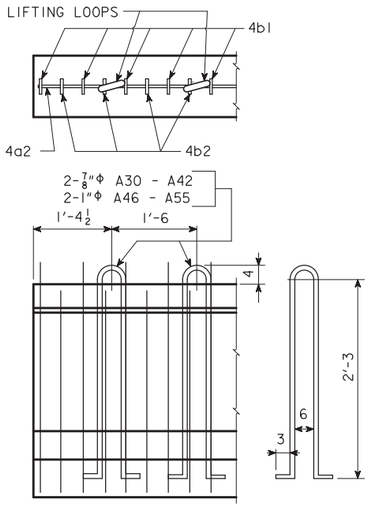
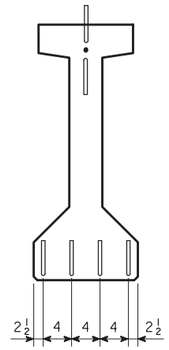
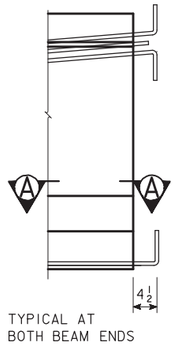


LIFTING LOOP DETAIL

ALTERNATE TYPES MAY BE SUBSTITUTED WITH THE APPROVAL OF THE ENGINEER. LIFTING LOOPS ARE TO BE STRUCTURAL GRADE.

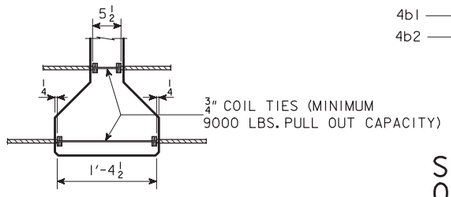


2 TOP DEFLECTED OR STRAIGHT STRANDS ARE TO BE CUT WITH 1'-0 PROJECTIONS AND SHOP BENT UP OR DOWN AS SHOWN (BEND TOP AND BOTTOM ROWS). THE REMAINING TOP STRANDS ARE TO BE CUT WITH 0'-3 PROJECTIONS.
FOUR BOTTOM STRANDS ARE TO BE CUT WITH 1'-0 PROJECTIONS AND SHOP BENT AS SHOWN. THE REMAINING BOTTOM STRANDS SHALL BE CUT OFF REASONABLY FLUSH WITH THE CONCRETE.



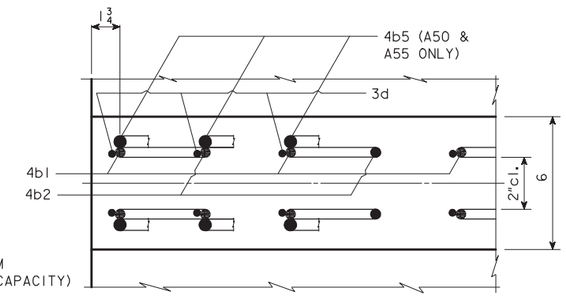
TYPICAL AT BOTH BEAM ENDS

STRAND PROJECTION AT BEAM ENDS WHEN EMBEDDED IN CONCRETE END DIAPHRAGMS



COIL TIE DETAIL

NUMBER AND EXACT LOCATION OF COIL TIES TO BE AS DETAILED ON SPECIFIC BRIDGE DESIGN.



SECTION A-A SHOWING PLACEMENT OF STIRRUPS NEAR END OF BEAM

A BEAM DATA

BEAM	SPAN LENGTH ℄-℄ BEARING	OVERALL BEAM LENGTH (L)	STRAND SIZE DIA. (inches)	NO. OF STRANDS		TOTAL INITIAL PRESTRESS ③ KIPS	HOLD DOWN FORCE-KIPS	CAMBER (in.)				DEFLECTION (in.) Δ_D				PERMISSIBLE SPACING				WEIGHT (TONS)		CONCRETE (C. Y.)	REINFORCING STEEL -(lb)
				STRAIGHT	DEFLECTED			AT RELEASE		AFTER LOSSES		IMMEDIATE① (ELASTIC) Δ_I		TIME ② (PLASTIC) Δ_T				HL93 LOADING					
												CONC. DIAPH.	STEEL DIAPH.	CONC. DIAPH.	STEEL DIAPH.			CONC. DIAPH.	STEEL DIAPH.				
A30	30'-0	31'-0	0.60	8	—	340	—	0.16		0.29		0.10	0.09	0.03	0.02			7'-6	7'-6	5.0		2.48	315
A34	34'-2	35'-2	0.60	9	—	383	—	0.26		0.46		0.17	0.15	0.04	0.04			7'-6	7'-6	5.7		2.82	352
A38	38'-4	39'-4	0.60	10	—	426	—	0.38		0.67		0.26	0.24	0.07	0.06			7'-6	7'-6	6.4		3.15	400
A42	42'-6	43'-6	0.60	7	2	383	9.3	0.70		1.24		0.38	0.35	0.09	0.09			7'-6	7'-6	7.1		3.49	452
✱A46	46'-8	47'-8	0.60	8	2	426	8.5	0.76		1.35		0.50	0.47	0.13	0.12			7'-6	7'-6	7.7		3.82	488
✱A50	50'-10	51'-10	0.60	9	3	511	10.7	1.02		1.82		0.69	0.65	0.17	0.16			7'-6	7'-6	8.4		4.15	503
✱A55	55'-0	56'-0	0.60	10	3	553	10.8	1.29		2.30		0.94	0.88	0.23	0.22			7'-6	7'-6	9.1		4.49	547

① DEFLECTIONS AT MID-SPAN DUE TO WEIGHT OF SLAB AND DIAPHRAGM. THE DEFLECTIONS SHOWN ARE FOR A SLAB WEIGHT OF 757 #/FT. (8" SLAB AND 7'-6 BEAM SPACING) AND ONE CONCRETE DIAPHRAGM (1912 #) OR ONE STEEL DIAPHRAGM (285 #) AT ℄ OF SPAN. FOR DIFFERENT SLAB AND DIAPHRAGM WEIGHTS, DEFLECTIONS WILL BE DIRECTLY PROPORTIONAL.

② DEFLECTIONS DUE TO THE COMBINED EFFECT OF CREEP DUE TO WEIGHT OF SLAB AND SHRINKAGE OF SLAB.

TOTAL BEAM DEFLECTIONS AT ℄ OF SPAN, Δ_D, DUE TO WEIGHT OF SLAB AND DIAPHRAGMS FOR DETAILING PURPOSE:
(A) $\Delta_D = \Delta_I + \Delta_T$ FOR SIMPLE SPAN.
(B) $\Delta_D = \Delta_I + \frac{3}{4}\Delta_T$ FOR END SPANS OF CONTINUOUS BRIDGE.
(C) $\Delta_D = \Delta_I + \frac{1}{2}\Delta_T$ FOR INTERIOR SPANS OF CONTINUOUS BRIDGE.

③ TOTAL INITIAL PRESTRESS IS BASED ON 72.6% f's, f's = 270 ksi AND As = 0.217 sq. in.

✱ MINIMUM CONCRETE f'c (AT 28 DAYS) SHALL BE 7,000 psi. MINIMUM f'ci AT RELEASE SHALL BE 6,000 psi.

BEAM NOTES:

THESE BEAMS ARE DESIGNED FOR AASHTO LIVE LOADS AS INDICATED IN ABOVE TABLE WITH AN ALLOWANCE OF 20 lb. PER SQUARE FOOT OF ROADWAY FOR FUTURE WEARING SURFACE.

ALL PPC BEAMS SHALL USE HIGH PERFORMANCE CONCRETE (HPC) IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

HOLD DOWN POINTS FOR DEFLECTED STRANDS MAY BE MOVED TOWARD ENDS OF BEAM A DISTANCE OF 0.05 L MAXIMUM AT PRODUCER'S OPTION.

ALL PRESTRESSING STRANDS SHALL CONFORM TO ASTM A416 GRADE 270 LOW RELAXATION STRANDS.

TOPS OF BEAMS ARE TO BE STRUCK OFF LEVEL AND FINISHED AS PER MATERIALS IM570.

BEARINGS SHALL BE AS DETAILED ON OTHER DESIGN SHEETS.

BEAMS TO BE USED IN BRIDGES MADE CONTINUOUS BY THE POURED IN PLACE FLOOR, ARE TO BE AT LEAST 28 DAYS OLD BEFORE THE FLOOR IS PLACED UNLESS A SHORTER CURING TIME IS APPROVED BY THE BRIDGE ENGINEER.

THE PORTIONS OF THE PRESTRESS BEAMS THAT ARE TO BE EMBEDDED IN THE ABUTMENT AND PIER DIAPHRAGMS SHALL BE ROUGHENED FOR A DISTANCE OF 10" FROM THE BEAM END BY SANDBLASTING OR OTHER APPROVED METHODS TO PROVIDE SUITABLE BOND BETWEEN THE BEAM AND THE DIAPHRAGM IN ACCORDANCE WITH ARTICLE 2403.03, I, OF THE STANDARD SPECIFICATIONS.

ALL BEAMS ARE TO BE INCREASED IN LENGTH TO COMPENSATE FOR ELASTIC SHORTENING, CREEP AND SHRINKAGE.

IF THE PRECAST PANEL OPTION IS ALLOWED AND USED FOR BRIDGE DECK FORMATION, THE BEAM STIRRUPS WILL NEED TO BE EXTENDED AND TOP FLANGE BEAM FINISH SHALL BE MODIFIED AS PER DETAILS ON THE PRECAST DECK PANEL SHEET.

IF THE STEEL DIAPHRAGM OPTION IS ALLOWED AND USED, HOLES MUST BE CAST IN THE WEB TO ACCOMMODATE THE STEEL DIAPHRAGM ATTACHMENTS AS DETAILED ON THE STEEL DIAPHRAGM DETAIL SHEET.

IF SOLE PLATE IS REQUIRED FOR BEARING, SOLE PLATE IS TO BE SET IN FORMS WHEN BEAM IS CAST AND FORMED OUT BELOW TO EXCLUDE CONCRETE AS DETAILED ON THE BEARING SHEET.

IF STUB ABUTMENTS ARE USED, ALL STRANDS AT THE ENDS OF BEAMS AT STUB ABUTMENTS SHALL BE CUT OFF REASONABLY FLUSH WITH THE CONCRETE.

0.6" DIAMETER STRANDS STRESSED TO NOT MORE THAN 5,000 LBS. EACH MAY BE USED IN LIEU OF THE a BARS WHICH RUN THE FULL LENGTH OF THE BEAM IN THE TOP FLANGE.

WHEN EXPANSION JOINTS ARE USED, CONCRETE SEALER SHALL BE APPLIED TO THE PRESTRESSED BEAM END SECTIONS. THE SEALING SHALL BE IN ACCORDANCE WITH MATERIALS I.M. 570 (FABRICATOR APPLICATION) AND I.M. 491.12 (CONTRACTOR APPLICATION).

SPECIFICATIONS:

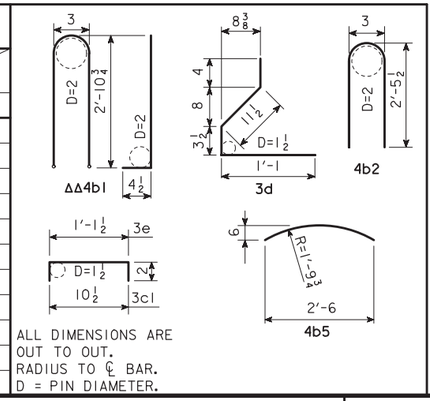
CONSTRUCTION: STANDARD SPECIFICATIONS OF THE IOWA DEPARTMENT OF TRANSPORTATION, CURRENT SERIES, WITH CURRENT APPLICABLE SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS.
DESIGN: A.A.S.H.T.O. LRFD, SERIES OF 2007, WITH MINOR MODIFICATIONS.

DESIGN STRESSES:

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE TO BE IN ACCORDANCE WITH A.A.S.H.T.O. LRFD SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 2007:
REINFORCING STEEL IN ACCORDANCE WITH SECTION 5, GRADE 60.
CONCRETE IN ACCORDANCE WITH SECTION 5, f'c = 5000 psi (EXCEPT AS NOTED)
PRESTRESSING STEEL IN ACCORDANCE WITH SECTION 5, f's = 270,000 psi.

REINFORCING BAR LIST

	BEAM / SPAN		A30 30'-0		A34 34'-2		A38 38'-4		A42 42'-6		A46 46'-8		A50 50'-10		A55 55'-0	
	BAR	SHAPE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	5a1	——	2	30'-9	2	34'-11	2	39'-1	4	22'-10	4	24'-11	4	27'-0	4	29'-1
	4a2	——	2	3'-3	2	3'-3	2	3'-3	2	3'-3	2	3'-3	2	3'-3	2	3'-3
ΔΔ	4b1	⊂⊃	28	6'-8	32	6'-8	36	6'-8	40	6'-8	44	6'-8	46	6'-8	50	6'-8
	4b2	⊂⊃	8	5'-0	8	5'-0	10	5'-0	12	5'-0	12	5'-0	8	5'-0	8	5'-0
	4b5	⌒	—	——	—	——	—	——	—	——	—	——	8	2'-9	12	2'-9
	3c1	⊓	28	1'-3	32	1'-3	36	1'-3	40	1'-3	44	1'-3	46	1'-3	50	1'-3
✱✱	3d	∠	72	2'-8	80	2'-8	92	2'-8	104	2'-8	112	2'-8	108	2'-8	116	2'-8
	3e	⊓	18	1'-6	18	1'-6	20	1'-6	20	1'-6	20	1'-6	18	1'-6	18	1'-6



ALL DIMENSIONS ARE OUT TO OUT.
RADIUS TO ℄ BAR.
D = PIN DIAMETER.

ΔΔ 4b1 BARS TO BE EPOXY COATED.

✱✱ WHERE DEFLECTING STRANDS INTERFERE WITH PLACEMENT, SOME IN-PLACE BENDING MAY BE NECESSARY.

Return after Exam

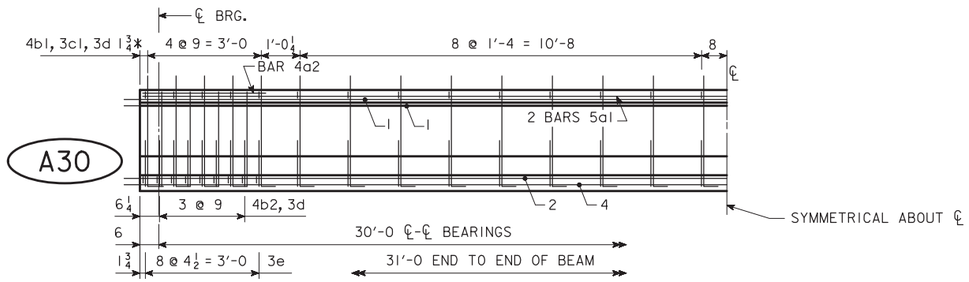
A BEAM DETAILS

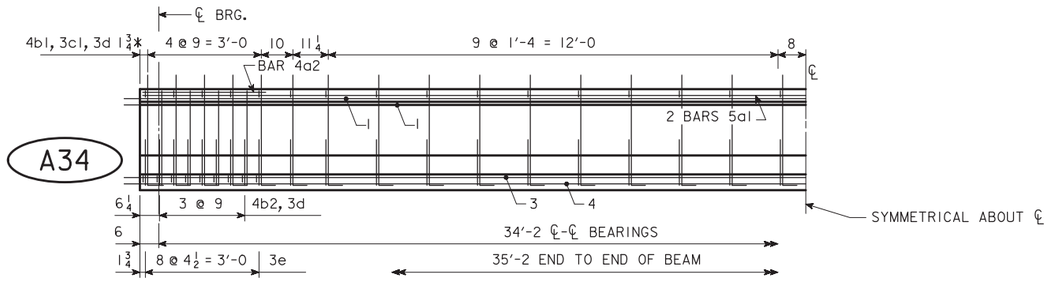
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. ____ OF ____ FILE NO. _____ DESIGN NO. _____

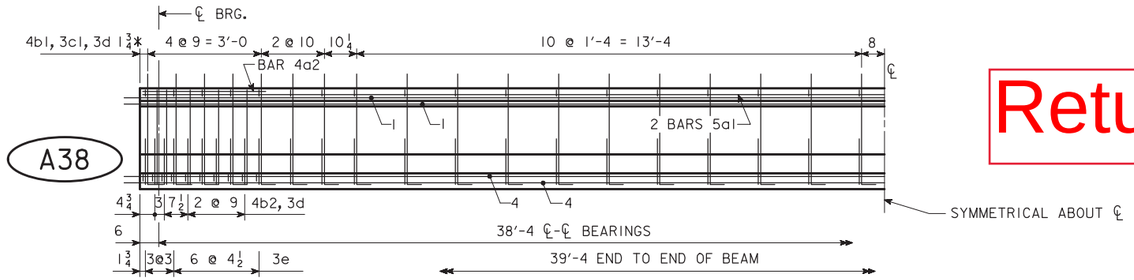
DESIGN TEAM	A BEAMS - LRFD DESIGN	STANDARD SHEET 4600	COUNTY	PROJECT NUMBER	SHEET NUMBER

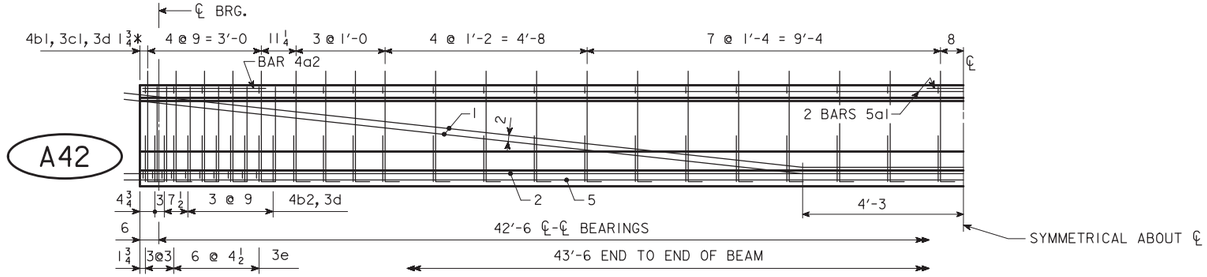
REVISION 08-12 - I.M. REFERENCE NOTE FOR SEALING BEAM ENDS DISTINGUISHES BETWEEN THE FABRICATOR AND CONTRACTOR.
ENGLISHBEAMS.DGN - 4600 - LRFD - THIS SHEET RE-ISSUED 09-06.

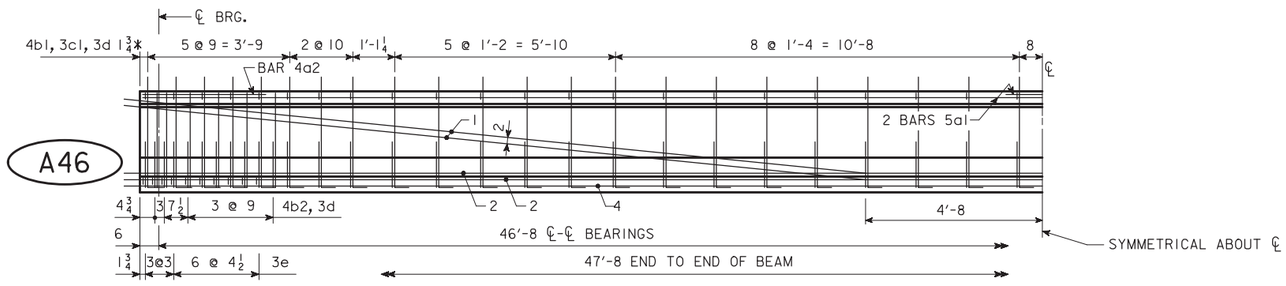
NOTE: DIMENSIONS FOR THE LOCATION OF THE DEFLECTED STRANDS ARE AT ℄ BEAM AND END OF BEAM.

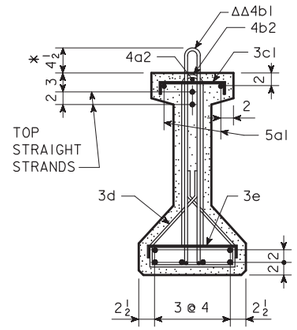




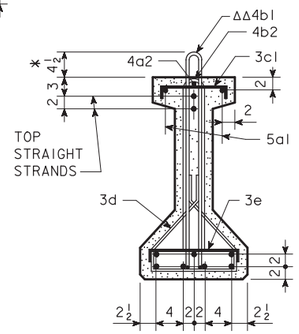




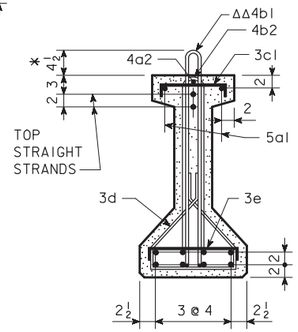




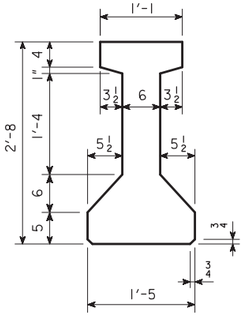
BEAM A30



BEAM A34

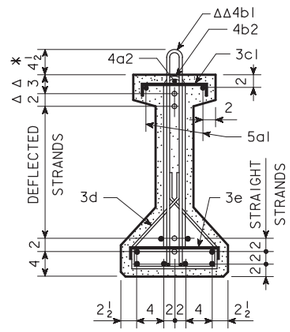


BEAM A38

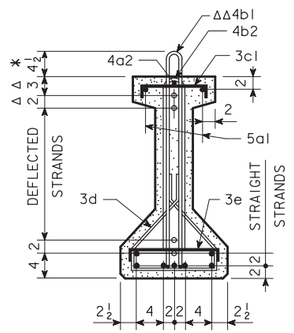


"A" BEAM CROSS SECTION

A = 311.5 in²
Y_b = 14.05 in.
I = 34,082 in.⁴



BEAM A46



BEAM A42

NOTE: BARS 3d ARE TO BE PLACED IN PAIRS.

- o DEFLECTED STRANDS
- * KEEP
- Δ DIMENSIONS AT END OF BEAM
- ΔΔ EPOXY COATED BARS

Return after Exam

A30-A46 BEAM DETAILS

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

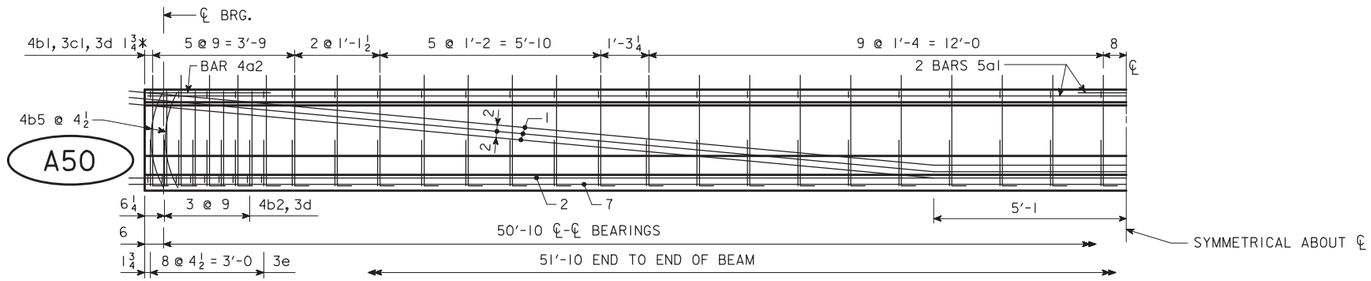
DESIGN SHEET NO. ____ OF ____ FILE NO. _____ DESIGN NO. _____

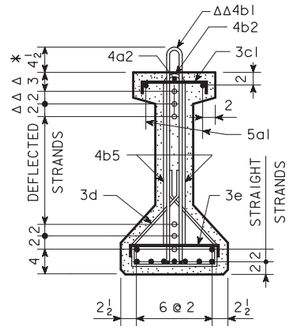
REVISION 05-09 - A42 & A46 BAR SPACINGS WERE CHANGED.
ENGLISHBEAMS.DGN - 4601 - LRFD - THIS SHEET RE-ISSUED 09-06.

DESIGN TEAM	A BEAMS - LRFD DESIGN	STANDARD SHEET 4601	COUNTY	PROJECT NUMBER	SHEET NUMBER

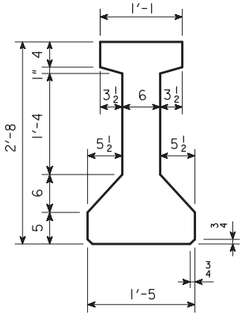
4/26/2011 3:00:06 PM tsorens W:\Highway\Bridge\Standards\Bridges\EnglishBeams.dgn 4601 11x17_pdf.pltcfg

NOTE: DIMENSIONS FOR THE LOCATION OF THE DEFLECTED STRANDS ARE AT ℄ BEAM AND END OF BEAM.



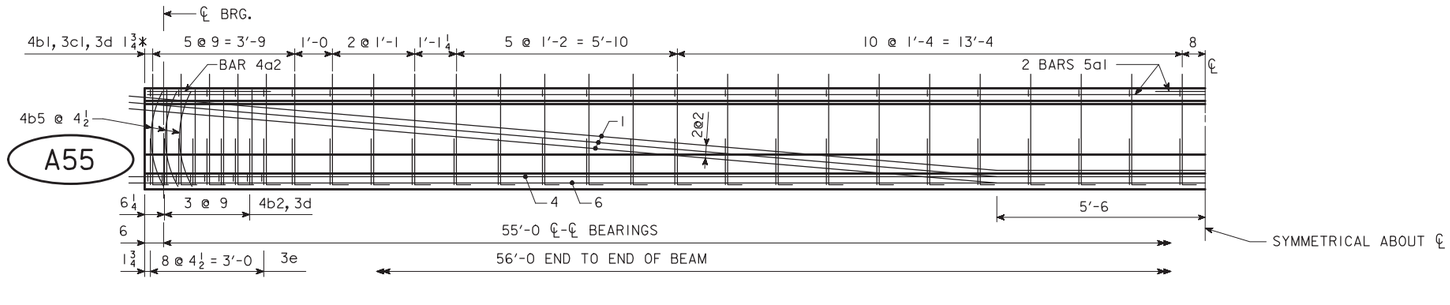


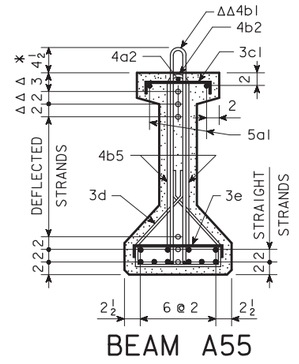
BEAM A50



"A" BEAM CROSS SECTION

A = 311.5 in.²
Y_b = 14.05 in.
I = 34,082 in.⁴





BEAM A55

Return after Exam

NOTE: BARS 4b5 AND 3d ARE TO BE PLACED IN PAIRS.

- ○ DEFLECTED STRANDS
- * KEEP
- Δ DIMENSIONS AT END OF BEAM
- ΔΔ EPOXY COATED BARS

A50-A55 BEAM DETAILS

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. ____ OF ____ FILE NO. _____ DESIGN NO. _____

REVISION 05-09 - A50 & A55 BAR SPACINGS WERE CHANGED.
ENGLISHBEAMS.DGN - 4602 - LRFD - THIS SHEET RE-ISSUED 09-06.

DESIGN TEAM	A BEAMS - LRFD DESIGN	STANDARD SHEET 4602	COUNTY	PROJECT NUMBER	SHEET NUMBER

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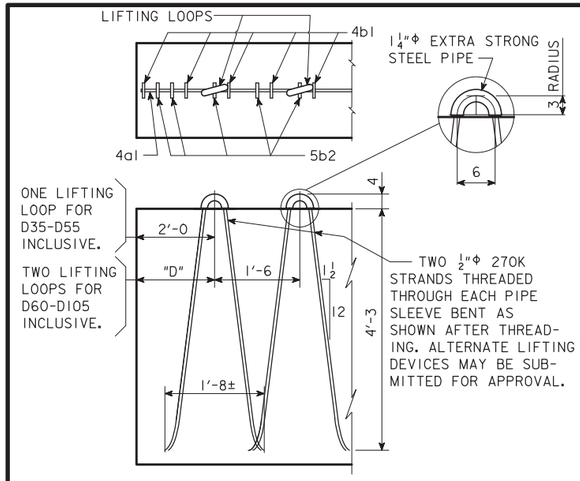
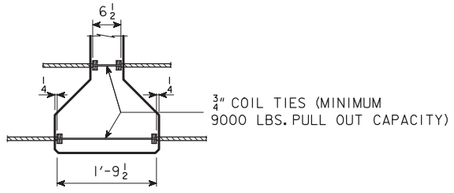


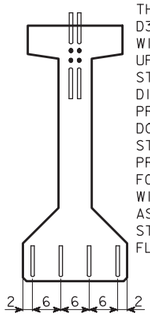
LIFTING LOOP DETAIL

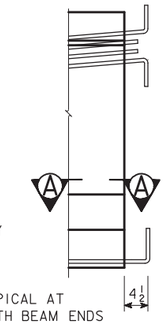
"D" = 1'-3 FOR D60 - D95
"D" = 3'-9 FOR D100
"D" = 6'-3 FOR D105

NUMBER AND EXACT LOCATION OF COIL TIES TO BE AS DETAILED ON SPECIFIC BRIDGE DESIGN.

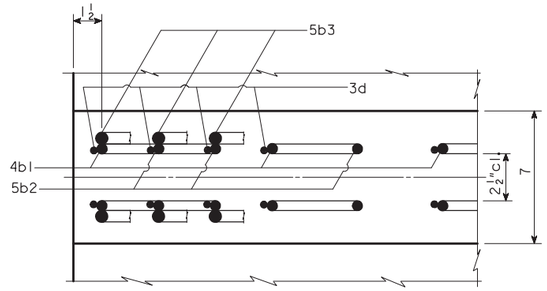


COIL TIE DETAIL





STRAND PROJECTION AT BEAM ENDS WHEN EMBEDDED IN CONCRETE END DIAPHRAGMS



SECTION A-A SHOWING PLACEMENT OF STIRRUPS NEAR END OF BEAM

SPECIFICATIONS:

CONSTRUCTION: STANDARD SPECIFICATIONS OF THE IOWA DEPARTMENT OF TRANSPORTATION, CURRENT SERIES, WITH CURRENT APPLICABLE SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS.
DESIGN: A.A.S.H.T.O. LRFD, SERIES OF 2007, WITH MINOR MODIFICATIONS.

DESIGN STRESSES:

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE TO BE IN ACCORDANCE WITH A.A.S.H.T.O. LRFD SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 2007:
REINFORCING STEEL IN ACCORDANCE WITH SECTION 5, GRADE 60.
CONCRETE IN ACCORDANCE WITH SECTION 5, f'c = 5000 psi (EXCEPT AS NOTED)
PRESTRESSING STEEL IN ACCORDANCE WITH SECTION 5, f's = 270,000 psi.

ΔΔ 4b1 BARS TO BE EPOXY COATED

A/B A=SIZE B=NO.

D BEAM DATA

BEAM	SPAN LENGTH ℄-℄ BEARING	OVERALL BEAM LENGTH (L)	STRAND SIZE DIA. (inches)	NO. OF STRANDS STRAIGHT	NO. OF STRANDS DEFLECTED	TOTAL INITIAL PRESTRESS KIPS ③	HOLD DOWN FORCE-KIPS	CAMBER (in.) AT RELEASE		CAMBER (in.) AFTER LOSSES		DEFLECTION (in.) Δ_D IMMEDIATE ① (ELASTIC) Δ_I CONC. DIAPH.	IMMEDIATE ① (ELASTIC) Δ_I STEEL DIAPH.	DEFLECTION (in.) Δ_D TIME ② (PLASTIC) Δ_T CONC. DIAPH.	TIME ② (PLASTIC) Δ_T STEEL DIAPH.	PERMISSIBLE SPACING HL93 LOADING		WEIGHT (TONS)		CONCRETE (C.Y.)	REINFORCING STEEL - (lbs.)
																CONC. DIAPH.	STEEL DIAPH.				
D35	35'-0	36'-0	0.60	10	—	425	——	0.09		0.15		0.03	0.03	0.01	0.01	7'-6	7'-6	12.0		5.9	502
D40	40'-0	41'-0	0.60	10	—	425	——	0.10		0.18		0.05	0.05	0.01	0.01	7'-6	7'-6	13.6		6.7	541
D45	45'-0	46'-0	0.60	12	—	510	——	0.18		0.31		0.08	0.07	0.02	0.02	7'-6	7'-6	15.3		7.6	561
D50	50'-0	51'-0	0.60	12	—	510	——	0.21		0.36		0.12	0.11	0.03	0.03	7'-6	7'-6	17.0		8.4	624
D55	55'-0	56'-0	0.60	12	—	510	——	0.24		0.42		0.18	0.16	0.04	0.04	7'-6	7'-6	18.6		9.2	681
D60	60'-0	61'-0	0.60	14	—	596	——	0.35		0.62		0.25	0.22	0.06	0.06	7'-6	7'-6	20.3		10.0	720
D65	65'-0	66'-0	0.60	8	4	510	23.7	0.46		0.80		0.33	0.30	0.08	0.08	7'-6	7'-6	22.0		10.8	910
D70	70'-0	71'-0	0.60	8	6	596	30.0	0.52		0.92		0.45	0.41	0.11	0.10	7'-6	7'-6	23.6		11.7	1004
D75	75'-0	76'-0	0.60	10	6	681	26.7	0.69		1.22		0.58	0.54	0.15	0.13	7'-6	7'-6	25.3		12.5	1064
D80	80'-0	81'-0	0.60	12	6	766	27.2	1.00		1.76		0.74	0.69	0.19	0.17	7'-6	7'-6	27.0		13.3	1116
D85	85'-0	86'-0	0.60	14	6	851	27.3	1.27		2.24		0.94	0.87	0.23	0.22	7'-6	7'-6	28.6		14.1	1159
D90	90'-0	91'-0	0.60	16	6	936	25.8	1.40		2.46		1.07	1.00	0.27	0.25	7'-6	7'-6	30.4		15.0	1310
D95	95'-0	96'-0	0.60	18	6	1021	24.5	1.64		2.89		1.32	1.24	0.33	0.31	7'-6	7'-6	31.9		15.8	1493
*D100	100'-0	101'-0	0.60	22	6	1192	22.3	2.08		3.67		1.61	1.51	0.40	0.38	7'-6	7'-6	33.6		16.6	1521
*D105	105'-0	106'-0	0.60	26	6	1362	22.2	2.42		4.27		1.80	1.70	0.45	0.42	7'-6	7'-6	35.3		17.4	1602

① DEFLECTIONS AT MID-SPAN DUE TO WEIGHT OF SLAB AND DIAPHRAGM. THE DEFLECTIONS SHOWN ARE FOR A SLAB WEIGHT OF 760 #/FT. (8" SLAB AND 7'-6 BEAM SPACING) AND ONE CONCRETE DIAPHRAGM (3191 #) OR ONE STEEL DIAPHRAGM (285 #) AT ℄ OF SPAN. FOR DIFFERENT SLAB AND DIAPHRAGM WEIGHTS, DEFLECTIONS WILL BE DIRECTLY PROPORTIONAL.

② DEFLECTIONS DUE TO THE COMBINED EFFECT OF CREEP DUE TO WEIGHT OF SLAB AND SHRINKAGE OF SLAB.

TOTAL BEAM DEFLECTIONS AT ℄ OF SPAN, Δ_D, DUE TO WEIGHT OF SLAB AND DIAPHRAGMS FOR DETAILING PURPOSE:
(A) $\Delta_D = \Delta_I + \Delta_T$ FOR SIMPLE SPAN.
(B) $\Delta_D = \Delta_I + \frac{3}{4}\Delta_T$ FOR END SPANS OF CONTINUOUS BRIDGE.
(C) $\Delta_D = \Delta_I + \frac{1}{2}\Delta_T$ FOR INTERIOR SPANS OF CONTINUOUS BRIDGE.

③ TOTAL INITIAL PRESTRESS IS BASED ON 72.6% f's, f's = 270 ksi AND As = 0.217 sq. in.

* MINIMUM CONCRETE f'c (AT 28 DAYS) SHALL BE 7500 psi. MINIMUM f'ci AT RELEASE SHALL BE 6000 psi.

BEAM NOTES: (CONTINUED)

IF THE STEEL DIAPHRAGM OPTION IS ALLOWED AND USED, HOLES MUST BE CAST IN THE WEB TO ACCOMMODATE THE STEEL DIAPHRAGM ATTACHMENTS AS DETAILED ON THE STEEL DIAPHRAGM DETAIL SHEET.

IF SOLE PLATE IS REQUIRED FOR BEARING, SOLE PLATE IS TO BE SET IN FORMS WHEN BEAM IS CAST AND FORMED OUT BELOW TO EXCLUDE CONCRETE AS DETAILED ON THE BEARING SHEET.

IF STUB ABUTMENTS ARE USED, ALL STRANDS AT THE ENDS OF BEAMS AT STUB ABUTMENTS SHALL BE CUT OFF REASONABLY FLUSH WITH THE CONCRETE.

WHEN EXPANSION JOINTS ARE USED, CONCRETE SEALER SHALL BE APPLIED TO THE PRESTRESSED BEAM END SECTIONS. THE SEALING SHALL BE IN ACCORDANCE WITH MATERIALS I.M. 570 (FABRICATOR APPLICATION) AND I.M. 491.12 (CONTRACTOR APPLICATION).

BEAM NOTES:

THESE BEAMS ARE DESIGNED FOR AASHTO LIVE LOADS AS INDICATED IN ABOVE TABLE WITH AN ALLOWANCE OF 20 lb. PER SQUARE FOOT OF ROADWAY FOR FUTURE WEARING SURFACE.

ALL PPC BEAMS SHALL USE HIGH PERFORMANCE CONCRETE (HPC) IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

HOLD DOWN POINTS FOR DEFLECTED STRANDS MAY BE MOVED TOWARD ENDS OF BEAM A DISTANCE OF 0.05 L MAXIMUM AT PRODUCER'S OPTION.

ALL PRESTRESSING STRANDS SHALL CONFORM TO ASTM A416 GRADE 270 LOW RELAXATION STRANDS.

TOPS OF BEAMS ARE TO BE STRUCK OFF LEVEL AND FINISHED AS PER MATERIALS IM570.

BEARINGS SHALL BE AS DETAILED ON OTHER DESIGN SHEETS.

BEAMS TO BE USED IN BRIDGES MADE CONTINUOUS BY THE POURED IN PLACE FLOOR, ARE TO BE AT LEAST 28 DAYS OLD BEFORE THE FLOOR IS PLACED UNLESS A SHORTER CURING TIME IS APPROVED BY THE BRIDGE ENGINEER.

THE PORTIONS OF THE PRESTRESS BEAMS THAT ARE TO BE EMBEDDED IN THE ABUTMENT AND PIER DIAPHRAGMS SHALL BE ROUGHENED FOR A DISTANCE OF 10" FROM THE BEAM END BY SANDBLASTING OR OTHER APPROVED METHODS TO PROVIDE SUITABLE BOND BETWEEN THE BEAM AND THE DIAPHRAGM IN IN ACCORDANCE WITH ARTICLE 2403.03, I, OF THE STANDARD SPECIFICATIONS.

ALL BEAMS ARE TO BE INCREASED IN LENGTH TO COMPENSATE FOR ELASTIC SHORTENING, CREEP AND SHRINKAGE.

FOR TRANSPORTING, THE OVERHANG SHALL BE IN ACCORDANCE WITH ARTICLE 2407.03, K, OF THE STANDARD SPECIFICATIONS, EXCEPT EXCEPT THE OVERHANG MAY BE INCREASED TO A MAXIMUM OF 8 FEET FOR THE D85 BEAM, 9 FEET FOR THE D90 BEAM, 11 FEET FOR THE D95 BEAM, 12 FEET FOR THE D100 BEAM, AND D105 BEAM.

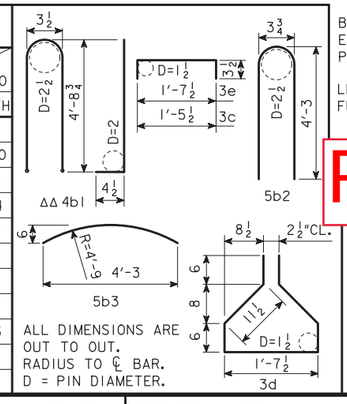
THE CONTRACTOR SHALL ASSURE THE LATERAL STABILITY OF THE D100 AND D105 BEAMS DURING HANDLING, TRANSPORTING AND ERECTION BY PROVIDING TEMPORARY BRACING AS NEEDED.

IF THE PRECAST PANEL OPTION IS ALLOWED AND USED FOR BRIDGE DECK FORMATION, THE BEAM STIRRUPS WILL NEED TO BE EXTENDED AND TOP FLANGE BEAM FINISH SHALL BE MODIFIED AS PER DETAILS ON THE PRECAST DECK PANEL SHEET.

0.6" DIAMETER STRANDS STRESSED TO NOT MORE THAN 5,000 LBS. EACH MAY BE USED IN LIEU OF THE a BARS WHICH RUN THE FULL LENGTH OF THE BEAM IN THE TOP FLANGE.

REINFORCING BAR LIST

BEAM / SPAN		D35 35'-0		D40 40'-0		D45 45'-0		D50 50'-0		D55 55'-0		D60 60'-0		D65 65'-0		D70 70'-0		D75 75'-0		D80 80'-0		D85 85'-0		D90 90'-0		D95 95'-0		D100 100'-0		D105 105'-0	
BAR	SHAPE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
4a1	——	2	4'-0	2	4'-0	2	4'-0	2	4'-0	2	4'-0	2	4'-0	2	4'-0	2	4'-0	2	4'-0	2	4'-0	2	16'-0	2	18'-0	2	20'-0	2	22'-0	2	24'-0
a2	——	——	——	——	——	——	——	——	——	——	——	——	——	5/4	22'-10	5/4	24'-4	5/4	25'-10	5/4	27'-4	5/4	29'-4	5/4	30'-10	6/4	32'-10	6/4	35'-4	6/4	36'-10
a3	——	——	——	——	——	——	——	——	——	——	——	——	——	6/2	25'-0	6/2	27'-0	6/2	29'-0	6/2	31'-0	6/2	32'-0	7/2	34'-0	8/2	36'-0	8/2	36'-0	8/2	38'-0
ΔΔ4b1	⊂	33	10'-4	37	10'-4	39	10'-4	43	10'-4	47	10'-4	51	10'-4	53	10'-4	57	10'-4	62	10'-4	66	10'-4	68	10'-4	74	10'-4	80	10'-4	81	10'-4	87	10'-4
5b2	⊂	12	8'-8	12	8'-8	12	8'-8	14	8'-8	14	8'-8	14	8'-8	14	8'-8	16	8'-8	16	8'-8	16	8'-8	16	8'-8	16	8'-8	16	8'-8	16	8'-8	16	8'-8
5b3	⌒	4	4'-4	4	4'-4	4	4'-4	4	4'-4	8	4'-4	8	4'-4	8	4'-4	12	4'-4	12	4'-4	12	4'-4	12	4'-4	20	4'-4	20	4'-4	20	4'-4	20	4'-4
3c	⌐¬	33	2'-1	37	2'-1	39	2'-1	43	2'-1	47	2'-1	51	2'-1	53	2'-1	57	2'-1	62	2'-1	66	2'-1	68	2'-1	74	2'-1	80	2'-1	81	2'-1	87	2'-1
3d	△	45	5'-7	49	5'-7	51	5'-7	57	5'-7	61	5'-7	65	5'-7	67	5'-7	73	5'-7	78	5'-7	82	5'-7	84	5'-7	90	5'-7	96	5'-7	97	5'-7	103	5'-7
3e	⌐¬	26	2'-3	26	2'-3	26	2'-3	28	2'-3	28	2'-3	28	2'-3	28	2'-3	30	2'-3	30	2'-3	30	2'-3	30	2'-3	30	2'-3	30	2'-3	30	2'-3	30	2'-3



ALL DIMENSIONS ARE OUT TO OUT.
RADIUS TO ℄ BAR.
D = PIN DIAMETER.

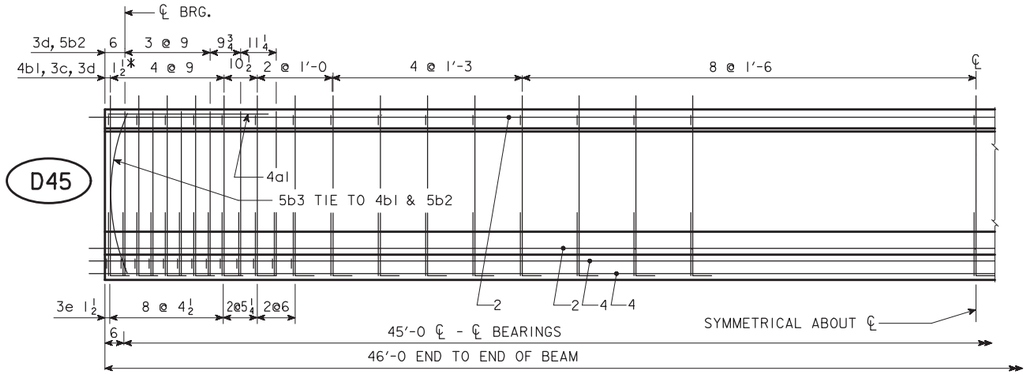
D BEAM DETAILS

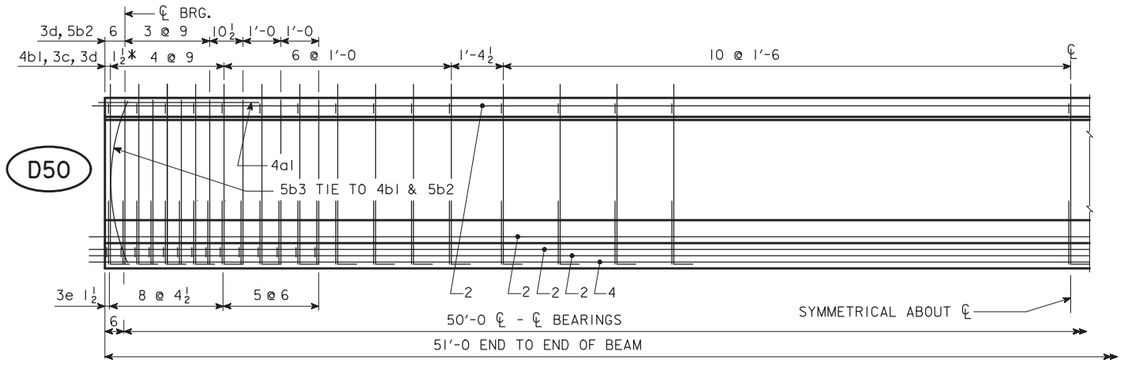
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. ____ OF ____ FILE NO. _____ DESIGN NO. _____

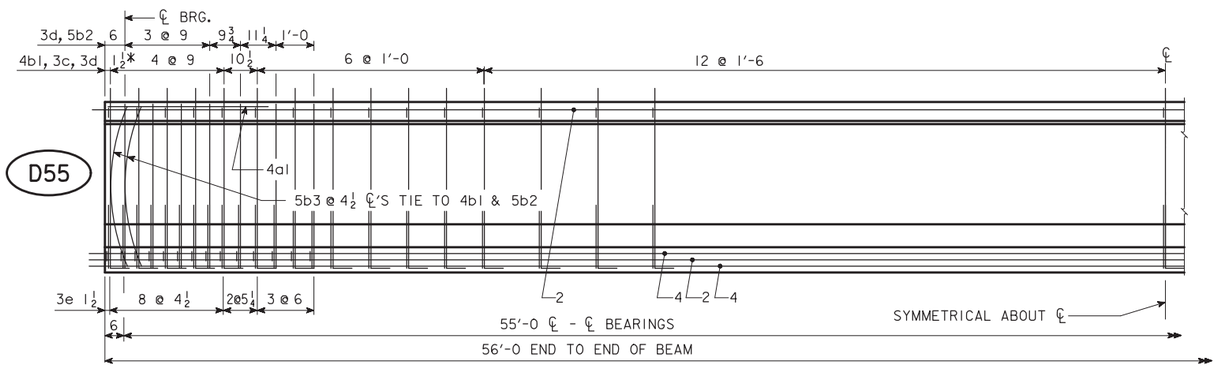
Return after Exam

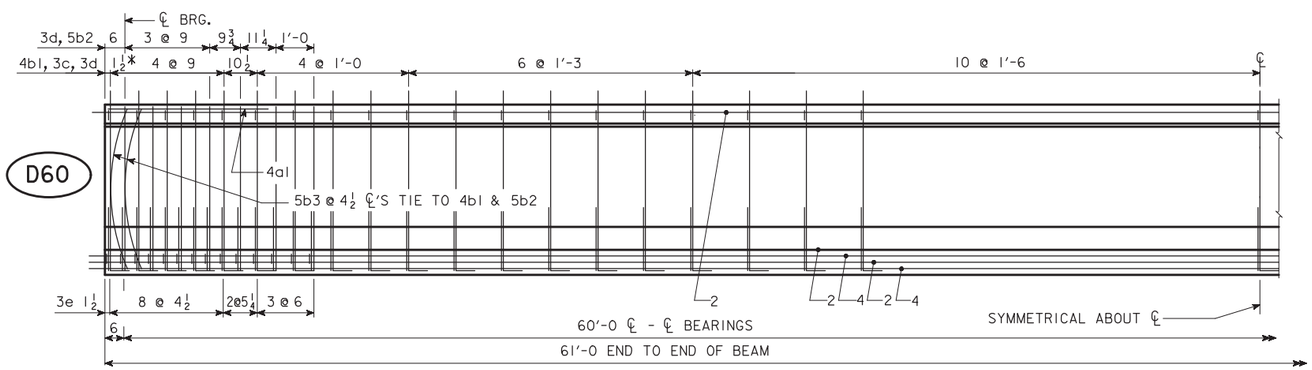
DESIGN TEAM	D BEAMS - LRFD DESIGN	STANDARD SHEET 4630	COUNTY	PROJECT NUMBER	SHEET NUMBER

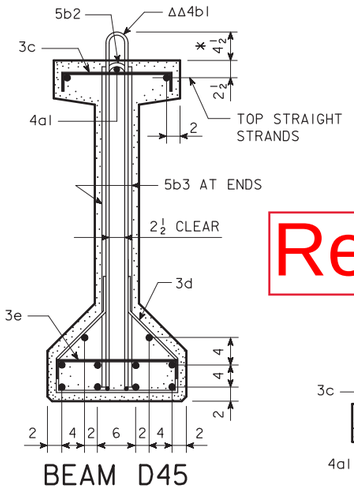
REVISION 08-12 - I.M. REFERENCE NOTE FOR SEALING BEAM ENDS DISTINGUISHES BETWEEN THE FABRICATOR AND CONTRACTOR.
ENGLISHBEAMS.DGN - 4630 - LRFD - THIS SHEET RE-ISSUED 09-06.



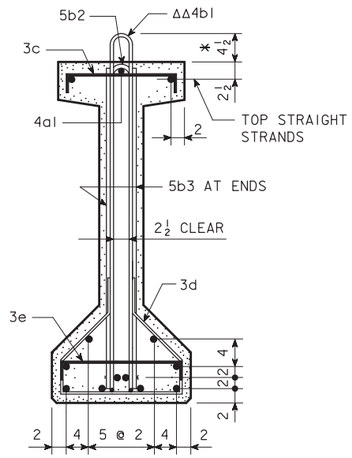




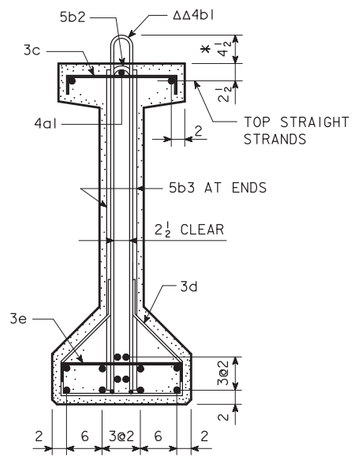




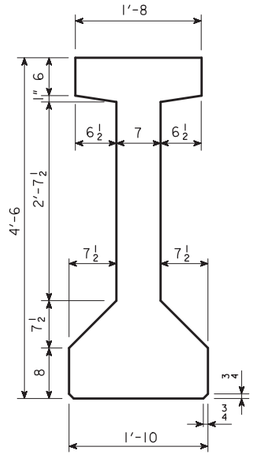
BEAM D45



BEAM D50

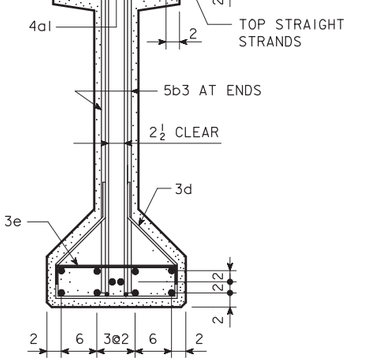


BEAM D60



"D" BEAM CROSS SECTION

AREA = 638.75 in²
Y_b = 24.37 in
I = 214,974 in⁴



BEAM D55

* KEEP
ΔΔ EPOXY COATED BARS

Return after Exam

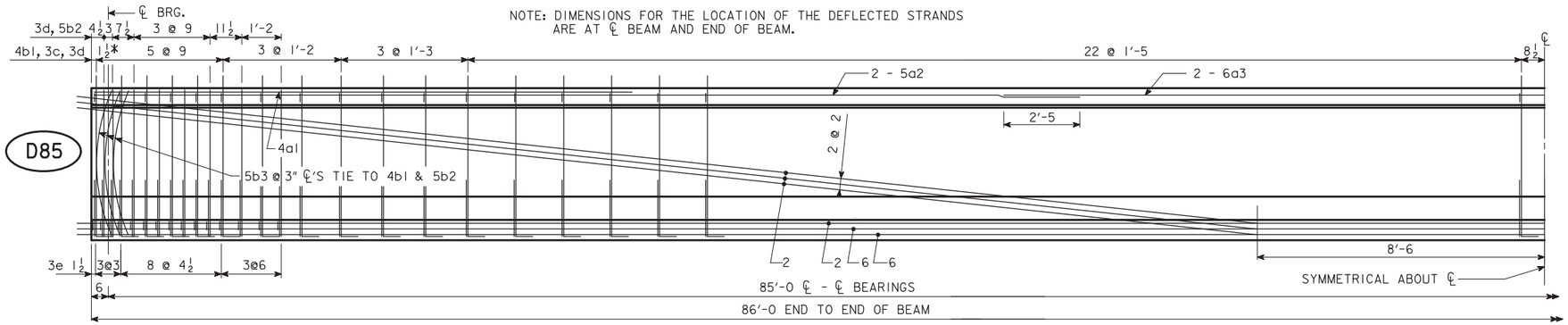
D45 - D60 BEAM DETAILS

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. ____ OF ____ FILE NO. _____ DESIGN NO. _____

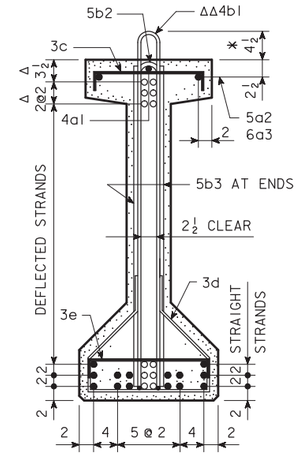
REVISION 80-09 - ADDED STRANDS TO THE D45 BEAM X-SECTION.
ENGLISHBEAMS.DGN - 4632 - LRFD - THIS SHEET RE-ISSUED 09-06.

DESIGN TEAM	D BEAMS - LRFD DESIGN	STANDARD SHEET 4632	COUNTY	PROJECT NUMBER	SHEET NUMBER

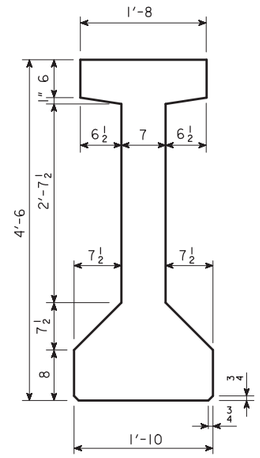
NOTE: DIMENSIONS FOR THE LOCATION OF THE DEFLECTED STRANDS ARE AT ℄ BEAM AND END OF BEAM.



D85

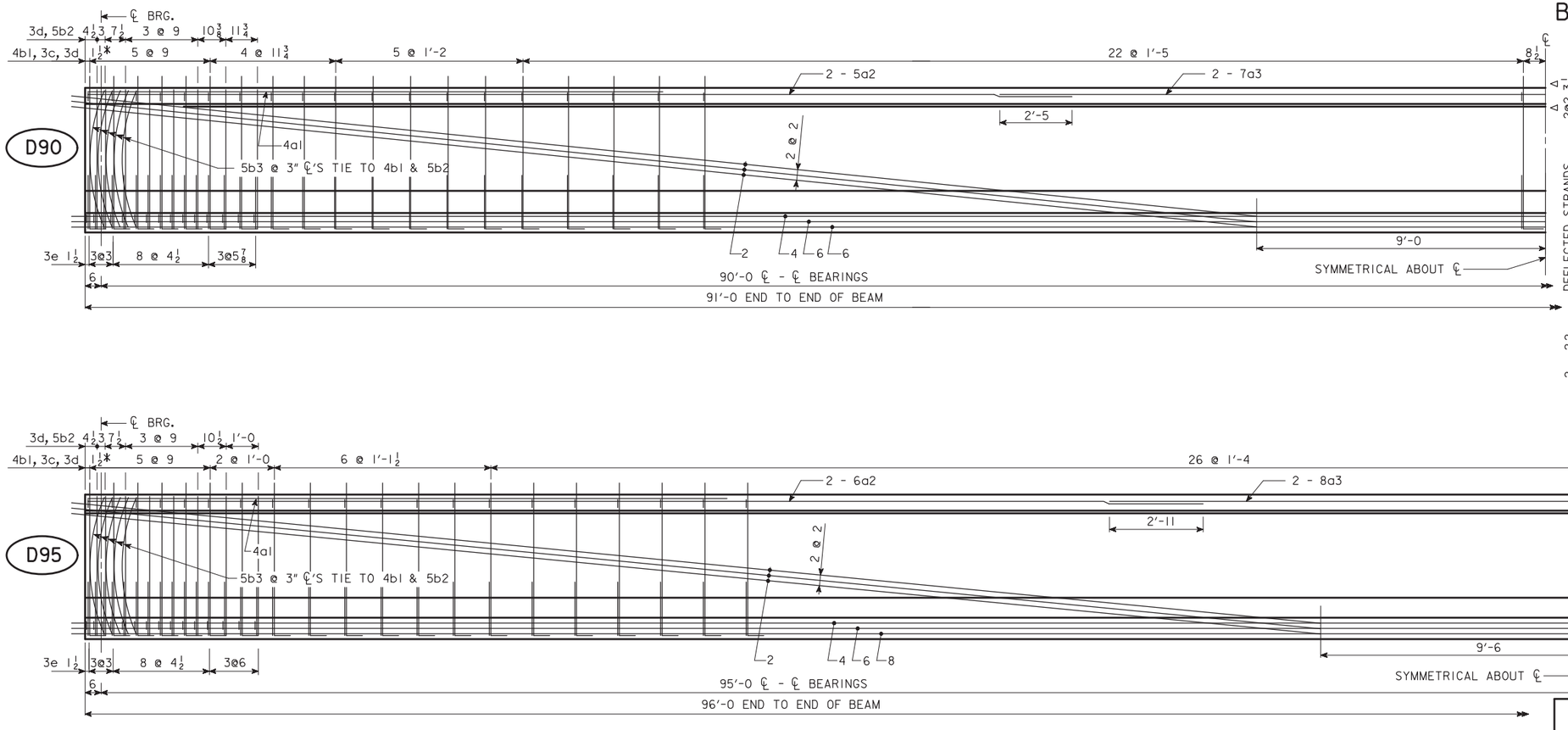


BEAM D85

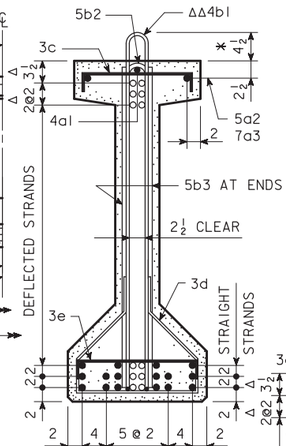


"D" BEAM CROSS SECTION

AREA = 638.75 in²
Y_b = 24.37 in
I = 214,974 in⁴

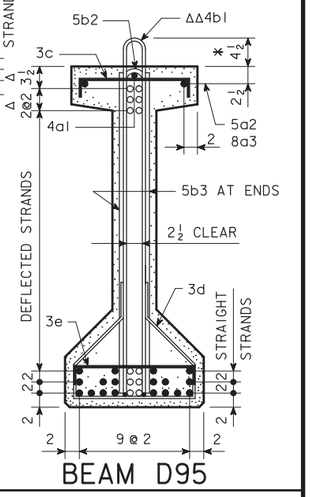


D90



BEAM D90

D95



BEAM D95

Return after Exam

○ DEFLECTED STRANDS
* KEEP
ΔΔ EPOXY COATED BARS
Δ DIMENSIONS AT END OF BEAM

D85 - D95 BEAM DETAILS

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. ____ OF ____ FILE NO. _____ DESIGN NO. _____

DESIGN TEAM	D BEAMS - LRFD DESIGN	STANDARD SHEET 4634	COUNTY	PROJECT NUMBER	SHEET NUMBER

ENGLISHBEAMS.DGN - 4634 - LRFD - THIS SHEET RE-ISSUED 09-06.

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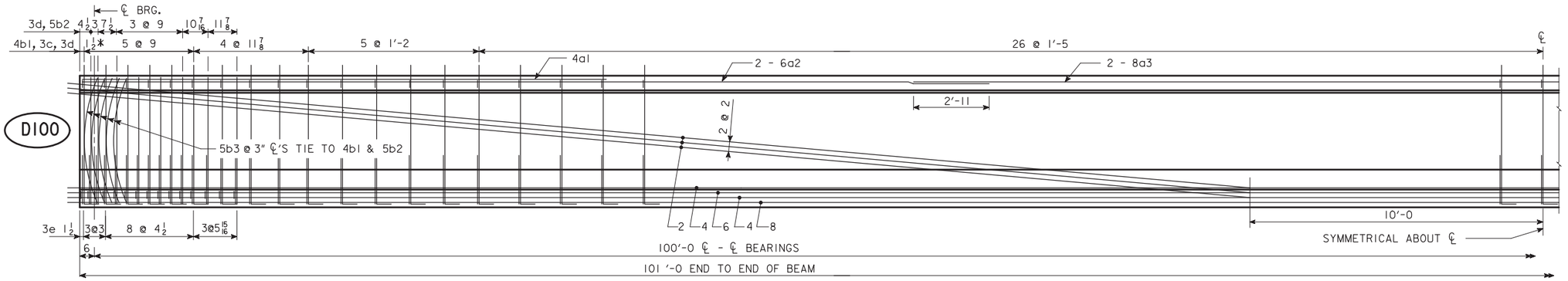
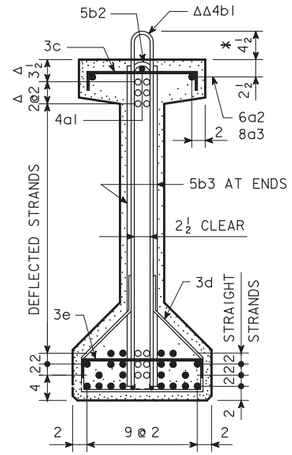
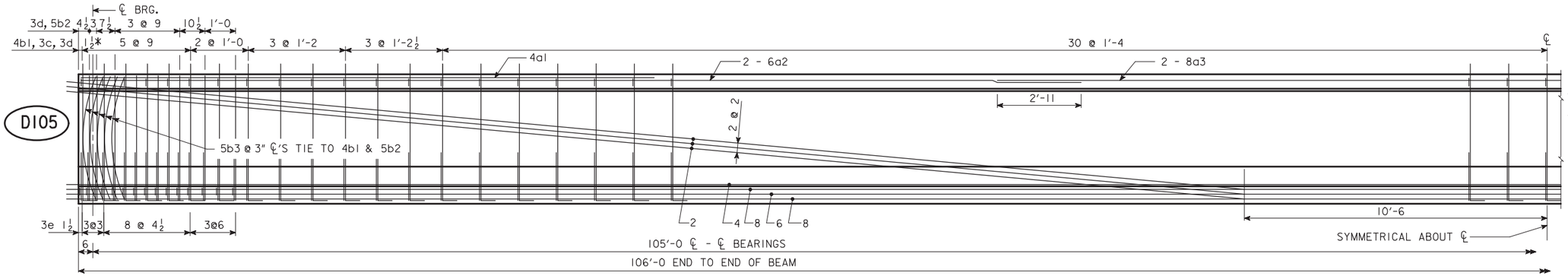
NOTE: DIMENSIONS FOR THE LOCATION OF THE DEFLECTED STRANDS ARE AT ℄ BEAM AND END OF BEAM.



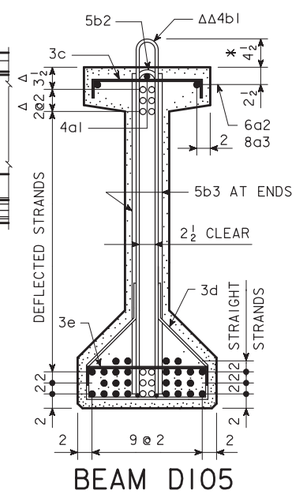
DI00



BEAM DI00

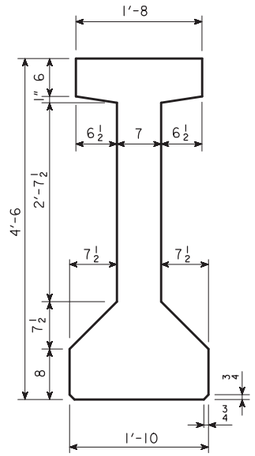


DI05



BEAM DI05

Return after Exam



"D" BEAM CROSS SECTION

○ DEFLECTED STRANDS
✱ KEEP
ΔΔ EPOXY COATED BARS
Δ DIMENSIONS AT END OF BEAM

AREA = 638.75 in²
Y_b = 24.37 in
I = 214,974 in⁴

DI00 & DI05 BEAM DETAILS

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. ____ OF ____ FILE NO. _____ DESIGN NO. _____

ENGLISHBEAMS.DGN - 4635 - LRFD - THIS SHEET RE-ISSUED 09-06.

DESIGN TEAM	D BEAMS - LRFD DESIGN	STANDARD SHEET 4635	COUNTY	PROJECT NUMBER	SHEET NUMBER

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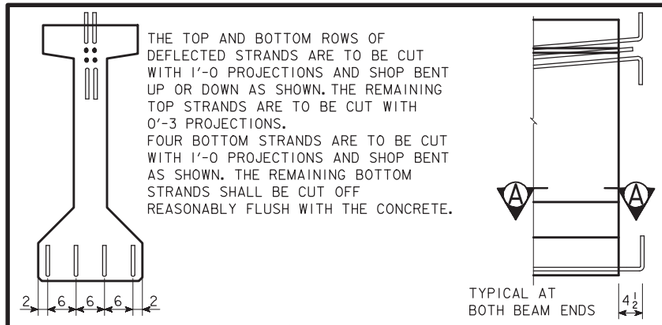
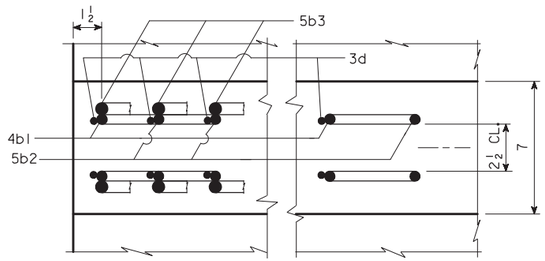


THE TOP AND BOTTOM ROWS OF DEFLECTED STRANDS ARE TO BE CUT WITH 1'-0 PROJECTIONS AND SHOP BENT UP OR DOWN AS SHOWN. THE REMAINING TOP STRANDS ARE TO BE CUT WITH 0'-3 PROJECTIONS.
FOUR BOTTOM STRANDS ARE TO BE CUT WITH 1'-0 PROJECTIONS AND SHOP BENT AS SHOWN. THE REMAINING BOTTOM STRANDS SHALL BE CUT OFF REASONABLY FLUSH WITH THE CONCRETE.

STRAND PROJECTION AT BEAM ENDS WHEN EMBEDDED IN CONCRETE END DIAPHRAGMS



PART SECTION A-A SHOWING PLACEMENT OF STIRRUPS NEAR END OF BEAM

BEAM NOTES:

THESE BEAMS ARE DESIGNED FOR AASHTO LIVE LOADS AS INDICATED IN BEAM DATA TABLE WITH AN ALLOWANCE OF 20 lb. PER SQUARE FOOT OF ROADWAY FOR FUTURE WEARING SURFACE.

ALL PPC BEAMS SHALL USE HIGH PERFORMANCE CONCRETE (HPC) IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

HOLD DOWN POINTS FOR DEFLECTED STRANDS MAY BE MOVED TOWARD ENDS OF BEAM A DISTANCE OF 0.05 L MAXIMUM AT PRODUCER'S OPTION.

ALL PRESTRESSING STRANDS SHALL CONFORM TO ASTM A416 GRADE 270 LOW RELAXATION STRANDS.

TOPS OF BEAMS ARE TO BE STRUCK OFF LEVEL AND FINISHED AS PER MATERIALS IM570

BEARINGS SHALL BE AS DETAILED ON OTHER DESIGN SHEETS.

BEAMS TO BE USED IN BRIDGES MADE CONTINUOUS BY THE POURED IN PLACE FLOOR, ARE TO BE AT LEAST 28 DAYS OLD BEFORE THE FLOOR IS PLACED UNLESS A SHORTER CURING TIME IS APPROVED BY THE BRIDGE ENGINEER.

THE PORTIONS OF THE PRESTRESS BEAMS THAT ARE TO BE EMBEDDED IN THE ABUTMENT AND PIER DIAPHRAGMS SHALL BE ROUGHENED FOR A DISTANCE OF 10" FROM THE BEAM END BY SANDBLASTING OR OTHER APPROVED METHODS TO PROVIDE SUITABLE BOND BETWEEN THE BEAM AND THE DIAPHRAGM IN ACCORDANCE WITH ARTICLE 2403.03, I, OF THE STANDARD SPECIFICATIONS.

ALL BEAMS ARE TO BE INCREASED IN LENGTH TO COMPENSATE FOR ELASTIC SHORTENING, CREEP AND SHRINKAGE.

FOR TRANSPORTING, THE OVERHANG SHALL BE IN ACCORDANCE WITH ARTICLE 2407.03, K, OF STANDARD SPECIFICATIONS, EXCEPT THE OVERHANG MAY BE INCREASED TO 14 FEET.

THE CONTRACTOR SHALL ASSURE THE LATERAL STABILITY OF THE BEAMS DURING HANDLING, TRANSPORTING AND ERECTION BY PROVIDING TEMPORARY BRACING AS NEEDED.

IF THE PRECAST PANEL OPTION IS ALLOWED AND USED FOR BRIDGE DECK FORMATION, THE BEAM STIRRUPS WILL NEED TO BE EXTENDED AND TOP FLANGE BEAM FINISH SHALL BE MODIFIED AS PER DETAILS ON THE PRECAST DECK PANEL SHEET.

0.6" DIAMETER STRANDS STRESSED TO NOT MORE THAN 5,000 LBS. EACH MAY BE USED IN LIEU OF THE a BARS WHICH RUN THE FULL LENGTH OF THE BEAM IN THE TOP FLANGE.

DII0 BEAM DATA

BEAM	SPAN LENGTH ℄-℄ BEARING	OVERALL BEAM LENGTH (L)	STRAND SIZE	NO. OF STRANDS		TOTAL INITIAL PRESTRESS KIPS ③	HOLD DOWN FORCE-KIPS	CAMBER (in.)				DEFLECTION (in.) Δ_D				PERMISSIBLE SPACING				WEIGHT (TONS)		CONCRETE (C.Y.)	REINFORCING STEEL - (lbs.)
				STRAIGHT	DEFLECTED			AT RELEASE		AFTER LOSSES		IMMEDIATE ① (ELASTIC) Δ_I		TIME ② (PLASTIC) Δ_T		HL93 LOADING							
												CONC. DIAPH.	STEEL DIAPH.	CONC. DIAPH.	STEEL DIAPH.	CONC. DIAPH.	STEEL DIAPH.						
DII0	110'-0	111'-0	0.6"	28	6	1446	21.2	2.83		4.83		1.92	1.81	0.48	0.45	7'-6	7'-6			36.9		18.2	1664

① DEFLECTIONS AT MID-SPAN DUE TO WEIGHT OF SLAB AND DIAPHRAGM. THE DEFLECTIONS SHOWN ARE FOR A SLAB WEIGHT OF 760 #/FT. (8" SLAB AND 7'-6 BEAM SPACING) AND ONE CONCRETE DIAPHRAGM (3191 #) OR ONE STEEL DIAPHRAGM (285 #) AT ℄ OF SPAN. FOR DIFFERENT SLAB AND DIAPHRAGM WEIGHTS, DEFLECTIONS WILL BE DIRECTLY PROPORTIONAL.

② DEFLECTIONS DUE TO THE COMBINED EFFECT OF CREEP DUE TO WEIGHT OF SLAB AND SHRINKAGE OF SLAB.

TOTAL BEAM DEFLECTIONS AT ℄ OF SPAN, Δ_D, DUE TO WEIGHT OF SLAB AND DIAPHRAGMS FOR DETAILING PURPOSE:

(A) $\Delta_D = \Delta_I + \Delta_T$ FOR SIMPLE SPAN.
(B) $\Delta_D = \Delta_I + \frac{3}{4}\Delta_T$ FOR END SPANS OF CONTINUOUS BRIDGE.
(C) $\Delta_D = \Delta_I + \frac{1}{2}\Delta_T$ FOR INTERIOR SPANS OF CONTINUOUS BRIDGE.

③ TOTAL INITIAL PRESTRESS FOR DII0 IS BASED ON 72.6% f's. f's = 270 ksi AND As = 0.217 sq. in.

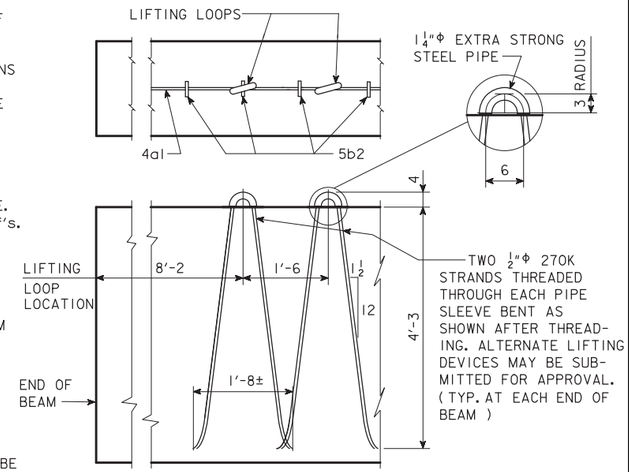
BEAM NOTES: (CONTINUED)

IF THE STEEL DIAPHRAGM OPTION IS ALLOWED AND USED, HOLES MUST BE CAST IN THE WEB TO ACCOMMODATE THE STEEL DIAPHRAGM ATTACHMENTS AS DETAILED ON THE STEEL DIAPHRAGM DETAIL SHEET.

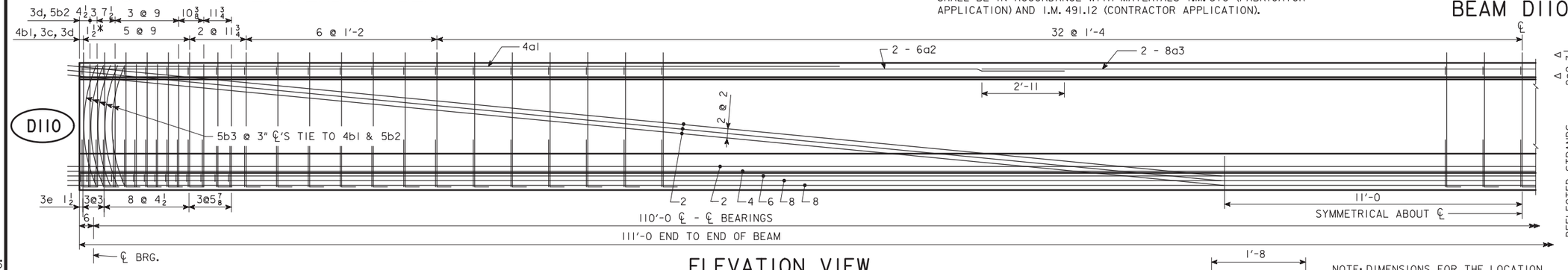
IF SOLE PLATE IS REQUIRED FOR BEARING, SOLE PLATE IS TO BE SET IN FORMS WHEN BEAM IS CAST AND FORMED OUT BELOW TO EXCLUDE CONCRETE AS DETAILED ON THE BEARING SHEET.

IF STUB ABUTMENTS ARE USED, ALL STRANDS AT THE ENDS OF BEAMS AT STUB ABUTMENTS SHALL BE CUT OFF REASONABLY FLUSH WITH THE CONCRETE.

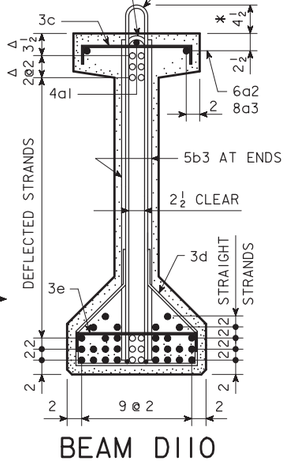
WHEN EXPANSION JOINTS ARE USED, CONCRETE SEALER SHALL BE APPLIED TO THE PRESTRESSED BEAM END SECTIONS. THE SEALING SHALL BE IN ACCORDANCE WITH MATERIALS I.M. 570 (FABRICATOR APPLICATION) AND I.M. 491.12 (CONTRACTOR APPLICATION).



LIFTING LOOP DETAIL BEAM DII0



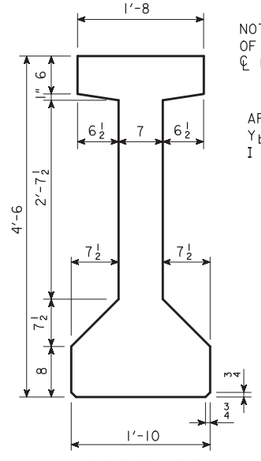
ELEVATION VIEW



BEAM DII0

NOTE: DIMENSIONS FOR THE LOCATION OF THE DEFLECTED STRANDS ARE AT ℄ BEAM AND END OF BEAM.

AREA = 638.75 in²
Y_b = 24.37 in
I = 214,974 in⁴

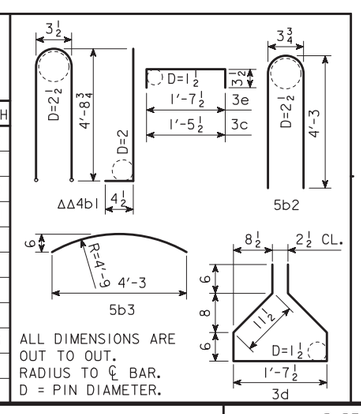


DII0 CROSS SECTION

○ DEFLECTED STRANDS
✱ KEEP
ΔΔ EPOXY COATED BARS
Δ DIMENSIONS AT END OF BEAM

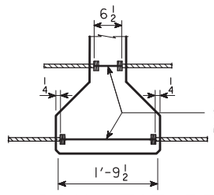
REINFORCING BAR LIST BEAM DII0

BAR	SHAPE	NO.	LENGTH
4a1		2	26'-6
6a2		4	38'-4
8a3		2	40'-0
ΔΔ 4b1		91	10'-4
5b2		16	8'-8
5b3		20	4'-4
3c		91	2'-1
3d		107	5'-7
3e		30	2'-3



ALL DIMENSIONS ARE OUT TO OUT.
RADIUS TO ℄ BAR.
D = PIN DIAMETER.

ΔΔ 4b1 BARS TO BE EPOXY COATED



COIL TIE DETAIL

NUMBER AND EXACT LOCATION OF COIL TIES TO BE AS DETAILED ON SPECIFIC BRIDGE DESIGN.

SPECIFICATIONS:

CONSTRUCTION: STANDARD SPECIFICATIONS OF THE IOWA DEPARTMENT OF TRANSPORTATION, CURRENT SERIES, WITH CURRENT APPLICABLE SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS.
DESIGN: A.A.S.H.T.O. LRFD, SERIES OF 2007, WITH MINOR MODIFICATIONS.

DESIGN STRESSES:

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE TO BE IN ACCORDANCE WITH A.A.S.H.T.O. LRFD SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 2007:
REINFORCING STEEL IN ACCORDANCE WITH SECTION 5, GRADE 60.
CONCRETE IN ACCORDANCE WITH SECTION 5.
MINIMUM CONCRETE f'c (AT 28 DAYS) SHALL BE 7500 psi.
MINIMUM f'ci AT RELEASE SHALL BE 6500 psi.
PRESTRESSING STEEL IN ACCORDANCE WITH SECTION 5, f's = 270,000 psi.

DII0 BEAM DETAILS

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. ____ OF ____ FILE NO. _____ DESIGN NO. _____

DESIGN TEAM	D BEAMS - LRFD DESIGN	STANDARD SHEET 4636	COUNTY	PROJECT NUMBER	SHEET NUMBER

REVISION 08-12 - I.M. REFERENCE NOTE FOR SEALING BEAM ENDS DISTINGUISHES BETWEEN THE FABRICATOR AND CONTRACTOR.
ENGLISHBEAMS.DGN - 4636 - LRFD - THIS SHEET RE-ISSUED 09-06.