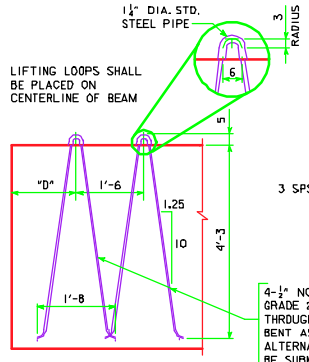
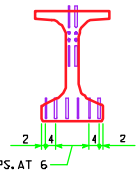
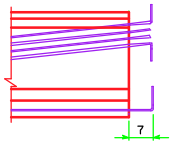


TYPICAL AT EACH END OF BEAM

LIFTING LOOP DETAIL



THE TOP AND BOTTOM ROWS OF THE DEFLECTED STRANDS ARE TO BE CUT WITH 1'-6 PROJECTIONS WHICH ARE TO BE SHOP BENT AS SHOWN. THE REMAINING TOP DEFLECTED STRANDS ARE TO BE CUT WITH 7" PROJECTIONS.
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.



TYPICAL AT BOTH BEAM ENDS

STRAND PROJECTION AT BEAM ENDS WHEN EMBEDDED IN CONCRETE END DIAPHRAGMS

DESIGN STRESSES:

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE TO BE IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 1998.
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 1998, WITH MINOR MODIFICATIONS.

BTD BEAM DATA

	BTD BEAM	SPAN LENGTH ℄-℄ BEARING	OVERALL BEAM LENGTH (LF)	CONCRETE STRENGTH f'ci (ksi)	CONCRETE STRENGTH f'c (ksi)	STRAND SIZE DIA. (in)	NO. OF STRAND STRAIGHT	NO. OF STRAND DEFLECTED	TOTAL INITIAL PRESTRESS ③ kips	HOLD DOWN FORCE-kips	CAMBER (in) AT RELEASE	CAMBER (in) AFTER LOSSES	DEFLECTION (in) Δ_D IMMEDIATE ① (ELASTIC) Δ_I STEEL DIAPHRAGM	DEFLECTION (in) Δ_D TIME ② (PLASTIC) Δ_T STEEL DIAPHRAGM	PERMISSIBLE MAXIMUM SPACING HL-93 LOADING STEEL DIAPHRAGM	WEIGHT (TONS)	CONCRETE (CU YD.)	REINFORCING STEEL (WEIGHT-LBS)
	BTD110	110'-0	111'-4	6.50	7.50	0.60	32	6	1617	20.9	2.60	4.51	2.16	0.54	9'-3	43.4	21.4	3279
	BTD115	115'-0	116'-4	7.00	7.50	0.60	36	6	1788	20.3	2.89	5.09	2.58	0.65	9'-3	46.4	22.4	3452
	BTD120	120'-0	121'-4	7.50	8.00	0.60	38	8	1958	24.4	3.27	5.75	2.97	0.74	9'-3	47.3	23.4	3613
④	BTD125	125'-0	126'-4	8.00	8.50	0.60	42	12	2297	31.9	3.81	6.71	3.42	0.86	9'-3	49.3	24.3	3814
④	BTD130	130'-0	131'-4	8.00	9.00	0.60	42	14	2384	33.9	3.95	6.94	3.79	0.95	9'-0	51.2	25.3	3934

① DEFLECTIONS AT MID-SPAN DUE TO WEIGHT OF SLAB AND DIAPHRAGM. THE DEFLECTIONS SHOWN ARE FOR A SLAB (8 in) AND HAUNCH (1.5 in) WEIGHT OF:
0.98 klps/ft FOR 9'-3 BEAM SPACING
0.96 klps/ft FOR 9'-0 BEAM SPACING

AND ONE STEEL DIAPHRAGM (0.500 klps) AT ℄ OF SPAN FOR BTD110 TO BTD120, AND THREE STEEL DIAPHRAGMS (0.500 klps) AT ¼ POINTS OF SPAN FOR BTD125 AND BTD130. 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:
$\Delta_D = \Delta_I + \frac{3}{4}\Delta_T$ FOR END SPANS OF CONTINUOUS BRIDGE.

③ TOTAL INITIAL PRESTRESS IS BASED ON 72.6% f's, f's. = 270 ksi. AND As = 0.217 in².

④ REQUIRES A 4000 psi, 28 DAY COMPRESSIVE STRENGTH FOR CAST-IN-PLACE SLAB CONCRETE.

BEAM NOTES:

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

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 EXCEPT LIFTING LOOP STRANDS SHALL BE 0.60 in. NOMINAL DIAMETER (NOMINAL STEEL AREA = 0.217 in²) AND CONFORM TO ASTM A416 GRADE 270 LOW RELAXATION STRANDS. MINIMUM STRAND BREAKING STRENGTH SHALL BE 58.6 kips.

TOPS OF BEAMS ARE TO BE STRUCK OFF LEVEL AND INTENTIONALLY ROUGHENED TRANSVERSELY TO A FULL AMPLITUDE OF APPROXIMATELY ¼" EXCEPT A 2 INCH WIDE FINISH SHALL BE PROVIDED ON THE TOP EDGE ON ONE SIDE ONLY OF THE BEAM.

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 PRESTRESSED 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 2403.14 OF THE SPECIFICATIONS.

THE EXTERIOR SURFACES OF THE EXTERIOR (FASCIA) BEAM ENDS OVER THE PIER SHALL NOT BE ROUGHENED.

UNLESS OTHERWISE NOTED ALL BEAMS ARE TO BE INCREASED IN LENGTH BY .0005L TO COMPENSATE FOR ELASTIC SHORTENING, CREEP AND SHRINKAGE.

FOR TRANSPORTING, THE ALLOWABLE OVERHANG IS SHOWN IN THE LIFTING LOOP TABLE.

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

HOLES MUST BE CAST IN THE WEB TO ACCOMMODATE THE STEEL DIAPHRAGM ATTACHMENTS AS DETAILED ON BT40-SD2-04.

MINIMUM CONCRETE f'c (AT 28 DAYS) AND MINIMUM f'ci AT RELEASE ARE LOCATED IN THE BTD BEAM DATA TABLE ABOVE.

FOUR 0.60 IN. DIAMETER STRANDS STRESSED TO NOT MORE THAN 5000 lbs. EACH MAY BE USED IN LIEU OF BARS 5a1 AND 5a2 IN THE TOP FLANGE.

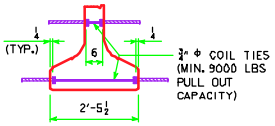
IF THE PRECAST PANEL OPTION IS ALLOWED AND USED FOR BRIDGE DECK FORMATION, THE BEAM STIRRUPS WILL NEED TO BE EXTENDED AND TOP FLANGE BEAM FINISH SHALL BE MODIFIED AS PER DETAILS ON THE PRECAST DECK PANEL SHEET.

LIFTING LOOP TABLE

BEAMS	LIFTING LOOPS EACH END	# OF STRANDS PER LOOP	D	BEAM OVERHANG (FT)
BTD110	2	4	8'-2	12
BTD115	2	4	8'-3	12
BTD120	2	4	9'-3	14
BTD125	2	4	9'-3	16
BTD130	2	4	9'-3	16

LIFTING LOOPS SHALL CARRY LOADS EQUALLY.

NUMBER AND EXACT LOCATION OF COIL TIES TO BE AS DETAILED ON BT40-SD2-04.

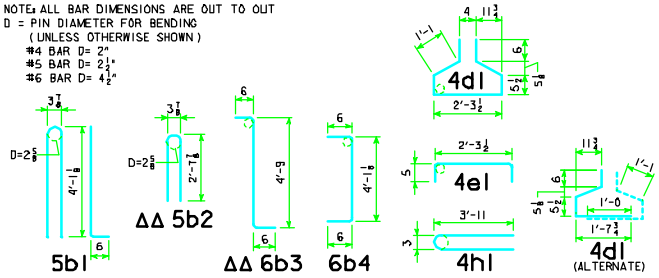


COIL TIE DETAIL

ΔΔ 5b2 AND 6b3 BARS TO BE EPOXY COATED
* 6b3 AND 6b4 BARS TO BE USED IN PAIRS

BENT BAR DETAILS

NOTE: ALL BAR DIMENSIONS ARE OUT TO OUT
D = PIN DIAMETER FOR BENDING
(UNLESS OTHERWISE SHOWN)
#4 BAR D= 2"
#5 BAR D= 2½"
#6 BAR D= 4½"



REINFORCING BAR LIST

BEAM		BTD110		BTD115		BTD120		BTD125		BTD130	
BAR	SHAPE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
5a1		12	37'-9	12	21'-4	12	23'-10	12	26'-4	12	28'-10
5a2		6	40'-0	12	40'-0	12	40'-0	12	40'-0	12	40'-0
5b1		85	9'-4	91	9'-4	97	9'-4	103	9'-4	107	9'-4
ΔΔ 5b2		85	5'-6	91	5'-6	97	5'-6	103	5'-6	107	5'-6
ΔΔ*6b3		36	5'-9	36	5'-9	36	5'-9	36	5'-9	36	5'-9
*6b4		20	5'-1	20	5'-1	20	5'-1	24	5'-1	24	5'-1
4c1		139	2'-7	145	2'-7	151	2'-7	163	2'-7	169	2'-7
4d1		105	6'-5	111	6'-5	117	6'-5	123	6'-5	127	6'-5
4e1		26	3'-2	26	3'-2	26	3'-2	26	3'-2	26	3'-2
4h1		6	8'-0	6	8'-0	6	8'-0	6	8'-0	6	8'-0

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

Iowa Department of Transportation
Highway Division

STANDARD DESIGN - 40' ROADWAY, 2 SPAN BRIDGES

PRETENSIONED PRESTRESSED BULB TEE CONCRETE BEAM BRIDGES

ALL SPANS — JULY, 2004

BTD BEAM DETAILS — BT40-DB1-04