

TOWER TOP NOTES

A. GOVERNING SPECIFICATION

1. PROVIDE STRUCTURAL STEEL IN ACCORDANCE WITH GOVERNING SPECIFICATIONS HARBOR BRIDGE ITEM 441 "STEEL STRUCTURES".
2. PROVIDE ZINC COATING AND PAINT IN ACCORDANCE WITH GOVERNING SPECIFICATIONS HARBOR BRIDGE ITEM 445 "GALVANIZING".

B. GENERAL REQUIREMENTS

1. THE TOWER TOP STRUCTURE HAS BEEN DESIGNED FOR THE FINAL CONFIGURATION ONLY. THE CONTRACTOR IS RESPONSIBLE FOR THE INTEGRITY OF THE STRUCTURE AT ALL STAGES OF CONSTRUCTION INCLUDING HANDLING AND LIFTING.
2. THE FABRICATOR IS RESPONSIBLE FOR THE DESIGN OF THE STRUCTURAL CONNECTIONS, THE HYDRAULIC HATCH INCLUDING HATCH FRAMING, HINGES, AND HYDRAULIC PISTONS, AND THE FAA LIGHT FIXTURE MOUNT.
3. SHOP DRAWINGS AND CALCULATIONS OF THE FINAL DESIGN OF THE TOWER TOP SHALL BE SUBMITTED TO THE DESIGNER FOR APPROVAL. SHOP DRAWINGS AND CALCULATIONS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER WITH ACTIVE REGISTRATION IN THE STATE OF TEXAS.
4. STIFFENERS IF REQUIRED SHALL BE PART OF THE CONNECTION DESIGN.
5. STRUCTURAL CONNECTIONS SHOWN ON THESE DRAWINGS ARE SCHEMATIC. ALTERNATE CONNECTION DETAILS CAN BE PROPOSED BY THE FABRICATOR PROVIDED THEY HAVE ADEQUATE CAPACITY TO RESIST FACTORED DEMANDS AND MEET PROJECT REQUIREMENTS.
6. LIFTING POINTS SHALL BE DEFINED BY THE CONTRACTOR AND INCLUDED IN FABRICATION.

C. MATERIALS

1. STEEL PLATE TO BE ASTM A709 GRADE 36.
2. WIDE FLANGE SECTIONS: ASTM A992, Fy = 50 KSI.
3. CHANNEL SECTIONS: ASTM A36, Fy = 36 KSI.
4. HOLLOW STRUCTURAL SECTIONS: ASTM A500 GRADE B, Fy = 46 KSI.
5. HIGH STRENGTH BOLTS: ASTM F3125-19 GRADE A325 Fu = 120 KSI, MIN.
6. ANCHORAGES INTO CONCRETE: STAINLESS STEEL GRADE 316 Fu = 85 KSI, MIN.
7. FLOWABLE HIGH STRENGTH NON-SHRINK CEMENTITIOUS GROUT: 28 DAY F'c = 8 KSI, MIN.

D. CORROSION PROTECTION

1. CORROSION PROTECTION SYSTEM FOR ALL EXPOSED STEEL SURFACES SHALL BE AS FOLLOWS:

a. SURFACE PREPARATION: ABRASIVE BLAST CLEAN TO SSPC SP10.

b. APPLY THERMAL SPRAYED ZINC TO A THICKNESS OF 5 TO 6 MIL.

c. APPLY EPOXY SEALER TO THERMAL SPRAY ZINC. NOMINAL THICKNESS 1 MIL.

d. APPLY SEMI-GLOSS URETHANE FINISH TO A DRY FILM THICKNESS OF 3 MIL. FINISH COAT COLOR TO BE A CLOSE MATCH TO TOWER CONCRETE. CONTRACTOR TO FORWARD COLOR SWATCH FOR APPROVAL BY THE DESIGNER.
2. STRUCTURAL STEEL RECEIVING CORROSION PROTECTION SYSTEM SHALL HAVE THEIR EDGES RADIUSED 1/8 INCH.
3. HIGH STRENGTH BOLTS SHALL BE HOT-DIP GALVANIZED PER ASTM F2329.

E. DESIGN REQUIREMENTS

1. TOWER TOP HYDRAULIC HATCH AND ELECTRICAL SUPPORTS SHALL HAVE A DESIGN SERVICE LIFE OF 30 YEARS MINIMUM. ELECTRICAL SUPPORTS INCLUDE FAA LIGHT FIXTURE MOUNT, FAA LIGHTING PHOTOCELL AND STRUCTURAL SUPPORT, AND LIGHTNING PROTECTION MOUNT AND STRUCTURAL SUPPORT.
2. TOWER TOP HYDRAULIC HATCH SHALL BE OPENABLE BY MAINTENANCE CREW ON ACCESS LADDER PRIOR TO STEPPING ONTO TOWER TOP ACCESS PLATFORM. HATCH SHALL OPEN WITH SELF CONTAINED HYDRAULIC SUPPORTS. HATCH SHALL BE SECURABLE IN THE OPEN AND CLOSED POSITIONS.

3. TOWER TOP HYDRAULIC HATCH AND ELECTRICAL SUPPORTS SHALL BE DESIGNED FOR THE FOLLOWING:

a. HYDRAULIC HATCH AND ASSOCIATED HARDWARE SHALL BE DESIGNED FOR 82 PSF WIND LOAD IN THE CLOSED AND OPEN POSITION.

b. HYDRAULIC HATCH SHALL MEET THE DEFLECTION CRITERIA OF L/120 AT A WIND SPEED OF 25 MPH OR 5 PSF IN BOTH THE CLOSED AND OPEN POSITIONS.

c. ELECTRICAL SUPPORTS SHALL BE DESIGNED FOR 82 PSF WIND LOAD.
4. A MINIMUM OF FOUR EXTERNAL PERSONAL FALL ARREST ACHORAGES ARE TO BE PROVIDED ADJACENT TO THE TOWER TOP HATCH OPENING TO FACILITATE EXTERNAL ACCESS TO UPPER TOWER AND CABLES. PERSONAL FALL ARREST ANCHORAGES SHALL BE IN ACCORDANCE WITH OSHA 1910.140 PERSONAL FALL PROTECTION SYSTEMS AND 1926.502 FALL PROTECTION SYSTEMS CRITERIA AND PRACTICES.
5. INTERNAL EDGES OF STRUCTURAL STEEL AT HATCH OPENING SHALL BE GROUND SMOOTH TO AVOID SHARP EDGES.
6. ELECTRICAL SUPPORTS SHALL SATISFY THE FOLLOWING CRITERIA:

a. FAA LIGHT FIXTURE MOUNT SHALL BE TELESCOPIC OR FOLDABLE AND SECURABLE IN THE MOUNTED AND SERVICE POSITIONS. IN THE MOUNTED POSITION, FAA LIGHT FIXTURE SHALL BE FREE OF OBSTRUCTION. IN THE SERVICE POSITION, FAA LIGHT FIXTURE SHALL BE WITHIN ACCESSIBLE REACH. ACCESSIBLE REACH IS DEFINED AS REMOVABLE, REPLACEABLE, AND MAINTAINABLE WHILE WORKING FROM THE TOP ACCESS PLATFORM. ROPE ACCESS AS THE ONLY MEANS OF ACCESS AND MAINTAINING IS NOT ACCEPTABLE. FAA LIGHT FIXTURE MOUNT SHALL BE HOT-DIP GALVANIZED STEEL WITH STAINLESS STEEL HARDWARE COMPLETE WITH ALL REQUIRED ACCESSORIES. GALVANIZED STEEL SHALL BE IN ACCORDANCE WITH ASTM A123 WITH COATING THICKNESS GRADE OF 100.

b. FAA LIGHTING PHOTOCELL SHALL BE MOUNTED ON THE SOUTH BOUND SIDE OF THE TOWER TOP FACING NORTH. FAA LIGHTING PHOTOCELL SHALL BE WITHIN ACCESSIBLE REACH.

c. LIGHTNING PROTECTION SHALL CONSIST OF A 3/4" DIAMETER 6' LONG COPPER AIR TERMINAL. AIR TERMINAL SHALL BE FASTENED TO TOWER TOP STRUCTURE SUCH THAT THE TOP OF TERMINAL EXTENDS A MINIMUM OF 1'-0" PAST HIGHEST POINT OF TOWER TOP INCLUDING ANY FIXTURES BUT NOT MORE THAN 10'-0" FROM TOP OF CONCRETE. LIGHTNING PROTECTION FIXINGS AND CONNECTIONS SHALL BE UL96A APPROVED. DISSIMILAR METALS SHALL BE AVOIDED PER NEC 344.14. THE LIGHTNING PROTECTION MOUNT AND MOUNTING HARDWARE SHALL BE WITHIN ACCESSIBLE REACH.

d. REFER TO ELECTRICAL PACKAGE 10B FOR TOWER TOP ELECTRICAL LAYOUTS. IF ANCHORAGE INTO CONCRETE FOR ELECTRICAL ITEMS EXCEED CONCRETE CLEAR COVER, THE CONTRACTOR SHALL COORDINATE THE DETAIL WITH THE TOP OF TOWER REINFORCEMENT PER NHB-111B AND NHB-111C.
7. STRUCTURAL ANCHORAGES INTO CONCRETE INCLUDING WASHERS, NUTS, AND DRILLED INSERTS SHALL BE STAINLESS STEEL.
8. ALL STAINLESS STEEL ELEMENTS SHALL BE APPROPRIATELY ISOLATED FROM REGULAR STEEL/GALVANIZED STEEL ELEMENTS.
9. STRUCTURAL ANCHORAGES INTO CONCRETE SHALL UTILIZE APPROPRIATE HILTI POST INSTALLED ANCHORS OR EQUAL APPROVED. FRAMING MEMBERS TO CONCRETE SHALL INCLUDE ADDITIONAL/ALTERNATE BOLT HOLES SPACED SUCH THAT AS-CONSTRUCTED LOCATIONS OF REINFORCEMENT CAN BE AVOIDED WHEN DRILLING ANCHORAGES INTO CONCRETE. UNDER NO CIRCUMSTANCES SHALL ADHESIVE ANCHORS BE USED IN TENSION APPLICATIONS.
10. ALL POST INSTALLED ANCHORS SHALL BE INSTALLED IN STRICT CONFORMANCE WITH ALL MANUFACTURER'S RECOMMENDATIONS.
11. EACH BOLTED CONNECTION SHALL USE 2No. BOLTS MINIMUM.
12. ALL BOLTS SHALL BE A MINIMUM OF 1/2" DIAMETER.
13. BOLTED CONNECTIONS SHALL BE BEARING TYPE CONNECTIONS, SNUG TIGHT. THREADS TO BE EXCLUDED FROM THE SHEAR PLANE.
14. ALL BOLT HOLES SHALL BE DRILLED AND REAMED IF NECESSARY, AND NOT PUNCHED.
15. ALL WELDING INCLUDING WELD TESTING SHALL COMPLY WITH THE PROVISIONS OF AWS D1.1 STRUCTURAL WELDING CODE.
16. ALL WELDING ELECTRODES SHALL BE APPROPRIATELY MATCHED.
17. ALL FILLET WELDS, UNLESS NOTED OTHERWISE, SHALL BE THE LARGEST DIMENSION CONSISTENT WITH THE DIMENSIONS AND THICKNESS OF THE COMPONENTS BEING JOINED.
18. ALL WELDS SHALL RECEIVE 100% VISUAL INSPECTION.
19. DYE PENETRANT TESTING SHALL BE PERFORMED ON 10% OF ALL FILLET WELDS IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELDING CODE.
20. ALL COMPLETE PENETRATION GROOVE WELDS SHALL BE EVALUATED BY AND CONFORM TO ULTRASONIC TESTS AS DESCRIBED IN AWS D1.1. ULTRASONIC TESTING SHALL BE PERFORMED ON 100% OF ALL COMPLETE PENETRATION GROOVE WELDS.
21. FABRICATOR SHALL STIFFEN STEEL PLATES AS REQUIRED TO AVOID EXCESSIVE PLATE DEFORMATION DURING WELDING.




22. TABLE 1 INDICATES FACTORED CONNECTION FORCES IN THE STRENGTH LIMIT STATE PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS 7TH EDITION WITH 2015 INTERIM REVISIONS. DESIGN AND DETAIL CONNECTIONS TO RESIST FORCES SHOWN. ANCHORAGES INTO CONCRETE SHALL BE DESIGNED TO ACI 318-14. WELDED AND BOLTED STRUCTURAL CONNECTIONS SHALL BE DESIGNED TO AASHTO LRFD BDS 7TH EDITION WITH 2015 INTERIM REVISIONS. PROVIDE EQUIVALENT DESIGN DETAILS FOR SIMILAR CONNECTIONS. POSITIVE SIGN FOR SHEAR AND AXIAL FORCES CORRESPOND TO THE POSITIVE DIRECTION OF THE LOCAL AXIS AS SHOWN ON THE CONNECTION DETAILS ON SHEET NHB-295D AND NHB-295E. POSITIVE SIGN FOR BENDING MOMENTS AND TORSION FOLLOW THE RIGHT HAND RULE. LOAD REVERSAL SHALL BE CONSIDERED FOR THE CONNECTION DESIGN.

TABLE 1

DETAIL	SHEET	LOAD CASE	SHEAR Fy [LBS]	SHEAR Fz [LBS]	AXIAL Fx [LBS]	BENDING My [LBS-IN]	BENDING Mz [LBS-IN]	TORSION Mx [LBS-IN]
ANCHORAGE*	295E	MAX Fz	1298	1410	275	0	0	0
		MAX Fy	1793	540	1075	0	0	0
		MAX Fx	1433	900	2656	0	0	0
5 (RAFTER BRACING TO RING BEAM)	295E	MAX Fx	900	1050	1500	0	0	0
		MIN Fx	900	1050	-2100	0	0	0
6 (RAFTER TO RING BEAM)	295E	MAX Fx	600	1050	8550	0	0	0
		MIN Fx	600	1050	-5700	0	0	0
4	295D	MAX Fx	150	300	450	0	0	0
		MIN Fx	150	300	-1200	0	0	0
5	295D	MAX Fx	1200	900	5550	0	-7500	-57900
		MIN Fx	1200	900	-4200	0	-7500	-57900
6	295D	MAX Fx	300	600	3750	0	0	0
		MIN Fx	300	600	-3750	0	0	0

\* ANCHORAGE FORCES SHOWN ARE FOR A SINGLE ANCHOR IN A GROUP OF 2.

SCALES SHOWN FOR FULL SIZE DRAWINGS (22"x34")

NO.	DATE	REVISION	APRV
 <b>FLATIRON DRAGADOS LLC</b>			
			
US-181 HARBOR BRIDGE			
MAIN SPAN			
UPPER TOWER			
TOWER TOP			
GENERAL TOWER TOP NOTES			
DESIGN KW	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	
GRAPHICS RG	X	(See Title Sheet)	
CHECK NT	STATE	DISTRICT	COUNTY
CHECK MC	TEXAS	CRP	NUECES
	CONTROL	SECTION	JOB
	0101	06	095
			NHB 295A



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