FY 2017-18 Design Standards
Update Training

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AASHTO LTS Specification
ASD → LRFD

LOADS

Wind Pressure

$$P = 0.00256\, K_z\, G\, V^2\, I_r\, C_d \text{ (ASD)}$$

$$P = 0.00256\, K_z\, K_d\, G\, V^2\, C_d \text{ (LRFD)}$$

LOADS

K_d vs. I_r

$I_r = 1.0$ (ASD)

$K_d = 0.85$ (LRFD)

V = Wind Speed

V = 110 – 130 – 150 mph (ASD)

V = 130 – 150 – 170 mph (LRFD)

RESISTANCE

Φ = 0.66 (ASD) steel pipe bending

Overstress = 1.33 (ASD)

Φ = 0.9 (LRFD)

S (section modulus – ASD)

vs.

Z (plastic modulus – LRFD)

Shape Factor (Z/S) = 1.27

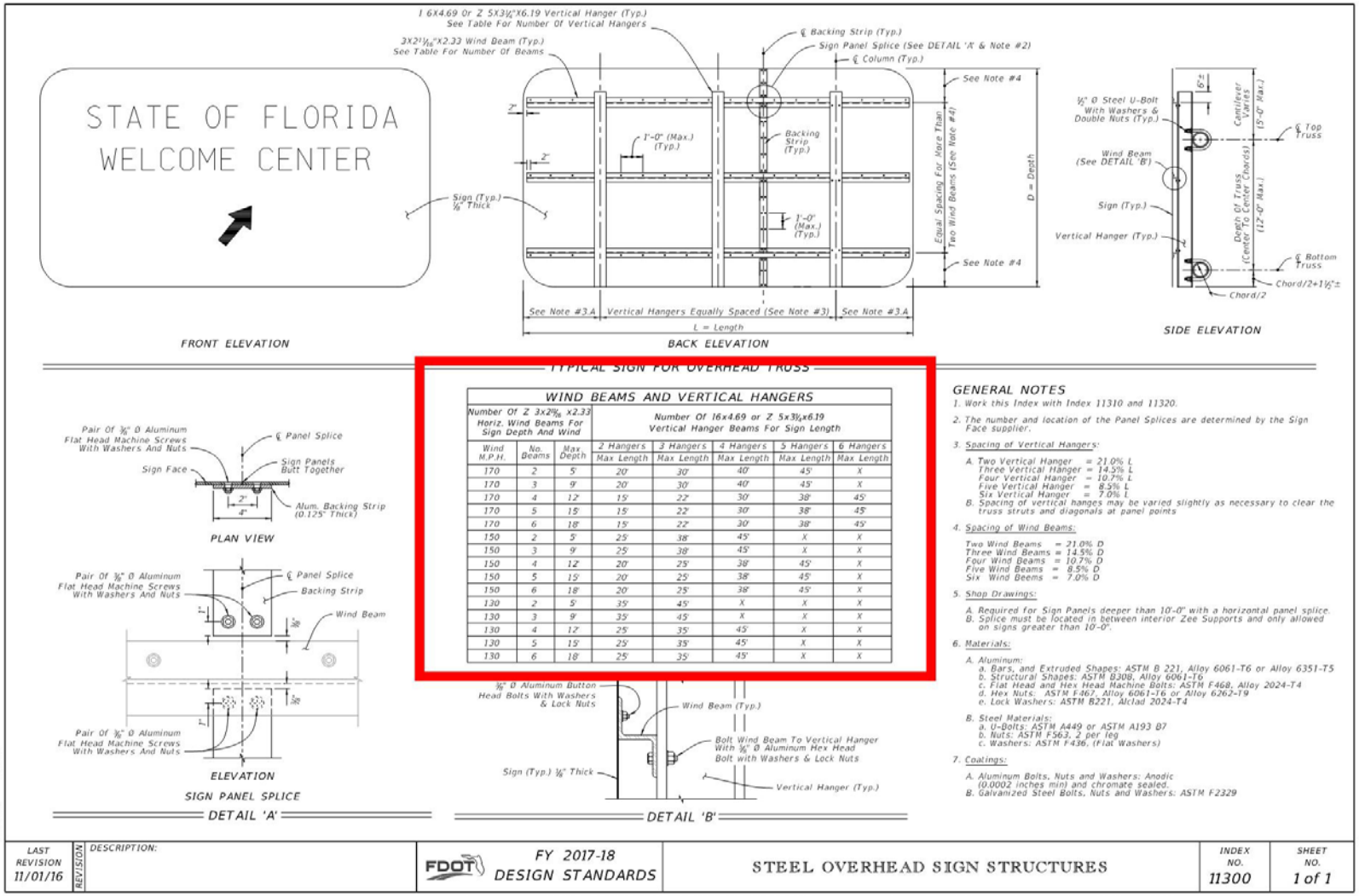
new LRFD vs. old ASD

About the same

Standard Index Table values changed

11200 – Multi-Column Ground Signs
11300 – Steel Overhead Sign Structures
11860 – Single Column Ground Signs
17502 – High Mast Lighting
17515 – Standard Aluminum Lighting
17723 – Steel Strain Pole
17743 – Standard Mast Arm Asemblies
18111 – Steel CCTV Pole

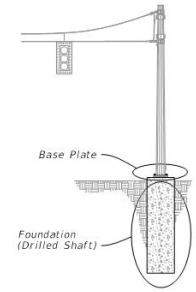
11300 Steel Overhead Sign Structures



17723 Steel Strain Pole

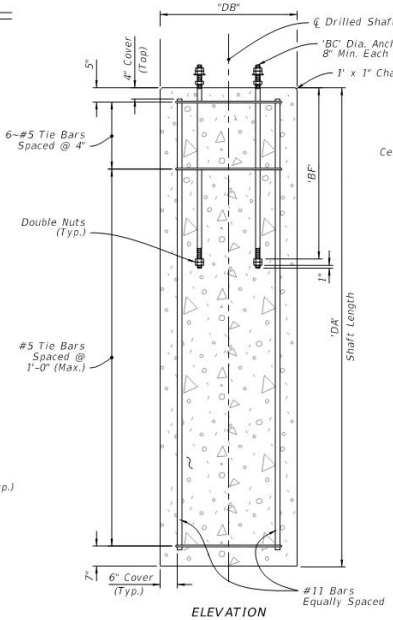
TABLE OF FACTORED FLEXURAL RESISTANCE M_T

POLE TYPE	MAXIMUM ALLOWABLE MOMENT (kip-ft)	POLE		BASE CONNECTION					SHAFT		
		J (in)	K (in)	No. of Bolts	BA (in)	BB (in)	BC (in)	BF (in)	DA (FT)	DB (FT)	No. of #11 Bars
PS-IV	172	0.250	14	8	25	2.50	1 3/8	60	14	4	14
PS-V	285	0.313	16	10	28	2.50	1 1/2	60	15	4	14
PS-VI	354	0.313	18	12	30	2.50	1 1/2	60	16	4	14
PS-VII	473	0.313	21	14	33	2.50	1 1/2	60	16	4.5	16
PS-VIII	561	0.313	23	16	35	2.50	1 1/2	60	17	4.5	16
PS-IX	657	0.313	25	12	39	3.00	1 3/4	60	17	5	18
PS-X	760	0.313	27	14	41	3.00	1 3/4	60	18	5	18

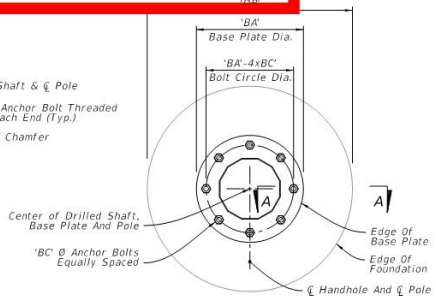


POLE ASSEMBLY

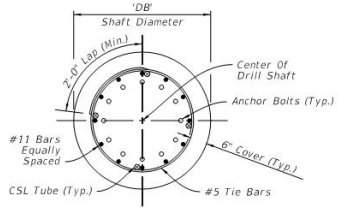
NOTE:
1. Double nuts: Bottom nut may be half height 'Jam' Nut. Provide individual nut covers (Not Shown) for each bolt.



ELEVATION

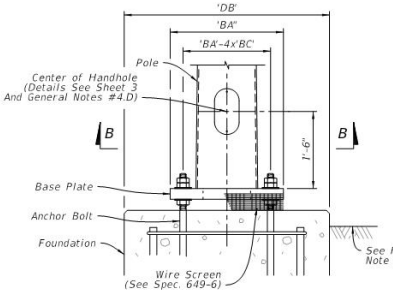


PLAN



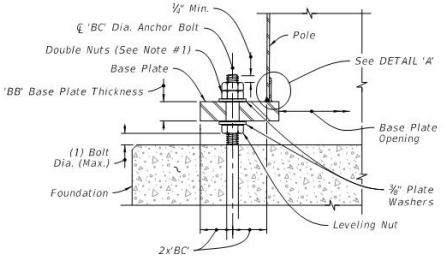
PLAN

FOUNDATION

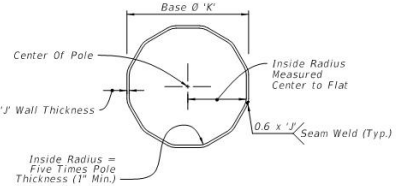


ELEVATION

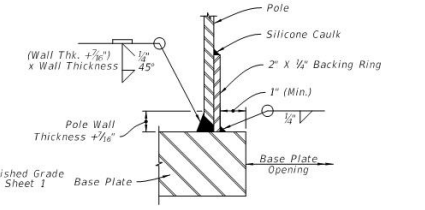
BASE PLATE



SECTION A-A



SECTION B-B



JOINT WELD DETAIL

DETAIL 'A'

FOUNDATON AND BASE DETAILS

LAST REVISION	REVISION	DESCRIPTION:				
11/01/16			FY 2017-18 DESIGN STANDARDS	STEEL STRAIN POLE	INDEX NO. 17723	SHEET NO. 2 of 3

10/14/2016 11:47:22 AM

17723 Steel Strain Pole

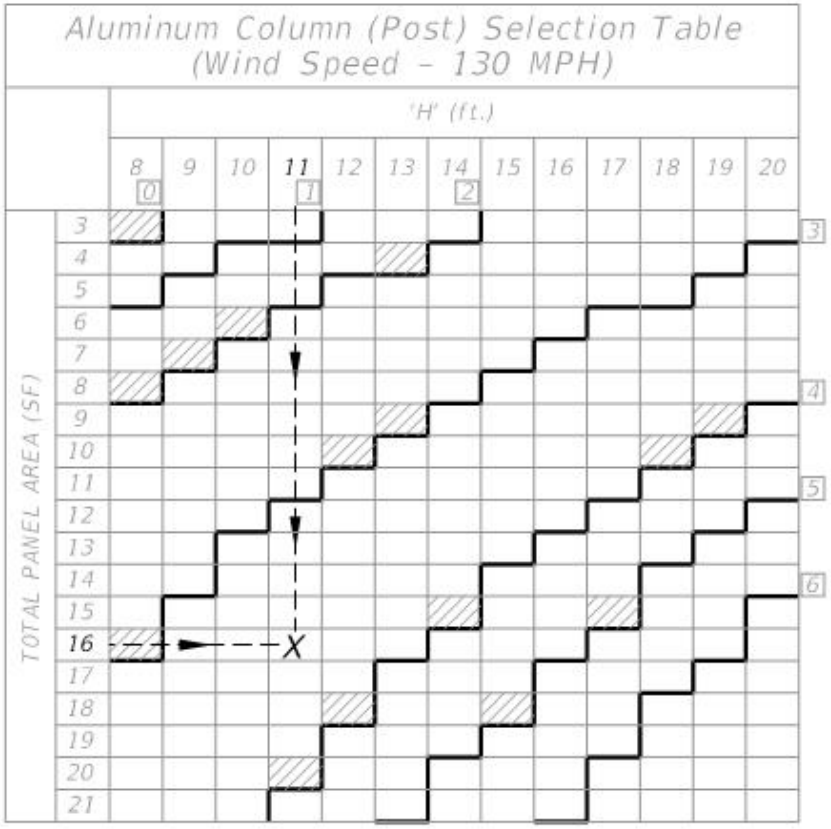
E OF FACTORED FLEXURAL RESISTANCE M_Y												
POLE TYPE	MAXIMUM ALLOWABLE MOMENT (kip-ft)	POLE		BASE CONNECTION					SHAFT		
		J (in)	K (in)	No. of Bolts	BA (in)	BB (in)	BC (in)	BF (in)	DA (FT)	DB (FT)	No. of #11 Bars
PS-IV	172	250	14	8	25	2.50	1 3/8	60	14	4	14
PS-V	285	313	16	10	28	2.50	1 1/2	60	15	4	14
PS-V	354	313	18	12	30	2.50	1 1/2	60	16	4	14
PS-VI	473	313	21	14	33	2.50	1 1/2	60	16	4.5	16
PS-VI	561	313	23	16	35	2.50	1 1/2	60	17	4.5	16
PS-I	657	313	25	12	39	3.00	1 3/4	60	17	5	18
PS-X	760	313	27	14	41	3.00	1 3/4	60	18	5	18

'DB'

11860 Single Column Ground Signs

(Old Standard)

EP 3: Select the appropriate Aluminum Column (Post) Selection Tables by Wind



EP 4: Design the Column (Post) and the foundation according to the dark-bold

11860 Single Column Ground Signs

(Old Standard – 3 tables)

ALUMINUM COLUMN (POST) SELECTION TABLE (WIND SPEED = 110 MPH)

'H' (FT)

TOTAL PANEL AREA (SF)	8	9	10	11	12	13	14	15	16	17	18	19	20
3			[6]		[7]				[8]				
4													
5													
6													
7													
8													
9													
10													
11													[8]
12													
13													
14													
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21													
22													
23													
24													
25													
26													
27													
28													
29													
30													[7]

ALUMINUM COLUMN (POST) SELECTION TABLE (WIND SPEED = 130 MPH)

'H' (FT)

TOTAL PANEL AREA (SF)	8	9	10	11	12	13	14	15	16	17	18	19	20
3			[6]		[7]				[8]				
4													
5													
6													
7													
8													
9													
10													[7]
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													[8]

ALUMINUM COLUMN (POST) SELECTION TABLE (WIND SPEED = 150 MPH)

'H' (FT)

TOTAL PANEL AREA (SF)	8	9	10	11	12	13	14	15	16	17	18	19	20
3			[7]		[8]								
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
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19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													[8]

▨ = If CANTILEVER SIGN configuration (see Cantilever Sign Details) falls in this region, use next larger Column (Post) size than that indicated.

CANTILEVER SIGN

NOTE:
1. For cantilever sign installations see Index 17302.
2. For cantilever signs with widths greater than 4' see Index 11861.

COLUMN (POST) AND FOUNDATION TABLE

	Column (Post) Size		Foundation Alternatives				
			Driven Post *		Concrete (Class I)		
	Diameter (NPS) (in)	Wall Thk. (in)	Embedment Depth (ft) without Soil Plate	Embedment Depth (ft) with Soil Plate	Diameter (ft)	Embedment Depth (ft)	Stub Length (ft)
[6]	2.0	1/8	4.5	2.5	2.0	2.0	2.0
[7]	2.5	1/8	5.0	3.0	2.0	2.0	2.0
[8]	3.0	1/8	5.0	3.5	2.0	2.5	2.5
[9]	3.5	3/16	6.0	4.5	2.0	3.0	3.0
[4]	4.0	1/4	---	---	2.0	4.0	3.0
[5]	4.5	1/4	---	---	2.0	4.0	3.0
[6]	5.0	1/4	---	---	2.0	4.5	3.0
[7]	6.0	1/4	---	---	2.0	5.0	3.0
[8]	8.0	5/16	---	---	2.0	5.5	3.0

* INSTALLING FRANGIBLE COLUMN SUPPORTS:
Columns (posts) may be installed by driving the post or the posts may be set to the depth indicated in preformed holes backfilled with suitable material tamped in layers not thicker than 6" (to provide adequate compaction) or filled with flowable fill or bagged concrete.

WIND SPEEDS BY COUNTY:

110 MPH
Alachua, Baker, Bradford, Clay, Columbia, Gadsden, Gilchrist, Hamilton, Hardee, Jackson, Jefferson, Lafayette, Lake, Leon, Madison, Marion, Polk, Putnam, Sumter, Suwannee and Union counties.

130 MPH
Bay, Brevard, Calhoun, Charlotte, Citrus, De Soto, Dixie, Duval, Flagler, Franklin, Glades, Gulf, Hendry, Hernando, Highlands, Hillsborough, Holmes, Lee, Levy, Liberty, Manatee, Nassau, Okaloosa, Okeechobee, Orange, Osceola, Pasco, Pinellas, Sarasota, Seminole, St. Johns, Taylor, Volusia, Wakulla, Walton and Washington counties.

150 MPH
Broward, Collier, Escambia, Indian River, Martin, Miami-Dade, Monroe, Palm Beach, Santa Rosa and St. Lucie counties.

COLUMN AND FOUNDATION TABLES

LAST REVISION	REVISION	DESCRIPTION:	FDOT			INDEX NO.	SHEET NO.
07/01/15			FY 2016-17 DESIGN STANDARDS	SINGLE COLUMN GROUND SIGNS		11860	3 of 9

11860 Single Column Ground Signs

(New Standard – 1 table)

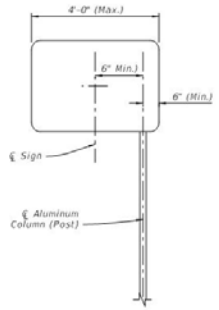
ALUMINUM COLUMN (POST) SELECTION TABLE (O.D. in.)

TOTAL PANEL AREA (SF)	'H' (FT) 8 ft	9 ft	10 ft	11 ft	12 ft	13 ft	14 ft	15 ft	16 ft	17 ft	18 ft	19 ft	20 ft
3 sf	2	2.5	2.5	2.5	3	3	3	3	3.5	3.5	3.5	3.5	3.5
4 sf	2.5	2.5	3	3	3	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5
5 sf	2.5	3	3	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4
6 sf	3	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4
7 sf	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4
8 sf	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4	4
9 sf	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4	4	4
10 sf	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4	4	4.5	4.5
11 sf	3.5	3.5	3.5	3.5	4	4	4	4	4	4	4	4.5	4.5
12 sf	3.5	3.5	3.5	4	4	4	4	4	4	4	4.5	4.5	4.5
13 sf	3.5	3.5	4	4	4	4	4	4	4	4.5	4.5	4.5	5
14 sf	3.5	3.5	4	4	4	4	4	4	4.5	4.5	4.5	5	5
15 sf	3.5	4	4	4	4	4	4	4.5	4.5	4.5	5	5	5
16 sf	3.5	4	4	4	4	4	4	4.5	4.5	5	5	5	6
17 sf	4	4	4	4	4	4	4.5	4.5	4.5	5	5	6	6
18 sf	4	4	4	4	4	4.5	4.5	4.5	5	5	5	6	6
19 sf	4	4	4	4	4	4.5	4.5	4.5	5	5	6	6	6
20 sf	4	4	4	4	4.5	4.5	4.5	5	5	5	6	6	6
21 sf	4	4	4	4	4.5	4.5	5	5	5	6	6	6	6
22 sf	4	4	4	4.5	4.5	4.5	5	5	6	6	6	6	6
23 sf	4	4	4	4.5	4.5	5	5	5	6	6	6	6	6
24 sf	4	4	4.5	4.5	4.5	5	5	6	6	6	6	6	6
25 sf	4	4	4.5	4.5	5	5	5	6	6	6	6	6	8
26 sf	4	4.5	4.5	4.5	5	5	5	6	6	6	6	8	8
27 sf	4	4.5	4.5	4.5	5	5	6	6	6	6	6	8	8
28 sf	4	4.5	4.5	5	5	5	6	6	6	6	6	8	8
29 sf	4.5	4.5	4.5	5	5	6	6	6	6	6	8	8	8
30 sf	4.5	4.5	5	5	5	6	6	6	6	6	8	8	8

COLUMN (POST) AND FOUNDATION TABLE

Column (Post) Size		Foundation Alternatives				
		Driven Post *		Concrete (Class I)		
Outside Diameter (in)	Wall Thk. (in)	Embedment Depth (ft) without Soil Plate	Embedment Depth (ft) with Soil Plate	Diameter (ft)	Embedment Depth (ft)	Stub Length (ft)
2.0	1/10	4.5	2.5	2.0	2.0	2.0
2.5	1/10	5.0	3.0	2.0	2.5	2.0
3.0	1/10	5.0	3.5	2.0	2.5	2.5
3.5	3/16	6.0	4.5	2.0	3.0	3.0
4.0	1/4	---	---	2.0	3.5	3.0
4.5	1/4	---	---	2.0	4.0	3.0
5.0	1/4	---	---	2.0	4.5	3.0
6.0	1/4	---	---	2.0	5.0	3.0
8.0	5/16	---	---	2.0	5.5	3.0

* INSTALLING FRANGIBLE COLUMN SUPPORTS:
Columns (post.s) 3½" O.D. and less are frangible. Frangible columns may be installed by driving the post or the posts may be set in preformed holes. Backfill preformed holes with suitable material tamped in layers not thicker than 6" (to provide adequate compaction) or filled with flowable fill or bagged concrete.



CANTILEVER SIGN

NOTE:
1. For cantilever sign installations see Index 17302.
2. For cantilever signs with widths greater than 4' see Index 11861.
3. Use of driven post for cantilever sign in not permitted.

COLUMN AND FOUNDATION TABLES

LAST REVISION 11/01/16	REVISION DESCRIPTION:	FDOT FY 2017-18 DESIGN STANDARDS	SINGLE COLUMN GROUND SIGNS	INDEX NO. 11860	SHEET NO. 3 of 9

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11860 Single Column Ground Signs

(New Standard)

		ALUMINUM COLUMN (POST) SELECTION TABLE (O.D. in.)												
		'H' (FT)												
		8 ft	9 ft	10 ft	11 ft	12 ft	13 ft	14 ft	15 ft	16 ft	17 ft	18 ft	19 ft	20 ft
TOTAL PANEL AREA (SF)	3 sf	2	2.5	2.5	2.5	3	3	3	3	3.5	3.5	3.5	3.5	3.5
	4 sf	2.5	2.5	3	3	3	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	5 sf	2.5	3	3	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4
	6 sf	3	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4
	7 sf	3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4
	8 sf	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4	4
	9 sf	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4	4	4
	10 sf	3.5	3.5	3.5	3.5	3.5	4	4	4	4	4	4	4.5	4.5
	11 sf	3.5	3.5	3.5	3.5	4	4	4	4	4	4	4.5	4.5	4.5
	12 sf	3.5	3.5	3.5	4	4	4	4	4	4	4	4.5	4.5	4.5
	13 sf	3.5	3.5	4	4	4	4	4	4	4	4.5	4.5	4.5	5
	14 sf	3.5	3.5	4	4	4	4	4	4	4.5	4.5	4.5	5	5
	15 sf	3.5	4	4	4	4	4	4	4.5	4.5	4.5	5	5	5
	16 sf	3.5	4	4	4	4	4	4	4.5	4.5	5	5	5	6
	17 sf	4	4	4	4	4	4	4.5	4.5	4.5	5	5	6	6
	18 sf	4	4	4	4	4	4.5	4.5	4.5	5	5	5	6	6
	19 sf	4	4	4	4	4	4.5	4.5	4.5	5	5	6	6	6
	20 sf	4	4	4	4	4.5	4.5	4.5	5	5	5	6	6	6
	21 sf	4	4	4	4	4.5	4.5	5	5	5	6	6	6	6
	22 sf	4	4	4	4.5	4.5	4.5	5	5	6	6	6	6	6
	23 sf	4	4	4	4.5	4.5	5	5	5	6	6	6	6	6
	24 sf	4	4	4.5	4.5	4.5	5	5	6	6	6	6	6	6
	25 sf	4	4	4.5	4.5	5	5	5	6	6	6	6	6	8
	26 sf	4	4.5	4.5	4.5	5	5	5	6	6	6	6	8	8
	27 sf	4	4.5	4.5	4.5	5	5	6	6	6	6	6	8	8
	28 sf	4	4.5	4.5	5	5	5	6	6	6	6	6	8	8
	29 sf	4.5	4.5	4.5	5	5	6	6	6	6	6	8	8	8
	30 sf	4.5	4.5	5	5	5	6	6	6	6	6	8	8	8

17743 Standard Mast Arm Assemblies

ARM AND BASE PLATE										
Arm ID Axx-ArmLength S-SingleArm D-DoubleArm H-HeavyDuty	Total Arm Length (ft)	Arm			Arm Extension			Base Plate		
		FA/SA (ft)	FC/SC (in)	FD/SD (in)	FE/SE (ft)	FG/SG (in)	H/SH (in)	HT (in)	FJ/SJ (in)	FK/SK (in)
A30/S	30	30	11	0.250				22	25	3
A30/S/H		30	12	0.250						
A30/D		30	11	0.250				30	36	
A30/D/H		30	12	0.250						
A40/S	40	40	13	0.250				22	27	3
A40/S/H		40	14	0.250						
A40/D		40	13	0.250				30	36	
A40/D/H		40	14	0.250						
A50/S	50	32.5	12	0.250	20.5	14	0.313	22	29	3
A50/S/H		32.5	13	0.250	20.5	15				
A50/D		32.5	12	0.250	20.5	14		30	36	
A50/D/H		32.5	13	0.250	20.5	15				
A60/S	60	35.5	12	0.250	27.5	15	0.375	30	36	3
A60/S/H		35.5	13	0.250	27.5	16				
A60/D		35.5	12	0.250	27.5	15				
A60/D/H		35.5	13	0.250	27.5	16				
A70/S	70	38	13	0.250	35	17	0.375	30	36	3
A70/S/H		38	14	0.250	35	18				
A70/D		38	13	0.250	35	17				
A70/D/H		38	14	0.250	35	18				
A78/S	78	39	13	0.250	42	18	0.375	30	36	3
A78/S/H		39	15	0.250	42	20				
A78/D		39	13	0.250	42	18				
A78/D/H		39	15	0.250	42	20				

POLE, BASE PLATE AND ARM CONNECTION																			
Pole ID Px-PoleNo S-SingleArm D-DoubleArm L-Luminaire	Upright				Base Plate					Arm-Upright Connection									
	UA (ft)	UD (in)	UE (in)	UG (ft)	No. Bolts	BA (in)	BB (in)	BC (in)	BF (in)	HT (in)	FJ/SJ (in)	FL/SL (in)	FN/SN (in)	FO/SO (in)	FP/SP (in)	FR/SR (in)	FS/SS (in)	FT/ST (in)
P1/S	25	16	0.375	37.5	6	30	2.5	1.75	40	22	25	0.75	0.438	14	1.25	2	8.5	0.438
P1/S/L	39																	
P1/D	25									30	36			23		2.75	12.5	
P1/D/L	39			37.5														
P2/S	25	18	0.375	37.5	6	34	2.5	2	40	22	27	0.75	0.438	15	1.25	2	8.5	0.438
P2/S/L	39																	
P2/D	25									30	36			23		2.75	12.5	
P2/D/L	39			37.5														
P3/S	25	20	0.375	37.5	6	36	2.5	2	40	22	29	0.75	0.438	16	1.25	2	8.5	0.438
P3/S/L	39																	
P3/D	25									30	36			23		2.75	12.5	
P3/D/L	39			37.5														
P4/S	25	22	0.375	37.5	6	38	2.5	2	40	30	36	0.75	0.438	17	1.25	2.5	12.5	0.438
P4/S/L	39																	
P4/D	25													23				
P4/D/L	39			37.5														
P5/S	25	24	0.375	37.5	6	40	2.5	2	40	30	36	0.75	0.5	18	1.25	2.5	12.5	0.5
P5/S/L	39																	
P5/D	25													23				
P5/D/L	39			37.5														
P6/S	25	24	0.5	37.5	6	42	2.5	2.25	45	30	36	0.75	0.625	18	1.5	2.5	12	0.625
P6/S/L	39																	
P6/D	25													23				
P6/D/L	39			37.5														
P7/S	25	26	0.5	37.5	6	44	2.5	2.25	45	30	36	0.75	0.625	19	1.5	2.5	12	0.625
P7/S/L	39																	
P7/D	25													23				
P7/D/L	39			37.5														

NOTE:

1. Work this Index with Index 17745.

DRILLED SHAFT								
Drilled Shaft ID	DA (ft)	DB (ft)	RA	RB	RC	RD (in)	RE	RF (in)
DS/12/4.0	12	4.0	11	14	8	12		
DS/12/4.5	12	4.5	11	16	8	12		
DS/14/4.5	14	4.5	11	16	10	8		
DS/14/5.0	14	5.0	11	18	10	8		
DS/16/4.5	16	4.5	11	16	10	8		
DS/16/5.0	16	5.0	11	18	10	8		
DS/18/5.0	18	5.0	11	18	10	8		
DS/20/5.0	20	5.0	11	18	10	6	10	9

LUMINAIRE AND CONNECTION											
LA (ft)	LB (ft)	LC (in)	LD (in)	LE	LF (ft)	LG (in)	LH (in)	LJ (in)	LK (in)	LL (deg)	UG (ft)
40	10	3	0.125	0.5	8	0.5	0.75	0.25	0.25	0	37.5

10/25/2016 9:46:29 AM

LAST REVISION	REVISION	DESCRIPTION:				
11/01/16			FDOT FY 2017-18 DESIGN STANDARDS	STANDARD MAST ARM ASSEMBLIES	INDEX NO. 17743	SHEET NO. 1 of 1

17743 Standard Mast Arm Assemblies

ARM AND BASE PLA					
Arm ID Axx-ArmLength S-SingleArm D-DoubleArm H-HeavyDuty	Total Arm Length (ft)	Arm			Arm
		FA/SA (ft)	FC/SC (in)	FD/SD (in)	FE/SE (ft)
A30/S	30	30	11	0.250	
A30/S/H		30	12	0.250	
A30/D		30	11	0.250	
A30/D/H		30	12	0.250	
A40/S	40	40	13	0.250	
A40/S/H		40	14	0.250	
A40/D		40	13	0.250	
A40/D/H		40	14	0.250	
A50/S	50	32.5	12	0.250	20.5
A50/S/H		32.5	13	0.250	20.5
A50/D		32.5	12	0.250	20.5

17743 Standard Mast Arm Assemblies

					POLE, BAS		
Pole ID Px-PoleNo S-SingleArm D-DoubleArm L-Luminaire	Upright				Base P		
	UA (ft)	UD (in)	UE (in)	UG (ft)	No. Bolts	BA (in)	BB (in)
P1/S	25	16	0.375		6	30	2.5
P1/S/L	39			37.5			
P1/D	25						
P1/D/L	39			37.5			
P2/S	25	18	0.375		6	34	2.5
P2/S/L	39			37.5			
P2/D	25						
P2/D/L	39			37.5			
P3/S	25	20	0.375		6	36	2.5
P3/S/L	39			37.5			

17743 Standard Mast Arm Assemblies

	DRILLED SHAFT			
Drilled Shaft ID	DA (ft)	DB (ft)	RA	RB
DS/12/4.0	12	4.0	11	14
DS/12/4.5	12	4.5	11	16
DS/14/4.5	14	4.5	11	16
DS/14/5.0	14	5.0	11	18
DS/16/4.5	16	4.5	11	16

17743 Standard Mast Arm Assemblies

FDOT Roadway Design Office Standards webpage: 17743 - IDS

17515		Standard Aluminum Lighting	IDS		
		TRAFFIC SIGNAL AND EQUIPMENT			Roadway Con
17700		Pull and Splice Box			
17721		Conduit Installation Details			
17723		Steel Strain Pole	IDS	PGM	
17725		Concrete Poles	IDS	PGM	
17727		Signal Cable and Span Wire Installation Details			
17733		Aerial Interconnect			
17736		Electric Power Service			
17743		Standard Mast Arm Assemblies	IDS	PGM	CEI
17745		Mast Arm Assemblies	IDS	PGM	CEI
17748		Free-Swinging, Internally-Illuminated Street Sign Assemblies			
17764		Pedestrian Control Signal Installation Details			
17781		Vehicle Loop Installation Details			
17784		Pedestrian Detector Assembly Installation Details			
17841		Cabinet Installation Details			
17870		Standard Signal Operating Plans			
17901		Advance Warning for R/R Crossing			

17743 Standard Mast Arm Assemblies

IDS – Arm / Pole / Foundation combinations

Instructions for Design Standards
Index 17743 Standard Mast Arm Assemblies (Rev. 11/16)

Topic No. 625-010-003
FY 2017-18

40 Foot Mast Arm Combinations						
Arm 1 Length	Arm 2 Length	Regular or Heavy Duty	Luminaire?	Designation		
40'	N/A	Reg	No	A40/S		P2/S
			Yes	A40/S		P2/S/L
		HD	No	A40/S/H		P2/S
			Yes	A40/S/H		P2/S/L
	30'	Reg/Reg	No	A40/D	A30/D	P2/D
			Yes	A40/D	A30/D	P2/D/L
		Reg/HD	No	A40/D	A30/D/H	P2/D
			Yes	A40/D	A30/D/H	P2/D/L
		HD/Reg	No	A40/D/H	A30/D	P2/D
			Yes	A40/D/H	A30/D	P2/D/L
		HD/HD	No	A40/D/H	A30/D/H	P2/D
			Yes	A40/D/H	A30/D/H	P2/D/L
	40'	Reg/Reg	No	A40/D	A40/D	P2/D
			Yes	A40/D	A40/D	P2/D/L
		Reg/HD	No	A40/D	A40/D/H	P2/D
			Yes	A40/D	A40/D/H	P2/D/L
		HD/Reg	No	A40/D/H	A40/D	P2/D
			Yes	A40/D/H	A40/D	P2/D/L
		HD/HD	No	A40/D/H	A40/D/H	P2/D
			Yes	A40/D/H	A40/D/H	P2/D/L
40 foot Mast Arm Total = 20						

17743 Standard Mast Arm Assemblies

FDOT Structures Design Office software webpage: MastArm-Index 17743 v1.0

High Mast-LRFD v1.0	11/18/2016	1.6 MB	High Mast-LRFD, v1.0, is a Mathcad 15 program that may be used with design highmast light poles in accordance with the AASHTO LRFD Sig Signals Specification, 1st Edition.
High Mast v2.2	10/24/2014	3.0 MB	High Mast, v2.2, is a Mathcad 15 program that may be used with **Index (FY2016-17)** to design highmast light poles in accordance with the AAS Lights and Signals Specification, 6th Edition.
Live Load Generator-LRFD v3.0	02/16/2011	2.5 MB	Live Load Generator-LRFD, v3.0, is a Mathcad 15 program that calcula for truck, truck train, lane, partial lane, and permit loads in accordance AASHTO LRFD Bridge Specification.
MastArm-LRFD v1.0	12/01/2016	2.0 MB	MastArm-LRFD, v1.0, is a Mathcad 15 program that may be used with design cantilever signal structures in accordance with the AASHTO LR and Signals Specification, 1st Edition.
MastArm v5.1	09/27/2016	1.5 MB	MastArm, v5.1, is a Mathcad 15 program that may be used with **Index 17)** to design cantilever signal structures in accordance with the AASH and Signals Specification, 6th Edition. Included are Standard Mastarm files.
MastArm-Index 17743 v1.0	11/18/2016	1 MB	MastArm-Index 17743, v1.0, is an Excel program that may be used with to design Standard cantilever signal structures in accordance with the A Signs, Lights and Signals Specification, 1st Edition.
Multi-Post Sign-LRFD v1.0	11/18/2016	1.0 MB	Multi-Post Sign-LRFD, v1.0, is a Mathcad 15 program that may be used **11200** to design ground signs in accordance with the AASHTO LRFD S Signals Specification, 1st Edition.
Multi-Post 2001 Sign v1.21	01/24/2011	1.3 MB	Multi-Post 2001 Sign, v1.21, is a Mathcad 15 program that may be use **11200(FY2016-17)** to design ground signs in accordance with the AAS Lights and Signals Specification, 5th Edition.
Multi-Post Sign v4.01	01/24/2011	1.1 MB	Multi-Post Sign, v4.01, is a program that may be used with **Index 1120** design ground signs in accordance with the AASHTO Signs, Lights and Specification, 5th Edition.
Pile Bent v1.71	09/12/2011	7.2 MB	Pile Bent, v1.71, is a Mathcad 15 program that analyzes fixed and pinn including lateral loads.
Prestressed Beam-LRFD v5.0	03/31/2016	6.2 MB	Prestressed Beam-LRFD, v5.0, is a Mathcad 15 program that may be **20010-20299** to design simple span prestressed beams (Florida-I, AAS

MastArm-Index 17743 v1.0

Design Aid for FDOT Design Standard 17743
Standard Mast Arm Assemblies

Wind Speed: ○ 130 mph ◉ 150 mph ○ 170 mph

Mast Arm Configuration: ○ One Arm ◉ Two Arms

Luminaire? ◉ Yes ○ No

For 2 arm assemblies, run smaller arm first with '2nd Arm ID' set to 'None'. Enter the given '2nd Arm ID' and deisgn the 1st Arm.

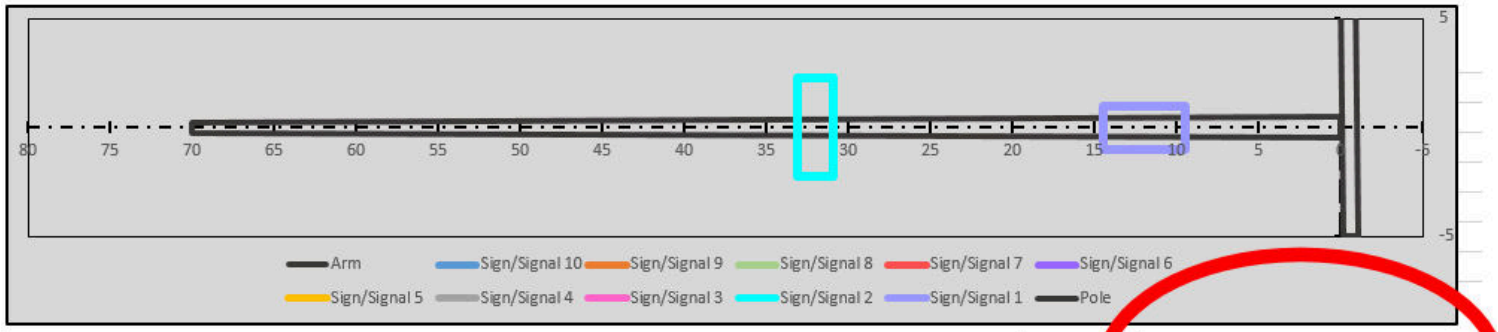
Arm Length: 30, 40, 50, 60, **70**, 78

Signal Orientation: ◉ Vertical ○ Horizontal

Back Plates? ◉ Yes ○ No

2nd Arm ID: A50/D, A50/D/H, A60/D, A60/D/H, **A70/D**, A70/D/H

Arm Info	Arm length, Signal/Sign Location and Size									
	Signal\Sign #10	Signal\Sign #9	Signal\Sign #8	Signal\Sign #7	Signal\Sign #6	Signal\Sign #5	Signal\Sign #4	Signal\Sign #3	Signal\Sign #2	Signal\Sign #1
Dist from Pole (ft.)	76	73	68	62	68	62	56	44	32	12
	◉ None	◉ None	◉ None	◉ None	◉ None	◉ None	◉ None	◉ None	○ None	○ None
	○ 3 Head	○ 3 Head	○ 3 Head	○ 3 Head	○ 3 Head	○ 3 Head	○ 3 Head	○ 3 Head	◉ 3 Head	○ 3 Head
	○ 4 Head	○ 4 Head	○ 4 Head	○ 4 Head	○ 4 Head	○ 4 Head	○ 4 Head	○ 4 Head	○ 4 Head	○ 4 Head
	○ 5 Head	○ 5 Head	○ 5 Head	○ 5 Head	○ 5 Head	○ 5 Head	○ 5 Head	○ 5 Head	○ 5 Head	○ 5 Head
	○ Sign	○ Sign	○ Sign	○ Sign	○ Sign	○ Sign	○ Sign	○ Sign	○ Sign	◉ Sign
Sign Width (in.)										60
Sign Height (in.)										24
Area (SF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8	10.0
M_{wl}. (kip*ft)	0	0	0	0	0	0	0	0	21	8

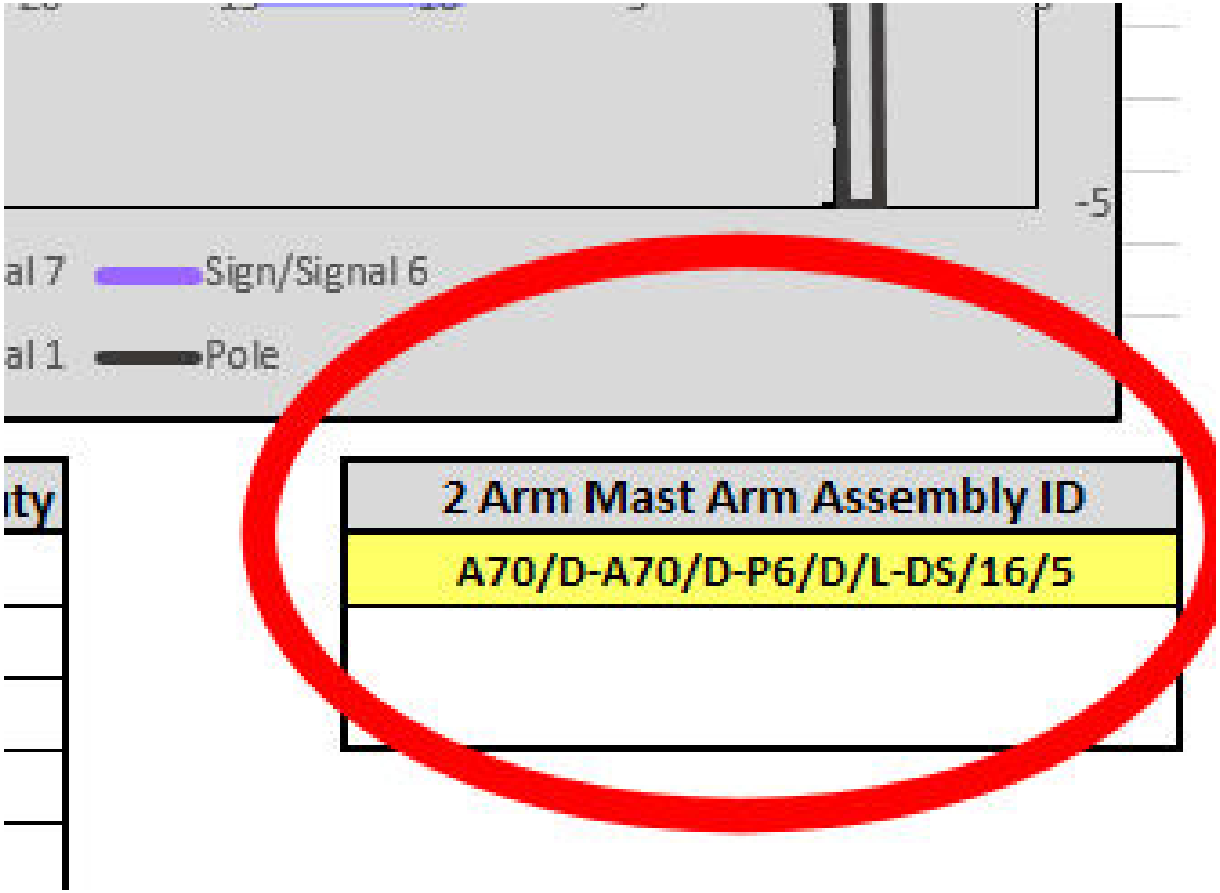


Mast Arm length (ft)	70	Two Arms
Design Standard Index 17743	Regular	Heavy Duty
Dia. at Arm Base (in)	17	18
Wall Thickness (in)	0.3750	0.3750
Resistance (M_r=ϕM_n) (kip*ft)	381	423

Mast Arm Loads	Regular	Heavy Duty
1.1*Arm M_{dl} (kip*ft)	94	110
Arm M_{wl} (kip*ft)	95	112
1.1*Sign/Signal M_{dl} (kip*ft)	2	
Sign/Signal M_{wl} (kip*ft)	29	
Total Moment ($M_{extreme}$)	156	181

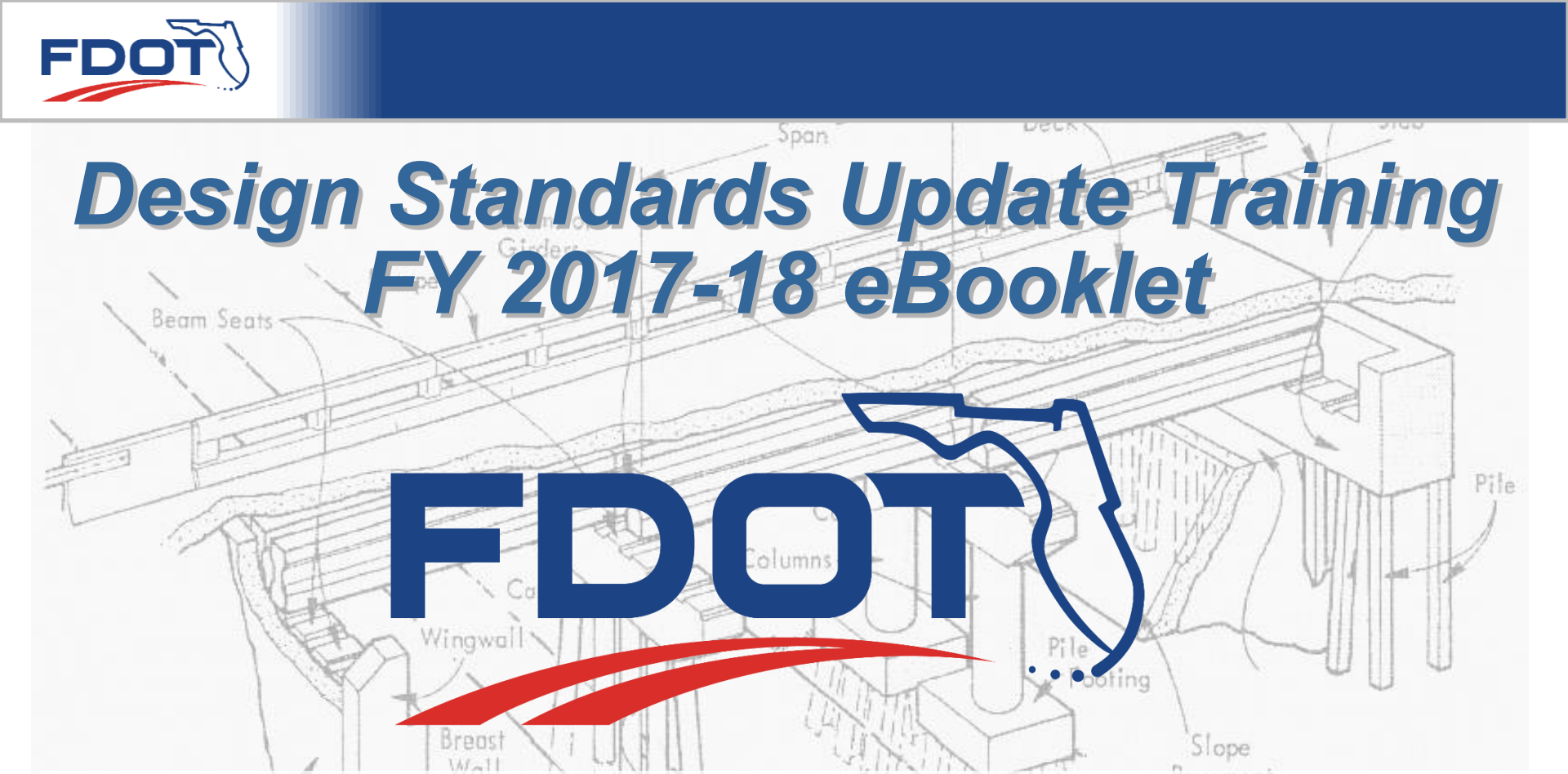
2 Arm Mast Arm Assembly ID
A70/D-A70/D-P6/D/L-DS/16/5

MastArm-Index 17743 v1.0



Questions

Design Standards Update Training
FY 2017-18 eBooklet



Structures Design Office Updates

(January, 2017)

Steven Nolan, P.E.

Structures Design Standards Group

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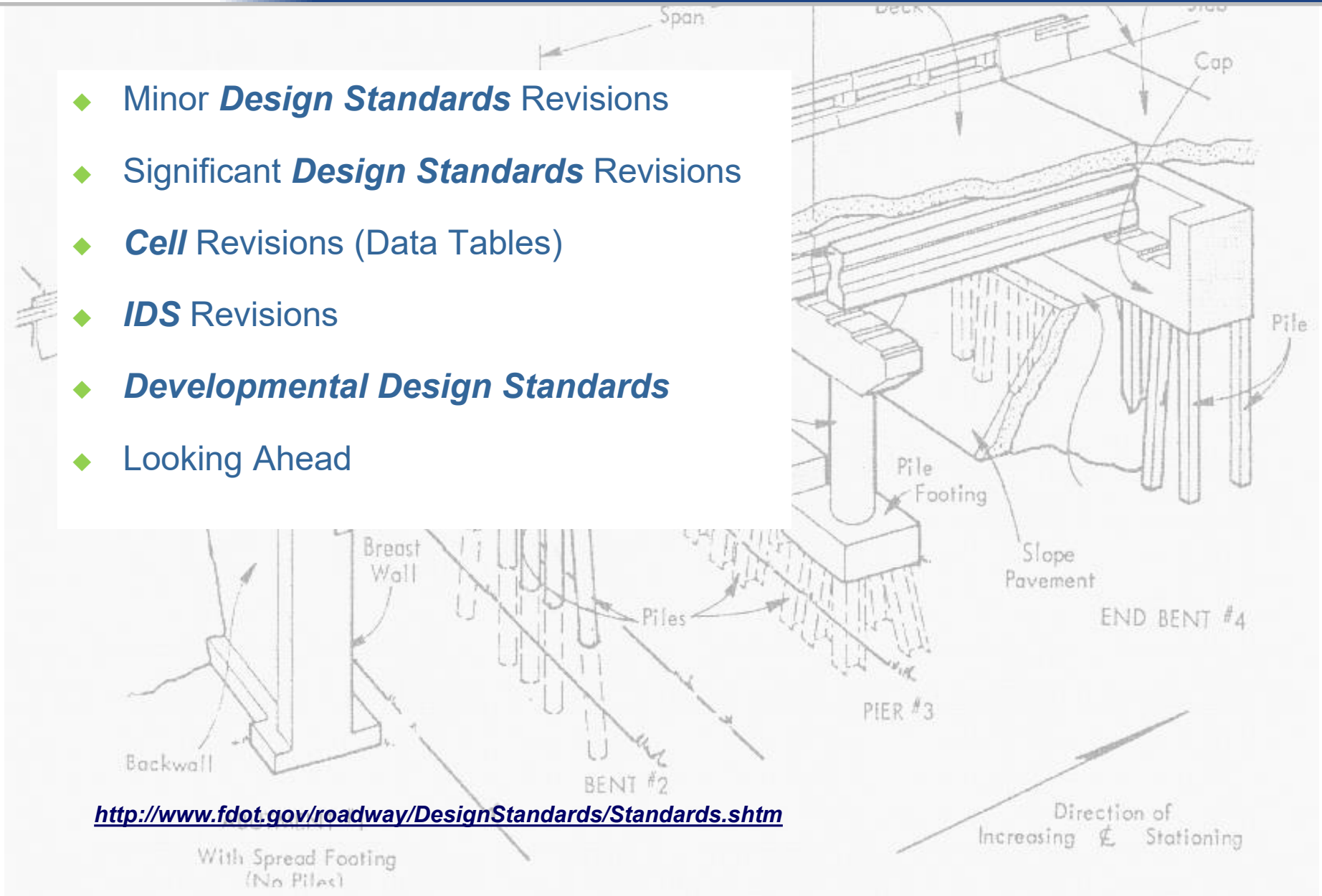
(850) 414-4272

Outline

- Minor ***Design Standards*** Revisions
- Significant ***Design Standards*** Revisions
- ***Cell*** Revisions (Data Tables)
- ***IDS*** Revisions
- ***Developmental Design Standards***
- Looking Ahead



http://www.fdot.gov/roadway/DesignStandards/Standards.shtm

Design Standards Overview

Index Number

Design Standards Revision

(PDF)

Design Information

Instructions for Design Stds (IDS)

Data Table Cell Library

Borderless DGNs

(PDF)

(ZIP)

Combined Available IDS (11mb)

Cover

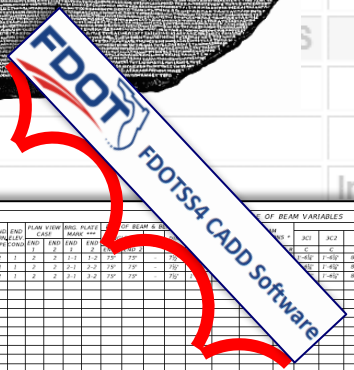
Content

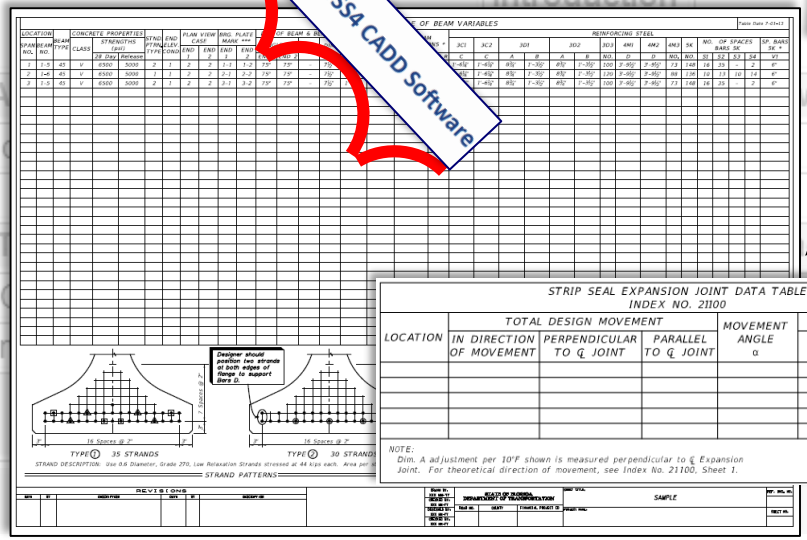
Introduction

Indexes
(for Contractor)

Data Tables
(Convey Designer's project specific information to the Contractor)

IDS
(for Designer)





001 Standard Abbreviations

002 Standard Symbols

104 Permanent Erosion

105 Shoulder Sodding

With Spread Footing
(No Piles)

Minor Revisions

- Revision History Sheet

http://www.fdot.gov/roadway/DS/18/IDx/Revisions.pdf

Fencing and Pedestrian Railings

851	All	All sheets: Notes revised/deleted to remove information included in Specification Section 515 and/or IDS.
	1 of 3	Added Notes (revised) from Sheet 3, Deleted Scheme 1 thru 3 Details;
	2 of 3	Added Scheme 1 thru 3 Details from Sheet 1; Removed Bottle Guard Details and Concrete Curb Details (WWR Details).
	3 of 3	Deleted Notes; Added Scheme 1 & 3 Bottle Guard Details from Sheet 2; Added Concrete Curb Details (WWR Details) from Sheet 2; Updated Splice Lap lengths per AASHTO-BDS 2015 Interim.

Prestressed Concrete Beams

20010	1 of 2	Change Notes.
	2 of 2	Updated references to Notes; Changed Welded Wire Reinforcement to WWR.
20036	All	Updated references to Index 20010 (series) notes.
20048	All	Updated references to Index 20010 (series) notes.
20054	All	Updated references to Index 20010 (series) notes.

Traffic Railings

420	1 & 2 of 4	Updated guardrail connection details per Index 400.
	4 of 4	Change splice length per AASHTO-BDS 2015 Interim.
421	1 & 2 of 4	Changed guardrail connections to match updated Index 400 (15'-0" overlap).
	4 of 4	Changed reinforcing splice length per AASHTO-BDS 2015 Interim.
422	1 & 2 of 3	Changed guardrail connection to match updated Index 400.
423	1 & 2 of 3	Changed guardrail connection to match updated Index 400.
424	2 of 7	Changed guardrail connection to match updated Index 400.
	5 of 7	Changed Note 4, Updated splice lengths per AASHTO BDS 2015 Interim.
425	1 & 2 of 3	Changed guardrail connection to match updated Index 400.
	2 & 3 of 3	Updated Lap Splice lengths per AASHTO-BDS 2015 Interim.
426	All	New Index.
427	All	New Index.
428	All	New Index.
471	4 of 4	Changed 30 lb smooth roofing paper to Organic Felt bond breaker.
480	2 of 2	Changed lap splice length per AASHTO-BDS 2015 Interim.
482	3 & 4 of 4	Changed 30 lb smooth roofing paper to Organic Felt bond breaker.
484	7 & 10 of 10	Changed 2 layers of 30 lb smooth roofing paper to Organic Felt bond breaker.

Minor Revisions (cont.)

Abbreviations, Roofing Paper, Type A or B Epoxy, and Reinforcing Development & Splice Lengths

Standard Abbreviations: New additions (PBR, SHBR, FSB) and expanded use of WWR in Drawings.

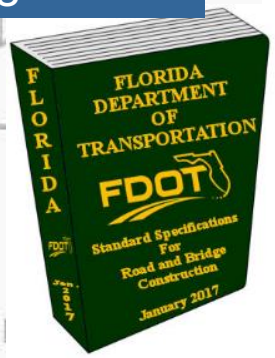
From Construction: “roofing paper” too generic – change made to Spec Section 400-11, now called “Organic Felt” bond breaker to match ASTM language.

Revised Neoprene Pads/Bearing Pads for Ancillary Structures to match Spec language.

Type A and Type B Epoxy – same material – combined in specifications by SMO to Type AB Epoxy.

ASTM A 325 & A490 Withdrawn: Bolts combined in new ASTM F3125 and renamed as Grade 325 and Grade 490.

AASHTO LRFD BDS 2015 Interims: Development & Splice Lengths

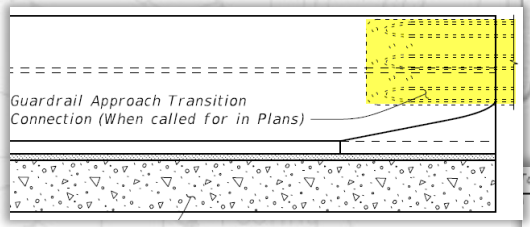


Minor Revisions (cont.)

- ***Index 810 through 812:*** *Bridge Fencing*
  - ✓ *Updates to component tables*

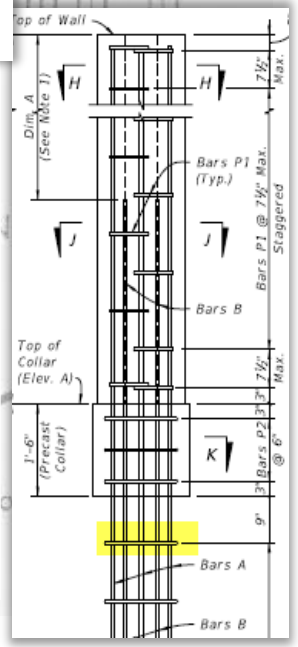
Deleted "No." after Sheet and Index and before Gage sizes, Deleted spaces between letter and number in ASTM Designations.
Table of Chain Link Fence Components – Added Class 2b to PVC Coated Chain Link Fabric & Deleted color note; Changed galvanized steel pipe designation to "Regular Grade" per ASTM F1083.

- ***Index 420 – 425 & 5210:*** *Traffic Railings*
  - ✓ Guardrail connections changed to match Index 400 revisions;
  - ✓ Change in Spec for slip-forming cover.



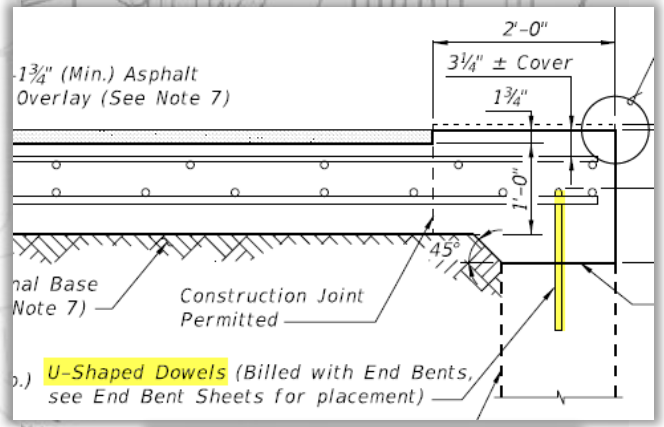
- ***Index 5200:*** *Noise Wall*
  - ✓ Increased the distance between bottom of precast post and first reinforcing tie (from 3” to 9”).

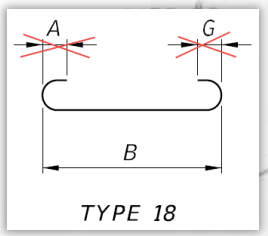
- ***Index 5250:*** *Perimeter Wall*
  - ✓ Increased the distance between bottom of precast post and first reinforcing tie (from 3” to 9”);
  - ✓ Changed the minimum/maximum embedment depth (match Noise Walls).

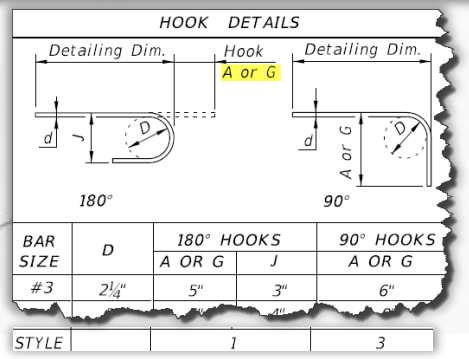


Minor Revisions (cont.)

- **Index 5213 - 5215:** *Traffic Railings/Noise Walls*
  - ✓ *Removed Slip Forming Restriction (still requires project specific approval since not addressed on the standard)*
- **Index 6110:** *Wall Coping with Junction Slab*
  - ✓ *Removed Slip Forming Restriction*
- **Index 20900 & 20910:** *Approach Slabs*
  - ✓ *Added "U-shaped" to dowels at backwall*
- **Index 21300:** *Bar Bending Details*
  - ✓ *Deleted dimension lines for A/G hooks*
  - ✓ *Changed Spiral Material Note (Spec)*





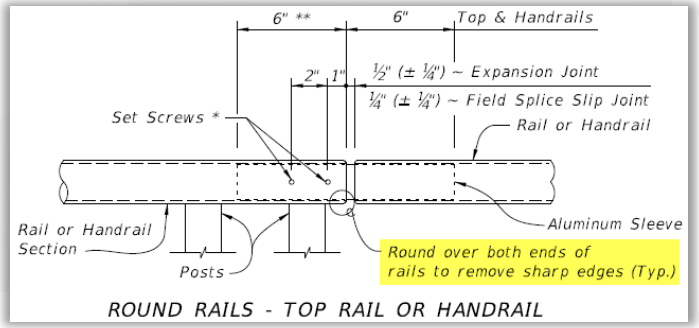


Minor Revisions (cont.)

Removal of information covered in Specification Section 515

Index 822, 851, 852, 861, 862, 870 & 880 Fencing and Pedestrian Railings:

- Removed Spec and IDS items and Reorganized Notes (new format)
  - ✓ Moved Notes to Sheet 1;
  - ✓ Reorganized drawings;
  - ✓ Updated references to Notes throughout.
- Splice Details: Changed the ¼" edge bevel to – *'Round over… to remove sharp edges'*

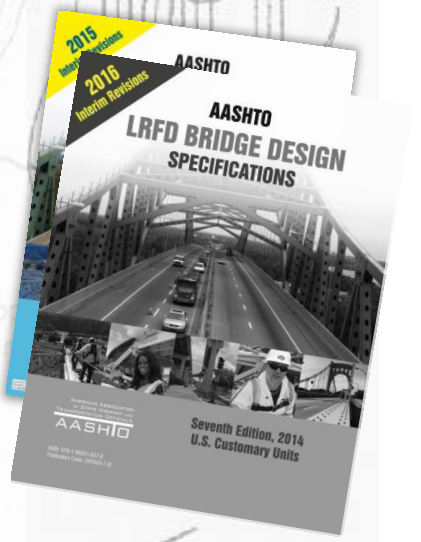


Significant Revisions

AASHTO LRFD BDS 2016 Interim - Wind Loads

Index 5200 Noise Walls:

- New wind speed categories and Load Factors for Extreme Event Wind on Structures (WS) (See SDG 2.4)
  - ✓ **110 => 130; 130 => 150; and 150 => 170**
    - Approximately the same forces and flexural moments
  - ✓ **Eliminated the 15' Post Spacing for 20'-22' walls**
    - 170 mph slightly less than the old 150 mph factored moment
    - Sharpened our pencils – *double reinforced section*
      - *Includes new Development Lengths in Dim. A calculations.*



Index 5250 Perimeter Walls

=> *ERRATA to be issued (Page 6 of 10)*

TABLE 1

Wind Speed (MPH)	Pile Length	Bars A	Bars P1 thru P6	Bars S1
110	11'-6"	#5	#3	#4
130	13'-6"	#6	#3	#4
150	15'-0"	#7	#3	#4

Significant Revisions (cont.)

Reorganization of Notes

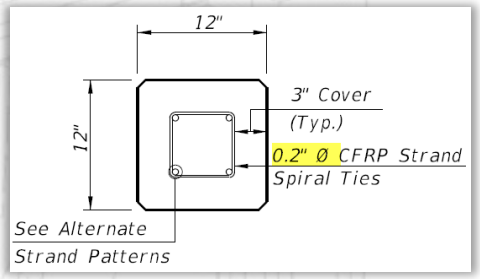
Part on an ongoing effort to standardize the note formats throughout the Standard Indexes to make referencing the appropriate note easier and to help with future updates (ASTM, Specs etc.):

- ***Index 20010:** Typical Florida-I Beam Details and Notes*
  - ✓ **Updated 20036-20096 note references** => *ERRATA to be issued for Bar Bending Tables on Index 20036 – 20096 (Note 13 & 14 do not exist)*
- ***Index 20120:** AASHTO Type II Beam (and note references)*
- ***Index 20210:** Typical Florida-U Beam Details and Notes*
  - ✓ **Updated 20248-20072 note references**
- ✓ ***Index 20600:** Notes & Details for Square Prestressed Concrete Piles*
- ***Indexes 20654 & 20660:** Concrete Cylinder Piles (and note references)*

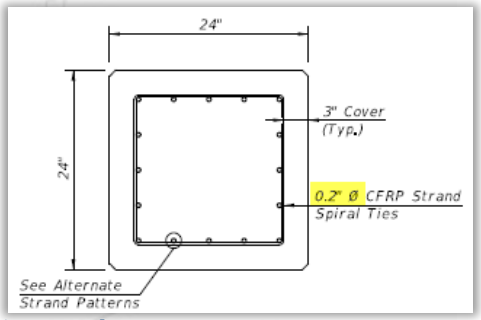
Significant Revisions (cont.)

Reorganization of Notes - continued

- ***Index 22600:*** ***Notes & Details for Square CFRP & SS Prestressed Concrete Piles***



- ***Indexes 22612:*** ***12" Square CFRP & SS Prestressed Concrete Pile***
  - ✓ *References to 22600 Notes;*
  - ✓ *Changed CFRP Alternate Strand Pattern: from 8 to 4 strands;*
  - ✓ *Corrected spiral size: from 0.3" to 0.2" dia. (all square pile sizes)*



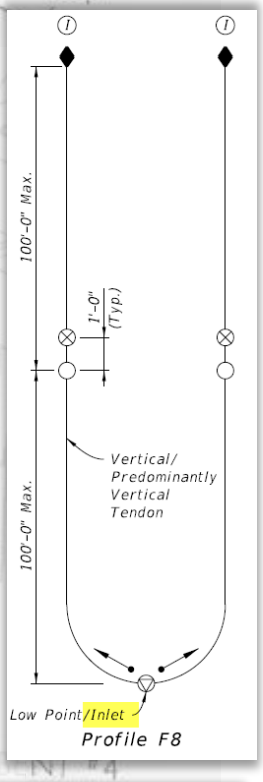
- ***Indexes 22624:*** ***24" Square CFRP & SS Prestressed Concrete Pile***
  - ✓ *References to 22600 Notes;*
  - ✓ *Changed CFRP Alternate Strand Pattern; from 20 to 16 strands.*

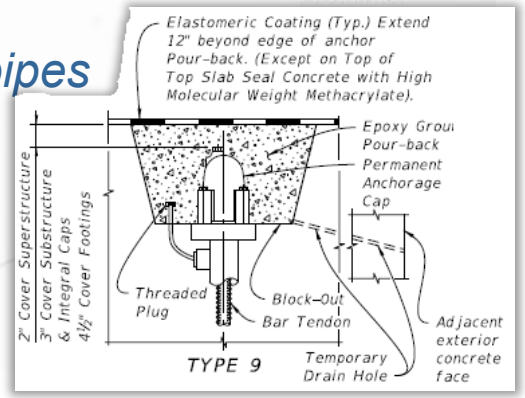
- ***Indexes 22654 & 22660:*** ***CFRP & SS Concrete Cylinder Piles***

Significant Revisions (cont.)

DSR in 2016 (plus+)

- ***Index 21801: Post-Tensioning Vertical Profiles***
  - ✓ Changed tendon profile and injection/venting locations to address flexible filler. (Also see ***SDB 16-07*** http://www.fdot.gov/design/bulletins/SDB16-07.pdf)
  - ✓ + Clarified "Low Point/Inlet" on Profile F8 and "Filler Port/Outlet" in LEGEND
- ***Index 21802: Post-Tensioning Anchorage Protection***
  - ✓ *Type 9 Detail: Show that the Temporary Drain Hole extends to the face of adjacent exterior concrete*
- ***Index 21803: Post-Tensioning Anchorage and Tendon Filling Details***
  - ✓ *Deleted High Point Inspection Detail with rigid filler pipes*
  - ✓ *Deleted Sheet 3*
  - ✓ *+ Added vacuum system*
  - ✓ *+ Revised orientation of Inlet End Detail*





New Indexes

426

Previously Developmental

428

427

Refer to Structures Design Bulletins 16-03 & 16-04

- ***Index 426:*** *Traffic Railing – (Median 36" Single-Slope)*
- ***Index 427:*** *Traffic Railing – (36" Single-Slope)*
- ***Index 428:*** *Traffic Railing – (42" Single-Slope)*

DDS

For now…. Include transition details in the Plans (see ***IDS***).

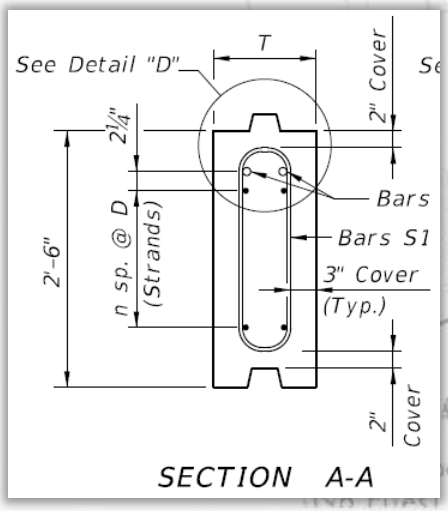
March 28, 2016	16-04 Single-Slope Traffic Railings for Bridges
February 5, 2016	16-03 MASH-16 Implementation Plan (Engineering and Operations Memorandum 16-01, Roadway Design Bulletin 16-02, Program Management Memorandum 16-01, DCE Memorandum No. 03-16, DME Memorandum No. 16-01)

New Indexes (cont.)

DDS

Previously Developmental

- ***Index 22440: Precast Concrete CFRP/GFRP & HSSS/GFRP Sheet Pile Wall***
  - ✓ *Was **Developmental Design Standard** Index D22440*
  - ✓ *Added High Strength Stainless Steel (HSSS) prestressing strand option*
  - ✓ *Added closed GFRP stirrup option*



Strand Material	Wall Thickness	STRAND DIA. (in.)	MAXIMUM L **	n	D (in.)	TOTAL # OF STRANDS	SECTION MODULUS (in.³)	* STRESS (psi)
CFRP Strand	T=10 in.	0.49 (12.5mm)	26'-0"	4	4	10	500	730
		0.5 (12.7mm)	27'-0"	3	5¼ (2)	8	500	830
		0.6 (15.2mm)	27'-0"	3	5¼ (2)	8	500	840
	T=12 in.	0.49 (12.5mm)	31'-0"	5	3¼ (1)	12	720	730
		0.5 (12.7mm)	31'-0"	3	5¼ (2)	8	720	700
		0.6 (15.2mm)	31'-0"	3	5¼ (2)	8	720	710
HSSS Strand	T=10 in.	0.5 (12.7mm)	27'-0"	5	3¼ (1)	12	500	790
		0.6 (15.2mm)	26'-0"	3	5¼ (2)	8	500	750
	T=12 in.	0.5 (12.7mm)	32'-0"	6	2¾ (3)	14	720	780
		0.6 (15.2mm)	32'-0"	4	4	10	720	780

Cell Revisions

- ***Some Structures Data Table cells were updated:***
  - ✓ ***Standard Mast Arm Data Table:*** *17743*
    - *Should have been in CADD FDOTSS4 MR2 release (errata: insert Data Table)*
  - ✓ ***Approach Slabs:*** *20900/20910 ➔ 20900*
    - *Combined into one cell for use with Flexible or Rigid Pavement*
  - ✓ ***Post-Tensioning Data Table*** *21800B & 21800T*
    - *Should have been in CADD FDOTSS4 MR2 release (errata: * ➔ footnote numerals)*
  - ✓ ***Concrete Sheet Piles:***
    - ***Cantilevered*** *22440 –CSPC*
    - ***Deadman Anchored*** *22440-CSPDA*
    - ***Soil Anchored*** *22440-CSPSA*

http://www.fdot.gov/structures/CADD/standards/CurrentStandards/MicrostationDrawings.shtm

Update your cells!!

Instructions for Design Standards

- ***Updated all Data Table images when cells changed;***
- ***IDS 426-428*: (New) - *Single Slope Traffic Railings***
  - ✓ *Added length of transition to 32" F-shape and instructions to provide special end transition details.*
- ***IDS-810 - 812*: *Bridge Fencing***
  - ✓ *Added "Alternative Technical Proposals" section (for consideration of proprietary system proposals - ATC or CSIP).*
- ***IDS-6011*: *Gravity Wall***
  - ✓ *Correct SPT Blow Count description to match LRFD 10.6.3.1.3-1*
  - ✓ *Updated the overall (global) stability analysis guidelines.*

IDS Revisions (cont.)

Instructions for Design Standards

- ***IDS 11860 – 17745:***
  - ✓ *Updated to AASHTO LRFD LTS-1*
- ***IDS-20010: Florida I-Beam & 20120 AASHTO Type II Beams***
  - ✓ *Removed reference to deleted Index 20005 (Bracing – from last year)*
- ***IDS-21210: Conduit***
  - ✓ *Clarified Plan Requirements*

Conduit Usage and Limits	Plan Requirements
Present use	Show supplemental project specific details and requirements to coordinate with conduit beyond bridge or retaining wall. Coordinate with the ITS, Lighting, etc. plans as required.
Future use with conduit limits consistent with limits shown on Design Standard	Designate conduit as "Future Use", no additional plan details required to show conduit limits.
Future use with conduit limits not consistent with limits shown on Design Standard	Show supplemental project specific details and requirements to coordinate with conduit beyond bridge or retaining wall. Coordinate with the ITS, Lighting, etc. plans as required.

- ***IDS-21210: Post-Tensioning – Released as part of DSR***
  - ✓ *Changed descriptions for Type 1, 2, 4, 5, 6, & 7 (Deleted Type 3)*
  - ✓ *Added descriptions of Type 3A & Type 3B*

IDDS Revisions (cont.)

Developmental *IDDS* Updates

- ***IDDS 20450*** *Updated…*
  - ✓ *Deleted "bottom layer" and "top layer" in C-I-P topping single rebar mat* ***Design Assumptions and Limitations.***
  - ✓ *Added Reinforcing Bar Bending "Type" to Bar Details to clarify Stirrup Bar radius*
  - ✓ *Drip Grooves are not required*
  - ✓ *Changed strand pattern instructions and added Strand Debonding discussion for Table of Variables bullet.*
  - ✓ *New Pay Item for "Plain Neoprene Bearing Pads"*

Figure 18 Superstructure Reinforcing Bar Details

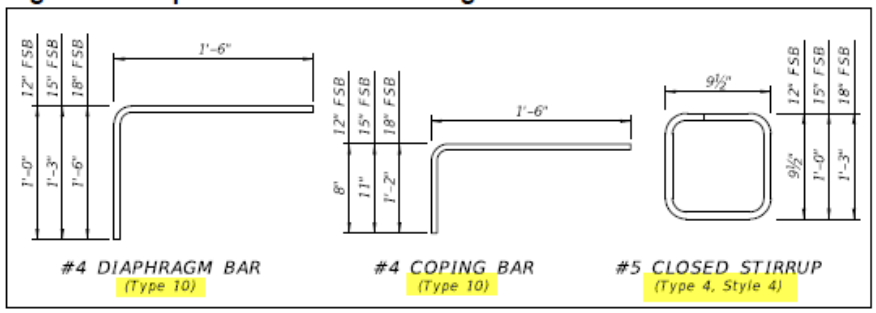
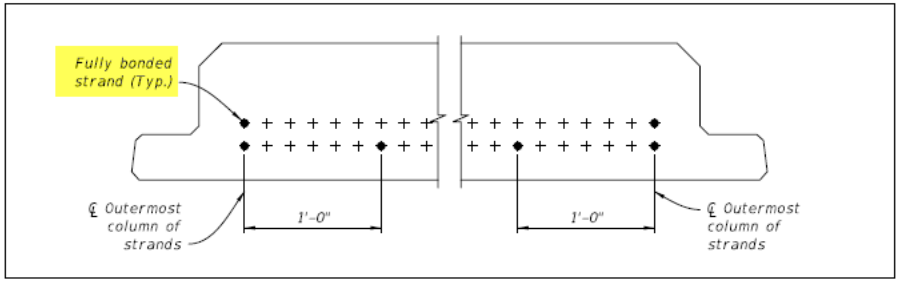
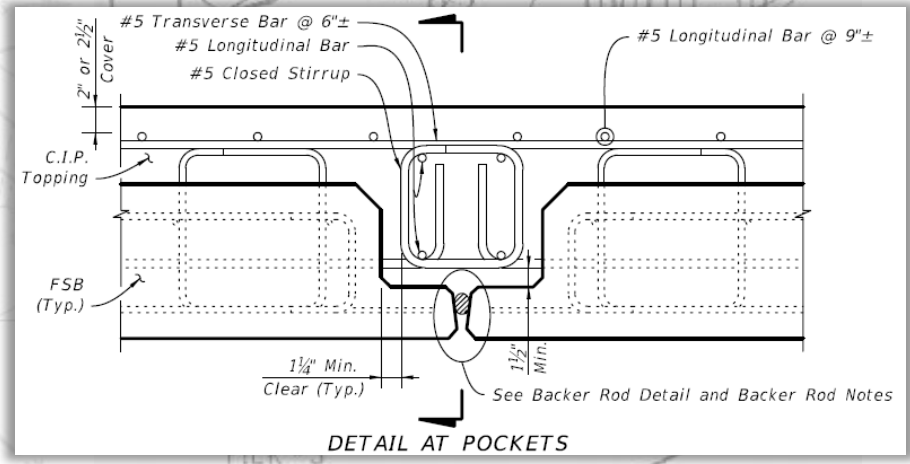


Figure 16 Fully Bonded Strand Locations



Developmental => DDS Updates

- ***D6025*: GRS-IBS**
  - ✓ *Changed multiple notes and reference to **Index 199** (deleted);*
  - ✓ *Updated Guardrail connection to match **Index 400.***
- ***D20451 – D20453 Florida Slab Beams***
  - ✓ *Clarified Bar Bend diameters for Stirrup Bars.*
- ***D21310: FRP Bar Bending Details***
  - ✓ *Changed to be more consistent with Details for Steel Reinforcing.*



Looking Ahead

Updates on Other *Design Standards in the works:*

- ✓ ***Index D6012*** – Slope-Cut Retaining Wall;
- ✓ ***Index D20700 series*** – Precast Intermediate Bent Cap;
- ✓ ***MASH*** implementation

  http://www.fdot.gov/design/bulletins/RDB16-02.pdf

- ✓ ***Index D30000 series*** – Off-System Bridge Packages (Superstructure):
  - 4 span lengths - 30', 40', 50' (done) and 60' (pending TBA);
  - 5 bridge clear widths – 15', 24', 28, 32' and 40';

2016 Design Training EXPO
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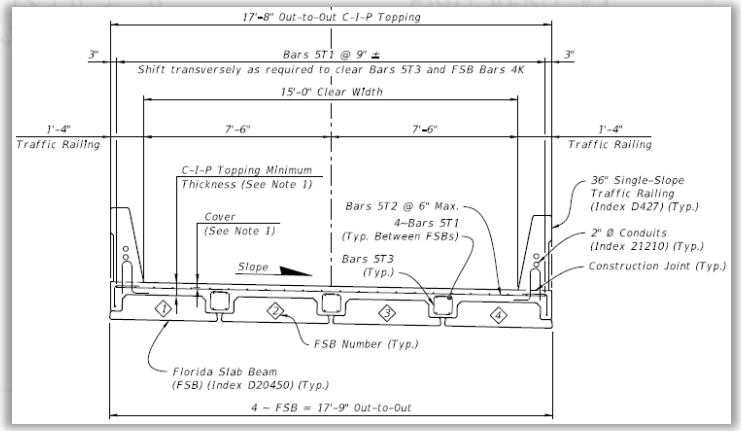
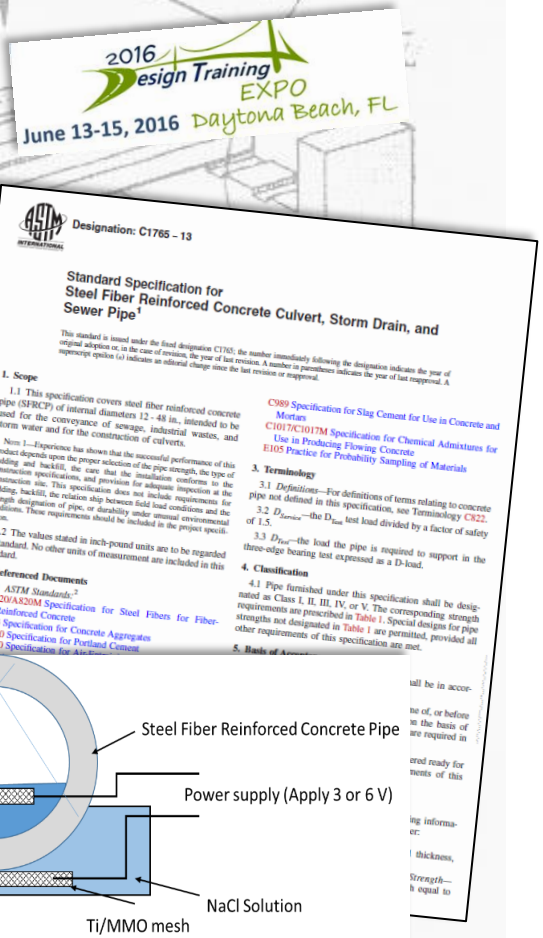
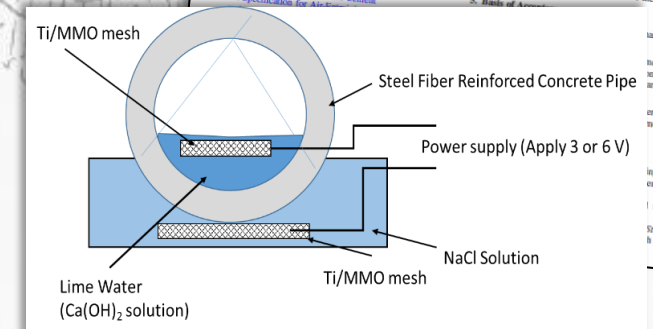


Looking Ahead (cont.)

- Fiber-Reinforced Concrete:
  - ✓ Prestressed Beam Research Project:
    - BDV31 977-41 *Macro Synthetic Fiber Reinforcement for Improved Structural Performance of Concrete Bridge Girders (2017);*
  - ✓ SFRC & SYNFRC Pipe ASTM's with additional durability research promoted by the State Materials:
    - BDV34 977-05 - Degradation Mechanisms and Service Life Estimation of Steel Fiber Reinforced Polymer (FRP) Concrete Reinforcements;
    - UT-Arlington & ACPA – Protocol for 100 Year Service Life of SYNFRC Concrete Pipes Based on ASTM C1818.

Photos courtesy of TxDOT: FHWA/TX-06/ 0-4819-1 *Fiber Reinforcement in Prestressed Concrete Beams (2005)*

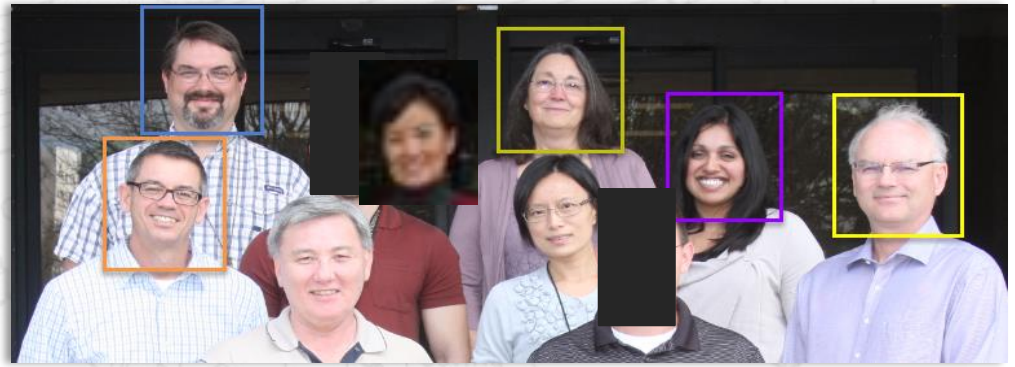




Schematic of proposed test to accelerate the corrosion of the fibers *(courtesy of FAU).*

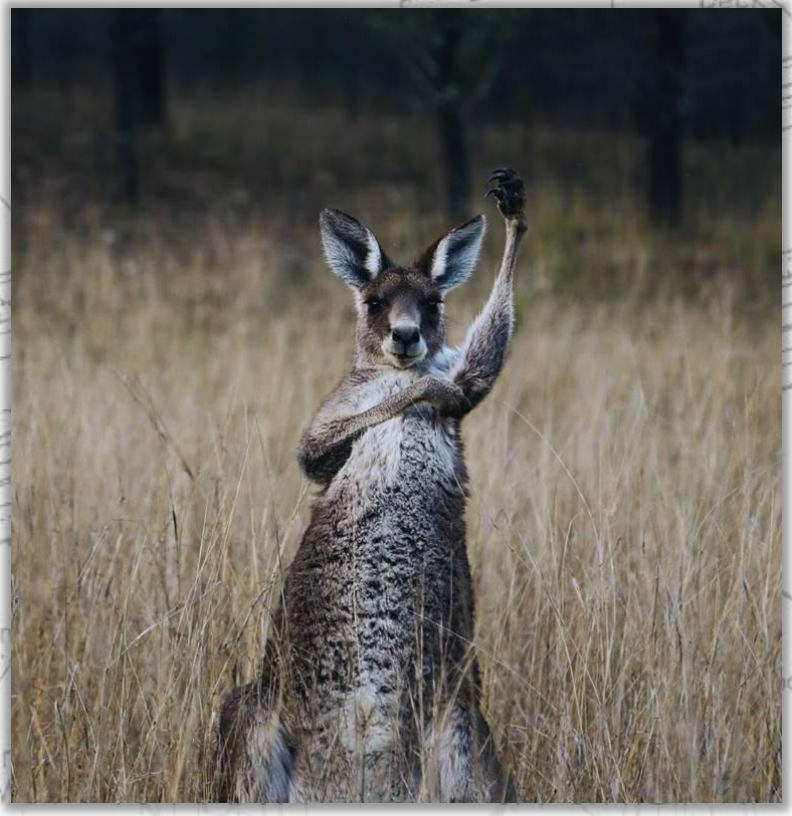
Message from the Structures Standards Group

We are here to assist you with your questions and concerns. Please contact us:



- ✓ If you have a suggestion:
  - for a new standard or
  - for an improvement to
  - an existing standard.
- ✓ If you have any issues during design or construction:
  - Fully explain the issue (photos help);
  - Provide suggestions (if you have any);
  - Provide any documentation that might support a proposed change and assist us during development.
- ✓ Anytime you have questions or concerns *(but, we recommend always reviewing the **IDS** first)*.

Questions ?



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