MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

INDEX

All work shall comply to the latest edition of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* and the latest edition of the Massachusetts Department of Transportation - Highway Division Standard Specifications for Highways and Bridges, including the latest Supplemental and Interim Supplemental Specifications.

OVERHEAD SIGNAL STRUCTURE & FOUNDATION

Standard Drawings

NOTES

1. These drawings are intended to provide standard designs for mast arms and foundations or design standards that must be met for span wire assemblies or non-standard mast arms and their respective foundations.

2. If a standard mast arm design is used the Design Engineer shall not propose overhead traffic signal components and signage that exceed the loading conditions depicted on Sheets 2 and 3 of this set.

3. For non-standard mast arms, including but not limited to specialty mast arms or mast arms that have loading conditions that exceed what is depicted on Sheets 2 and 3 of this set, it shall be the responsibility of the Design Engineer to submit a design for the structure and foundation that conforms to the latest edition of the AASHTO *Standard Specifications for Strucutural Supports for Highway Signs, Luminaires, and Traffic Signals*.

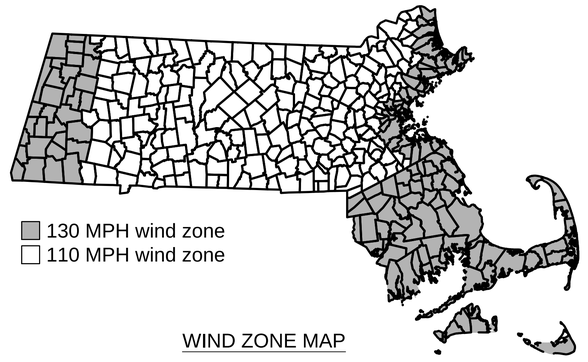
4. For span wire assemblies, the Design Engineer shall provide span length(s) and soil classification at proposed strain pole locations. The contractor shall provide the Design Engineer with shop drawings for the strain poles and foundations that conform to the latest edition of the AASHTO *Standard Specifications for Strucutral Supports for Highway Signs, Luminaires, and Traffic Signals* and are stamped and signed by a Massachusetts Professional Structural Engineer.

5. The Design Engineer is responsible for providing soil classification for all overhead signal structures, regardless of type, and for selecting a foundation design for standard mast arms.

6. Overhead signal structures and foundations located in the shaded region on the wind zone map shall use a Design Wind Speed of 130 MPH. This region includes all of Plymouth, Bristol, Barnstable, Dukes, Nantucket, Suffolk, and Berkshire counties, and coastal towns in Norfolk, Middlesex, and Essex counties as shown on the wind zone map. A Design Wind Speed of 110 MPH shall be used for all other regions.

7. With the exception of Note 8, mast arm structures and strain poles shall have a 50 year Design Life using Fatigue Category No. 2, with truck wind gusts excluded.

8. Overhead signal structures located at intersections with an AADT that exceeds 40,000 vehicles per day and a truck percentage of greater than 10% shall utilize a non-standard design. The Design Life shall be 50 years using Fatigue Category No. 1.



WIND ZONE MAP

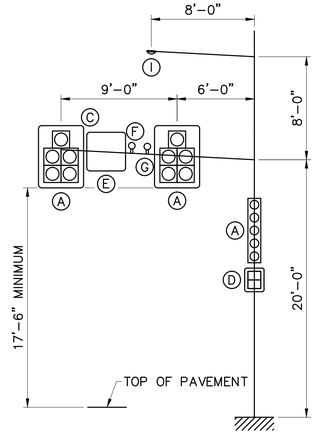
massDOT Massachusetts Department of Transportation Highway Division

STANDARD DRAWINGS

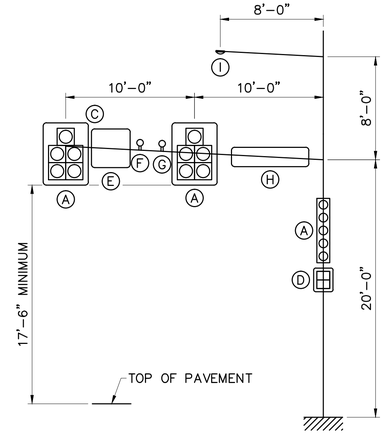
OVERHEAD SIGNAL STRUCTURE & FOUNDATION
TITLE SHEET

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

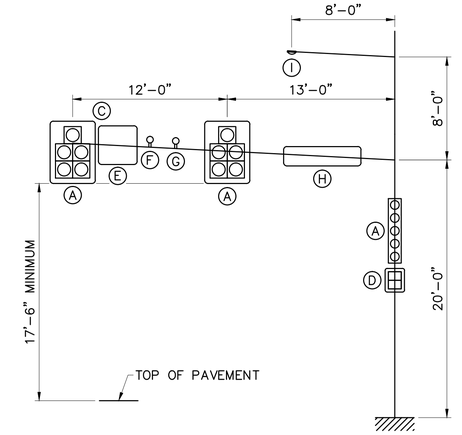
DECEMBER, 2015



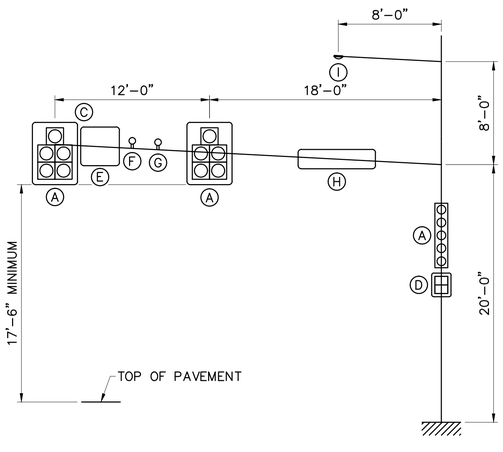
15' SPAN



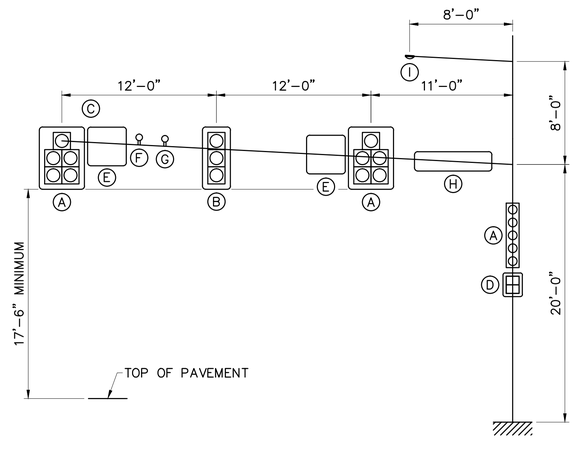
20' SPAN



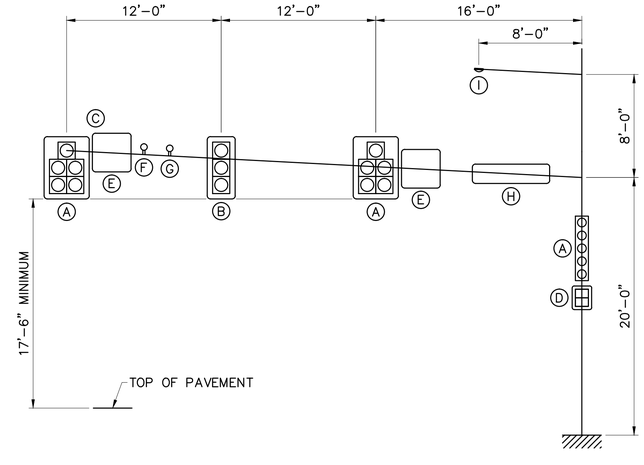
25' SPAN



30' SPAN



35' SPAN



40' SPAN

DESIGN LOADING							
DEVICE	DESCRIPTION	PROJ. AREA (FT^2)	WEIGHT (LBS)	DEVICE	DESCRIPTION	PROJ. AREA (FT^2)	WEIGHT (LBS)
(A)	5 SECTION, 1 WAY SIGNAL	13.33	110	(F)	DETECTOR	1.00	10
(B)	3 SECTION, 1 WAY SIGNAL	8.67	74	(G)	STROBE	1.00	10
(C)	DAMPENER PLATE (NOT SHOWN)	0.00	9	(H)	72" X 18" STREET NAME SIGN	9.00	12
(D)	DUAL PEDESTRIAN SIGNAL	8.00	80	(I)	OPTIONAL LUMINAIRE	3.30	75
(E)	36" X 36" REGULATORY SIGN	9.00	12				

NOTE: ALL SIGNALS HAVE 5.0" NON–LOUVERED BACKPLATES WITH REFLECTIVE BORDERS

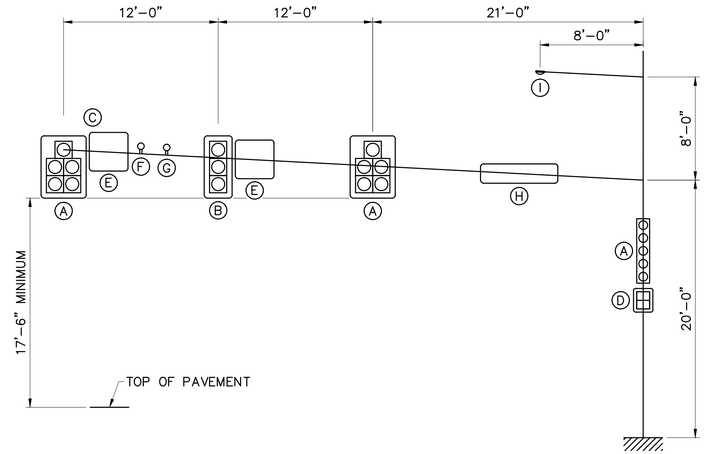
massDOT Massachusetts Department of Transportation Highway Division

STANDARD DRAWINGS

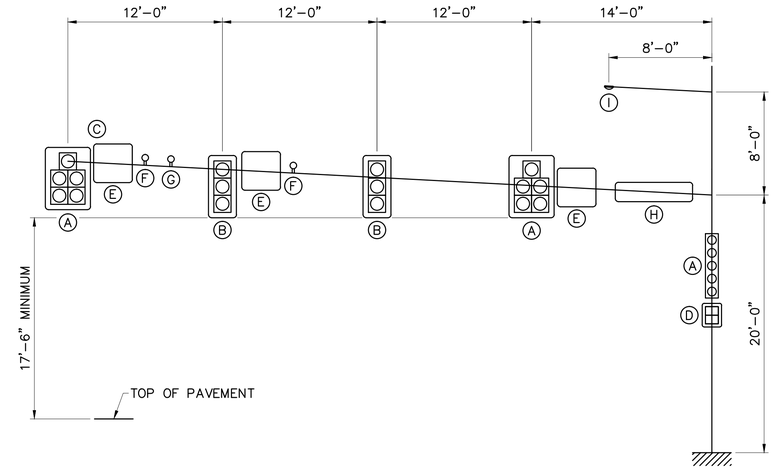
OVERHEAD SIGNAL STRUCTURE & FOUNDATION 15' – 40' ARM LOAD DIAGRAMS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

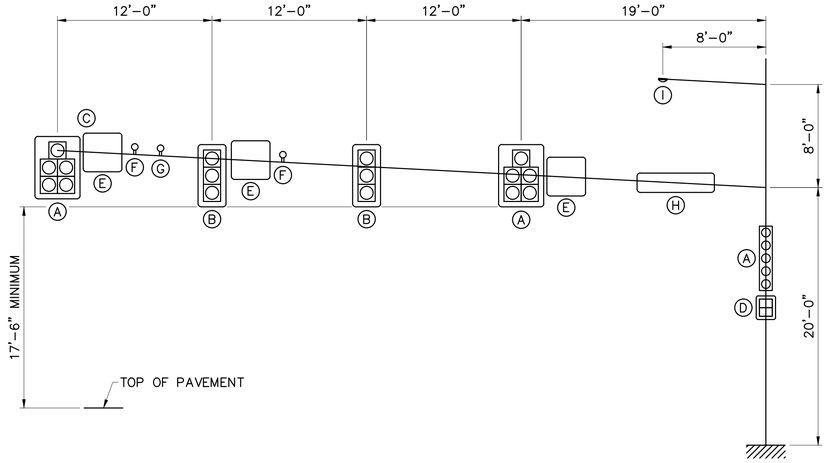
DECEMBER, 2015



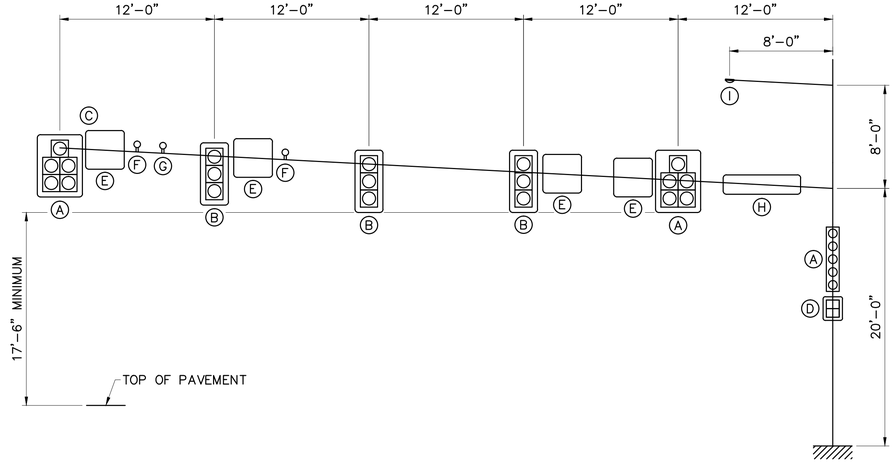
45' SPAN



50' SPAN



55' SPAN



60' SPAN

DESIGN LOADING							
DEVICE	DESCRIPTION	PROJ. AREA (FT^2)	WEIGHT (LBS)	DEVICE	DESCRIPTION	PROJ. AREA (FT^2)	WEIGHT (LBS)
(A)	5 SECTION, 1 WAY SIGNAL	13.33	110	(F)	DETECTOR	1.00	10
(B)	3 SECTION, 1 WAY SIGNAL	8.67	74	(G)	STROBE	1.00	10
(C)	DAMPENER PLATE (NOT SHOWN)	0.00	9	(H)	72" X 18" STREET NAME SIGN	9.00	12
(D)	DUAL PEDESTRIAN SIGNAL	8.00	80	(I)	OPTIONAL LUMINAIRE	3.30	75
(E)	36" X 36" REGULATORY SIGN	9.00	12				

NOTE: ALL SIGNALS HAVE 5.0" NON-LOUVERED BACKPLATES WITH REFLECTIVE BORDERS

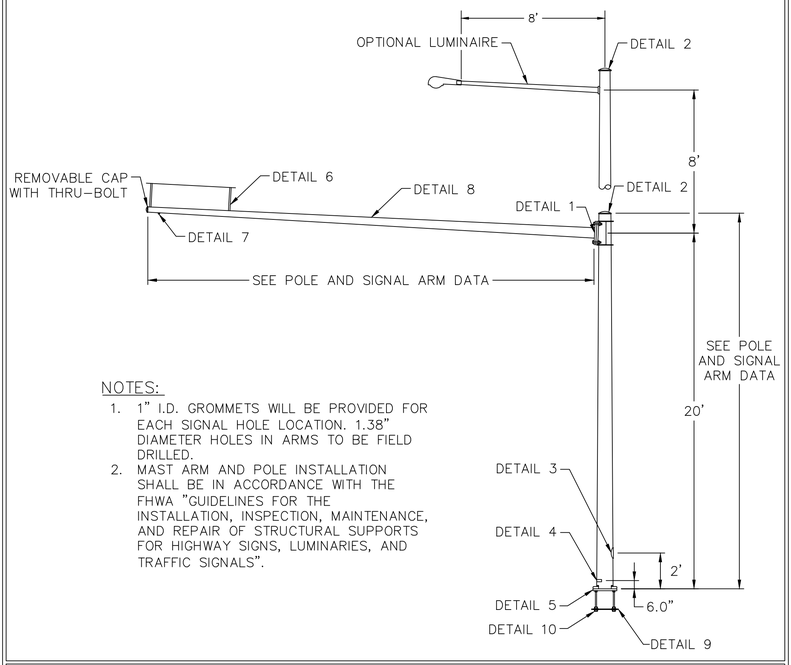
MassDOT Massachusetts Department of Transportation Highway Division

STANDARD DRAWINGS

OVERHEAD SIGNAL STRUCTURE & FOUNDATION 45' – 60' ARM LOAD DIAGRAMS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

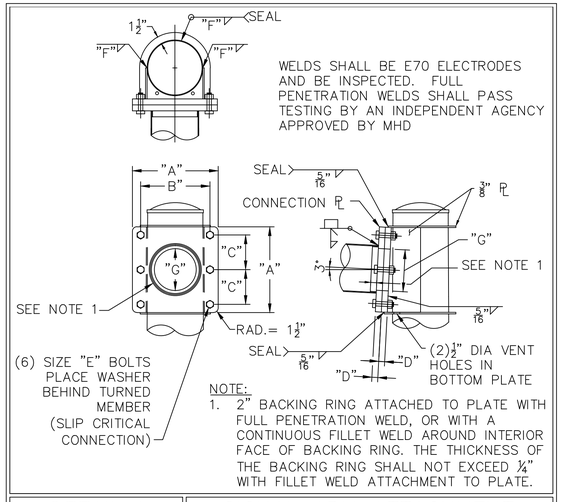
DECEMBER, 2015



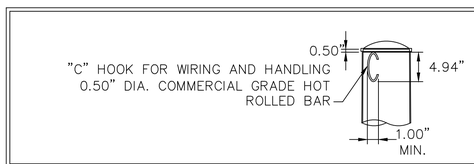
NOTES:

1. 1" I.D. GROMMETS WILL BE PROVIDED FOR EACH SIGNAL HOLE LOCATION. 1.38" DIAMETER HOLES IN ARMS TO BE FIELD DRILLED.
2. MAST ARM AND POLE INSTALLATION SHALL BE IN ACCORDANCE WITH THE FHWA "GUIDELINES FOR THE INSTALLATION, INSPECTION, MAINTENANCE, AND REPAIR OF STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS".

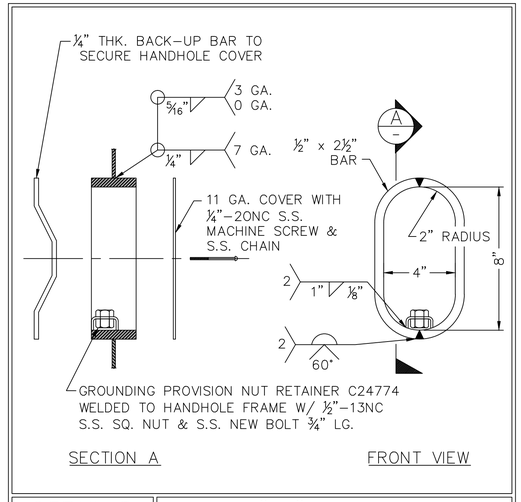
MAST ARM ELEVATION



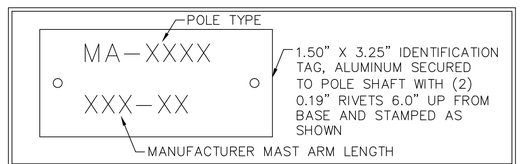
DETAIL 1 | SIGNAL ARM ATTACHMENT



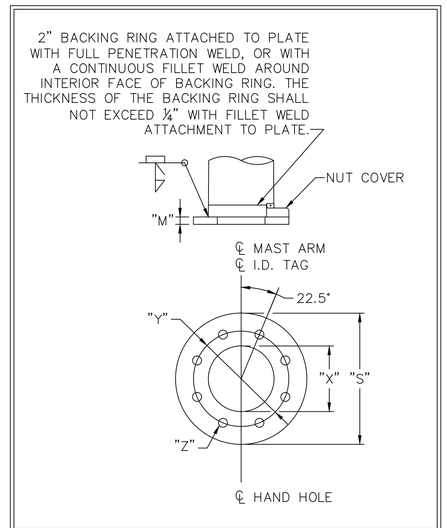
DETAIL 2 | POLE TOP



DETAIL 3 | 4"x8" HANDHOLE



DETAIL 4 | I.D. TAG

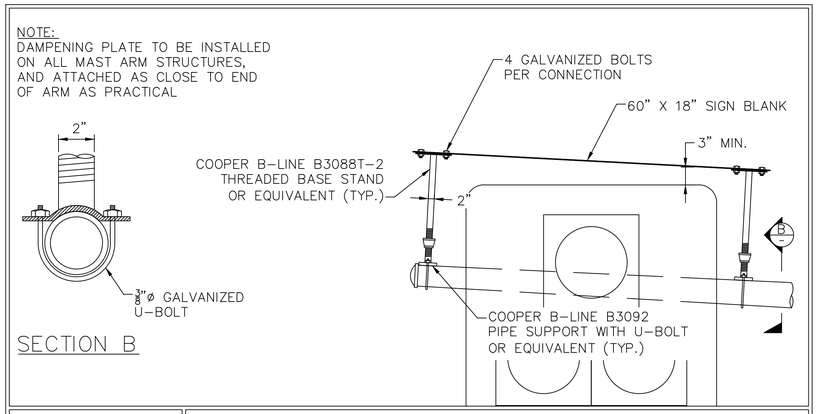


DETAIL 5 | POLE BASE

MATERIAL DATA

COMPONENT	DESIGNATION	YIELD (KSI)
POLE TUBE	ASTM A595 GR. A	55
POLE BASE PLATE	AASHTO M270, OR ASTM A709	50
ANCHOR BOLTS	AASHTO M314, OR ASTM A307 GR. C	55
GALVANIZING	AASHTO M111 OR M232	
ARM TUBE	ASTM A595 GR. A	55
ARM CONNECTION PLATE	AASHTO M270, OR ASTM A709	50
ARM CONNECTING BOLTS	AASHTO M164, OR ASTM A325 **	

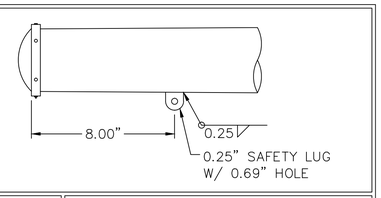
** BOLTS WHICH ACCUMULATE RUST OR DIRT SHALL BE DISCARDED.



DETAIL 6 | DAMPENER PLATE

POLE AND SIGNAL ARM DATA

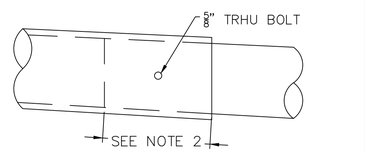
LOCATIONS	SIGNAL ARM TUBE				POLE TUBE				POLE BASE					ANCHOR BOLT		SIGNAL ARM ATTACHMENT DATA						
	SPAN (FT)	FIXED END DIA. (IN)	FREE END DIA. (IN)	WALL THK.	BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	WALL THK.	PLATE CIRCLE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "M" (IN)	HOLE "Z" (IN)	HOLE "X" (IN)	DIA. "K" (IN)	EMBED. LENGTH "J" (IN)	"A" (IN)	"B" (IN)	"C" (IN)	"D" (IN)	"E" (IN)	"F" (IN)	"G" (IN)
	15.00	9.00	6.90	7 GA.	13.00	9.92	22.00	7 GA.	24.00	19.00	2.00	1.50	10.00	1.25	36.00	17.25	14.00	7.00	2.00	1.00	0.188	7.00
	20.00	9.00	6.20	7 GA.	13.00	9.92	22.00	3 GA.	27.00	22.00	2.00	1.75	10.00	1.50	36.00	17.75	14.50	7.25	2.00	1.00	0.250	7.00
	25.00	10.00	6.50	7 GA.	13.00	9.92	22.00	3 GA.	27.00	22.00	2.00	1.75	10.00	1.50	36.00	18.25	15.00	7.50	2.00	1.00	0.250	7.50
	30.00	11.00	6.80	7 GA.	13.50	10.42	22.00	3 GA.	27.00	22.00	2.00	1.75	10.50	1.50	36.00	18.75	15.50	7.75	2.00	1.00	0.250	8.75
	35.00	12.00	7.10	3 GA.	15.00	11.92	22.00	3 GA.	27.00	22.00	2.00	1.75	12.50	1.50	36.00	20.25	17.00	8.50	2.00	1.25	0.313	6.50
	40.00	13.00	7.40	3 GA.	16.00	12.92	22.00	3 GA.	29.00	24.00	2.00	2.00	12.00	1.75	36.00	21.25	18.00	9.00	2.00	1.25	0.313	6.75
	45.00	13.50	7.20	3 GA.	17.50	14.42	22.00	3 GA.	29.00	24.00	2.00	2.00	12.00	1.75	48.00	22.25	19.00	9.50	2.25	1.25	0.313	8.00
	50.00	14.50	7.50	3 GA.	17.00	13.92	22.00	0 GA.	29.00	24.00	2.00	2.00	12.00	1.75	48.00	22.75	19.50	9.75	2.25	1.25	0.313	8.50
	55.00	16.00	8.30	3 GA.	18.00	14.92	22.00	0 GA.	31.00	26.00	2.00	2.25	12.00	2.00	48.00	23.75	20.00	10.00	2.25	1.25	0.313	8.75
	60.00	16.00	8.00	0 GA.	19.50	16.42	22.00	0 GA.	31.00	26.00	2.00	2.25	14.00	2.00	48.00	25.75	22.00	11.00	2.50	1.50	0.313	7.50



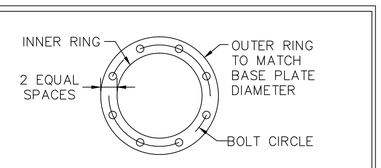
DETAIL 7 | SAFETY HANGER LUG

NOTES:

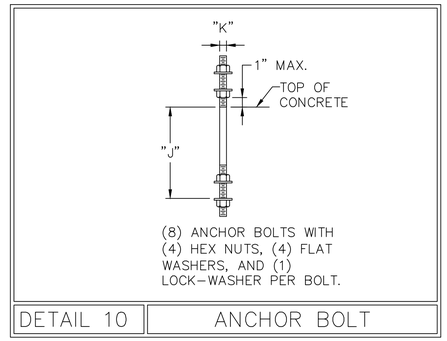
1. TELESCOPIC FIELD SPLICE REQUIRED ON ALL MAST ARM LENGTHS OF 45' OR GREATER
2. THE MINIMUM SPLICE LENGTH SHALL BE AT LEAST 1.5 TIMES THE INSIDE DIAMETER OF THE EXPOSED END OF THE FEMALE SECTION.



DETAIL 8 | ARM SPLICE DETAIL



DETAIL 9 | ANCHOR PLATE



DETAIL 10 | ANCHOR BOLT

MassDOT Massachusetts Department of Transportation Highway Division

STANDARD DRAWINGS

OVERHEAD SIGNAL STRUCTURE & FOUNDATION MAST ARM DETAILS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

DECEMBER, 2015

PIER FOUNDATIONS FOR 110 MPH WIND SPEED ZONE

SOIL TYPE	15' & 20' MAST ARMS				25' & 30' MAST ARMS				35' & 40' MAST ARMS				45' & 50' MAST ARMS				55' & 60' MAST ARMS			
	DIAMETER	DEPTH	VERT. BARS	TIE BARS	DIAMETER	DEPTH	VERT. BARS	TIE BARS	DIAMETER	DEPTH	VERT. BARS	TIE BARS	DIAMETER	DEPTH	VERT. BARS	TIE BARS	DIAMETER	DEPTH	VERT. BARS	TIE BARS
DRY SAND (LOOSE)	3'–6"	8'–6"	18–#8	#5 @ 12"	3'–6"	9'–0"	18–#8	#5 @ 12"	3'–6"	11'–6"	18–#8	#5 @ 9"	4'–0"	12'–0"	18–#9	#5 @ 9"	4'–6"	13'–0"	18–#10	#5 @ 6"
DRY SAND (DENSE)	3'–6"	7'–6"	18–#8	#5 @ 12"	3'–6"	7'–6"	18–#8	#5 @ 12"	3'–6"	8'–6"	18–#8	#5 @ 9"	4'–0"	9'–0"	18–#9	#5 @ 9"	4'–6"	9'–6"	18–#10	#5 @ 6"
WET SAND (LOOSE)	3'–6"	9'–6"	18–#8	#5 @ 12"	3'–6"	11'–6"	18–#8	#5 @ 12"	3'–6"	14'–6"	18–#8	#5 @ 9"	4'–0"	15'–6"	18–#9	#5 @ 9"	4'–6"	16'–6"	18–#10	#5 @ 6"
WET SAND (DENSE)	3'–6"	8'–6"	18–#8	#5 @ 12"	3'–6"	9'–0"	18–#8	#5 @ 12"	3'–6"	10'–6"	18–#8	#5 @ 9"	4'–0"	11'–6"	18–#9	#5 @ 9"	4'–6"	12'–0"	18–#10	#5 @ 6"
CLAY (SOFT TO MEDIUM STIFF)	3'–6"	12'–0"	18–#8	#5 @ 12"	3'–6"	12'–0"	18–#8	#5 @ 12"	3'–6"	13'–0"	18–#8	#5 @ 9"	4'–0"	14'–0"	18–#9	#5 @ 9"	4'–6"	15'–6"	18–#10	#5 @ 6"
CLAY (STIFF)	3'–6"	10'–6"	18–#8	#5 @ 12"	3'–6"	10'–6"	18–#8	#5 @ 12"	3'–6"	11'–0"	18–#8	#5 @ 9"	4'–0"	12'–0"	18–#9	#5 @ 9"	4'–6"	13'–6"	18–#10	#5 @ 6"

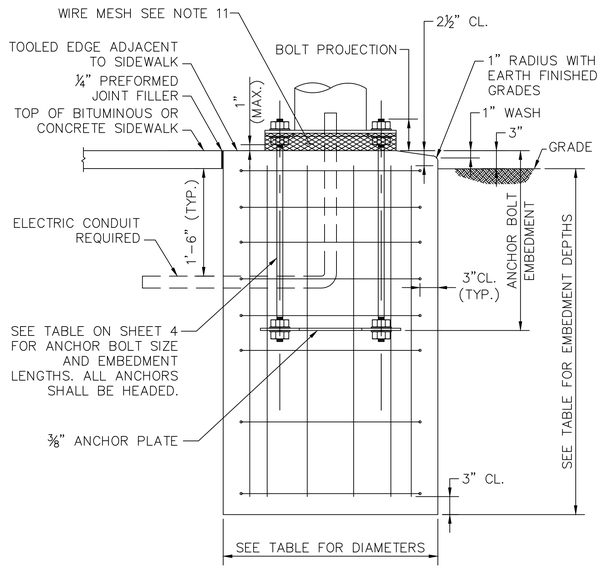
PIER FOUNDATIONS FOR 130 MPH WIND SPEED ZONE

SOIL TYPE	15' & 20' MAST ARMS				25' & 30' MAST ARMS				35' & 40' MAST ARMS				45' & 50' MAST ARMS				55' & 60' MAST ARMS			
	DIAMETER	DEPTH	VERT. BARS	TIE BARS	DIAMETER	DEPTH	VERT. BARS	TIE BARS	DIAMETER	DEPTH	VERT. BARS	TIE BARS	DIAMETER	DEPTH	VERT. BARS	TIE BARS	DIAMETER	DEPTH	VERT. BARS	TIE BARS
DRY SAND (LOOSE)	3'–6"	10'–0"	18–#8	#5 @ 12"	3'–6"	10'–6"	18–#8	#5 @ 12"	3'–6"	13'–6"	18–#8	#5 @ 8"	4'–0"	14'–6"	18–#9	#5 @ 6"	4'–6"	15'–6"	18–#10	#5 @ 5"
DRY SAND (DENSE)	3'–6"	8'–6"	18–#8	#5 @ 12"	3'–6"	9'–0"	18–#8	#5 @ 12"	3'–6"	10'–0"	18–#8	#5 @ 8"	4'–0"	11'–0"	18–#9	#5 @ 6"	4'–6"	11'–6"	18–#10	#5 @ 5"
WET SAND (LOOSE)	3'–6"	11'–6"	18–#8	#5 @ 12"	3'–6"	13'–6"	18–#8	#5 @ 12"	3'–6"	17'–0"	18–#8	#5 @ 8"	4'–0"	18'–6"	18–#9	#5 @ 6"	4'–6"	19'–6"	18–#10	#5 @ 5"
WET SAND (DENSE)	3'–6"	10'–0"	18–#8	#5 @ 12"	3'–6"	10'–0"	18–#8	#5 @ 12"	3'–6"	12'–6"	18–#8	#5 @ 8"	4'–0"	13'–6"	18–#9	#5 @ 6"	4'–6"	14'–6"	18–#10	#5 @ 5"
CLAY (SOFT TO MEDIUM STIFF)	3'–6"	12'–6"	18–#8	#5 @ 12"	3'–6"	13'–0"	18–#8	#5 @ 12"	3'–6"	14'–0"	18–#8	#5 @ 8"	4'–0"	16'–0"	18–#9	#5 @ 6"	4'–6"	17'–6"	18–#10	#5 @ 5"
CLAY (STIFF)	3'–6"	11'–0"	18–#8	#5 @ 12"	3'–6"	11'–0"	18–#8	#5 @ 12"	3'–6"	12'–0"	18–#8	#5 @ 8"	4'–0"	13'–0"	18–#9	#5 @ 6"	4'–6"	14'–0"	18–#10	#5 @ 5"

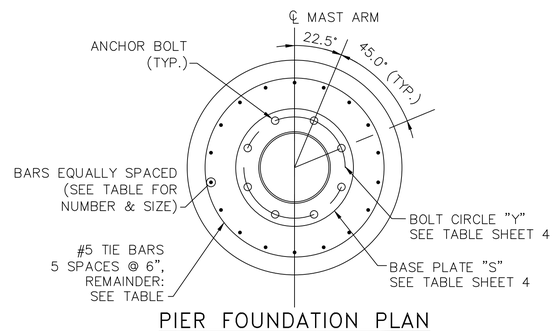
BASIS OF DESIGN

ALL MAST ARM STRUCTURES AND FOUNDATIONS ARE DESIGNED IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS, SIXTH EDITION 2013, AND THE FOLLOWING PARAMETERS:

OVERTURNING DESIGN	FOUNDATIONS ARE SIZED TO RESIST OVERTURNING ACCORDING TO BROMS' DESIGN METHOD WITH A SAFETY FACTOR THAT INCLUDES AN OVERLOAD FACTOR OF 2.0 AND A SOIL UNDERSTRENGTH FACTOR OF 0.7.		
SOIL PARAMETERS		UNIT WEIGHT	FRICTION ANGLE
	LOOSE DRY SAND:	γ = 102 PCF	Φ = 33°
	DENSE DRY SAND:	γ = 116 PCF	Φ = 39°
	LOOSE WET SAND:	γ = 125 PCF	Φ = 33°
	DENSE WET SAND:	γ = 135 PCF	Φ = 39°
		UNIT WEIGHT	SHEAR STRENGTH
	SOFT TO MEDIUM STIFF CLAY:	γ = 113 PCF	S_U = 1.0 KSF
	STIFF CLAY:	γ = 120 PCF	S_U = 1.9 KSF
DEFLECTION LIMITS	MAXIMUM LATERAL DEFLECTION AT TOP OF MAST ARM FOUNDATION SHAFTS: $\frac{1}{2}$"		



PIER FOUNDATION DETAIL
NO SCALE



PIER FOUNDATION PLAN
NO SCALE

NOTES:

1. FOUNDATIONS SHALL BE 4000 PSI, 565 MASSDOT APPROVED MIX DESIGN.
2. FOUNDATIONS SHALL BE INSTALLED IN ACCORDANCE WITH MASSDOT STANDARD SPECIFICATIONS ITEM 945 – DRILLED SHAFTS
3. REINFORCEMENT SHALL BE ASTM A615 GRADE 60.
4. ANCHOR BOLTS SHALL BE SET BY TEMPLATE.
5. PROVIDE FOR ELECTRICAL CONDUIT.
6. EXCAVATION SHALL BE BY THE AUGER METHOD TO THE NEAT LINES OF THE OUTSIDE DIMENSION OF THE FOUNDATIONS WITHOUT DISTURBING THE SOIL AROUND AND BELOW THE PROPOSED FOUNDATION BOTTOM. ALTERNATE METHODS OF EXCAVATION MAY BE SUBMITTED TO MASSDOT FOR APPROVAL IF THEY MEET THE REQUIREMENTS LISTED IN NOTES 6, 7, AND 8.
7. THE EARTH WALLS OF THE FOUNDATION SHALL BE ADEQUATELY AND SECURELY PROTECTED AT ALL TIMES AGAINST CAVE–INS, DISPLACEMENT OF THE SURROUNDING EARTH AND FOR THE EXCLUSION OF GROUND WATER. THIS MAY BE DONE BY THE USE OF STEEL CYLINDER LINERS OR CASINGS THAT ARE APPROVED BY MASSDOT. IF LINERS ARE USED THEY MAY BE RECLAIMED PROVIDED THAT THEY ARE WITHDRAWN AS THE CONCRETE IS BEING PLACED, MAINTAINING A SUFFICIENT HEAD OF CONCRETE WITHIN THE LINER TO PREVENT REDUCTION IN THE FOUNDATION DIAMETER AND TO PREVENT EXTRANEOUS MATERIAL FROM FALLING IN FROM THE SIDES AND MIXING WITH THE CONCRETE.
8. IF THE SOIL IS DISTURBED OR REMOVED BEYOND THE NEAT LINES OF THE OUTSIDE DIMENSION OF THE FOUNDATION, IT SHALL BE REPLACED WITH CONCRETE. ANY ADDITIONAL COST FOR THE CONCRETE SHALL BE PAID FOR BY THE CONTRACTOR.
9. SPECIAL CARE SHOULD BE GIVEN TO AREAS WHERE WET SOIL IS ENCOUNTERED, TO INSURE THAT THE PREAUGERED HOLE DOES NOT COLLAPSE. THIS MAY REQUIRE THE USE OF STEEL CYLINDER LINERS OR CASINGS TO HOLD THE SOIL IN PLACE UNTIL READY FOR CONCRETE PLACEMENT, UPON APPROVAL FROM THE MASSDOT. THE STEEL CYLINDERS OR CASINGS SHALL BE WITHDRAWN AS THE FOUNDATION CONCRETE IS PLACED.
10. IF LEDGE OR UNSUITABLE SOIL IS ENCOUNTERED (i.e. ONE WHICH DOES NOT APPLY TO THE DESIGN TABLES SHOWN ON THIS SHEET), AN ALTERNATIVE DESIGN SHALL BE PROVIDED BY THE DESIGN ENGINEER. IF UTILITIES OR OTHER UNDERGROUND OBSTRUCTIONS ARE ENCOUNTERED, THE CONTRACTOR SHALL BACKFILL THE AREA TO ITS ORIGINAL CONDITION UNTIL AN ALTERNATE DESIGN HAS BEEN PROVIDED BY THE DESIGN ENGINEER AND APPROVED BY MASSDOT. SPECIAL FOUNDATIONS SHALL BE DESIGNED IN ACCORDANCE WITH BASIS OF DESIGN TABLE ABOVE.
11. A GALVANIZED WIRE MESH SCREEN SHALL BE INSTALLED AT BASE OF POLE. SCREEN SHALL BE PRESS–FORMED OF 3 OR 4 MESH, 21 GAGE OR HEAVIER, STAINLESS STEEL OR HOT DIPPED GALVANIZED WIRE SCREEN OR APPROVED EQUIVALENT. SCREEN SHALL BE SCREWED INTO POLE BASE PLATE, AND SHALL BE FLUSH WITH THE TOP OF THE PIER FOUNDATION.
12. SANDY SOILS WITH STANDARD PENETRATION VALUES GREATER THAN 20 BLOWS PER FOOT SHALL BE CLASSIFIED AS DENSE DRY SAND AND DENSE WET SAND. SANDY SOILS WITH STANDARD PENETRATION VALUES RANGING FROM 6 TO 20 BLOWS PER FOOT SHALL BE CLASSIFIED LOOSE DRY SAND AND LOOSE WET SAND. SANDY SOILS WITH FEWER THAN 6 BLOWS PER FOOT SHALL REQUIRE SPECIAL FOUNDATION DESIGNS BY THE DESIGN ENGINEER AND APPROVED BY MASSDOT. SPECIAL FOUNDATIONS SHALL BE DESIGNED IN ACCORDANCE WITH BASIS OF DESIGN TABLE ABOVE.
13. CLAYS WITH STANDARD PENETRATION VALUES GREATER THAN 6 BLOWS PER FOOT SHALL BE CLASSIFIED AS STIFF CLAY. CLAYS WITH STANDARD PENETRATION VALUES RANGING FROM 2 TO 6 BLOWS PER FOOT SHALL BE CLASSIFIED AS SOFT TO MEDIUM STIFF CLAY. CLAYS WITH FEWER THAN 2 BLOWS PER FOOT SHALL REQUIRE SPECIAL FOUNDATION DESIGNS BY THE DESIGN ENGINEER AND APPROVED BY MASSDOT. SPECIAL FOUNDATIONS SHALL BE DESIGNED IN ACCORDANCE WITH BASIS OF DESIGN TABLE ABOVE.
14. A SANDY SOIL SHALL ONLY BE CLASSIFIED AS 'DRY' IF THE ENTIRE DRY SAND SHAFT LENGTH SITS ABOVE WET SOILS ACCORDING TO THE BORING LOGS. IF ANY PART OF THE SHAFT LENGTH IS CAST AT OR BELOW THE GROUNDWATER LEVEL, THE SOIL SHALL BE CLASSIFIED AS 'WET'.
15. WHERE THE PREDOMINATING SOIL TYPE IS INORGANIC SILT, THE SOIL SHOULD BE TREATED AS CLAY OR WET LOOSE SAND, WHICHEVER LEADS TO A MORE CONSERVATIVE FOUNDATION. INORGANIC SILTS WITH STANDARD PENETRATION N–VALUES LESS THAN 2 BLOWS PER FOOT, ORGANIC SILTS, AND PEAT SHALL REQUIRE SPECIAL FOUNDATION DESIGNS BY THE DESIGN ENGINEER AND APPROVED BY MASSDOT. SPECIAL FOUNDATIONS SHALL BE DESIGNED IN ACCORDANCE WITH BASIS OF DESIGN TABLE ABOVE.
16. WHERE FILL CONTAINS CLAY OR SILT, IT SHOULD BE TREATED AS SOFT CLAY.
17. MAST ARM FOUNDATIONS ARE DESIGNED TO SUPPORT MAST ARMS WITH OR WITHOUT OPTIONAL LUMINAIRE.
18. CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT FOUNDATION DIAMETER IS AT LEAST 17.5" GREATER THAN BOLT CIRCLE DIAMETER FOR ALL STRUCTURES
19. IN ORDER TO CREATE A FLUSH SURFACE, CONTRACTOR SHALL REFER TO THE FINAL ELEVATIONS SHOWN ON THE DESIGN PLANS WHEN INSTALLING FOUNDATIONS IMMEDIATELY ADJACENT TO OR WITHIN A SIDEWALK AREA.

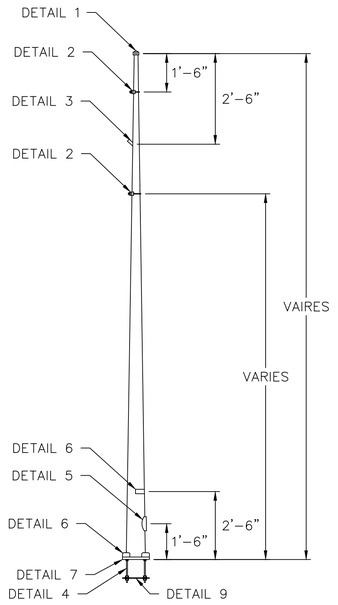
MassDOT Commonwealth Department of Transportation Highway Division

STANDARD DRAWINGS

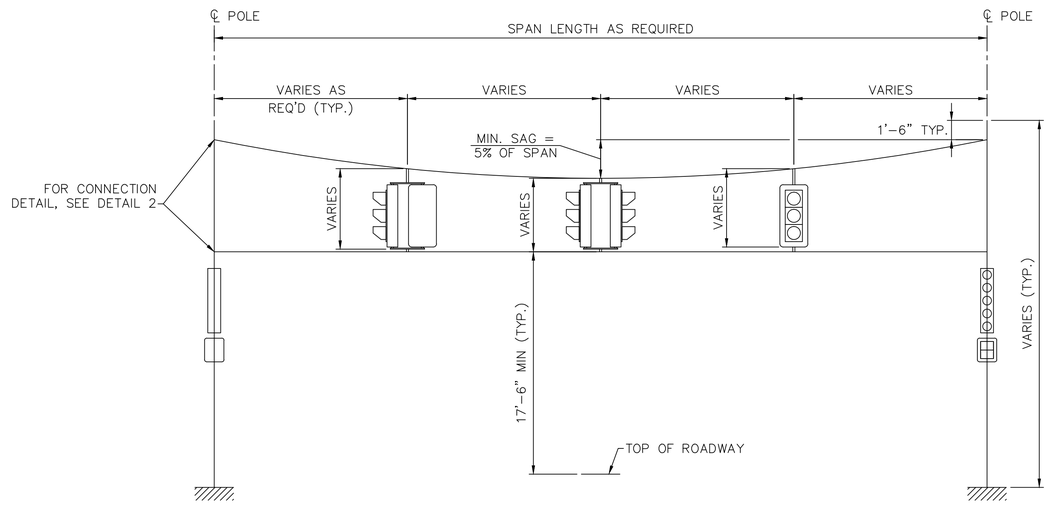
OVERHEAD SIGNAL STRUCTURE & FOUNDATION
MAST ARM CORED PIER FOUNDATIONS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

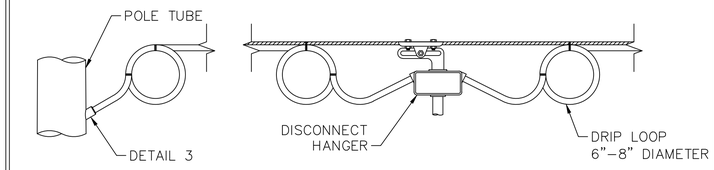
DECEMBER, 2015



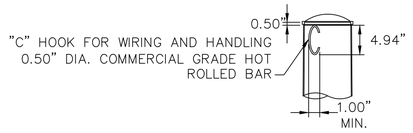
POLE ELEVATION



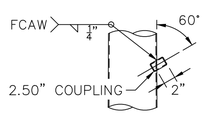
SPAN WIRE ASSEMBLY WITH TETHER WIRE ELEVATION



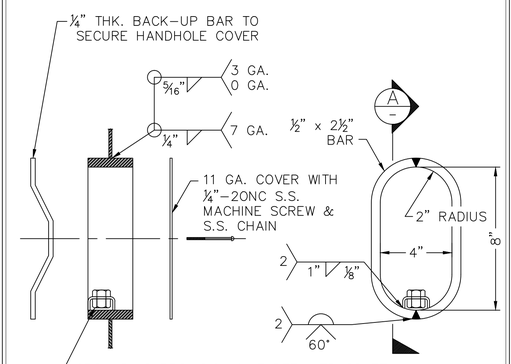
DRIP LOOP & SIGNAL CONNECTION



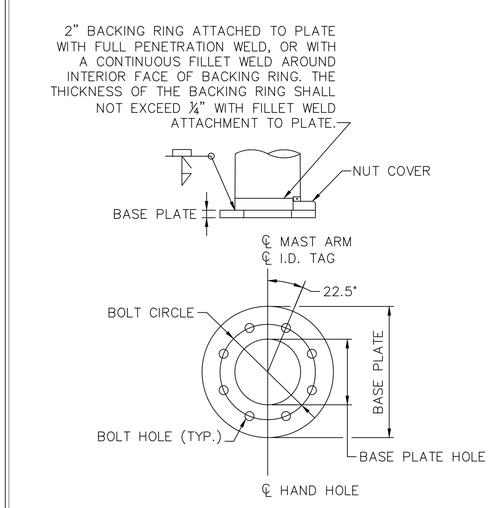
DETAIL 1 | POLE TOP



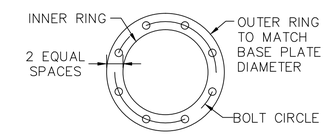
DETAIL 3 | POLE COUPLING



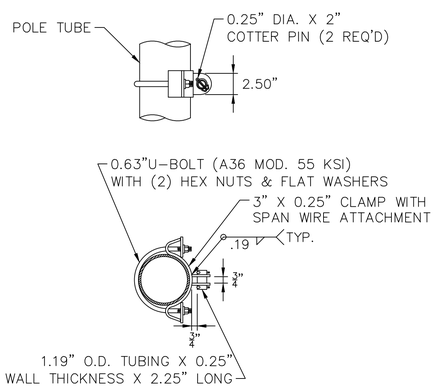
DETAIL 5 | 4"x8" HANDHOLE



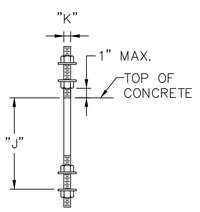
DETAIL 7 | POLE BASE



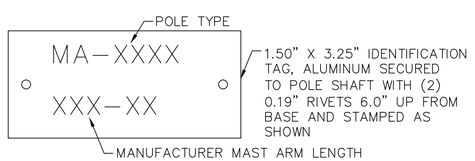
DETAIL 9 | ANCHOR PLATE



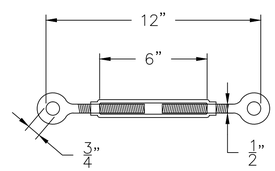
DETAIL 2 | WIRE CLAMP



DETAIL 4 | ANCHOR BOLT



DETAIL 6 | I.D. TAG



DETAIL 8 | TURN BUCKLE

MATERIAL DATA

COMPONENT	DESIGNATION	YIELD (KSI)
POLE TUBE	ASTM A595 GR. A	55
POLE BASE PLATE	AASHTO M270, OR ASTM A709	50
ANCHOR BOLTS	AASHTO M314, OR ASTM A307 GR. C	55
GALVANIZING	AASHTO M111 OR M232	

** BOLTS WHICH ACCUMULATE RUST OR DIRT SHALL BE DISCARDED.

MassDOT Massachusetts Department of Transportation Highway Division

STANDARD DRAWINGS

OVERHEAD SIGNAL STRUCUTRE & FOUNDATION SPAN WIRE DETAILS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

DECEMBER, 2015

SOIL TYPE: DRY SAND (LOOSE)

MOMENT AT BASE OF POLE (KIP–FT.)	DIA. (B) = 3'–0"		DIA. (B) = 3'–6"		DIA. (B) = 4'–0"	
	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS
100 OR LESS	11'–6"	18 – #8	10'–6"	18 – #8	10'–0"	18 – #9
150	12'–0"	18 – #8	11'–6"	18 – #8	11'–0"	18 – #9
200	13'–0"	18 – #8	12'–6"	18 – #8	12'–0"	18 – #9
250	13'–6"	18 – #8	13'–0"	18 – #8	12'–6"	18 – #9
300	–	–	13'–6"	18 – #8	13'–0"	18 – #9
350	–	–	14'–0"	18 – #8	13'–6"	18 – #9
400	–	–	14'–6"	18 – #8	14'–0"	18 – #9
450	–	–	15'–0"	18 – #8	14'–6"	18 – #9
500	–	–	15'–6"	18 – #8	15'–0"	18 – #9
550	–	–	16'–0"	18 – #8	15'–0"	18 – #9
600	–	–	16'–6"	18 – #8	15'–6"	18 – #9
650	–	–	–	–	16'–0"	18 – #9
700	–	–	–	–	16'–6"	18 – #9

SOIL TYPE: DRY SAND (DENSE)

MOMENT AT BASE OF POLE (KIP–FT.)	DIA. (B) = 3'–0"		DIA. (B) = 3'–6"		DIA. (B) = 4'–0"	
	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS
100 OR LESS	10'–0"	18 – #8	9'–6"	18 – #8	9'–0"	18 – #9
150	10'–6"	18 – #8	10'–0"	18 – #8	10'–0"	18 – #9
200	11'–6"	18 – #8	11'–0"	18 – #8	10'–6"	18 – #9
250	12'–0"	18 – #8	11'–6"	18 – #8	11'–0"	18 – #9
300	–	–	12'–0"	18 – #8	11'–6"	18 – #9
350	–	–	12'–6"	18 – #8	12'–0"	18 – #9
400	–	–	13'–0"	18 – #8	12'–6"	18 – #9
450	–	–	13'–6"	18 – #8	13'–0"	18 – #9
500	–	–	13'–6"	18 – #8	13'–0"	18 – #9
550	–	–	14'–0"	18 – #8	13'–6"	18 – #9
600	–	–	14'–6"	18 – #8	14'–0"	18 – #9
650	–	–	–	–	14'–0"	18 – #9
700	–	–	–	–	14'–6"	18 – #9

SOIL TYPE: WET SAND (LOOSE)

MOMENT AT BASE OF POLE (KIP–FT.)	DIA. (B) = 3'–0"		DIA. (B) = 3'–6"		DIA. (B) = 4'–0"	
	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS
100 OR LESS	13'–6"	18 – #8	12'–6"	18 – #8	12'–0"	18 – #9
150	14'–6"	18 – #8	13'–6"	18 – #8	13'–0"	18 – #9
200	15'–6"	18 – #8	14'–6"	18 – #8	14'–0"	18 – #9
250	16'–0"	18 – #8	15'–6"	18 – #8	14'–6"	18 – #9
300	–	–	16'–0"	18 – #8	15'–6"	18 – #9
350	–	–	16'–6"	18 – #8	16'–0"	18 – #9
400	–	–	17'–0"	18 – #8	16'–6"	18 – #9
450	–	–	18'–0"	18 – #8	17'–0"	18 – #9
500	–	–	18'–0"	18 – #8	17'–6"	18 – #9
550	–	–	18'–6"	18 – #8	18'–0"	18 – #9
600	–	–	19'–0"	18 – #8	18'–6"	18 – #9
650	–	–	–	–	18'–6"	18 – #9
700	–	–	–	–	19'–0"	18 – #9

SOIL TYPE: WET SAND (DENSE)

MOMENT AT BASE OF POLE (KIP–FT.)	DIA. (B) = 3'–0"		DIA. (B) = 3'–6"		DIA. (B) = 4'–0"	
	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS
100 OR LESS	11'–6"	18 – #8	11'–0"	18 – #8	10'–6"	18 – #9
150	12'–6"	18 – #8	12'–0"	18 – #8	11'–6"	18 – #9
200	13'–6"	18 – #8	12'–6"	18 – #8	12'–0"	18 – #9
250	14'–0"	18 – #8	13'–6"	18 – #8	13'–0"	18 – #9
300	–	–	14'–0"	18 – #8	13'–6"	18 – #9
350	–	–	14'–6"	18 – #8	14'–0"	18 – #9
400	–	–	15'–0"	18 – #8	14'–6"	18 – #9
450	–	–	15'–6"	18 – #8	15'–0"	18 – #9
500	–	–	16'–0"	18 – #8	15'–0"	18 – #9
550	–	–	16'–6"	18 – #8	15'–6"	18 – #9
600	–	–	16'–6"	18 – #8	16'–0"	18 – #9
650	–	–	–	–	16'–6"	18 – #9
700	–	–	–	–	16'–6"	18 – #9

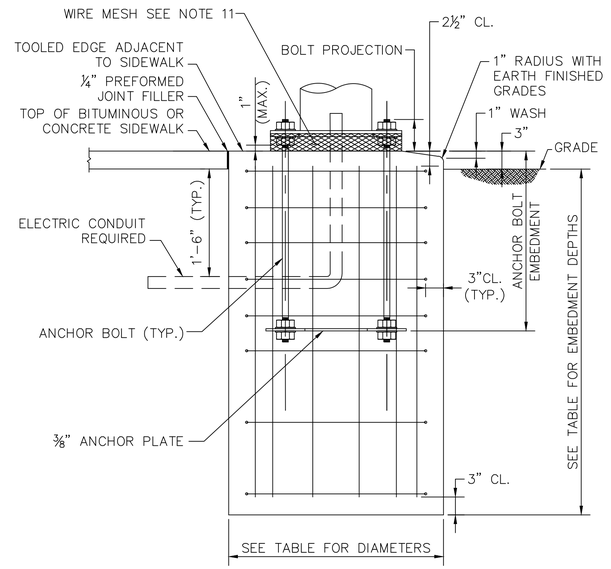
SOIL TYPE: CLAY (SOFT TO MEDIUM STIFF)

MOMENT AT BASE OF POLE (KIP–FT.)	DIA. (B) = 3'–0"		DIA. (B) = 3'–6"		DIA. (B) = 4'–0"	
	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS
100 OR LESS	14'–6"	18 – #8	14'–6"	18 – #8	15'–0"	18 – #9
150	15'–6"	18 – #8	15'–6"	18 – #8	16'–0"	18 – #9
200	16'–6"	18 – #8	16'–6"	18 – #8	17'–0"	18 – #9
250	17'–6"	18 – #8	17'–6"	18 – #8	17'–6"	18 – #9
300	–	–	18'–6"	18 – #8	18'–6"	18 – #9
350	–	–	19'–0"	18 – #8	19'–0"	18 – #9
400	–	–	20'–0"	18 – #8	20'–0"	18 – #9
450	–	–	20'–6"	18 – #8	20'–6"	18 – #9
500	–	–	21'–6"	18 – #8	21'–0"	18 – #9
550	–	–	22'–0"	18 – #8	21'–6"	18 – #9
600	–	–	22'–6"	18 – #8	22'–6"	18 – #9
650	–	–	–	–	23'–0"	18 – #9
700	–	–	–	–	23'–6"	18 – #9

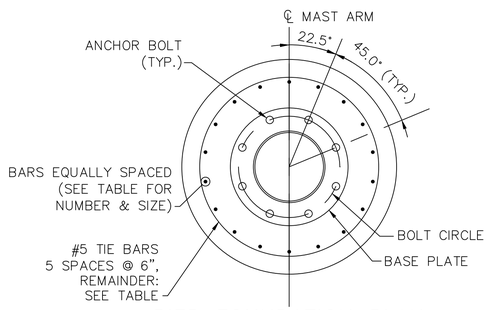
SOIL TYPE: CLAY (STIFF)

MOMENT AT BASE OF POLE (KIP–FT.)	DIA. (B) = 3'–0"		DIA. (B) = 3'–6"		DIA. (B) = 4'–0"	
	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS	DEPTH (D)	VERTICAL BARS
100 OR LESS	12'–0"	18 – #8	12'–0"	18 – #8	12'–6"	18 – #9
150	12'–6"	18 – #8	13'–0"	18 – #8	13'–6"	18 – #9
200	13'–6"	18 – #8	13'–6"	18 – #8	14'–0"	18 – #9
250	14'–0"	18 – #8	14'–6"	18 – #8	14'–6"	18 – #9
300	–	–	15'–0"	18 – #8	15'–0"	18 – #9
350	–	–	15'–6"	18 – #8	16'–0"	18 – #9
400	–	–	16'–0"	18 – #8	16'–6"	18 – #9
450	–	–	16'–6"	18 – #8	16'–6"	18 – #9
500	–	–	17'–0"	18 – #8	17'–0"	18 – #9
550	–	–	17'–6"	18 – #8	17'–6"	18 – #9
600	–	–	18'–0"	18 – #8	18'–0"	18 – #9
650	–	–	–	–	18'–6"	18 – #9
700	–	–	–	–	19'–0"	18 – #9

NOTES:
SEE NOTES SHEET 5 OF 7



PIER FOUNDATION DETAIL
NO SCALE



PIER FOUNDATION PLAN
NO SCALE

MassDOT Massachusetts Department of Transportation Highway Division

STANDARD DRAWINGS

OVERHEAD SIGNAL STRUCTURE & FOUNDATION
SPAN WIRE CORED PIER FOUNDATIONS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

DECEMBER, 2015