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GENERAL CONSIDERATIONS:

THE H24-06 BRIDGE STANDARDS, IF PROPERLY USED, PROVIDE THE STRUCTURAL PLANS NECESSARY TO CONSTRUCT THREE SPAN 24' ROADWAY PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES WITH LENGTHS OF 138'-10, 151'-4, 163'-10, 176'-4, 188'-10, 201'-4, 213'-10, 226'-4 AND 243'-0.

THESE BRIDGES MAY BE BUILT ON A 0°, 15°, 30° OR 45° SKEW. THESE PLANS SHOW THE BRIDGES SKEWED IN ONE DIRECTION, BUT ALL DIMENSIONS AND DETAILS WOULD BE THE SAME FOR THE OPPOSITE SKEW.

THE SUPERSTRUCTURES FOR THESE BRIDGES ARE DESIGNED FOR HL93 LOADING PLUS 20 LBS. PER SQ. FT. OF ROADWAY FOR FUTURE WEARING SURFACE. THE SUBSTRUCTURES ARE DESIGNED FOR HS25-44 LOADING PLUS 20 LBS. PER SQ. FT. OF ROADWAY FOR FUTURE WEARING SURFACE. CONTROL OF CRACKING BY DISTRIBUTION OF REINFORCEMENT FOR SLAB DESIGN BASED ON PRE LRFD 2005 INTERIMS.

THE FLOOR SLAB AS SHOWN INCLUDES $\frac{1}{2}$" INTEGRAL WEARING SURFACE.

THE ABUTMENTS FOR THESE BRIDGES ARE BUILT INTEGRAL WITH THE SUPERSTRUCTURE. THEREFORE, IT IS IMPORTANT THAT A PROPER JOINT FOR EXPANSION BE PROVIDED BETWEEN THE BRIDGE AND APPROACH PAVING, WHEN APPROACH PAVING IS NEEDED.

THE INTEGRAL ABUTMENT DESIGN UTILIZED ON THESE BRIDGES RESTRICTS THEIR USE IN THE FOLLOWING MANNER:

(1) THE 201'-4, 213'-10, 226'-4 AND 243'-0 BRIDGES SHALL USE STEEL PILES AT THE ABUTMENTS.
(2) THESE BRIDGES ARE NOT TO BE USED WHEN POINT BEARING FOR THE ABUTMENT STEEL PILING WOULD BE OBTAINED ON ROCK AT A DISTANCE LESS THAN 12 FEET FROM THE BOTTOM OF FOOTING.
(3) THE ABUTMENT PILING ARE TO BE DRIVEN THROUGH OVERSIZED HOLES PREBORED TO A MINIMUM OF 10 FEET BELOW THE BOTTOM OF FOOTING. THE PREBORED HOLES SHALL BE IN ACCORDANCE WITH SECTION 2501.19 OF THE STANDARD SPECIFICATIONS. THE ELEVATION OF THE BOTTOM OF THE PREBORED HOLE SHALL BE SHOWN ON THE PLANS.

THESE STANDARDS GIVE MOST OF THE INFORMATION NECESSARY TO BUILD THESE BRIDGES ON EITHER A CREST VERTICAL CURVE OR A STRAIGHT GRADE. BECAUSE OF THE INFINITE NUMBER OF GRADE POSSIBILITIES IT WILL BE NECESSARY TO SHOW ON THE PLANS THE ABUTMENT AND PIER STEP DIMENSIONS. TO HELP IN OBTAINING THIS STEP INFORMATION SEE "EXAMPLES OF BRIDGE SEAT AND STEP CALCULATIONS" ON SHEET H24-02-06 .

THE ABUTMENT FOOTING AND PIER CAP CONCRETE QUANTITIES SHOWN IN THESE PLANS ARE CALCULATED BASED ON A 0.3% GRADE. FOR HIGHER GRADES, THESE CONCRETE QUANTITIES FOR BRIDGES SKEWED AT 15°, 30°, AND 45° MAY NEED TO BE INCREASED. IN ADDITION, THE LAYOUT OF THE PIER CAP STEP REINFORCING STEEL IS GRADE DEPENDENT FOR BRIDGES SKEWED AT 15°, 30°, AND 45°. SEE SHEETS H30-17-06, H30-24-06, AND H30-31-06 TO DETERMINE THE ADDITIONAL CONCRETE QUANTITIES REQUIRED AND FOR THE LAYOUT AND QUANTITY OF THE PIER CAP STEP REINFORCING STEEL.

PROVIDE TOP OF SLAB ELEVATIONS AND WING ELEVATIONS A, B AND C AS NOTED ON THE STANDARD SHEETS (LONGITUDINAL SECTION).

VARIOUS TYPES OF PIERS MAY BE USED WITH THESE STANDARDS. IT SHOULD BE NOTED THAT THE DETAILS FOR THE PIER DIAPHRAGM ON THE SUPERSTRUCTURE DEPEND ON THE TYPE OF PIER USED.

THE PIERS AND ABUTMENTS FOR THESE STANDARDS HAVE BEEN DESIGNED FOR THE USE OF BOTH FRICTION AND POINT BEARING PILES. IT IS NECESSARY THAT THE TYPE AND LENGTH FOR BOTH THE ABUTMENT AND PIER PILES BE DESIGNATED ON THE FRONT SHEET OF THE PLANS.

THESE STANDARDS ARE FOR USE FOR BRIDGES WITH NON-EPOXY COATED REINFORCING. REINFORCING BAR LAP LENGTHS ARE BASED ON THE USE OF NON-EPOXY COATED REINFORCING.

FOR PIERS SUBJECT TO SCOUR THE DESIGN BEARING SHALL BE OBTAINED BELOW SCOUR ELEVATION. SCOUR ELEVATION SHALL BE SHOWN ON THE FRONT SHEET.

CONCRETE INTERMEDIATE DIAPHRAGMS SHALL BE USED FOR OVERPASS BRIDGES. THE DESIGNER SHALL ADJUST THE CONCRETE AND REINFORCING QUANTITIES ACCORDINGLY.

3" WING PVC PIPE IS INCIDENTAL TO STRUCTURAL CONCRETE.

THESE BRIDGE PLANS LABEL ALL REINFORCING STEEL WITH ENGLISH NOTATION (5a1 IS $\frac{5}{8}$" INCH DIAMETER BAR). ENGLISH REINFORCING STEEL RECEIVED IN THE FIELD MAY DISPLAY THE FOLLOWING "BAR DESIGNATION". THE "BAR DESIGNATION" IS THE STAMPED IMPRESSION ON THE REINFORCING BARS, AND IS EQUIVALENT TO THE BAR DIAMETER IN MILLIMETERS.

ENGLISH SIZE	BAR DESIGNATION
3	10
4	13
5	16
6	19
7	22
8	25
9	29
10	32
11	36

TEE PIER NOTES:

THE TEE PIERS SHOWN IN THESE PLANS ARE DESIGNED FOR USE WITH THE H24-06 PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGE STANDARDS. THE PIER MAY BE USED FOR EITHER GRADE SEPARATION OR STREAM CROSSING STRUCTURES. THE PIERS WERE DESIGNED FOR THE FOLLOWING STREAM FORCE AND ICE LOADING CONDITIONS, AND SHOULD NOT BE USED WHERE THESE LOADING CONDITIONS ARE EXCEEDED.

ICE FORCE:
ICE FORCES WERE APPLIED AT A HEIGHT OF H/2 + 1'-6 ABOVE THE BOTTOM OF THE PIER FOOTING, WHERE H IS THE OVERALL HEIGHT OF PIER. THE ICE PRESSURE WAS 200 PSI FOR 1'-7 OF ICE DEPTH. THE PRIMARY ICE FORCE WAS ASSUMED TO ACT PARALLEL TO THE PIER'S LONG AXIS, WHILE 15% OF THIS FORCE WAS APPLIED PERPENDICULAR TO THE PIER'S LONG AXIS.

STREAM FLOW:
THE STREAM VELOCITY USED WAS 5 FT/SEC WITH THE K COEFFICIENT EQUAL TO 1.4. THE RESULTING STREAM FORCE WAS ASSUMED TO ACT PARALLEL TO THE PIER'S LONG AXIS. IT WAS ASSUMED THAT SUPERSTRUCTURE ELEMENTS WILL CLEAR HIGH WATER BY APPROXIMATELY 3'-0.

FOOTING GEOMETRY:
IT WAS ASSUMED THAT THE PIER FOOTING WILL BE SET APPROXIMATELY 6'-0 BELOW THE ADJACENT STREAMBED OR GROUND SURFACE. IT WAS ALSO ASSUMED THAT THERE ARE NO SIGNIFICANT UNBALANCED EARTH PRESSURES APPLIED TO THE PIER.

ALL BRIDGES WITH TEE PIERS DETAILED ON THESE STANDARDS ARE INTENDED TO HAVE ONE FIXED PIER AND ONE EXPANSION PIER. THE PILE LAYOUT AND REINFORCEMENT SHOWN ARE THE SAME FOR EITHER FIXED OR EXPANSION PIER. THE ONLY DISTINCTION BETWEEN FIXED PIER AND EXPANSION PIER LIES IN THE SELECTION OF BEARINGS AND PRESENCE OF THE KEYWAY IN THE TOP OF THE CAP. EACH BRIDGE SHALL HAVE ONE SET OF FIXED BEARINGS AND ONE SET OF EXPANSION BEARINGS, WHICH MAY BE USED ON EITHER PIER 1 OR PIER 2. THE KEYWAY IN THE TOP OF THE CAP SHOULD BE ELIMINATED FROM THE EXPANSION PIER.

HP10x57 STEEL PILES SHALL BE USED IN THE PILE FOOTINGS OF THE PIERS. THE MAXIMUM ALLOWABLE STRESS FOR EACH PILE WAS TAKEN AS 6 KSI FOR EITHER THE FRICTION OR POINT BEARING PILE CONDITIONS. A MAXIMUM UPLIFT FORCE OF 10 KIPS PER PILE WAS USED IN THE DESIGN OF THE PIER FOOTINGS. THE PIER SHALL NOT BE USED AT SITES WHERE THIS UPLIFT FORCE CANNOT BE ACHIEVED DUE TO SPECIFIC CONDITIONS SUCH AS NEAR SURFACE ROCK LAYERS.

WHEN PIERS ARE USED IN GRADE SEPARATION STRUCTURES, EPOXY COATED REINFORCEMENT MAY BE REQUIRED FOR PIER COLUMNS. CONSULT CURRENT POLICY FOR GUIDANCE ON THE USE OF EPOXY COATED REINFORCEMENT IN SUCH CASES. ADJUST THE dl COLUMN BAR PROJECTION INTO THE CAP AND dl/d2 LAP DISTANCE ACCORDINGLY.

DESIGN STRESSES:

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 2002.
REINFORCING STEEL IN ACCORDANCE WITH SECTION 8, GRADE 60.
CONCRETE IN ACCORDANCE WITH SECTION 8, f'c = 3500 PSI.
FOR 24' STANDARD PRESTRESSED CONCRETE BEAMS, SEE SHEETS H24-32-06 THRU H24-37-06.

SPECIFICATIONS:

DESIGN:
SUBSTRUCTURE: AASHTO, SERIES OF 2002.
SUPERSTRUCTURE: AASHTO LRFD, SERIES OF 2004 WITH INTERIM 2005.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

Iowa Department of Transportation
Highway Division

STANDARD DESIGN STANDARDS FOR THREE SPAN BRIDGE
PRETENSIONED PRESTRESSED
CONCRETE BEAM BRIDGES
HL93 SUPERSTRUCTURE DECEMBER 2006 HS25 SUBSTRUCTURE

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