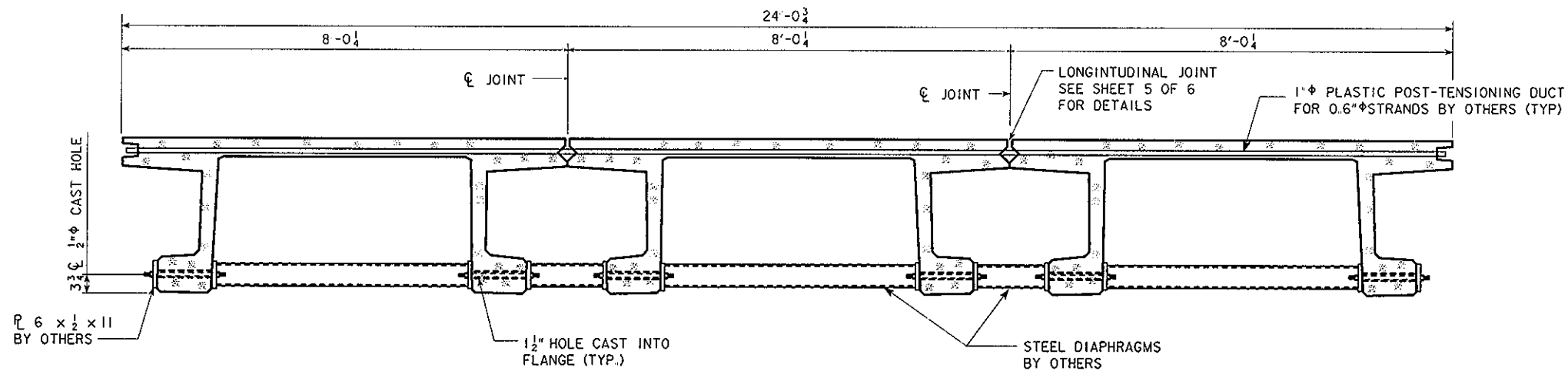



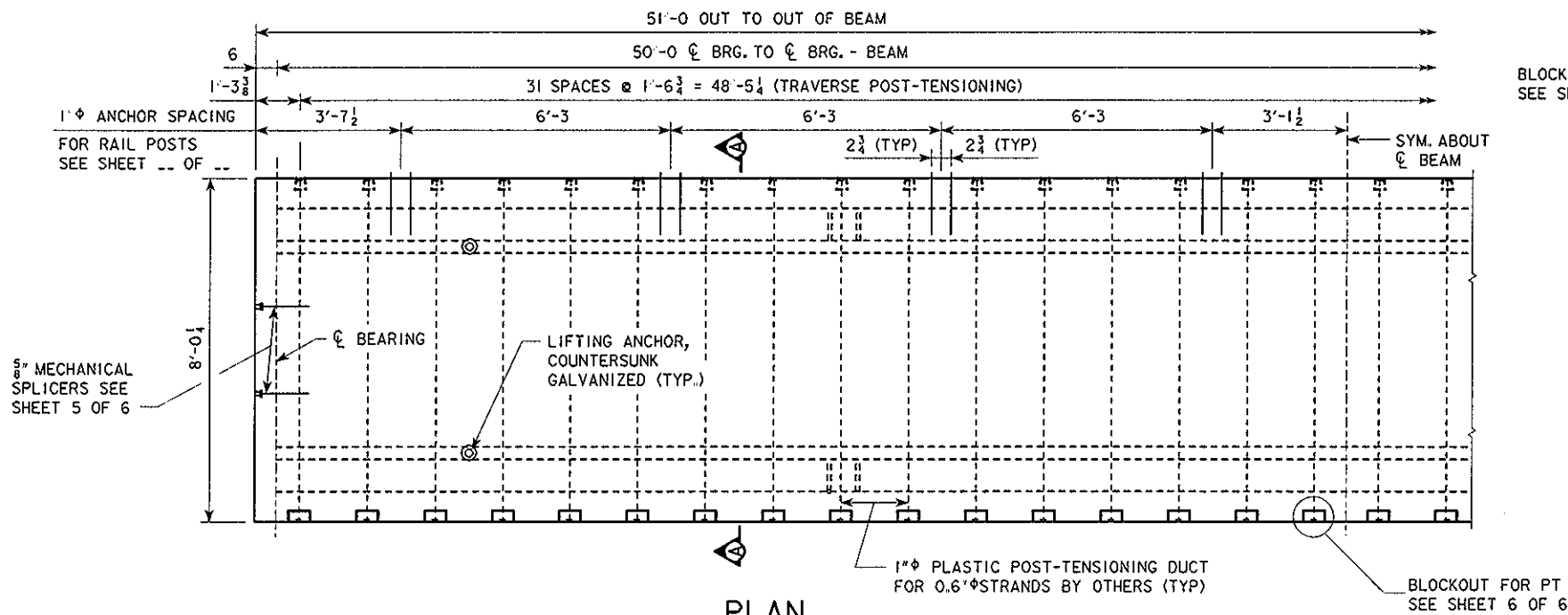
PLAN VIEW  
(ASSEMBLED BEAMS)



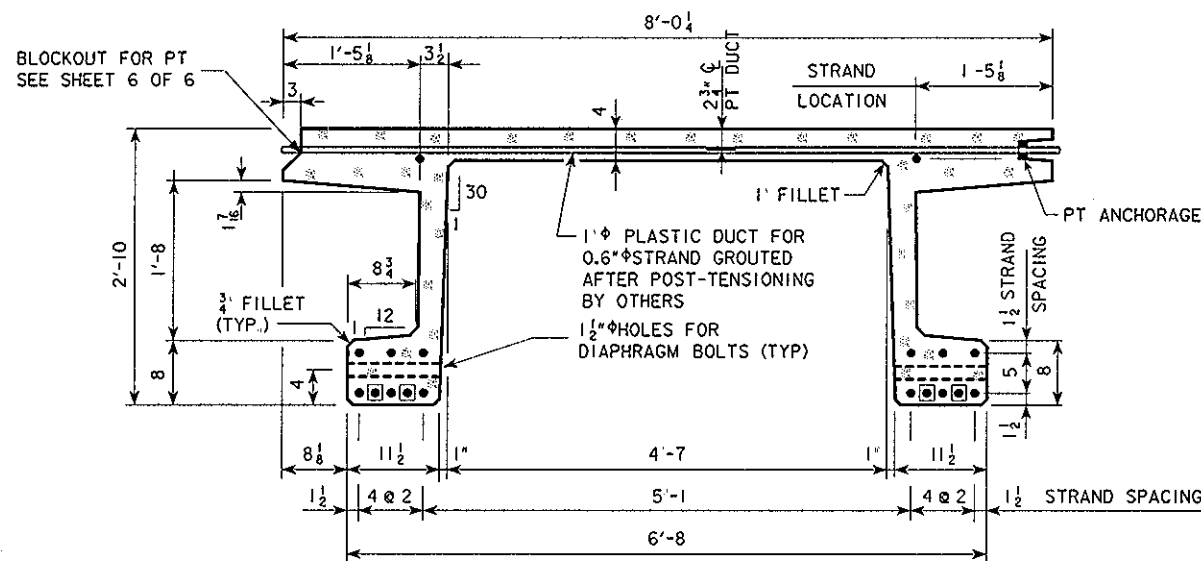
SECTION B-B  
(INTERMEDIATE DIAPHRAGMS AT 1/4 POINTS, RAILING NOT SHOWN)

STRUCTURAL DESIGN	
I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.	
	Signature: <i>Dean G. Bierwagen</i> Date: 07-23-07
Printed or Typed Name: <u>Dean G. Bierwagen</u>	
My license renewal date is December 31, 2007	
Pages or sheets covered by this seal: DESIGN SHEETS 1 - 6 OF 6	

DESIGN FOR ?	
51'-0 UHPC PI BEAM DETAILS	
FOR 110' x 24' UHPC BRIDGE	
30'-7 END SPANS	51'-2 INTERIOR SPAN
DETAIL CROSS SECTION	
STA. ?	?, 2007
BUCHANAN COUNTY	
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION	
DESIGN SHEET NO. 1 OF 6	FILE NO. ? DESIGN NO. ?



PLAN

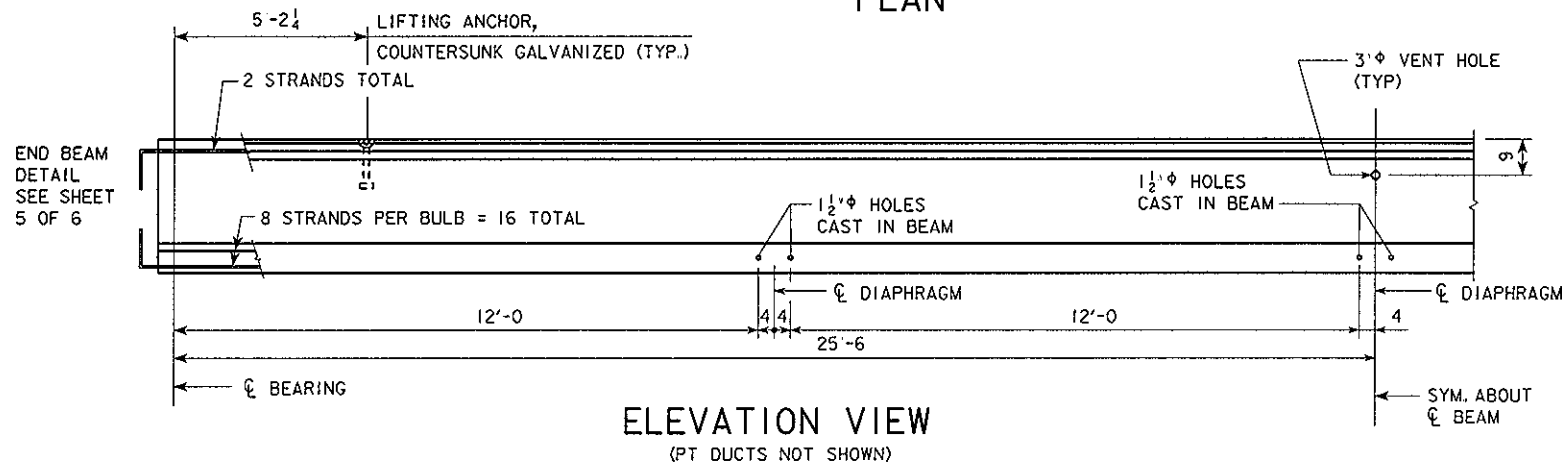


SECTION A-A

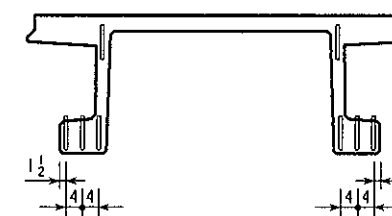
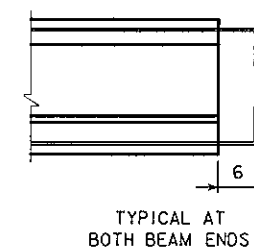
BOTTOM STRAND DEBONDING	
SYMBOL	DEBONDED LENGTH FROM EACH END OF BEAM
□	3'-0

PI SECTION PROPERTIES

A = 804.6 in<sup>2</sup>  
 y<sub>b</sub> = 22.75 in  
 I = 110,719 in<sup>4</sup>



ELEVATION VIEW  
(PT DUCTS NOT SHOWN)



STRAND PROJECTION AT BEAM ENDS

THE TOP STRANDS ARE TO BE CUT WITH 1'-6 PROJECTIONS WHICH ARE TO BE SHOP BENT AS SHOWN. SIX BOTTOM STRANDS ARE TO BE CUT WITH 1'-6 PROJECTIONS WHICH ARE TO BE SHOP BENT AS SHOWN. THE REMAINING BOTTOM STRANDS ARE TO BE CUT OFF REASONABLY FLUSH WITH THE CONCRETE.

PI BEAM DATA												
PI BEAM	SPAN LENGTH CL-BEARING	OVERALL BEAM LENGTH (L)	CONCRETE STRENGTH		STRAND SIZE DIA. (in)	NO. OF STRAND		TOTAL INITIAL PRESTRESS kips	CAMBER (in)		WEIGHT (TONS)	CONCRETE (CU YD.)
			f' <sub>ci</sub> (ksi)	f' <sub>c</sub> (ksi)		STRAIGHT	DEFLECTED		AT RELEASE	AFTER LOSSES		
PI 50	50'-0	51'-0	14.0	24.0	0.60	18	0	766	1.0	1.90	22.2	10.55

**DESIGN STRESSES:**

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE TO BE IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 2007. REINFORCING STEEL IN ACCORDANCE WITH SECTION 5, GRADE 60. CONCRETE IN ACCORDANCE WITH SECTION 5. PRESTRESSING STEEL IN ACCORDANCE WITH SECTION 5, GRADE 270.

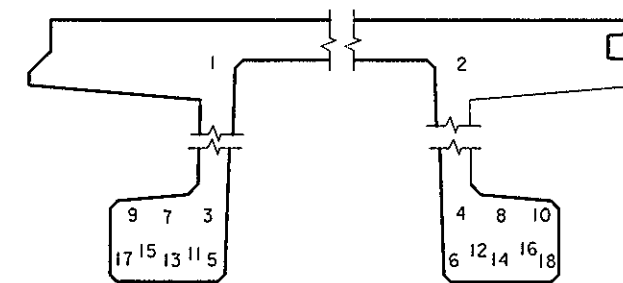
**SPECIFICATIONS:**

CONSTRUCTION: STANDARD SPECIFICATIONS OF THE IOWA DEPARTMENT OF TRANSPORTATION, CURRENT SERIES, WITH CURRENT APPLICABLE SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS.

DESIGN: AASHTO LRFD, SERIES OF 2007, WITH MINOR MODIFICATIONS.

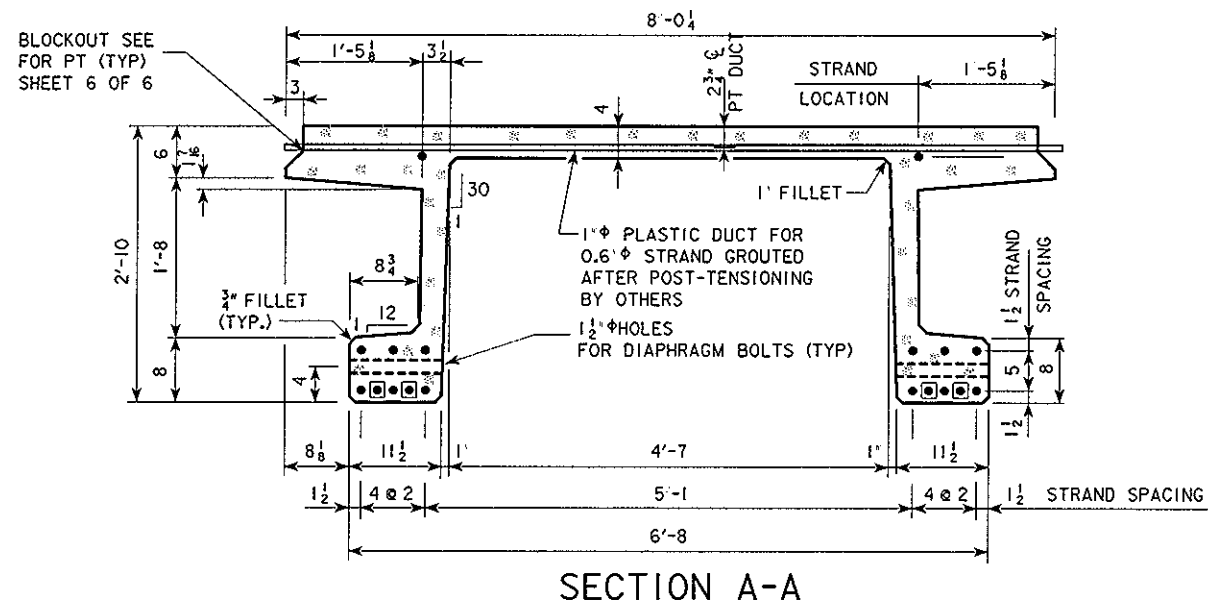
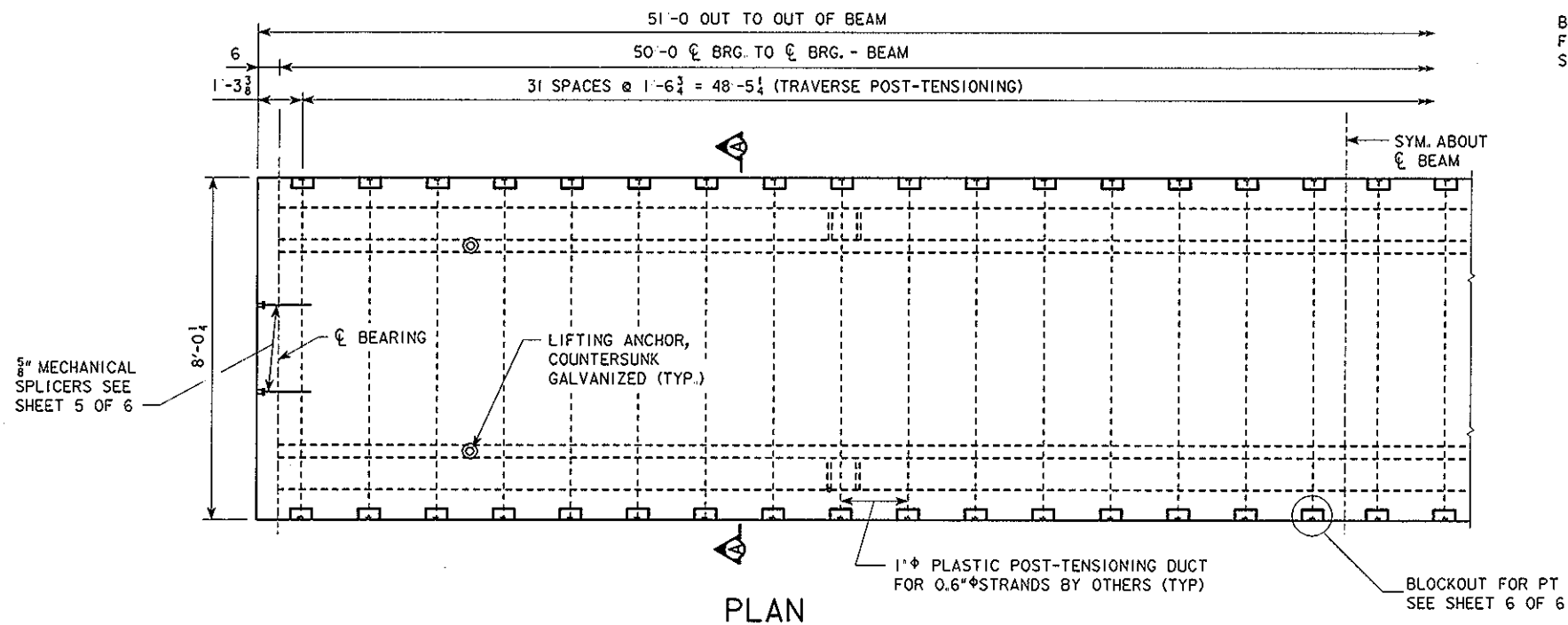
**BEAM NOTES:**

ALL PRESTRESSING STRANDS SHALL BE 0.60 in. NOMINAL DIAMETER (NOMINAL STEEL AREA = 0.217 in<sup>2</sup>) AND CONFORM TO ASTM A416 GRADE 270 LOW RELAXATION STRANDS. MINIMUM STRAND BREAKING STRENGTH SHALL BE 58.6 kips. TOTAL INITIAL PRESTRESS IS BASED ON 72.6% f<sub>s</sub>, f<sub>s</sub> = 270 ksi. ALL BEAMS ARE TO BE INCREASED IN LENGTH BY 0.5 INCH TO COMPENSATE FOR ELASTIC SHORTENING, CREEP AND SHRINKAGE. THE CONTRACTOR SHALL ASSURE THE LATERAL STABILITY OF THE BEAM DURING HANDLING, TRANSPORTING AND ERECTION BY PROVIDING TEMPORARY BRACING AS NEEDED.



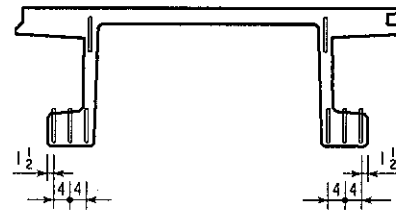
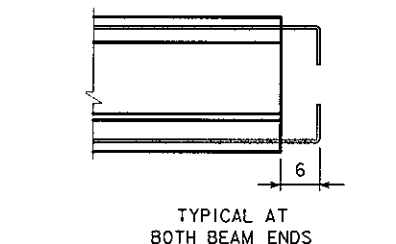
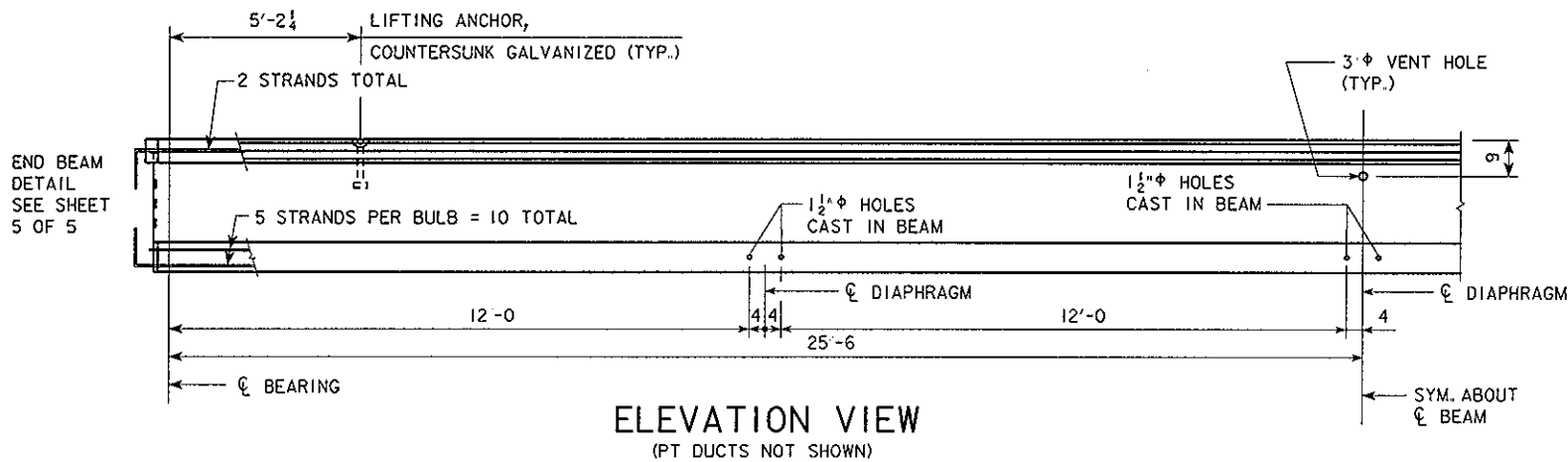
STRAND DETENSIONING SEQUENCE

DESIGN FOR ?  
**51'-0 UHPC PI BEAM DETAILS**  
**FOR 110' x 24' UHPC BRIDGE**  
 30'-7 END SPANS 51'-2 INTERIOR SPAN  
**BEAM #1 DETAILS** ? , 2007  
 IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
 DESIGN SHEET NO. 2 OF 6 FILE NO. ? DESIGN NO. ?



BOTTOM STRAND DEBONDING	
SYMBOL	DEBONDED LENGTH FROM EACH END OF BEAM
□	3'-0

**PI SECTION PROPERTIES**  
 A = 804.6 in<sup>2</sup>  
 y<sub>b</sub> = 22.75 in  
 I = 110,719 in<sup>4</sup>



THE TOP STRANDS ARE TO BE CUT WITH 1'-6 PROJECTIONS WHICH ARE TO BE SHOP BENT AS SHOWN. SIX BOTTOM STRANDS ARE TO BE CUT WITH 1'-6 PROJECTIONS WHICH ARE TO BE SHOP BENT AS SHOWN. THE REMAINING BOTTOM STRANDS ARE TO BE CUT OFF REASONABLY FLUSH WITH THE CONCRETE.

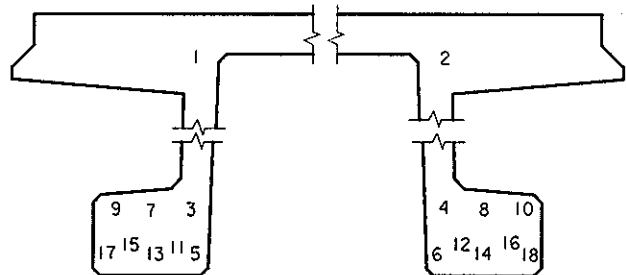
STRAND PROJECTION AT BEAM ENDS

PI BEAM DATA												
PI BEAM	SPAN LENGTH CL-BEARING	OVERALL BEAM LENGTH (L)	CONCRETE STRENGTH		STRAND SIZE DIA. (in)	NO. OF STRAND		TOTAL INITIAL PRESTRESS kips	CAMBER (in)		WEIGHT (TONS)	CONCRETE (CU YD.)
			f <sub>ci</sub> (ksi)	f <sub>c</sub> (ksi)		STRAIGHT	DEFLECTED		AT RELEASE	AFTER LOSSES		
PI 50	50'-0	51'-0	14.0	24.0	0.60	18	0	766	1.0	1.90	22.2	10.55

**DESIGN STRESSES:**  
 DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE TO BE IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 2007. REINFORCING STEEL IN ACCORDANCE WITH SECTION 5, GRADE 60. CONCRETE IN ACCORDANCE WITH SECTION 5. PRESTRESSING STEEL IN ACCORDANCE WITH SECTION 5, GRADE 270.

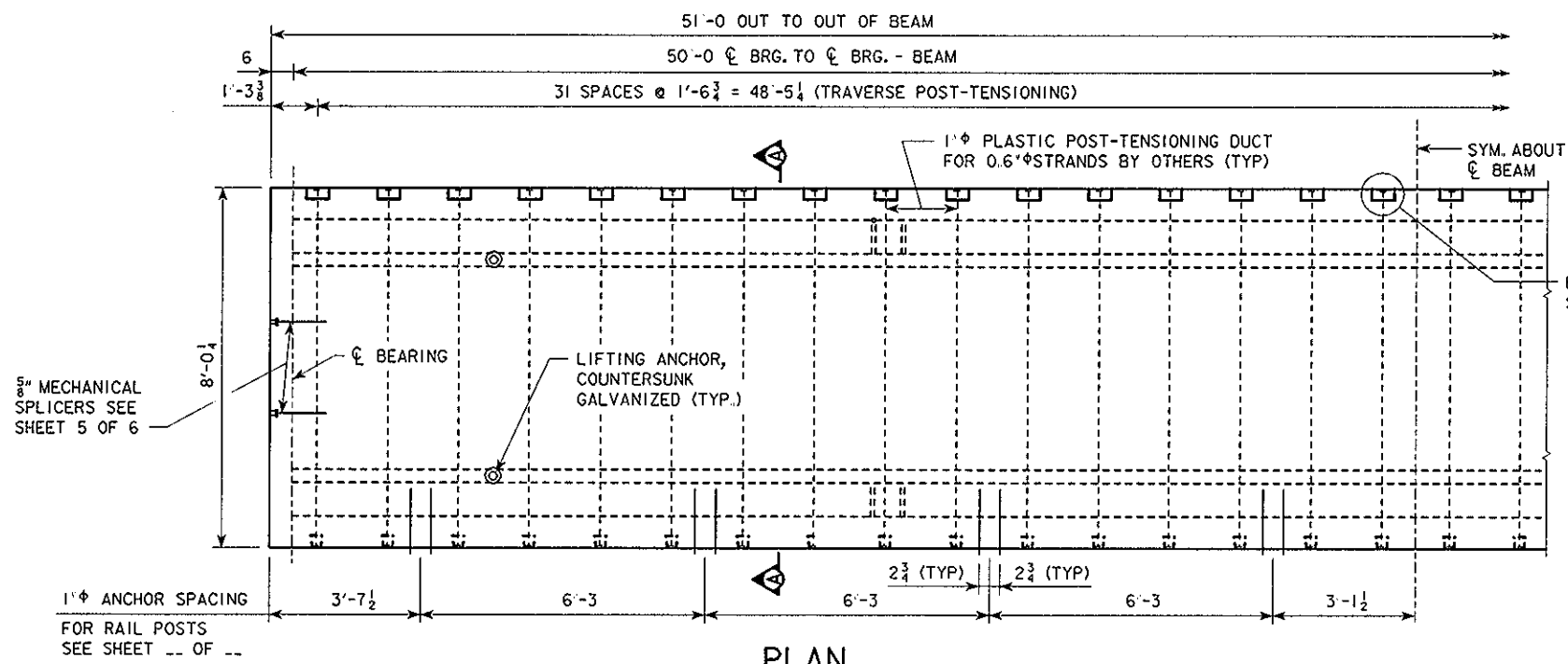
**SPECIFICATIONS:**  
 CONSTRUCTION: STANDARD SPECIFICATIONS OF THE IOWA DEPARTMENT OF TRANSPORTATION, CURRENT SERIES, WITH CURRENT APPLICABLE SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS.  
 DESIGN: AASHTO LRFD, SERIES OF 2007, WITH MINOR MODIFICATIONS.

**BEAM NOTES:**  
 ALL PRESTRESSING STRANDS SHALL BE 0.60 in. NOMINAL DIAMETER (NOMINAL STEEL AREA = 0.217 in<sup>2</sup>) AND CONFORM TO ASTM A416 GRADE 270 LOW RELAXATION STRANDS. MINIMUM STRAND BREAKING STRENGTH SHALL BE 58.6 kips.  
 TOTAL INITIAL PRESTRESS IS BASED ON 72.6% f<sub>s</sub>, f'<sub>s</sub> = 270 ksi.  
 ALL BEAMS ARE TO BE INCREASED IN LENGTH BY 0.5 INCH TO COMPENSATE FOR ELASTIC SHORTENING, CREEP AND SHRINKAGE.  
 THE CONTRACTOR SHALL ASSURE THE LATERAL STABILITY OF THE BEAM DURING HANDLING, TRANSPORTING AND ERECTION BY PROVIDING TEMPORARY BRACING AS NEEDED.

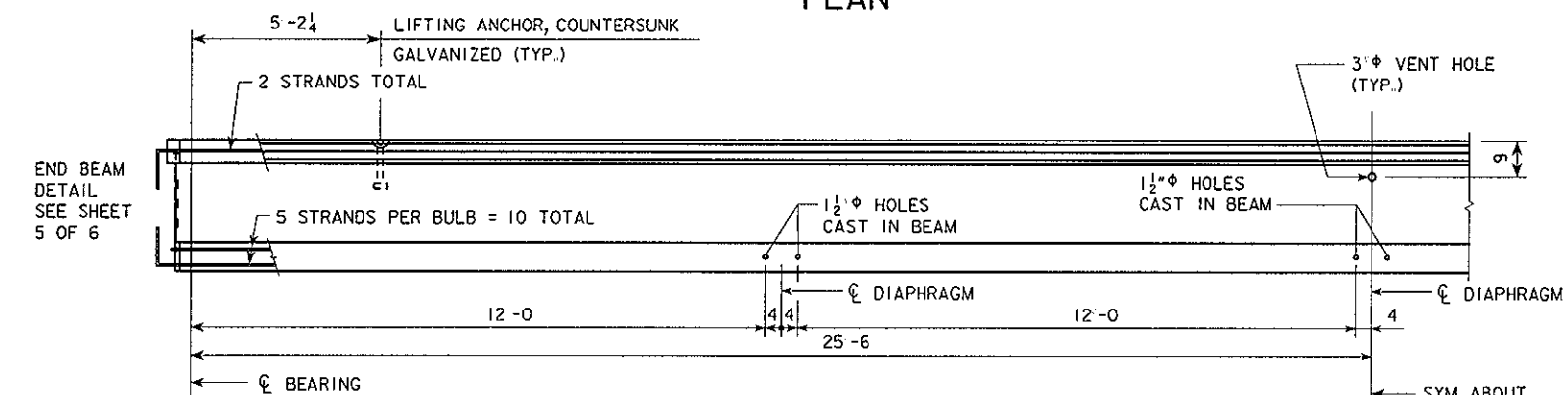


STRAND DETENSIONING SEQUENCE

DESIGN FOR ?  
**51'-0 UHPC PI BEAM DETAILS FOR 110' x 24' UHPC BRIDGE**  
 30'-7 END SPANS 51'-2 INTERIOR SPAN  
**BEAM #2 DETAILS**  
 STA. ? ? , 2007  
**BUCHANAN COUNTY**  
 IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
 DESIGN SHEET NO. 3 OF 6 FILE NO. ? DESIGN NO. ?



PLAN



ELEVATION VIEW  
(PT DUCTS NOT SHOWN)

PI BEAM DATA												
PI BEAM	SPAN LENGTH CL-BEARING	OVERALL BEAM LENGTH (L)	CONCRETE STRENGTH		STRAND SIZE DIA. (in)	NO. OF STRAND		TOTAL INITIAL PRESTRESS kips	CAMBER (in)		WEIGHT (TONS)	CONCRETE (CU YD.)
			f <sub>ci</sub> (ksi)	f <sub>c</sub> (ksi)		STRAIGHT	DEFLECTED		AT RELEASE	AFTER LOSSES		
PI 50	50'-0"	51'-0"	14.0	24.0	0.60	18	0	766	1.0	1.90	22.2	10.55

**DESIGN STRESSES:**

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE TO BE IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 2007. REINFORCING STEEL IN ACCORDANCE WITH SECTION 5, GRADE 60. CONCRETE IN ACCORDANCE WITH SECTION 5. PRESTRESSING STEEL IN ACCORDANCE WITH SECTION 5, GRADE 270.

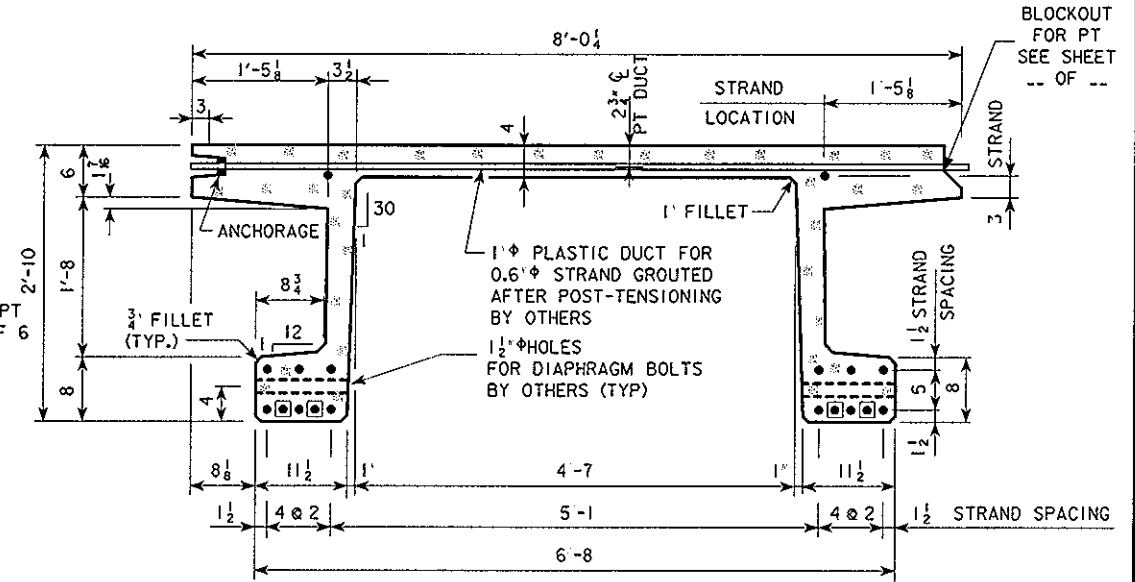
**SPECIFICATIONS:**

CONSTRUCTION: STANDARD SPECIFICATIONS OF THE IOWA DEPARTMENT OF TRANSPORTATION, CURRENT SERIES, WITH CURRENT APPLICABLE SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS.

DESIGN: AASHTO LRFD, SERIES OF 2007, WITH MINOR MODIFICATIONS.

**BEAM NOTES:**

ALL PRESTRESSING STRANDS SHALL BE 0.60 in. NOMINAL DIAMETER (NOMINAL STEEL AREA = 0.217 in<sup>2</sup>) AND CONFORM TO ASTM A416 GRADE 270 LOW RELAXATION STRANDS. MINIMUM STRAND BREAKING STRENGTH SHALL BE 58.6 kips. TOTAL INITIAL PRESTRESS IS BASED ON 72.6% f'<sub>s</sub>, f'<sub>s</sub> = 270 ksi. ALL BEAMS ARE TO BE INCREASED IN LENGTH BY 0.5 INCH TO COMPENSATE FOR ELASTIC SHORTENING, CREEP AND SHRINKAGE. THE CONTRACTOR SHALL ASSURE THE LATERAL STABILITY OF THE BEAM DURING HANDLING, TRANSPORTING AND ERECTION BY PROVIDING TEMPORARY BRACING AS NEEDED.

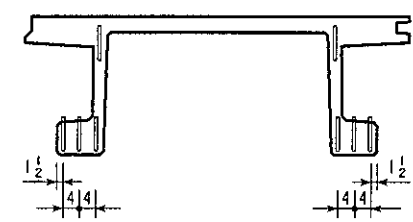
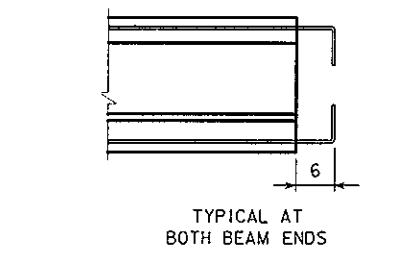


SECTION A-A

BOTTOM STRAND DEBONDING	
SYMBOL	DEBONDED LENGTH FROM EACH END OF BEAM
□	3'-0"

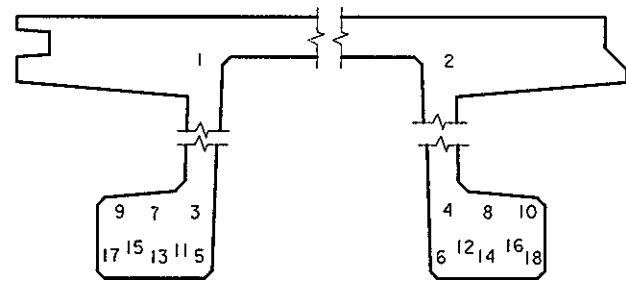
**PI SECTION PROPERTIES**

A = 804.6 in<sup>2</sup>  
y<sub>b</sub> = 22.75 in  
I = 110,719 in<sup>4</sup>



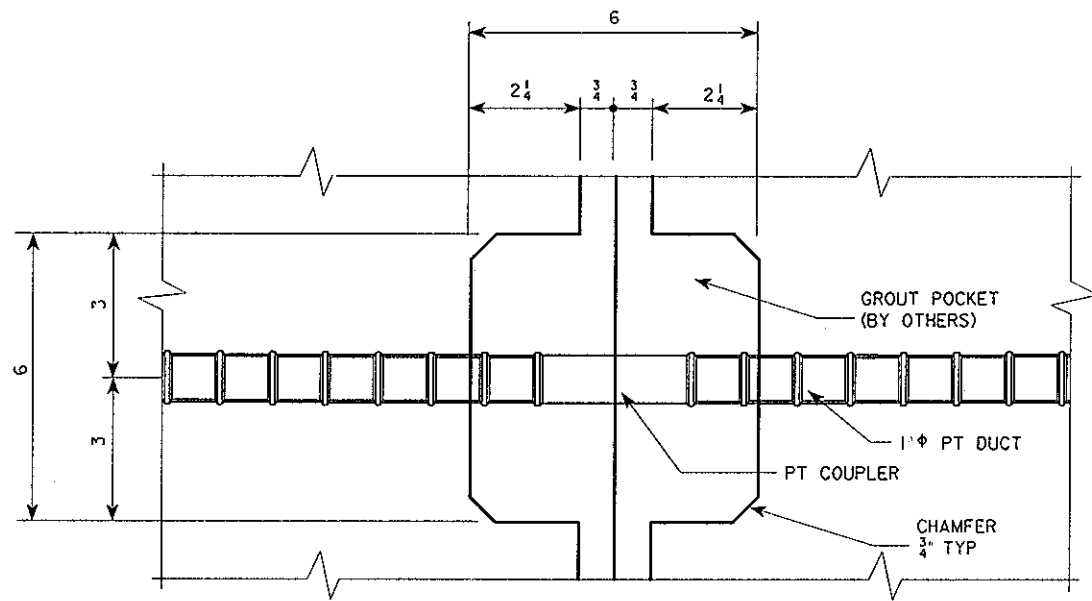
STRAND PROJECTION AT BEAM ENDS

THE TOP STRANDS ARE TO BE CUT WITH 1'-6" PROJECTIONS WHICH ARE TO BE SHOP BENT AS SHOWN. SIX BOTTOM STRANDS ARE TO BE CUT WITH 1'-6" PROJECTIONS WHICH ARE TO BE SHOP BENT AS SHOWN. THE REMAINING BOTTOM STRANDS ARE TO BE CUT OFF REASONABLY FLUSH WITH THE CONCRETE.

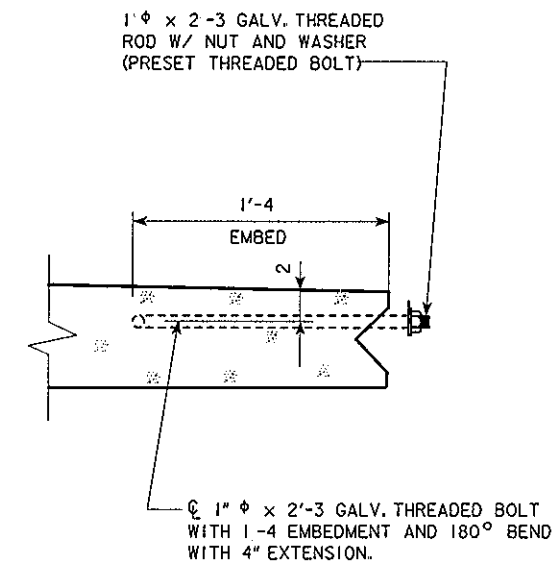


STRAND DETENSIONING SEQUENCE

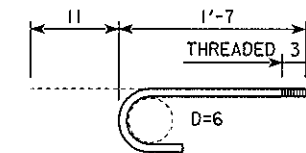
DESIGN FOR ?  
**51'-0" UHPC PI BEAM DETAILS**  
**FOR 110' x 24' UHPC BRIDGE**  
 30-7 END SPANS 51'-2 INTERIOR SPAN  
**BEAM #3 DETAILS**  
 STA. ? ? , 2007  
**BUCHANAN COUNTY**  
 IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
 DESIGN SHEET NO. 4 OF 6 FILE NO. ? DESIGN NO. ?



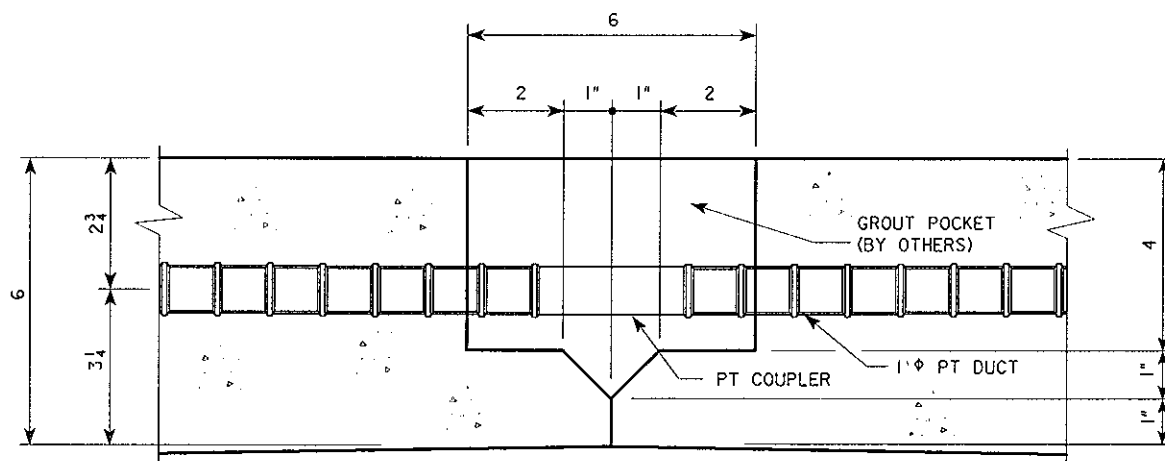
PLAN VIEW



ANCHOR BOLT DETAILS

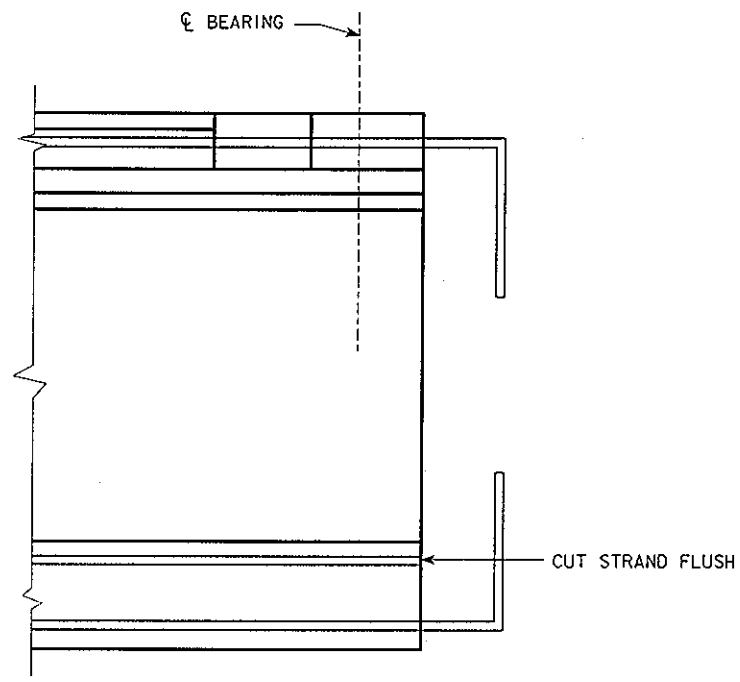


1"  $\phi$  x 2'-3 GALV. THREADED BOLT

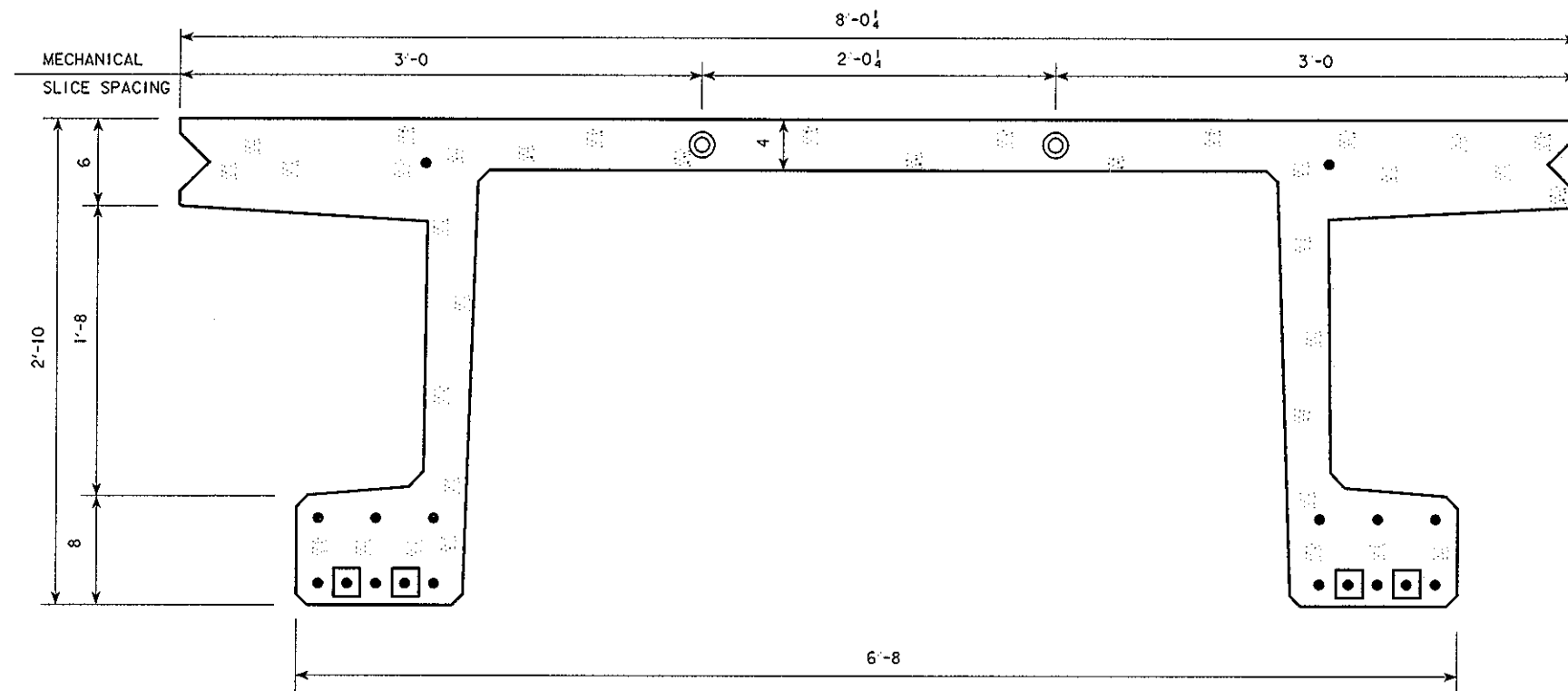


SECTION VIEW  
PT BLOCKOUT DETAILS

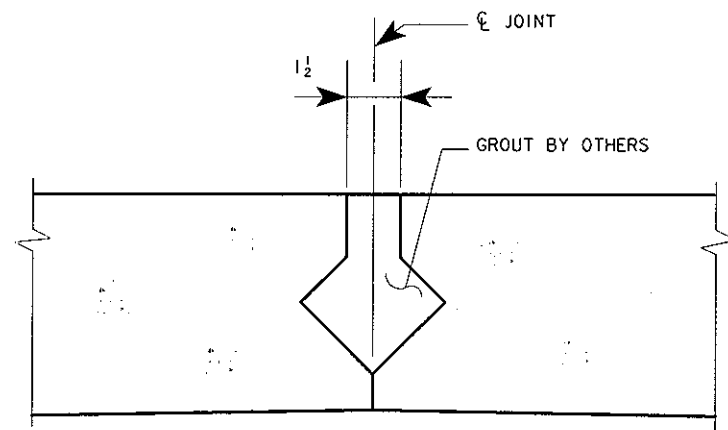
DESIGN FOR ?  
**51'-0 UHPC PI BEAM DETAILS**  
**FOR 110' x 24' UHPC BRIDGE**  
 30'-7 END SPANS 51'-2 INTERIOR SPAN  
**MISC. JOINT DETAILS** ? , 2007  
**BUCHANAN COUNTY**  
 IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
 DESIGN SHEET NO. 5 OF 6 FILE NO. ? DESIGN NO. ?



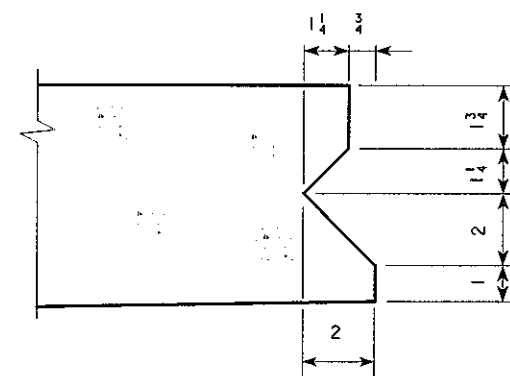
PART SIDE VIEW



END OF BEAM DETAIL  
(TYP ALL BEAM ENDS)



TYPICAL JOINT DETAIL



LONGITUDINAL SHEAR KEY

DESIGN FOR ?

51'-0 UHPC PI BEAM DETAILS  
FOR 110' x 24' UHPC BRIDGE

30'-7 END SPANS 51'-2 INTERIOR SPAN

END OF BEAM DETAILS

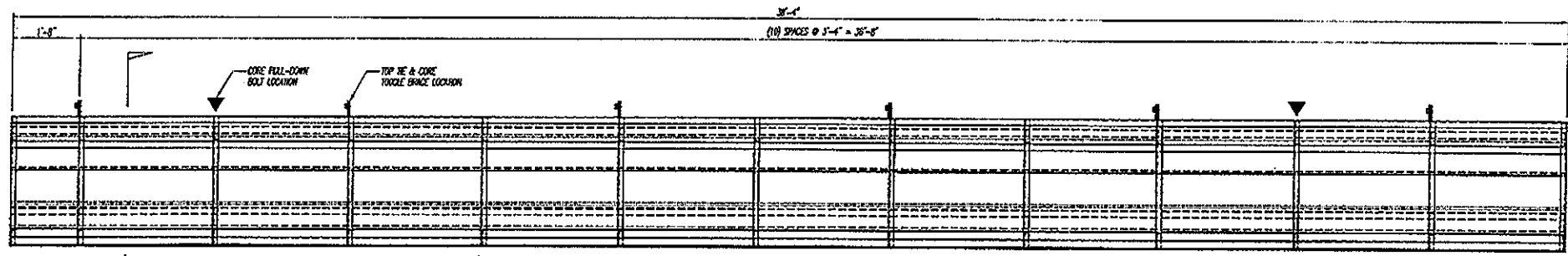
STA. ? ? , 2007

BUCHANAN COUNTY

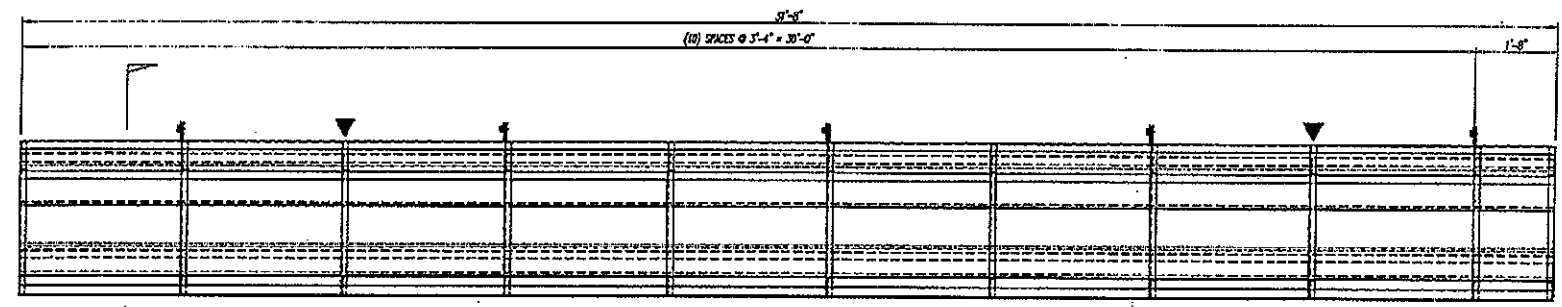
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 6 OF 6 FILE NO. ? DESIGN NO. ?

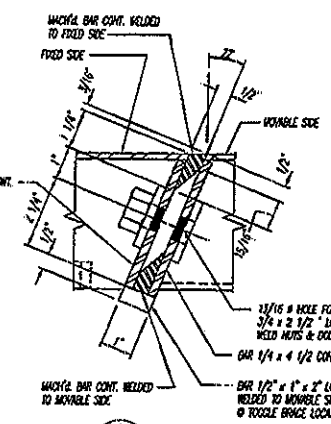
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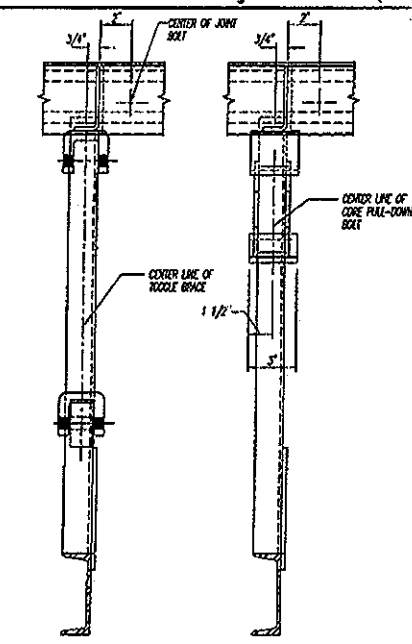
**ELEVATION-FORM**  
(1) SHAW SECTION REVD.



**ELEVATION-FORM**  
(1) END SECTION REVD.

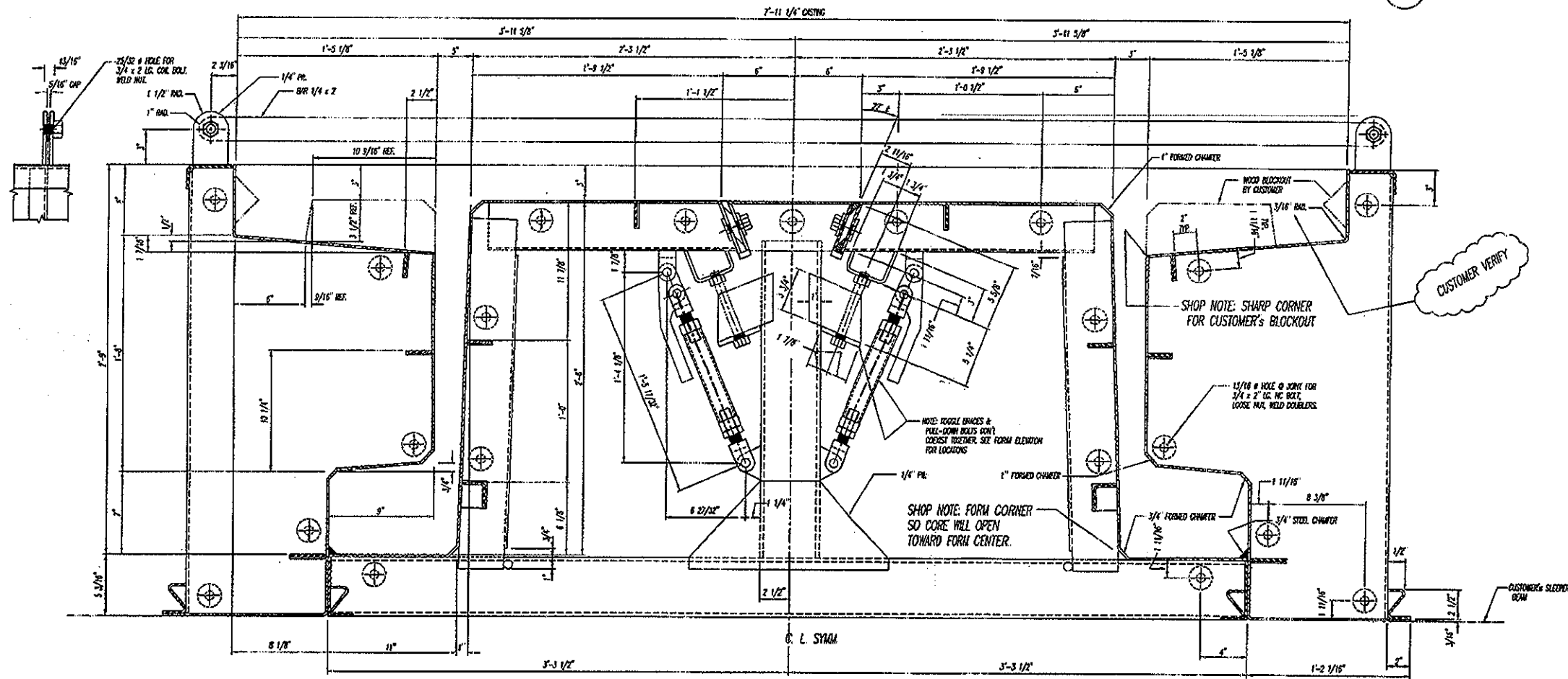


**1** DETAIL



**B** SECTION

**C** SECTION



**A** SECTION

**MATERIAL LIST - U.N.**

- BASE FORM**
- SHW - 3/16" PL.
  - SHW MEMBER - 1/4" PL. x 3' CONT.
  - CLUSSETS - PL. L 4 x 1 1/2" x 3/16"
  - STAYDOWN - PL. L 2 x 2 x 1/4" CONT.
  - STAYDOWN - BAR 1/4" x 2" CONT.
  - FRAMING - 2" x 6" VERTICAL @ CENTER & HORIZONTAL
  - 3/4" STEEL CHANNEL CONT.
  - BOTTOM MEMBER - STANDARD 7" MEMBER CONT. BETWEEN CHANNELS
  - TOGGLE BRACE - STANDARD 1 1/4" PIPE
- SIDE FORM**
- SHW - 3/16" PL.
  - TOP MEMBER - PL. L 4 x 2 x 1/4" CONT.
  - CLUSSETS - 3/16" PL. w/ 1 1/2" FLANGE
  - STAYDOWN - BAR 1/4" x 2" & BAR 1/4" x 3" CONT.
  - BOTTOM MEMBER - STANDARD 7" MEMBER CONT.

**CUSTOMER NOTE:**  
FORM DIMENSIONAL INTENSITY MAY BE COMPROMISED DUE TO METAL FATIGUE BROUGHT ON BY EXTERNAL VIBRATION WHEN NO CONCRETE IS PRESENT TO BUFFER THE SHOCKWAVES.

ISSUED APPROVED - 1/1/14

NO.	DATE	REVISION	BY

THIS DRAWING IS THE PROPERTY OF HELSER INDUSTRIES. IT IS LOANED TO YOU UNDER THE UNDERSTANDING THAT IT MAY NOT BE REPRODUCED OR IN PART OR USED IN ANY MANNER UNLAWFUL TO THE INTEREST OF HELSER INDUSTRIES.

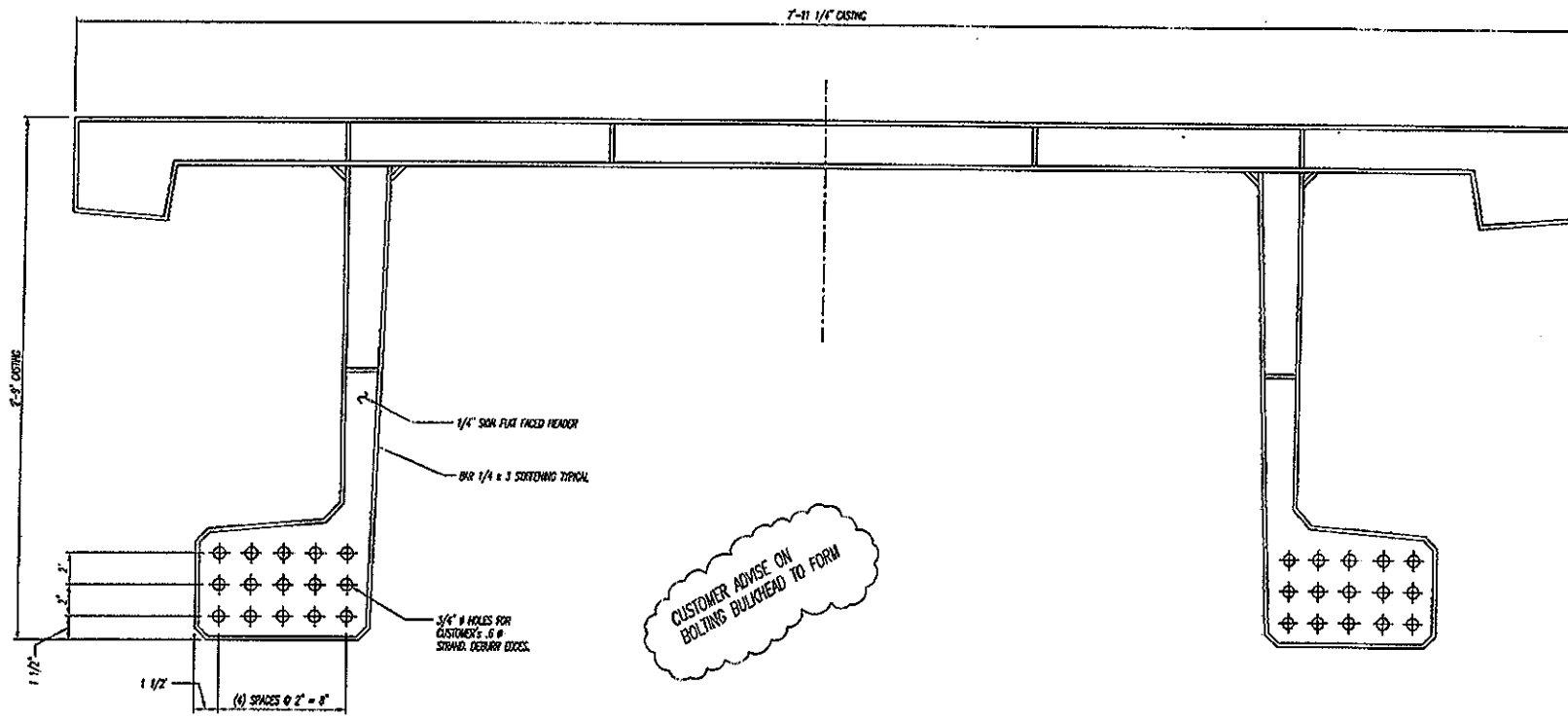
**HELSEY INDUSTRIES**  
P.O. Box 1559, 10750 S.W. Tuleton Road, Tuleton, Or. 97062  
Phone: (503) 682-4828 FAX: (503) 682-1666  
Email: engineering@helsery.com

DOUBLE BULB TEC GRIDER

**PRESTRESS SERVICES**

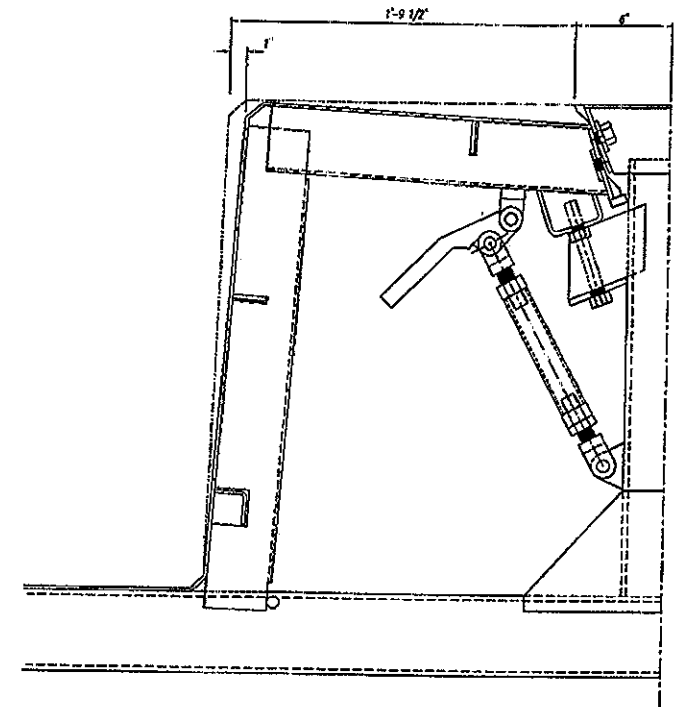
LEXINGTON KY U.S.A.

Scale:	AS SHOWN	Date:	2/26/03	Drawing Number:	03-614
Drawn By:	R. WYLL	Checked By:	R. THOMSON	Rev:	1
Approved By:					



CUSTOMER ADVISE ON  
BOLTING BULKHEAD TO FORM

**ELEVATION-INTERNAL BULKHEAD**  
(2) REV. TOTAL



**A**  
**I** SECTION THRU CORE (CORE COLLAPSED)

**CUSTOMER NOTE:**  
FROM DIMENSIONAL INTENSITY WILL BE COMPROMISED DUE  
TO METAL FATIGUE BROUGHT ON BY EXTERNAL VIBRATION  
WHEN NO CONCRETE IS PRESENT TO BUFFER THE STRUCTURES.

ISSUED APPROVED - 1/1/11

NO.	DATE	REVISION	BY

THIS DRAWING IS THE PROPERTY OF HELSER INDUSTRIES. IT IS LOANED WITH THE UNDERSTANDING THAT IT MAY NOT BE REPRODUCED IN WHOLE OR IN PART OR USED IN ANY WAY INJURIOUS TO THE INTERESTS OF HELSER INDUSTRIES.

**HELSE** **INDUSTRIES**  
P.O. Box 1509, 10750 S.W. Tucker Road, Tualatin, Or. 97062  
Phone: (503) 622-6200 FAX: (503) 622-1666  
Email: [engineering@helsel.com](mailto:engineering@helsel.com)

**DOUBLE BULB TEE GRIDER**  
**PRESTRESS SERVICES**  
LEXINGTON KY U.S.A.

Scale:	AS SHOWN	Date:	1/27/11	Drawing Number:	03-614
Drawn By:	R. THOMSEN	Checked By:	R. THOMSEN	Rev:	2
Approved By:					