March 20, 2025

Sign Support Structures

Courtney Holle, P.E.

Bridge Division – Design Section

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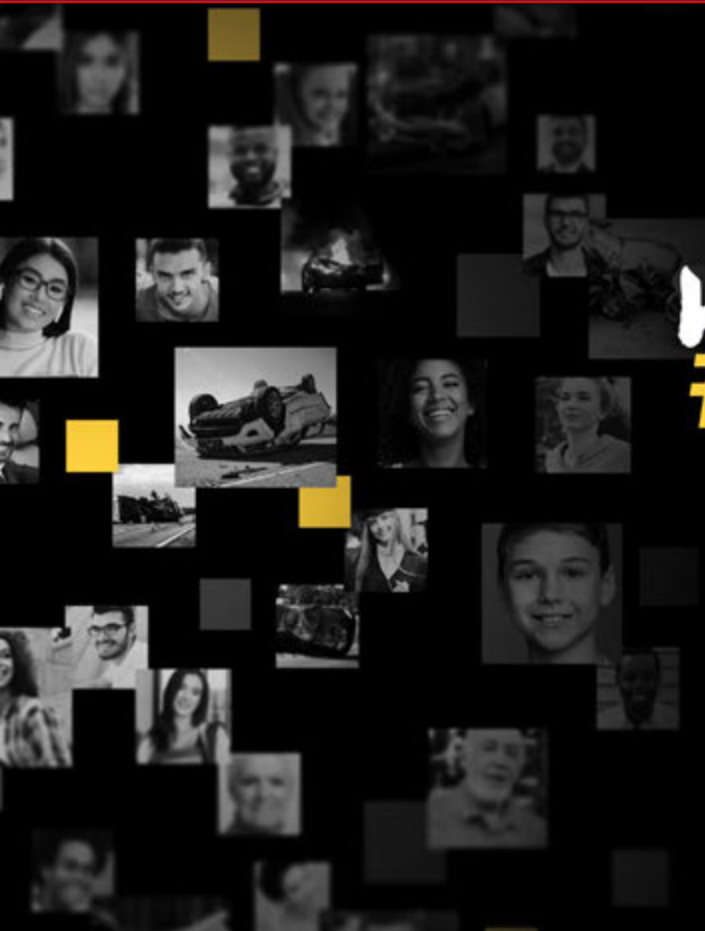

HELP

#EndTheStreakTX

End the streak of daily deaths on Texas roadways.

TxDOT.gov
#EndTheStreakTX Toolkit

TxDOT Ancillary Structure Standards
BRG maintains the *structural aspects* of:

Standard Description	Standards	Current Design Spec.	Upcoming Design Spec.
High Mast Illumination Assembly	HMIP, HMID	LTS-3 (1994)	LTS-6
Roadway Illumination Assembly	RIP, RID	LTS-6 (2013)	LRFD-LTS
Overhead Sign Structures	OSB, HOSB, COSS, HCOSS	LTS-3 (1994)	LRFD-LTS
Monotube Sign Structures	MS, MC	LTS-6 (2013)	
Traffic Signal Poles	SP, SMA, DMA, MA, MAC, MAD, TS, LUM, CFA, LMA	LTS-3 (1994)	LRFD-LTS
Wind and Ice Maps	WV & IZ	LTS-3 (1994) & LTS-6 (2013)	LRFD-LTS

https://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/toc.htm

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COSS Standards

CANTILEVER OVERHEAD SIGN SUPPORT STANDARDS

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62	HCOSS-Z1-21	8-21	High Level Cantilever Overhead Sign Supports	hcoss-z1-21.dgn
63	COSS-Z2I-10	4-10	Cantilever Overhead Sign Supports	stds63.dgn
64	COSS-Z3&Z3I-10	4-10	Cantilever Overhead Sign Supports	stds64.dgn
65	COSS-Z4&Z4I-10	4-10	Cantilever Overhead Sign Supports	stds65.dgn
66A	COSSD	11-07	Cantilever Overhead Sign Support Details	stds66.dgn
66B	COSSD	11-07	Cantilever Overhead Sign Support Details	"
67	COSSF-21	8-21	Cantilever Overhead Sign Support Foundation	cossf-21.dgn
68	COSS-FD	11-07	Foundation Embedment Selection Charts	stds68.dgn

OSB Standards

OVERHEAD SIGN BRIDGE STANDARDS

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33B	HOSB-Z1	8-08	High Level Overhead Sign Bridge Details
34A	HOSB-Z1L	8-08	High Level Overhead Sign Bridge Details
34B	HOSB-Z1L	8-08	High Level Overhead Sign Bridge Details
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37A	OSB-Z3	11-07	Overhead Sign Bridge Details
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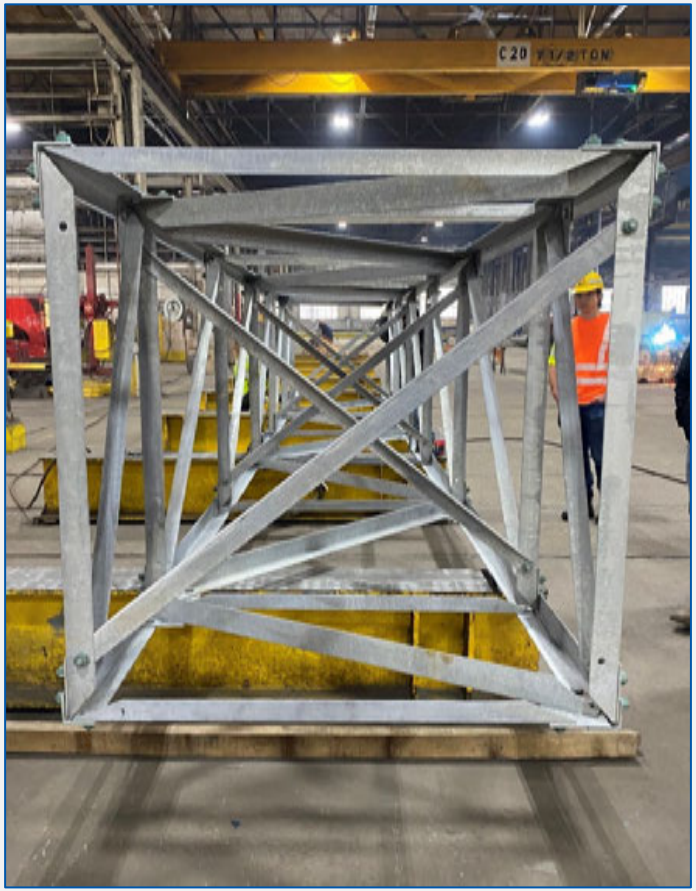
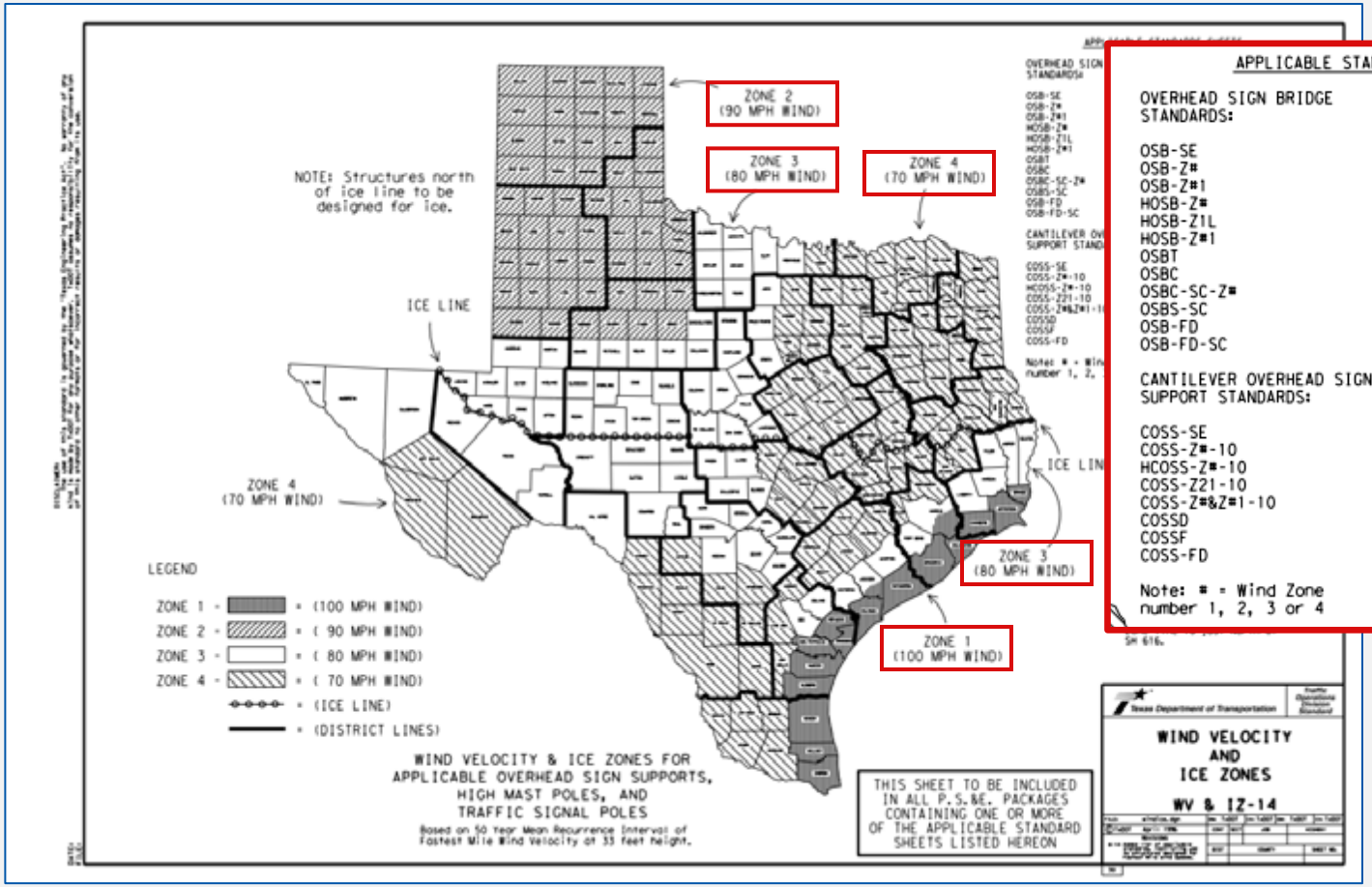
53	OSB-FD-SC	11-07	Foundation Embedment Selection Charts
54	COSS & OSB-SZ-21	8-21	Overhead Sign Bridge Details

Standard Sheets

- Include:
  - Wind Zone Map (WV & IZ-14)
  - Standard structure (e.g. COSS-Z1)
  - Structure Details (COSSD)
  - Foundation Details (COSSF and COSS-FD)
  - Sign Brackets
    - SMD(2-5)-24 for typical signs
    - DMS-(HZ)-21 or DMS(TM-1)-16 for Dynamic Message Signs (DMS)
  - Elevation View of structure





APPLICABLE STANDARDS SHEETS

OVERHEAD SIGN BRIDGE STANDARDS:

OSB-SE
OSB-Z*
OSB-Z*1
HOSB-Z*
HOSB-Z1L
HOSB-Z*1
OSBT
OSBC
OSBC-SC-Z*
OSBS-SC
OSB-FD
OSB-FD-SC

CANTILEVER OVERHEAD SIGN SUPPORT STANDARDS:

COSS-SE
COSS-Z*-10
HCOSS-Z*-10
COSS-Z21-10
COSS-Z*&Z*1-10
COSSD
COSSF
COSS-FD

Note: * = Wind Zone number 1, 2, 3 or 4

HIGH MAST ILLUMINATION POLE STANDARDS:

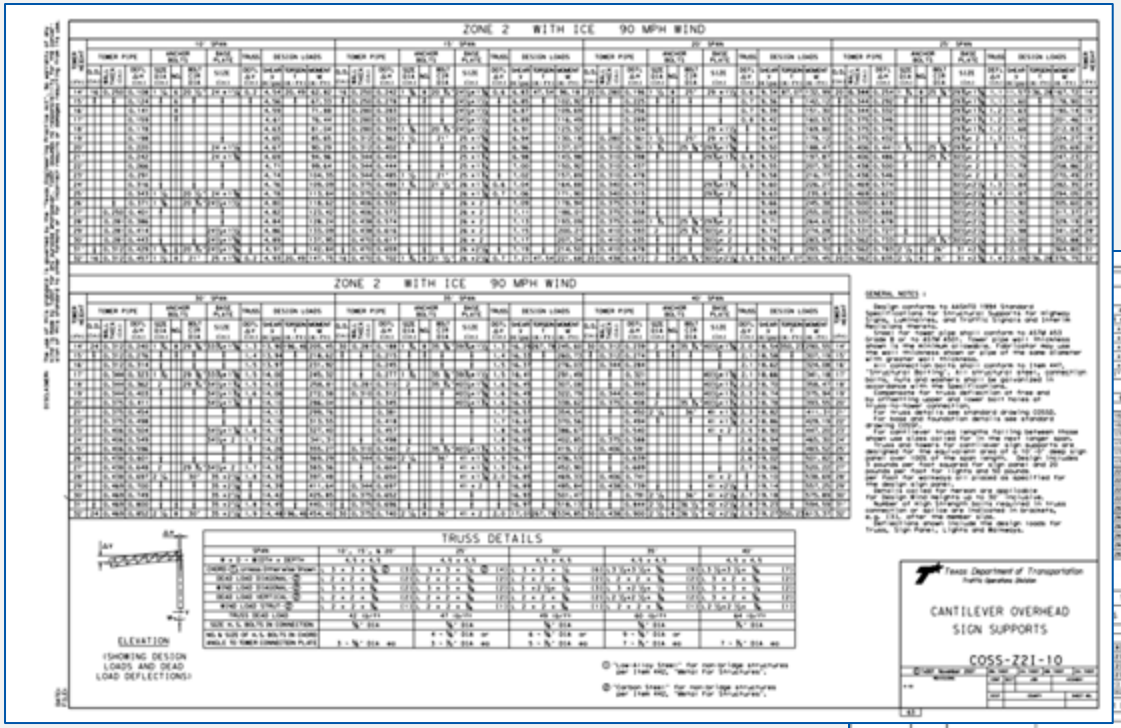
HMIP-98
HMIF-98

WALKWAYS AND BRACKETS STANDARDS:

SWW
SB(SWL-1)

TRAFFIC SIGNAL POLE STANDARDS:

SP-80
SP-100
SMA-80
SMA-100
DMA-80
DMA-100
MA-C
MAC(ILSN)
MAD-D
TS-FD
LUM-A
CFA
LMA
TS-C
MA-DPD



ZONE 2 WITH ICE 90 MPH WIND

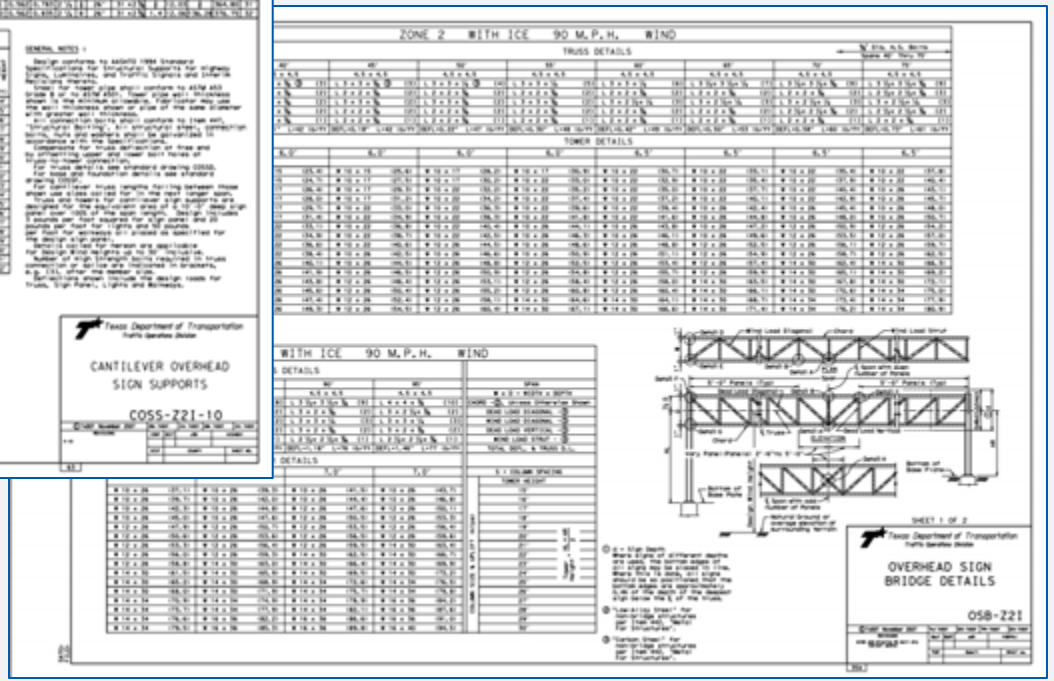
ZONE 2 WITH ICE 90 MPH WIND

TRUSS DETAILS

ELEVATION
(SHOWING DESIGN LOADS AND DEAD LOAD DEFLECTIONS)

CANTILEVER OVERHEAD SIGN SUPPORTS

CO5S-Z21-10



ZONE 2 WITH ICE 90 M.P.H. WIND

TRUSS DETAILS

TOWER DETAILS

WITH ICE 90 M.P.H. WIND

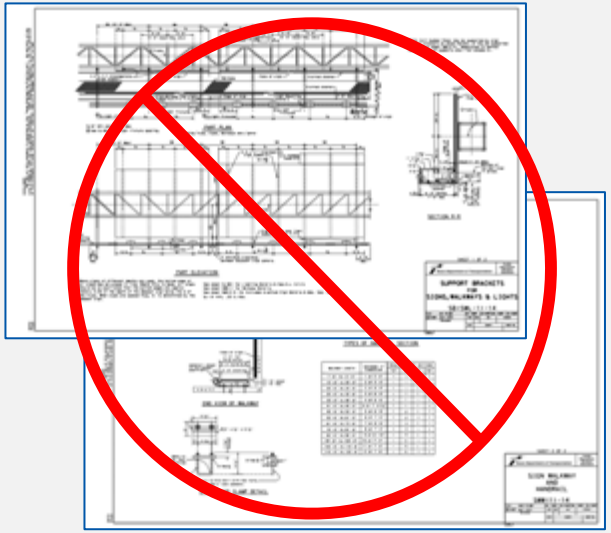
DETAILS

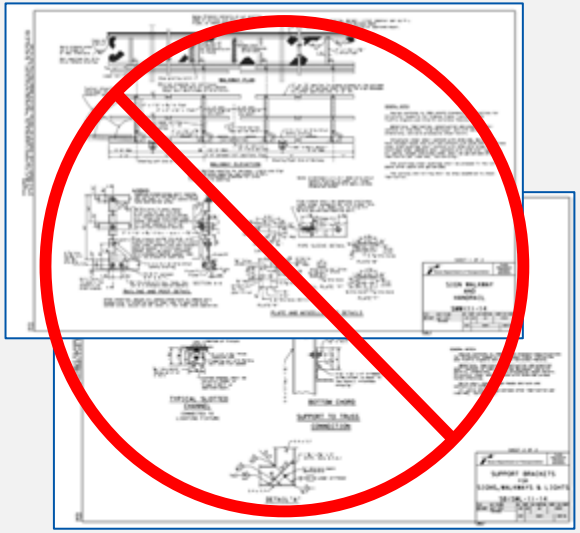
OVERHEAD SIGN BRIDGE DETAILS

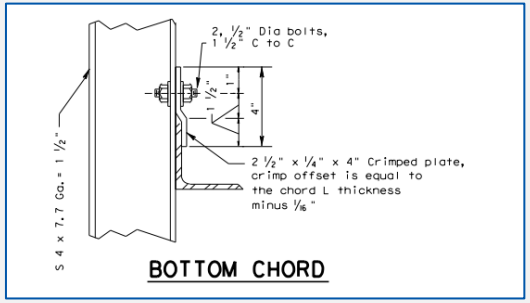
O5B-Z21

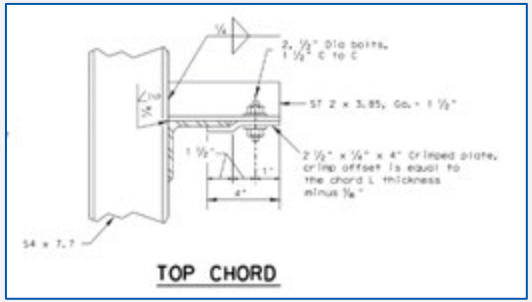
Removal of Sign Walkway and Lighting Brackets

- SWW(1)-14 | Sign Walkway and Handrail
- SB(SWL-1)-14 | Support Bracket for Signs, Walkways and Lights
  - Relocated relevant support to truss connection details to SMD(2-5)-24.



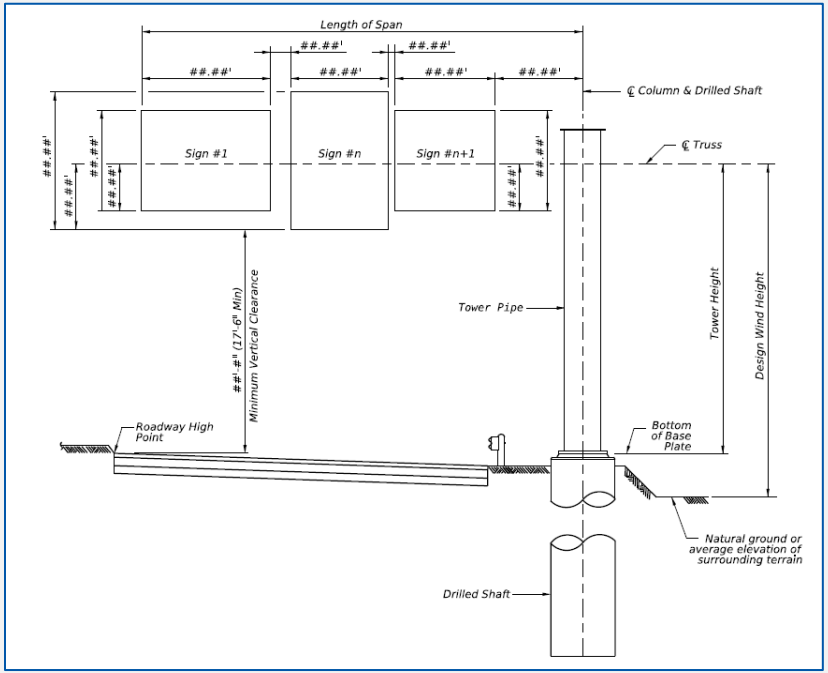






Elevation and Design Criteria

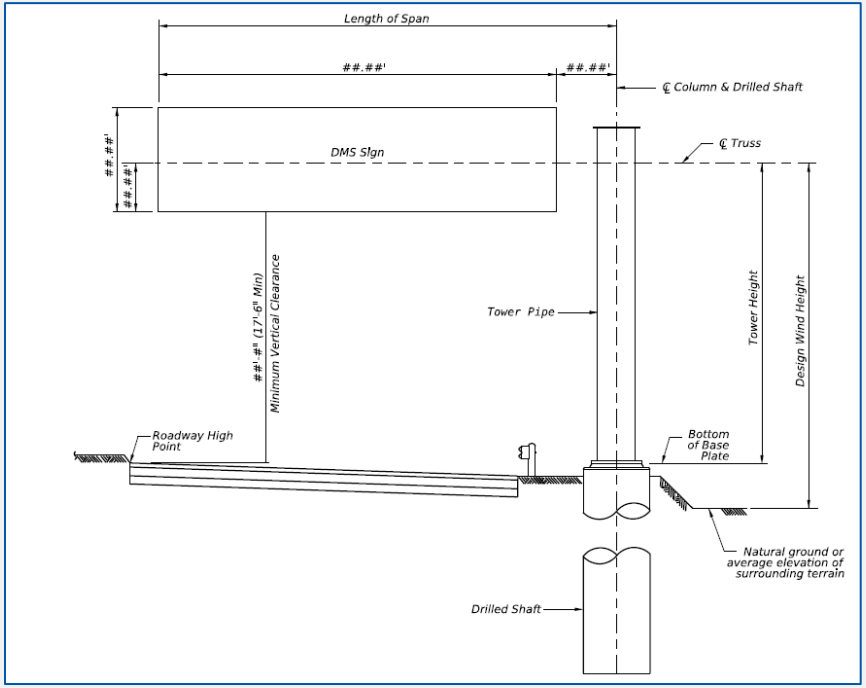
Cantilevered Overhead Sign Support



Sign Structure Design Details	
Structure Type	COSS
Roadway	CL Alignment
Station	##+##.##
Design Data	
Applicable Standard	HCOSSZ1, COSS Z1 THRU Z4
Span Length	## ft
Sign Area	##.## sq ft
Standard Sign Area	##.## sq ft
Design Wind Height	## ft
Tower Height	## ft
Tower Diameter	## ft
Tower Wall Thickness	## ft
Foundation Design	
Shear	##.## kips
Torsion	###.## kip-ft
Moment	###.## kip-ft
Foundation Top Elev	###.## ft
Foundation Tip Elev	###.## ft
Drilled Shaft Diameter	## in
Soil	Sand or Clay
Penetrometer Value	N

Elevation and Design Criteria

Cantilevered Overhead DMS Sign Support



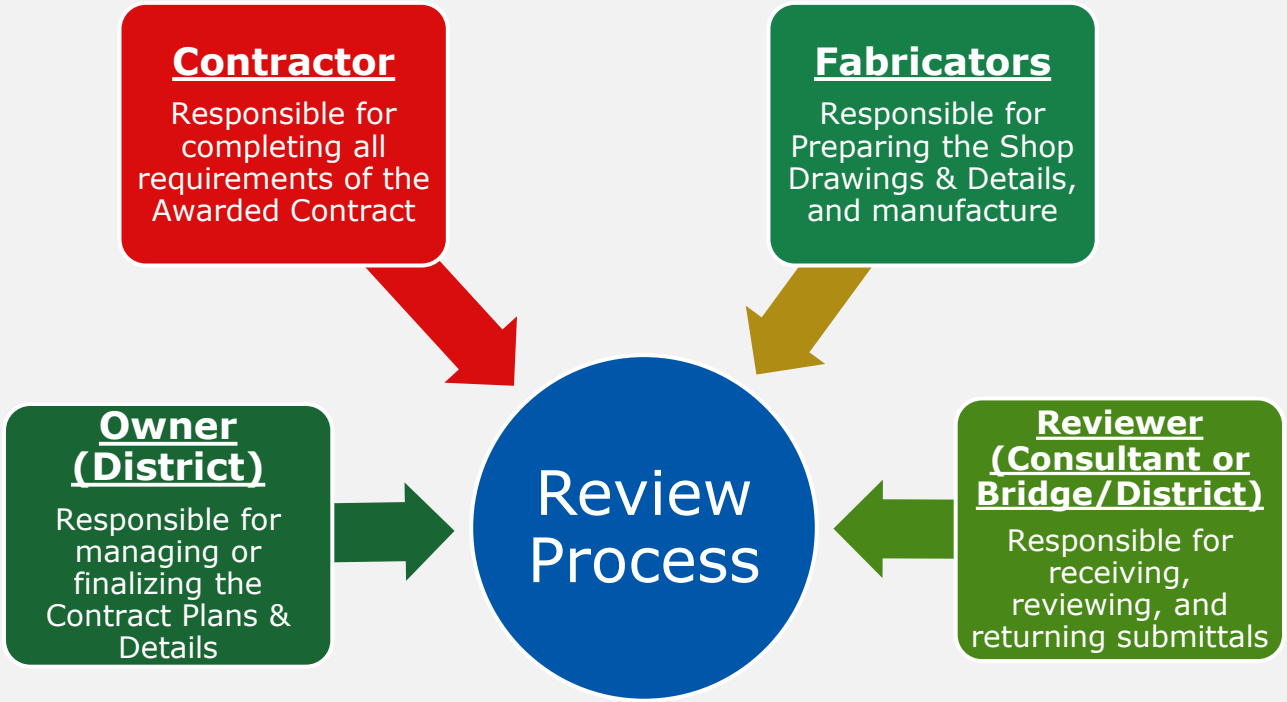
Sign Structure Design Details		
Structure Type		COSS or DMS
Roadway		CL Alignment
Station		##+##.##
Design Data		
Applicable Standard		SZ
Span Length		## ft
Sign Area		##.## sq ft
Design Wind Height		## ft
Truss Details		
W x D = Width x Depth		# ft x # ft
Length of Truss Panel		End = # ft, Other = # ft
HS Bolt Diameter		#/# in
Total # of HS Bolts in Tower Connection		#
Chord	Member	L # x # x #/#
	HS Bolts Req'd	#
Dead Load Diagonal	Member	L # x # x #/#
	HS Bolts Req'd	#
Wind Load Diagonal	Member	L # x # x #/#
	HS Bolts Req'd	#
Dead Load Vertical	Member	L # x # x #/#
	HS Bolts Req'd	#
Wind Load Strut	Member	L # x # x #/#
	HS Bolts Req'd	#
Truss Dead Load		## lb/ft
Truss Deflection		#.# in
Tower Details		
Tower Height		## ft
Tower Diameter		## in
Tower Wall Thickness		## in
Tower Δh at Truss CL		## in
Base Plate	Diameter	## in
	Thickness	## in
Anchor Bolt	Circle Diameter	## in
	Number of Bolt	#
	Bolt Diameter	## in
Foundation Design		
Shear		##.## kips
Torsion		###.## kip-ft
Moment		###.## kip-ft
Foundation Top Elev		###.## ft
Foundation Tip Elev		###.## ft
Drilled Shaft Diameter		## in
Soil		Sand or Clay
Penetrometer Value		N
Main Shaft Steel		XX (#XX Bar)
Shaft Spiral Reinforcing		#X Spiral @ X in Pitch

Sign Structure Design Details	
Structure Type	COSS or DMS
Roadway	CL Alignment
Station	##+##.##
Design Data	
Applicable Standard	SZ
Span Length	## ft
Sign Area	##.## sq ft
Design Wind Height	## ft
Truss Details	
W x D = Width x Depth	# ft x # ft
Length of Truss Panel	End = # ft, Other = # ft
HS Bolt Diameter	#/# in
Total # of HS Bolts in Tower Connection	#
Chord – Member	L # x # x #/#
Chord – HS Bolts Req'd	#
Dead Load Diagonal – Member	L # x # x #/#
Dead Load Diagonal – HS Bolts Req'd	#
Wind Load Diagonal – Member	L # x # x #/#
Wind Load Diagonal – HS Bolts Req'd	#
Dead Load Vertical – Member	L # x # x #/#
Dead Load Vertical – HS Bolts Req'd	#
Wind Load Strut – Member	L # x # x #/#
Wind Load Strut – HS Bolts Req'd	#
Truss Dead Load	## lb/ft
Truss Deflection	#.# in

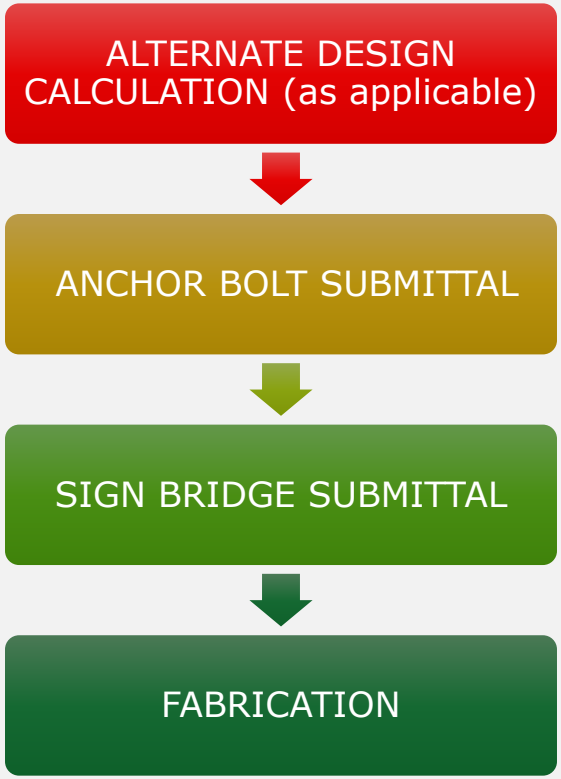
Tower Details		
Tower Height		## ft
Tower Diameter		## in
Tower Wall Thickness		## in
Tower Δh at Truss CL		## in
Base Plate	Diameter	## in
Base Plate	Thickness	## in
Anchor Bolt	Circle Diameter	## in
Anchor Bolt	Number of Bolt	#
Anchor Bolt	Bolt Diameter	## in
Foundation Design		
Shear		##.## kips
Torsion		###.## kip-ft
Moment		###.## kip-ft
Foundation Top Elev		###.## ft
Foundation Tip Elev		###.## ft
Drilled Shaft Diameter		## in
Soil		Sand or Clay
Penetrometer Value		N
Main Shaft Steel		XX (#XX Bar)
Shaft Spiral Reinforcing		#X Spiral @ X in Pitch

The Review Process

The parties involved with the Review Process:



The Review Process – for COSS and OSB Structures



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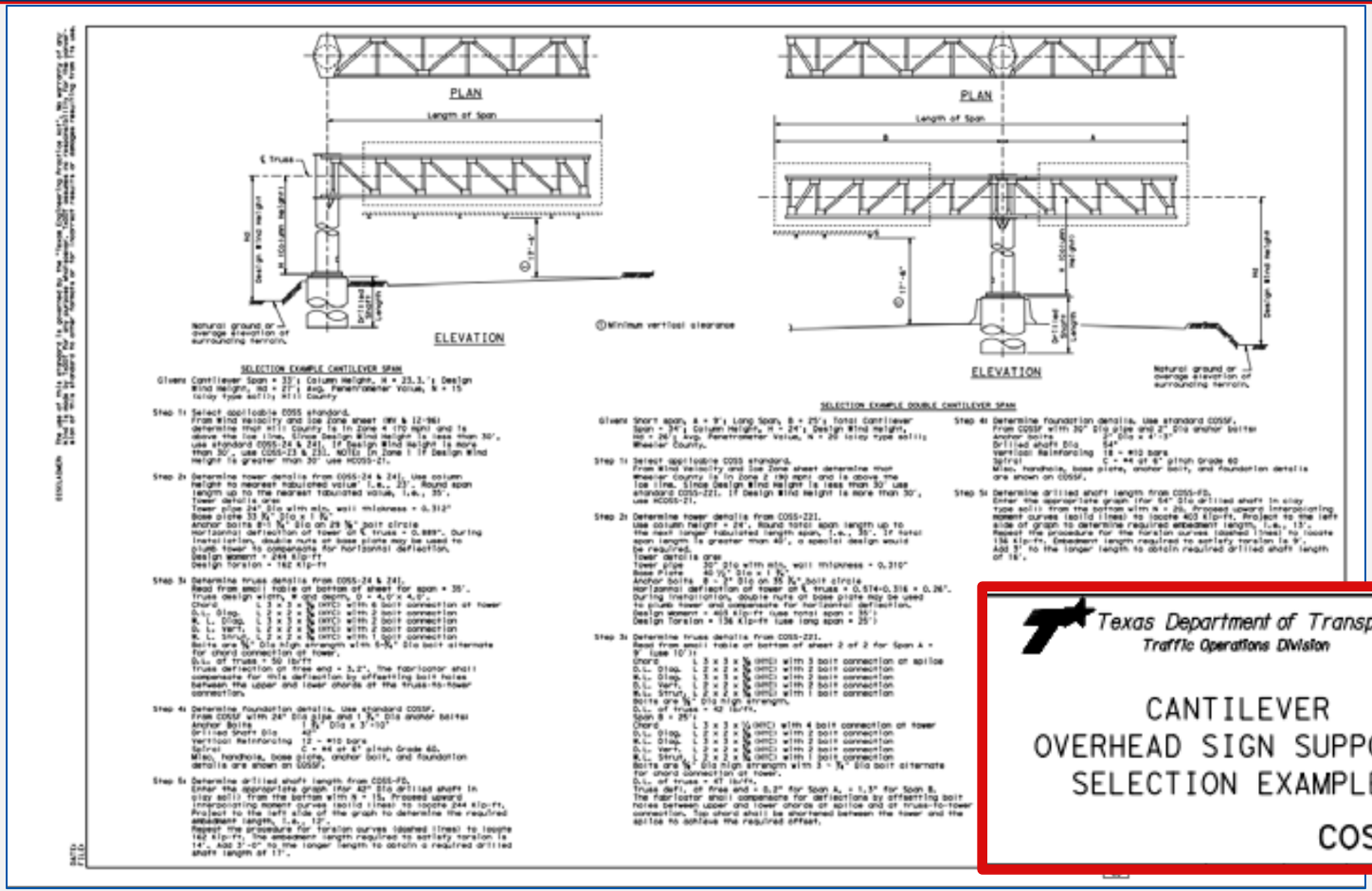
PLAN
Length of Span
℄ truss
Design Wind Height
Column Height
Drilled Shaft Length
Natural ground or average elevation of surrounding terrain.
ELEVATION
SELECTION EXAMPLE CANTILEVER SPAN
Given: Cantilever Span = 33'; Column Height, H = 23.3'; Design Wind Height, HD = 27'; Avg. Penetrometer Value, N = 15 (clay type soil); Hill County
Step 1: Select applicable COSS standard.
Step 2: Determine tower details from COSS-24 & 24].
Step 3: Determine truss details from COSS-24 & 24].
Step 4: Determine foundation details. Use standard COSSF.
Step 5: Determine drilled shaft length from COSS-FD.
PLAN
Length of Span
A
B
Design Wind Height
Drilled Shaft Length
ELEVATION
Natural ground or average elevation of surrounding terrain.
SELECTION EXAMPLE DOUBLE CANTILEVER SPAN
Given: Short span, A = 9'; Long Span, B = 25'; Total Cantilever Span = 34'; Column Height, H = 24'; Design Wind Height, HD = 26'; Avg. Penetrometer Value, N = 20 (clay type soil); Wheeler County.
Step 1: Select applicable COSS standard.
Step 2: Determine tower details from COSS-221.
Step 3: Determine truss details from COSS-221.
Step 4: Determine foundation details. Use standard COSSF.
Step 5: Determine drilled shaft length from COSS-FD.
Texas Department of Transportation
Traffic Operations Division
CANTILEVER
OVERHEAD SIGN SUPPORTS
SELECTION EXAMPLES
COSS-SE

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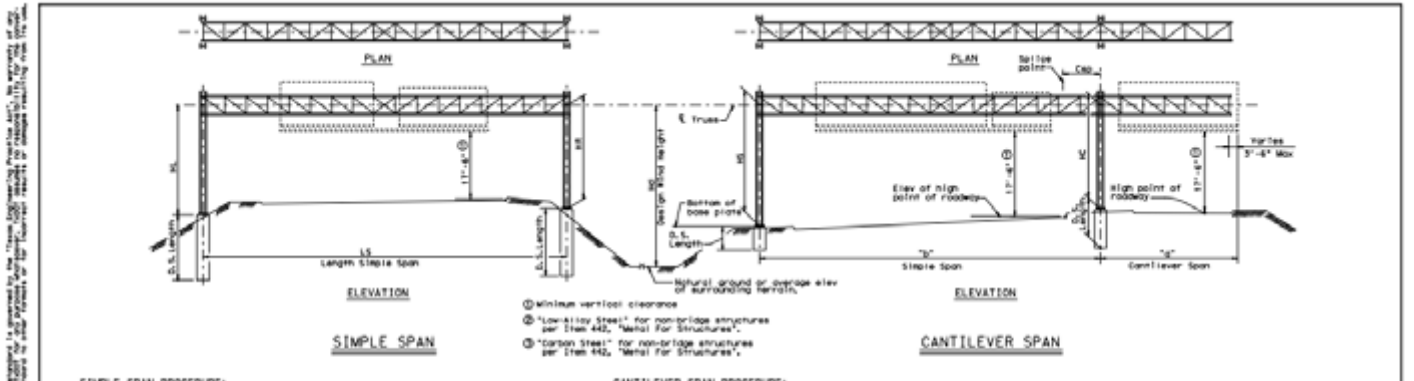


SIMPLE SPAN

SIMPLE SPAN PROCEDURE:

Given: Span, Ls = 93.0'; Left Tower Height, H_L = 26.3'; Right Tower Height, H_R = 22.6'; Design Height, H = 21.0'; Avg. Penetrometer Value, N = 25; Dawson County.

Step 1: Select applicable OSB standard. From Wind Velocity and Ice Zone sheet (WVSZ-96) determine that Dawson County is in Zone 2, (90 mph) and Ice above the Ice line. Since Design Height, H = 21.0', use standard OSB-221. If the Design Height were more than 30.0', the applicable standard would be HOSB-221.

Step 2: Determine truss details and tower size from OSB-221. For our 93.0' span go to the next larger span, i.e. 95.0'. Truss members are:
Chord = L 4"x 4"x ½" @ 10' with 10 bolt splice
Web Diag. = L 3"x 3"x ¼" @ 8' with 2 bolt connection
Web Diag. = L 3"x 3"x ¼" @ 8' with 2 bolt connection
Web Vert. = L 3"x 3"x ¼" @ 8' with 2 bolt connection
Web Strut = L 3"x 3"x ¼" @ 8' with 1 bolt connection
Bolts are ⅞" Dia high Strength, Truss WxD = 4.5'x 4.5'
Required truss camber to compensate for dead load deflection is 1.46". Dead load of truss is 77 lb/ft. Avg. Tower Height = (26.3' + 22.6')÷2 = 24.45', use 25.0' to determine column size and spacing for both towers, i.e. W14 x 34 spaced at 7.0'.
Use actual tower heights for drilled shaft uplift as follows: For H_L = 26.3' use 26.0' to determine design uplift at the left tower = 79.8K. For H_R = 22.6' use 25.0' to determine design uplift at the right tower = 69.9K.

Step 3: Determine tower and anchor bolt details. Use OSBT standard.
From OSBT with W14 x 34 columns spaced at 7'-0"c
Anchor Bolts = 1 ¾" Dia x 3'-10"
Base Plate = 11½" x 2 ½" x 2'-1"
X, Y, and Z = 9 ½", 3", and 2 ½" respectively
Tower Bracing = 2L6 x 3½ x 2½ x ½"
Foundation = 36" Dia shafts with 8 - #9 Bars.

Step 4: Determine drilled shaft length from OSB-FD. Enter chart for 36" Dia drilled shafts at N = 25.
Left Tower Uplift = 79.8K, therefore, L = 8'- 5" 15'.
Right Tower Uplift = 69.9K, therefore, L = 8'- 5" 15'.

Step 5: Determine maximum spacing of tower bracing. The maximum spacing would normally be the same as the column spacing, i.e. 7.0'. However, the special note for tower bracing on Sheet 1 of the OSBT standard makes provision for an increase in spacing as follows: On OSB-221 under 95.0' span, the W14 x 34 column is shown for 25.0' and 26.0' column heights. Thus, the W14 x 34 is shown one time for heights greater than the design height of 21'-0", the special note for tower bracing allows a 1'-0" increase in the maximum spacing from 11.0' to 8.0'.

CANTILEVER SPAN

CANTILEVER SPAN PROCEDURE:

Given: Simple Span b = 80.0'; Cantilever Span, a = 30.0'; Left Tower Height, H_L = 25.0'; Right Tower Height, H_R = 26.0'; Design Wind Height, H = 30.0'; Avg. Penetrometer Value, N = 25.0'; Duval County.

Step 1: Calculate the following:
Equiv. Simple Span, E_{ss} = b + 2a + (a²/b =) = 151.50'. Use 155.0'.

If E_{ss} exceeds 155.0' a special tower design is required. Cantilever Equiv. Simple Span, E_{ss} = b + 2a = 80.0'+ 2(30.0') = 140.0'. Splice Point, Cap = (a²÷b =) = 11.50'; Equiv. Simple Span for Truss Web, E_{SW} = b + (a²÷b =) = 91.0'. Use 95.0'.

Step 2: Select applicable OSB standards. From Wind Velocity and Ice Zone sheet determine that Duval County is in Zone 4 (70 mph) and is below the Ice line. Since Design Wind Height, H = 30.0', use standard OSB-24. If the Design Height were more than 30.0' the applicable standard would be HOSB-24.

Step 3: Determine truss details and tower size from OSB-24.
Cantilever Truss: For E_{SW} = 90.0' truss members are:
Chord = L 5"x 3½"x ½" with 6 bolt splice
Web Diag. = L 3½"x 3"x ½" with 2 bolt connection
Web Diag. = L 3½"x 3"x ½" with 2 bolt connection
Web Vert. = L 3"x 3"x ½" with 2 bolt connection
Web Strut = L 3"x 3"x ½" with 1 bolt connection
Bolts are ⅞" Dia High Strength, Truss WxD = 4.0'x 4.0'
Required cantilever truss camber to compensate for dead load deflection is 0.49".

Simple Span Truss: For b = 80.0' truss members are:
Chord = L 5"x 3½"x ½" with 9 bolt splice
Web Diag. = L 3½"x 3"x ½" with 2 bolt connection
Web Diag. = L 3½"x 3"x ½" with 2 bolt connection
Web Vert. = L 3"x 3"x ½" with 2 bolt connection
Web Strut = L 3"x 3"x ½" with 1 bolt connection
Bolts are ⅞" Dia High Strength, Truss WxD = 4.0'x 4.0'
If W and D for the cantilever and simple spans are different, increase smaller W and D to match the larger truss. Required simple span camber to compensate for dead load deflection is 1.13".

Truss from cantilever tower to splice point: Extend cantilever chords past the tower a distance, Cap= 11.5' which falls in the third panel. The splice is permissible at any point within the third panel. Web members from the tower out to and including the splice panel, i.e. the third panel, shall be modified as follows: For E_{SW} = 90.0' web members are:
Web Diag. = L 2½"x 2½"x ¼" with 2 bolt connection
Web Diag. = L 2½"x 2½"x ¼" with 2 bolt connection
Web Vert. = L 2½"x 2½"x ¼" with 2 bolt connection
Web Strut = L 2½"x 2½"x ¼" with 1 bolt connection
Ignore W and D dimensions. Instead, use W and D as required for cantilever and simple span trusses. Use ⅞" Dia strength bolts as required for 90.0' span.

Tower Sizes: Avg. Tower Height = (26.0' + 26.0')÷2 = 26.0'. Use 24.0' height and 155.0' equivalent simple span to determine column size and spacing for both towers, i.e. W14 x 34 spaced at 7.5'.
Use spans and actual tower heights for uplift as follows: For H_L = 26.0', and b = 80.0' determine uplift = 31.3K. For H_R = 26.0', and E_{SS} = 155.0' determine uplift = 73.9K.

Step 4: Determine tower and anchor bolt details. Use standard OSBT. From OSBT with W14 x 34 columns spaced at 7.5':
Anchor Bolts = 1 ¾" Dia x 3'-10"
Base Plate = 11½" x 2 ½" x 2'-1"
X, Y, and Z = 9 ½", 3", and 2 ½" respectively
Tower Bracing = 2L6 x 3½ x 2½ x ½"
Foundation = 36" Dia shafts with 8-#9 bars.

Step 5: Determine drilled shaft length from OSB-FD. Enter chart for 36" Dia drilled shaft at N = 25.0'.
Left Tower Uplift = 31.3K, therefore L = 8'- 3" 9'.
Right Tower Uplift = 73.9K, therefore L = 8'- 5" 11'.

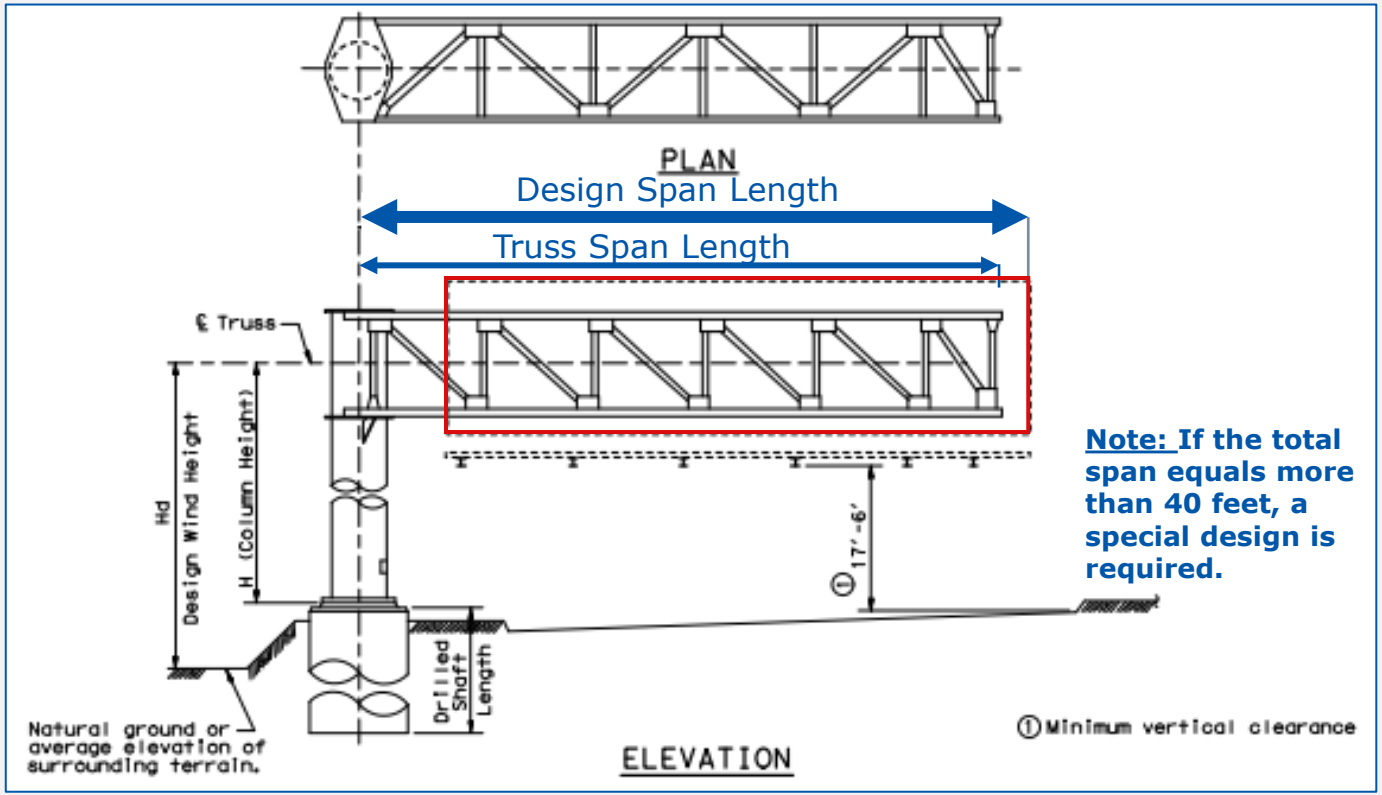
Step 6: Determine maximum spacing of tower bracing. The maximum spacing would normally be the same as the column spacing, i.e. 7.5', however, the special note for tower bracing on Sheet 1 of the OSBT standard makes provision for an increase

Texas Department of Transportation
Traffic Operations Division

OVERHEAD SIGN BRIDGE SELECTION EXAMPLES

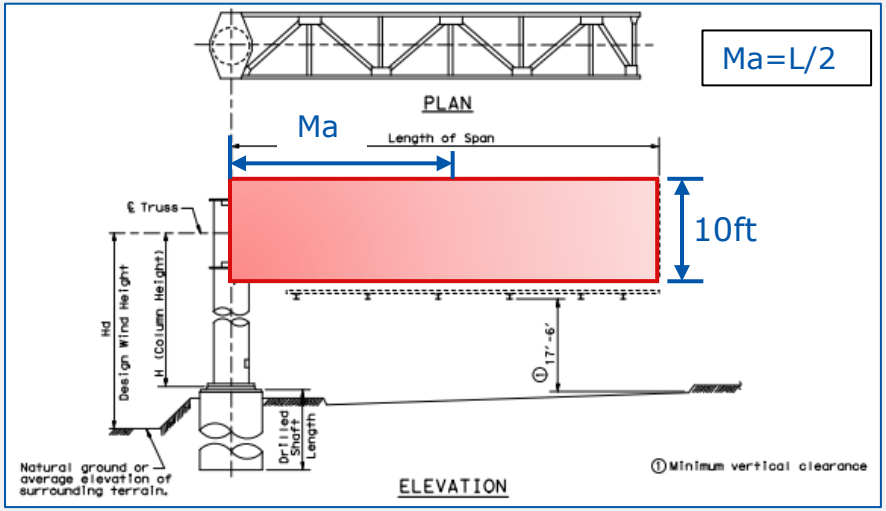
OSB-SE

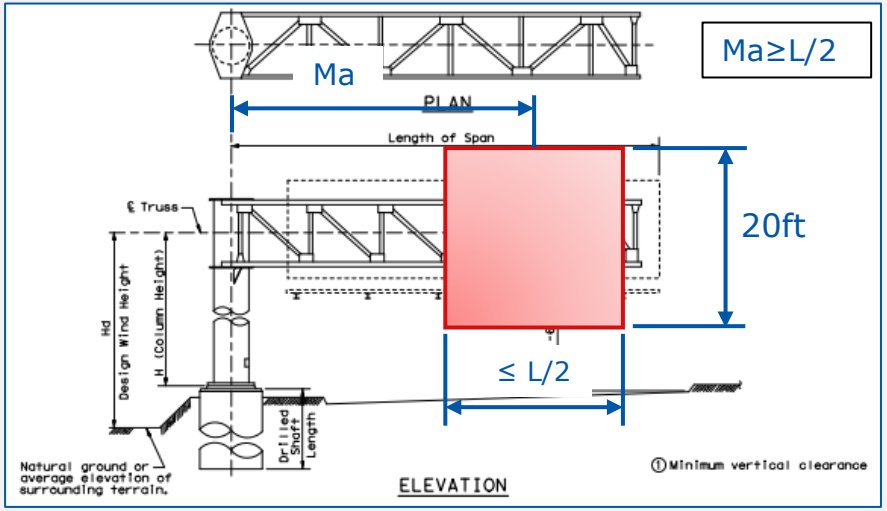
Span Length



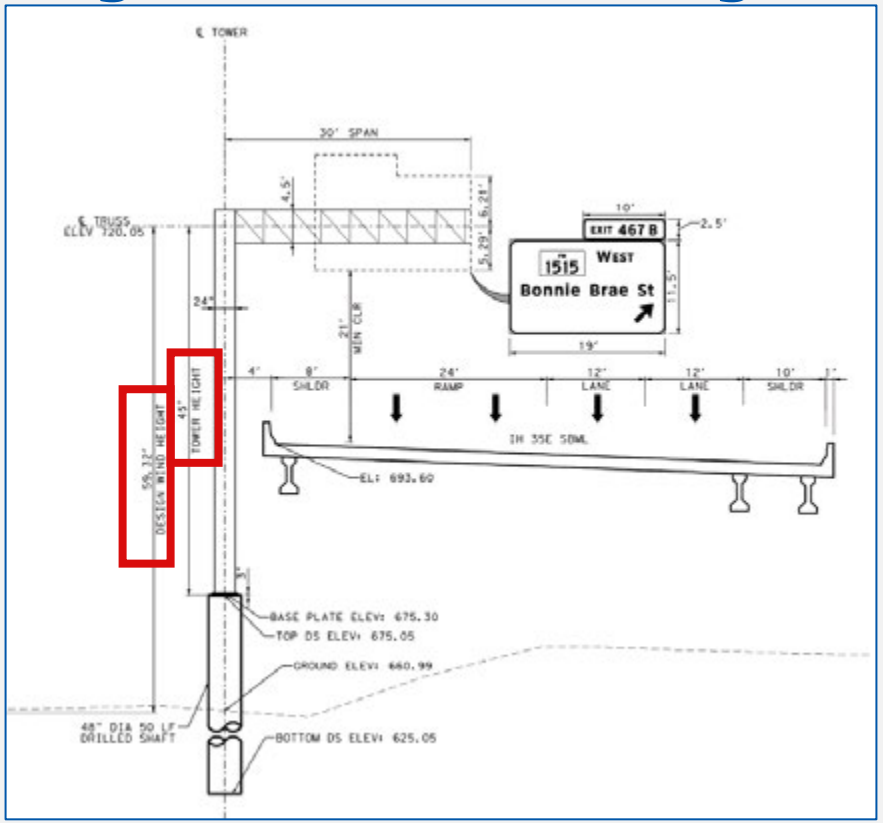
Note: If the total span equals more than 40 feet, a special design is required.

Sign Area

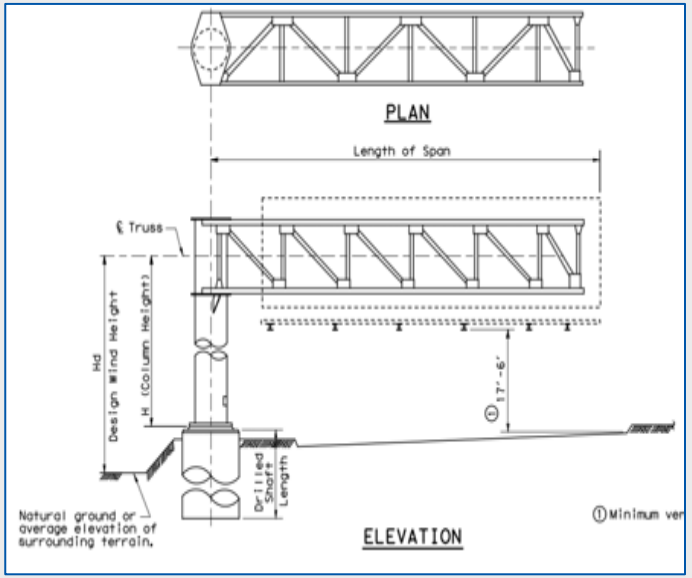

Ma=L/2
PLAN
Ma
Length of Span
℄ Truss
10ft
Hd
Design Wind Height
H (Column Height)
17'-6"
Drilled Shaft Length
Natural ground or average elevation of surrounding terrain.
ELEVATION
① Minimum vertical clearance


Ma≥L/2
Ma
PLAN
Length of Span
℄ Truss
20ft
Hd
Design Wind Height
H (Column Height)
≤ L/2
Drilled Shaft Length
Natural ground or average elevation of surrounding terrain.
ELEVATION
① Minimum vertical clearance

Design Wind Height vs. Column Height

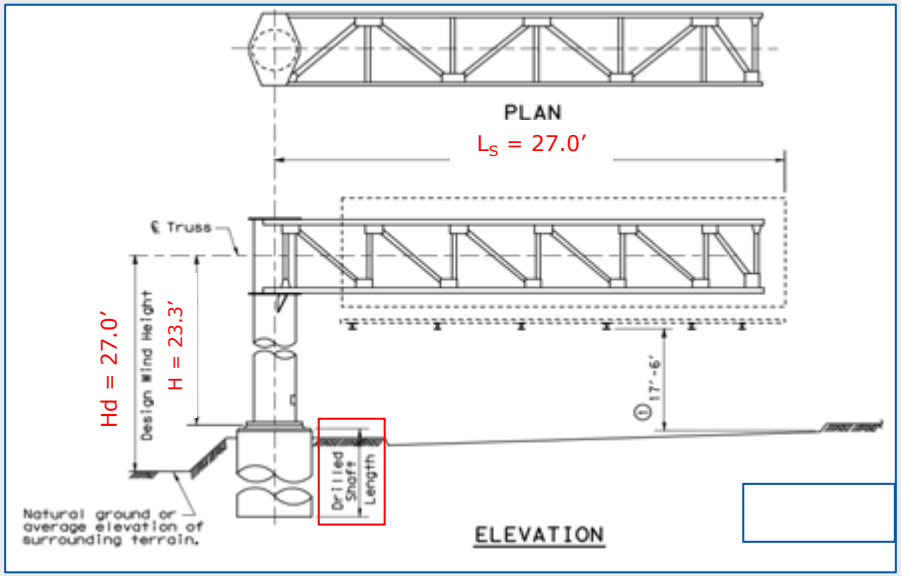


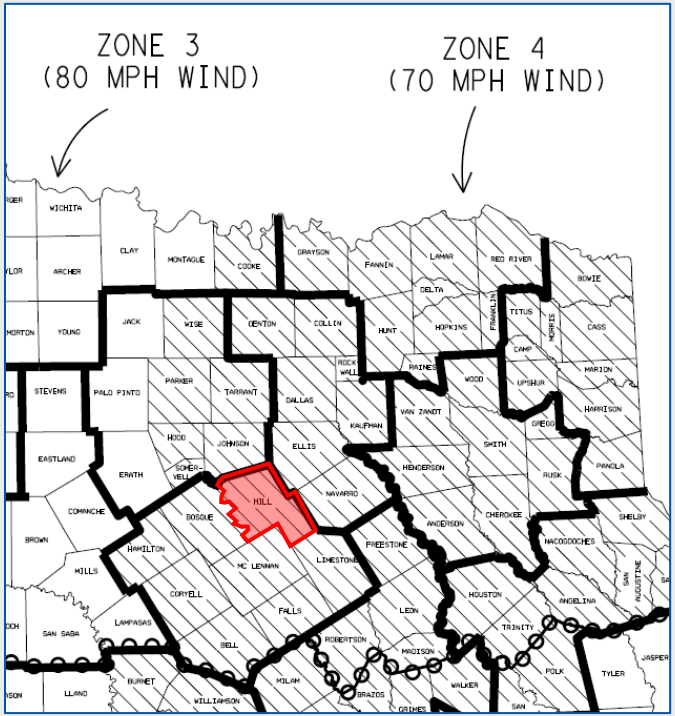
Cantilever Overhead Sign Structures (COSS)



Cantilever Overhead Sign Structures (COSS)

- Given:
  - Cantilever Span = 27.0’
  - Column Height, H = 23.3’
  - Design Wind Height, H_d = 27.0’
  - N = 15
  - Hill County

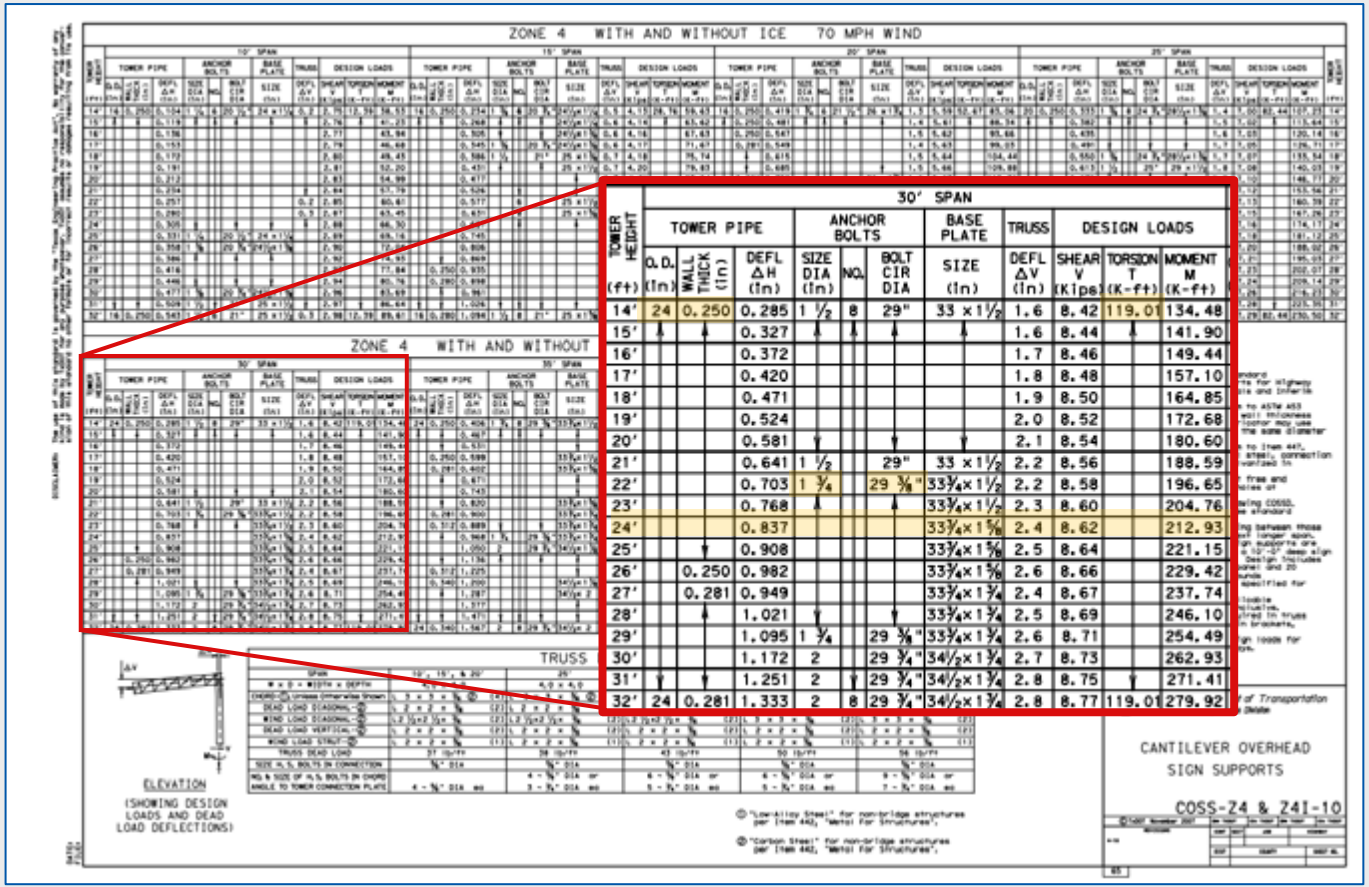




- Zone 4
- 70 mph
- Design Height, Hd = 27.0’

↓

Standard: COSS-Z4 & Z4I-10



ZONE 4 WITH AND WITHOUT ICE 70 MPH WIND

30' SPAN

TOWER HEIGHT (ft)	TOWER PIPE O.D. (In)	TOWER PIPE WALL THICK (In)	TOWER PIPE DEFL ΔH (In)	ANCHOR BOLTS SIZE DIA (In)	ANCHOR BOLTS NO.	ANCHOR BOLTS BOLT CIR DIA	BASE PLATE SIZE (In)	TRUSS DEFL ΔV (In)	DESIGN LOADS SHEAR V (Kips)	DESIGN LOADS TORSION T (K-ft)	DESIGN LOADS MOMENT M (K-ft)
14'	24	0.250	0.285	1 ½	8	29"	33 x 1½	1.6	8.42	119.01	134.48
15'	↓	↓	0.327	↓	↓	↓	↓	1.6	8.44	↓	141.90
16'			0.372					1.7	8.46		149.44
17'			0.420					1.8	8.48		157.10
18'			0.471					1.9	8.50		164.85
19'			0.524					2.0	8.52		172.68
20'			0.581	↓		↓	↓	2.1	8.54		180.60
21'			0.641	1 ½		29"	33 x 1½	2.2	8.56		188.59
22'			0.703	1 ¾		29 ¾"	33¾x1½	2.2	8.58		196.65
23'			0.768	↓		↓	33¾x1½	2.3	8.60		204.76
24'			0.837				33¾x1⅞	2.4	8.62		212.93
25'		↓	0.908				33¾x1⅞	2.5	8.64		221.15
26'		0.250	0.982				33¾x1⅞	2.6	8.66		229.42
27'		0.281	0.949				33¾x1¾	2.4	8.67		237.74
28'		↓	1.021	↓		↓	33¾x1¾	2.5	8.69		246.10
29'			1.095	1 ¾		29 ⅝"	33¾x1¾	2.6	8.71		254.49
30'			1.172	2		29 ¾"	34½x1¾	2.7	8.73		262.93
31'	↓	↓	1.251	2	↓	29 ¾"	34½x1¾	2.8	8.75	↓	271.41
32'	24	0.281	1.333	2	8	29 ¾"	34½x1¾	2.8	8.77	119.01	279.92

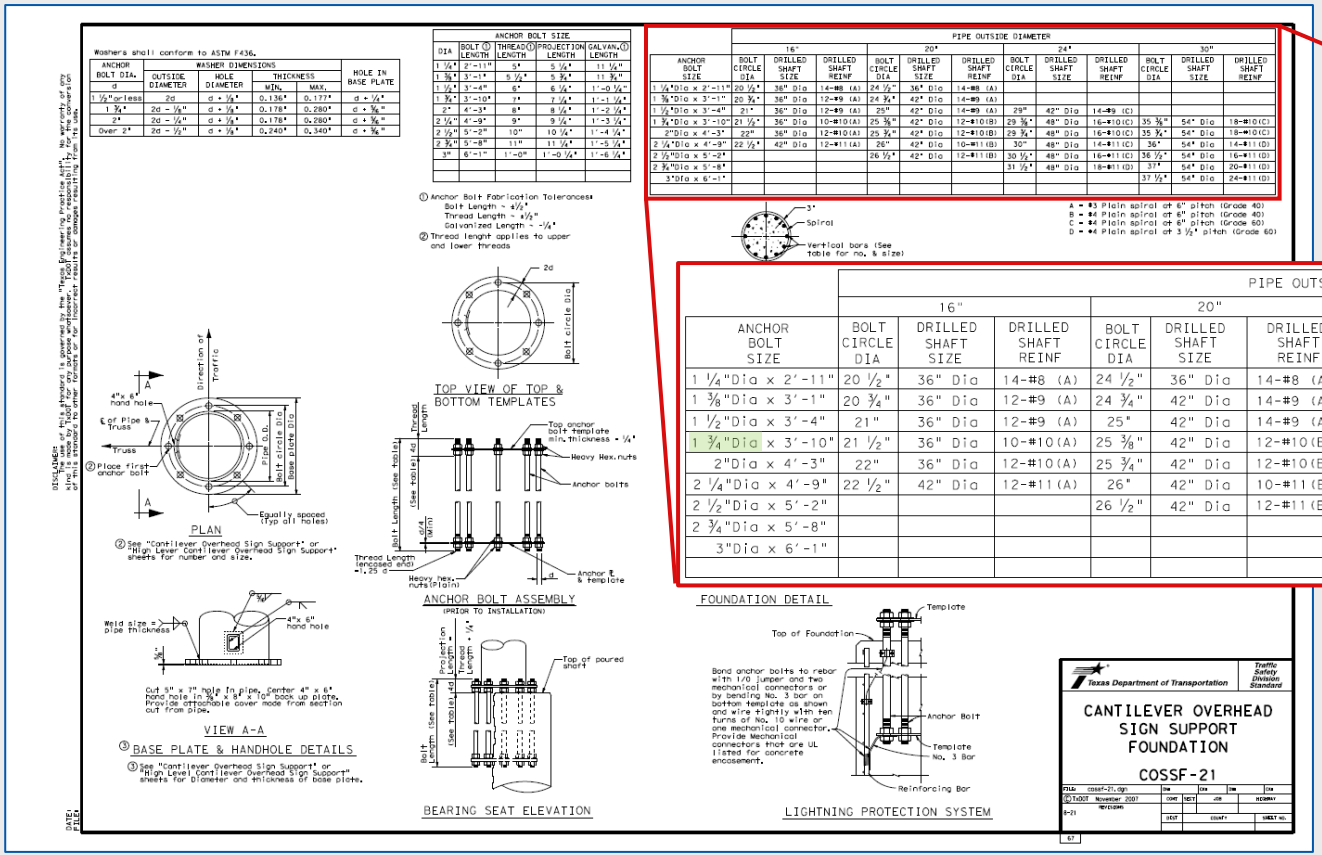
ZONE 4 WITH AND WITHOUT

TRUSS

ELEVATION
(SHOWING DESIGN LOADS AND DEAD LOAD DEFLECTIONS)

CANTILEVER OVERHEAD SIGN SUPPORTS

COSS-Z4 & Z4I-10



Washers shall conform to ASTM F436.

ANCHOR BOLT DIA. d	WASHER DIMENSIONS OUTSIDE DIAMETER	HOLE DIAMETER	THICKNESS MIN.	THICKNESS MAX.	HOLE IN BASE PLATE
1 ½"orless	2d	d + ⅛"	0.136"	0.177"	d + ¼"
1 ¾"	2d - ½"	d + ⅛"	0.178"	0.280"	d + ⅜"
2"	2d - ½"	d + ⅛"	0.178"	0.280"	d + ⅜"
Over 2"	2d - ½"	d + ⅛"	0.240"	0.340"	d + ⅜"

DIA	ANCHOR BOLT SIZE BOLT ① LENGTH	THREAD② LENGTH	PROJECTION LENGTH	GALVAN.③ LENGTH
1 ¼"	2'-11"	5"	5 ¼"	11 ½"
1 ⅜"	3'-1"	5 ½"	5 ¾"	11 ¾"
1 ½"	3'-4"	6"	6 ¼"	1'-0 ¼"
1 ¾"	3'-10"	7"	7 ¼"	1'-1 ¼"
2"	4'-3"	8"	8 ¼"	1'-2 ¼"
2 ¼"	4'-9"	9"	9 ¼"	1'-3 ¼"
2 ½"	5'-2"	10"	10 ¼"	1'-4 ¼"
2 ¾"	5'-8"	11"	11 ¼"	1'-5 ¼"
3"	6'-1"	1'-0"	1'-0 ¼"	1'-6 ¼"

① Anchor Bolt Fabrication Tolerances
Bolt Length = ±½"
Thread Length = ±½"
Galvanized Length = -¼"

② Thread lenght applies to upper and lower threads

ANCHOR BOLT SIZE	PIPE OUTSIDE DIAMETER 16" BOLT CIRCLE DIA	16" DRILLED SHAFT SIZE	16" DRILLED SHAFT REINF	20" BOLT CIRCLE DIA	20" DRILLED SHAFT SIZE	20" DRILLED SHAFT REINF	24" BOLT CIRCLE DIA	24" DRILLED SHAFT SIZE	24" DRILLED SHAFT REINF	30" BOLT CIRCLE DIA	30" DRILLED SHAFT SIZE	30" DRILLED SHAFT REINF
1 ¼"Dia x 2'-11"	20 ½"	36" Dia	14-#8 (A)	24 ½"	36" Dia	14-#8 (A)						
1 ⅜"Dia x 3'-1"	20 ¾"	36" Dia	12-#9 (A)	24 ¾"	42" Dia	14-#9 (A)						
1 ½"Dia x 3'-4"	21"	36" Dia	12-#9 (A)	25"	42" Dia	14-#9 (A)	29"	42" Dia	14-#9 (C)			
1 ¾"Dia x 3'-10"	21 ½"	36" Dia	10-#10(A)	25 ⅜"	42" Dia	12-#10(B)	29 ⅜"	48" Dia	16-#10(C)	35 ⅜"	54" Dia	18-#10(C)
2"Dia x 4'-3"	22"	36" Dia	12-#10(A)	25 ¾"	42" Dia	12-#10(B)	29 ¾"	48" Dia	16-#10(C)	35 ¾"	54" Dia	18-#10(C)
2 ¼"Dia x 4'-9"	22 ½"	42" Dia	12-#11(A)	26"	42" Dia	10-#11(B)	30"	48" Dia	14-#11(C)	36"	54" Dia	14-#11(D)
2 ½"Dia x 5'-2"				26 ½"	42" Dia	12-#11(B)	30 ½"	48" Dia	16-#11(C)	36 ½"	54" Dia	16-#11(D)
2 ¾"Dia x 5'-8"							31 ½"	48" Dia	18-#11(D)	37"	54" Dia	20-#11(D)
3"Dia x 6'-1"										37 ½"	54" Dia	24-#11(D)

A = #3 Plain spiral at 6" pitch (Grade 40)
B = #4 Plain spiral at 6" pitch (Grade 40)
C = #4 Plain spiral at 6" pitch (Grade 60)
D = #4 Plain spiral at 3 ½" pitch (Grade 60)

3" Spiral
Vertical bars (See table for no. & size)

ANCHOR BOLT SIZE	PIPE OUTSIDE DIAMETER 16" BOLT CIRCLE DIA	16" DRILLED SHAFT SIZE	16" DRILLED SHAFT REINF	20" BOLT CIRCLE DIA	20" DRILLED SHAFT SIZE	20" DRILLED SHAFT REINF	24" BOLT CIRCLE DIA	24" DRILLED SHAFT SIZE	24" DRILLED SHAFT REINF	30" BOLT CIRCLE DIA	30" DRILLED SHAFT SIZE	30" DRILLED SHAFT REINF
1 ¼"Dia x 2'-11"	20 ½"	36" Dia	14-#8 (A)	24 ½"	36" Dia	14-#8 (A)						
1 ⅜"Dia x 3'-1"	20 ¾"	36" Dia	12-#9 (A)	24 ¾"	42" Dia	14-#9 (A)						
1 ½"Dia x 3'-4"	21"	36" Dia	12-#9 (A)	25"	42" Dia	14-#9 (A)	29"	42" Dia	14-#9 (C)			
1 ¾"Dia x 3'-10"	21 ½"	36" Dia	10-#10(A)	25 ⅜"	42" Dia	12-#10(B)	29 ⅜"	48" Dia	16-#10(C)	35 ⅜"	54" Dia	18-#10(C)
2"Dia x 4'-3"	22"	36" Dia	12-#10(A)	25 ¾"	42" Dia	12-#10(B)	29 ¾"	48" Dia	16-#10(C)	35 ¾"	54" Dia	18-#10(C)
2 ¼"Dia x 4'-9"	22 ½"	42" Dia	12-#11(A)	26"	42" Dia	10-#11(B)	30"	48" Dia	14-#11(C)	36"	54" Dia	14-#11(D)
2 ½"Dia x 5'-2"				26 ½"	42" Dia	12-#11(B)	30 ½"	48" Dia	16-#11(C)	36 ½"	54" Dia	16-#11(D)
2 ¾"Dia x 5'-8"							31 ½"	48" Dia	18-#11(D)	37"	54" Dia	20-#11(D)
3"Dia x 6'-1"										37 ½"	54" Dia	24-#11(D)

TOP VIEW OF TOP & BOTTOM TEMPLATES

PLAN

② See "Cantilever Overhead Sign Support" or "High Level Cantilever Overhead Sign Support" sheets for number and size.

ANCHOR BOLT ASSEMBLY (PRIOR TO INSTALLATION)

Cut 8" x 7" hole in pipe, Center 4" x 6" hand hole in ⅜" x 8" x 10" back up plate. Provide attachable cover made from section cut from pipe.

VIEW A-A

③ BASE PLATE & HANDHOLE DETAILS

③ See "Cantilever Overhead Sign Support" or "High Level Cantilever Overhead Sign Support" sheets for diameter and thickness of base plate.

BEARING SEAT ELEVATION

FOUNDATION DETAIL

Bond anchor bolts to rebar with 1/0 jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Provide Mechanical connectors that are UL listed for concrete encasement.

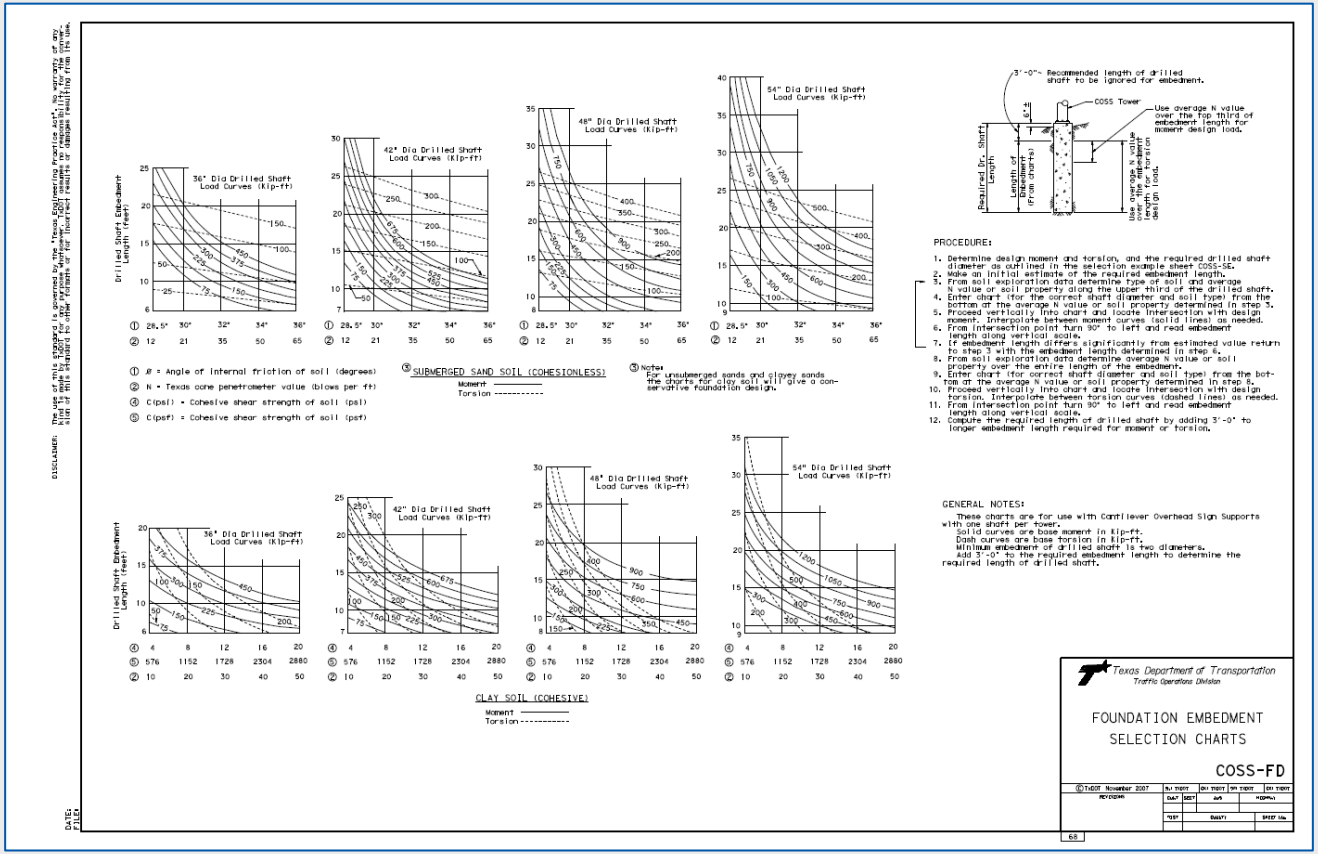
LIGHTNING PROTECTION SYSTEM

Texas Department of Transportation — Traffic Safety Division Standard

CANTILEVER OVERHEAD SIGN SUPPORT FOUNDATION

COSSF-21

FILE: cossf-21.dgn	DN:	CK:	DW:	CK:
©TxDOT November 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-21	DIST	COUNTY		SHEET NO.


DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the Texas Department of Transportation for any purpose whatsoever. The Department assumes no responsibility and shall not be liable for any damages resulting from the reuse of this standard or for incorrect results or damages resulting from its use.
DATE:
FILE:
36" Dia Drilled Shaft Load Curves (Kip-ft)
42" Dia Drilled Shaft Load Curves (Kip-ft)
48" Dia Drilled Shaft Load Curves (Kip-ft)
54" Dia Drilled Shaft Load Curves (Kip-ft)
Drilled Shaft Embedment Length (feet)
① ϕ = Angle of internal friction of soil (degrees)
② N = Texas cone penetrometer value (blows per ft)
④ C(psi) = Cohesive shear strength of soil (psi)
⑤ C(psf) = Cohesive shear strength of soil (psf)
③ SUBMERGED SAND SOIL (COHESIONLESS)
Moment
Torsion
③ Note: For unsubmerged sands and clayey sands the charts for clay soil will give a conservative foundation design.
CLAY SOIL (COHESIVE)
3'-0"~ Recommended length of drilled shaft to be ignored for embedment.
COSS Tower
Use average N value over the top third of embedment length for moment design load.
Required Dr. Shaft Length
Length of Embedment (from chart)
Use average N value over the bottom third of embedment length for torsion design load.
PROCEDURE:
1. Determine design moment and torsion, and the required drilled shaft diameter as outlined in the selection example sheet COSS-SE.
2. Make an initial estimate of the required embedment length.
3. From soil exploration data determine type of soil and average N value or soil property along the upper third of the drilled shaft.
4. Enter chart (for the correct shaft diameter and soil type) from the bottom at the average N value or soil property determined in step 3.
5. Proceed vertically into chart and locate intersection with design moment. Interpolate between moment curves (solid lines) as needed.
6. From intersection point turn 90° to left and read embedment length along vertical scale.
7. If embedment length differs significantly from estimated value return to step 3 with the embedment length determined in step 6.
8. From soil exploration data determine average N value or soil property over the entire length of the embedment.
9. Enter chart (for correct shaft diameter and soil type) from the bottom at the average N value or soil property determined in step 8.
10. Proceed vertically into chart and locate intersection with design torsion. Interpolate between torsion curves (dashed lines) as needed.
11. From intersection point turn 90° to left and read embedment length along vertical scale.
12. Compute the required length of drilled shaft by adding 3'-0" to longer embedment length required for moment or torsion.
GENERAL NOTES:
These charts are for use with Cantilever Overhead Sign Supports with one shaft per tower.
Solid curves are base moment in Kip-ft.
Dash curves are base torsion in Kip-ft.
Minimum embedment of drilled shaft is two diameters.
Add 3'-0" to the required embedment length to determine the required length of drilled shaft.
Texas Department of Transportation
Traffic Operations Division
FOUNDATION EMBEDMENT SELECTION CHARTS
COSS-FD
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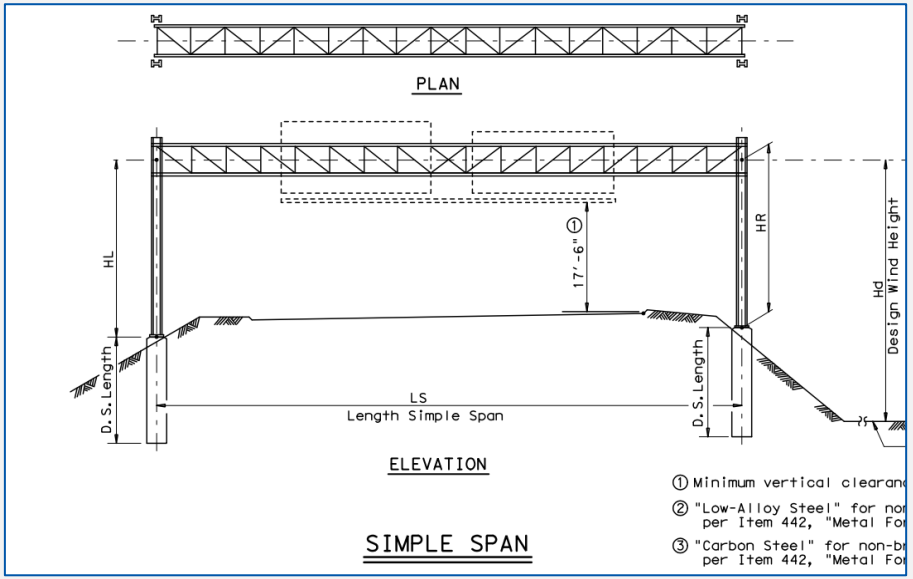
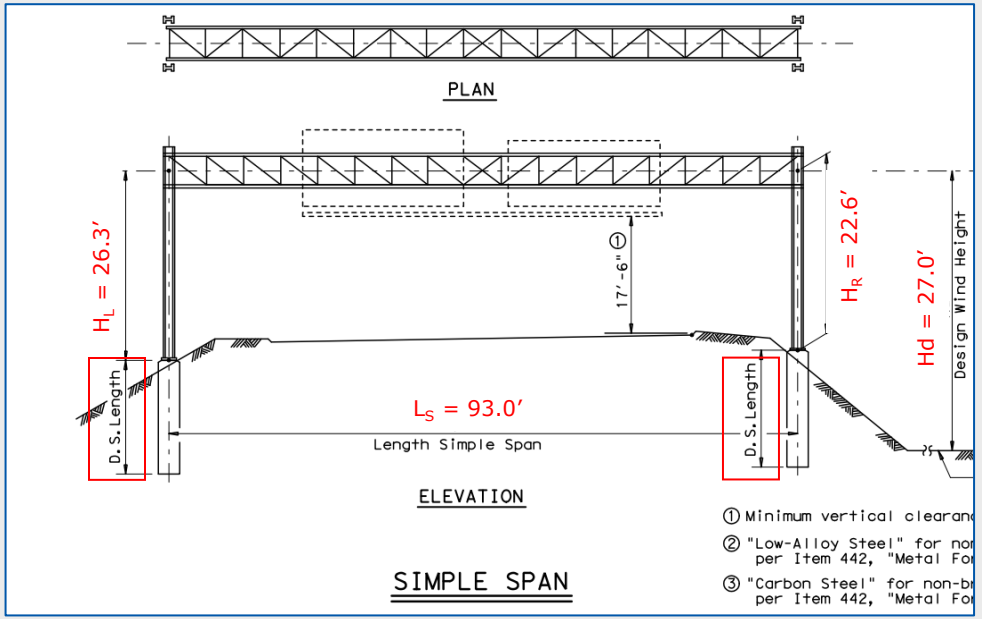
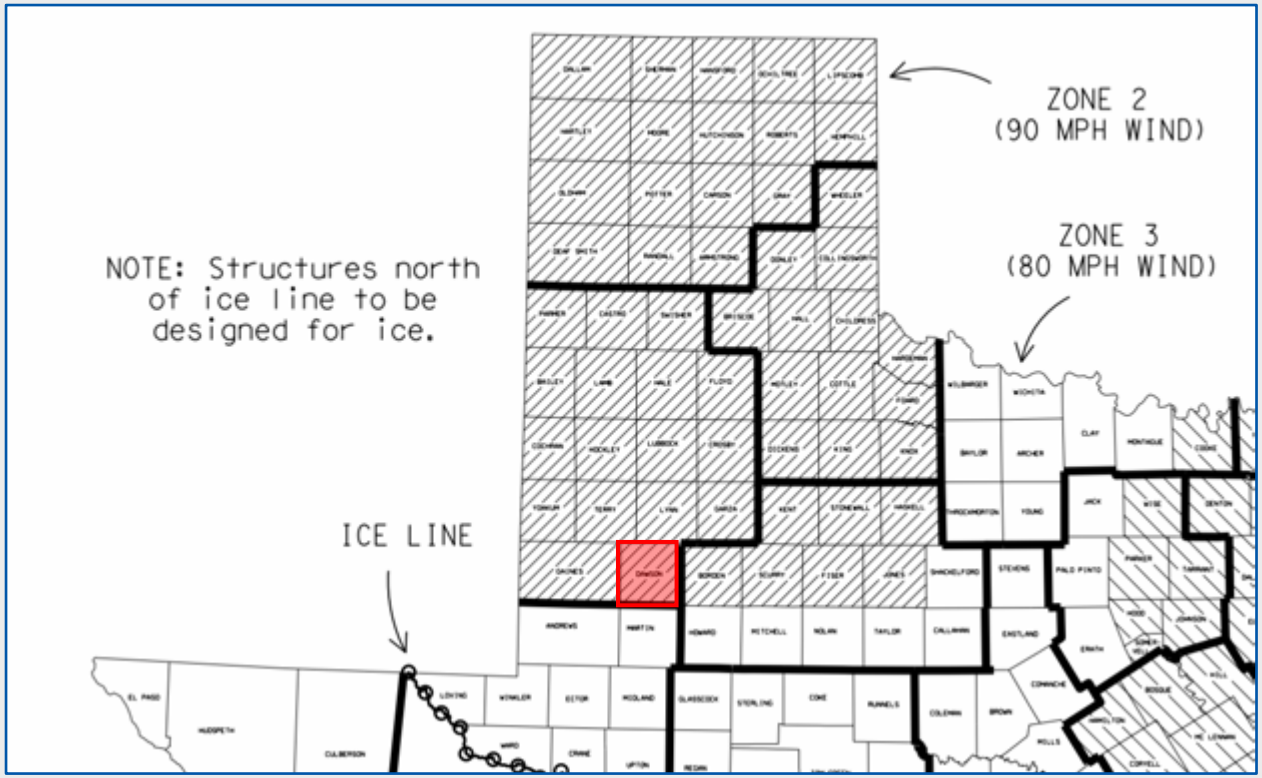
Overhead Sign Bridges (OSB)



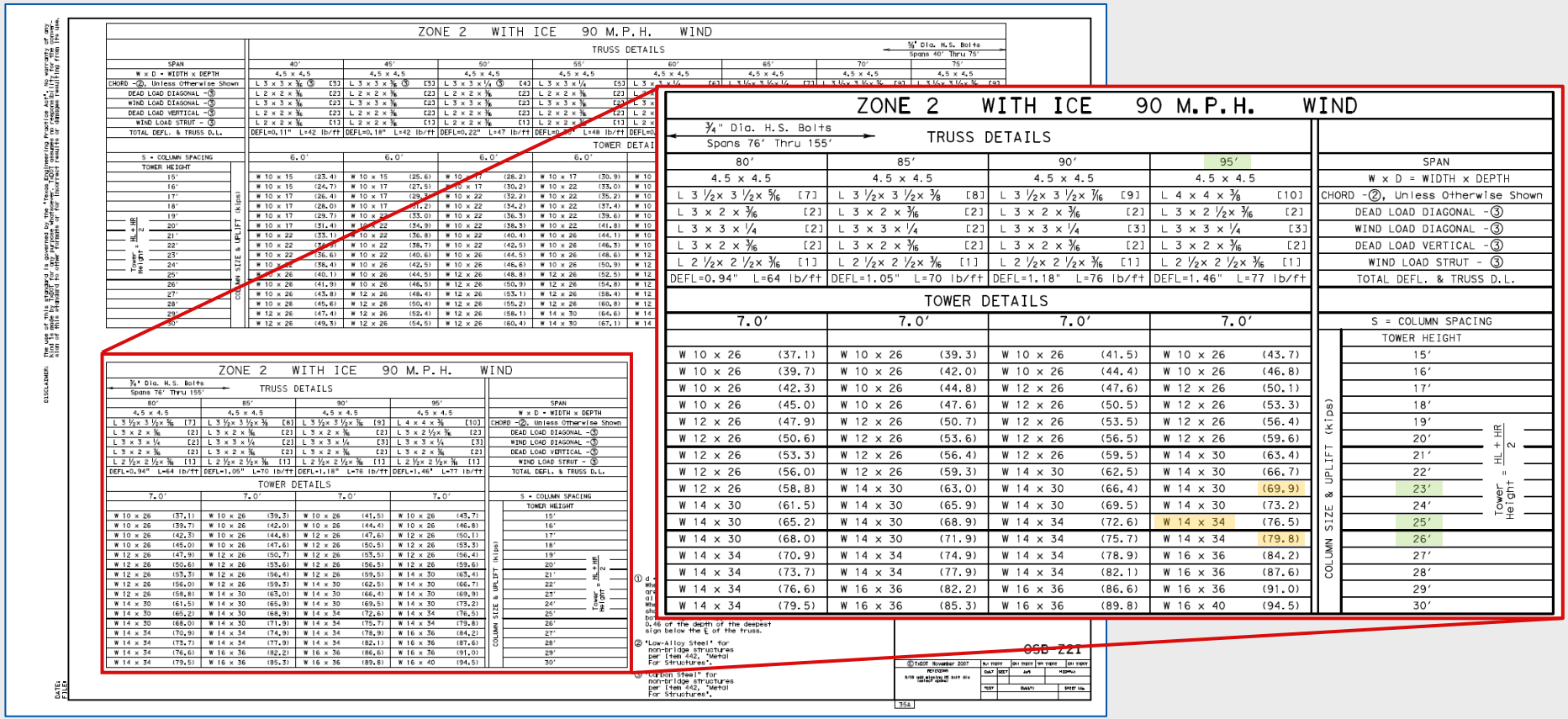
Overhead Sign Bridges (OSB)

- Given:
  - Span, L_S = 93.0’
  - Left Tower Height, H_L = 26.3’
  - Right Tower Height, H_R = 22.6’
  - Design Wind Height, H_d = 27.0’
  - N = 20
  - Dawson County





- Zone 2
- 90 mph
- Design Height, Hd = 27.0’
  ↓
  Standard: OSB-Z2I



ZONE 2 WITH ICE 90 M.P.H. WIND

¾" Dia. H.S. Bolts
Spans 76' Thru 155'

TRUSS DETAILS

SPAN	80'	85'	90'	95'
W x D = WIDTH x DEPTH	4.5 x 4.5	4.5 x 4.5	4.5 x 4.5	4.5 x 4.5
CHORD -②, Unless Otherwise Shown	L 3 ½x 3 ½x 5/16 [7]	L 3 ½x 3 ½x 3/8 [8]	L 3 ½x 3 ½x 7/16 [9]	L 4 x 4 x 3/8 [10]
DEAD LOAD DIAGONAL -③	L 3 x 2 x 3/16 [2]	L 3 x 2 x 3/16 [2]	L 3 x 2 x 3/16 [2]	L 3 x 2 ½x 3/16 [2]
WIND LOAD DIAGONAL -③	L 3 x 3 x ¼ [2]	L 3 x 3 x ¼ [2]	L 3 x 3 x ¼ [3]	L 3 x 3 x ¼ [3]
DEAD LOAD VERTICAL -③	L 3 x 2 x 3/16 [2]	L 3 x 2 x 3/16 [2]	L 3 x 2 x 3/16 [2]	L 3 x 2 x 3/16 [2]
WIND LOAD STRUT - ③	L 2 ½x 2 ½x 3/16 [1]	L 2 ½x 2 ½x 3/16 [1]	L 2 ½x 2 ½x 3/16 [1]	L 2 ½x 2 ½x 3/16 [1]
TOTAL DEFL. & TRUSS D.L.	DEFL=0.94" L=64 lb/ft	DEFL=1.05" L=70 lb/ft	DEFL=1.18" L=76 lb/ft	DEFL=1.46" L=77 lb/ft

TOWER DETAILS

S = COLUMN SPACING / TOWER HEIGHT	7.0'	7.0'	7.0'	7.0'
15'	W 10 x 26 (37.1)	W 10 x 26 (39.3)	W 10 x 26 (41.5)	W 10 x 26 (43.7)
16'	W 10 x 26 (39.7)	W 10 x 26 (42.0)	W 10 x 26 (44.4)	W 10 x 26 (46.8)
17'	W 10 x 26 (42.3)	W 10 x 26 (44.8)	W 12 x 26 (47.6)	W 12 x 26 (50.1)
18'	W 10 x 26 (45.0)	W 10 x 26 (47.6)	W 12 x 26 (50.5)	W 12 x 26 (53.3)
19'	W 12 x 26 (47.9)	W 12 x 26 (50.7)	W 12 x 26 (53.5)	W 12 x 26 (56.4)
20'	W 12 x 26 (50.6)	W 12 x 26 (53.6)	W 12 x 26 (56.5)	W 12 x 26 (59.6)
21'	W 12 x 26 (53.3)	W 12 x 26 (56.4)	W 12 x 26 (59.5)	W 14 x 30 (63.4)
22'	W 12 x 26 (56.0)	W 12 x 26 (59.3)	W 14 x 30 (62.5)	W 14 x 30 (66.7)
23'	W 12 x 26 (58.8)	W 14 x 30 (63.0)	W 14 x 30 (66.4)	W 14 x 30 (69.9)
24'	W 14 x 30 (61.5)	W 14 x 30 (65.9)	W 14 x 30 (69.5)	W 14 x 30 (73.2)
25'	W 14 x 30 (65.2)	W 14 x 30 (68.9)	W 14 x 34 (72.6)	W 14 x 34 (76.5)
26'	W 14 x 30 (68.0)	W 14 x 30 (71.9)	W 14 x 34 (75.7)	W 14 x 34 (79.8)
27'	W 14 x 34 (70.9)	W 14 x 34 (74.9)	W 14 x 34 (78.9)	W 16 x 36 (84.2)
28'	W 14 x 34 (73.7)	W 14 x 34 (77.9)	W 14 x 34 (82.1)	W 16 x 36 (87.6)
29'	W 14 x 34 (76.6)	W 16 x 36 (82.2)	W 16 x 36 (86.6)	W 16 x 36 (91.0)
30'	W 14 x 34 (79.5)	W 16 x 36 (85.3)	W 16 x 36 (89.8)	W 16 x 40 (94.5)

COLUMN SIZE & UPLIFT (kips)

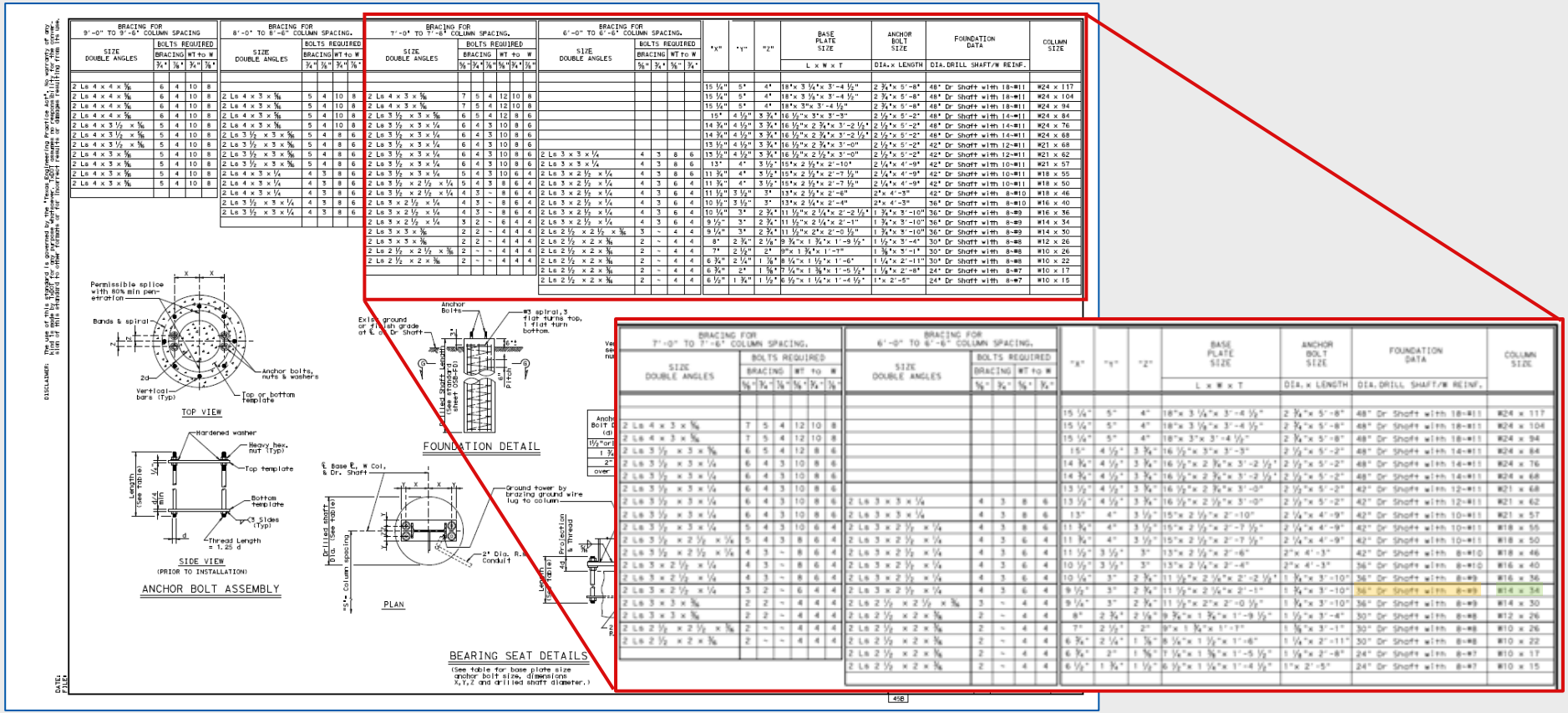
Tower Height = (HL + HR)/2

① d... where... all... where... horizontal... 0.46 of the depth of the deepest sign below the ℄ of the truss.

② "Low-Alloy Steel" per Item 442, "Metal For Structures".

③ "Carbon Steel" for non-bridge structures per Item 442, "Metal For Structures".

OSD 221



BRACING FOR 9'-0" TO 9'-6" COLUMN SPACING

SIZE DOUBLE ANGLES	BOLTS REQUIRED BRACING ¾"	BRACING ⅞"	WT to W ¾"	WT to W ⅞"
2 Ls 4 x 4 x ⅜	6	4	10	8
2 Ls 4 x 4 x ½	6	4	10	8
2 Ls 4 x 4 x ⅝	6	4	10	8
2 Ls 4 x 4 x ¾	6	4	10	8
2 Ls 4 x 3 ½ x ⅜	5	4	10	8
2 Ls 4 x 3 ½ x ½	5	4	10	8
2 Ls 4 x 3 ½ x ⅝	5	4	10	8
2 Ls 4 x 3 ½ x ¾	5	4	10	8
2 Ls 4 x 3 x ⅜	5	4	10	8
2 Ls 4 x 3 x ½	5	4	10	8
2 Ls 4 x 3 x ⅝	5	4	10	8
2 Ls 4 x 3 x ¾	5	4	10	8

BRACING FOR 8'-0" TO 8'-6" COLUMN SPACING.

SIZE DOUBLE ANGLES	BOLTS REQUIRED BRACING ¾"	BRACING ⅞"	WT to W ¾"	WT to W ⅞"
2 Ls 4 x 3 x ⅜	5	4	10	8
2 Ls 4 x 3 x ½	5	4	10	8
2 Ls 4 x 3 x ⅝	5	4	10	8
2 Ls 3 ½ x 3 x ⅜	5	4	8	6
2 Ls 3 ½ x 3 x ½	5	4	8	6
2 Ls 3 ½ x 3 x ⅝	5	4	8	6
2 Ls 3 ½ x 3 x ¾	5	4	8	6
2 Ls 4 x 3 x ¼	4	3	8	6
2 Ls 4 x 3 x ¼	4	3	8	6
2 Ls 3 ½ x 3 x ¼	4	3	8	6

BRACING FOR 7'-0" TO 7'-6" COLUMN SPACING.

SIZE DOUBLE ANGLES	BOLTS REQUIRED BRACING ⅝"	BRACING ¾"	WT to W ⅝"	WT to W ¾"	WT to W ⅞"
2 Ls 4 x 3 x ⅜	7	5	4	12	10
2 Ls 4 x 3 x ½	7	5	4	12	10
2 Ls 4 x 3 x ⅝	6	5	4	12	8
2 Ls 3 ½ x 3 x ⅜	6	4	3	10	8
2 Ls 3 ½ x 3 x ½	6	4	3	10	8
2 Ls 3 ½ x 3 x ⅝	6	4	3	10	8
2 Ls 3 ½ x 3 x ¾	6	4	3	10	8
2 Ls 3 ½ x 2 ½ x ¼	5	4	3	8	6
2 Ls 3 ½ x 2 ½ x ¼	4	3	~	8	6
2 Ls 3 x 2 ½ x ¼	4	3	~	8	6
2 Ls 3 x 3 x ⅜	2	2	~	4	4
2 Ls 3 x 3 x ½	2	2	~	4	4
2 Ls 2 ½ x 2 ½ x ⅜	2	~	~	4	4
2 Ls 2 ½ x 2 x ⅜	2	~	~	4	4

BRACING FOR 6'-0" TO 6'-6" COLUMN SPACING.

SIZE DOUBLE ANGLES	BOLTS REQUIRED BRACING ⅝"	BRACING ¾"	WT to W ⅝"	WT to W ¾"
2 Ls 3 x 3 x ¼	4	3	8	6
2 Ls 3 x 3 x ¼	4	3	8	6
2 Ls 3 x 2 ½ x ¼	4	3	6	4
2 Ls 3 x 2 ½ x ¼	4	3	6	4
2 Ls 3 x 2 ½ x ¼	4	3	6	4
2 Ls 3 x 2 ½ x ¼	4	3	6	4
2 Ls 2 ½ x 2 ½ x ⅜	3	~	4	4
2 Ls 2 ½ x 2 x ⅜	2	~	4	4
2 Ls 2 ½ x 2 x ⅜	2	~	4	4
2 Ls 2 ½ x 2 x ⅜	2	~	4	4
2 Ls 2 ½ x 2 x ⅜	2	~	4	4

"X"	"Y"	"Z"	BASE PLATE SIZE L x W x T	ANCHOR BOLT SIZE DIA. x LENGTH	FOUNDATION DATA DIA. DRILL SHAFT/W REINF.	COLUMN SIZE
15 ¼"	5"	4"	18" x 3 ¼" x 3'-4 ½"	2 ¾" x 5'-8"	48" Dr Shaft with 18-#11	#24 x 117
15 ¼"	5"	4"	18" x 3 ½" x 3'-4 ½"	2 ¾" x 5'-8"	48" Dr Shaft with 18-#11	#24 x 104
15 ¼"	5"	4"	18" x 3" x 3'-4 ½"	2 ¾" x 5'-8"	48" Dr Shaft with 18-#11	#24 x 94
15"	4 ½"	3 ¾"	16 ½" x 3" x 3'-3"	2 ½" x 5'-2"	48" Dr Shaft with 14-#11	#24 x 84
14 ¾"	4 ½"	3 ¾"	16 ½" x 2 ¾" x 3'-2 ½"	2 ½" x 5'-2"	48" Dr Shaft with 14-#11	#24 x 76
14 ¾"	4 ½"	3 ¾"	16 ½" x 2 ¾" x 3'-2 ½"	2 ½" x 5'-2"	48" Dr Shaft with 14-#11	#24 x 68
13 ½"	4 ½"	3 ¾"	16 ½" x 2 ¾" x 3'-0"	2 ½" x 5'-2"	42" Dr Shaft with 12-#11	#21 x 68
13 ½"	4 ½"	3 ¾"	16 ½" x 2 ½" x 3'-0"	2 ½" x 5'-2"	42" Dr Shaft with 12-#11	#21 x 62
13"	4"	3 ½"	15" x 2 ½" x 2'-10"	2 ¼" x 4'-9"	42" Dr Shaft with 10-#11	#21 x 57
11 ¾"	4"	3 ½"	15" x 2 ½" x 2'-7 ½"	2 ¼" x 4'-9"	42" Dr Shaft with 10-#11	#18 x 55
11 ¾"	4"	3 ½"	15" x 2 ½" x 2'-7 ½"	2 ¼" x 4'-9"	42" Dr Shaft with 10-#11	#18 x 50
11 ¼"	3 ½"	3"	13" x 2 ½" x 2'-6"	2" x 4'-3"	42" Dr Shaft with 8-#10	#18 x 46
10 ½"	3 ½"	3"	13" x 2 ¼" x 2'-4"	2" x 4'-3"	36" Dr Shaft with 8-#10	#16 x 40
10 ¼"	3"	2 ¾"	11 ½" x 2 ¼" x 2'-2 ½"	1 ¾" x 3'-10"	36" Dr Shaft with 8-#9	#16 x 36
9 ½"	3"	2 ¾"	11 ½" x 2 ¼" x 2'-1"	1 ¾" x 3'-10"	36" Dr Shaft with 8-#9	#14 x 34
9 ¼"	3"	2 ¾"	11 ½" x 2" x 2'-0 ½"	1 ¾" x 3'-10"	36" Dr Shaft with 8-#9	#14 x 30
8"	2 ¾"	2 ½"	9 ¾" x 1 ¾" x 1'-9 ½"	1 ½" x 5'-4"	30" Dr Shaft with 8-#8	#12 x 26
7"	2 ½"	2"	9" x 1 ¾" x 1'-7"	1 ⅜" x 5'-1"	30" Dr Shaft with 8-#8	#10 x 26
6 ¾"	2 ¼"	1 ⅞"	8 ¼" x 1 ½" x 1'-6"	1 ¼" x 2'-11"	30" Dr Shaft with 8-#8	#10 x 22
6 ¾"	2"	1 ⅝"	7 ¼" x 1 ⅜" x 1'-5 ½"	1 ¼" x 2'-8"	24" Dr Shaft with 8-#7	#10 x 17
6 ½"	1 ¾"	1 ½"	6 ½" x 1 ¼" x 1'-4 ½"	1" x 2'-5"	24" Dr Shaft with 8-#7	#10 x 15

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the Texas Department of Transportation for any purpose whatsoever. TxDOT assumes no responsibility for the completeness of this standard or for other formats or media derived from it.

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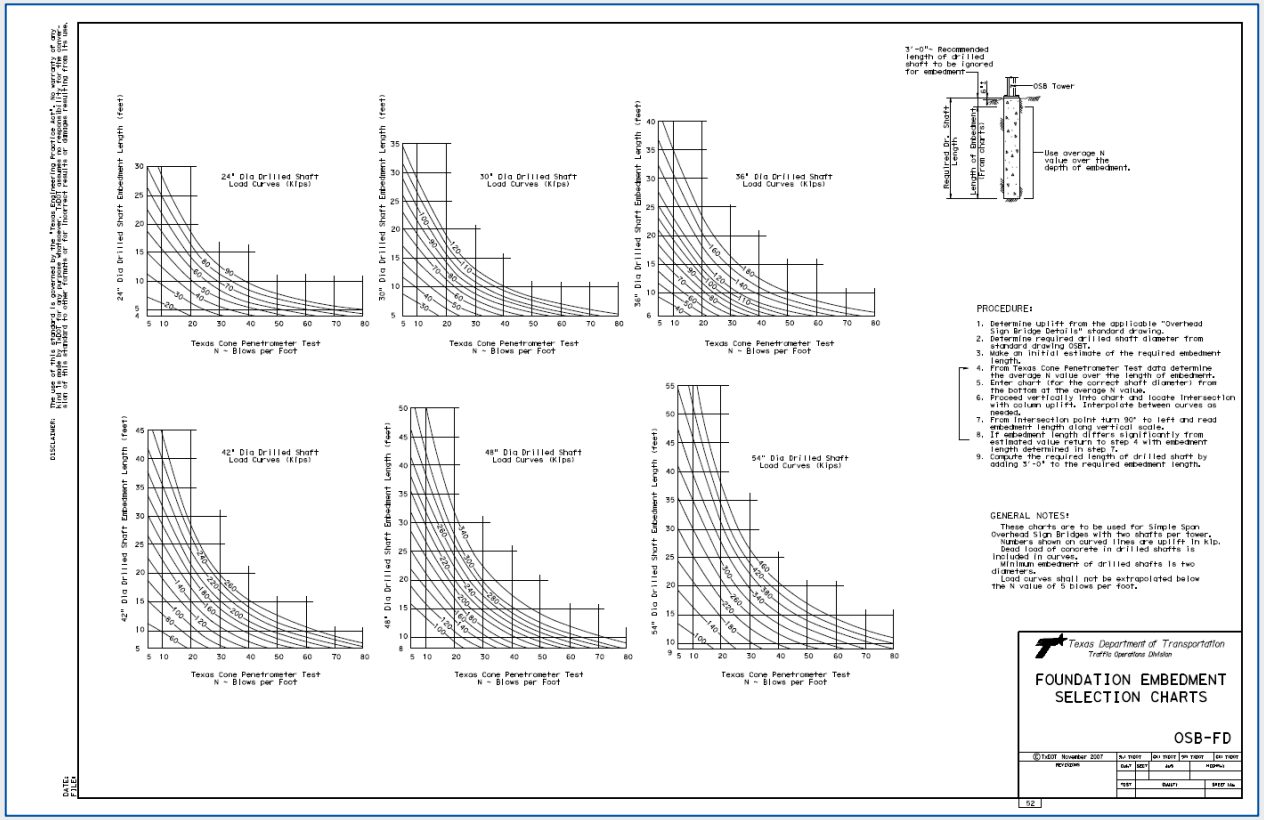
FILE:

458


24" Dia Drilled Shaft Load Curves (Kips)
30" Dia Drilled Shaft Load Curves (Kips)
36" Dia Drilled Shaft Load Curves (Kips)
42" Dia Drilled Shaft Load Curves (Kips)
48" Dia Drilled Shaft Load Curves (Kips)
54" Dia Drilled Shaft Load Curves (Kips)
Texas Cone Penetrometer Test N - Blows per Foot
3'-0"± Recommended length of drilled shaft to be ignored for embedment
OSB Tower
Required Dr. Shaft Length
Length of Embedment from Charts
Use average N value over the depth of embedment.
PROCEDURE:
1. Determine uplift from the applicable "Overhead Sign Bridge Details" standard drawing.
2. Determine required drilled shaft diameter from standard drawing OSBT.
3. Make an initial estimate of the required embedment length.
4. From Texas Cone Penetrometer Test data determine the average N value over the length of embedment.
5. Enter chart (for the correct shaft diameter) from the bottom at the average N value.
6. Proceed vertically into chart and locate intersection with column uplift. Interpolate between curves as needed.
7. From intersection point turn 90° to left and read embedment length along vertical scale.
8. If embedment length differs significantly from estimated value return to step 4 with embedment length determined in step 7.
9. Compute the required length of drilled shaft by adding 3'-0" to the required embedment length.
GENERAL NOTES:
These charts are to be used for Simple Span Overhead Sign Bridges with two shafts per tower.
Numbers shown on curved lines are uplift in kip.
Dead load of concrete in drilled shafts is included in curves.
Minimum embedment of drilled shafts is two diameters.
Load curves shall not be extrapolated below the N value of 5 blows per foot.
Texas Department of Transportation
Traffic Operations Division
FOUNDATION EMBEDMENT SELECTION CHARTS
OSB-FD
DISCLAIMER:
DATE:
FILE:

TxDOT Geotechnical Manual - LRFD

Appendix 2

Ancillary Structure Foundations

When using roadway and traffic standards developed for foundations from TCP information (COSS, High Mast Illumination Poles), use the following correlations (from *Touma and Reese, 1972*) from SPT values acquired in the drilled boring logs:

In Clay: $N_{TCP} = 1.5 * N_{SPT}$

In Sand: $N_{TCP} = 2.0 * N_{SPT}$

Where, N_{TCP} = equivalent TCP blow counts when using STP information

N_{SPT} = uncorrected blow counts from STP in-situ testing

These correlations apply to the standard foundation embedment selection charts regarding TCP information currently refenced in the standards.

Cantilever Overhead Sign Structures

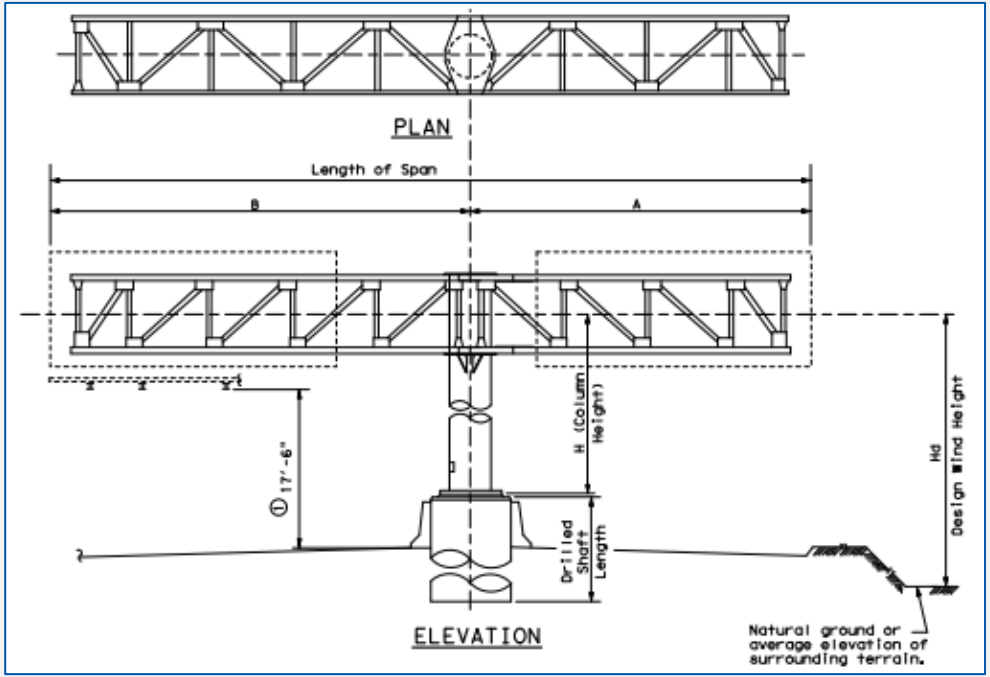
Design Parameters:	Code: LTS-3 (1994) Sign Height: 10 ft Sign Length: 100% of the span length from the centerline of the tower Sign Weight: 3 lb/ft^2 Sign Coefficient of Drag (Cd): 1.2 based on conventional sign Truss Self Weight: Weight of all truss members and gusset plates Truss Coefficient of drag (Cd): 2.85 for use with the projected area in the plane of wind loading Governing Wind Velocity & Ice Zones: WV & IZ-14
Notes:	Alternate Designs of pipe columns are permitted. The alternate design requirements shall be per Specification Item 650
Special Considerations:	The width of a truss member may be adjusted by up to ½ inch and/or the thickness by up to 1/16 inch due to member availability, assembly clearances, or other justifiable reasons as indicated in the shop drawings. These adjustments are only applicable to standard COSS and OSB designs. Any changes to the SZ Standard must be approved by the Engineer of Record.
	Standard Design does not account for DMS. Structures requiring DMS shall be designed, and a Signed and Sealed SZ provided in the Contract Plans.
	Minimum baseplate thickness is increased above the Code design requirement based on Fatigue research funded by TxDOT.
	Spans exceeding 40 feet are not covered on the standards and must be designed in accordance with AASHTO LTS-6 or LRFD-LTS specifications.

Overhead Sign Bridges

Design Parameters:	Code: LTS-3 (1994) Sign Height: 10 ft Sign Length: 75% of the span length from the centerline of the towers Sign Weight: 3 lb/ft^2 Sign Coefficient of Drag (Cd): 1.2 based on conventional sign Truss Self Weight: Weight of all truss members and gusset plates Truss Coefficient of drag (Cd): 2.85 for use with the projected area in the plane of wind loading Governing Wind Velocity & Ice Zones: WV & IZ-14
Notes:	Overhead Sign Bridge Towers is not permitted to deviate from the Standard Designs.
Special Considerations:	The width of a truss member may be adjusted by up to ½ inch and/or the thickness by up to 1/16 inch due to member availability, assembly clearances, or other justifiable reasons as indicated in the shop drawings. These adjustments are only applicable to standard COSS and OSB designs. Any changes to the SZ Standard must be approved by the Engineer of Record.
	Standard Design does not account for DMS. Structures requiring DMS shall be designed, and a Signed and Sealed SZ provided.
	Minimum baseplate thickness is increased above the Code design requirement based on Fatigue research funded by TxDOT.

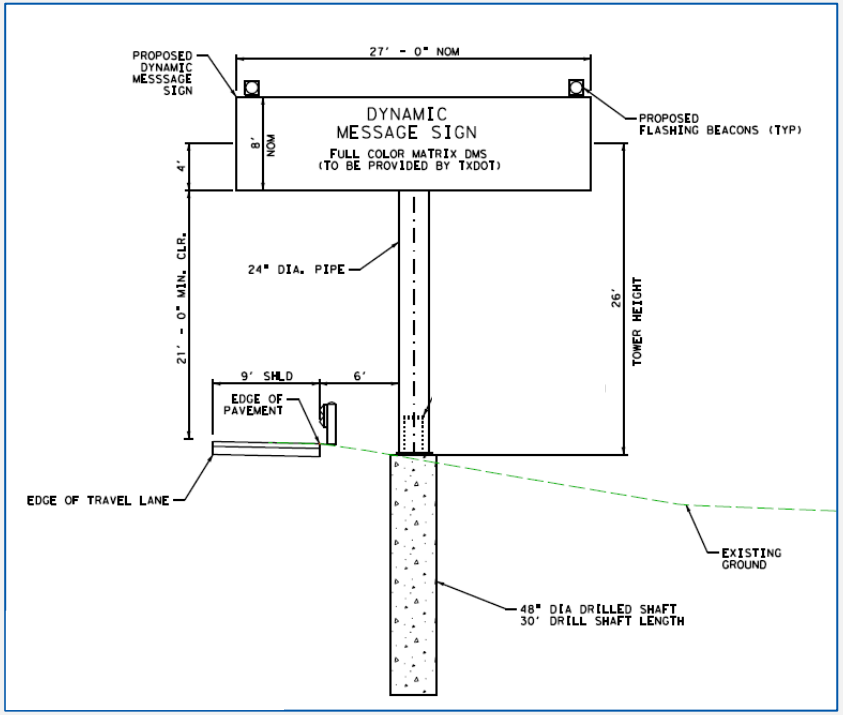
Double Cantilever

1. Select applicable COSS standard based on the location of the project and Design Wind Height. Note: If Design Wind Height is greater than 30’, it is recommended to increase the Wind Zone.
2. Determine tower details. Remember to round the total span length (Span A + Span B) up to the nearest tabulated value.
3. Determine truss details for Span A and **THEN** Span B.
4. Determine foundation details.
5. Determine drilled shaft length.



DMS

All COSS traffic standards are designed for conventional signs and does not account for a DMS.



1. Select applicable COSS standard based on the location of the project and Design Wind Height. Note: It recommended to increase the Wind Zone to account for increased loading from the DMS.
2. Determine tower details. Remember to round the total span length (Span A + Span B) up to the nearest tabulated value.
3. Determine truss details for Span A and Span B accounting for the full length of both cantilevers as one.
4. Determine foundation details.
5. Determine drilled shaft length.

DMS

- DMS Structures are special designs
  - Typically a higher wind zone is used to account for increased loading
  - e.g. using zone 3 design for a DMS in zone 4
- Drilled shaft diameter based on pipe diameter and bolt circle
- Drilled shaft embedment length based on soil conditions

ZONE 4 WITH AND WITHOUT ICE 70 MPH WIND

35' SPAN

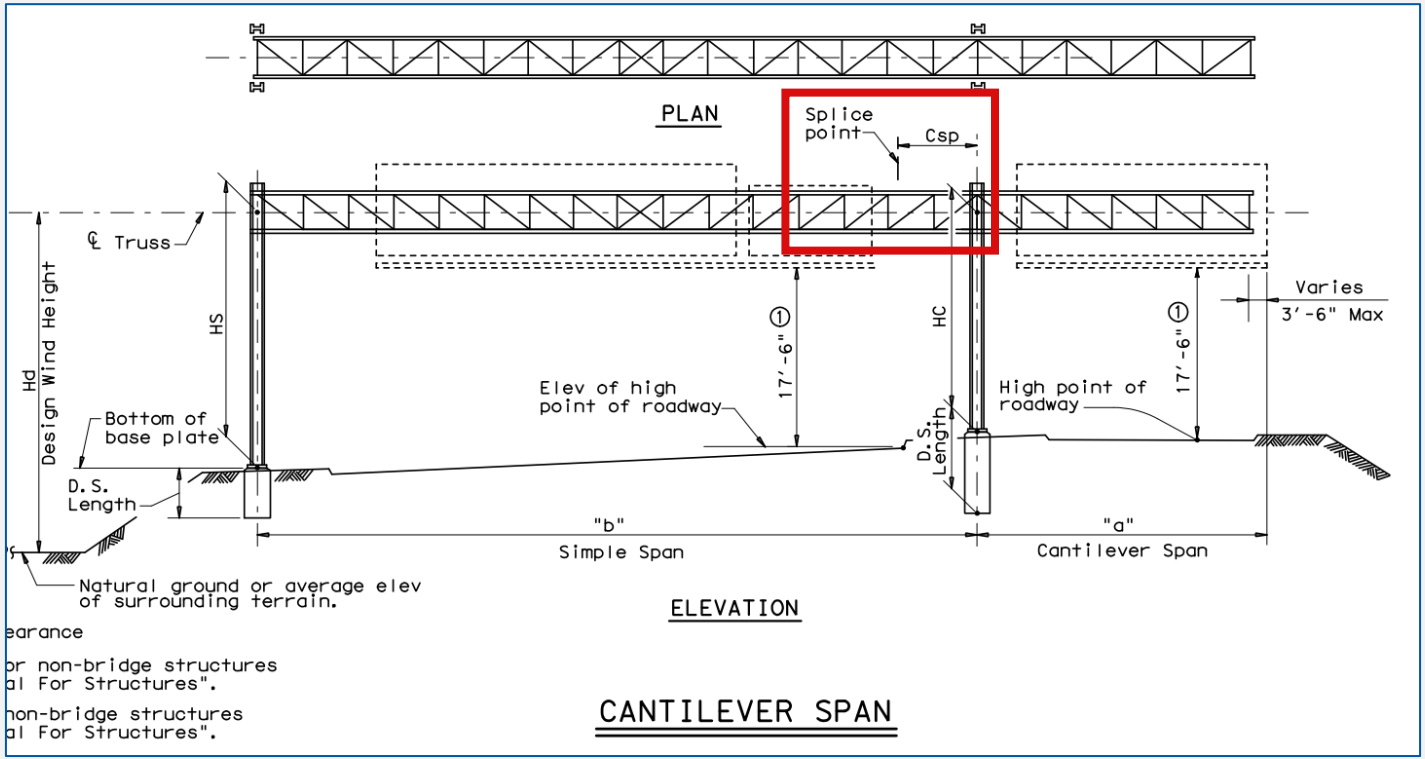
SIGN LOADS		TOWER PIPE			ANCHOR BOLTS			BASE PLATE	TRUSS	DESIGN LOADS				TOWER PIP		
TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	
119.01	134.48	24	0.250	0.406	1 3/4	8	29 3/8"	33 3/4 x 1 1/2	2.6	9.77	161.98	165.20	30	0.250	0
	141.90			0.467					2.7	9.79		173.37			0
	149.44			0.531					2.8	9.81		181.71			0

ZONE 3 WITH AND WITHOUT ICE 80 MPH WIND

35' SPAN

SIGN LOADS		TOWER PIPE			ANCHOR BOLTS			BASE PLATE	TRUSS	DESIGN LOADS				TOWER PI		
TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	
155.44	167.11	30	0.250	0.210	1 3/4	8	35 3/8"	39 3/4 x 1 1/2	1.5	12.87	211.58	202.48	30	0.280	
	177.27			0.241					1.6	12.90		213.97			
	187.54			0.275					1.6	12.93		225.63			

OSB - Cantilever



OSB Standards

OVERHEAD SIGN BRIDGE STANDARDS

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31	OSB-SE	11-07	Overhead Sign Bridge Selection Examples
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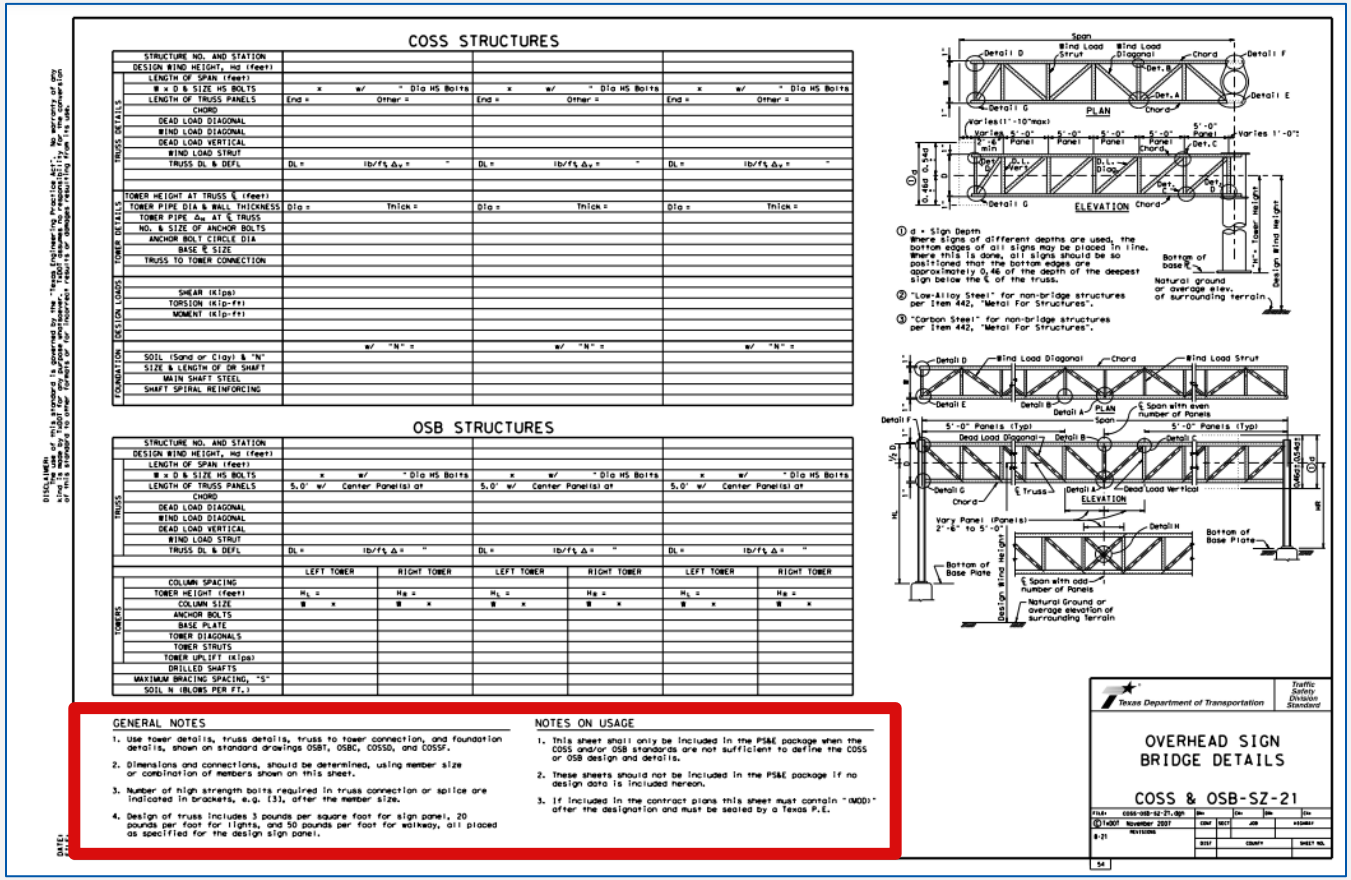
32B	OSB-Z1	8-08	Overhead Sign Bridge Details
33A	HOSB-Z1-21	8-21	High Level Overhead Sign Bridge Details
33B	HOSB-Z1	8-08	High Level Overhead Sign Bridge Details
34A	HOSB-Z1L	8-08	High Level Overhead Sign Bridge Details
34B	HOSB-Z1L	8-08	High Level Overhead Sign Bridge Details
35A	OSB-Z2I	8-08	Overhead Sign Bridge Details
35B	OSB-Z2I	8-08	Overhead Sign Bridge Details
36A	HOSB-Z2I	8-08	High Level Overhead Sign Bridge Details
36B	HOSB-Z2I	8-08	High Level Overhead Sign Bridge Details
37A	OSB-Z3	11-07	Overhead Sign Bridge Details
37B	OSB-Z3	8-08	Overhead Sign Bridge Details
38A	HOSB-Z3	8-08	High Level Overhead Sign Bridge Details
38B	HOSB-Z3	8-08	High Level Overhead Sign Bridge Details
39A	OSB-Z3I	8-08	Overhead Sign Bridge Details
39B	OSB-Z3I	8-08	Overhead Sign Bridge Details
40A	HOSB-Z3I	11-07	High Level Overhead Sign Bridge Details
40B	HOSB-Z3I	8-08	High Level Overhead Sign Bridge Details
41A	OSB-Z4	8-08	Overhead Sign Bridge Details
41B	OSB-Z4	8-08	Overhead Sign Bridge Details
42A	HOSB-Z4	11-07	High Level Overhead Sign Bridge Details
42B	HOSB-Z4	8-08	High Level Overhead Sign Bridge Details
43A	OSB-Z4I	11-07	Overhead Sign Bridge Details
43B	OSB-Z4I	8-08	Overhead Sign Bridge Details
44A	HOSB-Z4I	8-08	High Level Overhead Sign Bridge Details
44B	HOSB-Z4I	8-08	High Level Overhead Sign Bridge Details
45A	OSBT-21	8-21	Overhead Sign Bridge Tower Details
45B	OSBT	11-07	Overhead Sign Bridge Tower Details
46	OSBC	11-07	Overhead Sign Bridge Truss Details
47A	OSBC-SC-Z1	11-07	Overhead Sign Bridge Truss / Single Column
47B	OSBC-SC-Z1	11-07	Overhead Sign Bridge Truss / Single Column
48A	OSBC-SC-Z2	11-07	Overhead Sign Bridge Truss / Single Column
48B	OSBC-SC-Z2	11-07	Overhead Sign Bridge Truss / Single Column
49A	OSBC-SC-Z3	11-07	Overhead Sign Bridge Truss / Single Column
49B	OSBC-SC-Z3	11-07	Overhead Sign Bridge Truss / Single Column
50A	OSBC-SC-Z4	11-07	Overhead Sign Bridge Truss / Single Column
50B	OSBC-SC-Z4	11-07	Overhead Sign Bridge Truss / Single Column
51	OSBS-SC	11-07	Overhead Sign Bridge Single Column and Drilled Shaft Reinforcing
52	OSB-FD	11-07	Foundation Embedment Selection Charts
54	COSS & OSB-SZ-21	8-21	Overhead Sign Bridge Details

Special Zone Sheet



COSS STRUCTURES

STRUCTURE NO. AND STATION				
DESIGN WIND HEIGHT, Hd (feet)				
TRUSS DETAILS: LENGTH OF SPAN (feet)				
TRUSS DETAILS: # x D & SIZE HS BOLTS	x w/ " Dia HS Bolts	x w/ " Dia HS Bolts	x w/ " Dia HS Bolts	
TRUSS DETAILS: LENGTH OF TRUSS PANELS	End = Other =	End = Other =	End = Other =	
TRUSS DETAILS: CHORD				
TRUSS DETAILS: DEAD LOAD DIAGONAL				
TRUSS DETAILS: WIND LOAD DIAGONAL				
TRUSS DETAILS: DEAD LOAD VERTICAL				
TRUSS DETAILS: WIND LOAD STRUT				
TRUSS DETAILS: TRUSS DL & DEFL	DL = lb/ft, Δ_V = "	DL = lb/ft, Δ_V = "	DL = lb/ft, Δ_V = "	
TOWER HEIGHT AT TRUSS ℄ (feet)				
TOWER DETAILS: TOWER PIPE DIA & WALL THICKNESS	Dia = Thick =	Dia = Thick =	Dia = Thick =	
TOWER DETAILS: TOWER PIPE Δ_W AT ℄ TRUSS				
TOWER DETAILS: NO. & SIZE OF ANCHOR BOLTS				
TOWER DETAILS: ANCHOR BOLT CIRCLE DIA				
TOWER DETAILS: BASE ℄ SIZE				
TOWER DETAILS: TRUSS TO TOWER CONNECTION				
DESIGN LOADS:				
DESIGN LOADS: SHEAR (Kips)				
DESIGN LOADS: TORSION (Kip-ft)				
DESIGN LOADS: MOMENT (Kip-ft)				
FOUNDATION:	w/ "N" =	w/ "N" =	w/ "N" =	
FOUNDATION: SOIL (Sand or Clay) & "N"				
FOUNDATION: SIZE & LENGTH OF DR SHAFT				
FOUNDATION: MAIN SHAFT STEEL				
FOUNDATION: SHAFT SPIRAL REINFORCING				

OSB STRUCTURES

STRUCTURE NO. AND STATION						
DESIGN WIND HEIGHT, Hd (feet)						
TRUSS: LENGTH OF SPAN (feet)						
TRUSS: # x D & SIZE HS BOLTS	x w/ " Dia HS Bolts		x w/ " Dia HS Bolts		x w/ " Dia HS Bolts	
TRUSS: LENGTH OF TRUSS PANELS	5.0' w/ Center Panel(s) at		5.0' w/ Center Panel(s) at		5.0' w/ Center Panel(s) at	
TRUSS: CHORD						
TRUSS: DEAD LOAD DIAGONAL						
TRUSS: WIND LOAD DIAGONAL						
TRUSS: DEAD LOAD VERTICAL						
TRUSS: WIND LOAD STRUT						
TRUSS: TRUSS DL & DEFL	DL = lb/ft, Δ = "		DL = lb/ft, Δ = "		DL = lb/ft, Δ = "	
	LEFT TOWER	RIGHT TOWER	LEFT TOWER	RIGHT TOWER	LEFT TOWER	RIGHT TOWER
TOWERS: COLUMN SPACING						
TOWERS: TOWER HEIGHT (feet)	H_L =	H_R =	H_L =	H_R =	H_L =	H_R =
TOWERS: COLUMN SIZE	x	x	x	x	x	x
TOWERS: ANCHOR BOLTS						
TOWERS: BASE PLATE						
TOWERS: TOWER DIAGONALS						
TOWERS: TOWER STRUTS						
TOWERS: TOWER UPLIFT (Kips)						
DRILLED SHAFTS						
MAXIMUM BRACING SPACING, "S"						
SOIL N (BLOWS PER FT.)						

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the Texas Department of Transportation for any purpose whatsoever. The Texas Department of Transportation assumes no responsibility for the accuracy or suitability of this standard's use for incorrect results or damages resulting from its use.

DATE:
FILE:

GENERAL NOTES

1. Use tower details, truss details, truss to tower connection, and foundation details, shown on standard drawings OSBT, OSBC, COSSD, and COSSF.
2. Dimensions and connections, should be determined, using member size or combination of members shown on this sheet.
3. Number of high strength bolts required in truss connection or splice are indicated in brackets, e.g. (3), after the member size.
4. Design of truss includes 3 pounds per square foot for sign panel, 20 pounds per foot for lights, and 50 pounds per foot for walkway, all placed as specified for the design sign panel.

NOTES ON USAGE

1. This sheet shall only be included in the PS&E package when the COSS and/or OSB standards are not sufficient to define the COSS or OSB design and details.
2. These sheets should not be included in the PS&E package if no design data is included hereon.
3. If included in the contract plans this sheet must contain "(MOD)" after the designation and must be sealed by a Texas P.E.

Texas Department of Transportation
Traffic Safety Division Standard

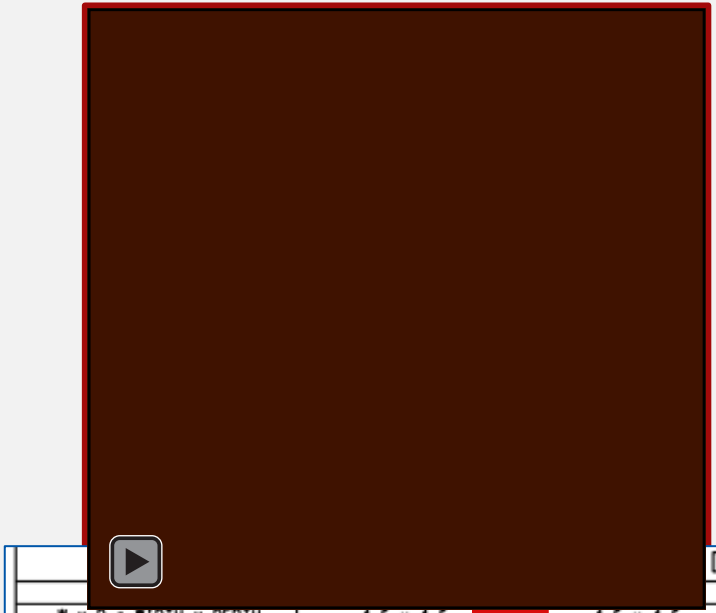
OVERHEAD SIGN BRIDGE DETAILS

COSS & OSB-SZ-21

FILE:	COSS-OSB-SZ-21.dgn	Dn:	Ck:	Dw:	Ck:
©TxDOT	November 2007	CONT	SECT	JOB	HIGHWAY
8-21	REVISIONS	DIST	COUNTY		SHEET NO.

General Notes when using the Special Zone Standard (COSS & OSB-SZ):

1. Use tower details, truss details, truss to tower connection, and foundation details, shown on standard drawings OSBT, OSBC, COSSD, and COSSF.
2. Dimensions and connections, should be determined, using member size or combination of member size or combination of members shown on this sheet.
3. **Number of high strength bolts required in truss connection or splice are indicated in brackets, e.g. [3], after the member size.**
4. Design of truss includes as specified for the Sign Panel (10’ H times length of truss)
   - -3 psf for sign panel
   - -20 plf for lights
   - -50 plf for walkway



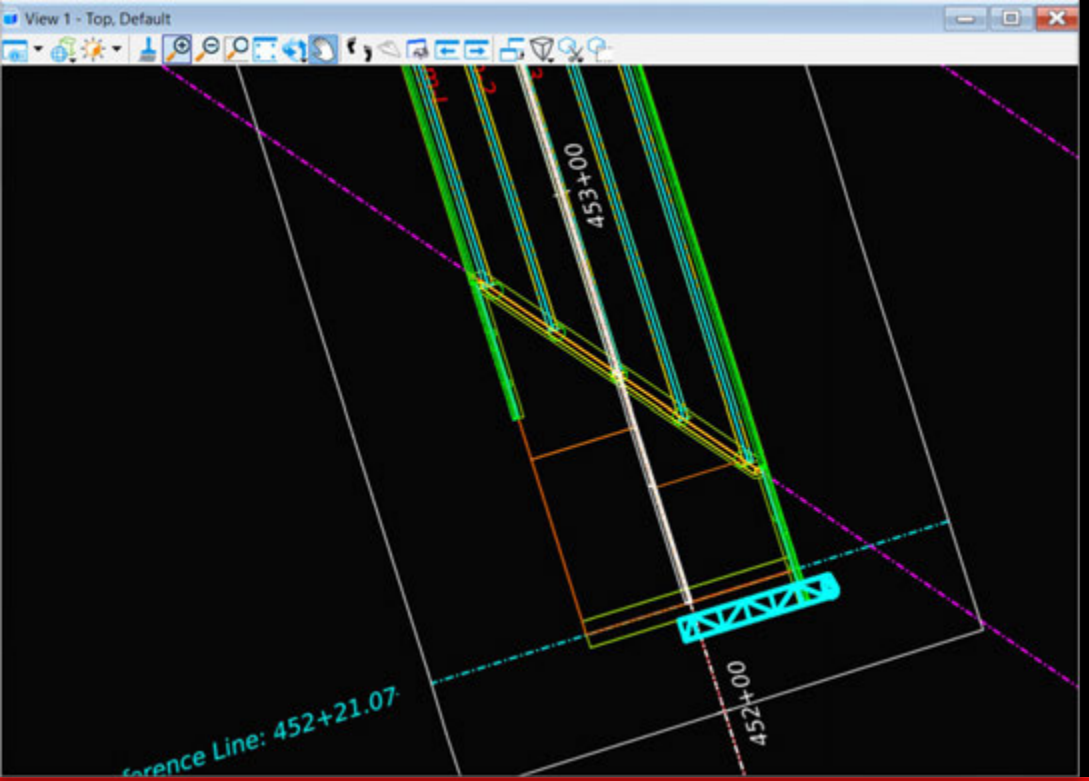
W x D = WIDTH x DEPTH	4.5 x 4.5			4.5 x 4.5	
CHORD-①, Unless Otherwise Shown	L 3 x 3 x 5/16 ②	[3]		3 x 3 x 1/4 ②	[4]
DEAD LOAD DIAGONAL-②	L 2 x 2 x 5/16	[2]		2 x 2 x 5/16	[2]
WIND LOAD DIAGONAL-②	L 3 x 3 x 5/16	[2]		3 x 3 x 5/16	[2]
DEAD LOAD VERTICAL-②	L 2 x 2 x 5/16	[2]		2 x 2 x 5/16	[2]
WIND LOAD STRUT-②	L 2 x 2 x 5/16	[1]		2 x 2 x 5/16	[1]
TRUSS DEAD LOAD	42 lb/ft			47 lb/ft	
SIZE H.S. BOLTS IN CONNECTION	5/8" DIA			5/8" DIA	
NO. & SIZE OF H.S. BOLTS IN CHORD ANGLE TO TOWER CONNECTION PLATE	3 - 5/8" DIA ea			4 - 5/8" DIA or 3 - 3/4" DIA ea	

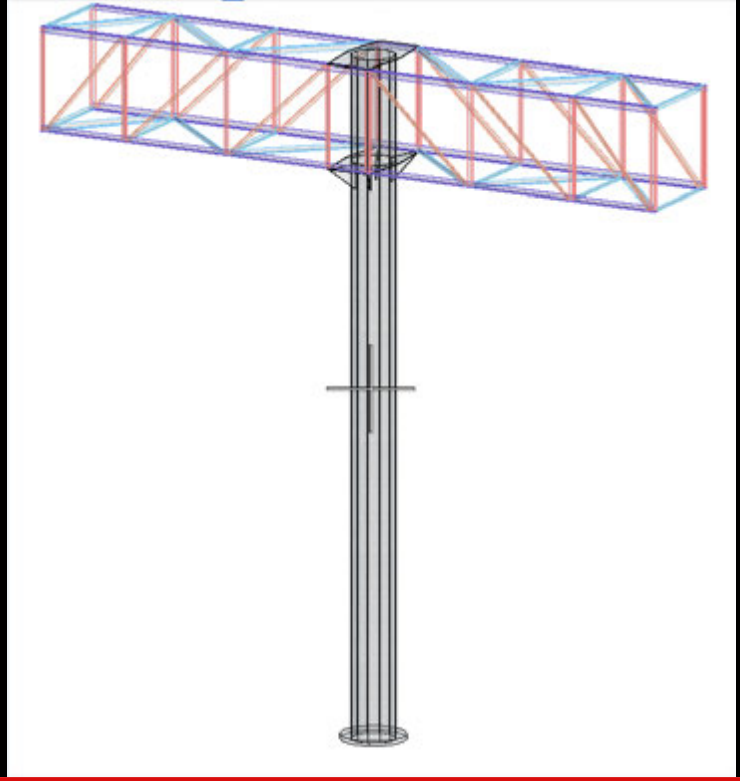
Notes on Usage of the Special Zone Sheet:

1. This sheet shall ONLY be included in the PS&E package when the COSS and/or OSB standards are not sufficient to define the COSS or OSB design and details.
2. These sheets should not be included in the PS&E package if no design data is included hereon i.e. DO NOT LEAVE BLANK
3. **If included in the contract plans this, sheet must contain "(MOD)" after the designation and must be sealed by a Texas P.E.**

Summary

- Every standard for ancillary structures are different
  - Read the general notes on usage
- Current Standards are per LTS-3
- Update coming for LTS-LRFD
- Special Designs per LTS-6 or LTS-LRFD
- Keep an eye out for updates
- Feel free to reach out if you have questions





Questions?

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Texas Department of Transportation

March 20, 2025