

**2007 Western Bridge
Engineers Seminar –
September 24 – 26, 2007**

Design Like a Contractor

John M. Yadlosky, P.E., HDR Engineering

Steel Bridges – Fast, Safe, Smart: Design Like a Contractor

Three Themes for Today's Discussion

- **Think**

- Creatively, it's more than P/A and MC/I.

- **Understand**

- Should it be this way or that way?

- **Communicate**

- So that's what you really wanted!















Think Like a Contractor....

'In April 1867 a charter authorizing a private company to build and operate an East River bridge had been voted through at Albany.'

Think Like a Contractor....

'In April 1867 a charter authorizing a private company to build and operate an East River bridge had been voted through at Albany.'

What Bridge is this?

The Great Bridge, David McCullough, Avon Publishers, 1972

Think Like a Contractor....



Think Like a Contractor....

'In April **1867** a charter authorizing a private company to build and operate an East River bridge had been voted through at Albany.'

Think Like a Developer?

'In April 1867 a charter authorizing a private company to build and operate an East River bridge had been voted through at Albany.'

'A month after the charter became law, Roebling had been named engineer of the work. By whom or by what criteria remained a puzzle for anyone trying to follow the story in the papers.'

Think Like a?

Roebling:

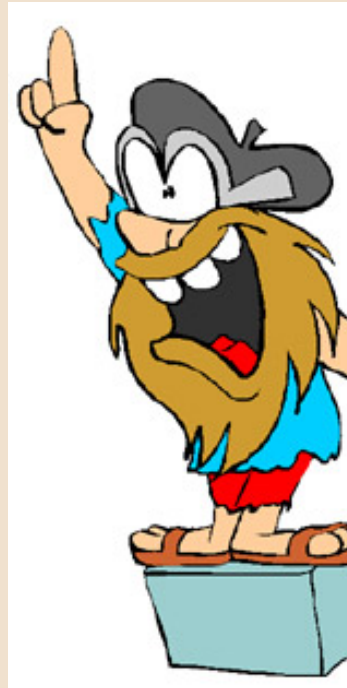
- **Engineer,**
- **Developer,**
- **Financier, and**
- **Contractor.**



Think Like a Developer....

Three Themes for Today's Discussion

- Think
- Understand
- Communicate
- Create!?



Design Like a Contractor....

- But Why the Title: Design Like a Contractor?
- AASHTO all but requires it:

AASHTO LRFD 2.5.3 Constructability

‘ ...Where there are, or are likely to be, constraints imposed on the method of construction, by environmental considerations or for other reasons, attention shall be drawn to those constraints in the documents.

Where the bridge is of unusual complexity, such that it would be unreasonable to expect an experienced contractor to predict and estimate a suitable method of construction while bidding the project, at least one feasible construction method shall be indicated in the contract documents.’

Design Like a Contractor....

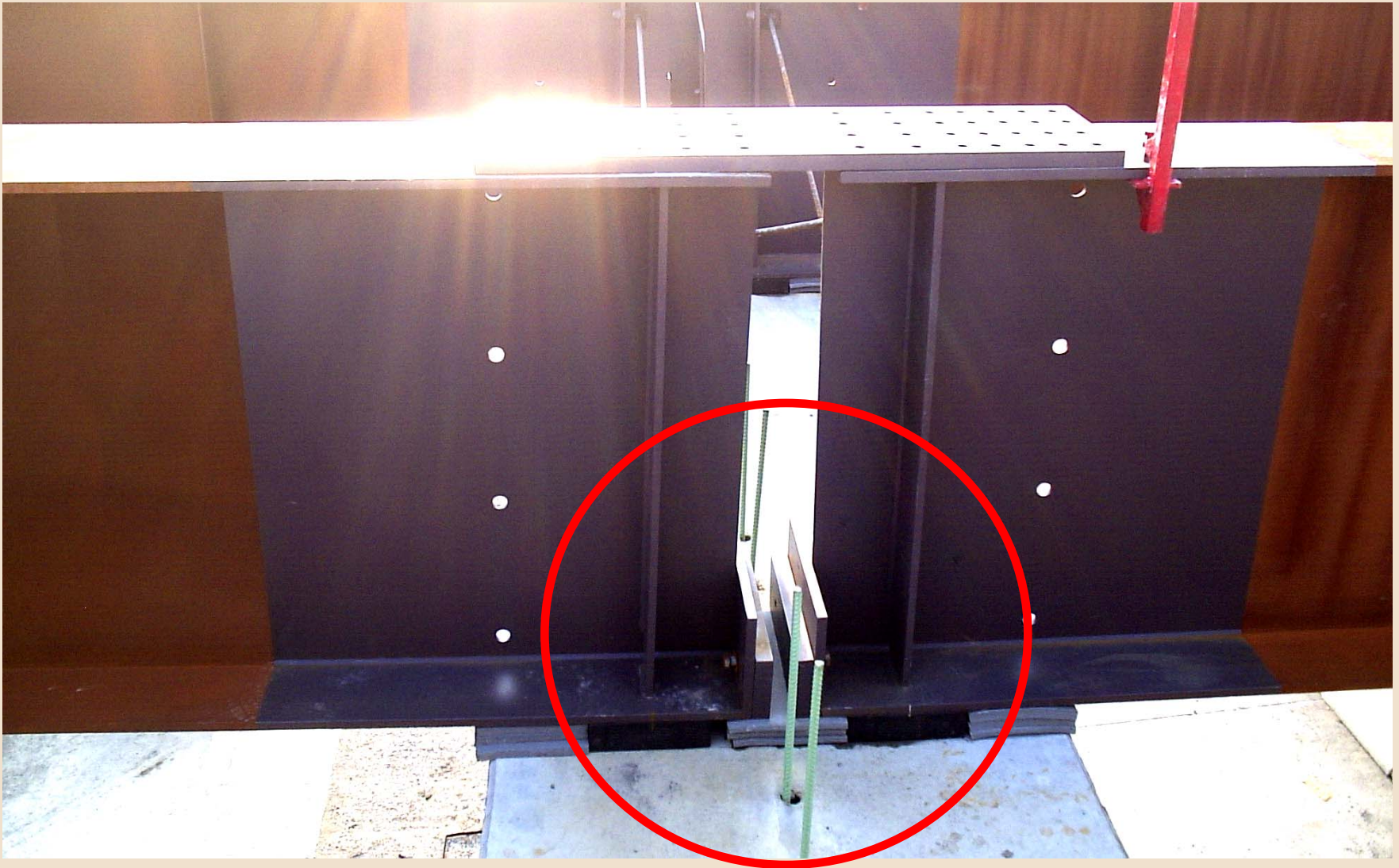
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- **Think**
 - Creatively, it's more than P/A and MC/I.
- Understand
- Communicate

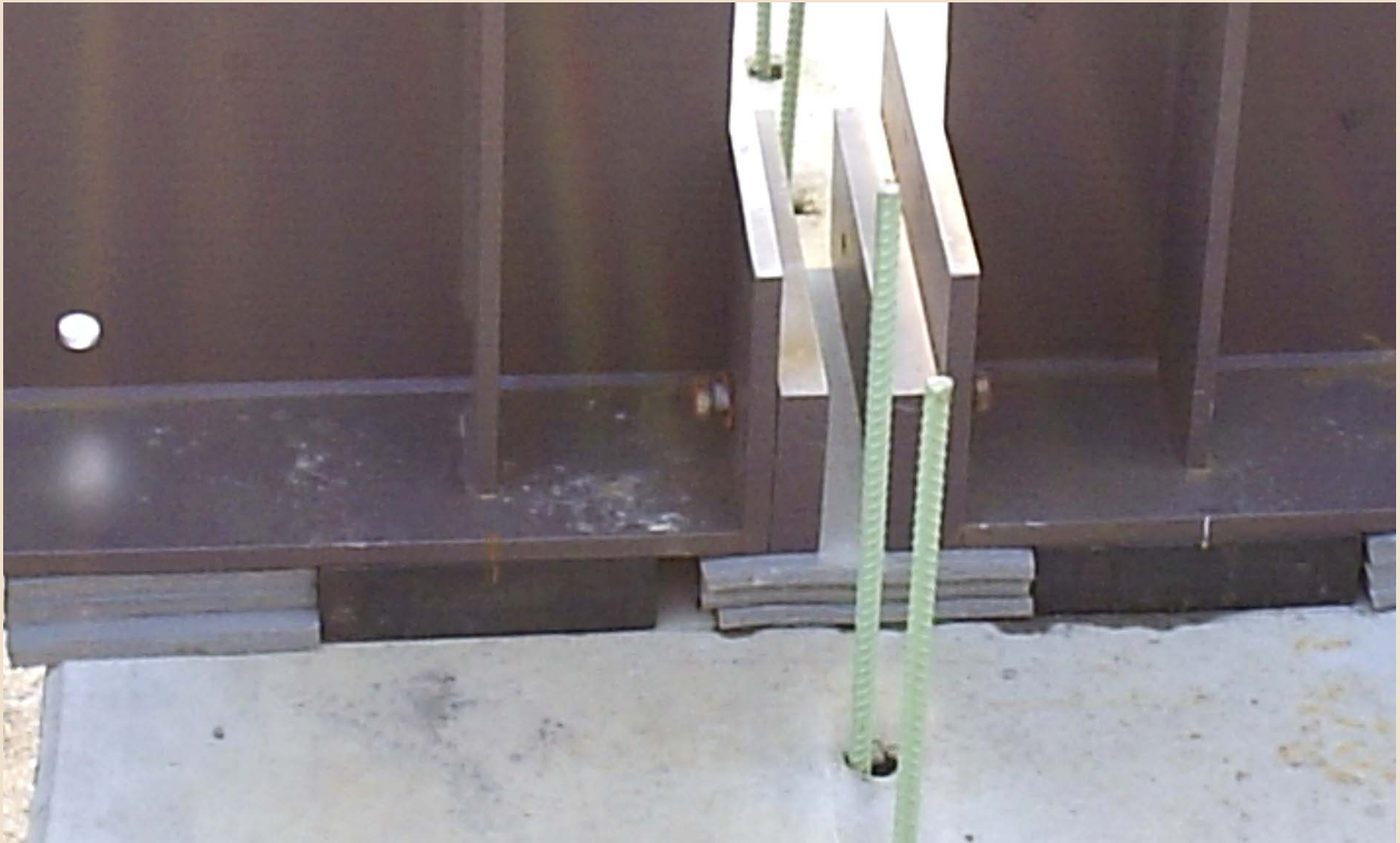
Think Like a Contractor....



Think Like a Contractor....



Think Like a Contractor....



Think Like a Contractor, or....



Think Like a Fabricator



Bridge 1

Think Like a Fabricator



Bridge 2

Think Like a Fabricator



About \$1 Million!

Think Like a Fabricator

Eliminated Cross Frames and Reduced Tonnage



Think Like a Fabricator

Eliminated Longitudinal Stiffener



Think Like a Contractor....?



Value Added? – Yes.

Think Like a Contractor....?



Value Added? – Yes.
Quantifiable? – No.

Think Like a Fabricator?



Think Like a Fabricator?



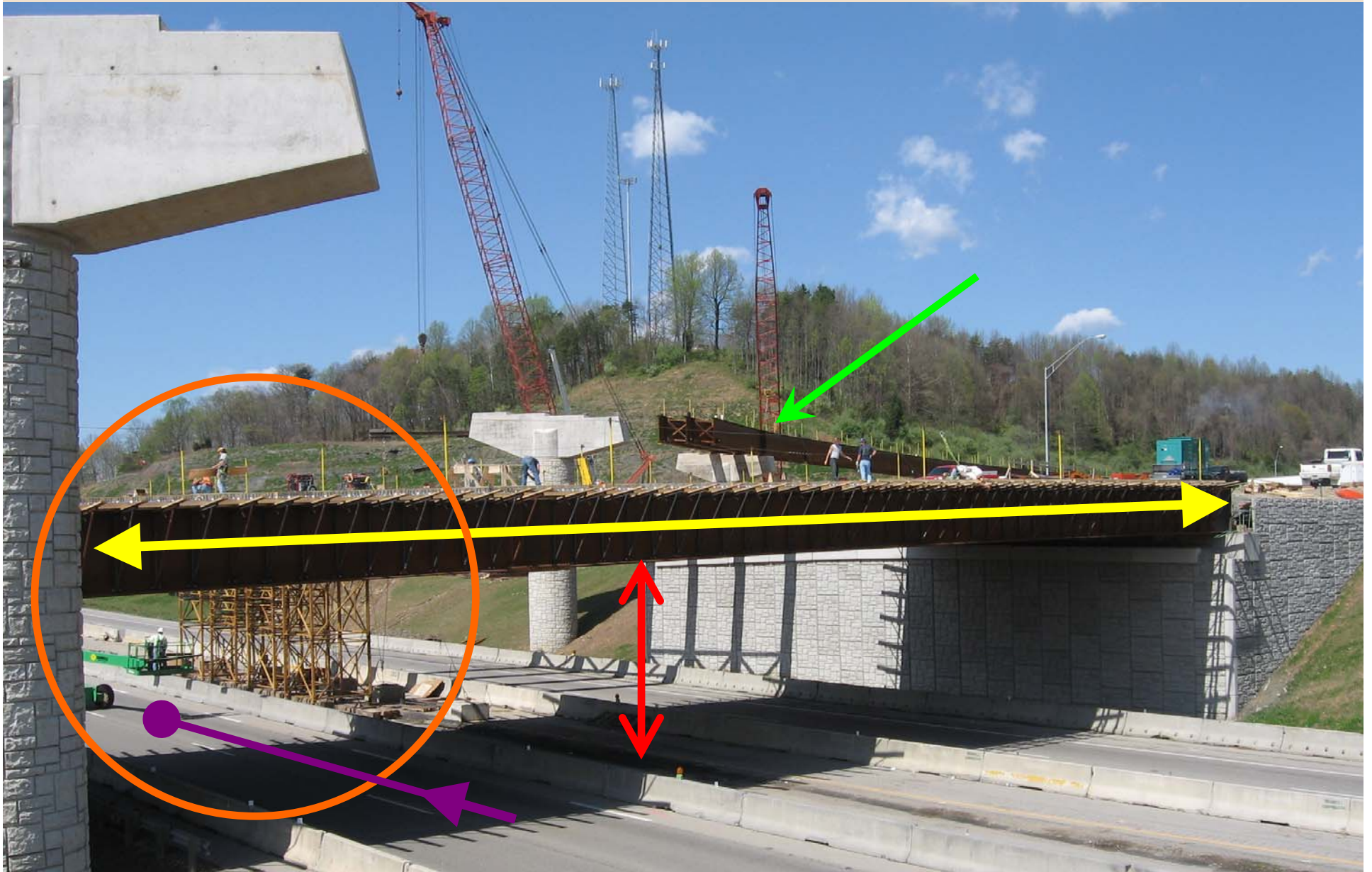
**Value Added? – Yes.
Quantifiable? – Yes.**

Design Like a Contractor....

Three Themes for Today's Discussion

- Think
- **Understand**
 - Should it be this way or that way?
- Communicate

Understand the Contractor.



Understand the Contractor.



Understand the Contractor.



Understand the Contractor.



Understand the Contractor....

AASHTO LRFD 6.7.2 Dead Load Camber

‘ ...For straight skewed I-girder bridges and horizontally curved I-girder bridges with or without skewed supports, the contract documents should clearly state an intended erection position of the girders and the condition under which that position is to be theoretically achieved. ...’

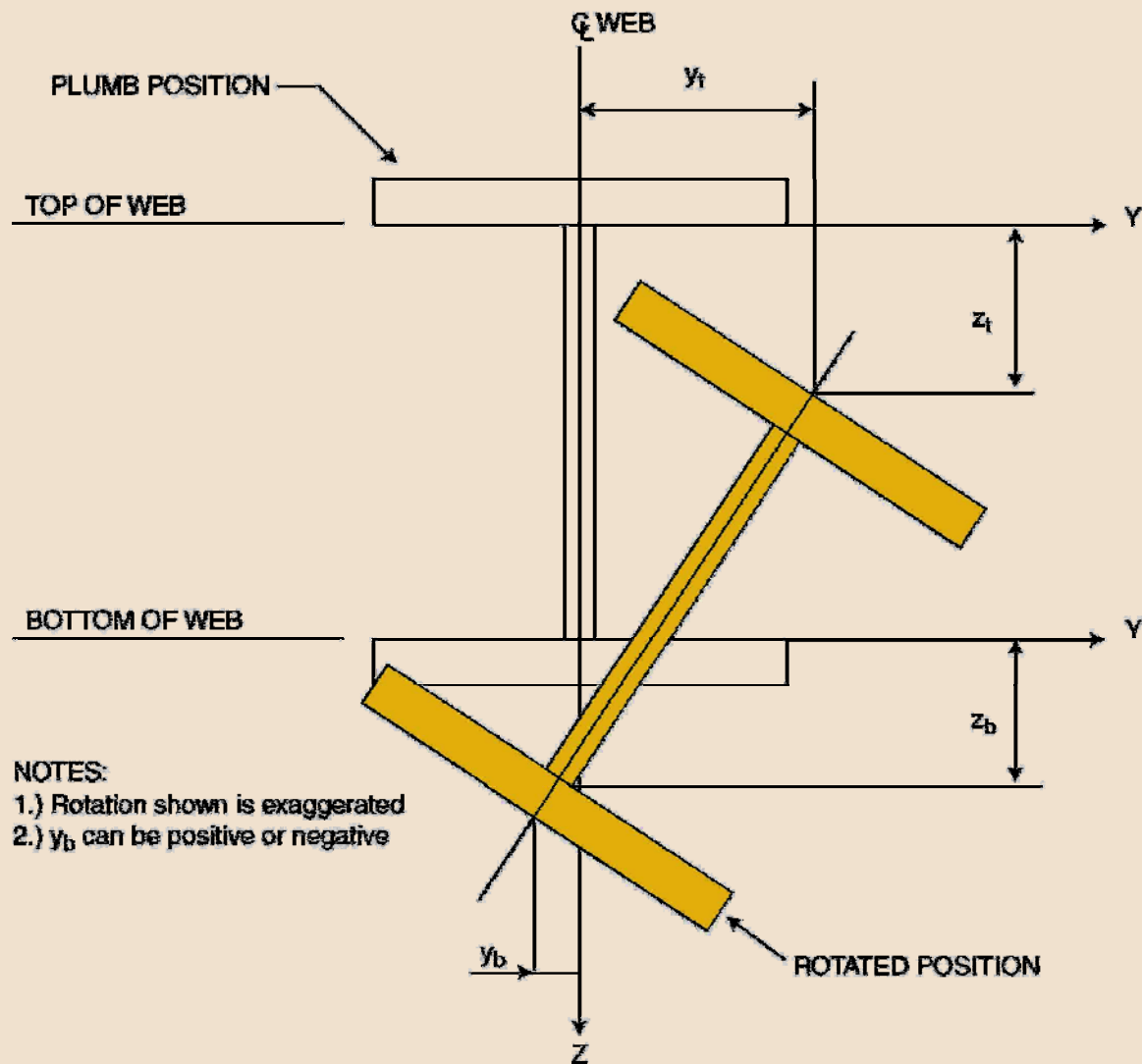
Understand the Contractor....



Understand the Contractor....



Understand the Contractor....



Design Like a Contractor....

Three Themes for Today's Discussion

- Think
- Understand
- **Communicate**
 - So that's what you really wanted!

Communicate with the Contractor....

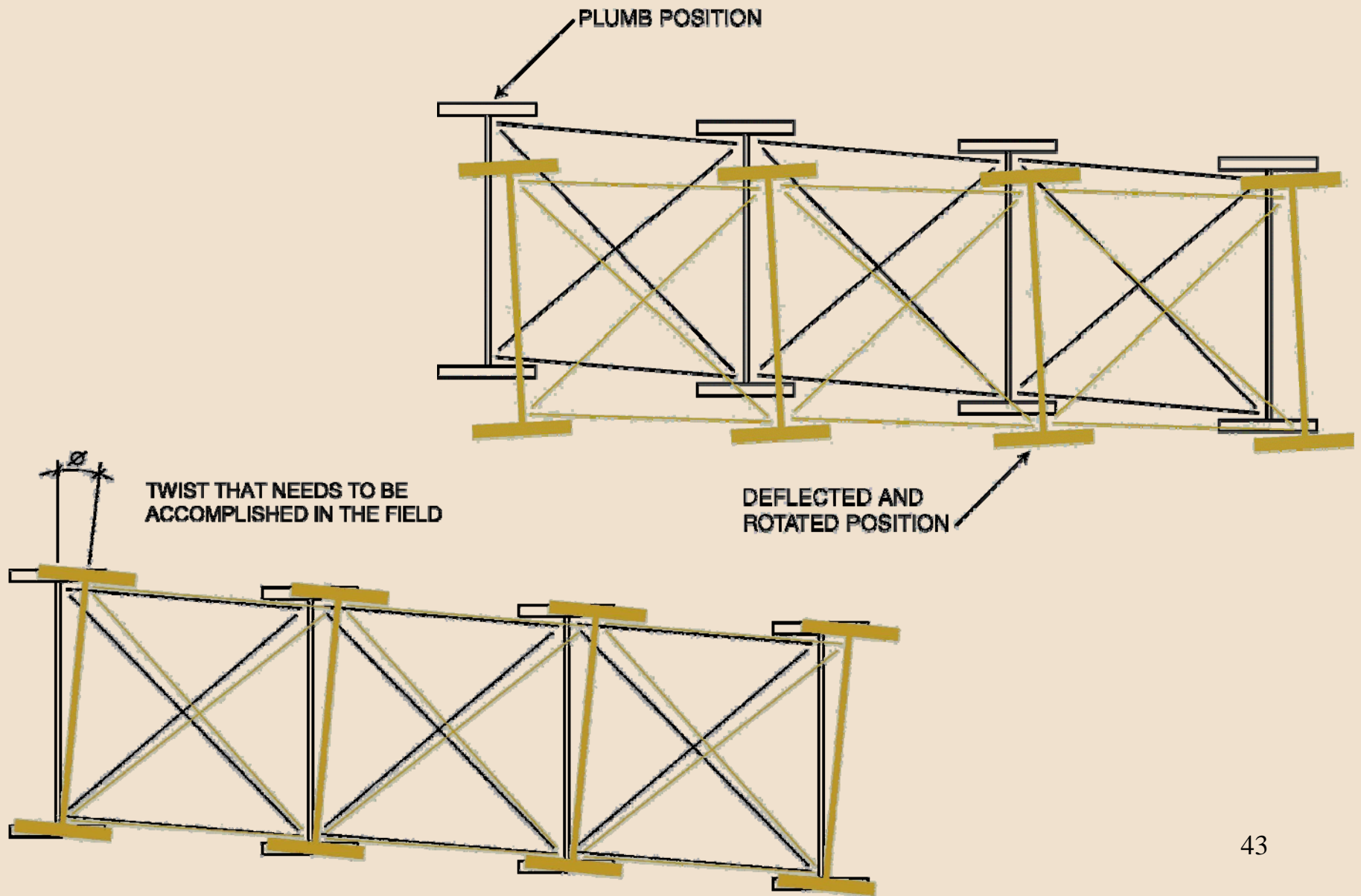
AASHTO LRFD 6.7.2 Dead Load Camber

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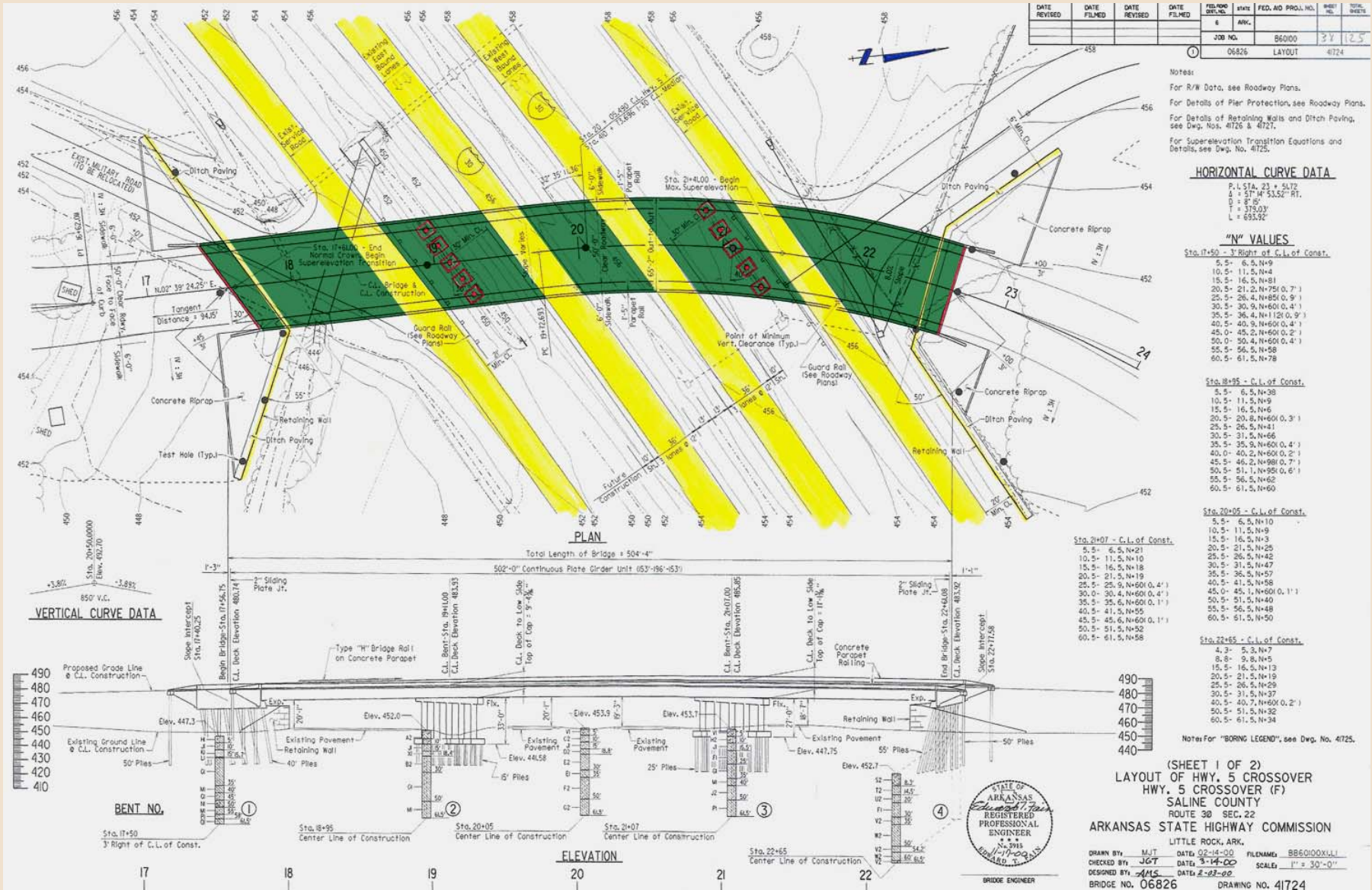
AASHTO LRFD C6.7.2

‘...vertical or plumb, ...or out-of plumb...no-load condition, the steel dead load condition, or the full dead load condition...’

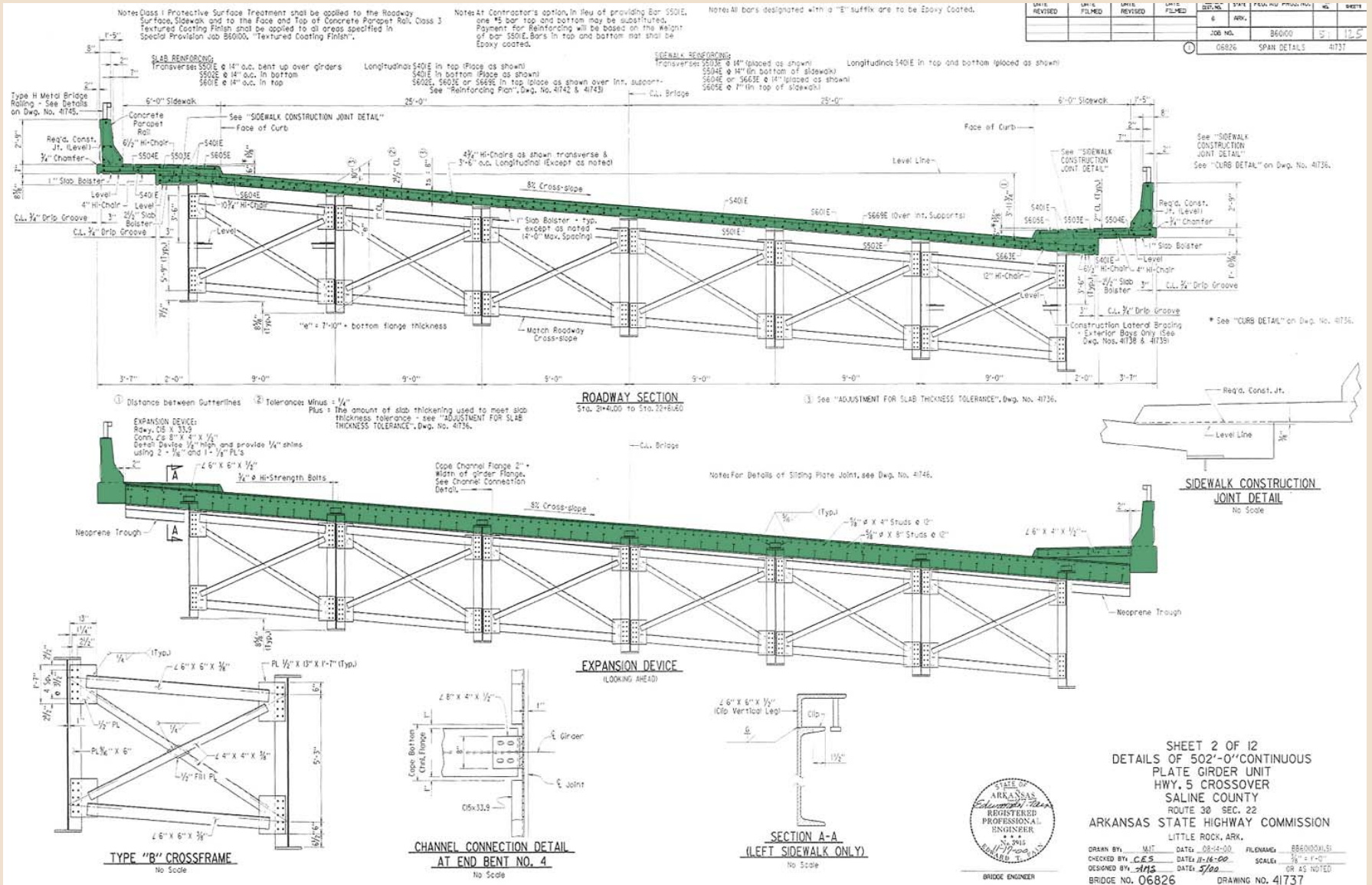
Communicate with the Contractor....



Communicate with the Contractor....



Communicate with the Contractor....



STATE OF ARKANSAS
 REGISTERED PROFESSIONAL ENGINEER
 EDWARD J. WARD
 No. 1177
 12/17/2004

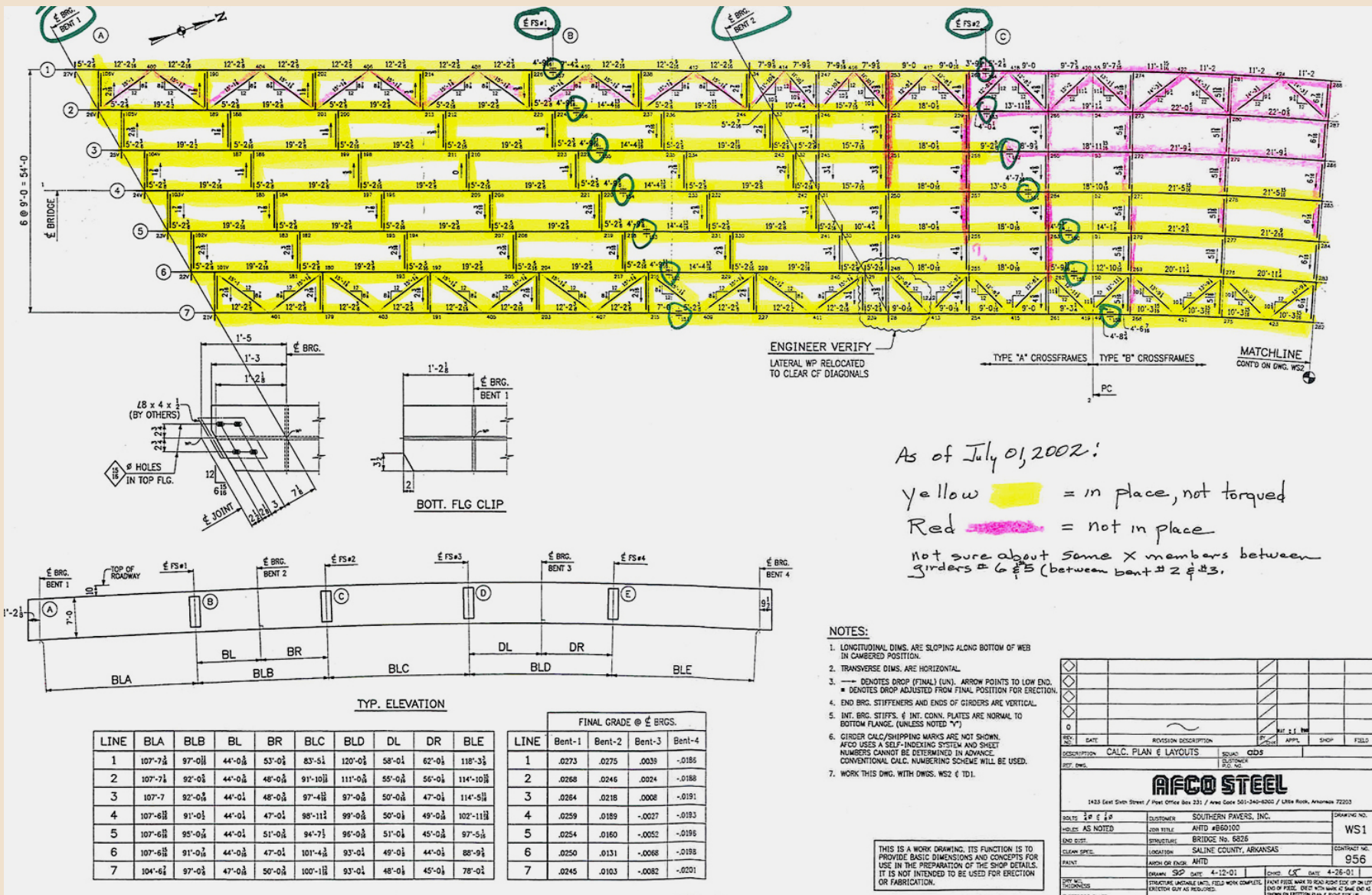
BRIDGE ENGINEER

SHEET 2 OF 12
 DETAILS OF 502'-0" CONTINUOUS
 PLATE GIRDER UNIT
 HWY. 5 CROSSOVER
 SALINE COUNTY
 ROUTE 38 SEC. 22
 ARKANSAS STATE HIGHWAY COMMISSION
 LITTLE ROCK, ARK.

DRAWN BY: MMT DATE: 08-14-00 FILENAME: B600004151
 CHECKED BY: CES DATE: 11-14-00 SCALE: 3/8" = 1'-0"
 DESIGNED BY: sls DATE: 5/00 OR AS NOTED

BRIDGE NO. 06826 DRAWING NO. 41737

Communicate with the Contractor....



Communicate with the Contractor....



As of July, 2002: Yellow = in place; airwrench tight, not torqued
 Red = not in place

NOTE:
 1. WORK THIS DWG. WITH DWGS. WS1 & TD1.

THIS IS A WORK DRAWING. ITS FUNCTION IS TO PROVIDE BASIC DIMENSIONS AND CONCEPTS FOR USE IN THE PREPARATION OF THE SHOP DETAILS. IT IS NOT INTENDED TO BE USED FOR ERECTION OR FABRICATION.

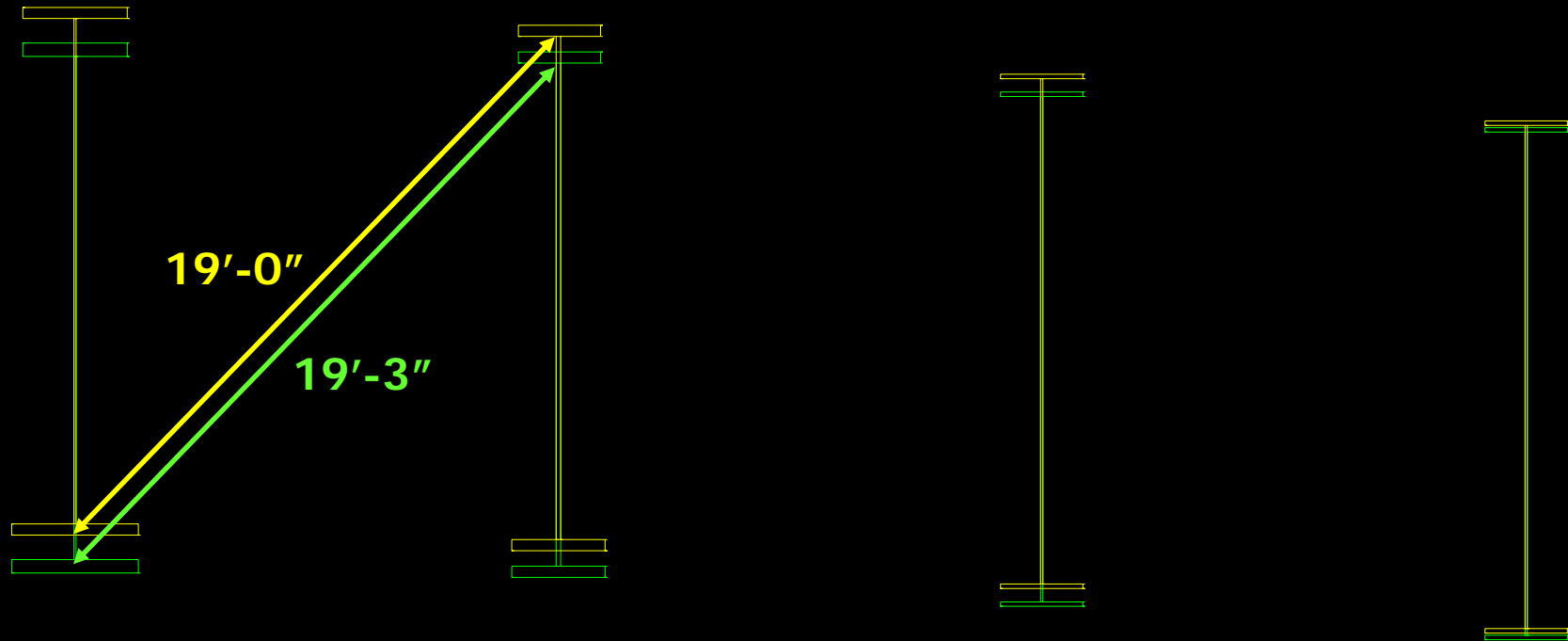
REV.	DATE	REVISION DESCRIPTION	SCALE	APPX.	SHOP	FIELD
0						
DESCRIPTION		CALC. PLAN & LAYOUTS	SQUAD	CHS		
REF. DWG.						
ARCO STEEL						
1423 East Sixth Street / Post Office Box 231 / Ark. Co. 301-340-9300 / 224 Ark. Arkansas 72203						
BOLTS	3/8 x 4	CUSTOMER	SOUTHERN PAPERS, INC.	DRAWING NO.		
Holes	AS NOTED	DWG. TITLE	AHFD #850100		WS2	
END DATE		LOCATION	BRIDGE NO. 5825	CONTRACT NO.	956	
CLEAN SPEC.		APPROX. DR. ENCL.	AHFD			
DATE	SEP	DATE	4-12-01	DATE	4-26-01	
DRY WEIGHT		ERECTOR UNPAID UNTIL FIELD WORK COMPLETE		PRINT FILES ARE TO BEA RIGHT SIDE UP ON LIST	DO NOT SCALE. CHECK WITH WORK AT TIME. DO NOT SHOW ON DETAIL PLAN & RIGHT SIDE UP.	
ELECTRODE CLASS		ERECTOR SUIT AS REQUIRED.				

Communicate with the Contractor....



14 feet

Communicate with the Contractor....



- Crossframe dimension per no load shape (full camber)
- Crossframe dimension per steel dead load shape

Steel Bridges: Fast, Safe, Smart!

However, be careful!

Design Like a Contractor....

Three Themes for Today's Discussion

- Think
- Understand
- **Communicate**
 - **But, clearly!**

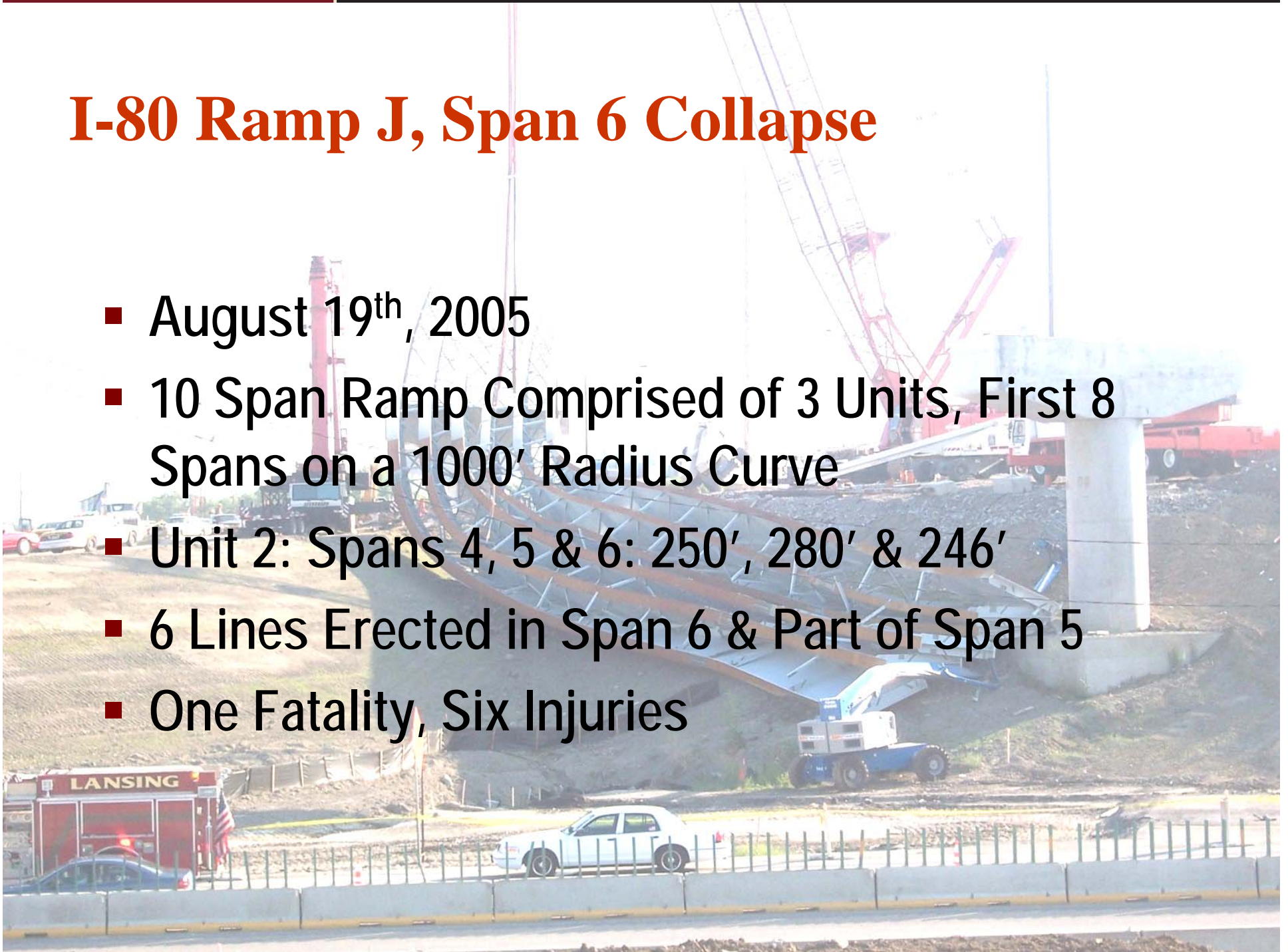
Steel Bridges: Fast, Safe, Smart!

I-80 Ramp J, Span 6 Collapse



I-80 Ramp J, Span 6 Collapse

- August 19th, 2005
- 10 Span Ramp Comprised of 3 Units, First 8 Spans on a 1000' Radius Curve
- Unit 2: Spans 4, 5 & 6: 250', 280' & 246'
- 6 Lines Erected in Span 6 & Part of Span 5
- One Fatality, Six Injuries



Steel Bridges: Fast, Safe, Smart!



Steel Bridges: Fast, Safe, Smart!



Steel Bridges: Fast, Safe, Smart!



Design Like a Contractor....

Three Themes for Today's Discussion

- Think
- Understand, and
- Communicate!

We can and do, get it right!

Design Like a Contractor....



Design Like a Contractor....



Design Like a Contractor....



Design Like a Contractor....



Design Like a Contractor....



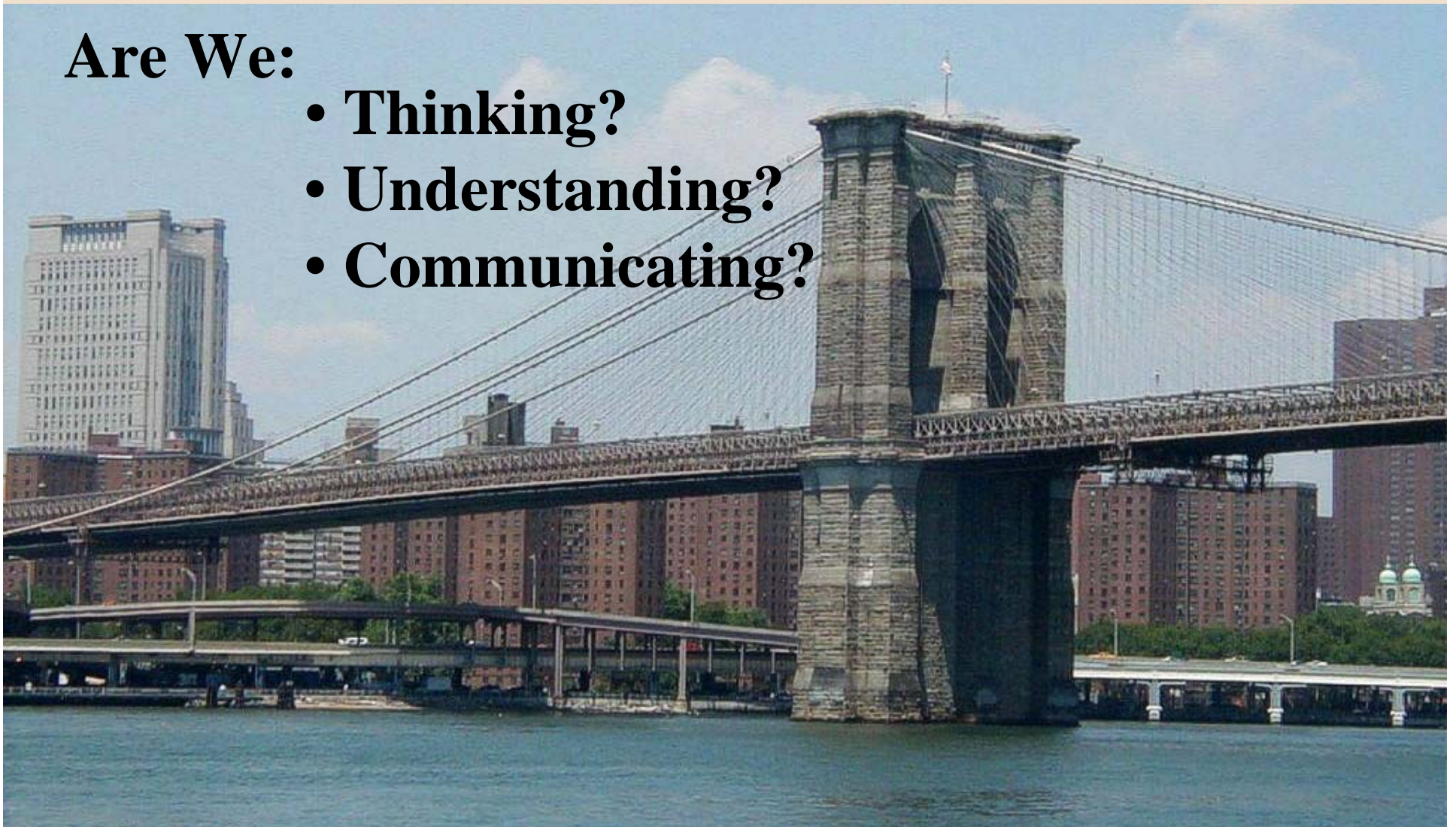
Design Like a Contractor....



What has Changed?

Are We:

- **Thinking?**
- **Understanding?**
- **Communicating?**



Steel Bridges – Fast, Safe, Smart!

In Summary....

Today's Three Themes:

- **Think**

- Creatively, it's more than P/A and MC/I.

- **Understand**

- Should it be this way or that way?

- **Communicate**

- So that's what you really wanted!

In Closing....

Today's Three Themes:

- Think
- Understand, and
- Communicate!

When we do all three, we can and do:

Get it right!

Any Questions?

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Thank You!

