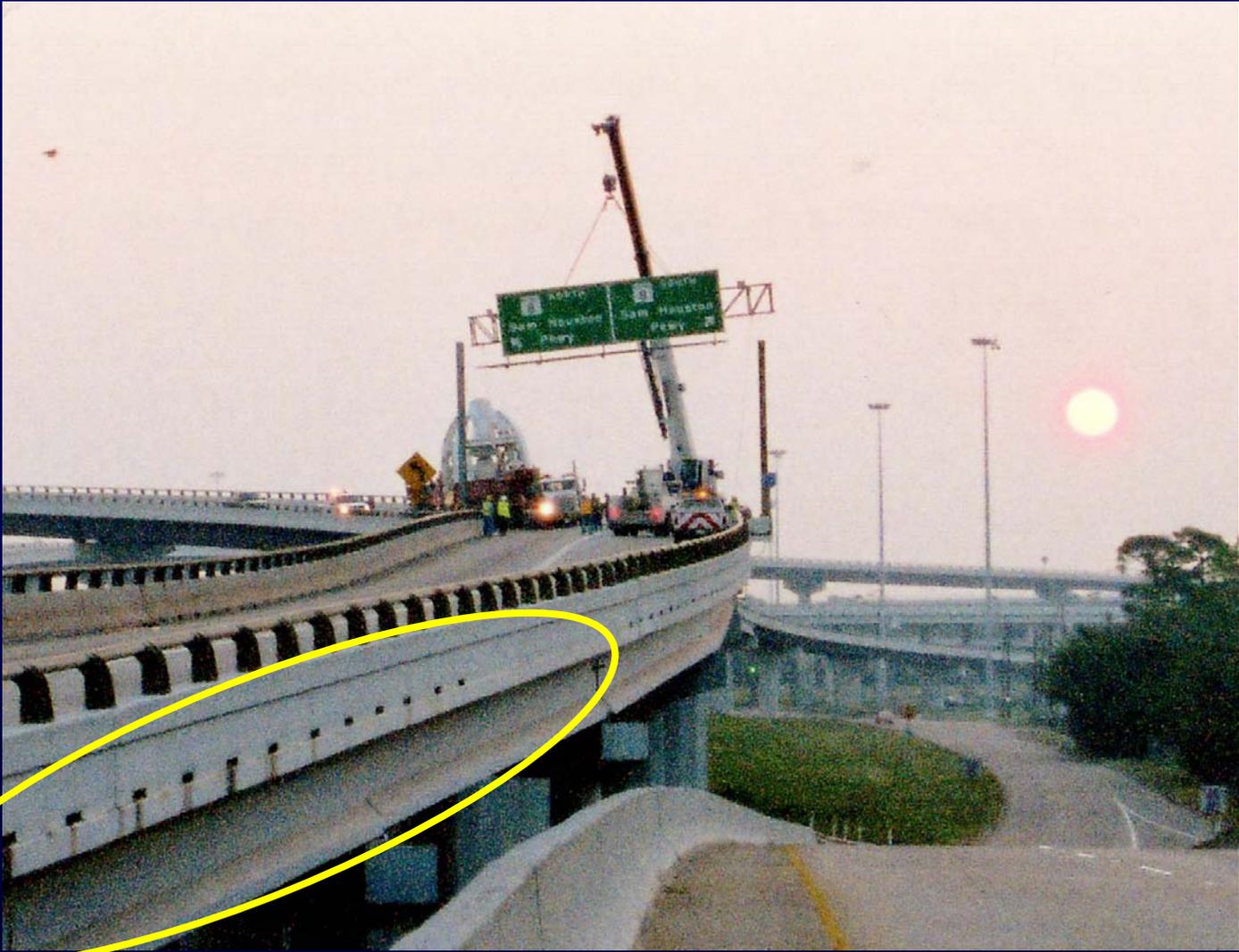




Drains:

What seems to work best?

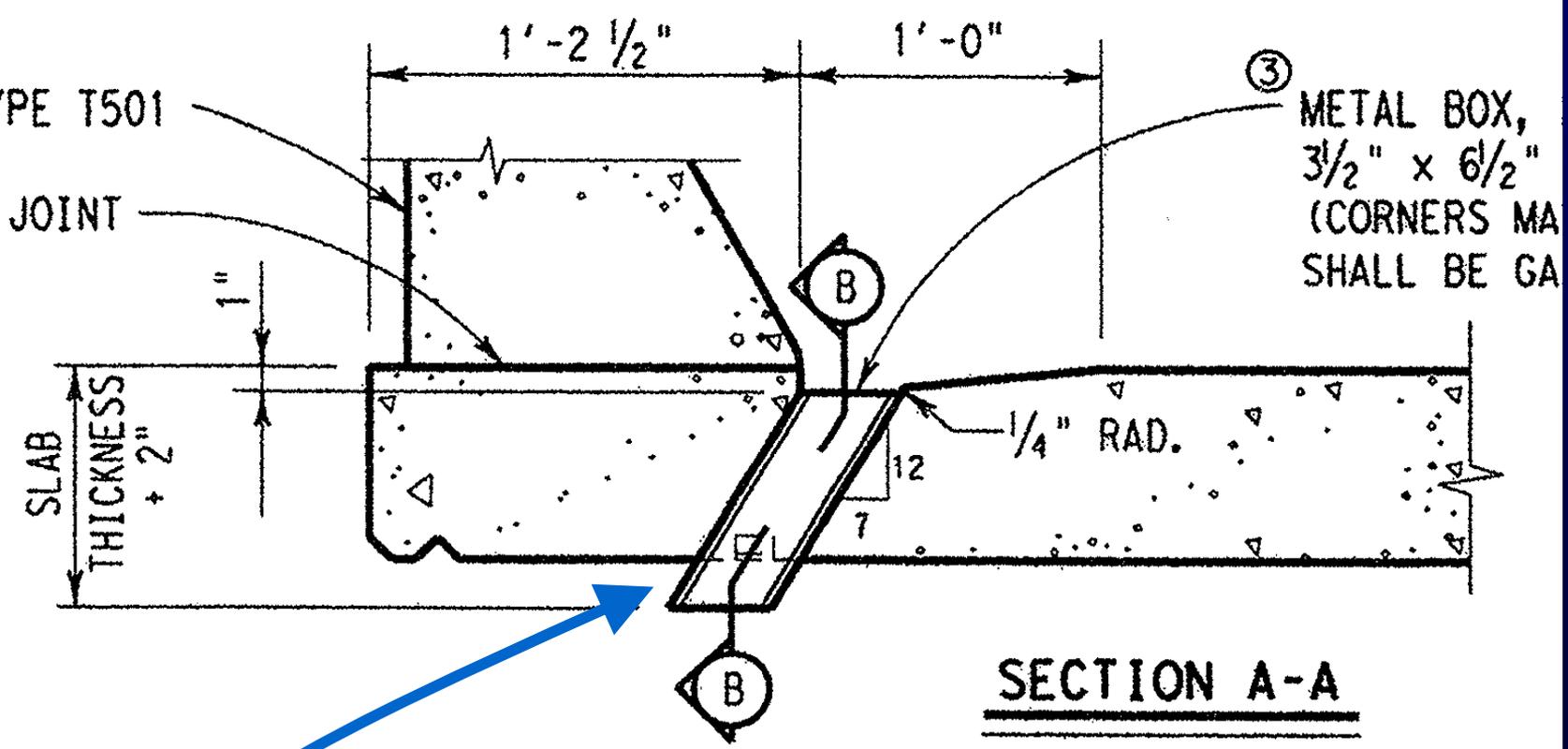








RAIL TYPE T501  
CONST. JOINT



4 x 6 tube works, too

# Riprap

- Avoid concrete for stream crossings (\$3.90/sf)
- Use flexible systems:
  1. Stone protection (\$3.70/sf)(can use crushed concrete)
  2. Gabion Mattresses (\$11.00/sf)
  3. Interlocking articulated blocks (\$10.00/sf)
  4. Concrete Armor Units
  5. Gabions
- Provide adequate shoulder drains











Articulated Blocks



Gabion Mattresses



# Bridge Construction & Maintenance Branch

- 6 PE's + 1 EIT
- 4 Structural Steel Field Inspectors
- Serve as in-house consultant to districts, divisions, and consultants on bridge construction & maintenance issues
- Contact Brian Merrill (512) 416-2232 or [bmerrill@dot.state.tx.us](mailto:bmerrill@dot.state.tx.us)