

Appendix R


Engineering Drawings




MERRIMACK VALLEY RELIABILITY PROJECT LINE 3124 345 kV TRANSMISSION

nationalgrid

EVERSOURCE
ENERGY

 **BLACK & VEATCH**
CORPORATION

 **TRC**

MERRIMACK VALLEY RELIABILITY PROJECT

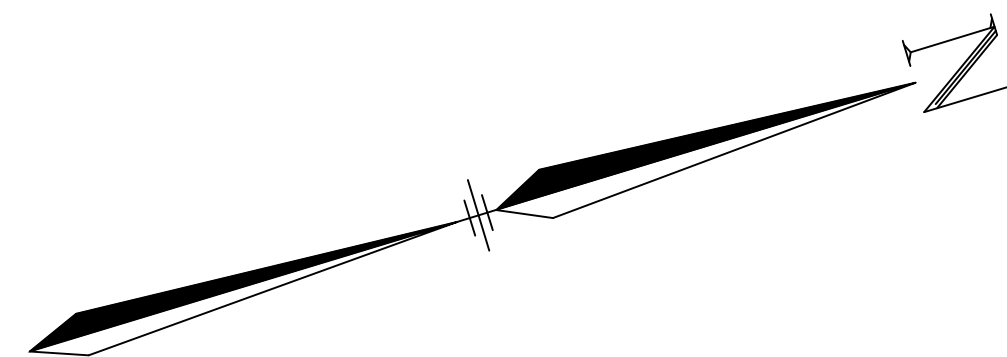
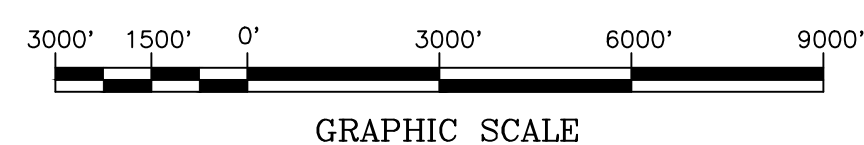
LINE 3124 345 kV TRANSMISSION

KEY SHEET - NEW HAMPSHIRE PROJECT AREA



LEGEND:

- - - DENOTES 3124 TRANSMISSION LINE
- - - DENOTES Y151 TRANSMISSION LINE
- 200 DENOTES PROPOSED STRUCTURE NUMBERS



CONTRACT SERVICES	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
3	UPDATED RE-NHSEC PERMIT FILING	-	7/01/15	ROW	TSW	GEL
2	RE-ISSUED NHSEC PERMIT FILING	-	6/04/15	ROW	CRP	GEL
1	NHSEC PERMIT FILING	-	3/23/15	JJD	CRP	GEL

NATIONAL GRID & EVERSOURCE ENERGY		X X DRAWN JJD/TRC ENGINEER GEL/TRC CHECKED CRP/TRC APPROVED GEL/TRC DATE 01/23/15
LINE 3124 345 kV TRANSMISSION KEY SHEET MERRIMACK VALLEY RELIABILITY PROJECT NEW HAMPSHIRE PROJECT AREA		
SCALE NTS	FILE: 400298-S3124_SH.3.DWG IMAGE:	DRAWING NO. 400298-S3124_SH.3

NATIONAL GRID MERRIMACK VALLEY RELIABILITY PROJECT



BLACK & VEATCH
CORPORATION

MERRIMACK VALLEY RELIABILITY PROJECT

PREPARED BY	J.L.M.	05/22/15
REVIEWED BY	FTX	05/22/15
APPROVED BY	NPA	05/22/15
SCALE	N.T.S.	
SHEET	1	OF 1
INDEX	400298	



VER	DATE	DESCRIPTION
1	05/22/15	INHSEC - PERMIT FILING
2		
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REVISION	DATE	BY
JLM	FTX	NPA

VERSION
1

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NATIONAL GRID MERRIMACK VALLEY RELIABILITY PROJECT

DRAWING INDEX

DRAWING NO.	REVISION NO.	DESCRIPTION	DRAWING NO.	REVISION NO.	DESCRIPTION
400298-C-R-001	1	COVER SHEET	400298-C-S-12	1	115_ST_DASU_RS FRAMING DETAIL
400298-C-R-002	1	DRAWING INDEX	400298-C-S-13	1	115_ST_HFDE_SW FRAMING DETAIL
400298-C-R-003	1	STRUCTURE OUTLINE	400298-C-S-14A	1	115_ST_3PDE_SS FRAMING DETAIL
400298-C-R-004	1	LEGEND AND NOTES	400298-C-S-14B	1	115_ST_3PDE_SS FRAMING DETAIL
400298-C-R-304	1	PLAN AND PROFILE-Y151	400298-C-S-15	1	115_ST_DADE_SS FRAMING DETAIL
400298-C-R-305	1	PLAN AND PROFILE-Y151	400298-C-S-16	1	115_ST_DADE_DS FRAMING DETAIL
400298-C-R-306	1	PLAN AND PROFILE-Y151	400298-C-S-17	2	115_ST_SPDE_SW FRAMING DETAIL
400298-C-R-307	1	PLAN AND PROFILE-Y151	400298-C-S-18	2	115_ST_SPDE FRAMING DETAIL
400298-C-R-308	1	PLAN AND PROFILE-Y151	400298-C-S-19	1	115_ST_HFDE FRAMING DETAIL
400298-C-R-309	1	PLAN AND PROFILE-Y151	400298-C-S-20	1	115_ST_SPDE FRAMING DETAIL
400298-C-R-310	1	PLAN AND PROFILE-Y151	400298-C-S-51	1	345_ST_HFSU_NB FRAMING DETAIL
400298-C-R-311	1	PLAN AND PROFILE-Y151	400298-C-S-52 SH. 1	1	345_ST_HFDE FRAMING DETAIL
400298-C-R-312	1	PLAN AND PROFILE-Y151	400298-C-S-52 SH. 2	1	345_ST_HFDE FRAMING DETAIL
400298-C-R-706	1	PLAN AND PROFILE-3124	400298-C-S-53	1	345_ST_3PDE FRAMING DETAIL
400298-C-R-707	1	PLAN AND PROFILE-3124	400298-C-S-54	1	345_ST_SPDE FRAMING DETAIL
400298-C-R-708	1	PLAN AND PROFILE-3124	400298-C-F-EX-01	1	REINFORCED CONCRETE CAISSON FOUNDATION (SOIL)
400298-C-R-709	1	PLAN AND PROFILE-3124	400298-C-F-EX-02	1	REINFORCED CONCRETE CAISSON FOUNDATION (GROUTED REBAR)
400298-C-R-710	1	PLAN AND PROFILE-3124	400298-C-F-EX-03	1	REINFORCED CONCRETE CAISSON FOUNDATION (ROCK SOCKET)
400298-C-R-711	1	PLAN AND PROFILE-3124	SP.06.01.301.401	6	DIRECT EMBEDMENT FOUNDATION
400298-C-R-712	1	PLAN AND PROFILE-3124			
400298-C-R-713	1	PLAN AND PROFILE-3124	SP.06.01.301.101 SH. 1	9	GROUNDING DETAILS FOR TRANSMISSION LINE STRUCTURES
400298-C-R-714	1	PLAN AND PROFILE-3124	SP.06.01.301.101 SH. 2	9	GROUNDING DETAILS FOR TRANSMISSION LINE STRUCTURES
			SP.06.01.301.101 SH. 3	9	GROUNDING DETAILS FOR TRANSMISSION LINE STRUCTURES
			SP.06.01.301.101 SH. 4	9	GROUNDING DETAILS FOR WOOD SWITCH STRUCTURES
			SP.06.01.301.101 SH. 5	9	GROUNDING DETAILS FOR STEEL SWITCH STRUCTURES
			SP.06.01.301.101 SH. 6	9	ALT. GROUNDING DETAILS INSTALL. W/O STEEL CULVERT
			400298-C-P-01 SH. 1	2	PHASING DIAGRAM-Y151
			400298-C-P-01 SH. 2	2	PHASING DIAGRAM-Y151
			400298-C-P-05	2	PHASING DIAGRAM-3124
			400298-C-X-08 (E)	4	EXISTING CROSS SECTION
			400298-C-X-08 (P)	4	PROPOSED CROSS SECTION
			400298-C-X-09 (E)	4	EXISTING CROSS SECTION
			400298-C-X-09 (P)	3	PROPOSED CROSS SECTION

NOTES
REFER TO PSNH NHSEC PERMIT DRAWING SET FOR
LINE 3124, Y151 KEY SHEET DRAWING

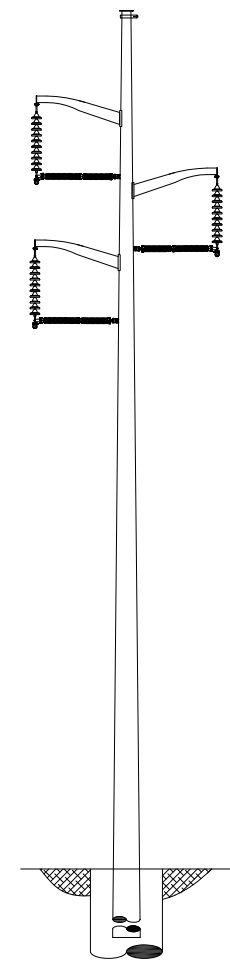
nationalgrid	
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VERSION DESCRIPTION JLM FTX INPA	VERSION 1

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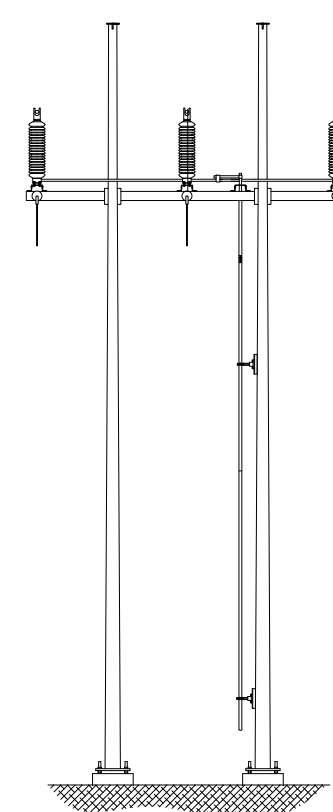
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NATIONAL GRID MERRIMACK VALLEY RELIABILITY PROJECT

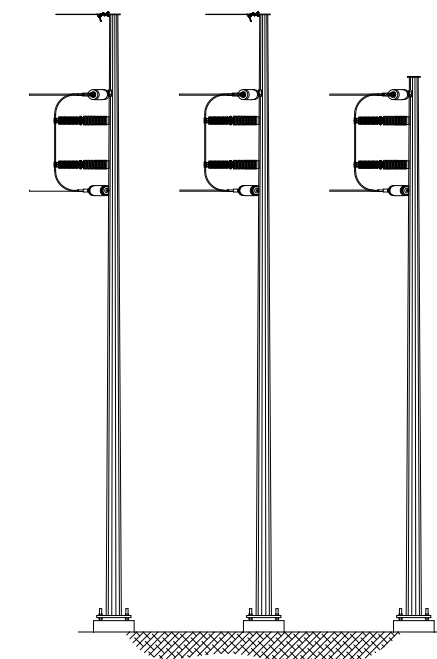
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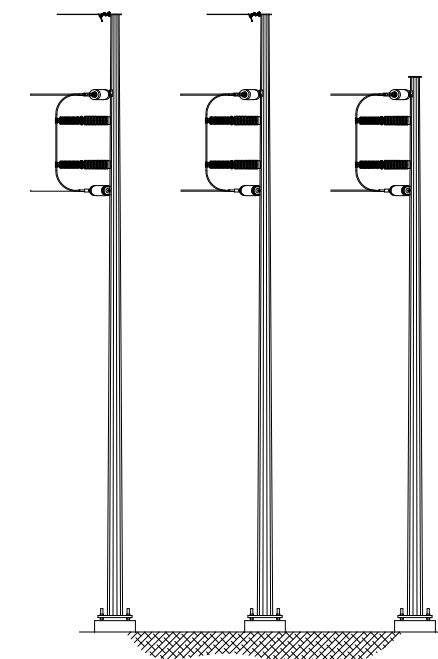
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STEEL DAVIT ARM
SUSPENSION
DWG. 400298-C-S-12



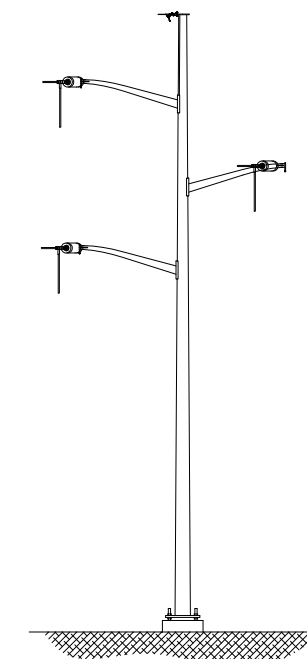
115_ST_HFDE_SW
STEEL H-FRAME
DEAD END-SWITCH
DWG. 400298-C-S-13



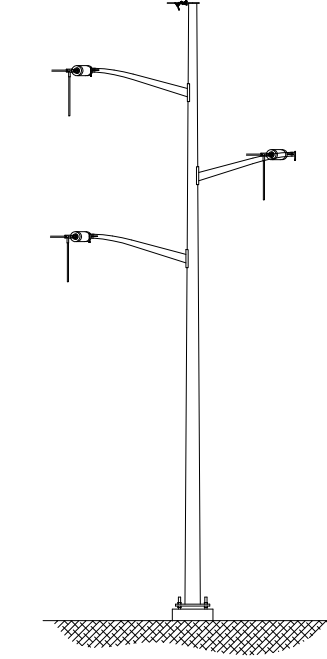
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STEEL 3 POLE - PSNH DEMARCATION
DEAD END
DWG. 400298-C-S-14A



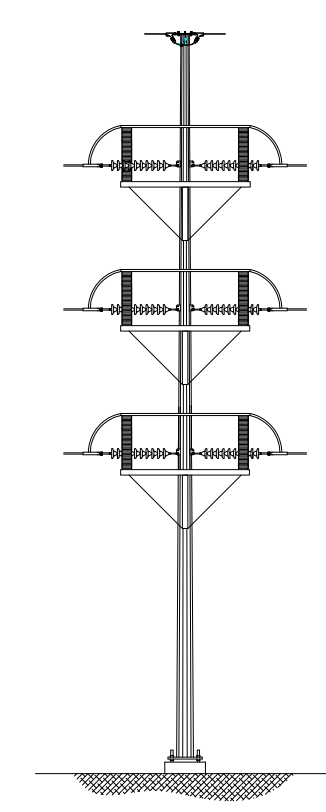
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DEAD END
DWG. 400298-C-S-14B



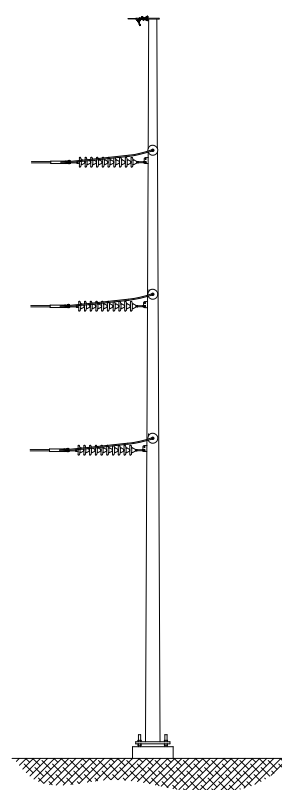
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STEEL DAVIT ARM
DEAD END-SINGLE STRING
DWG. 400298-C-S-15



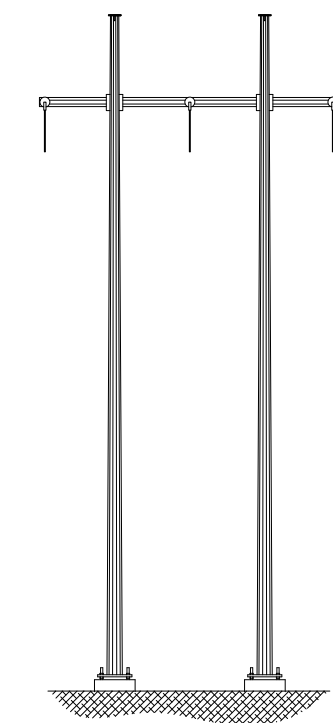
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DEAD END-DOUBLE STRING
DWG. 400298-C-S-16



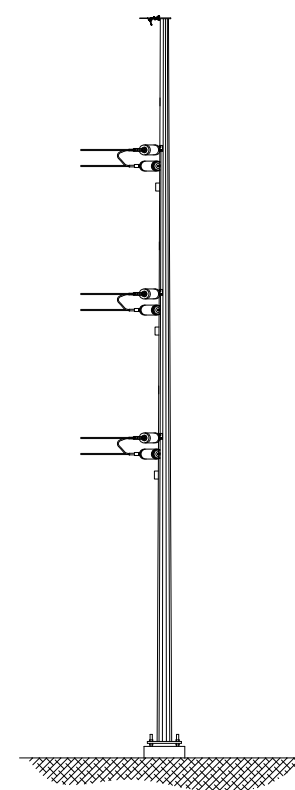
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STEEL SINGLE POLE
DEAD END-SWITCH
DWG. 400298-C-S-17



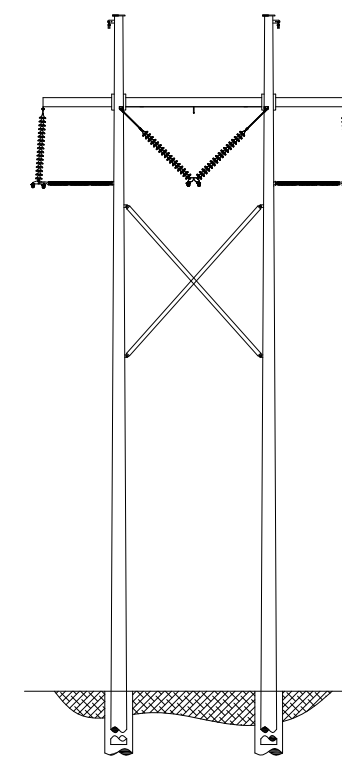
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3-WAY DEAD END
DWG. 400298-C-S-18



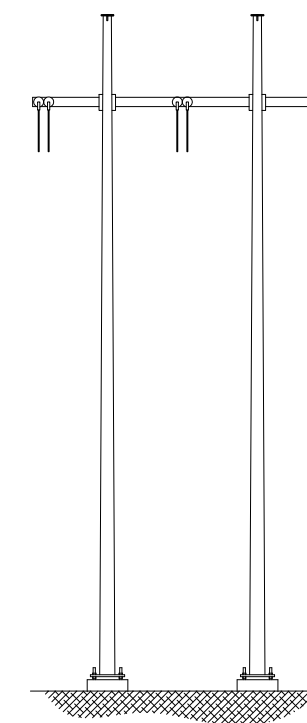
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STEEL H-FRAME
DEAD END
DWG. 400298-C-S-19



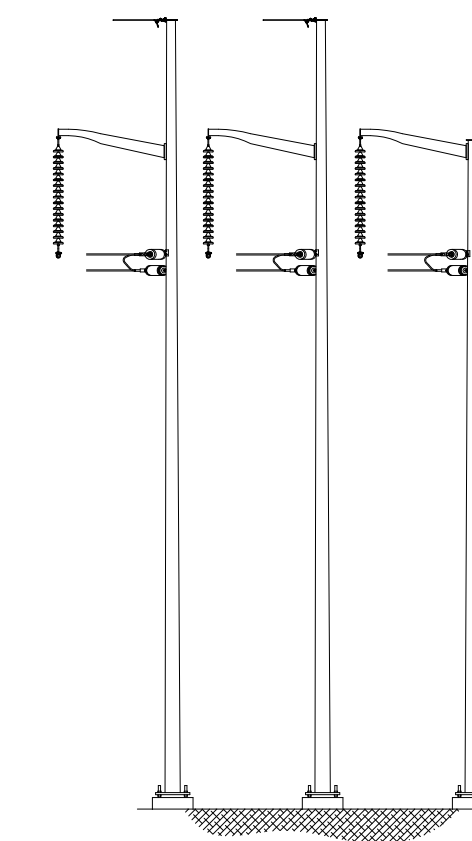
115_ST_SPDE
STEEL SINGLE POLE
DEAD END
DWG. 400298-C-S-20



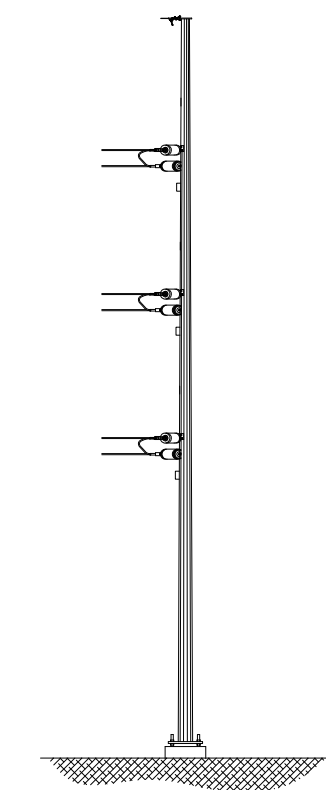
345_ST_HFSU_NB
STEEL H-FRAME
SUSPENSION
DWG. 400298-C-S-51



345_ST_HFDE
STEEL H-FRAME
DEAD END
DWG. 400298-C-S-52



345_ST_3PDE
STEEL 3 POLE
DEAD END
DWG. 400298-C-S-53



345_ST_SPDE
STEEL SINGLE POLE
DEAD END
DWG. 400298-C-S-54

INCHES ON ORIGINAL

MERRIMACK VALLEY RELIABILITY PROJECT		PREPARED BY: JLM	DATE: 05/22/15
STRUCTURE OUTLINE		REVIEWED BY: FTX	DATE: 05/22/15
		APPROVED BY: NPA	DATE: 05/22/15
		SCALE: N.T.S.	SHEET: 1 OF 1
		INDEX: 400298	
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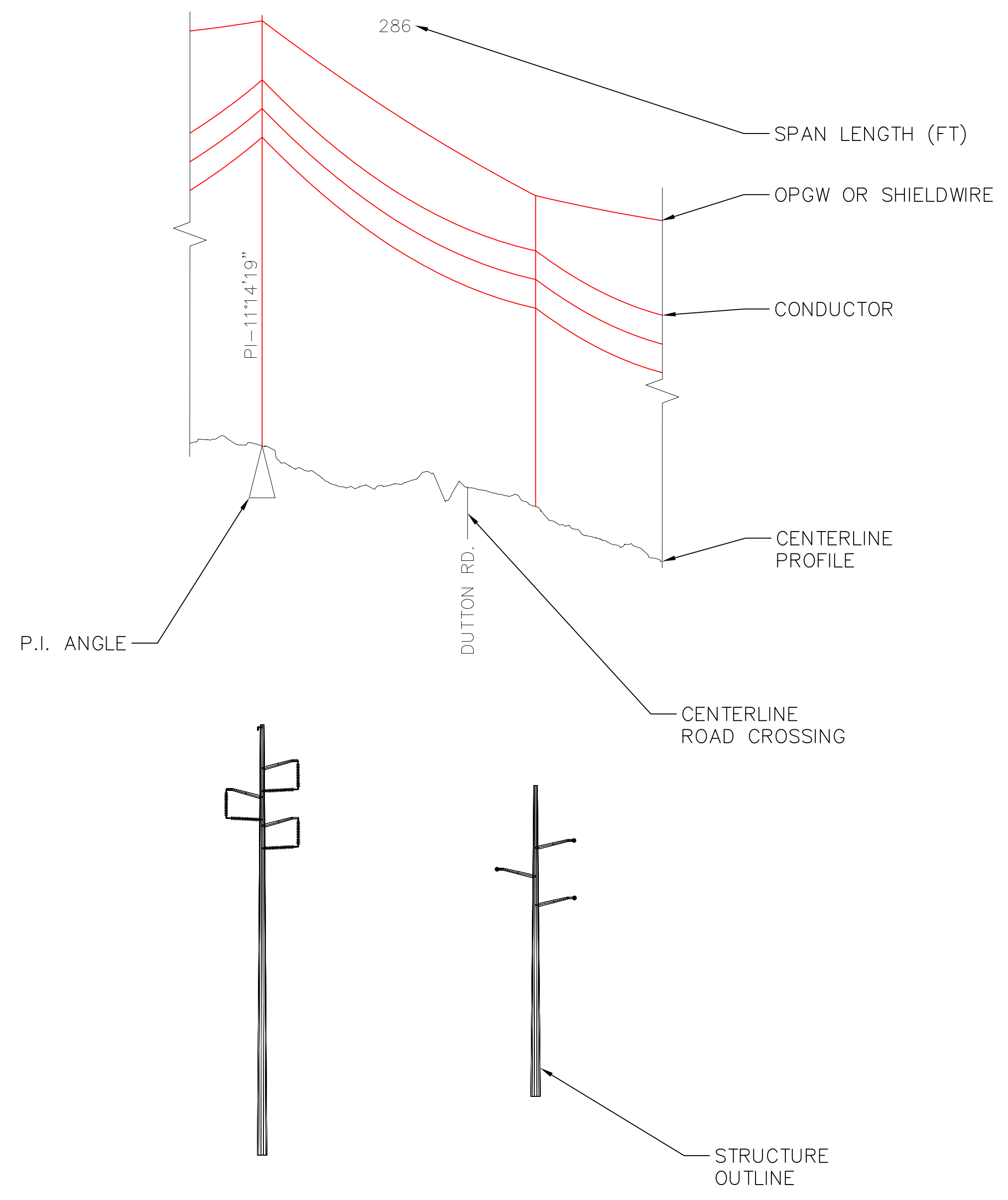
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 400298-C-R-003

NATIONAL GRID MERRIMACK VALLEY RELIABILITY PROJECT

LEGEND AND NOTES



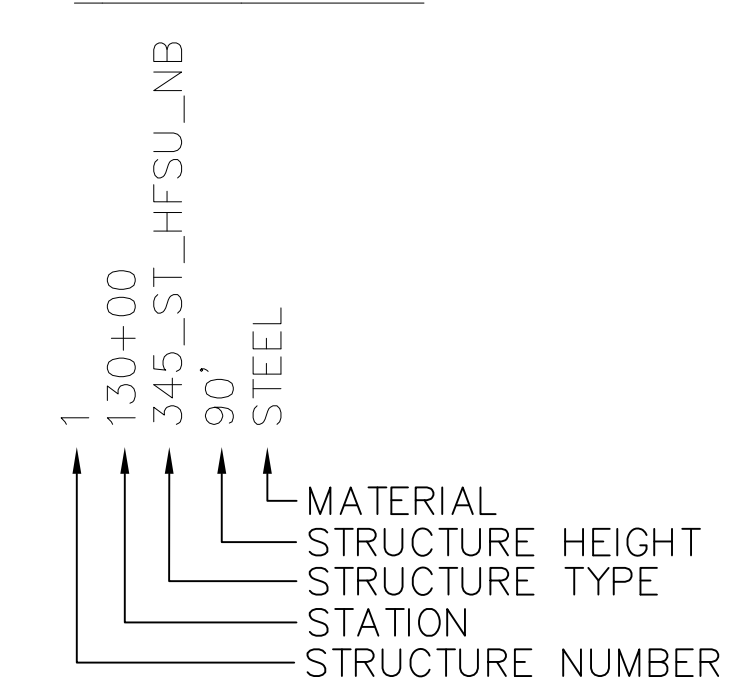
PLAN LEGEND

- WETLANDS
- ROW LIMITS
- STREAM OR BROOK
- CONTOURS
- EXISTING TRANSMISSION CENTERLINE
- PROPERTY LINE
- TOWN LINE
- PROPOSED TRANSMISSION CENTERLINE
- FEMA FLOOD LINE
- EXISTING DISTRIBUTION LINE
- STRUCTURE CENTER

NOTES

1. PHYSICAL FEATURES MAPPED USING AERIAL IMAGERY.
2. ENVIRONMENTAL DELINEATIONS CONDUCTED BY VHB IN 2014.
3. COORDINATES BASED ON UTM ZONE 18N.
4. LEGAL SURVEY OF PROPERTY LINES PRODUCED BY BEALS & THOMAS.
5. DATA FOR GENERAL REFERENCE ONLY

PROFILE LEGEND



WIRE DATA						
LINE	WIRE	# OF CABLES	TYPE	DIA. (IN.)	WEIGHT/ 1000 FT	CABLE STRENGTH (LBS.)
3124	NEW OPGW	1	TO BE DETERMINED	-	-	-
	NEW SHIELD WIRE	1	3/8"-7 STRAND EHS	0.360	273	15,400
	NEW CONDUCTOR	6	FALCON 1590 KCMIL 54/19 ACSR	1.545	2044	54,500
Y151	NEW OPGW	1	TO BE DETERMINED	-	-	-
	NEW CONDUCTOR	3	DRAKE 795 KCMIL 26/7 ACSS HS285	1.108	1093	32,600

MERRIMACK VALLEY RELIABILITY PROJECT
 LEGEND AND NOTES
 PREPARED BY: JLM 05/22/15
 REVIEWED BY: FTX 05/22/15
 APPROVED BY: NPA 05/22/15
 SCALE: N.T.S.
 SHEET: 1 OF 1
 INDEX: 400298

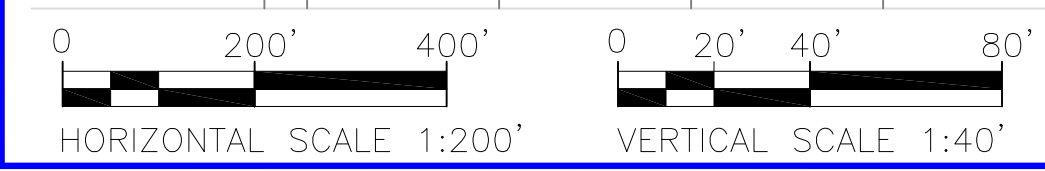
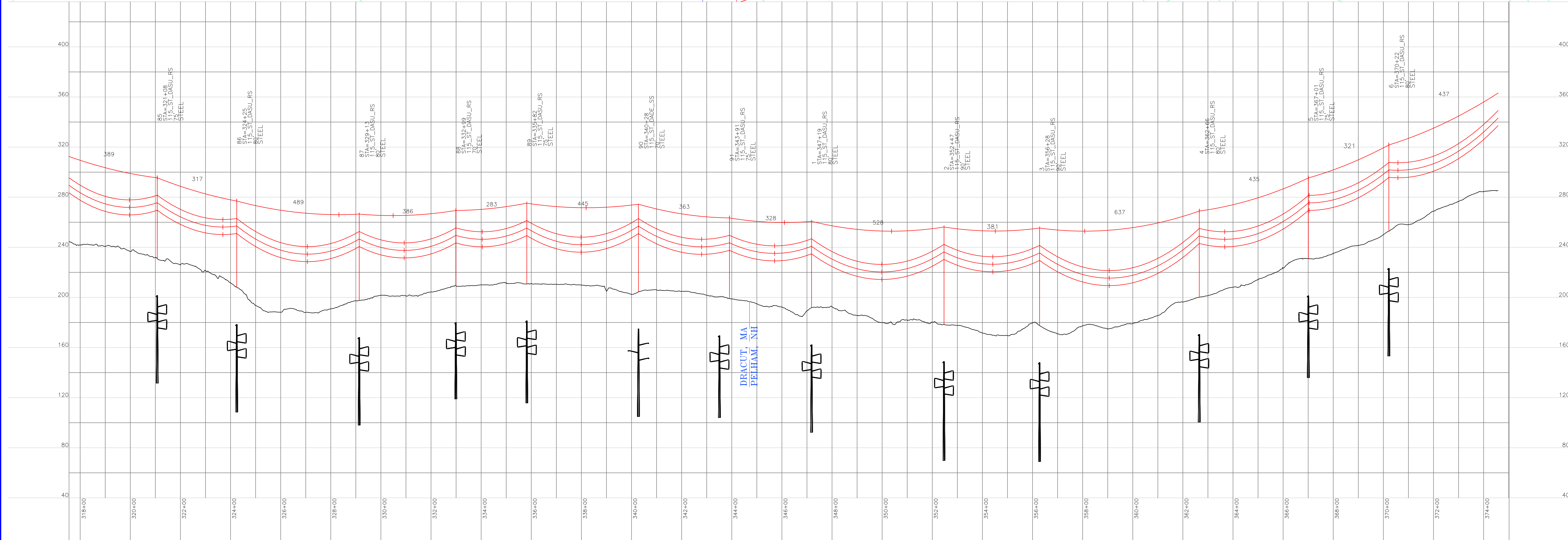
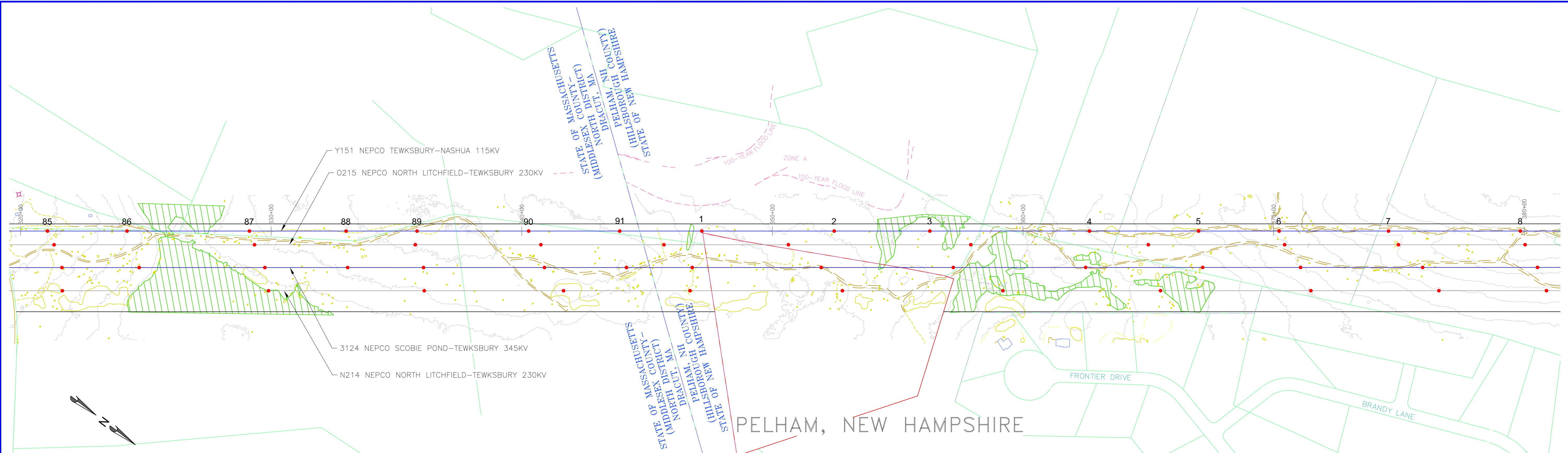
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PROPOSED OPGW (TO BE DETERMINED) SHIELD WIRE SHOWN AT NESC HEAVY 4000 LBS, 60°F MAX SAG
 PROPOSED DRAKE 795 KCMIL 26/7 ACSS HS285 CONDUCTOR SHOWN AT NESC HEAVY 8000 LBS, 392°F MAX SAG

INCHES ON ORIGINAL

MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE Y151 115KV

PREPARED BY: JLM 05/22/15
 REVIEWED BY: FTX 05/22/15
 APPROVED BY: NPA 05/22/15
 SCALE: 1" = 200'
 SHEET: 1 OF 1
 INDEX: 400298

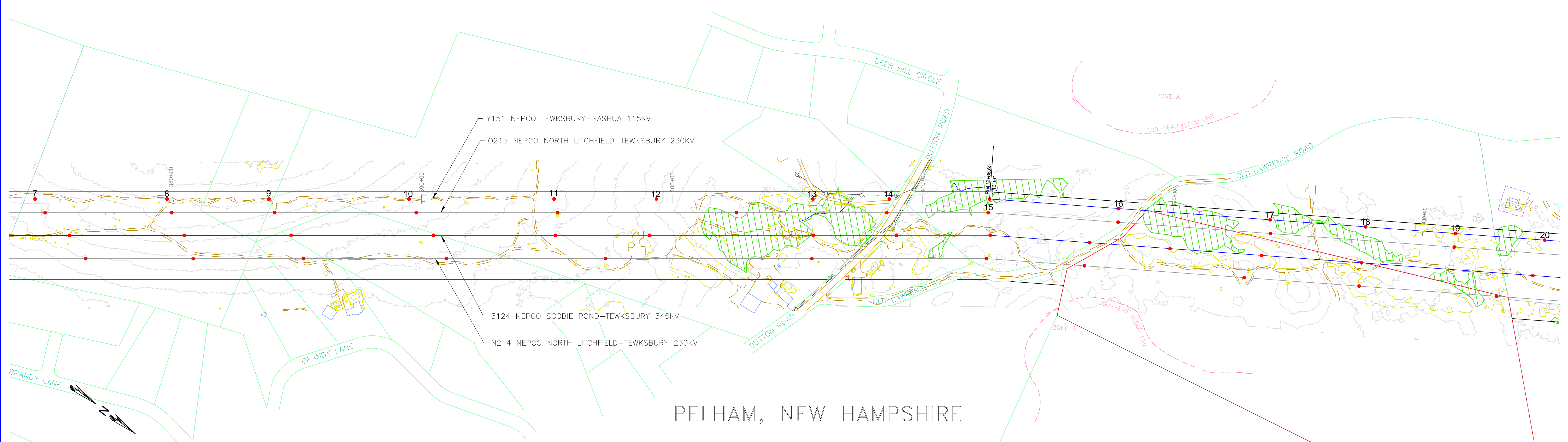
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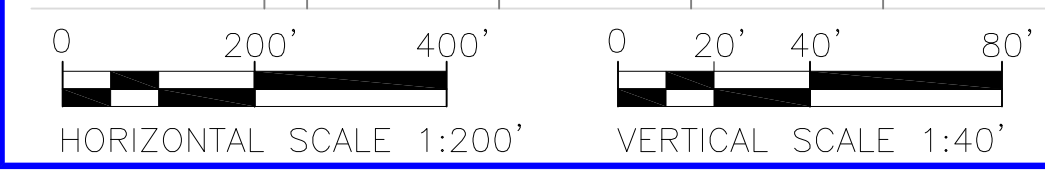
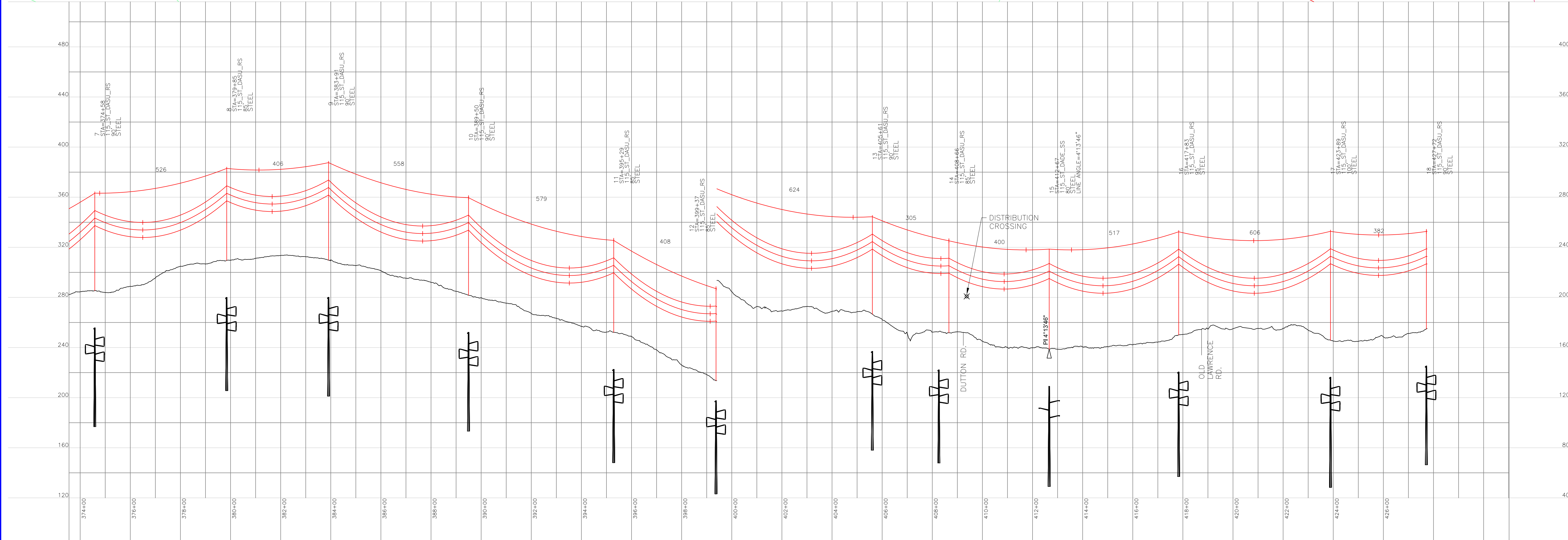
REVISIONS: JLM/FTX/NPA

VERSION: 1

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PELHAM, NEW HAMPSHIRE



PROPOSED OPGW (TO BE DETERMINED)
PROPOSED DRAKE 795 KCMIL 26/7 ACSS HS285

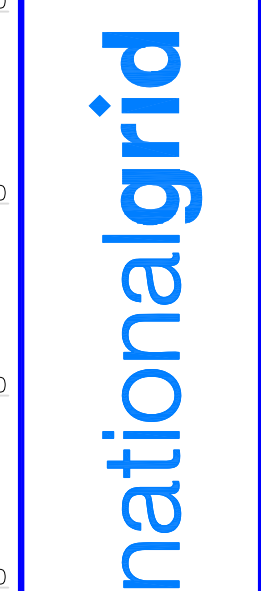
SHIELD WIRE SHOWN AT NESC HEAVY 4000 LBS, 60°F MAX SAG
CONDUCTOR SHOWN AT NESC HEAVY 8000 LBS, 392°F MAX SAG

INCHES ON ORIGINAL

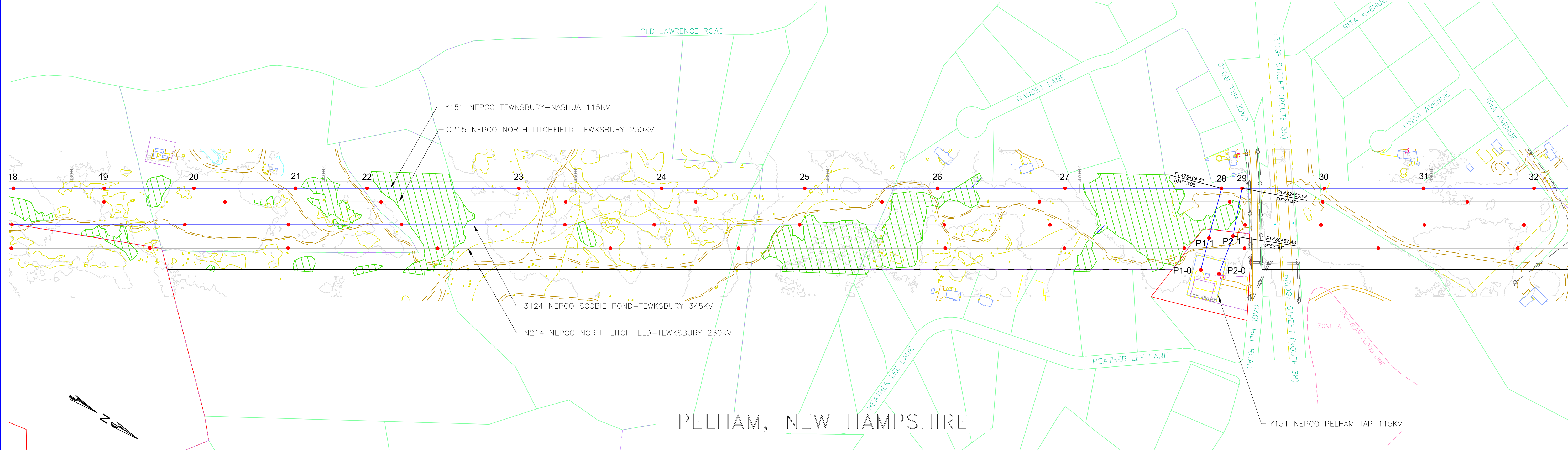
MERRIMACK VALLEY RELIABILITY PROJECT		PREPARED BY JLM 05/22/15
PLAN AND PROFILE DRAWINGS		REVIEWED BY FTX 05/22/15
SCOBIE POND TO TEWKSBURY		APPROVED BY NPA 05/22/15
LINE Y151 115KV		SCALE 1" = 400'
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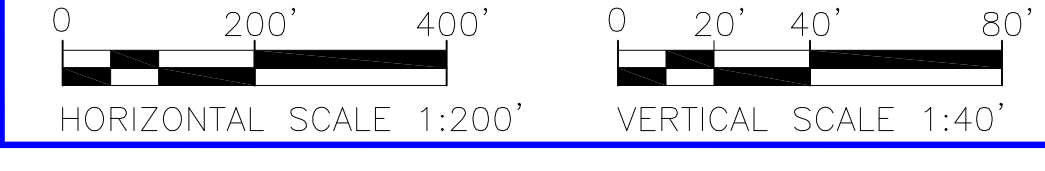
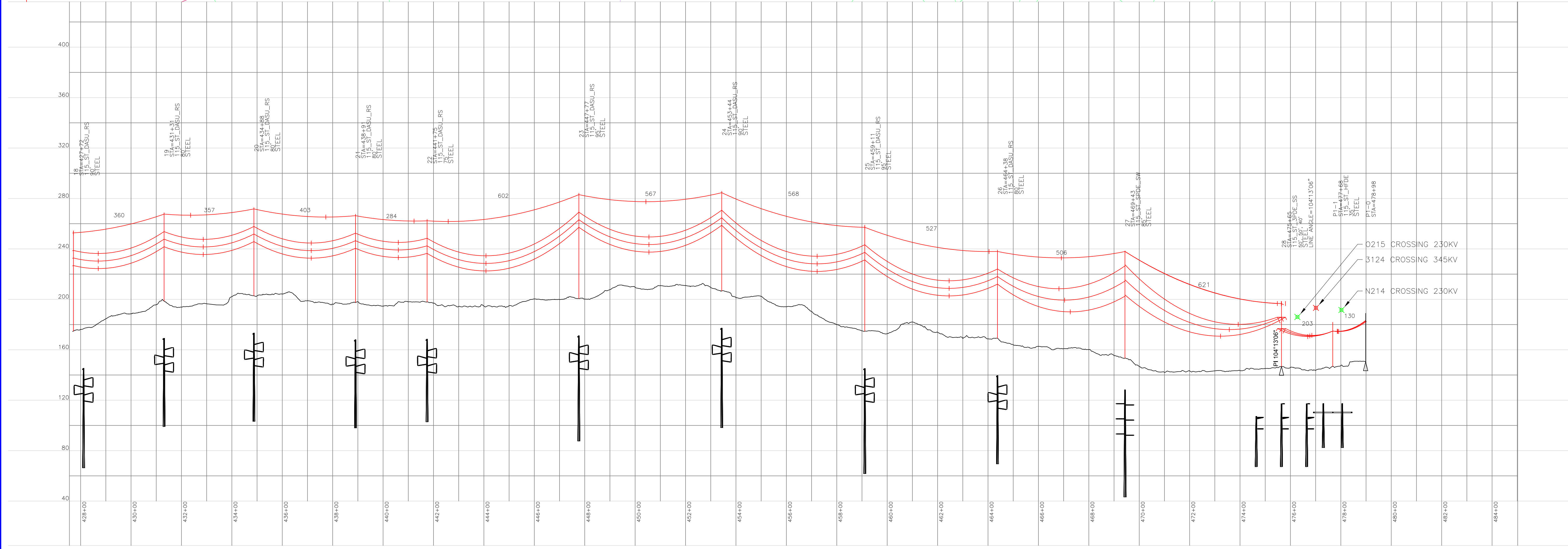
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PELHAM, NEW HAMPSHIRE

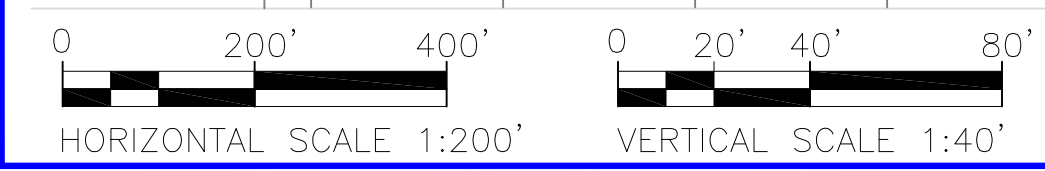
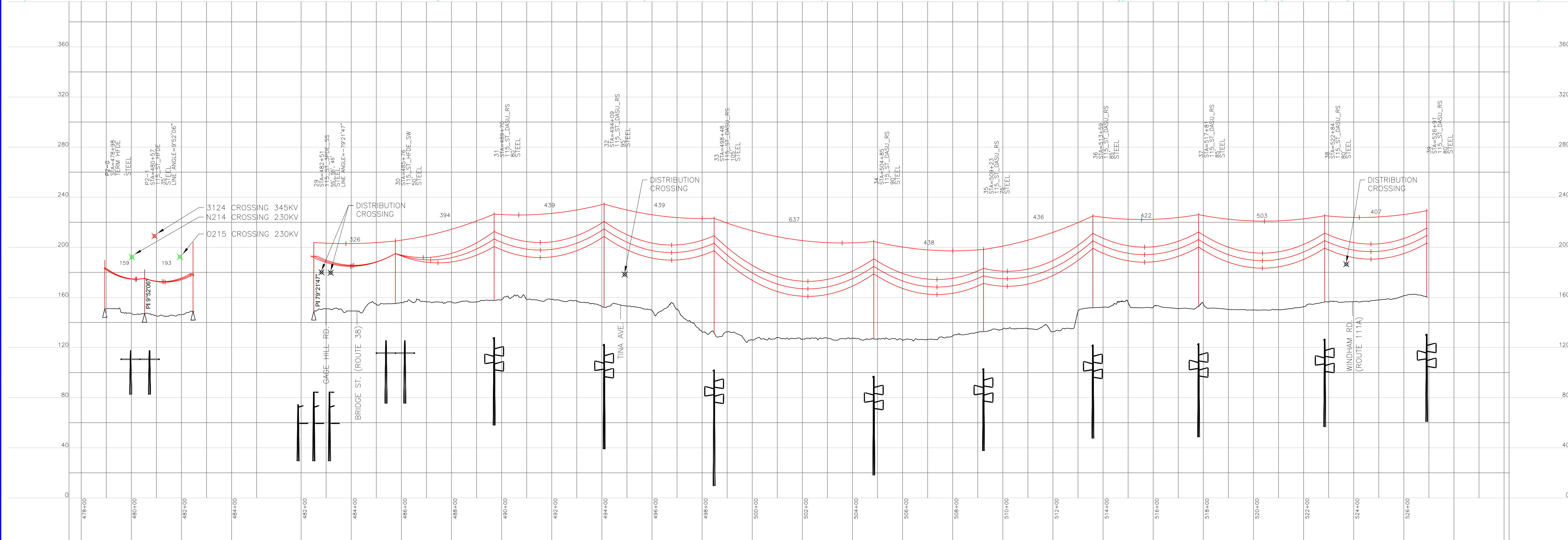
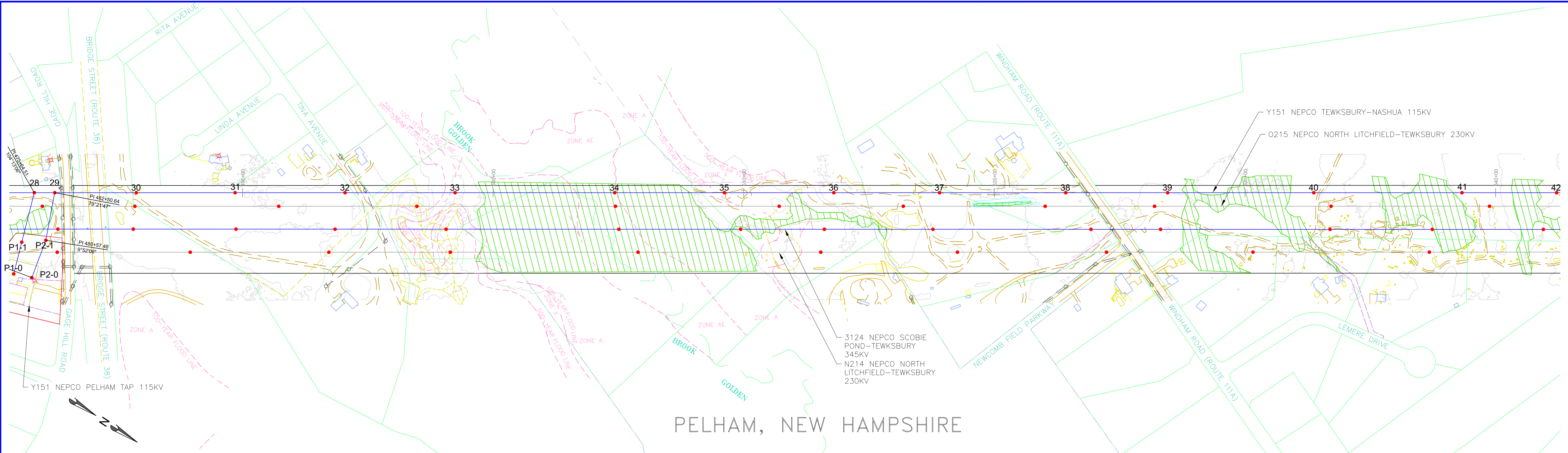


PROPOSED OPGW (TO BE DETERMINED) SHIELD WIRE SHOWN AT NESC HEAVY 4000 LBS, 60°F MAX SAG
 PROPOSED DRAKE 795 KCMIL 26/7 ACSS HS285 CONDUCTOR SHOWN AT NESC HEAVY 8000 LBS, 392°F MAX SAG

INCHES ON ORIGINAL

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PLAN AND PROFILE DRAWINGS		REVIEWED BY: JLM	DATE: 05/22/15
SCOBIE POND TO TEWKSBURY		APPROVED BY: NPA	DATE: 05/22/15
LINE Y151 115KV		SCALE: 1" = 100'	SHEET: 1 OF 1
INDEX: 400298		VERSION DESCRIPTION	VERSION
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PROPOSED OPGW (TO BE DETERMINED) SHIELD WIRE SHOWN AT NESC HEAVY 4000 LBS, 60°F MAX SAG
 PROPOSED DRAKE 795 KCMIL 26/7 ACSS HS285 CONDUCTOR SHOWN AT NESC HEAVY 8000 LBS, 392°F MAX SAG

INCHES ON ORIGINAL

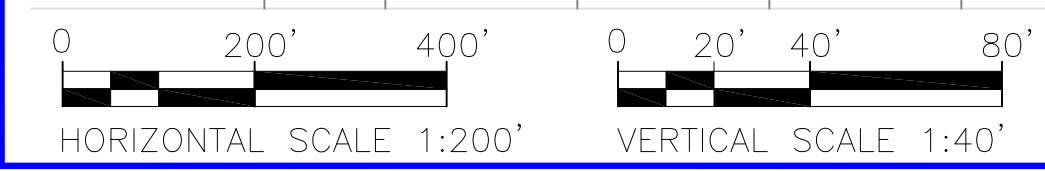
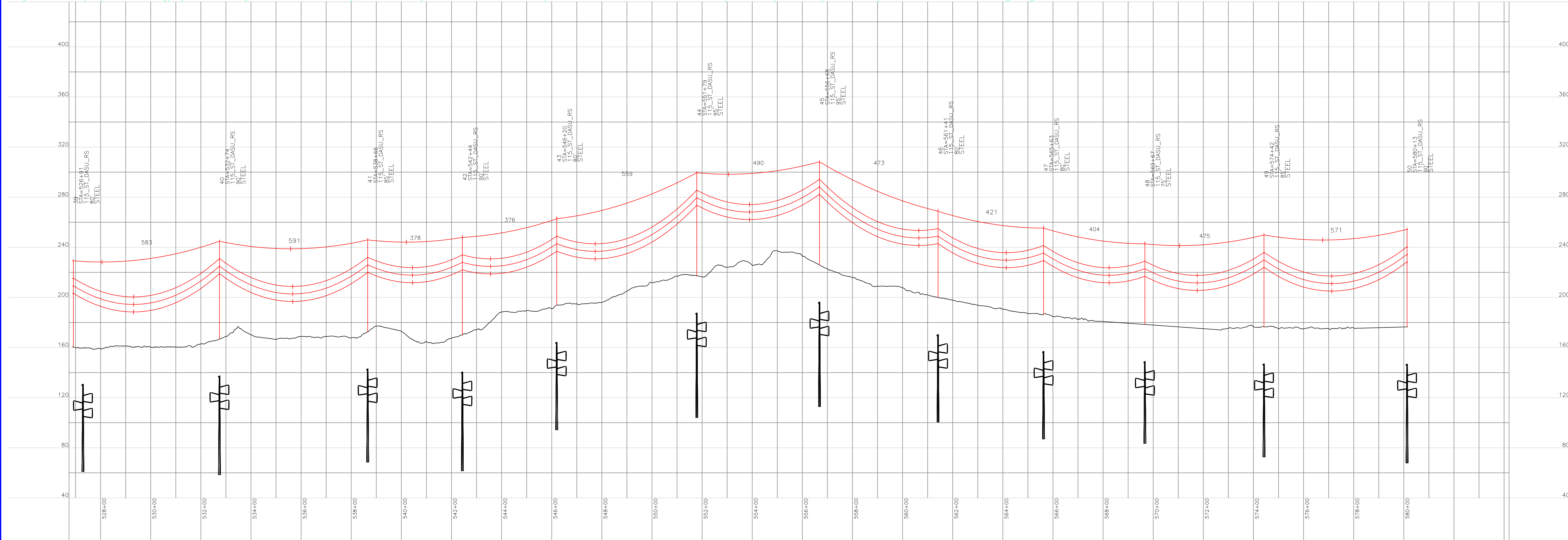
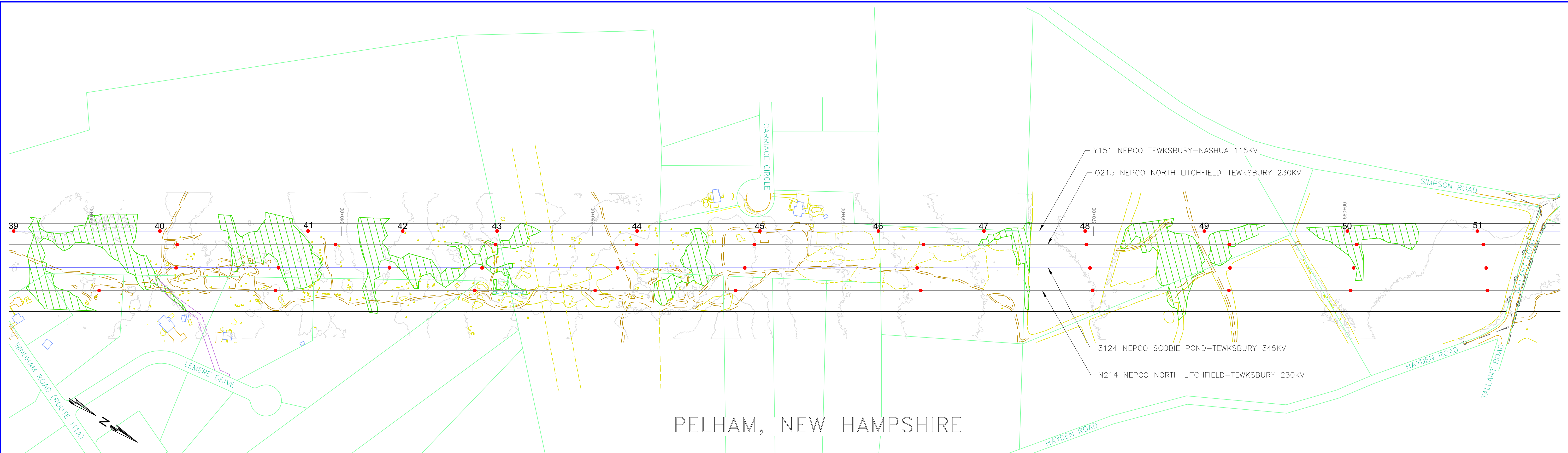
nationalgrid

MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE Y151 115KV

VER	DATE	DESCRIPTION
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PREPARED BY: JLM 05/22/15
 REVIEWED BY: JLM 05/22/15
 APPROVED BY: NPA 05/22/15
 SCALE: 1" = 400'
 SHEET: 1 OF 1
 INDEX: 400298

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PROPOSED OPGW (TO BE DETERMINED)
 PROPOSED DRAKE 795 KCMIL 26/7 ACSS HS285
 SHIELD WIRE SHOWN AT NESC HEAVY 4000 LBS, 60°F MAX SAG
 CONDUCTOR SHOWN AT NESC HEAVY 8000 LBS, 392°F MAX SAG

INCHES ON ORIGINAL

MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE Y151 115KV

PREPARED BY: JLM 05/22/15
 REVIEWED BY: FTX 05/22/15
 APPROVED BY: NPA 05/22/15
 SCALE: 1" = 200'
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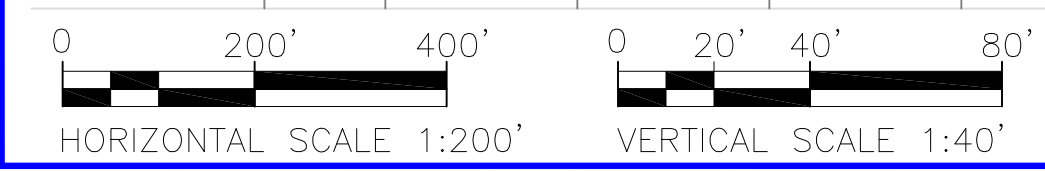
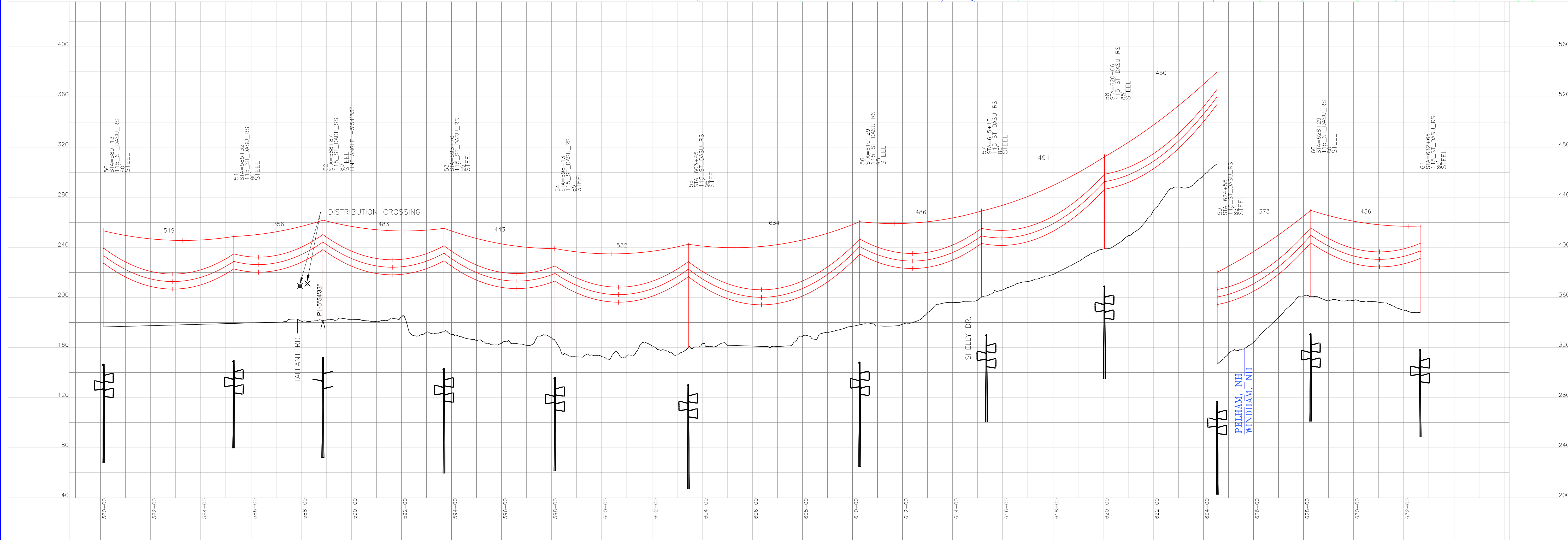
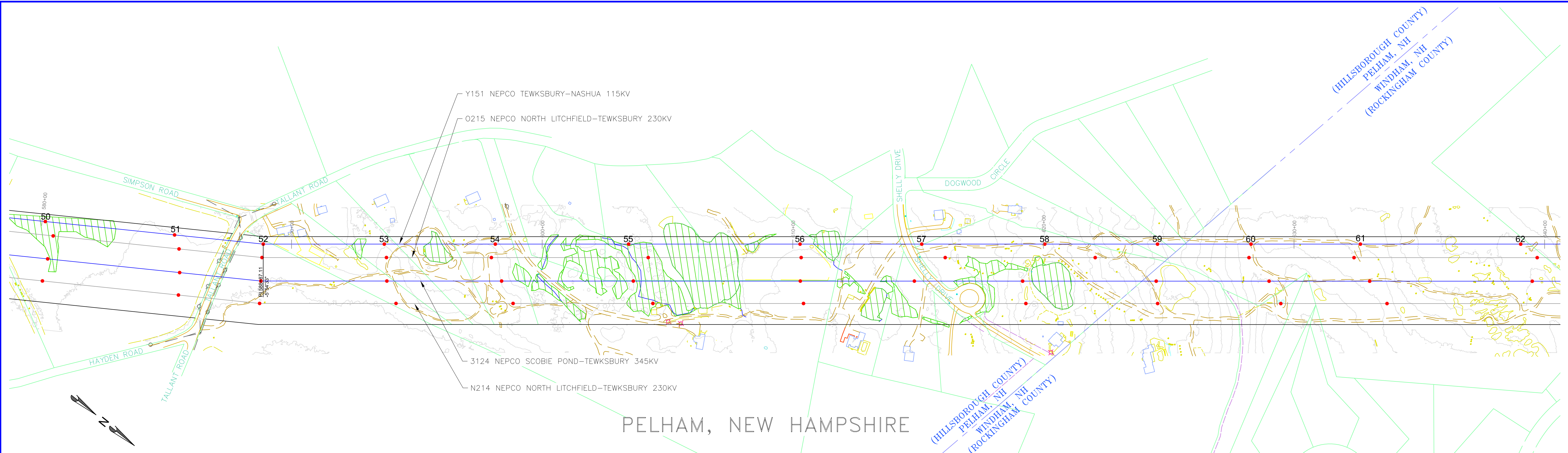
nationalgrid

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APPROVED BY: JLM FTX NPA

VERSION: 1

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 PROPOSED DRAKE 795 KCMIL 26/7 ACSS HS285

SHIELD WIRE SHOWN AT NESC HEAVY 4000 LBS, 60°F MAX SAG
 CONDUCTOR SHOWN AT NESC HEAVY 8000 LBS, 392°F MAX SAG

INCHES ON ORIGINAL

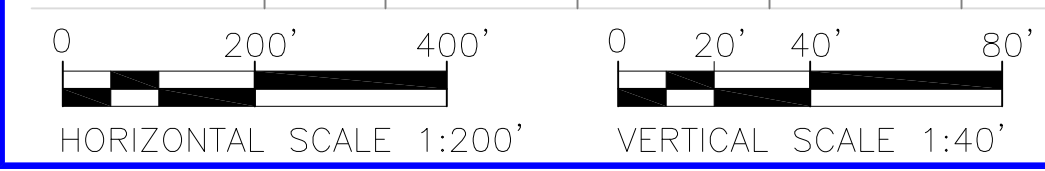
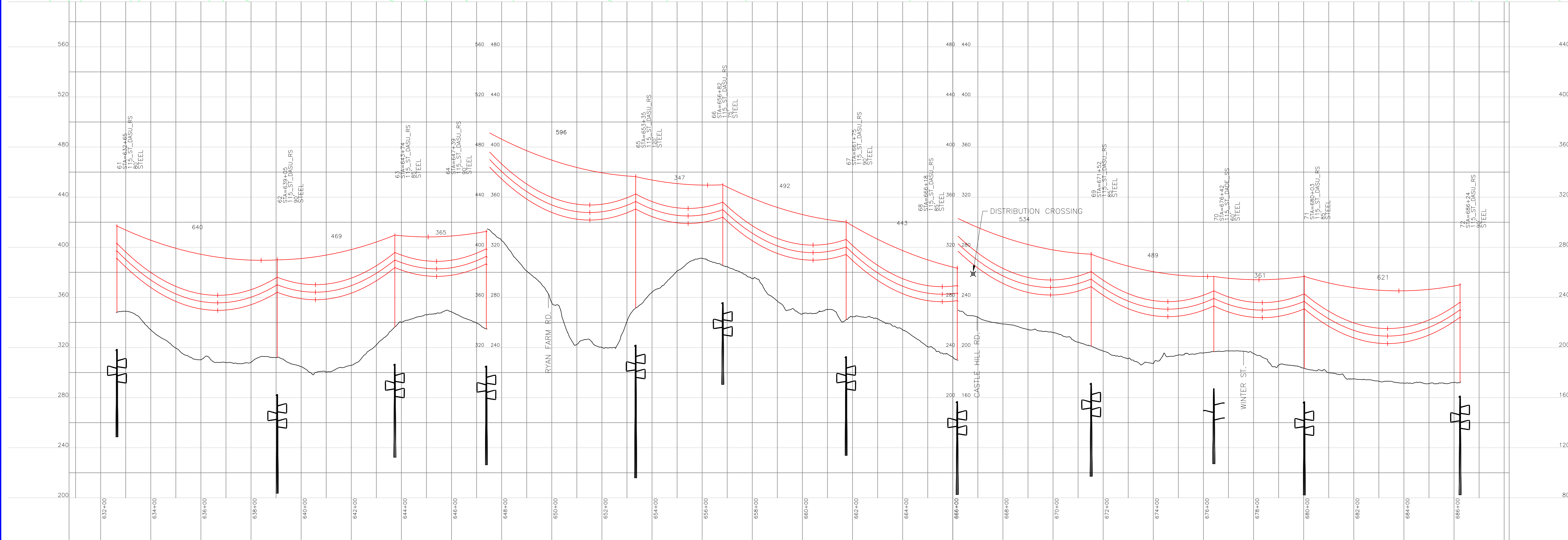
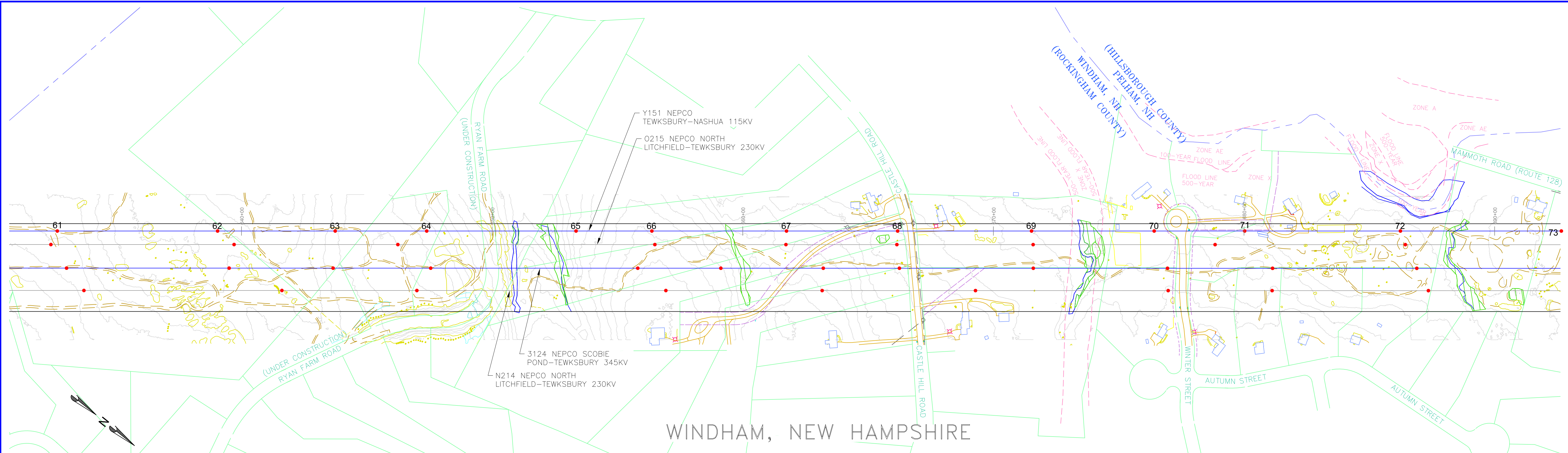
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MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE Y151 115KV

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PREPARED BY: JLM 05/22/15
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 APPROVED BY: NPA 05/22/15
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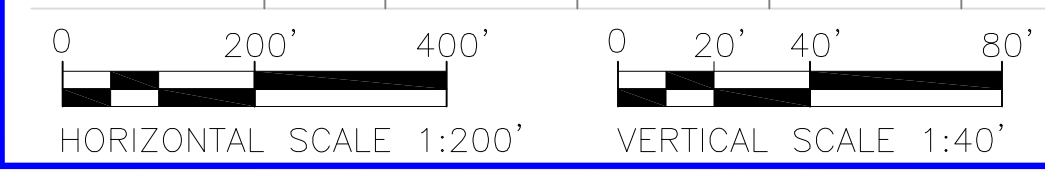
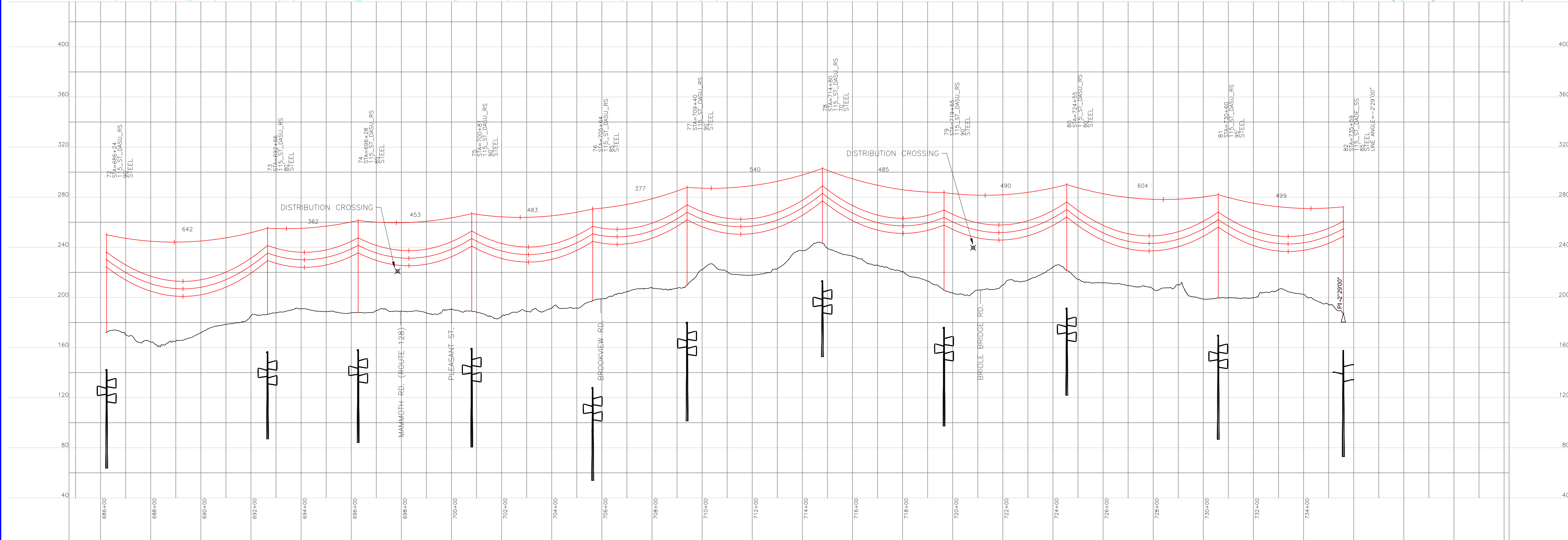
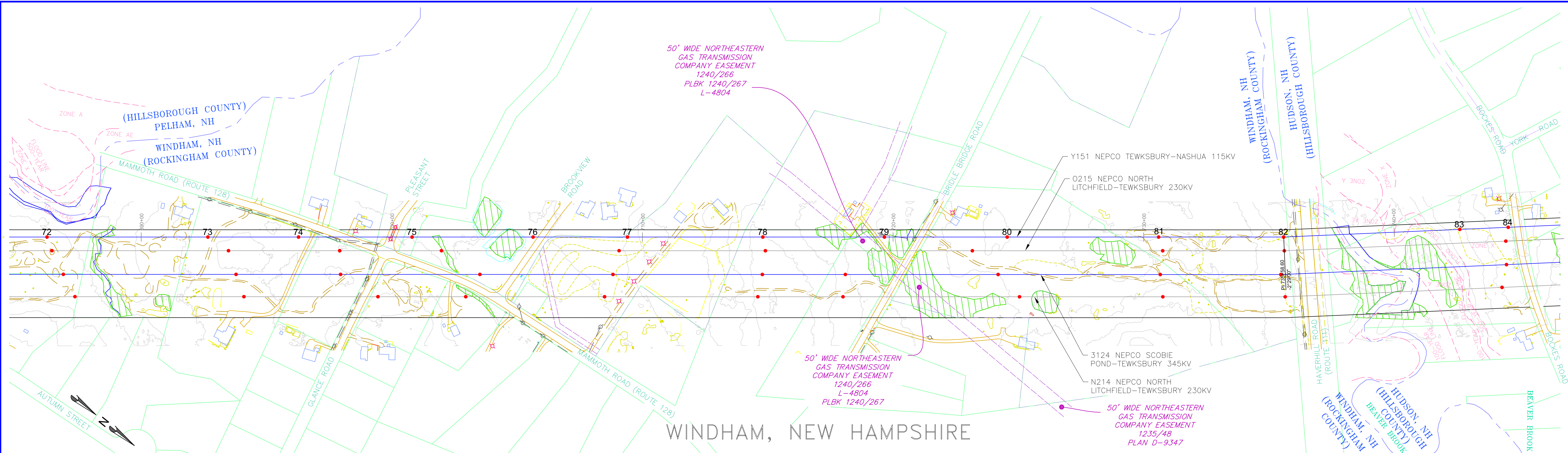
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MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE Y151 115KV

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 PROPOSED DRAKE 795 KCMIL 26/7 ACSS HS285
 SHIELD WIRE SHOWN AT NESC HEAVY 4000 LBS, 60°F MAX SAG
 CONDUCTOR SHOWN AT NESC HEAVY 8000 LBS, 392°F MAX SAG

INCHES ON ORIGINAL

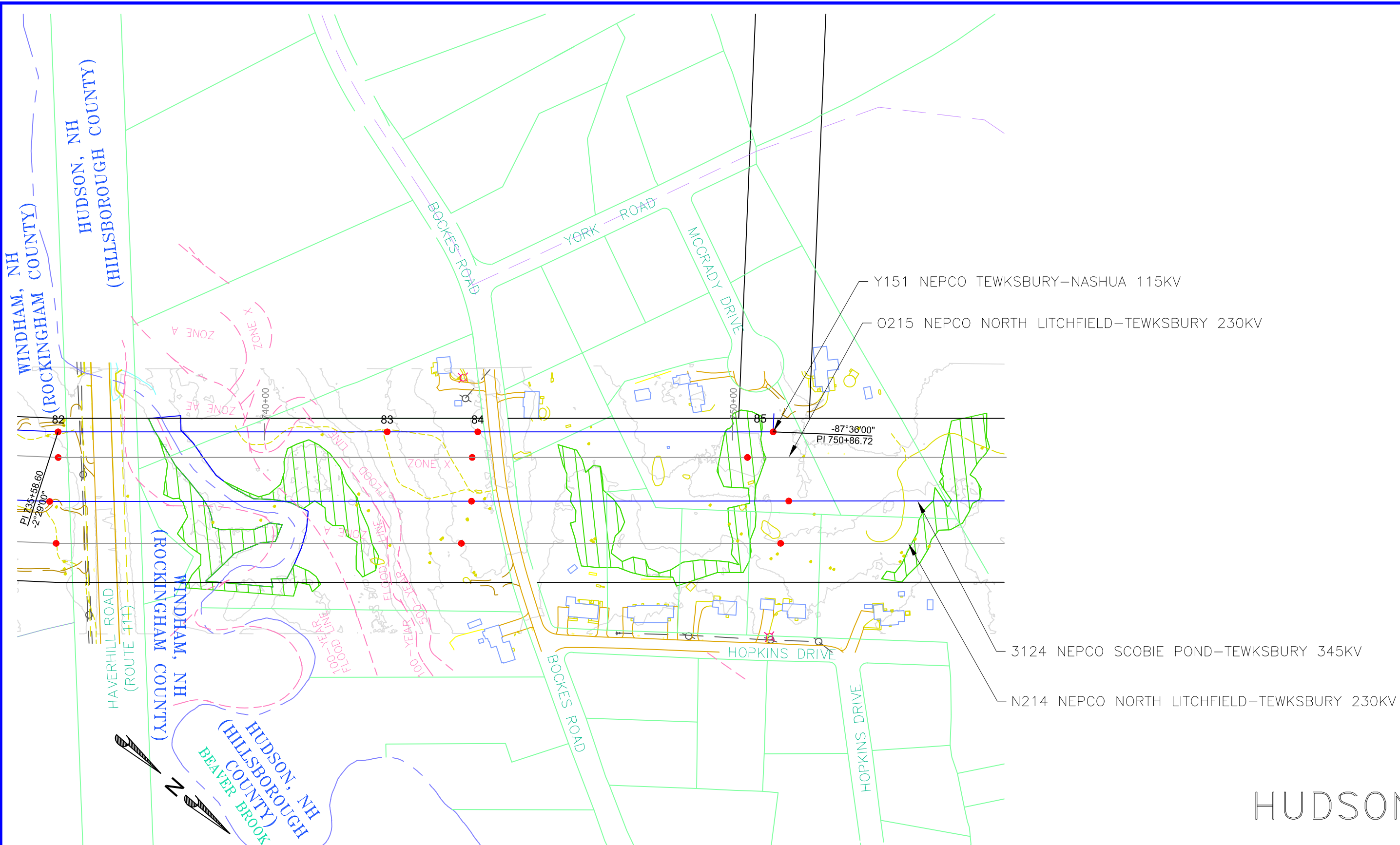
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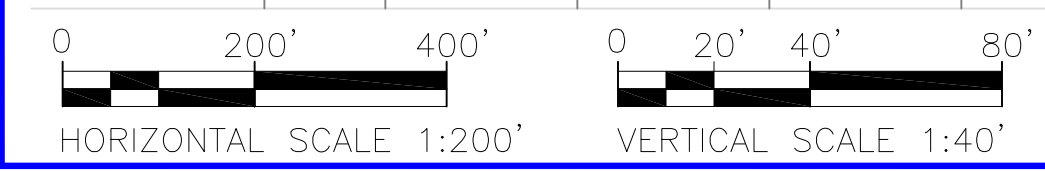
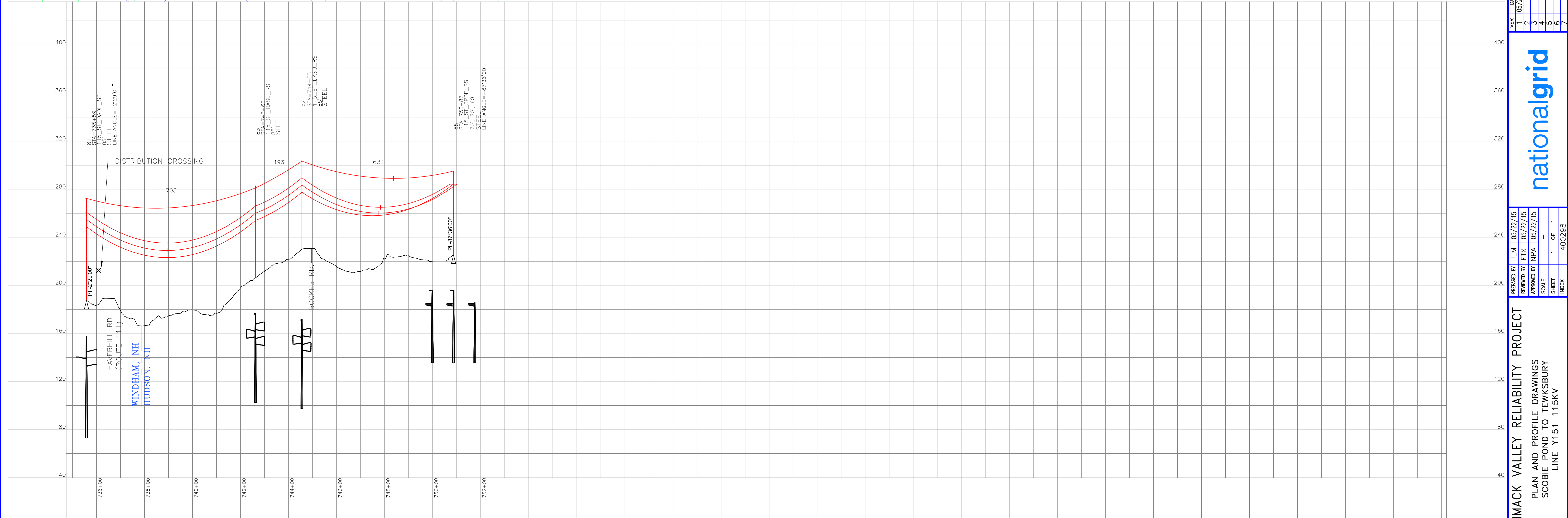
PREPARED BY	JLM	DATE	05/22/15
REVIEWED BY	JLM	DATE	05/22/15
APPROVED BY	NPA	DATE	05/22/15
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HUDSON, NEW HAMPSHIRE



PROPOSED OPGW (TO BE DETERMINED) SHIELD WIRE SHOWN AT NESC HEAVY 4000 LBS, 60°F MAX SAG
 PROPOSED DRAKE 795 KCMIL 26/7 ACSS HS285 CONDUCTOR SHOWN AT NESC HEAVY 8000 LBS, 392°F MAX SAG

INCHES ON ORIGINAL

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MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE Y151 115KV

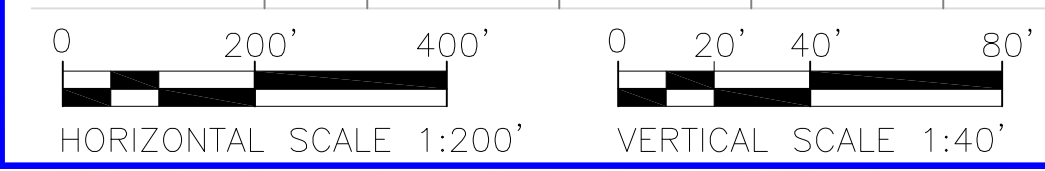
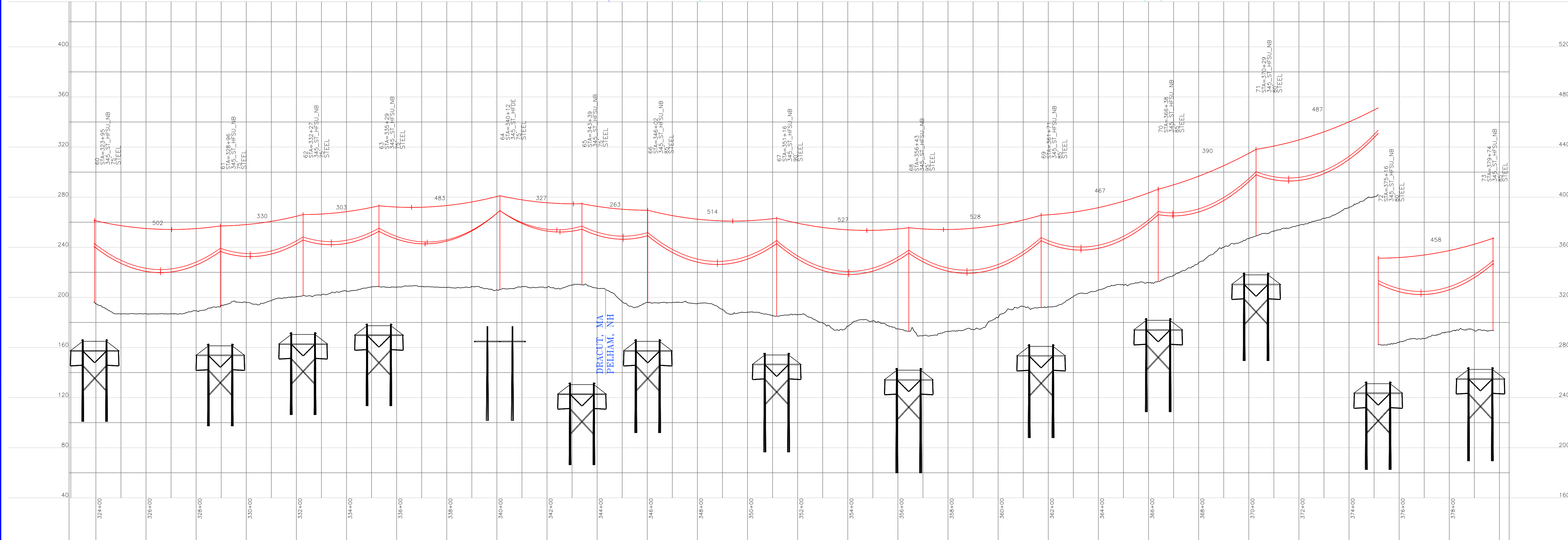
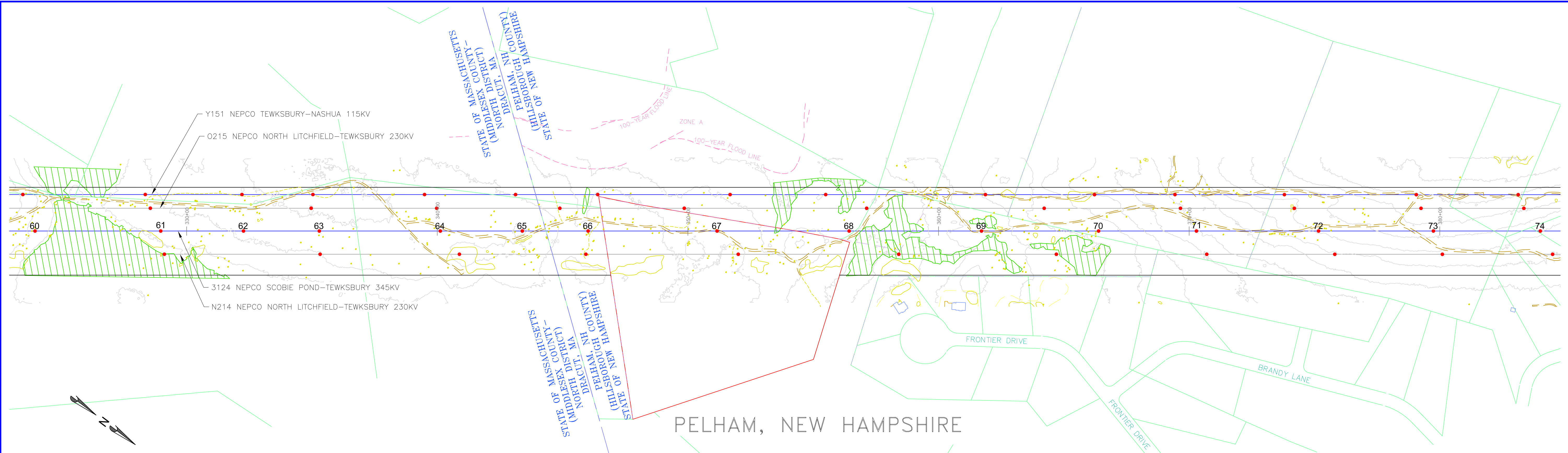
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PREPARED BY: JLM
 REVIEWED BY: JLM
 APPROVED BY: NPA
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REVISIONS: JLM, FTX, NPA

VERSION: 1

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PROPOSED 3/8"-7 STRAND EHS AND OPGW (TO BE DETERMINED)
 PROPOSED BUNDLED FALCON 1590 KCMIL 54/19 ACSR
 SHIELD WIRE SHOWN AT NESC HEAVY, 4000 LBS, 60°F MAX SAG
 CONDUCTOR SHOWN AT NESC HEAVY, 10000 LBS 284°F MAX SAG

INCHES ON ORIGINAL

MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE 3124 345KV

PREPARED BY: JLM 05/22/15
 REVIEWED BY: FTX 05/22/15
 APPROVED BY: NPA 05/22/15
 SCALE: 1" = 200'
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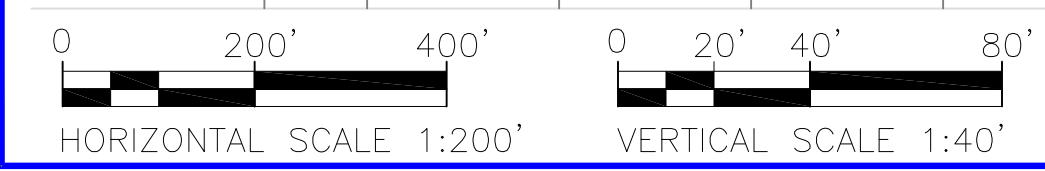
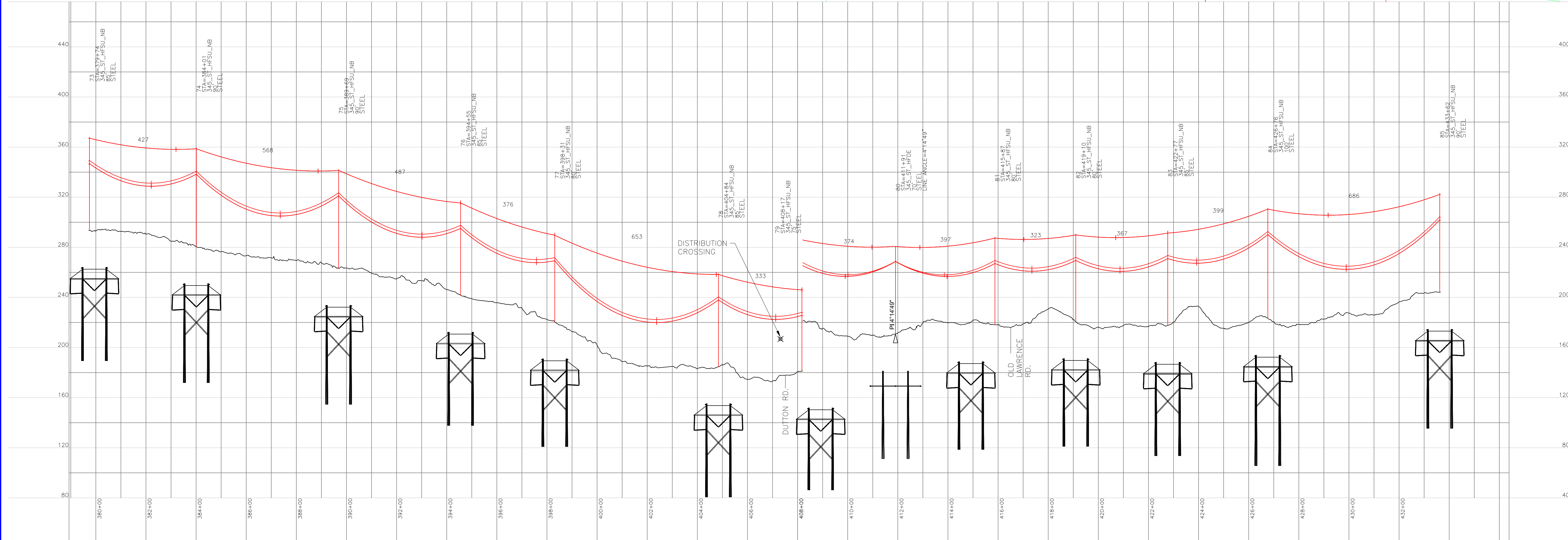
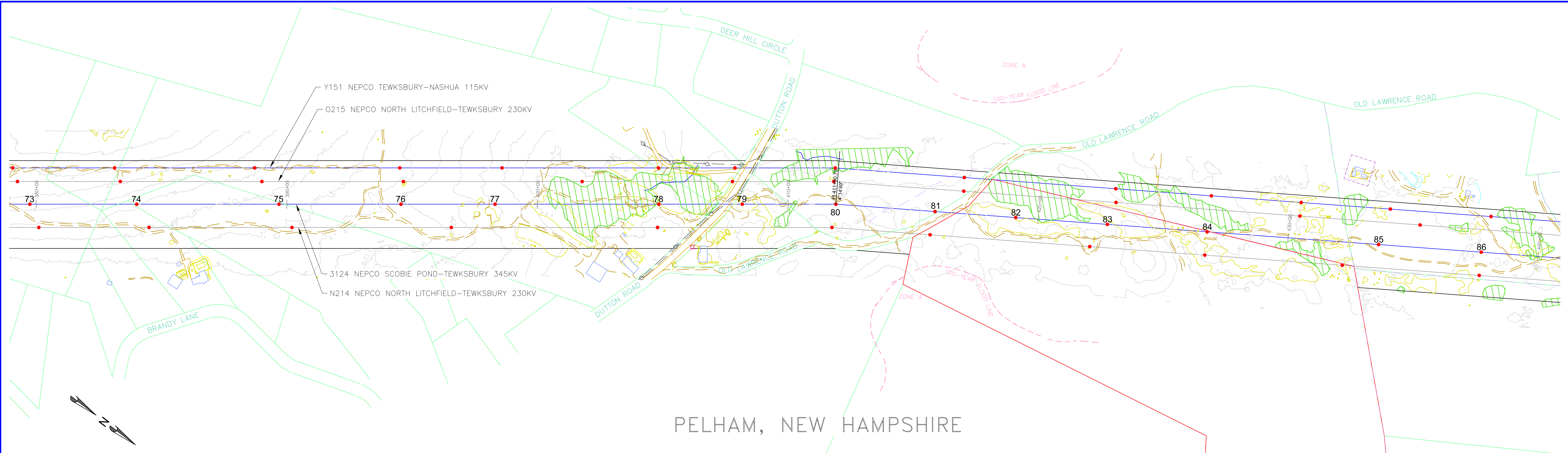
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REVISIONS: JLM, FTX, NPA

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PROPOSED 3/8"-7 STRAND EHS AND OPGW (TO BE DETERMINED)
PROPOSED BUNDLED FALCON 1590 KCMIL 54/19 ACSR

SHIELD WIRE SHOWN AT NESC HEAVY, 4000 LBS, 60°F MAX SAG
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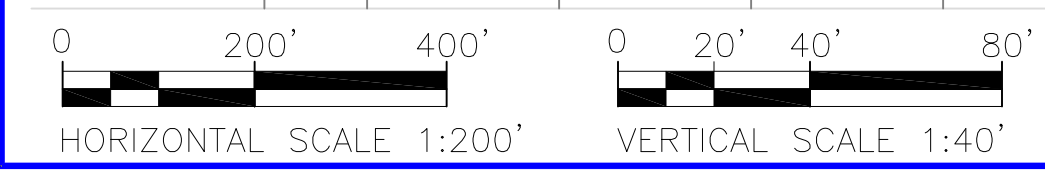
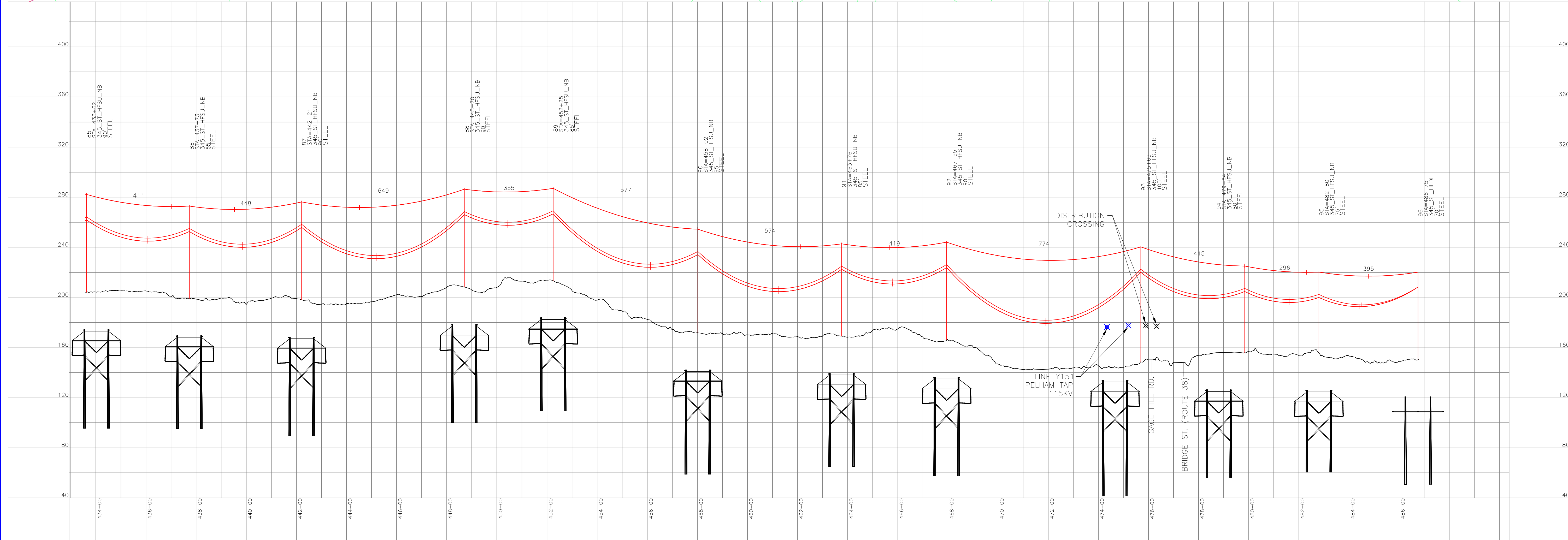
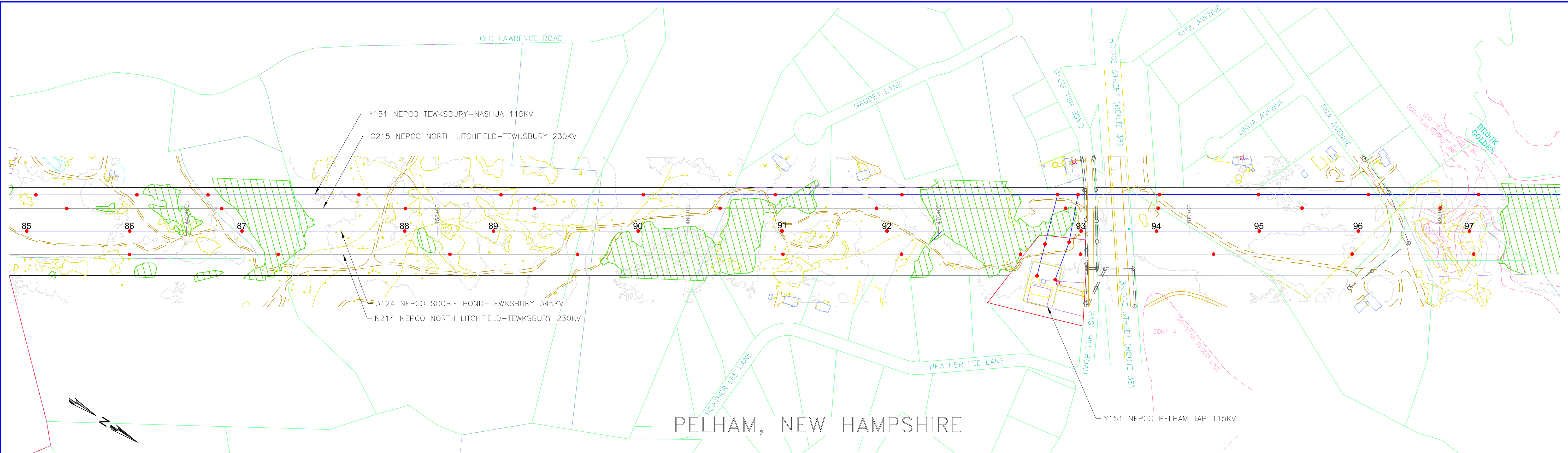
INCHES ON ORIGINAL

MERRIMACK VALLEY RELIABILITY PROJECT		PREPARED BY	JLM	DATE	05/22/15
PLAN AND PROFILE DRAWINGS		REVIEWED BY	FTX	DATE	05/22/15
SCOBIE POND TO TEWKSBURY		SCALE	N/A	INDEX	1 OF 1
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PROPOSED 3/8"-7 STRAND EHS AND OPGW (TO BE DETERMINED)
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INCHES ON ORIGINAL

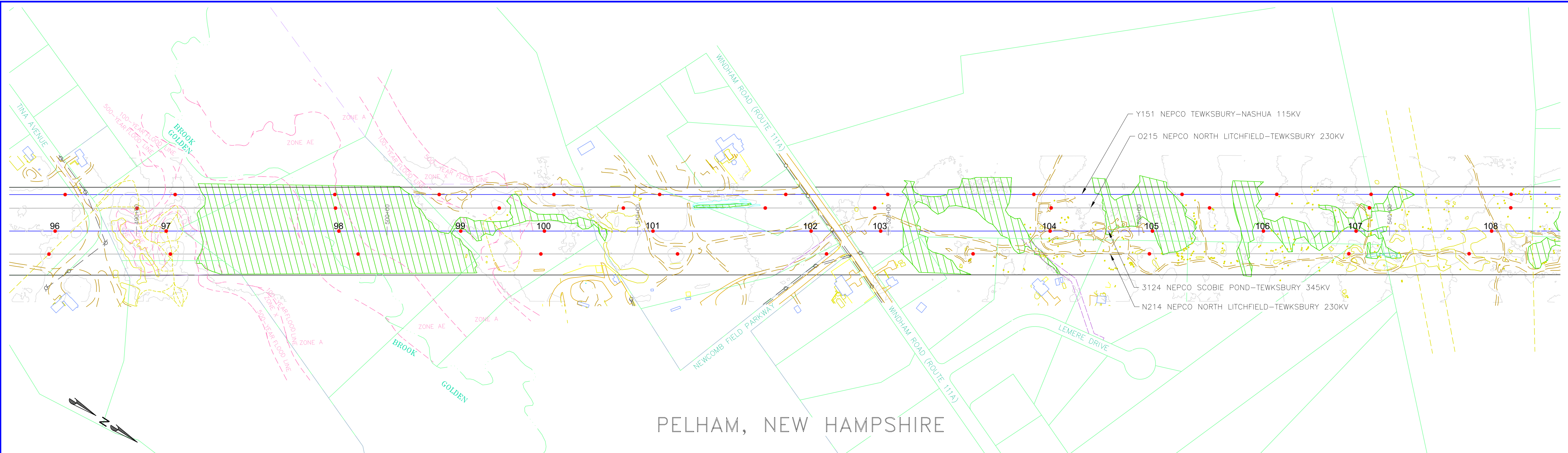
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MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE 3124 345KV

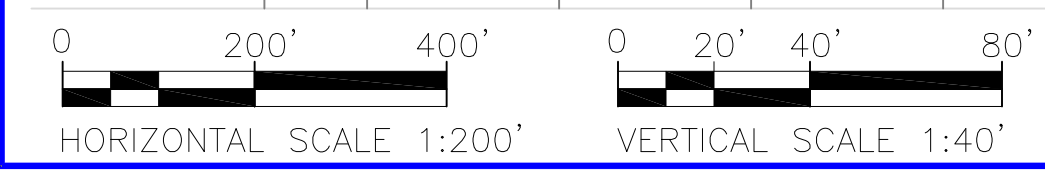
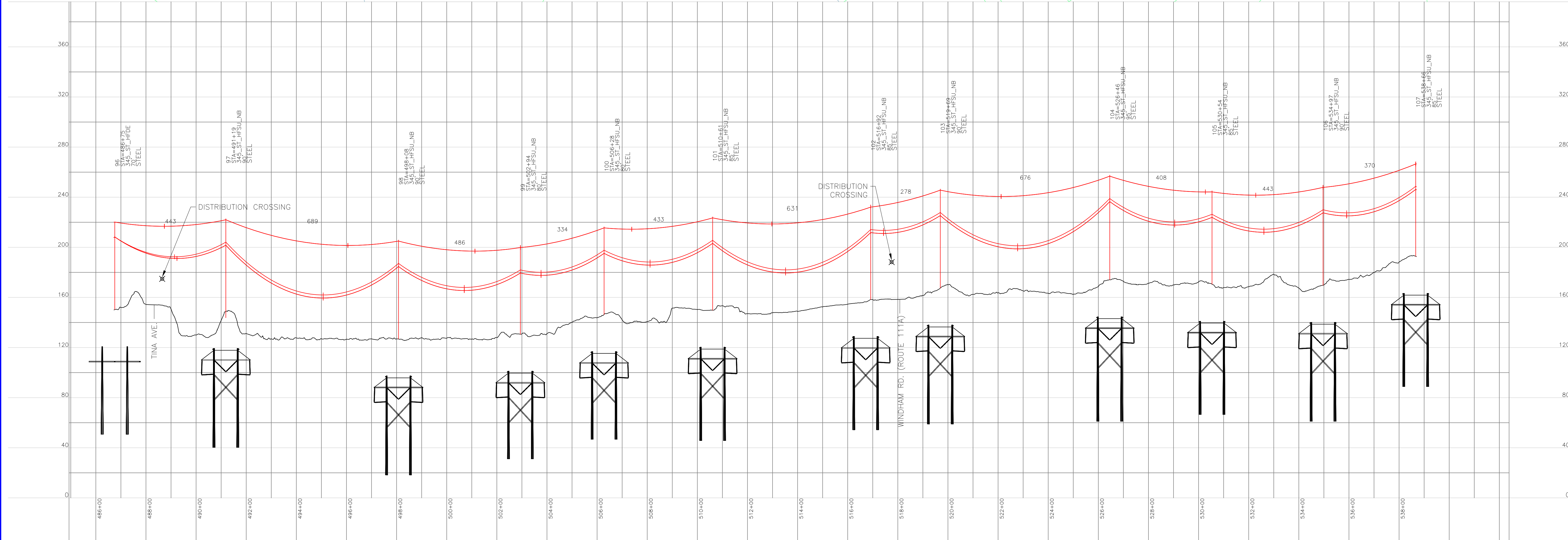
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PREPARED BY: JLM 05/22/15
 REVIEWED BY: FTX 05/22/15
 APPROVED BY: NPA 05/22/15
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PELHAM, NEW HAMPSHIRE



PROPOSED 3/8"-7 STRAND EHS AND OPGW (TO BE DETERMINED)
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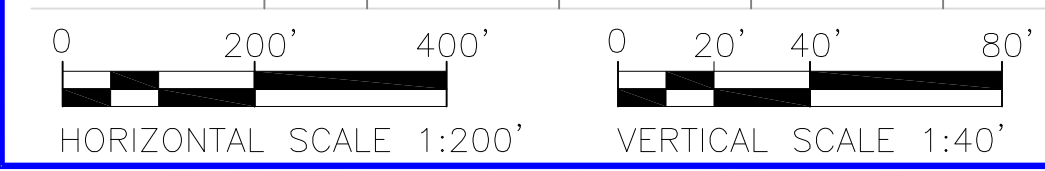
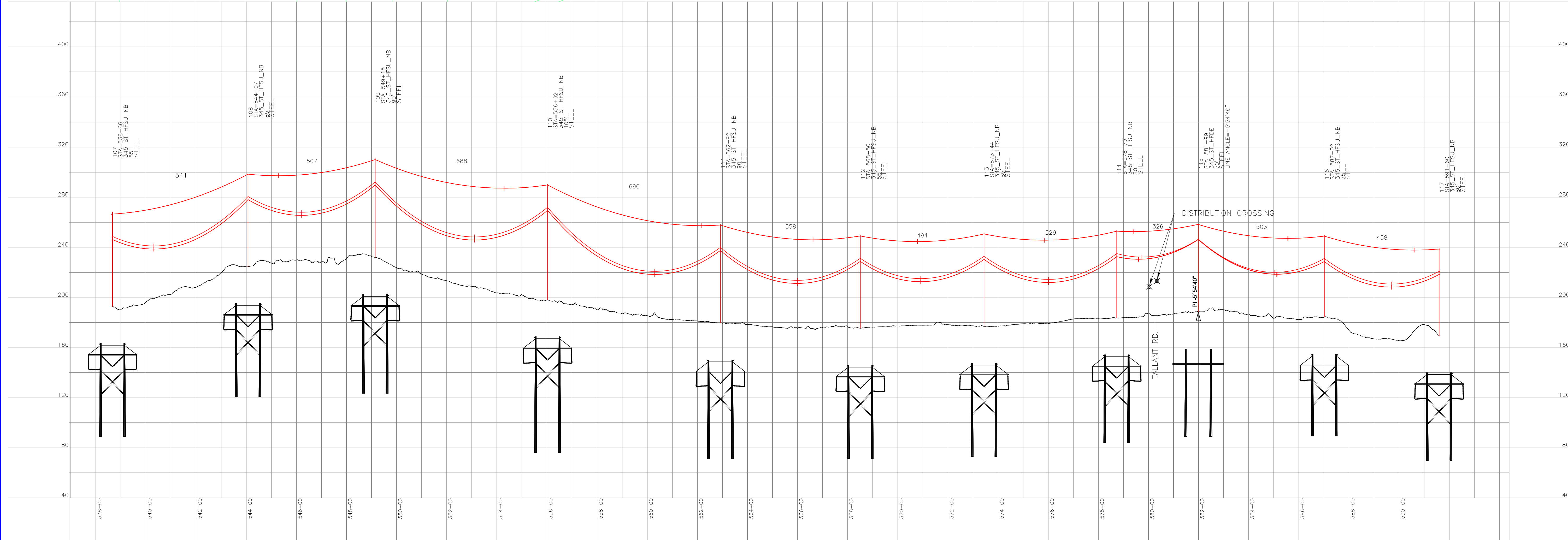
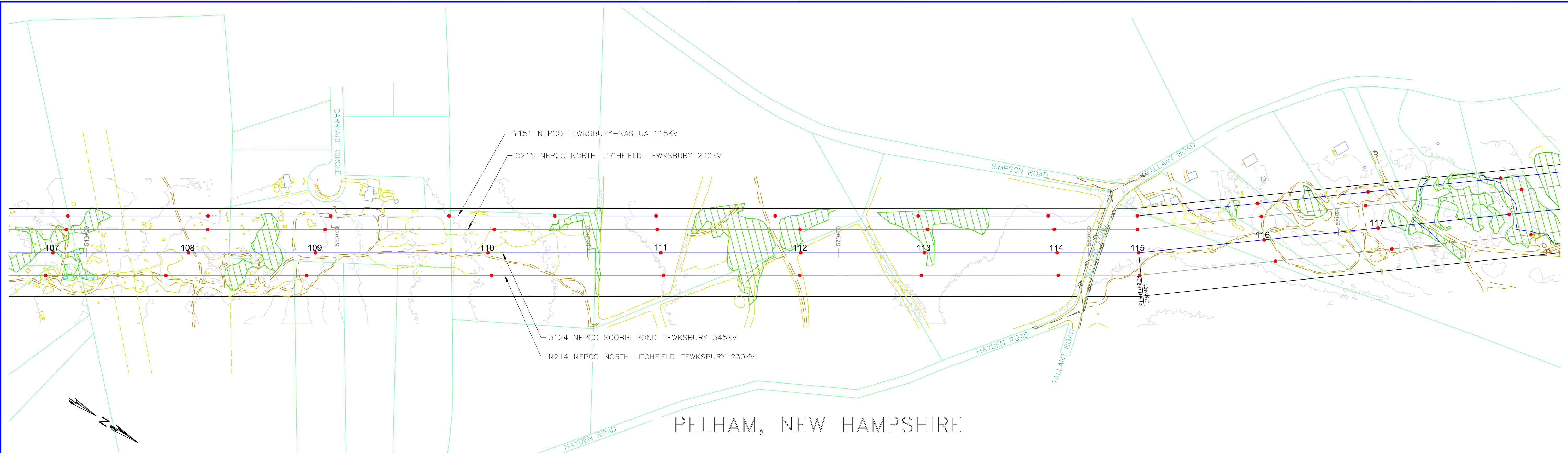
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MERRIMACK VALLEY RELIABILITY PROJECT
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PREPARED BY: JLM
 REVIEWED BY: JLM
 APPROVED BY: NPA
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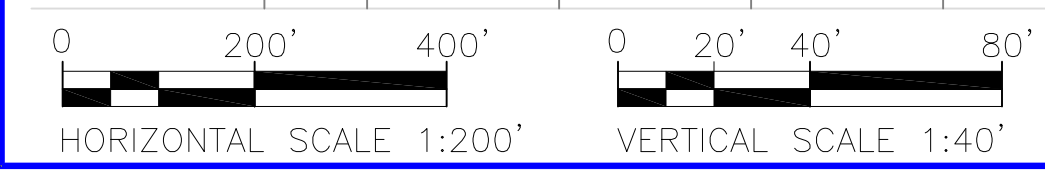
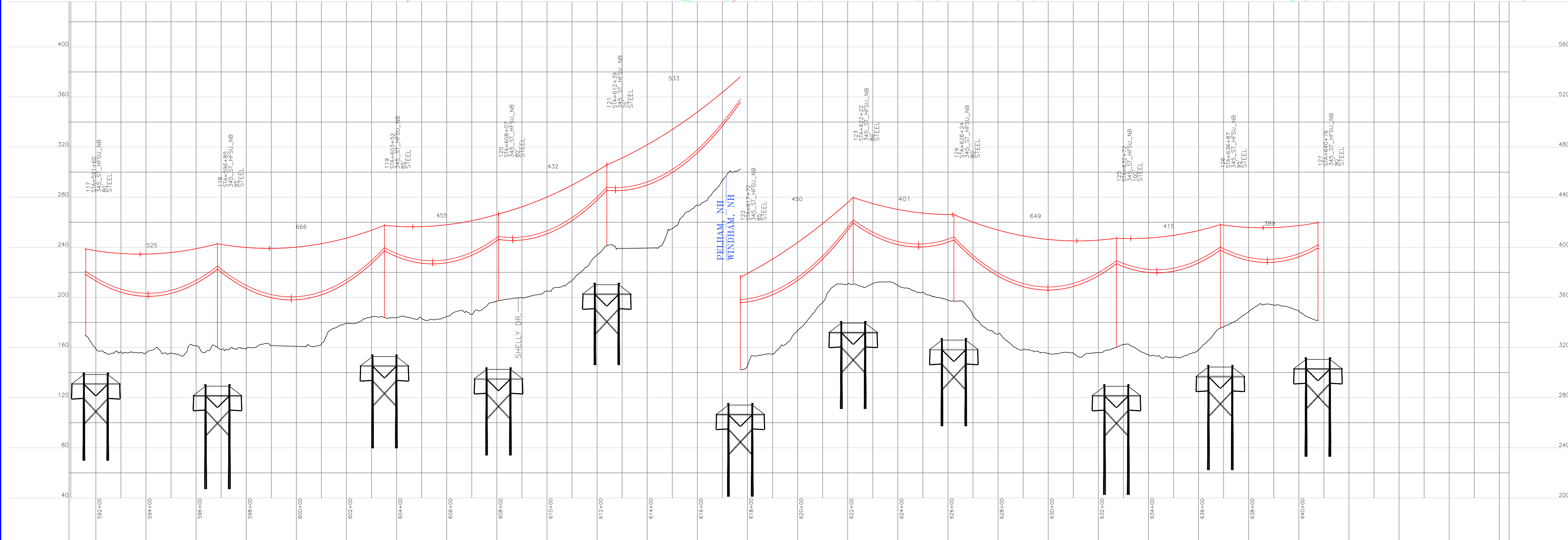
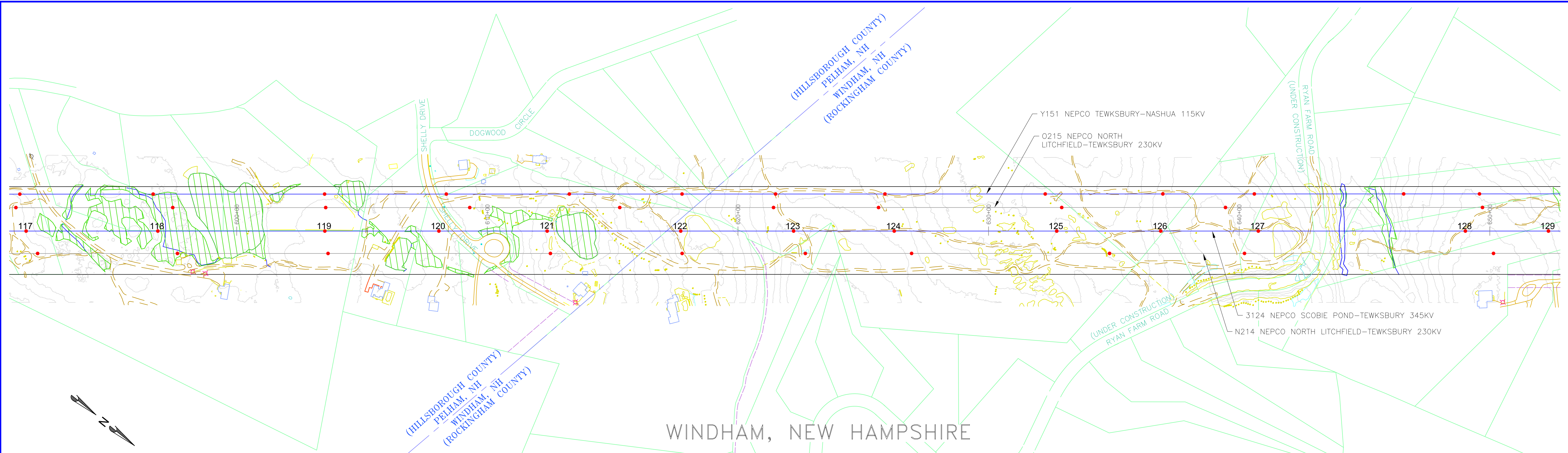
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MERRIMACK VALLEY RELIABILITY PROJECT
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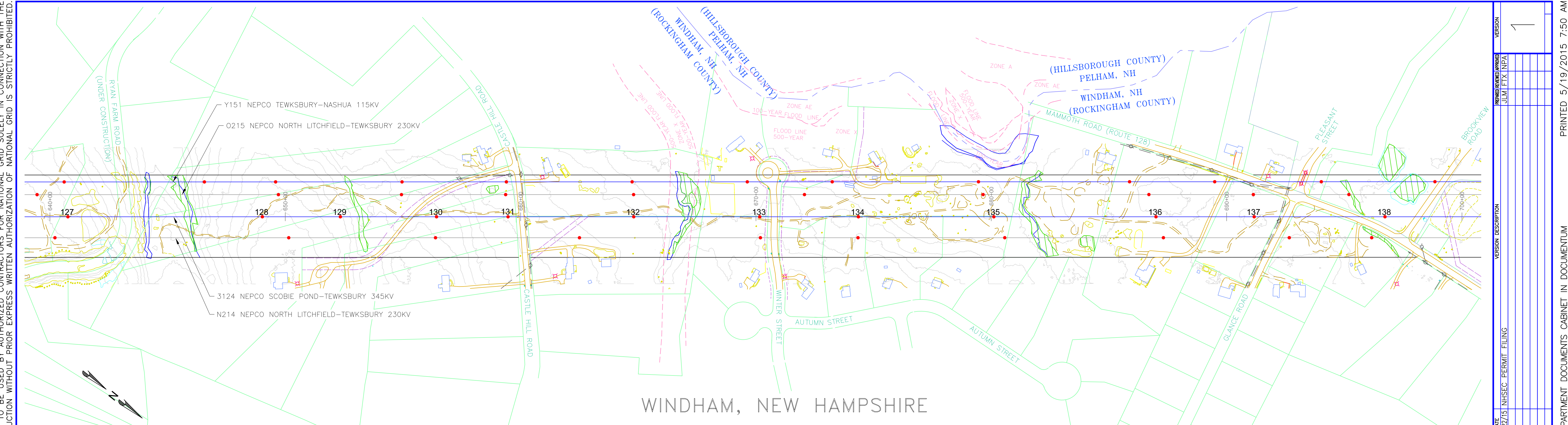
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PREPARED BY: JLM 05/22/15
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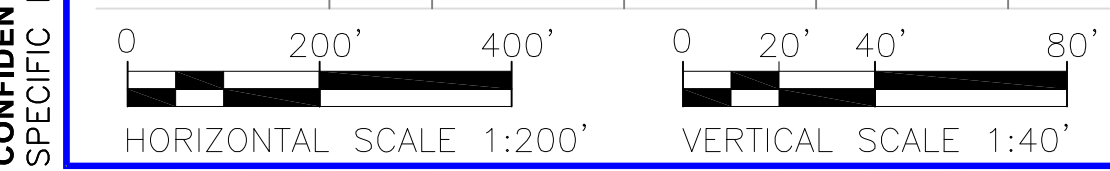
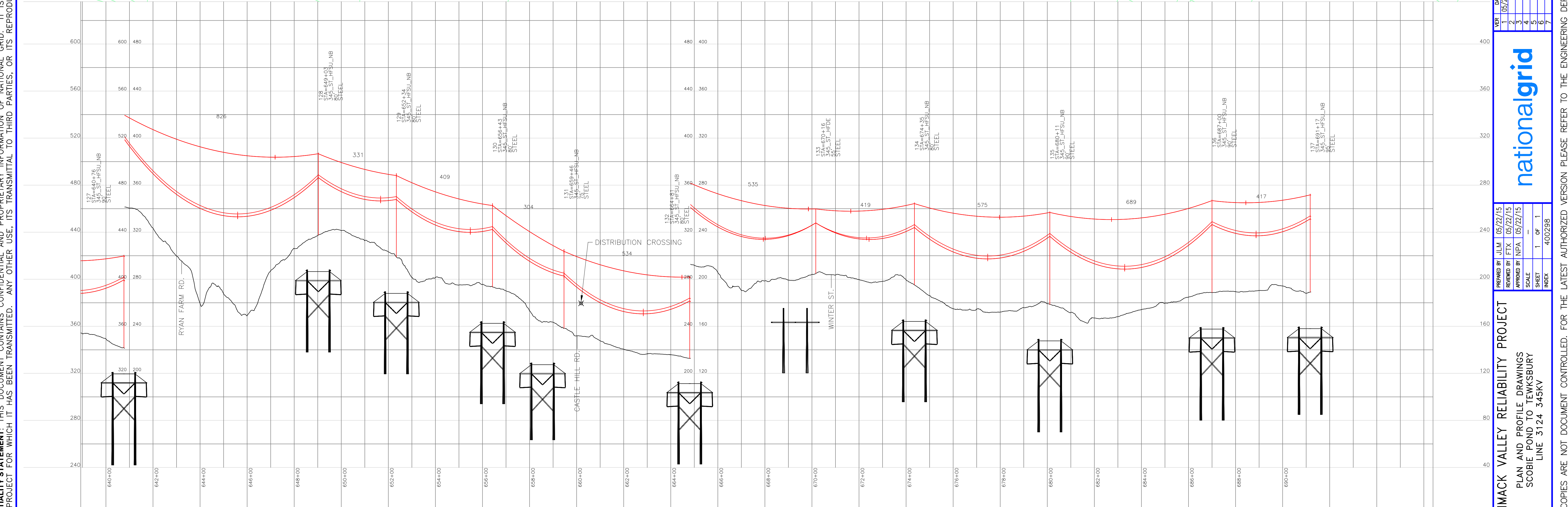
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WINDHAM, NEW HAMPSHIRE



PROPOSED 3/8"-7 STRAND EHS AND OPGW (TO BE DETERMINED)
 PROPOSED BUNDLED FALCON 1590 KCMIL 54/19 ACSR

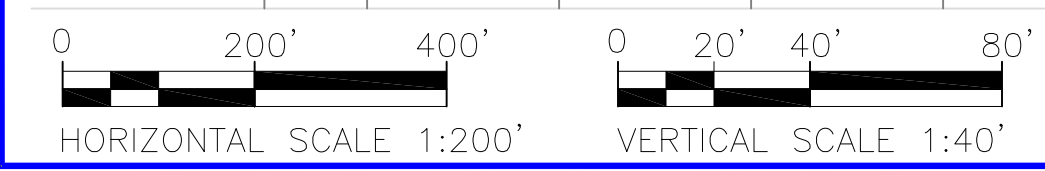
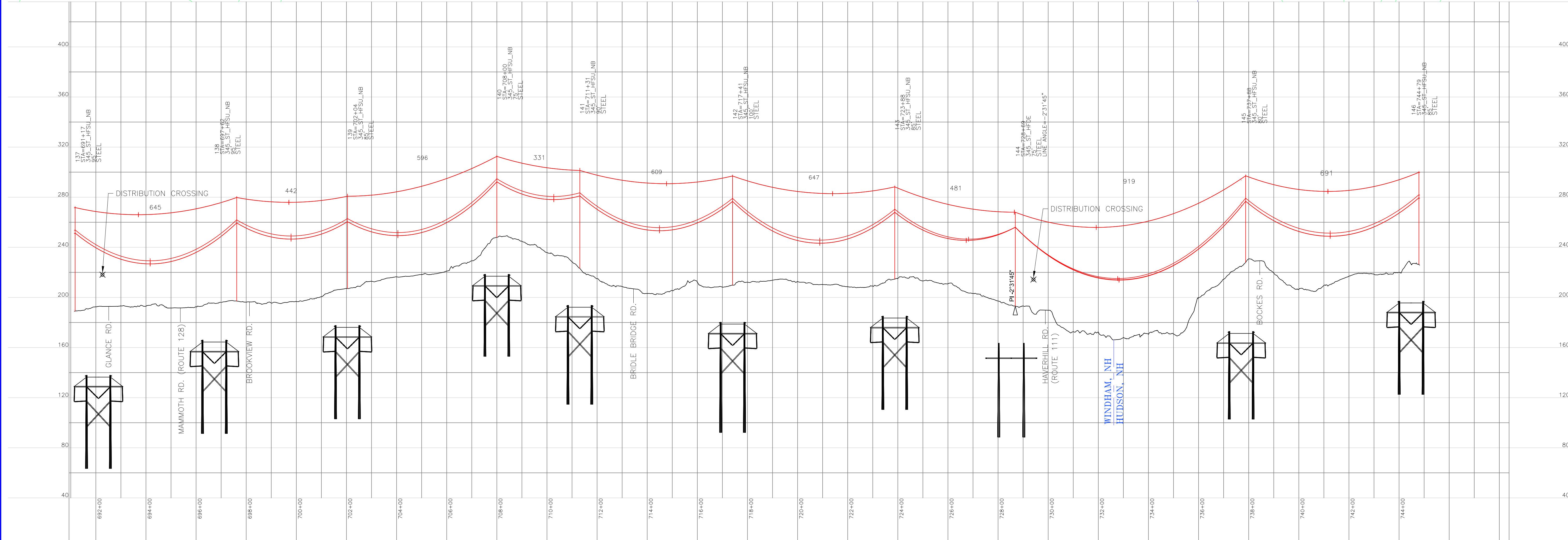
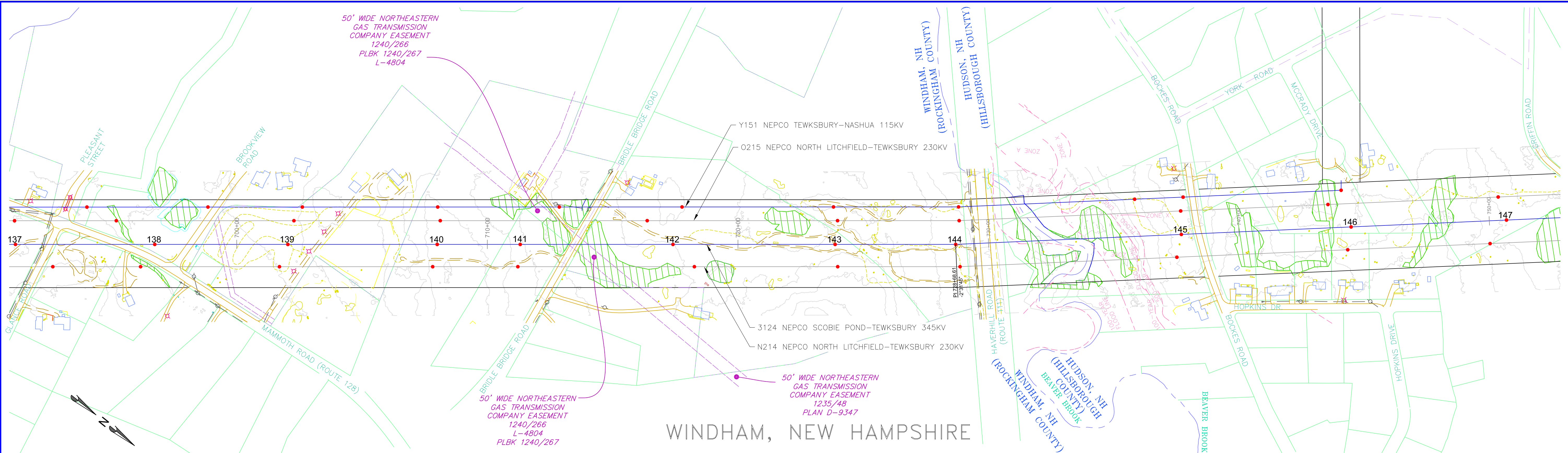
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		1			

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PROPOSED 3/8"-7 STRAND EHS AND OPGW (TO BE DETERMINED)
 PROPOSED BUNDLED FALCON 1590 KCMIL 54/19 ACSR
 SHIELD WIRE SHOWN AT NESC HEAVY, 4000 LBS, 60°F MAX SAG
 CONDUCTOR SHOWN AT NESC HEAVY, 10000 LBS 284°F MAX SAG

INCHES ON ORIGINAL

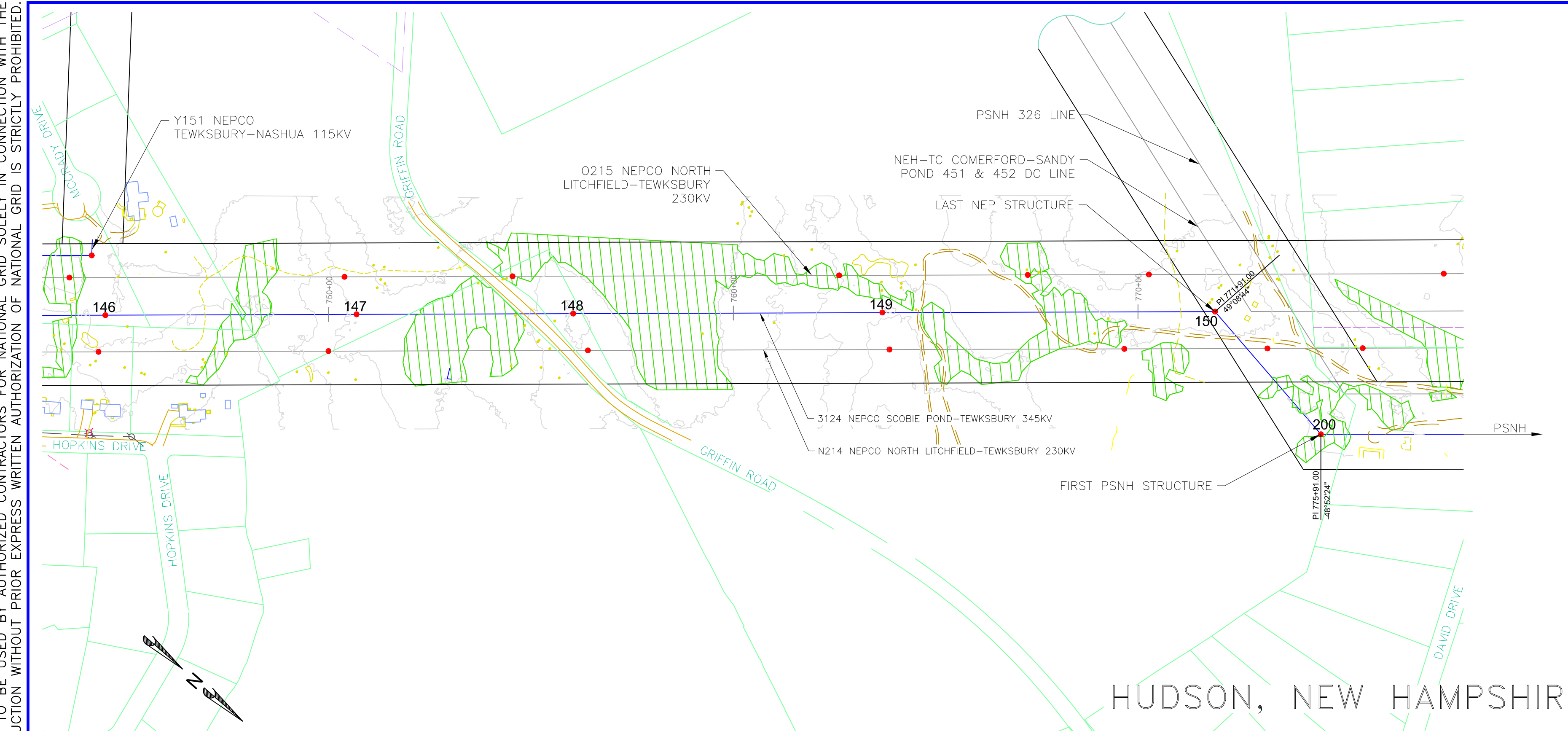
nationalgrid

MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE 3124 345KV

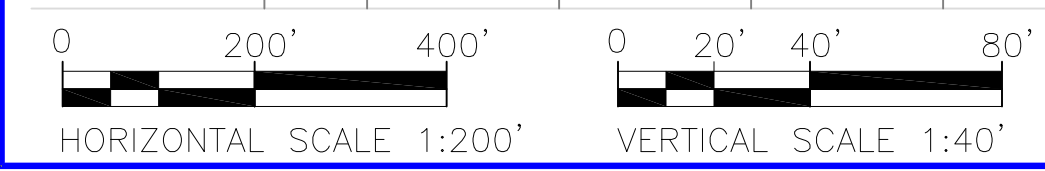
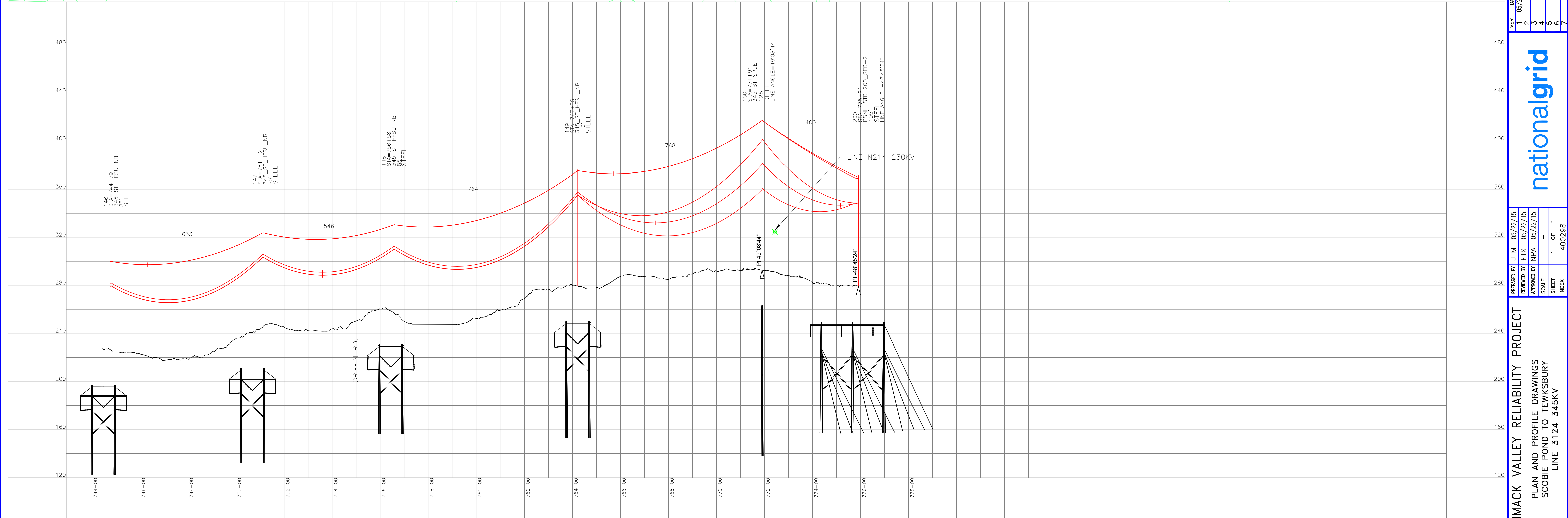
VER	DATE	DESCRIPTION
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PREPARED BY JLM 05/22/15
 REVIEWED BY JLM 05/22/15
 APPROVED BY NPA 05/22/15
 SCALE 1" = 200'
 SHEET 1 OF 1
 INDEX 400298

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HUDSON, NEW HAMPSHIRE



PROPOSED 3/8"-7 STRAND EHS AND OPGW (TO BE DETERMINED)
 PROPOSED BUNDLED FALCON 1590 KCMIL 54/19 ACSR
 SHIELD WIRE SHOWN AT NESC HEAVY, 4000 LBS, 60°F MAX SAG
 CONDUCTOR SHOWN AT NESC HEAVY, 10000 LBS 284°F MAX SAG

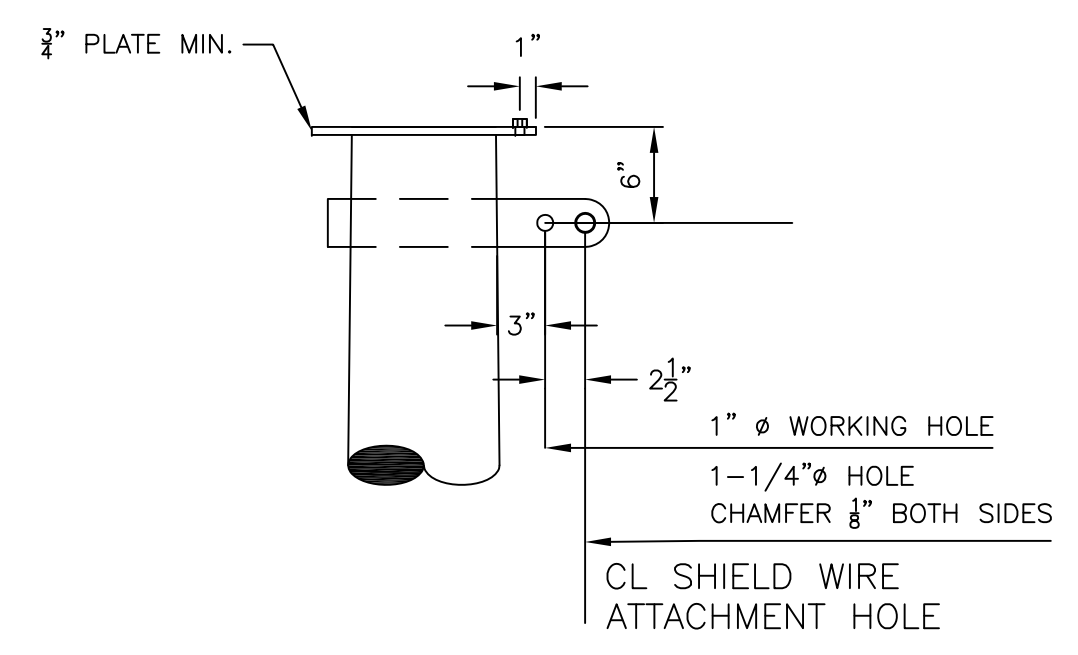
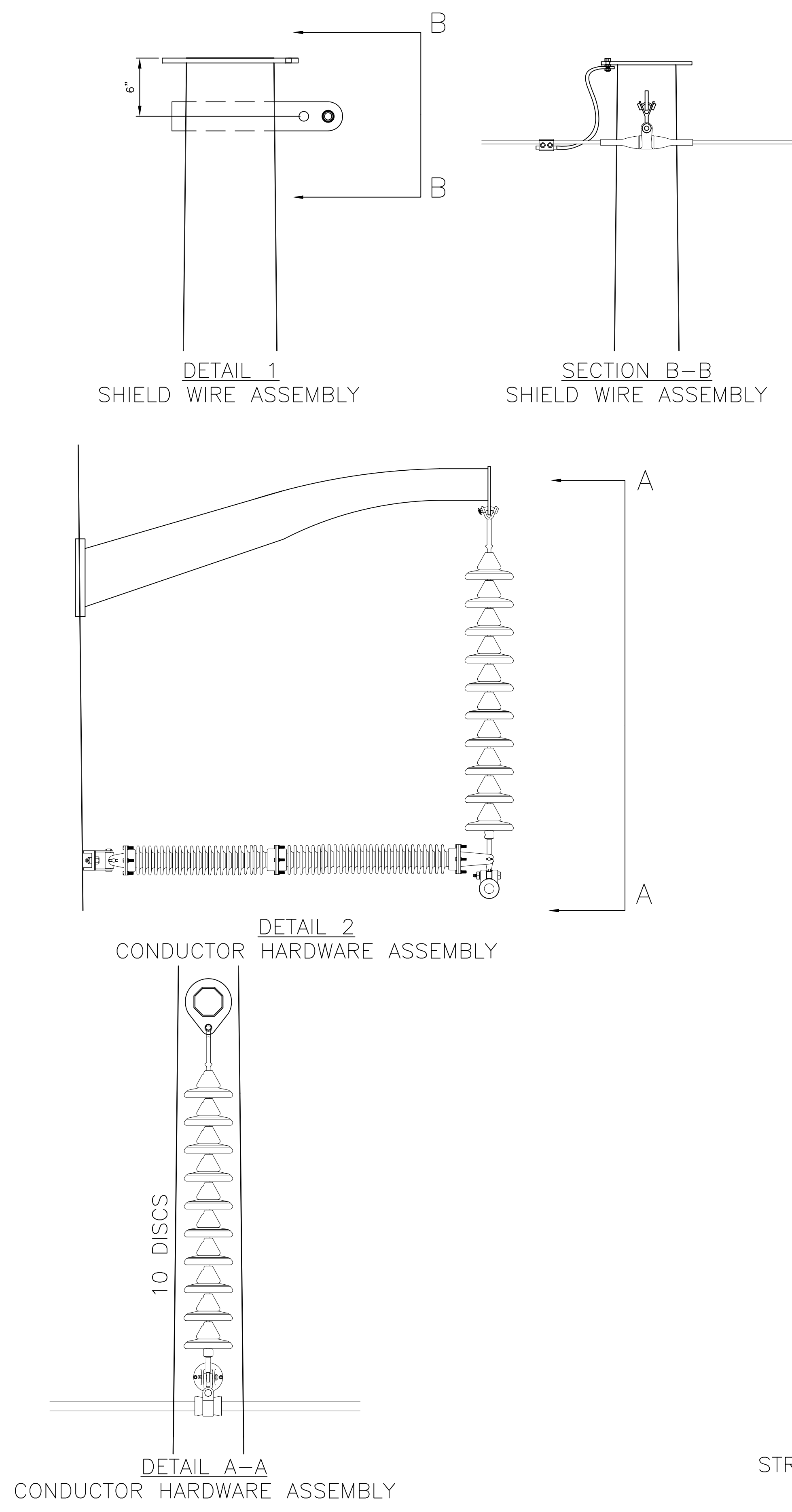
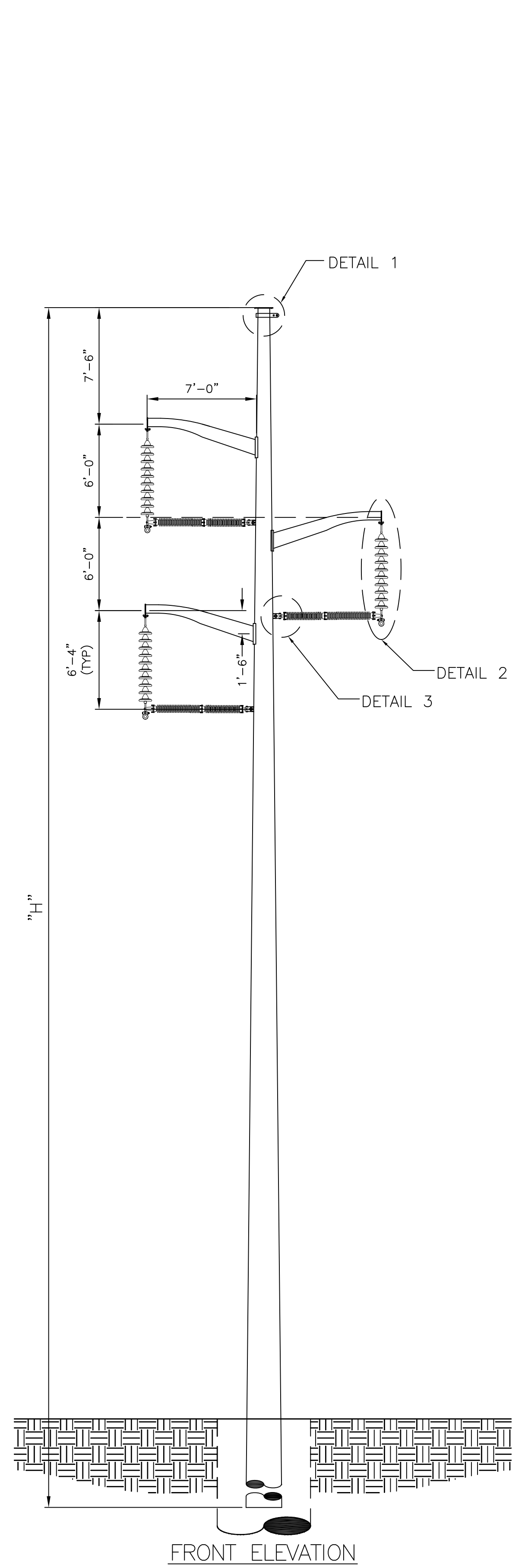
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VER	DATE	DESCRIPTION
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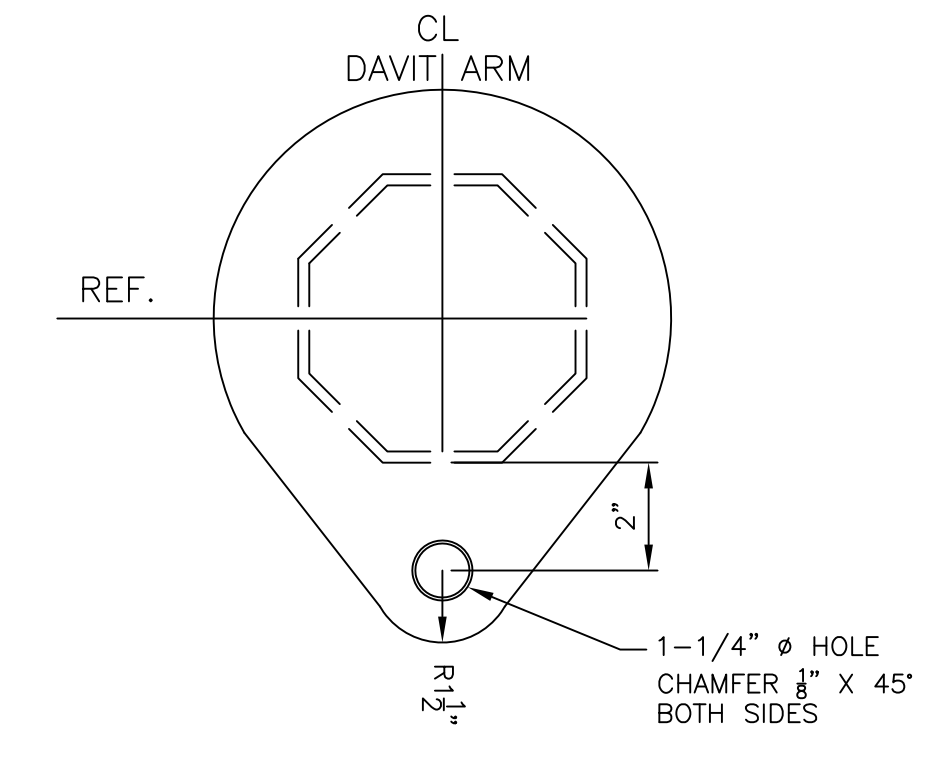
PREPARED BY JLM 05/22/15
 REVIEWED BY JLM 05/22/15
 APPROVED BY JLM 05/22/15
 SCALE 1" = 400'
 SHEET 1 OF 1
 INDEX 400298

MERRIMACK VALLEY RELIABILITY PROJECT
 PLAN AND PROFILE DRAWINGS
 SCOBIE POND TO TEWKSBURY
 LINE 3124 345KV

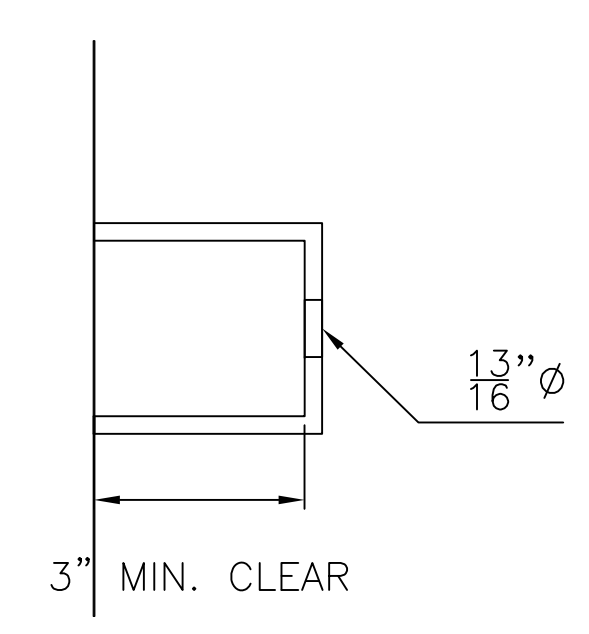
CONFIDENTIALITY STATEMENT: THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION OF NATIONAL GRID. IT IS TO BE USED BY AUTHORIZED CONTRACTORS FOR NATIONAL GRID SOLELY IN CONNECTION WITH THE SPECIFIC PROJECT FOR WHICH IT HAS BEEN TRANSMITTED. ANY OTHER USE, ITS TRANSMITTAL TO THIRD PARTIES, OR ITS REPRODUCTION WITHOUT PRIOR EXPRESS WRITTEN AUTHORIZATION OF NATIONAL GRID IS STRICTLY PROHIBITED.



DETAIL 1A
SHIELD WIRE ATTACHMENT VANG
WITH GROUNDING NUT



DETAIL 2A
CONDUCTOR ATTACHMENT PLATES
(TYPICAL 3 LOCATIONS)

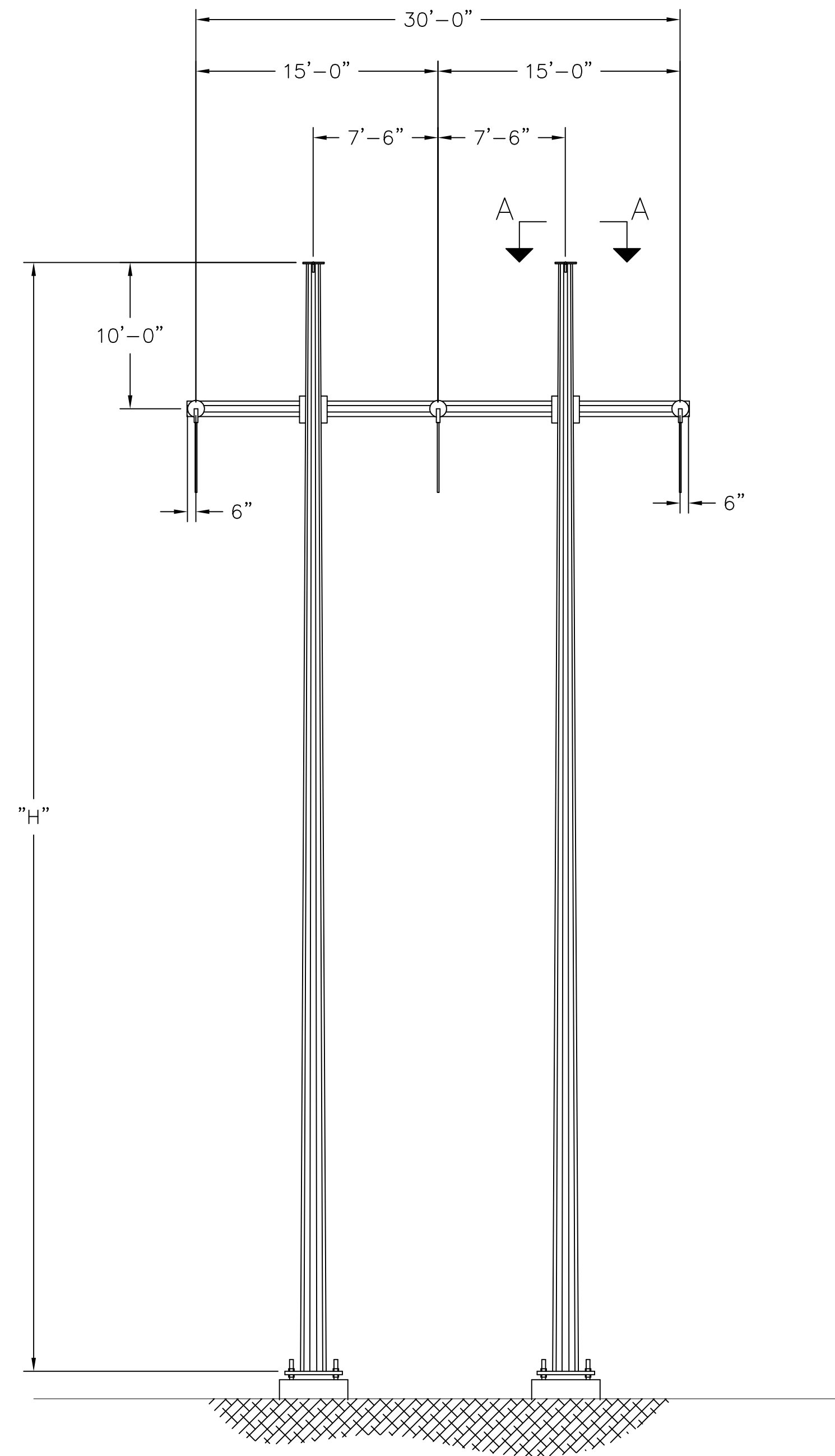


DETAIL 3
STRUT INSULATOR ATTACHMENT BRACKET
(TYPICAL 3 LOCATIONS)

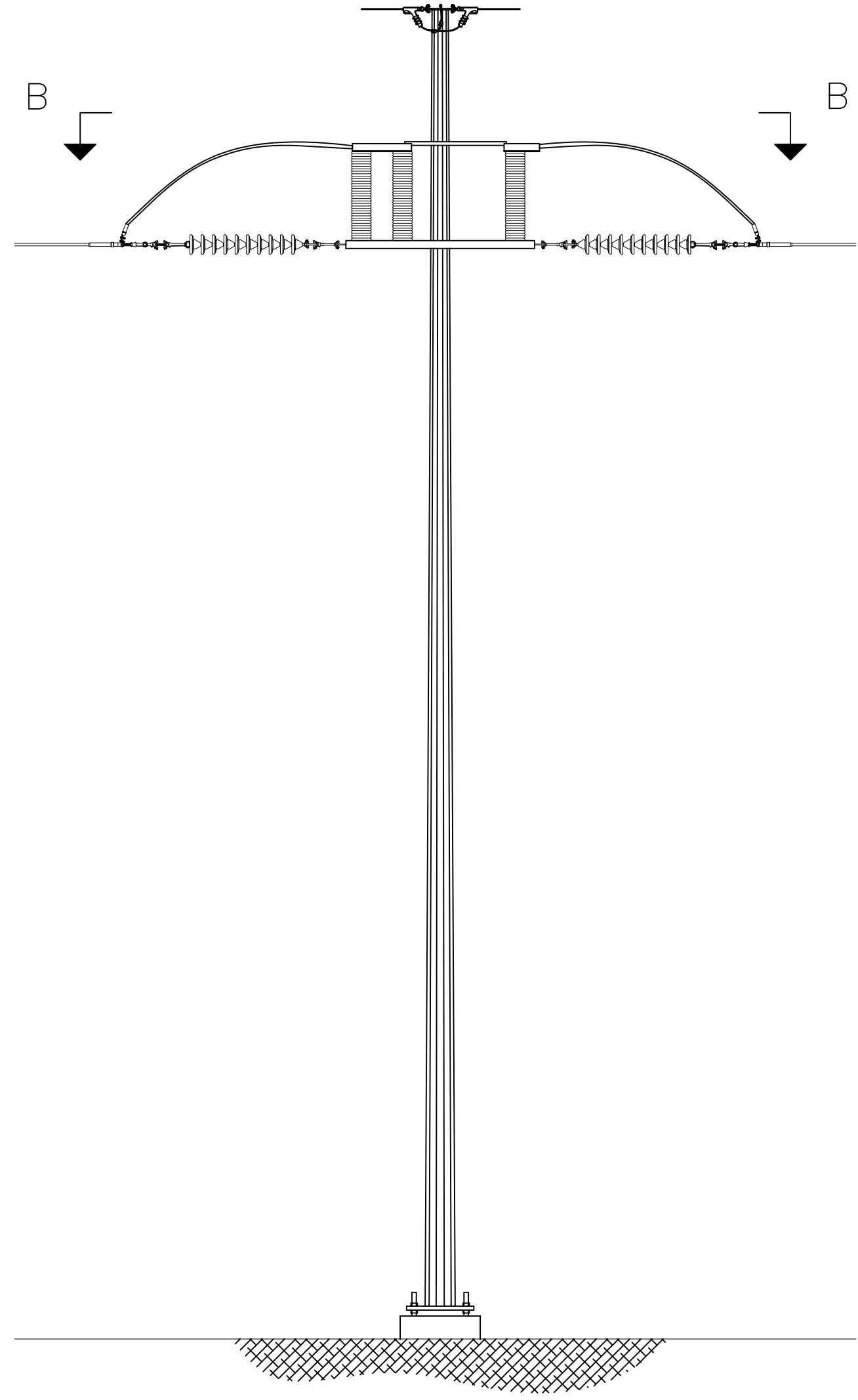
- NOTES:
- REFER TO WORK LIST FOR POLE HEIGHT.
 - SEE SPECIFICATION SP.06.01.301.101 FOR STRUCTURE GROUNDING DETAILS.
 - SEE SPECIFICATION SP.06.01.301.201 FOR STRUCTURE NUMBERING AND WARNING SIGNS REQUIRED FOR ALL STRUCTURES.
 - STEEL POLE MANUFACTURER DRAWINGS TO SUPERCEDE CONCEPT DRAWINGS AND WILL BE ISSUED FOR CONSTRUCTION AS SOON AS THEY ARE AVAILABLE.

PREPARED BY	EJW	9/19/14	ISSUED FOR SCOPE DOCUMENT	VERSION DESCRIPTION	VERSION
REVIEWED BY	FTX	9/19/14			
APPROVED BY	NPA	9/19/14			
SCALE	N.T.S.				
SHEET	1	OF	1		
INDEX					
SCOBIE POND - TEWKSBURY			nationalgrid		
115 KV REPLACEMENT STRUCTURE					
SINGLE CIRCUIT Y151 LINE					
STEEL DELTA DAVIT ARM SUSPENSION - RESTRAINED					
795 ACSS DRAKE					

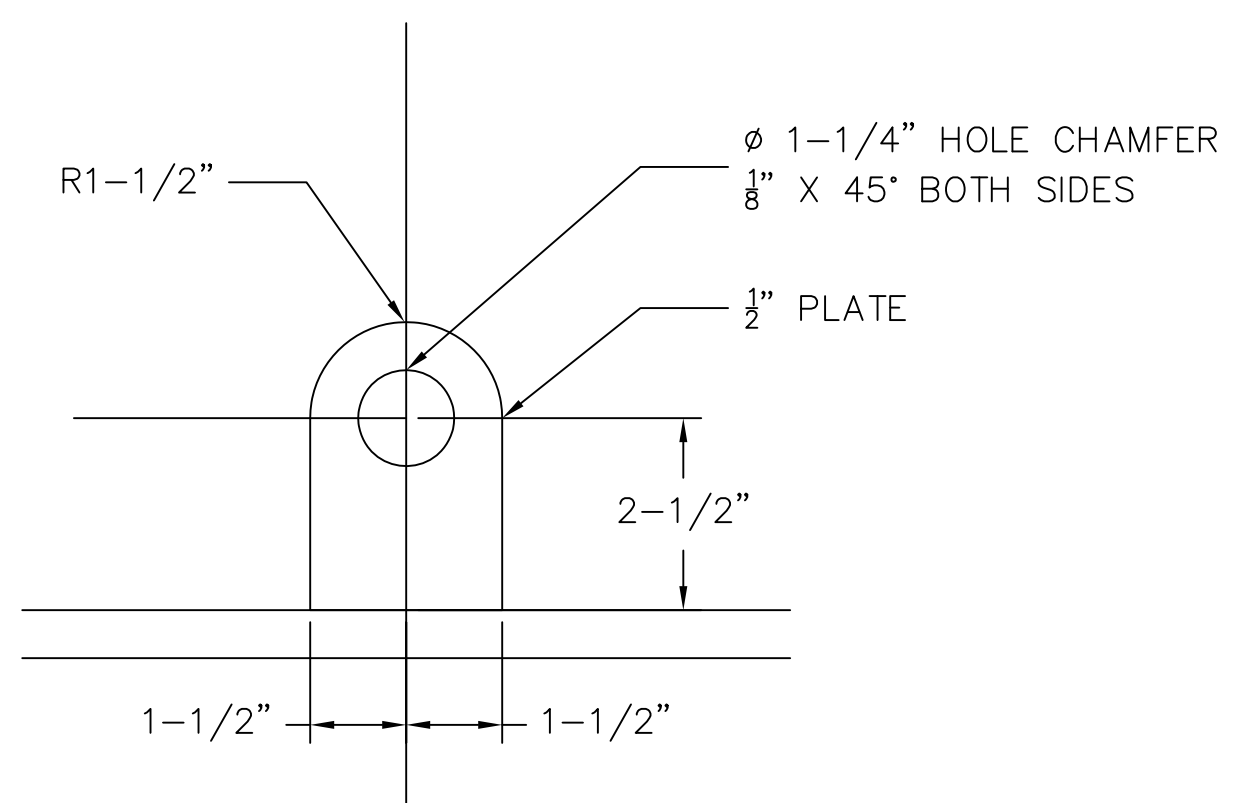
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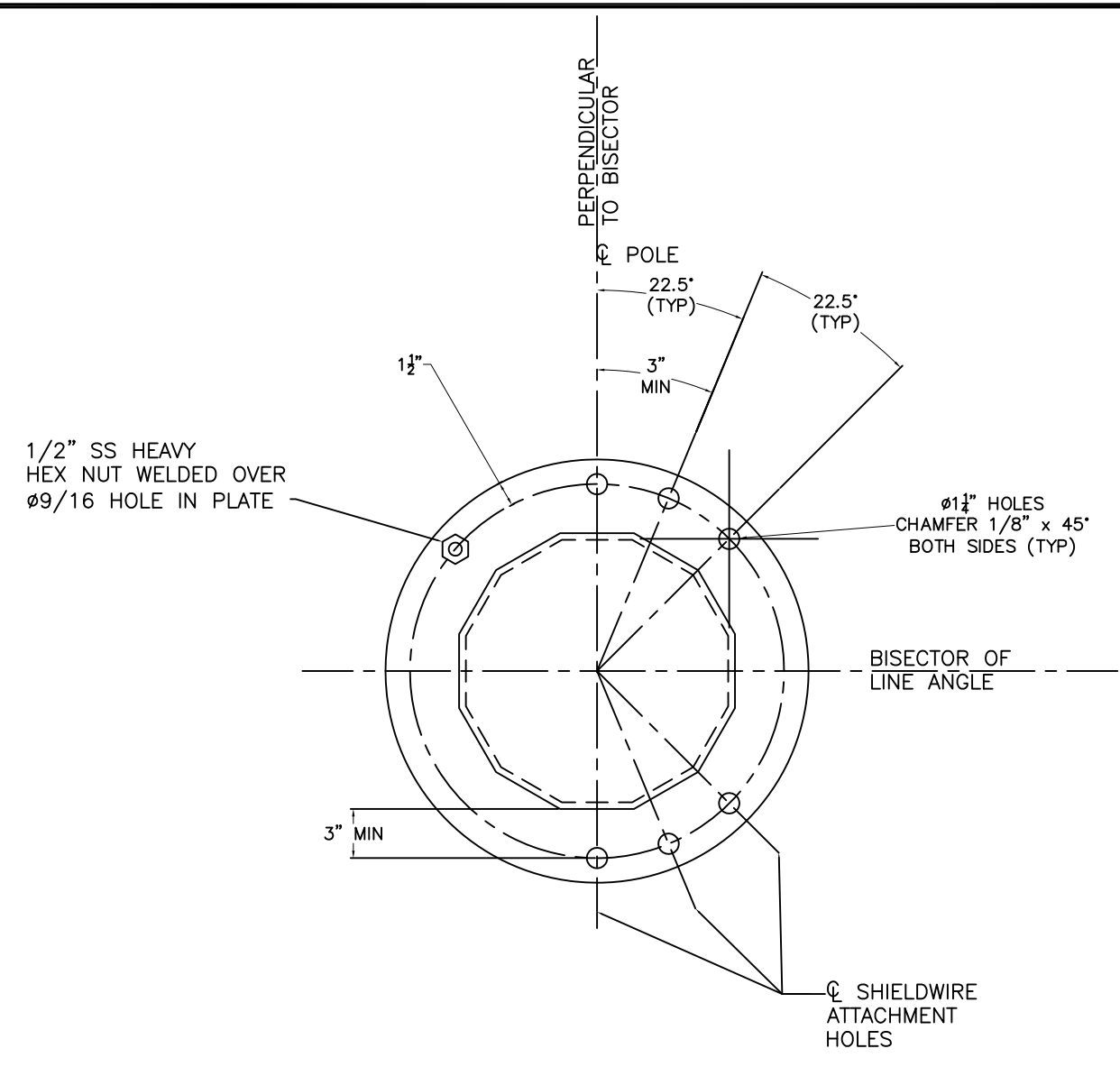
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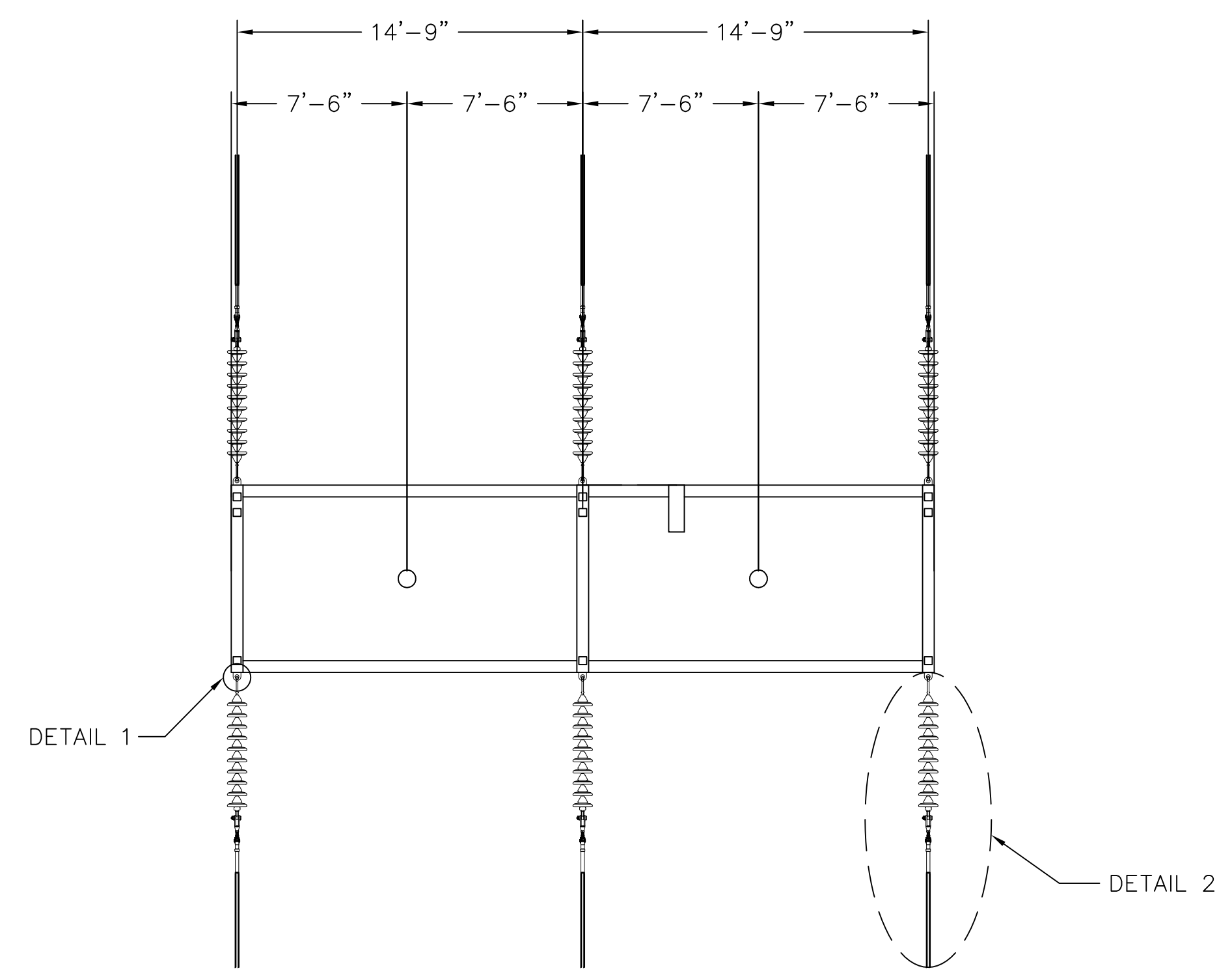
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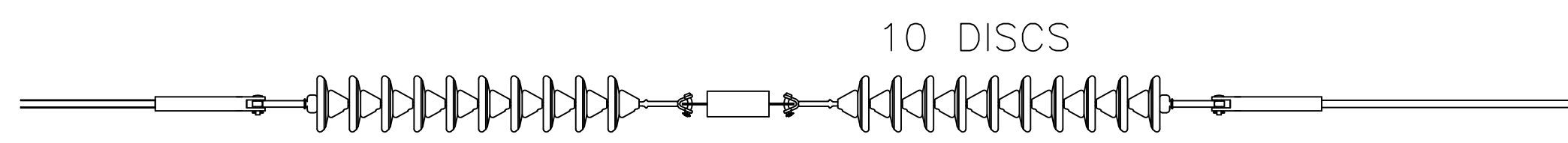
DETAIL 1
6 LOCATIONS



SECTION A-A
POLE CAP WITH SHIELD WIRE
ATTACHMENT AND GROUNDING NUT
(TYPICAL 2 LOCATIONS)



SECTION B-B
PLAN VIEW OF SWITCH RACK

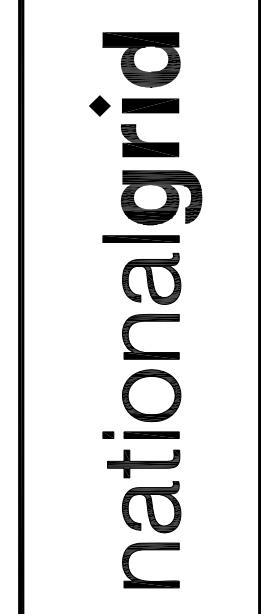


DETAIL 2
CONDUCTOR HARDWARE ASSEMBLY

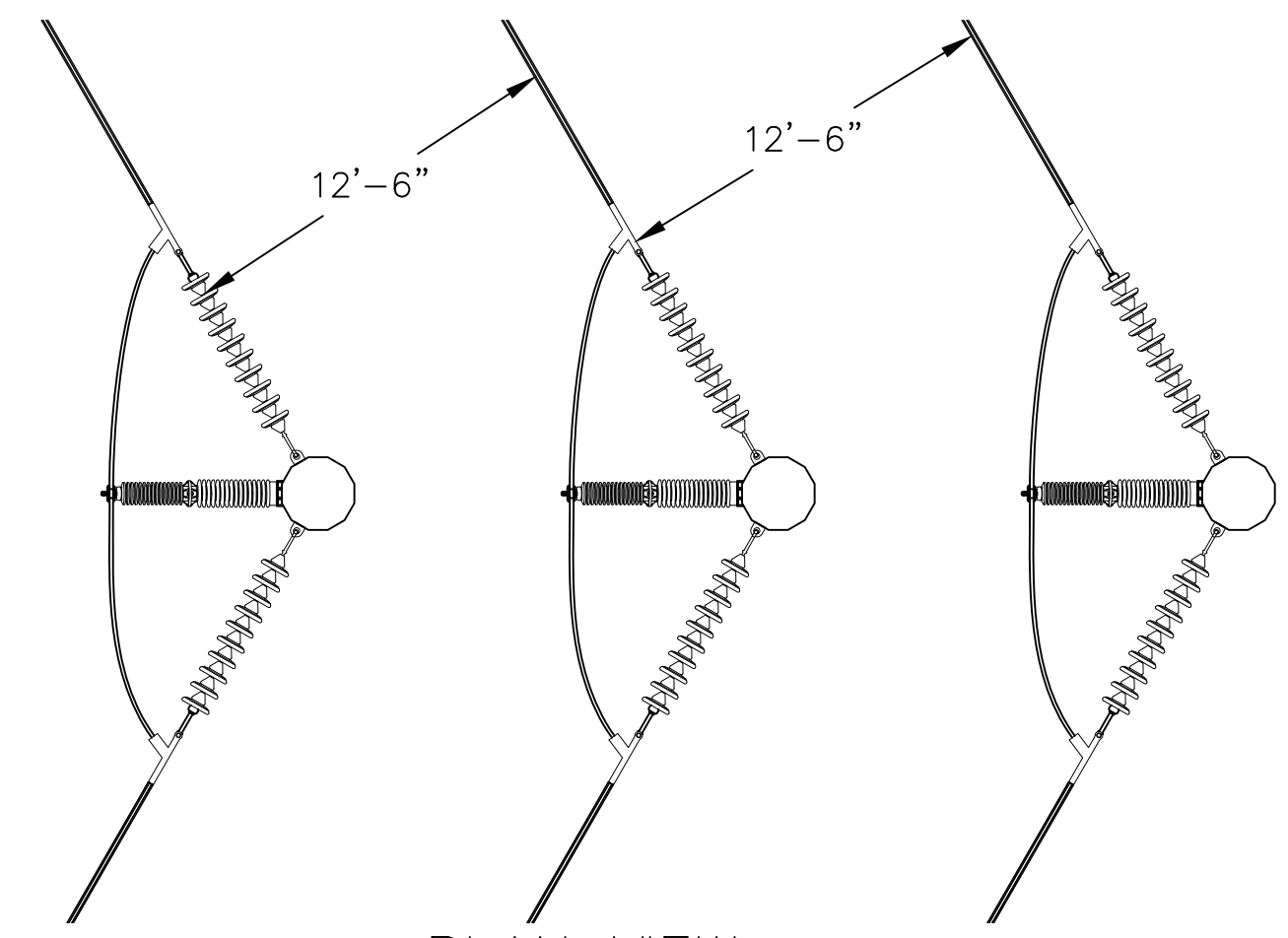
- NOTES:
1. REFER TO WORK LIST FOR POLE HEIGHT.
 2. SEE SPECIFICATION SP.06.01301.101 FOR STRUCTURE GROUNDING DETAILS.
 3. SEE SPECIFICATION SP.06.01.301.201 FOR STRUCTURE NUMBERING AND WARNING SIGNS REQUIRED FOR ALL STRUCTURES.
 4. STEEL POLE MANUFACTURER DRAWINGS TO SUPERCEDE CONCEPT DRAWINGS AND WILL BE ISSUED FOR CONSTRUCTION AS SOON AS THEY ARE AVAILABLE.
 5. TURNER 2000A LOAD BREAK TMX SWITCH TO BE USED.

PREPARED BY	EUJ 9/19/14	ISSUED FOR SCOPE DOCUMENT	VERSION	1
REVIEWED BY	FIX 9/19/14	DATE	9/19/14	
APPROVED BY	NPA 9/19/14	VERSION DESCRIPTION	EUJ FTX INPA	
SCALE	N.T.S.			
SHEET	1 OF 1			
INDEX	400298			

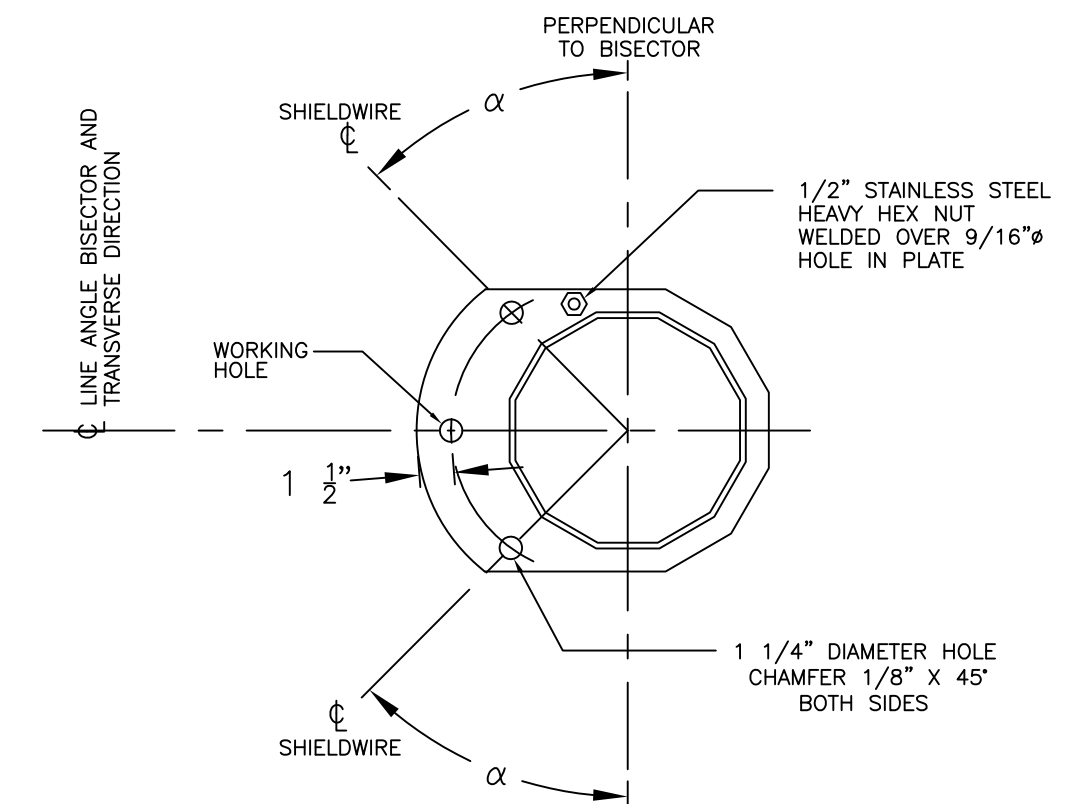
SCOBIE POND - TEWKESURY
115KV REPLACEMENT STRUCTURE
SINGLE CIRCUIT Y151 LINE
STEEL H-FRAME SWITCH SINGLE INS STRING



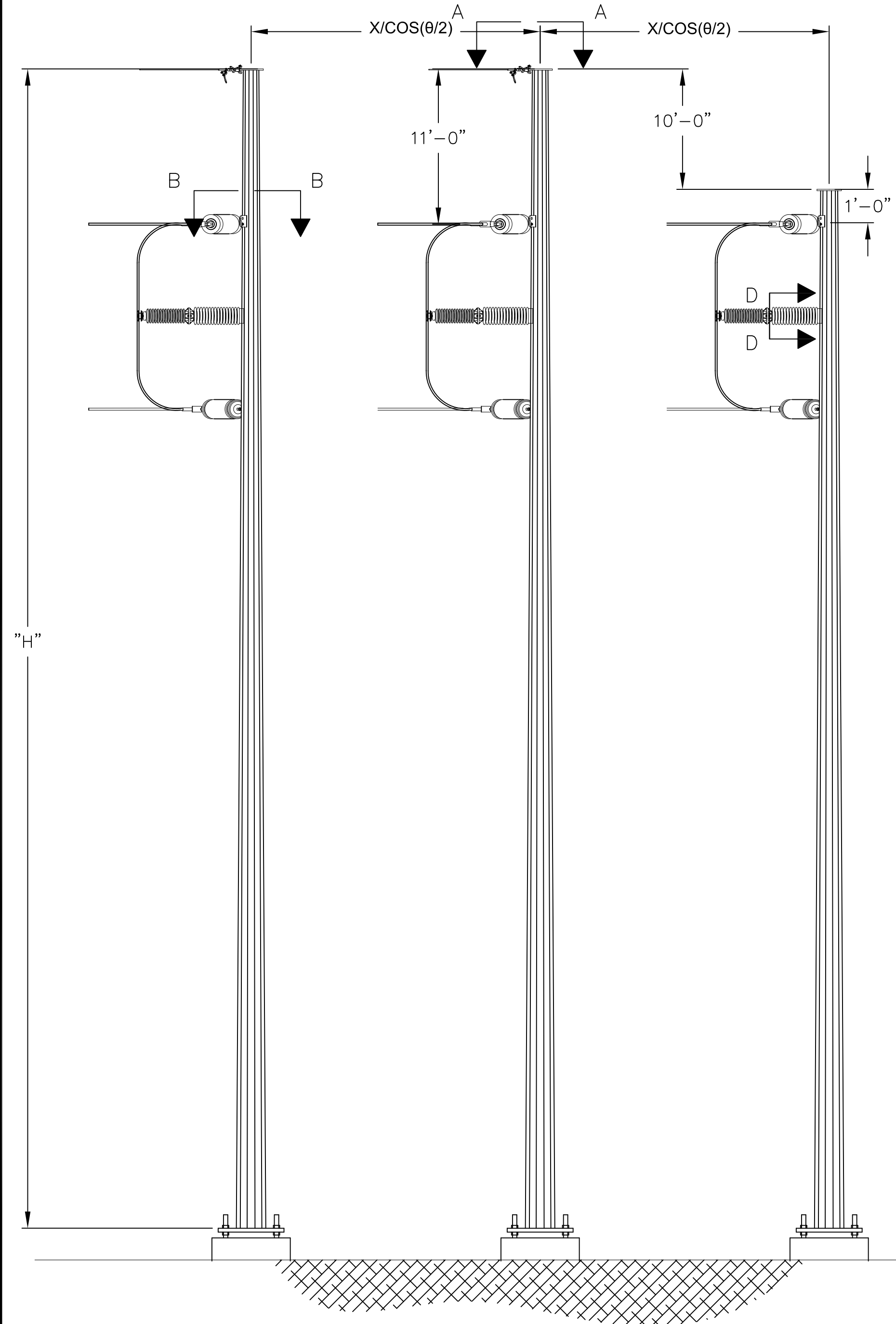
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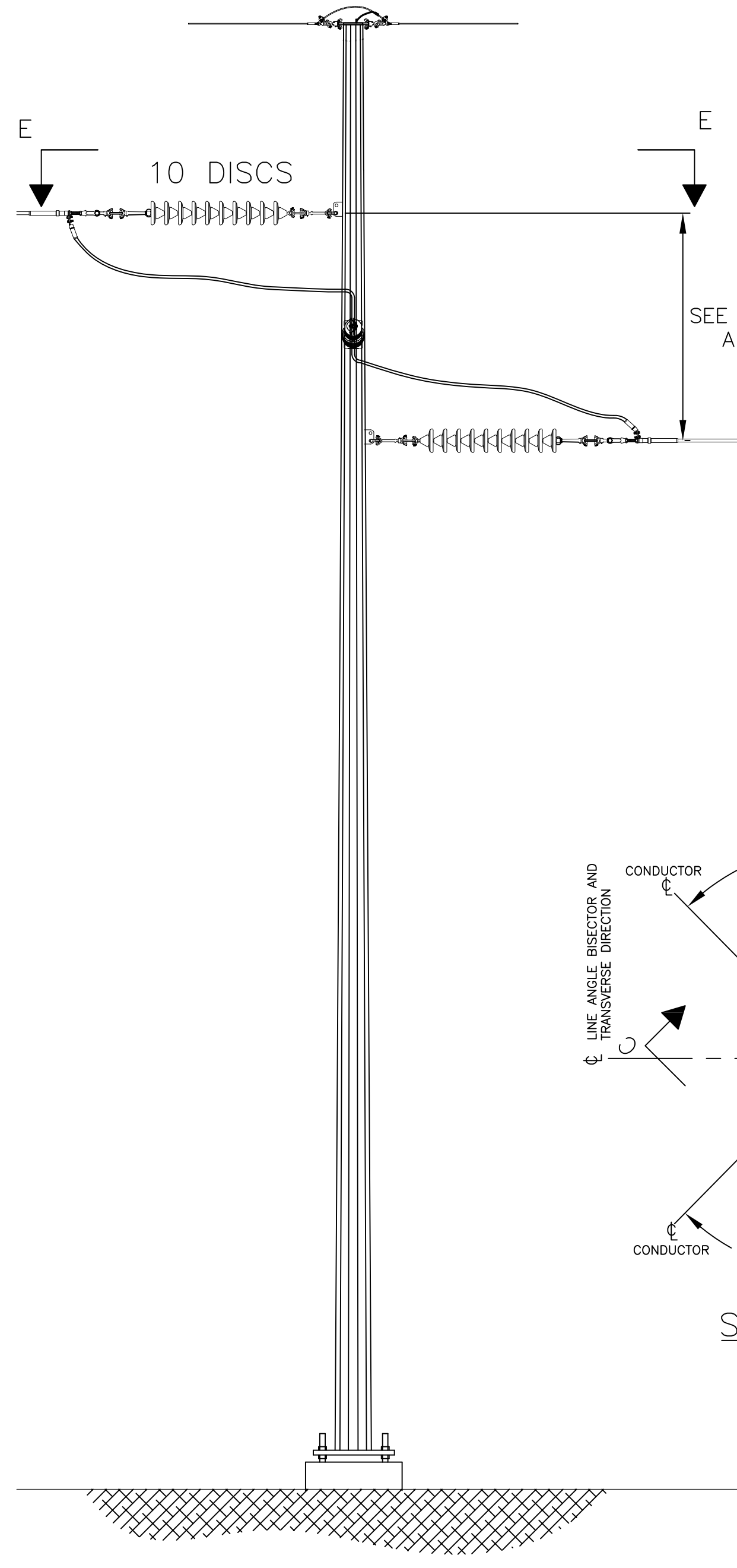
PLAN VIEW



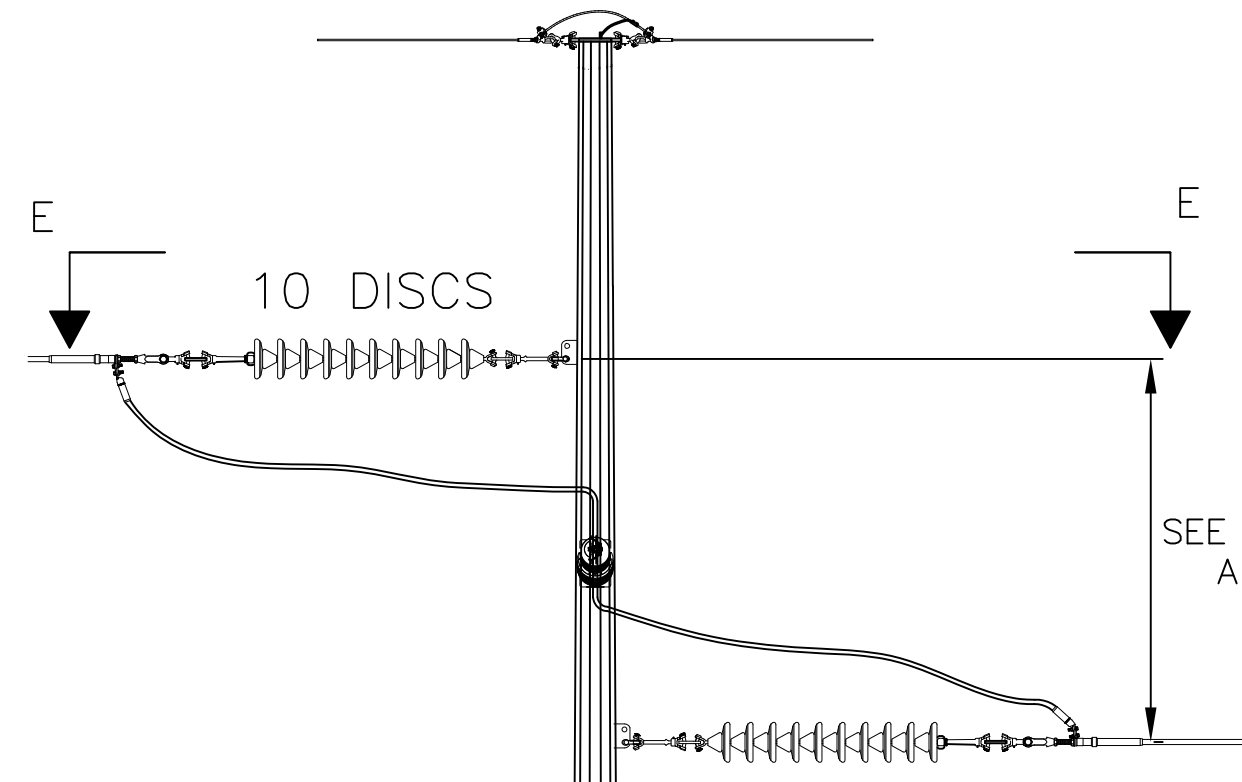
SECTION A-A
POLE CAP WITH SHIELD WIRE
ATTACHMENT AND GROUNDING NUT



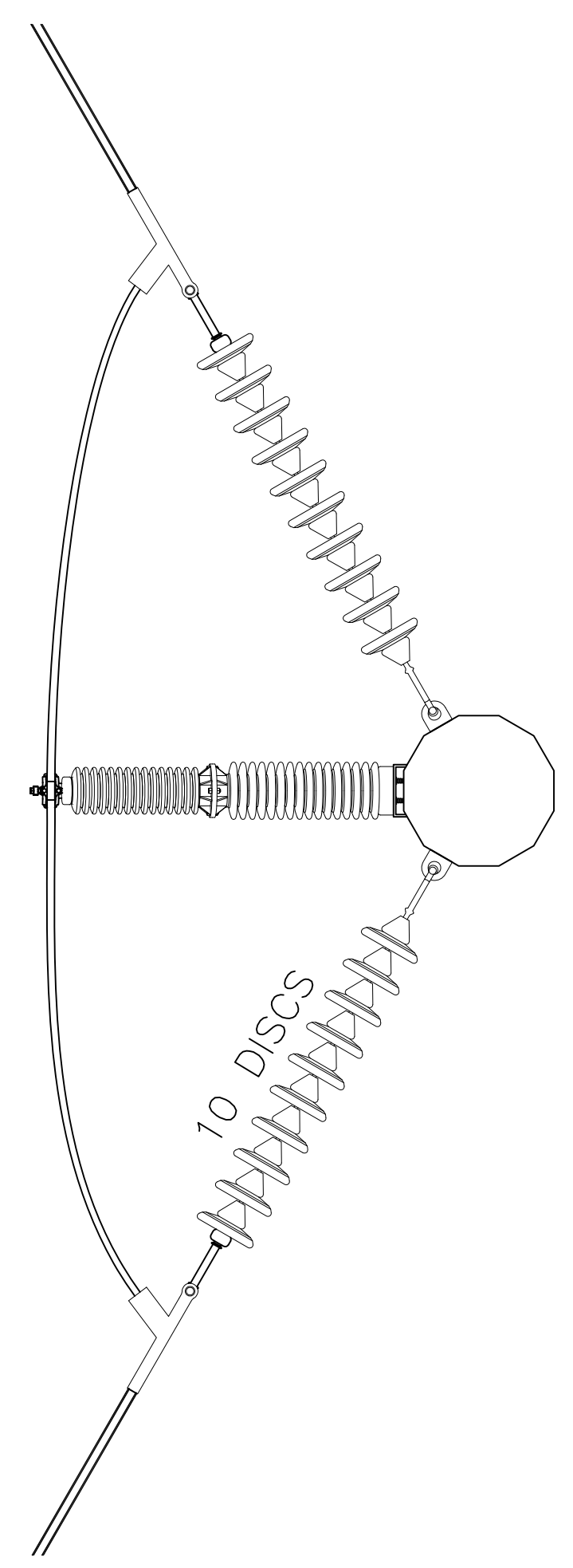
FRONT ELEVATION



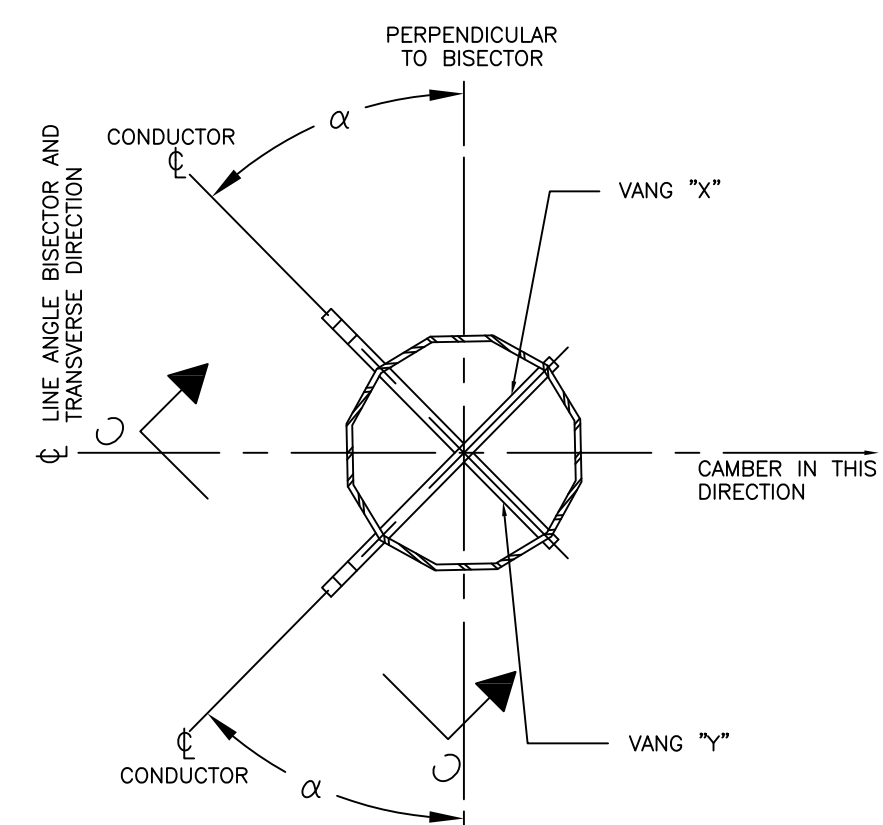
SIDE ELEVATION



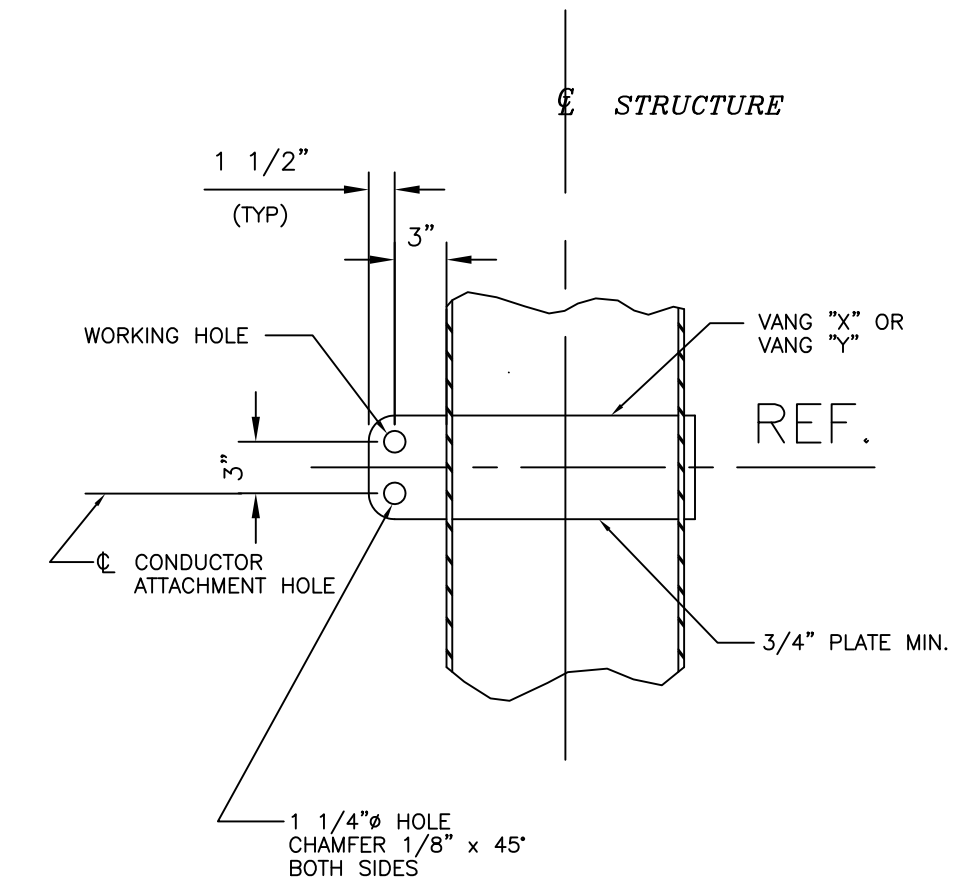
SECTION E-E
CONDUCTOR HARDWARE
ASSEMBLY



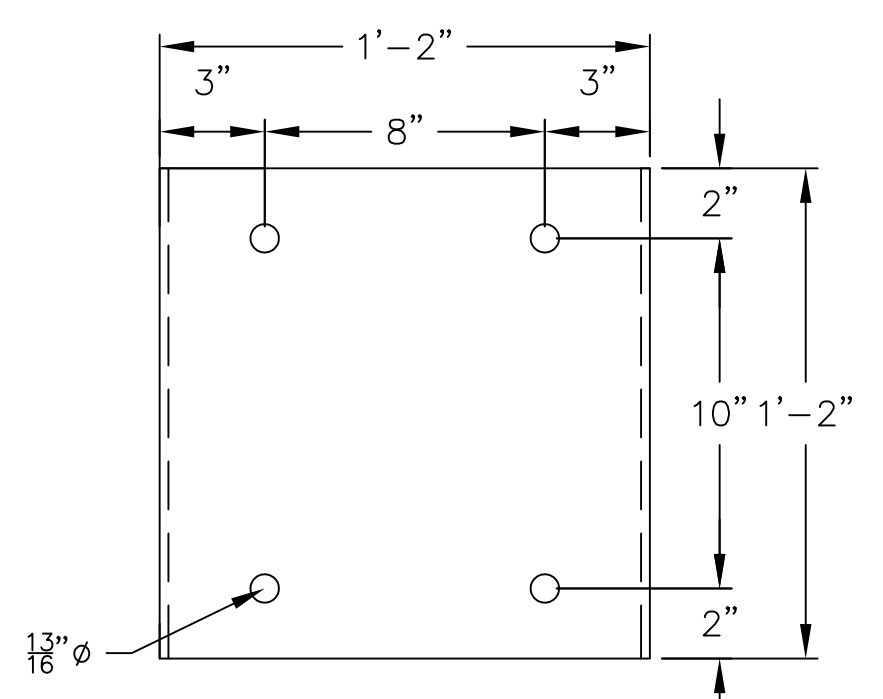
- NOTES:
1. REFER TO WORK LIST FOR POLE HEIGHT.
 2. SEE SPECIFICATION SP.06.01.301.101 FOR STRUCTURE GROUNDING DETAILS.
 3. SEE SPECIFICATION SP.06.01.301.201 FOR STRUCTURE NUMBERING AND WARNING SIGNS REQUIRED FOR ALL STRUCTURES.
 4. STEEL POLE MANUFACTURER DRAWINGS TO SUPERCEDE CONCEPT DRAWINGS AND WILL BE ISSUED FOR CONSTRUCTION AS SOON AS THEY ARE AVAILABLE.
 5. DIMENSION IS 14'-0" FOR STRUCTURE 85
 6. POST INSULATORS TO BE ATTACHED AT MIDPOINT OF VANG ATTACHMENTS.



SECTION B-B



SECTION C-C

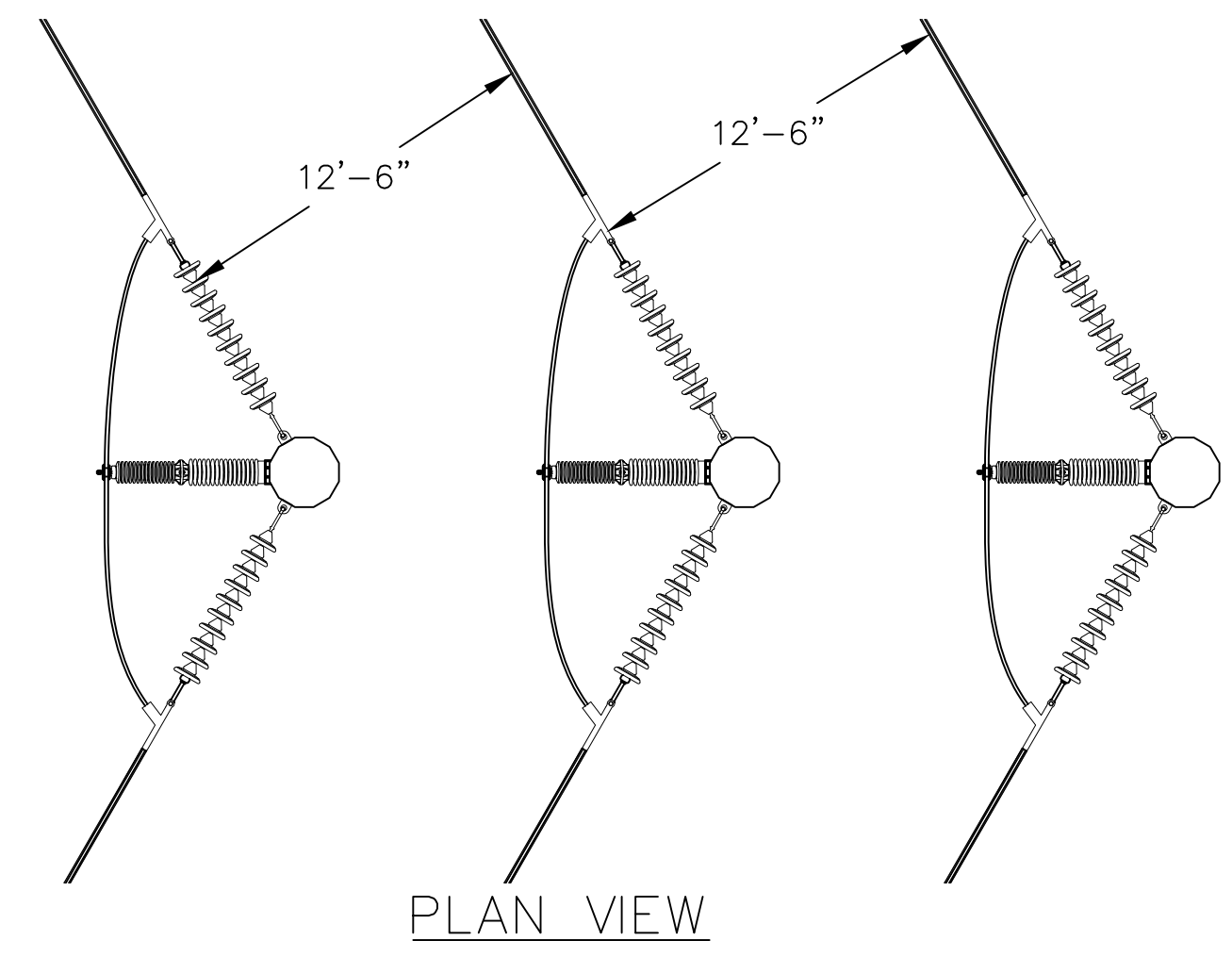


SECTION D-D
POST INSULATOR BRACKET
FOR JUMPER LOOP
3" MIN. CLEAR REQ.

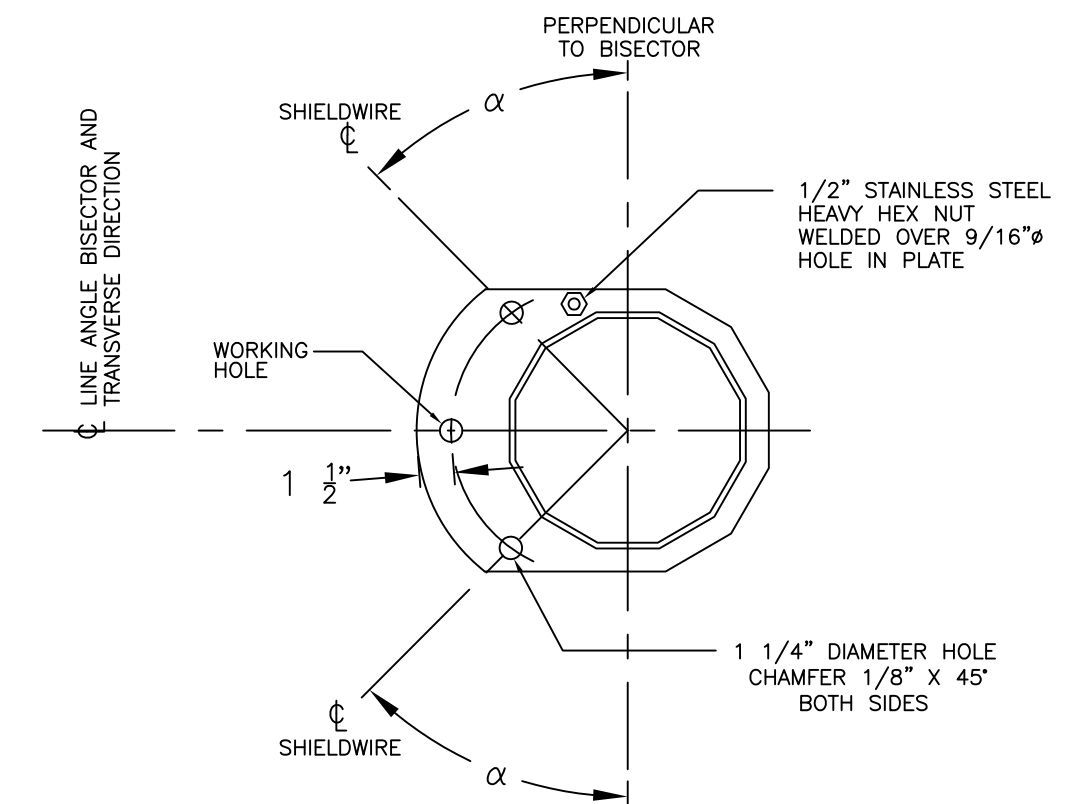
INCHES ON ORIGINAL

<p>PREPARED BY: EJJ 9/19/14 REVIEWED BY: FTX 9/19/14 APPROVED BY: NPA 9/19/14 SCALE: N.T.S. SHEET: 1 OF 1 INDEX: 400298</p>		<p>ISSUED FOR SCOPE DOCUMENT</p>	<p>DATE: 09/19/14</p>	<p>VERSION DESCRIPTION</p>	<p>VERSION</p>
<p>SCOBIE POND - TEWKSBURY 115KV REPLACEMENT STRUCTURE-DEMARCATON SINGLE CIRCUIT Y151 LINE STEEL 3 POLE DEAD-END - SINGLE INS. STRING</p>					
<p>nationalgrid</p>		<p>400298-C-S-14A</p>			

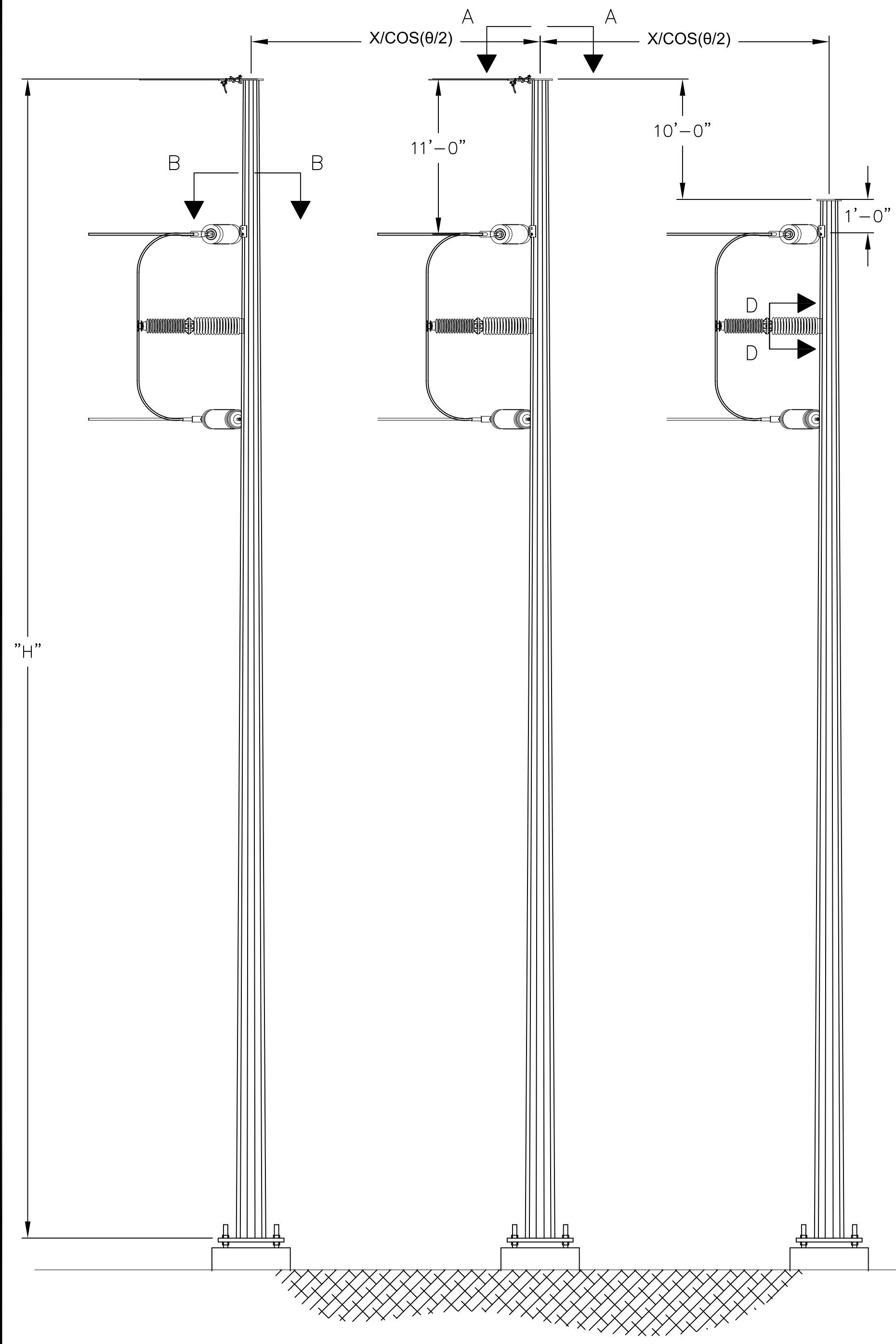
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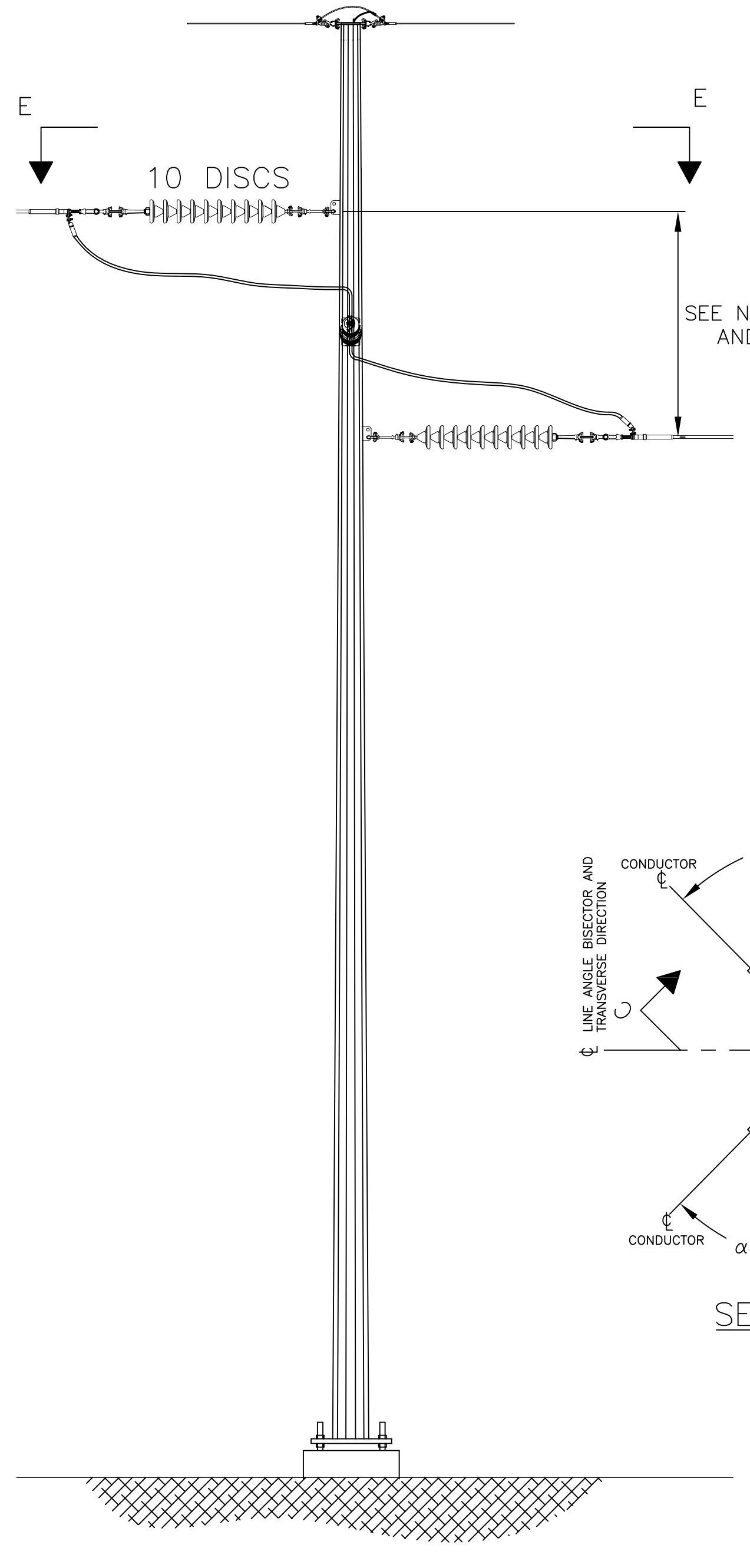
PLAN VIEW



SECTION A-A
POLE CAP WITH SHIELD WIRE
ATTACHMENT AND GROUNDING NUT

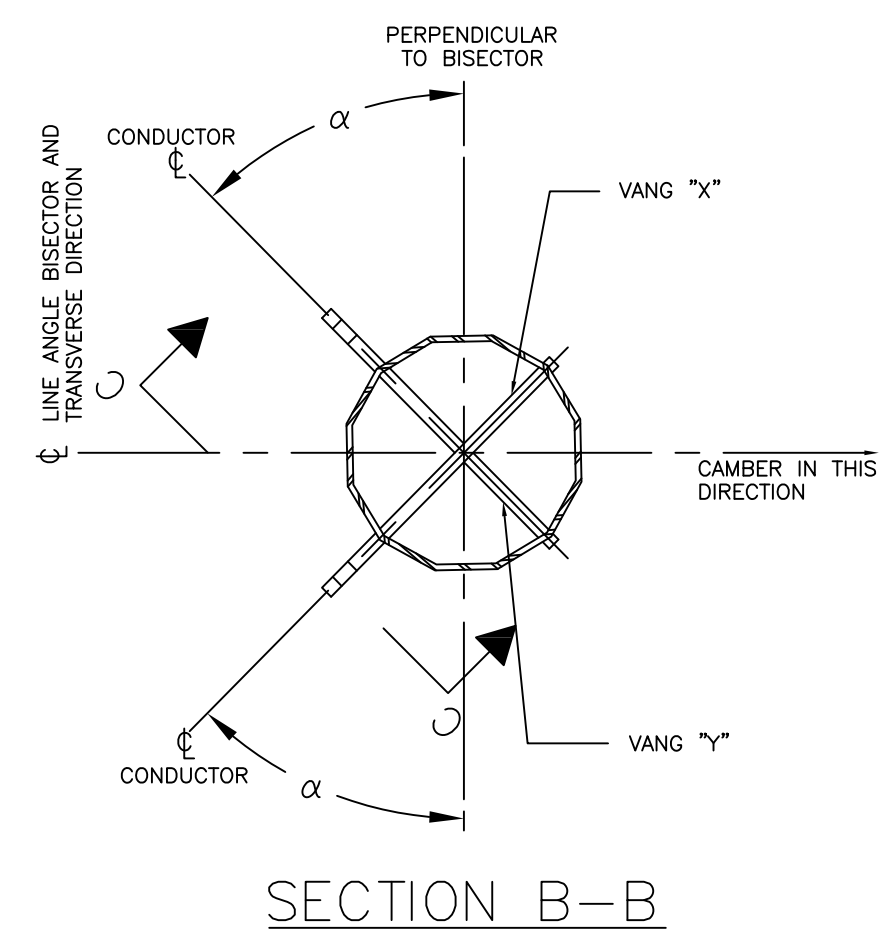


FRONT ELEVATION

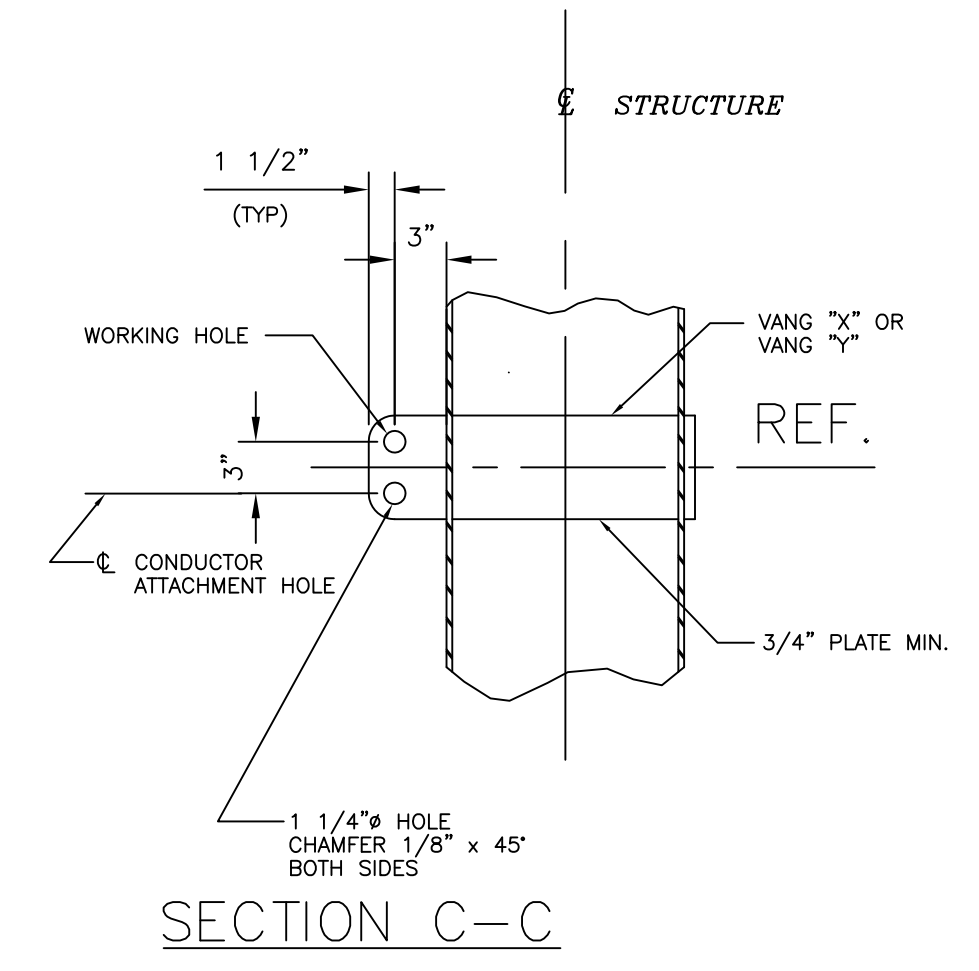


SIDE ELEVATION

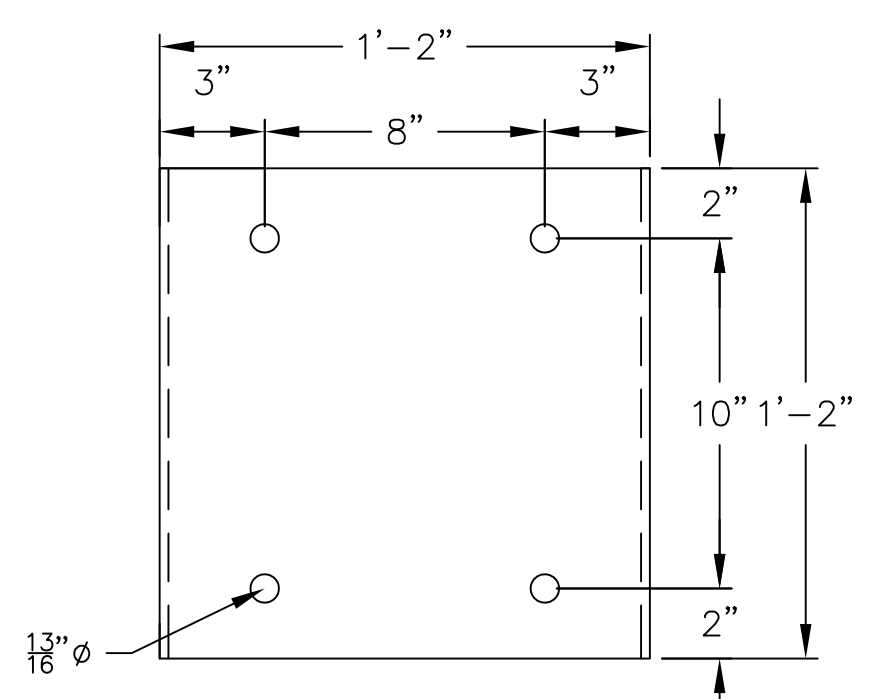
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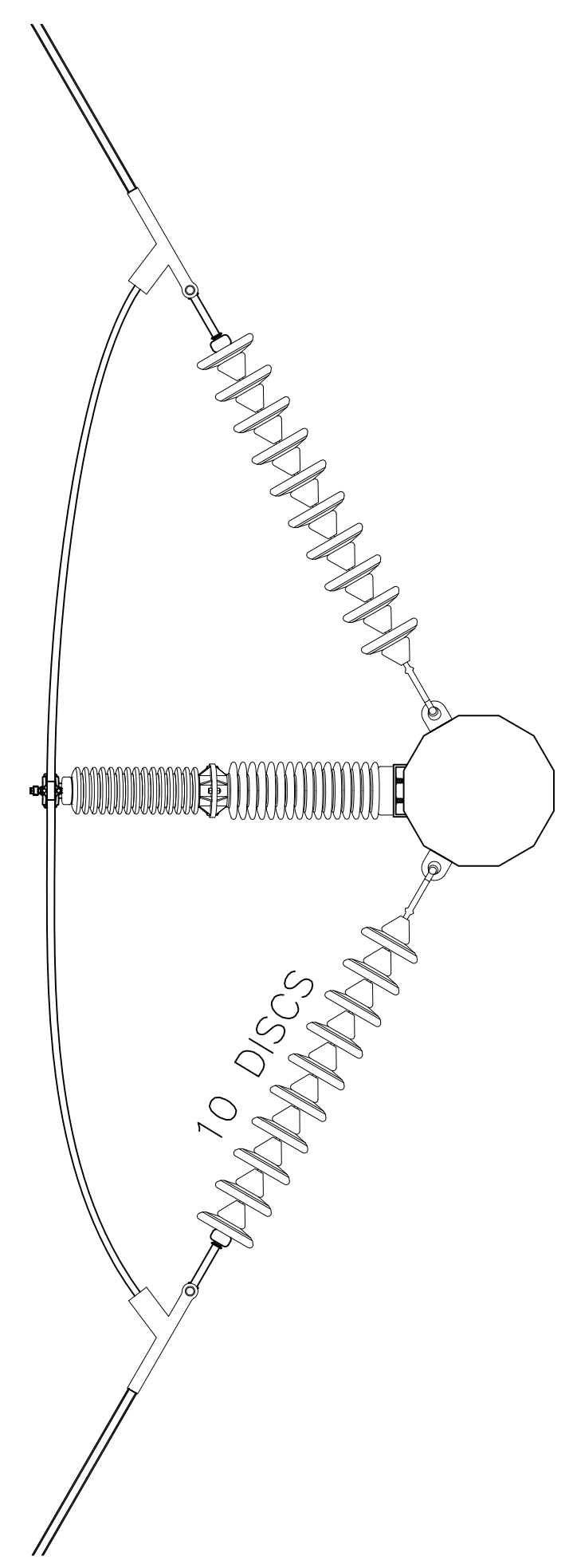
SECTION B-B



SECTION C-C



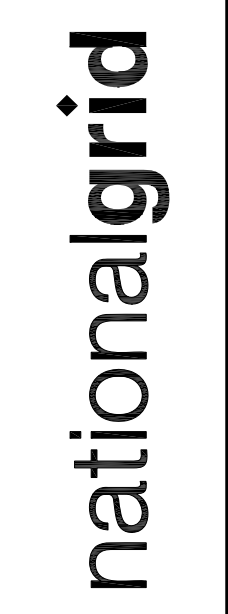
SECTION D-D
POST INSULATOR BRACKET
FOR JUMPER LOOP
3" MIN. CLEAR REQ.



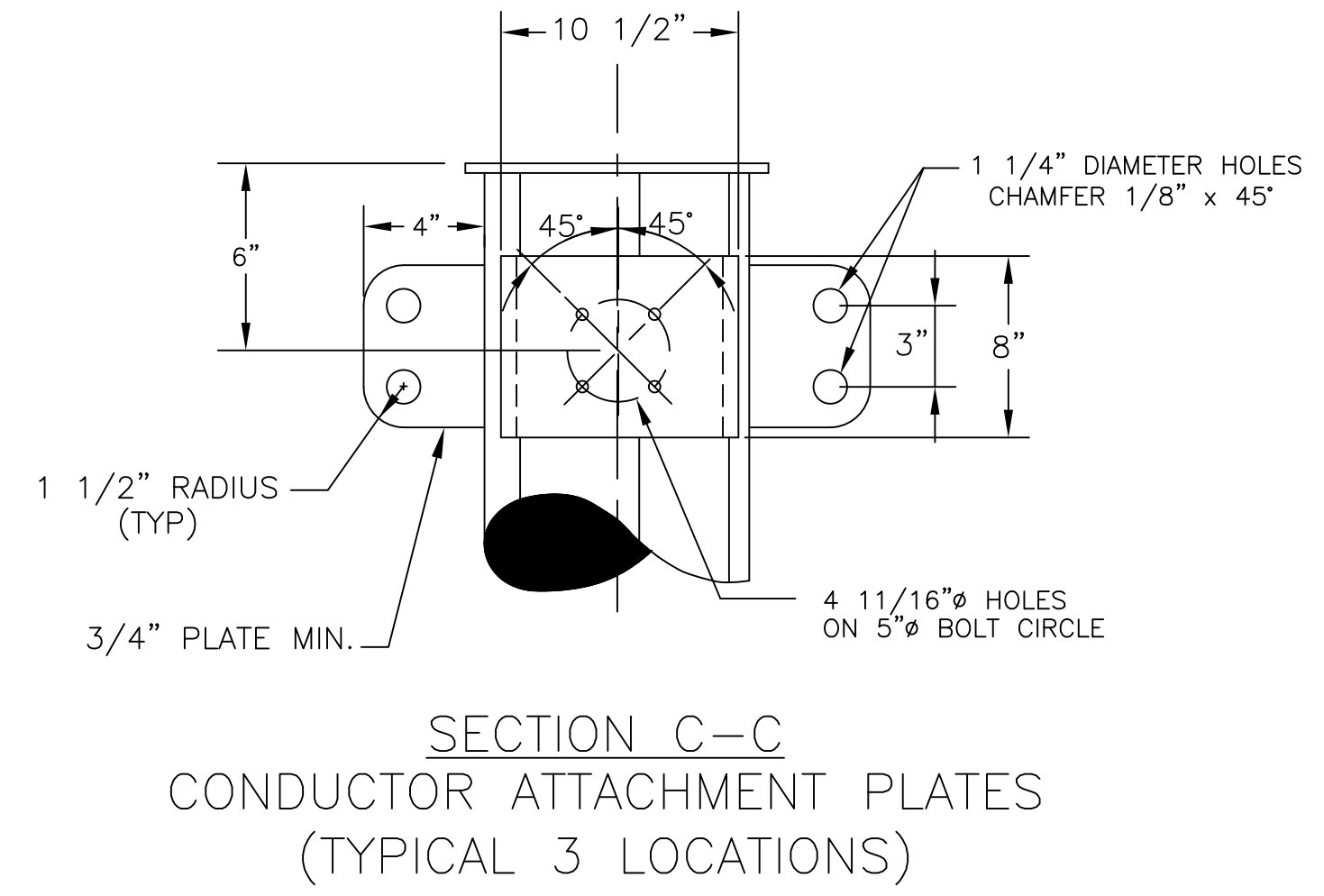
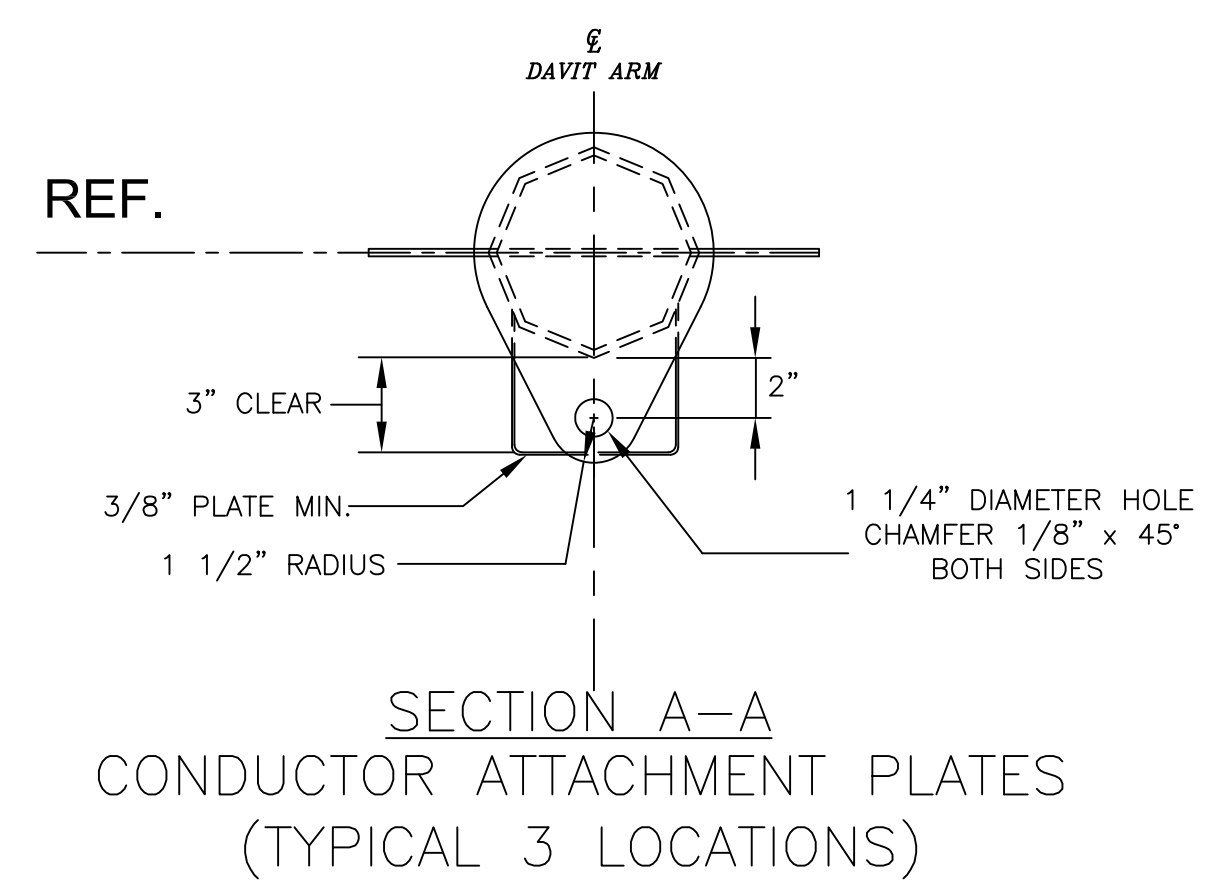
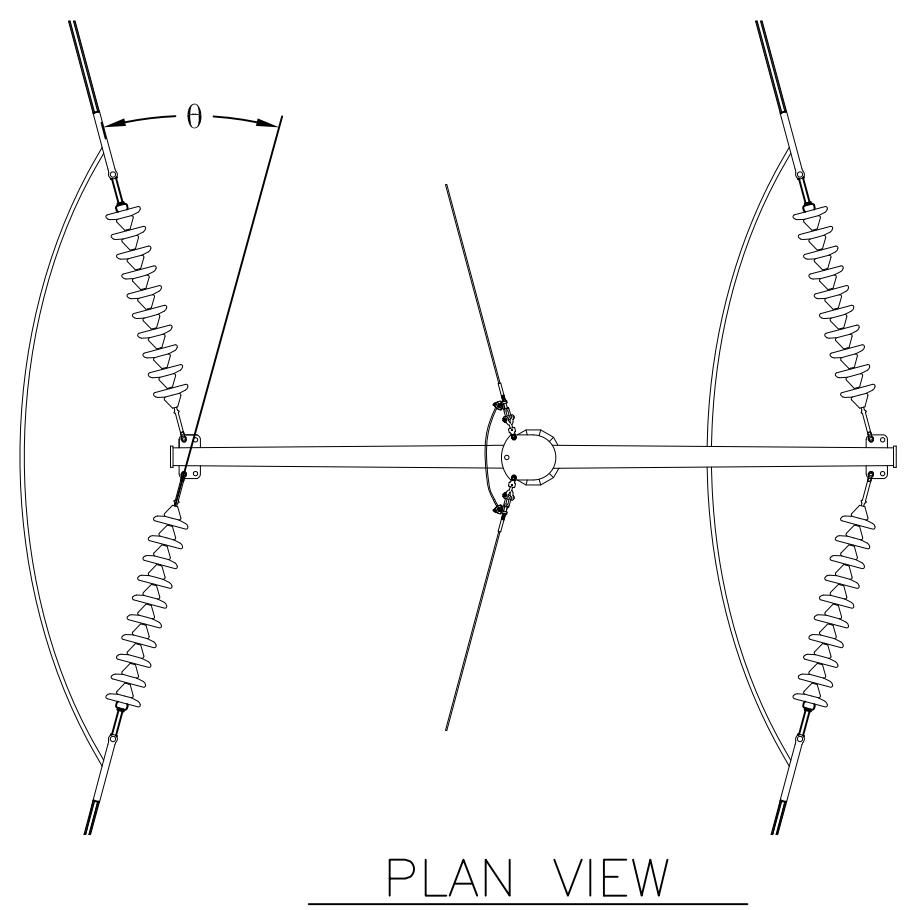
SECTION E-E
CONDUCTOR HARDWARE
ASSEMBLY

- NOTES:
1. REFER TO WORK LIST FOR POLE HEIGHT.
 2. SEE SPECIFICATION SP.06.01.301.101 FOR STRUCTURE GROUNDING DETAILS.
 3. SEE SPECIFICATION SP.06.01.301.201 FOR STRUCTURE NUMBERING AND WARNING SIGNS REQUIRED FOR ALL STRUCTURES.
 4. STEEL POLE MANUFACTURER DRAWINGS TO SUPERCEDE CONCEPT DRAWINGS AND WILL BE ISSUED FOR CONSTRUCTION AS SOON AS THEY ARE AVAILABLE.
 5. DIMENSION IS 8'-0" FOR STRUCTURE 28 AND 14'-0" FOR STRUCTURE 29.
 6. POST INSULATORS TO BE ATTACHED AT MIDPOINT OF VANG ATTACHMENTS.

<p>PREPARED BY: EJJ 5/22/15 REVIEWED BY: FTX 5/22/15 APPROVED BY: NPA 5/22/15 SCALE: N.T.S. SHEET: 1 OF 1 INDEX: 400298</p>		<p>ISSUED FOR PERMITTING DATE: 05/22/15 VER: 1 JLM/FTX/NPA</p>	<p>VERSION DESCRIPTION 1 2 3 4 5 6 7</p>	<p>VERSION 1</p>
<p>SCOBIE POND - TEWKSBURY 115KV REPLACEMENT STRUCTURE SINGLE CIRCUIT Y151 LINE STEEL 3 POLE DEAD-END - SINGLE INS. STRING</p>				



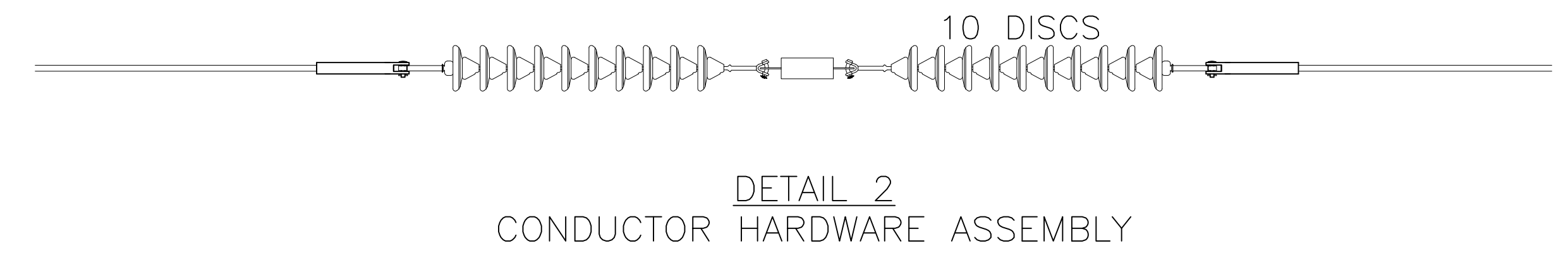
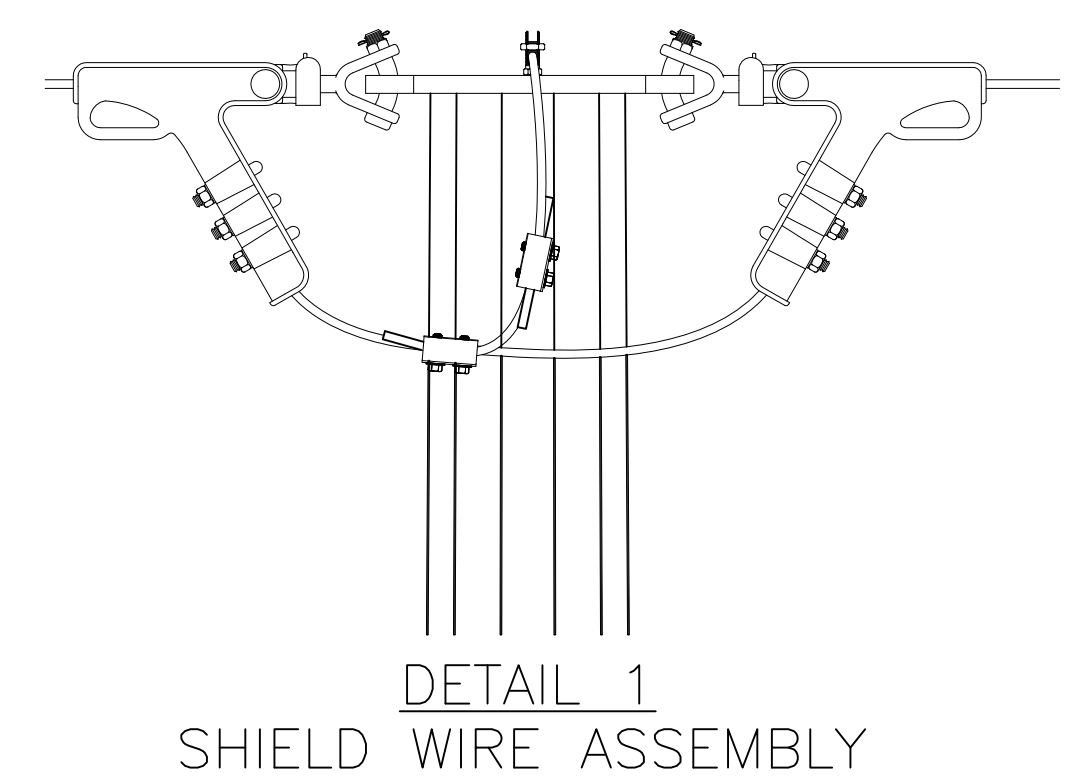
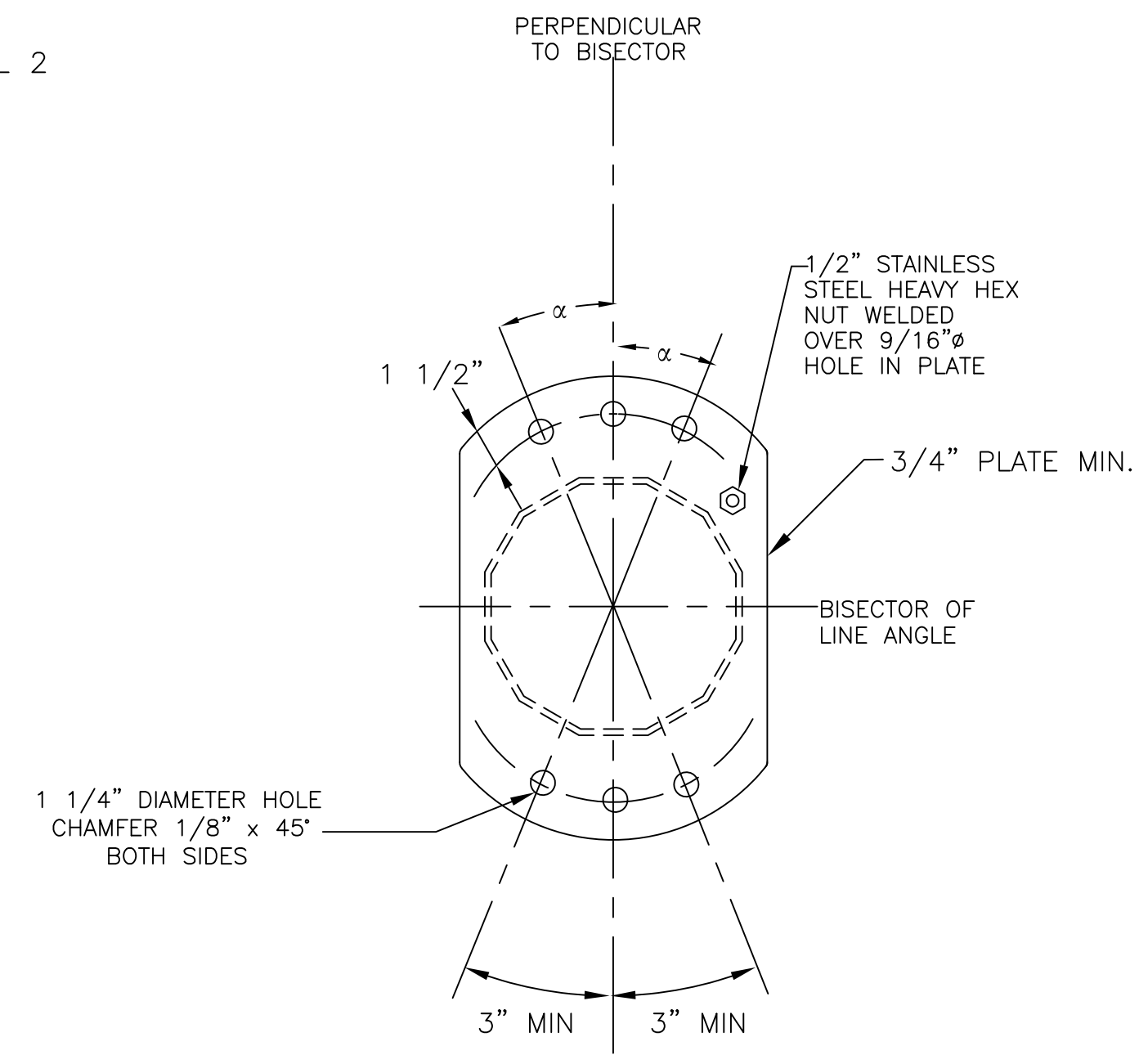
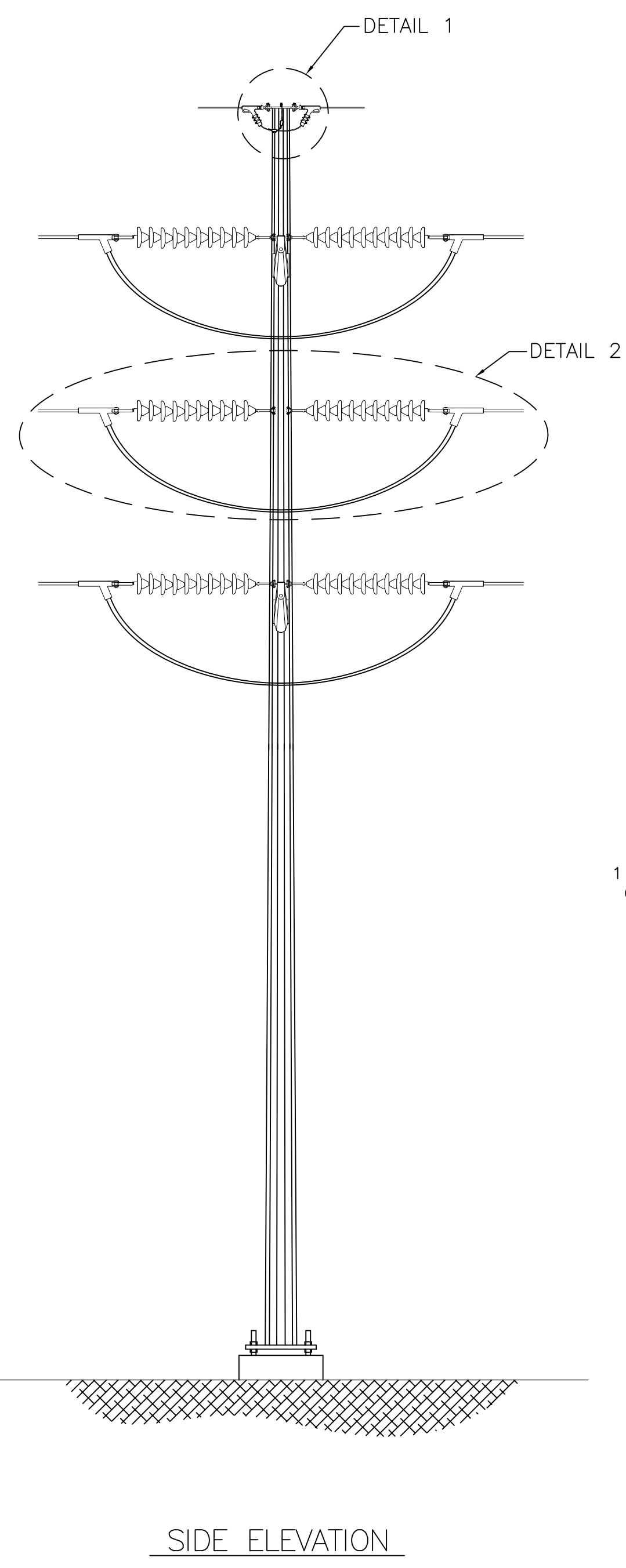
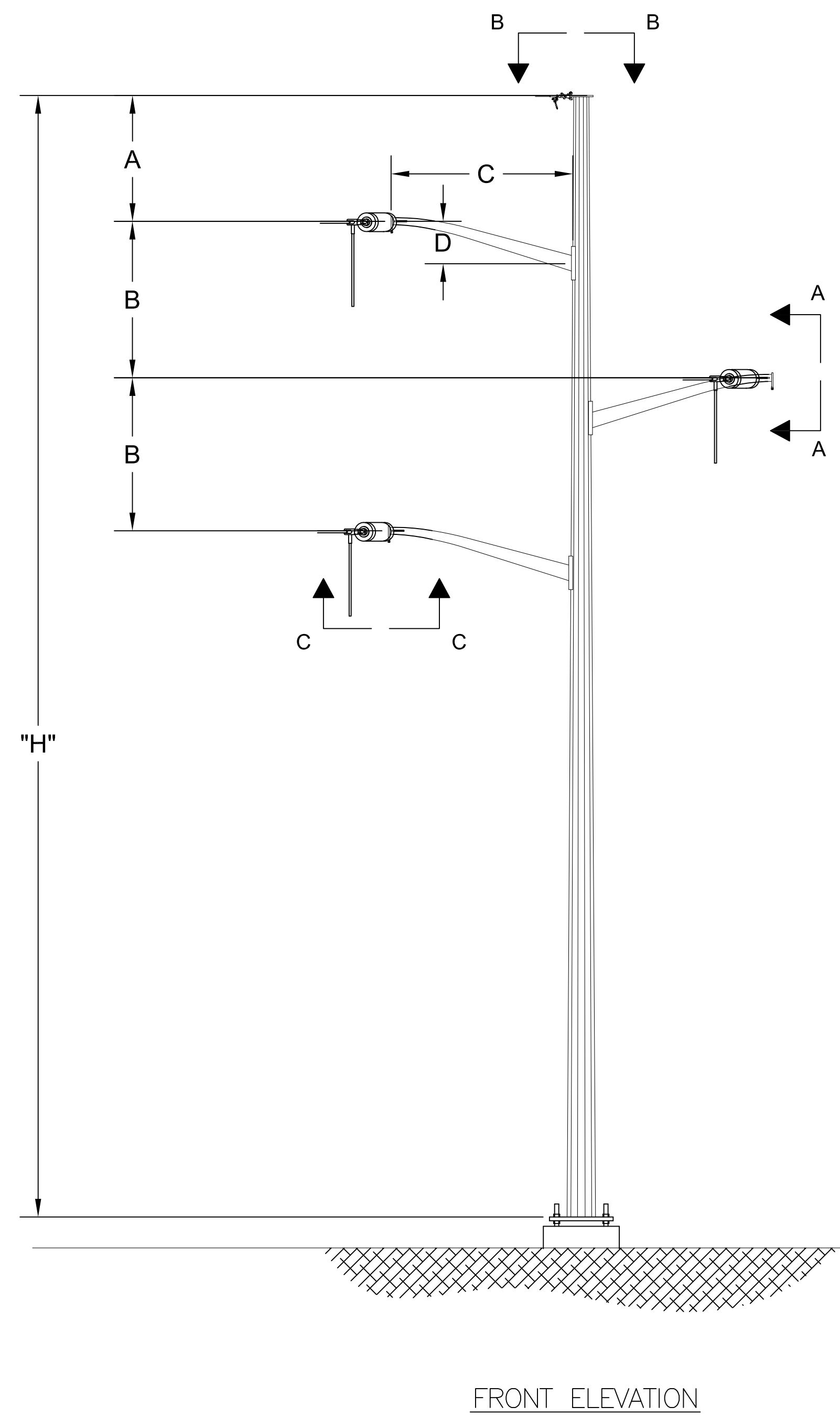
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- NOTES:
1. REFER TO WORK LIST FOR POLE HEIGHT.
 2. SEE SPECIFICATION SP.06.01.301.101 FOR STRUCTURE GROUNDING DETAILS.
 3. SEE SPECIFICATION SP.06.01.301.201 FOR STRUCTURE NUMBERING AND WARNING SIGNS REQUIRED FOR ALL STRUCTURES.
 4. STEEL POLE MANUFACTURER DRAWINGS TO SUPERCEDE CONCEPT DRAWINGS AND WILL BE ISSUED FOR CONSTRUCTION AS SOON AS THEY ARE AVAILABLE.

DIMENSION TABLE

	A	B	C	D	α	θ
1	11'-6"	6'-0"	7'-6"	1'-6" TYP	10°	0°-20°
2	11'-6"	6'-0"	8'-0"	1'-6" TYP	15°	>20°-40°



INCHES ON ORIGINAL

nationalgrid

SCOBIE POND - TEWKSBURY
115 KV REPLACEMENT STRUCTURE
SINGLE CIRCUIT Y151 LINE
STEEL DAVIT ARM DEADEND - SINGLE INS STRING

PREPARED BY: EJJ 9/19/14
REVIEWED BY: FIX 9/19/14
APPROVED BY: NPA 9/19/14
SCALE: N.T.S.
SHEET: 1 OF 1
INDEX: 400298

ISSUED FOR SCOPE DOCUMENT

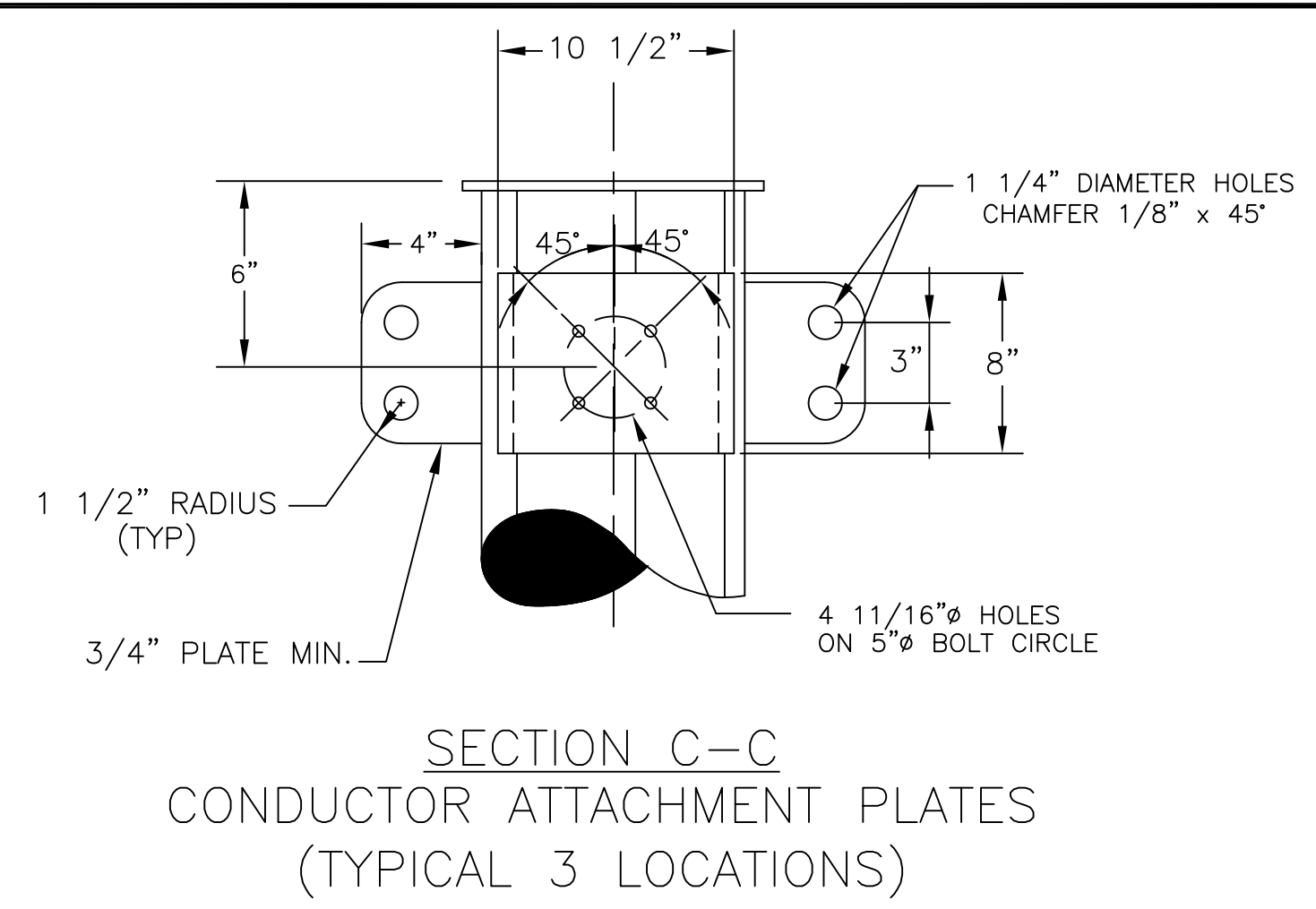
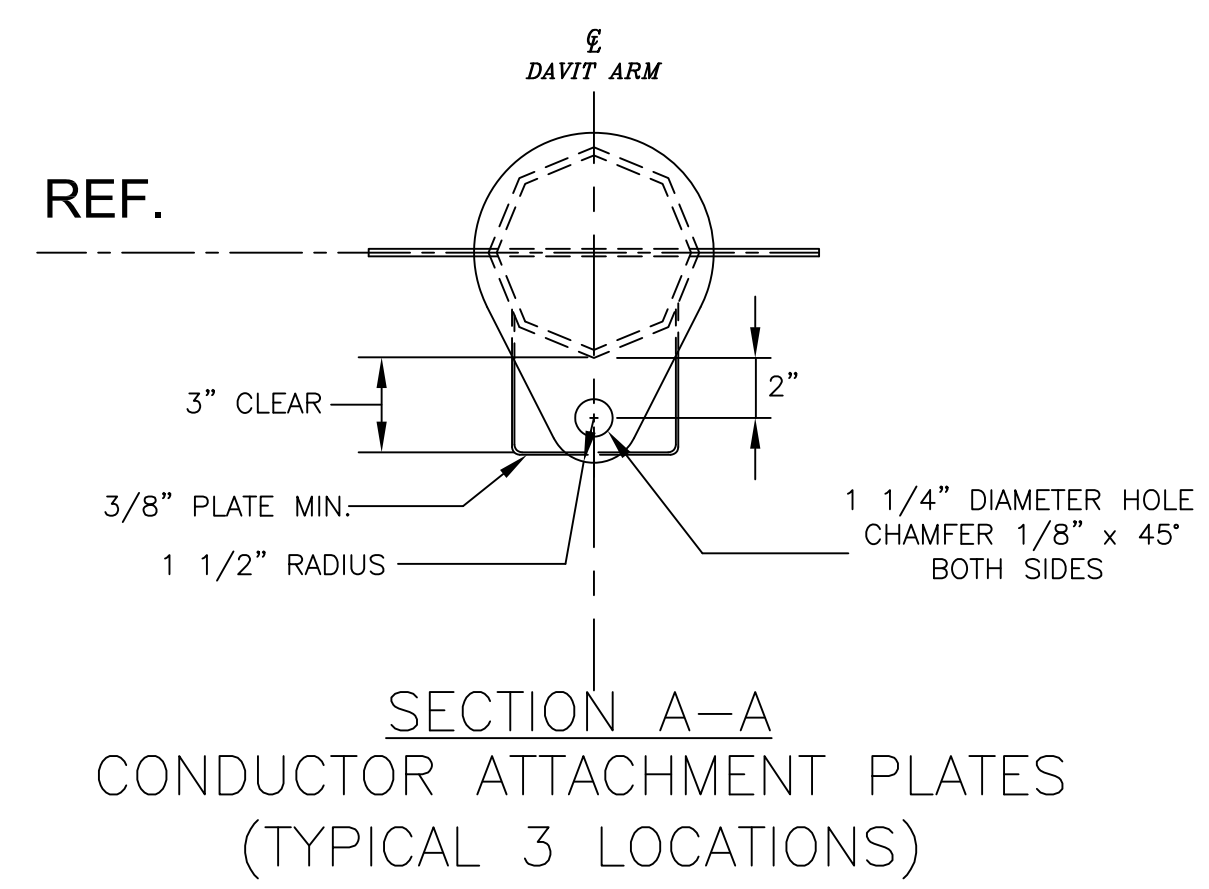
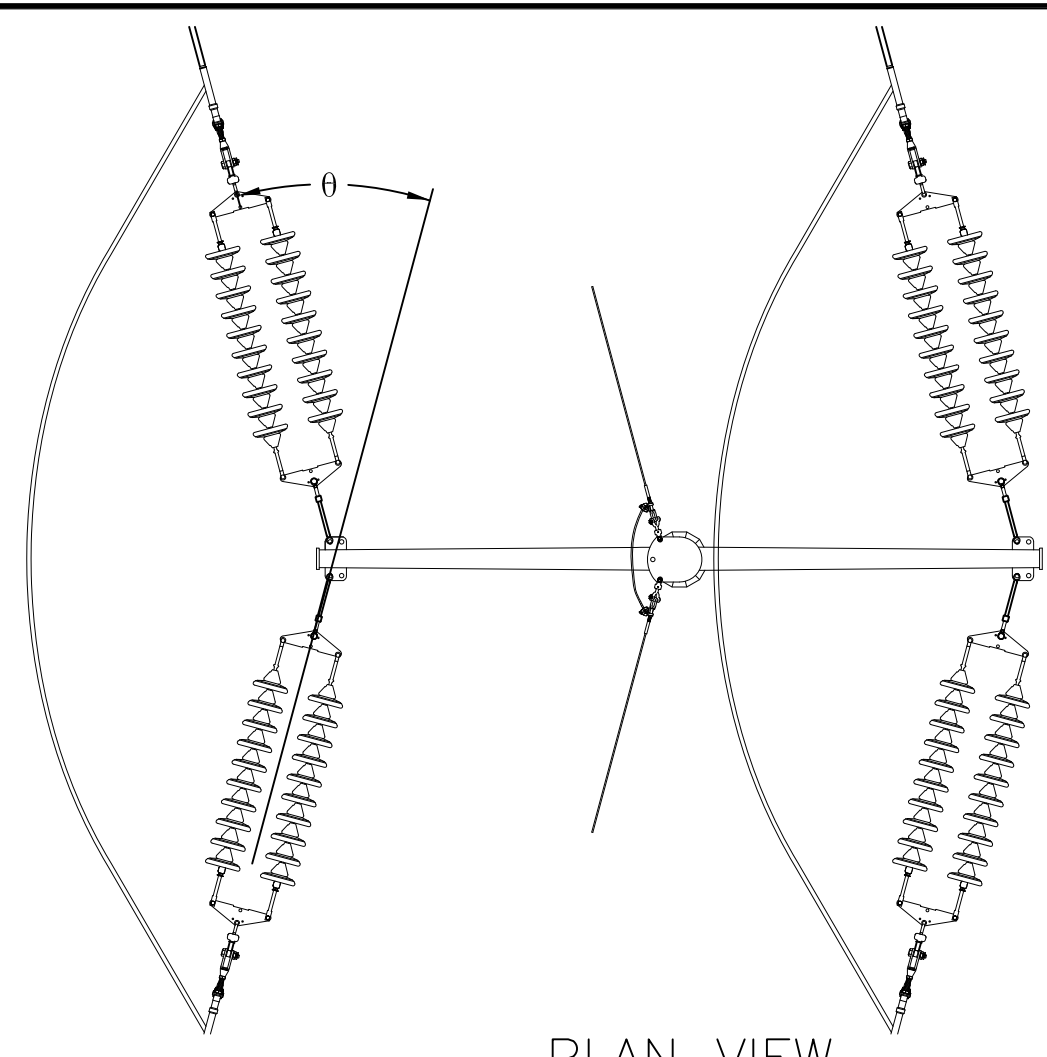
DATE: 9/19/14

VERSION DESCRIPTION

VER	DATE	DESCRIPTION
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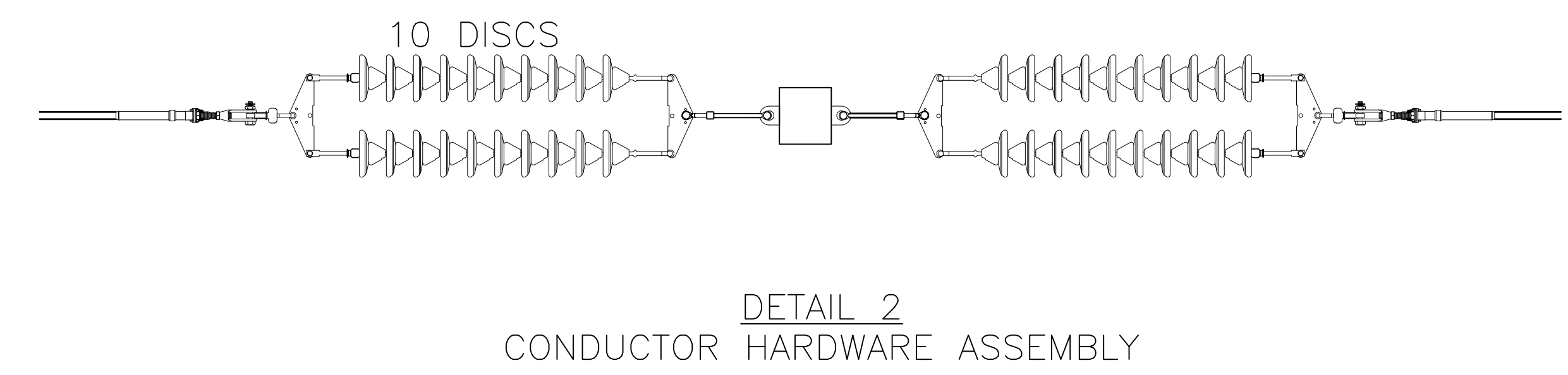
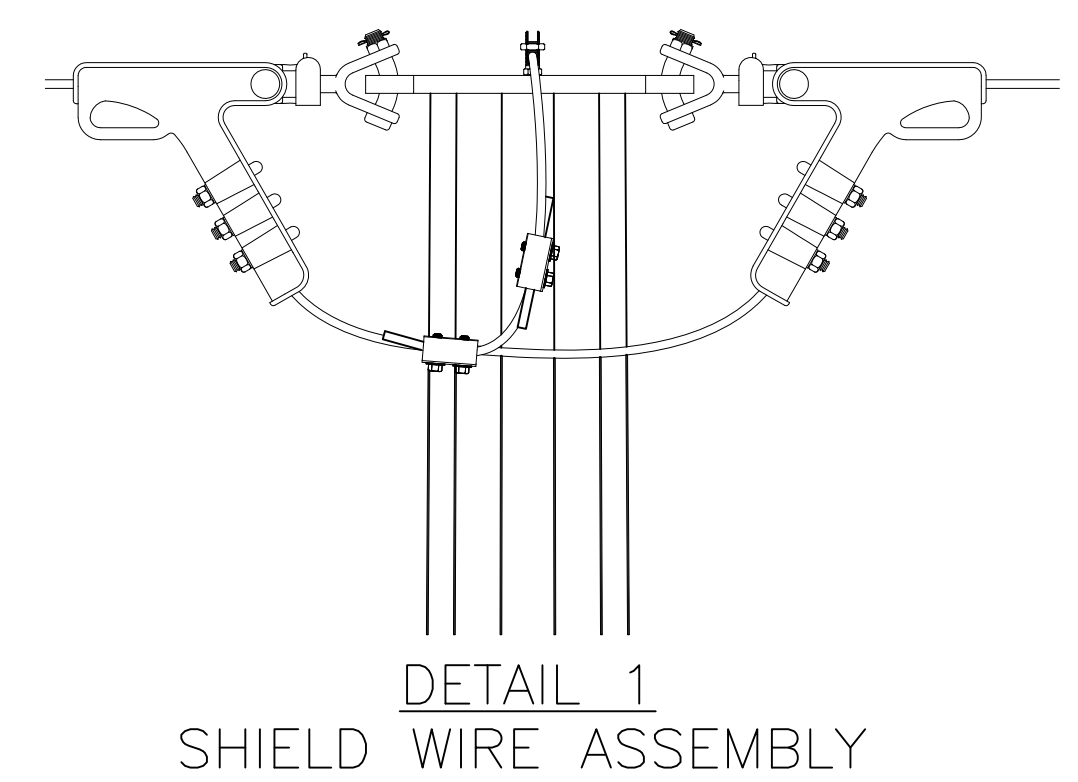
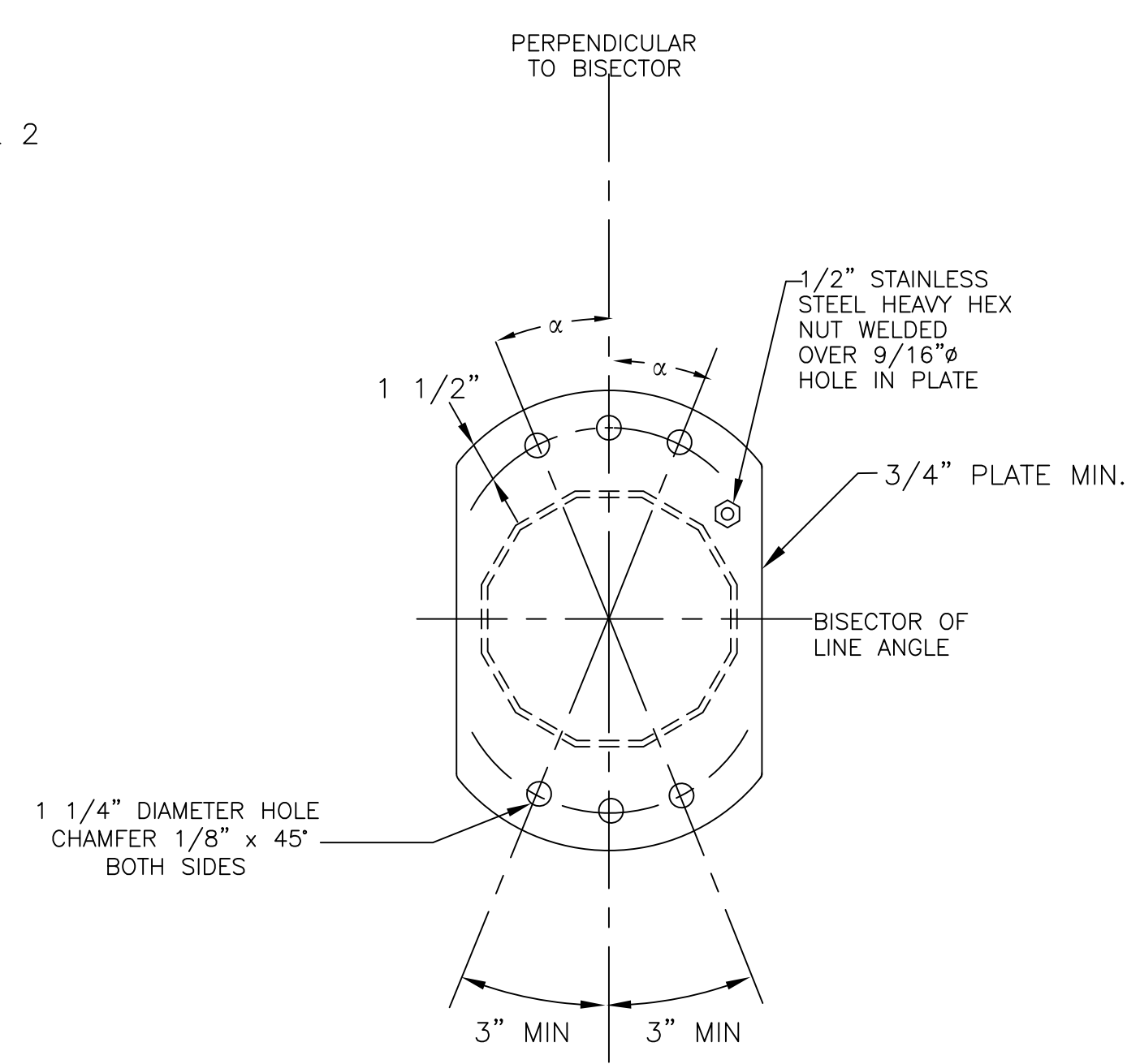
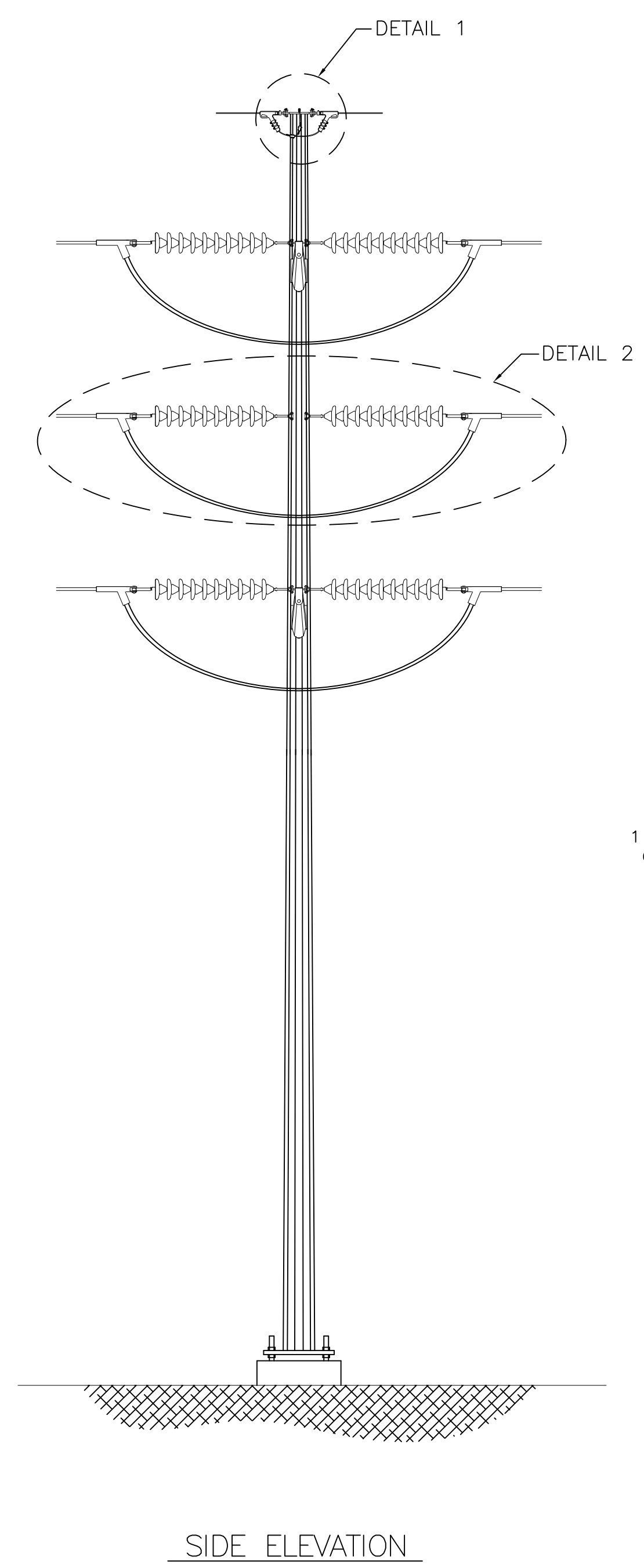
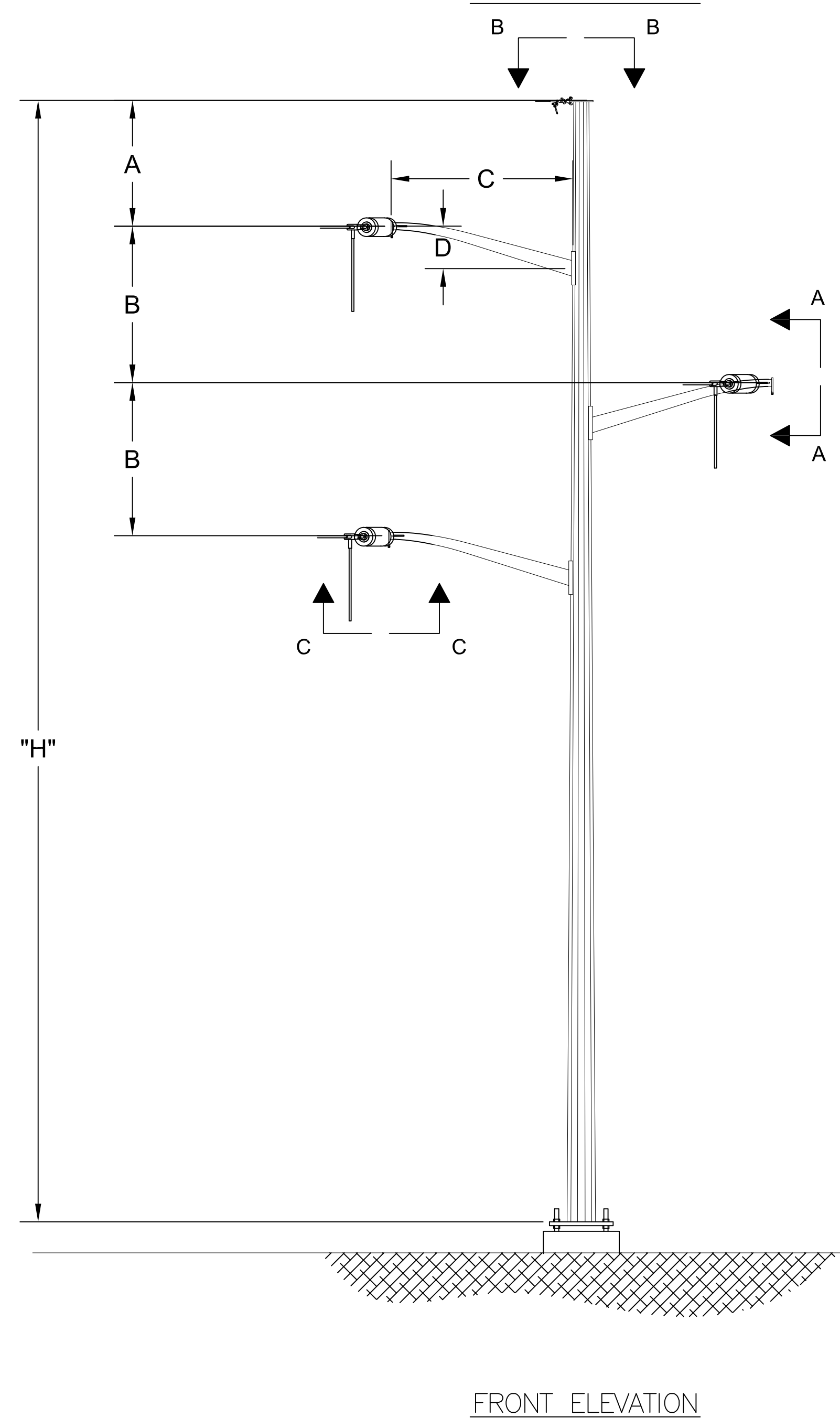
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- NOTES:
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 - SEE SPECIFICATION SP.06.01.301.101 FOR STRUCTURE GROUNDING DETAILS.
 - SEE SPECIFICATION SP.06.01.301.201 FOR STRUCTURE NUMBERING AND WARNING SIGNS REQUIRED FOR ALL STRUCTURES.
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DIMENSION TABLE						
	A	B	C	D	α	θ
1	11'-6"	6'-0"	7'-6"	1'-6" TYP	10°	0°-20°
2	11'-6"	6'-0"	8'-0"	1'-6" TYP	15°	>20°-40°



nationalgrid

SCOBIE POND - TEWKSBURY
115 KV REPLACEMENT STRUCTURE
SINGLE CIRCUIT Y151 LINE
STEEL DAVIT ARM DEADEND - DOUBLE INS STRING

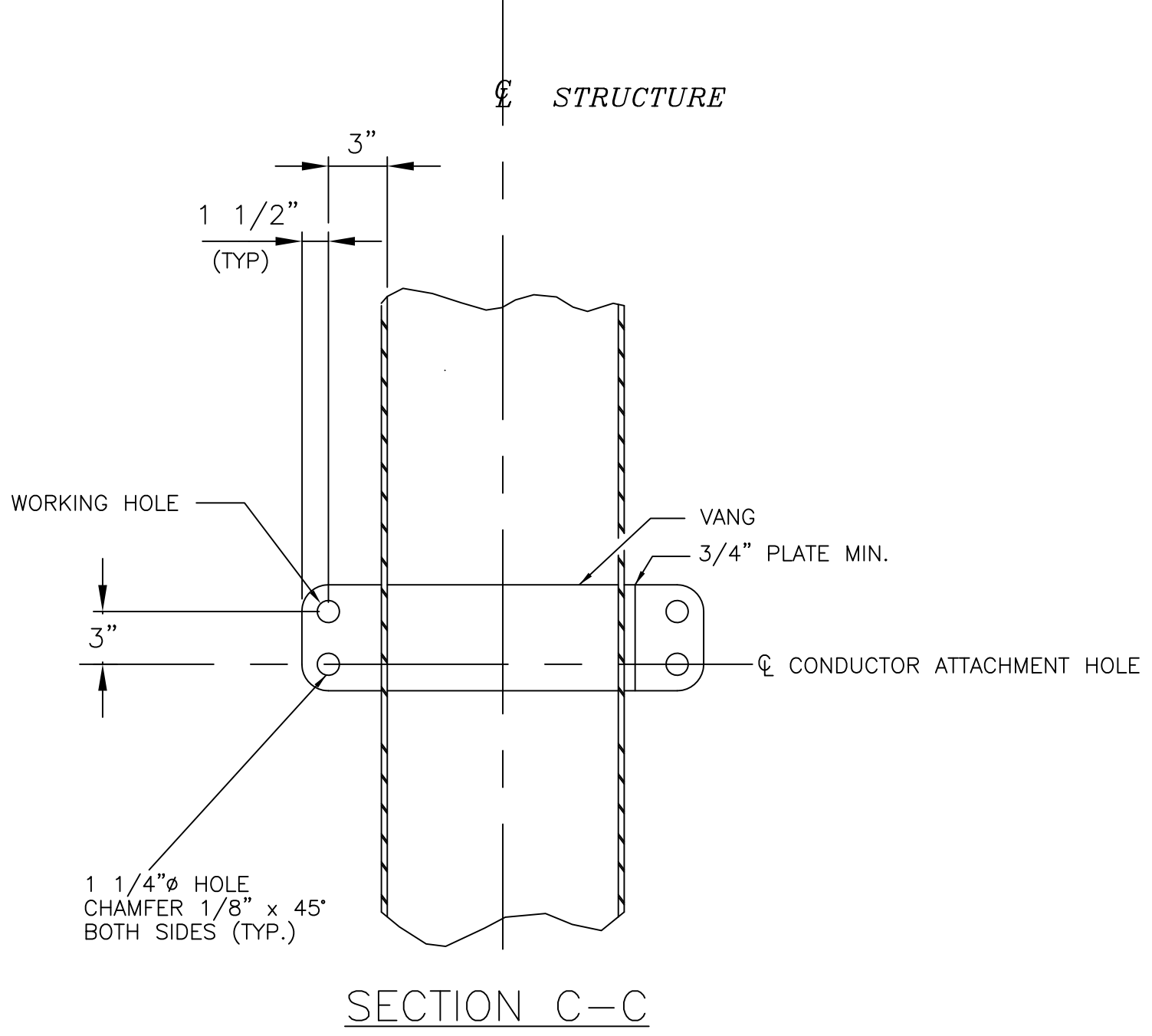
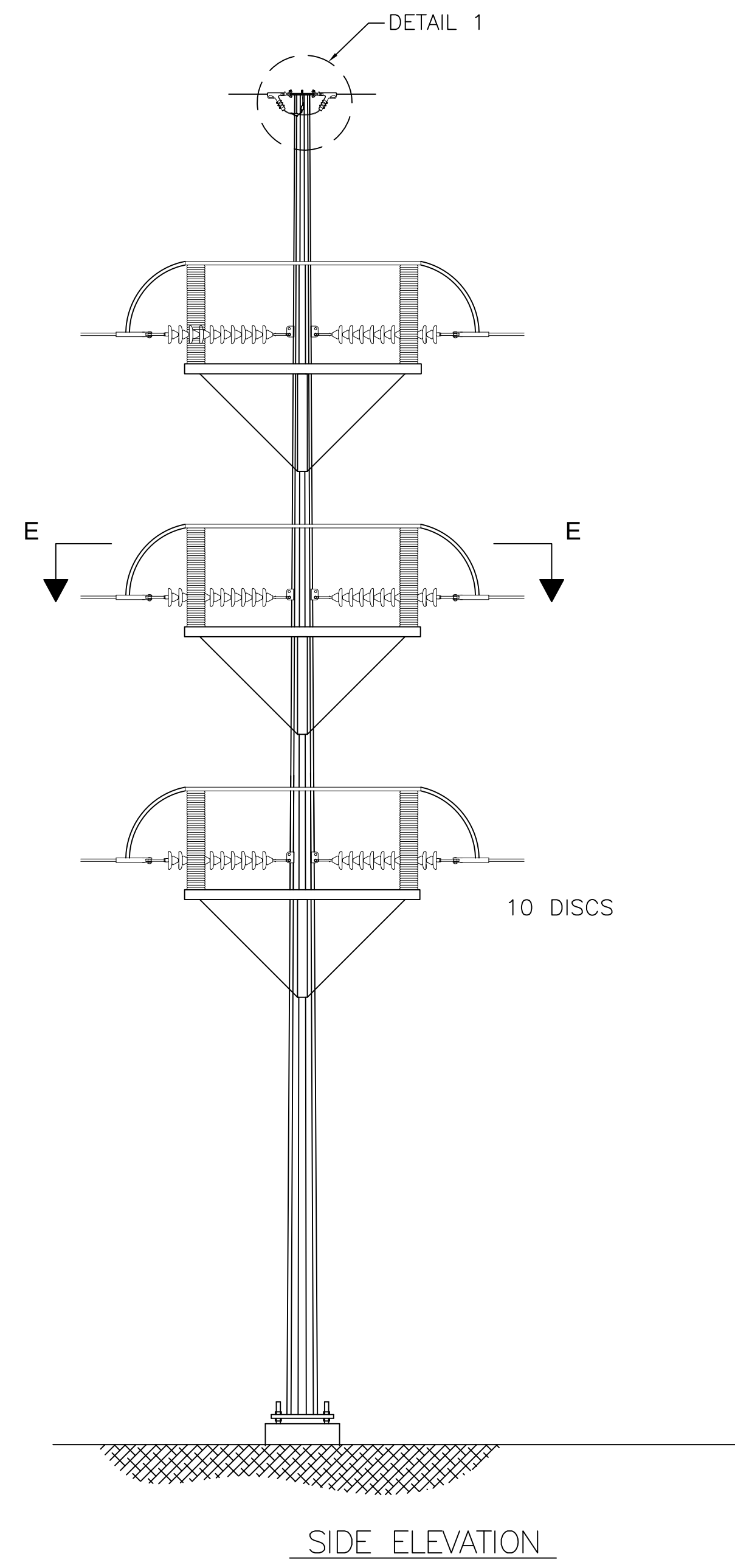
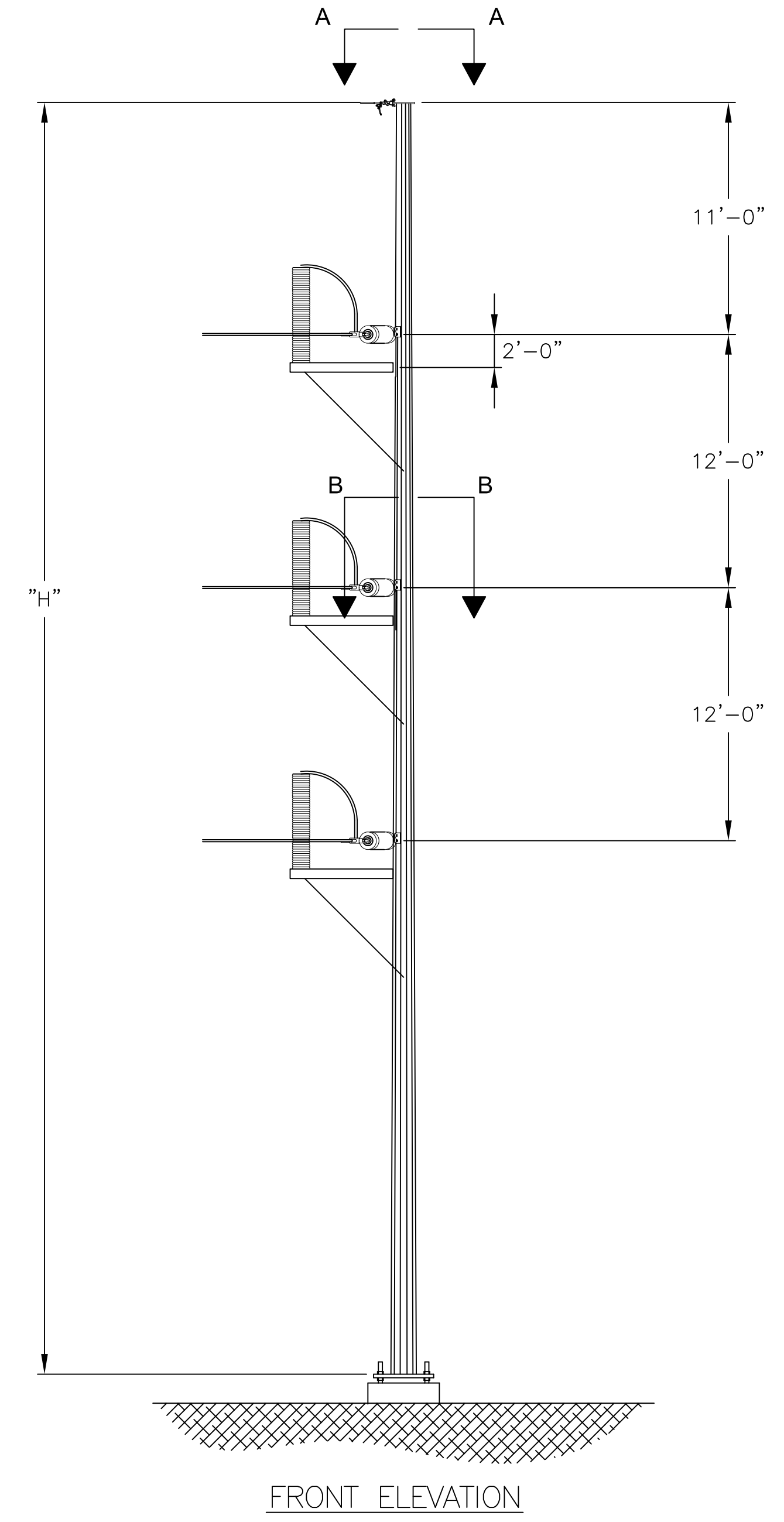
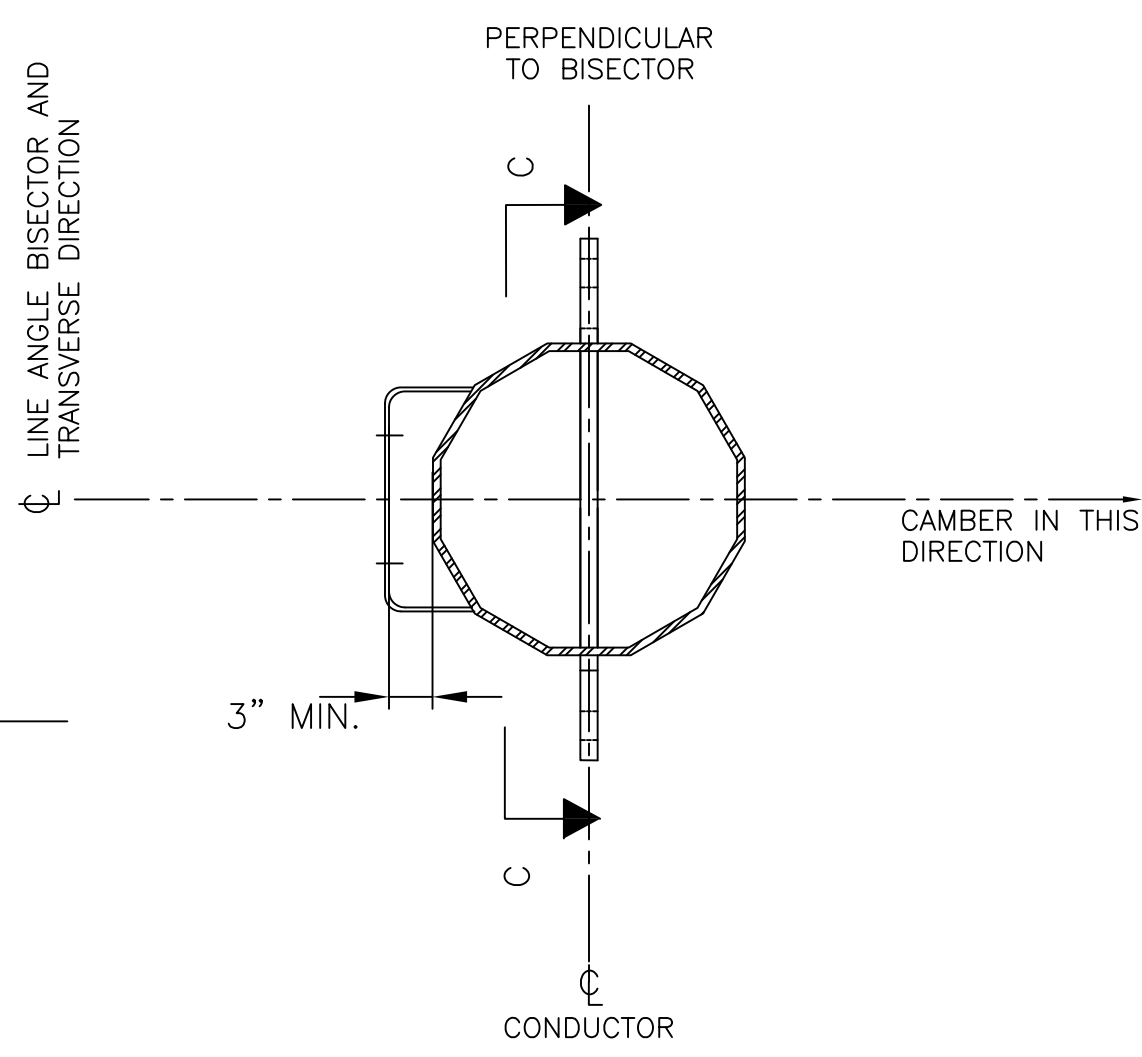
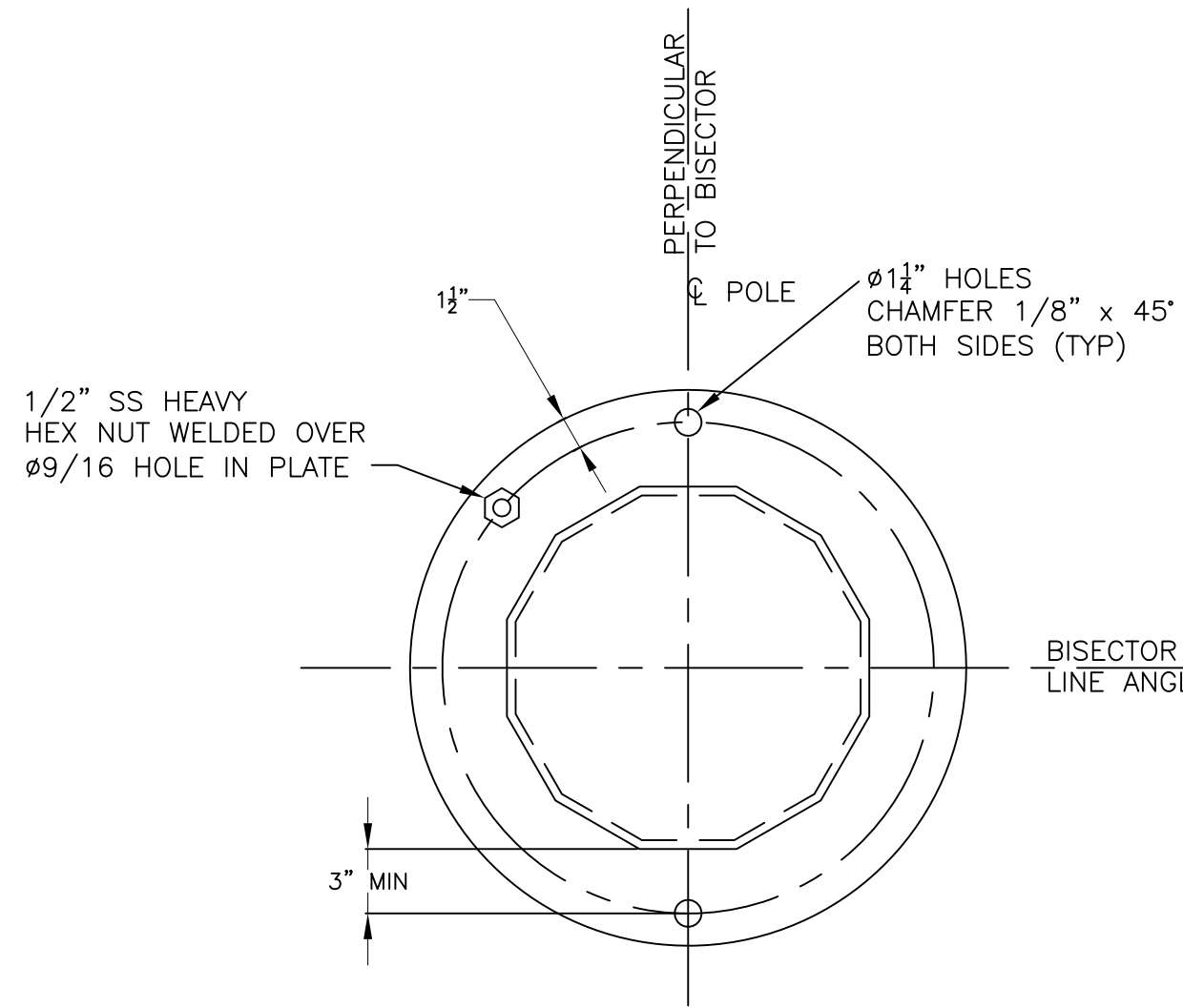
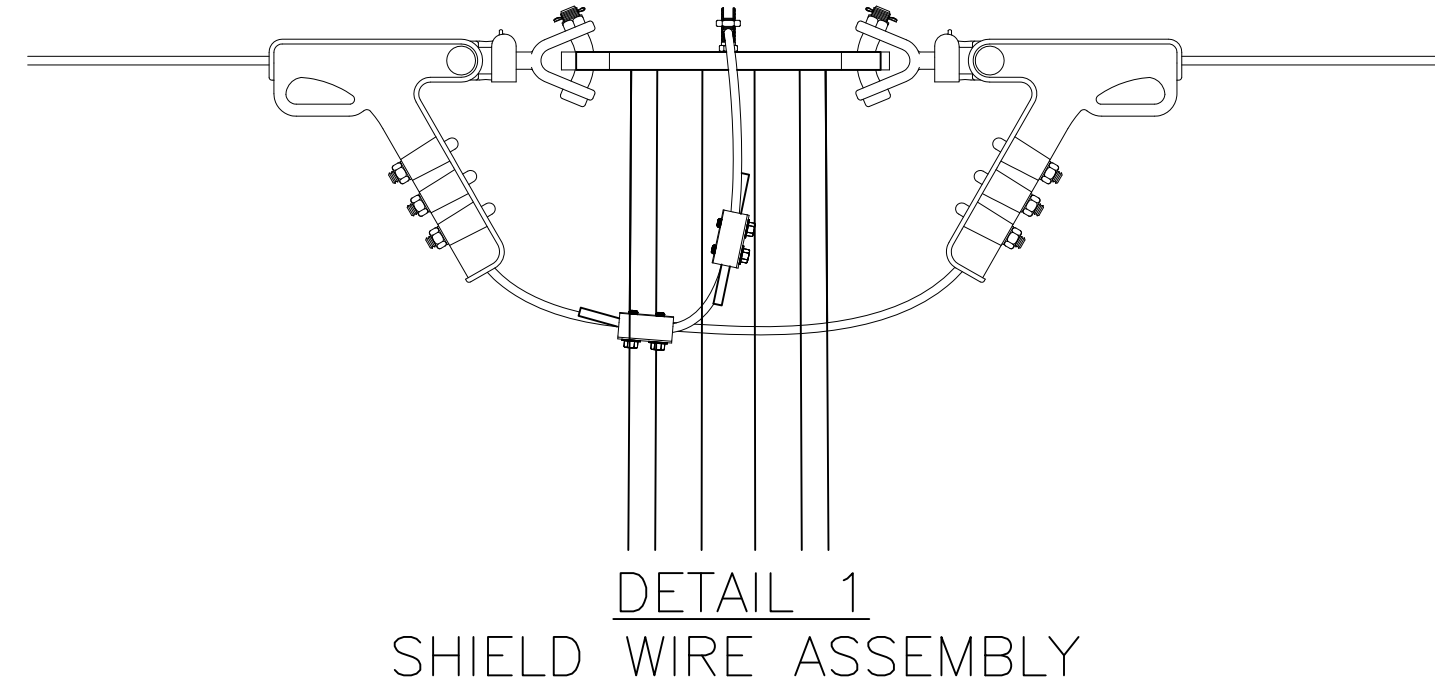
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REVIEWED BY	FTX	9/19/14
APPROVED BY	NPA	9/19/14
SCALE	N.T.S.	
SHEET	1	OF 1
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DATE: 9/19/14
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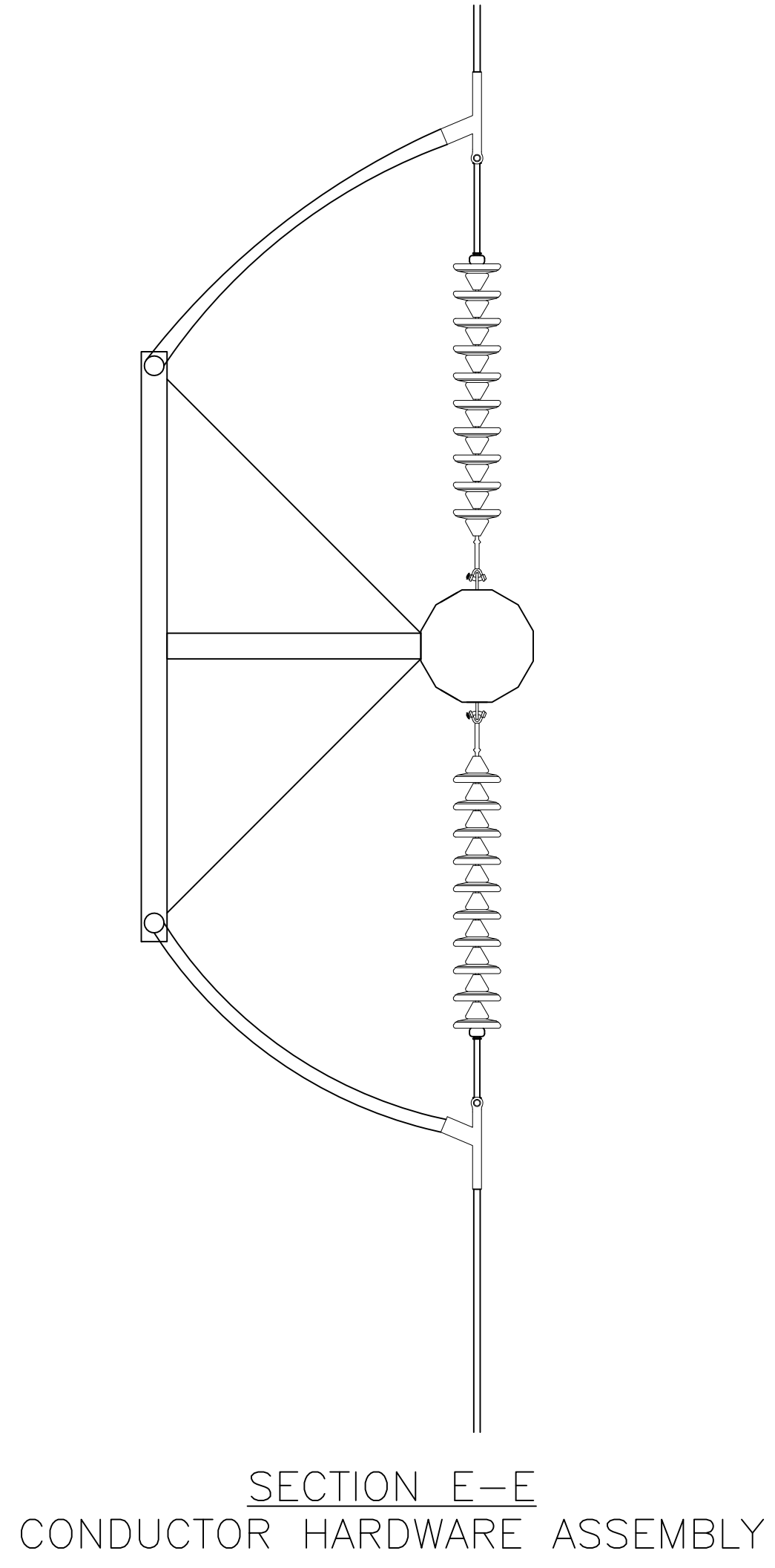
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EJ, FTX, INPA

VERSION: 1

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- NOTES:
1. REFER TO WORK LIST FOR POLE HEIGHT.
 2. SEE SPECIFICATION SP.06.01.301.101 FOR STRUCTURE GROUNDING DETAILS.
 3. SEE SPECIFICATION SP.06.01.301.201 FOR STRUCTURE NUMBERING AND WARNING SIGNS REQUIRED FOR ALL STRUCTURES.
 4. STEEL POLE MANUFACTURER DRAWINGS TO SUPERCEDE CONCEPT DRAWINGS AND WILL BE ISSUED FOR CONSTRUCTION AS SOON AS THEY ARE AVAILABLE.
 5. TURNER SILVERTIP 1TSB SWITCH OR SIMILAR TO BE USED.
 6. SINGLE POLE STRUCTURE SHIELDWIRE ON Y151 MAINLINE WILL UTILIZE OPGW AND ON SOUTH BROADWAY TAP WILL UTILIZE 3/8" EHS

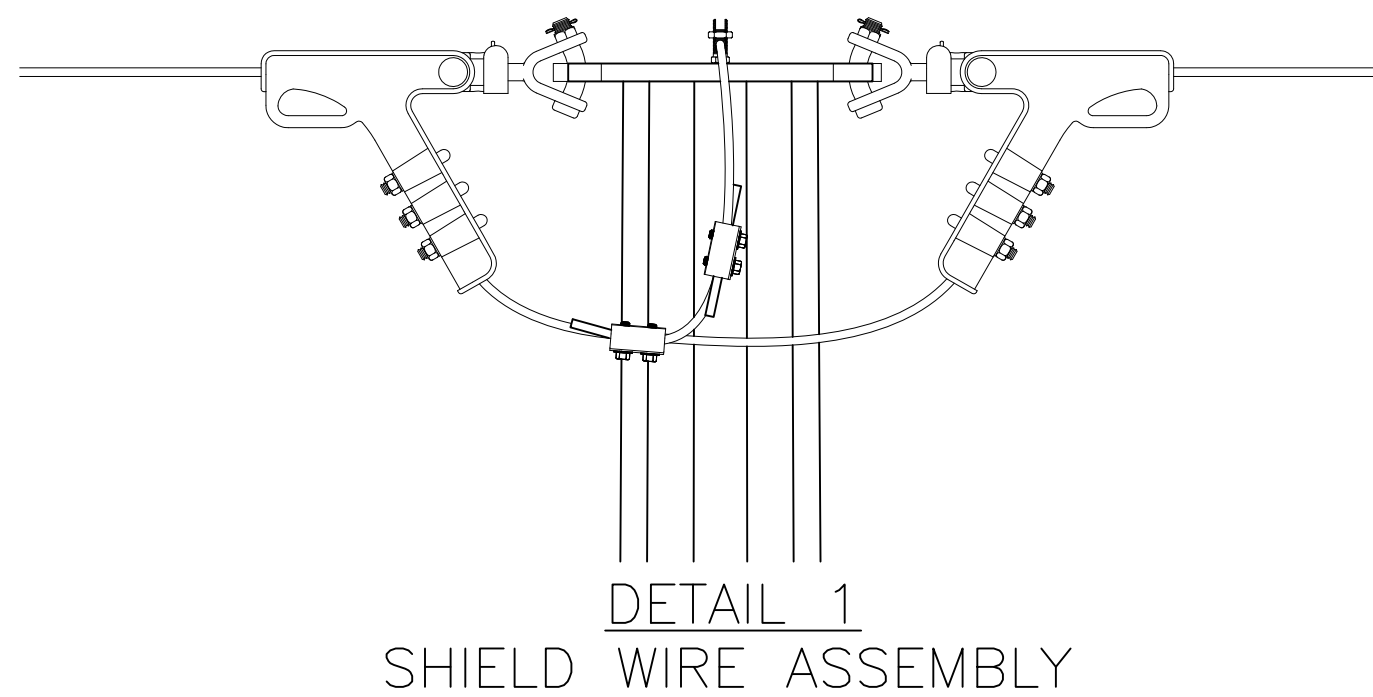


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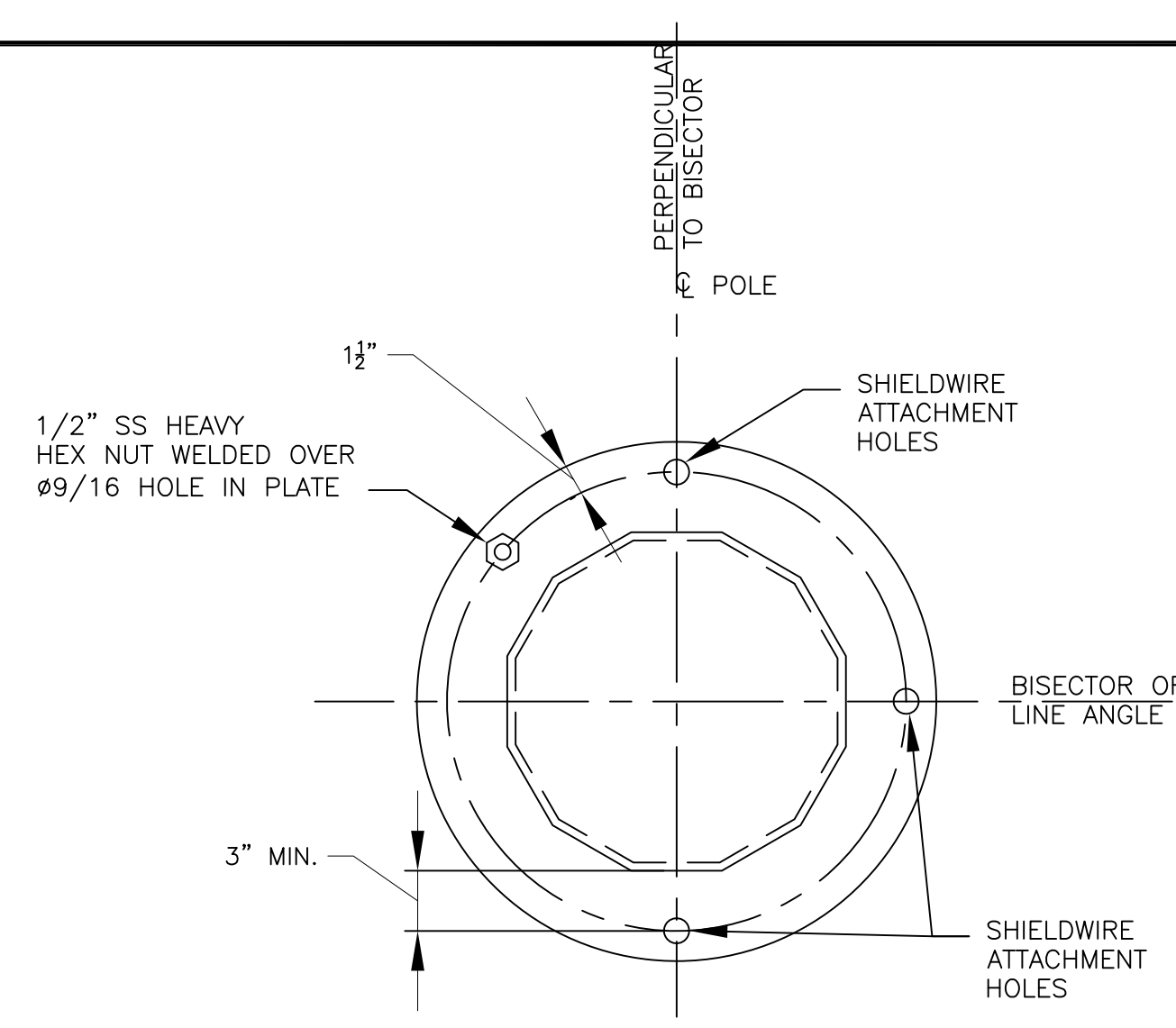
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REVIEWED BY	FTX	2/27/15
APPROVED BY	NPA	2/27/15
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SCOBIE POND - TEWKSBURY
115KV REPLACEMENT STRUCTURE
SINGLE CIRCUIT Y151 LINE
STEEL SINGLE POLE SWITCH - SINGLE INS. STRING

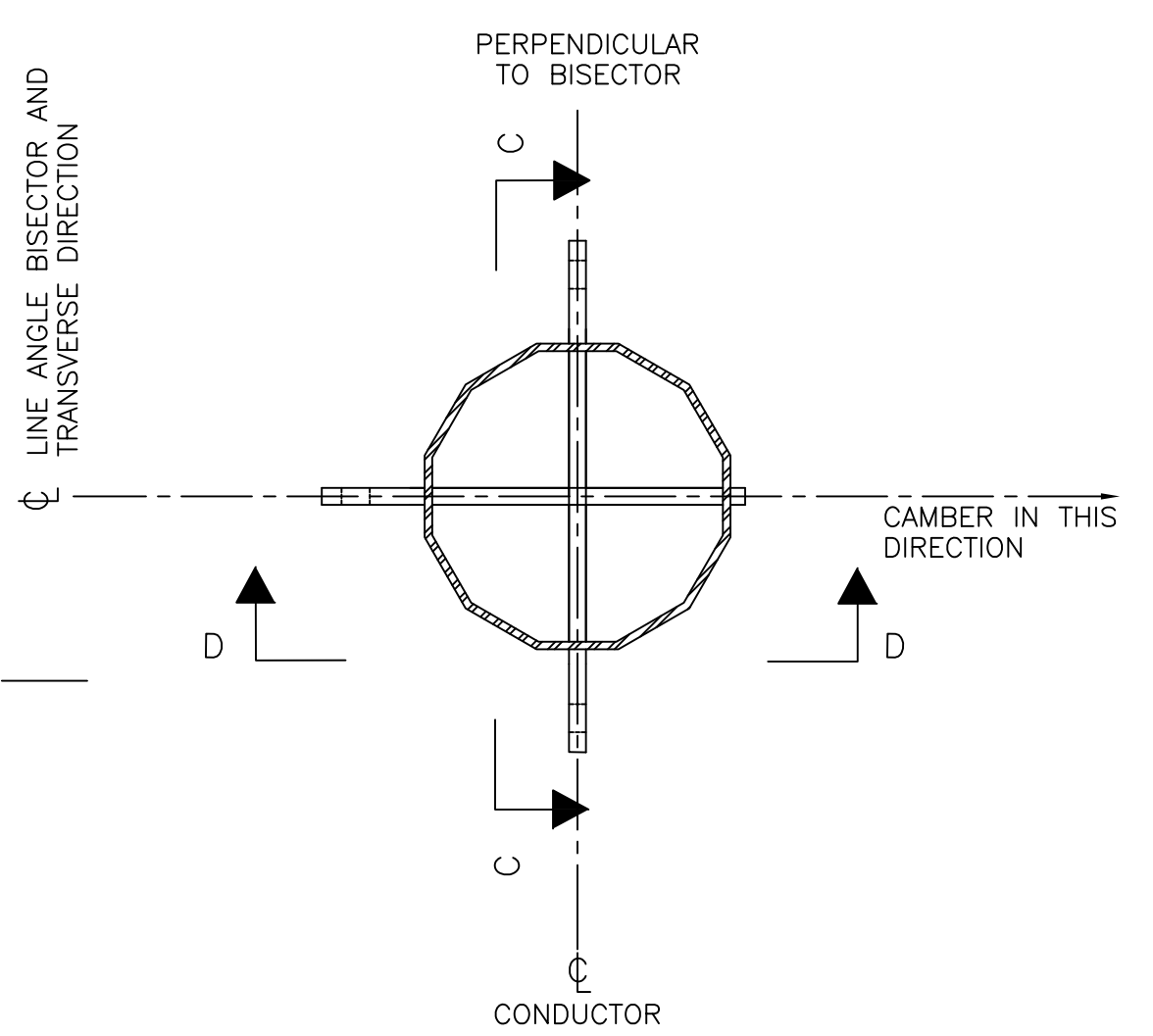
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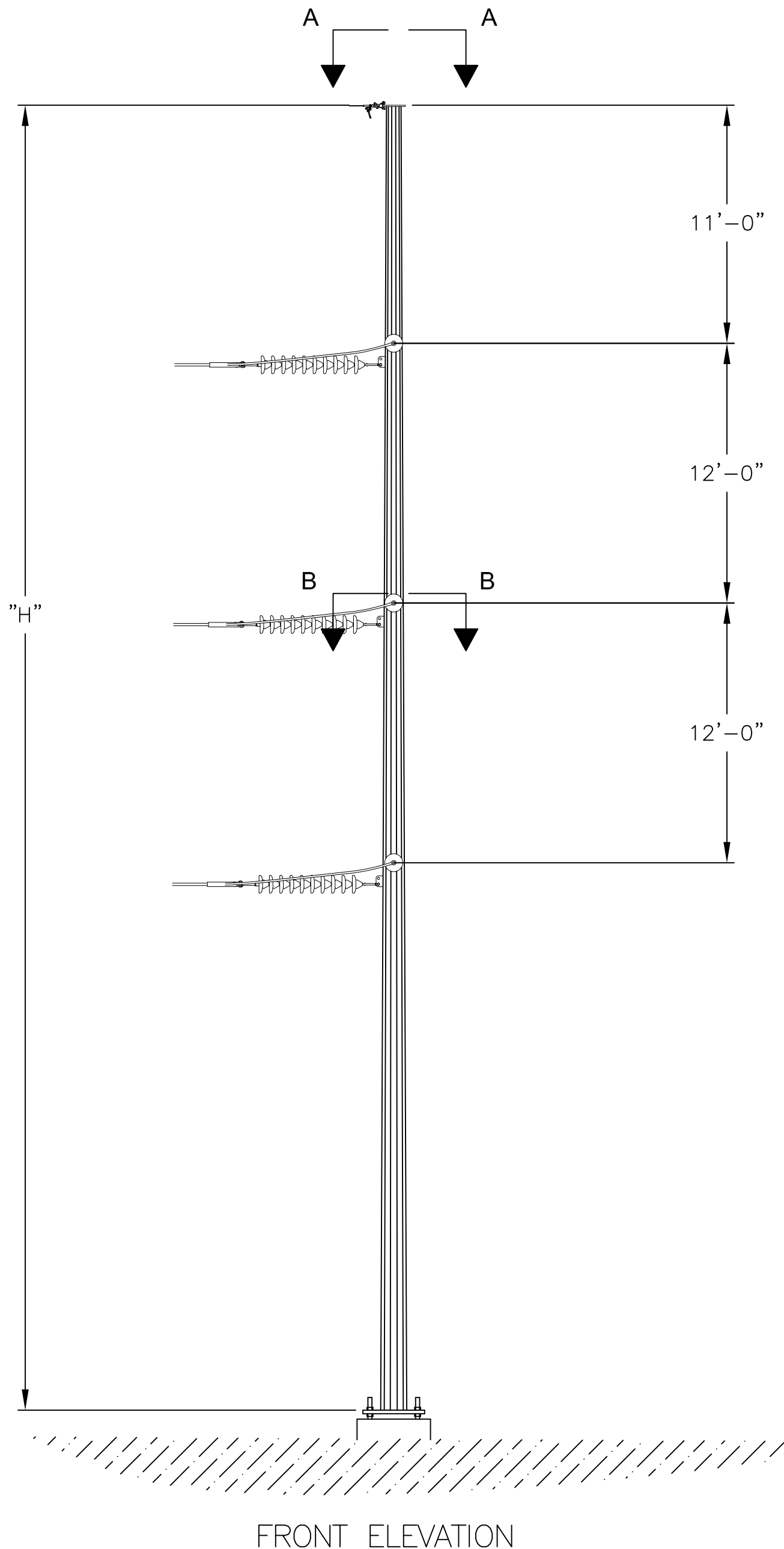
DETAIL 1
SHIELD WIRE ASSEMBLY



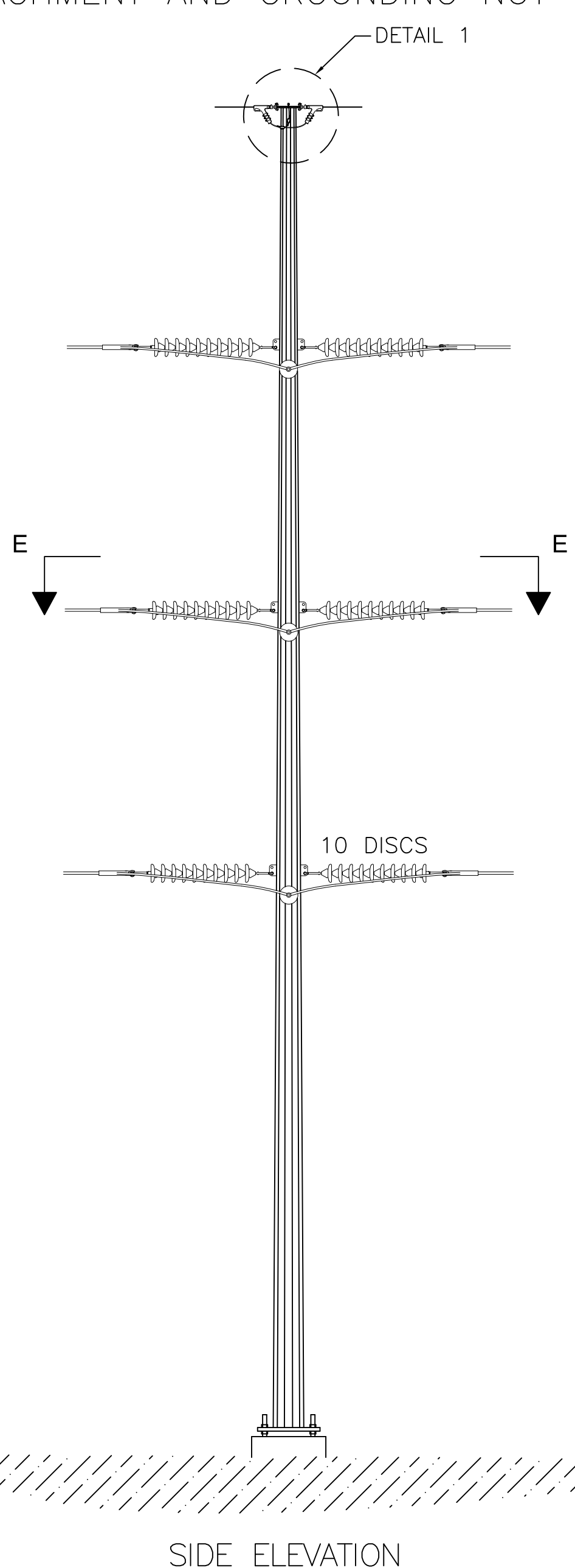
SECTION A-A
POLE CAP WITH SHIELD WIRE
ATTACHMENT AND GROUNDING NUT



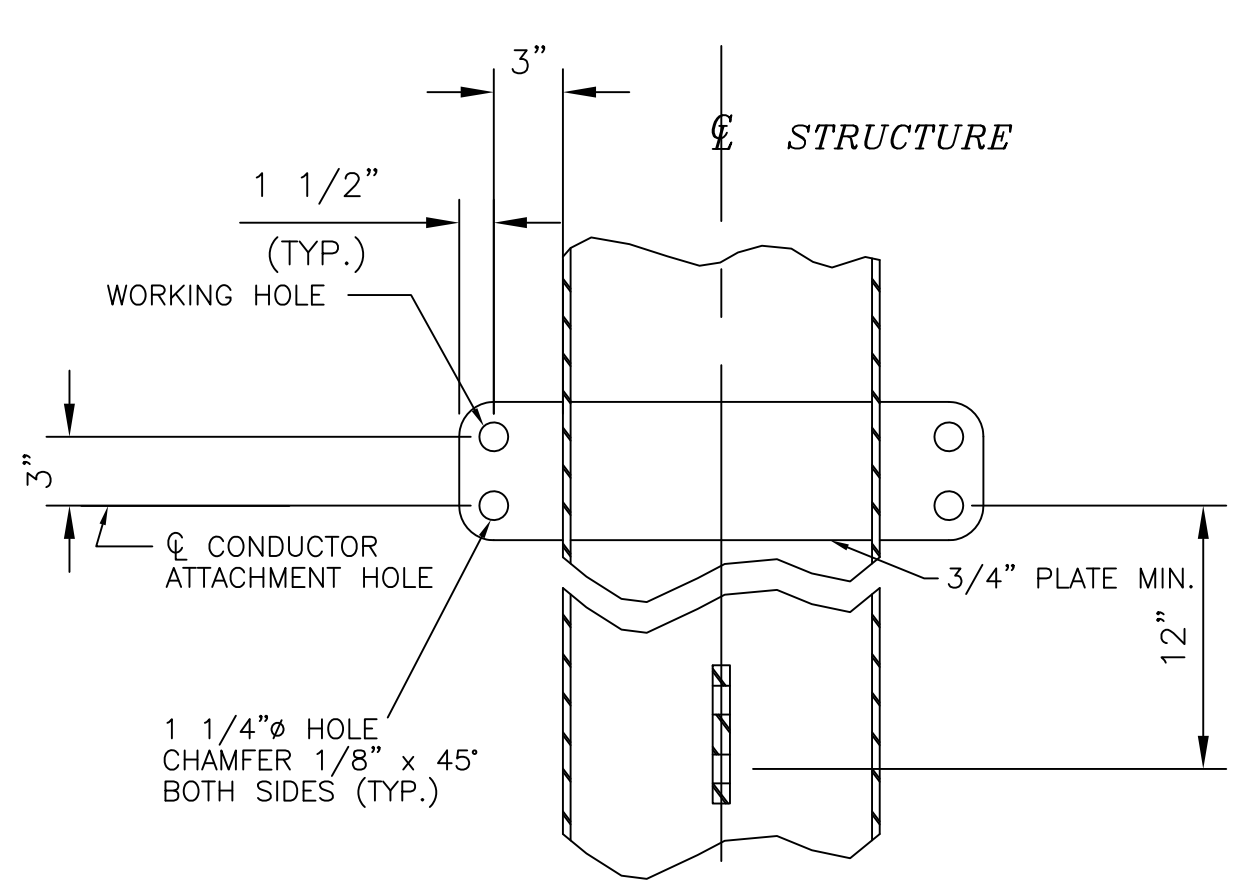
SECTION B-B
(TYP. 3 PLACES)



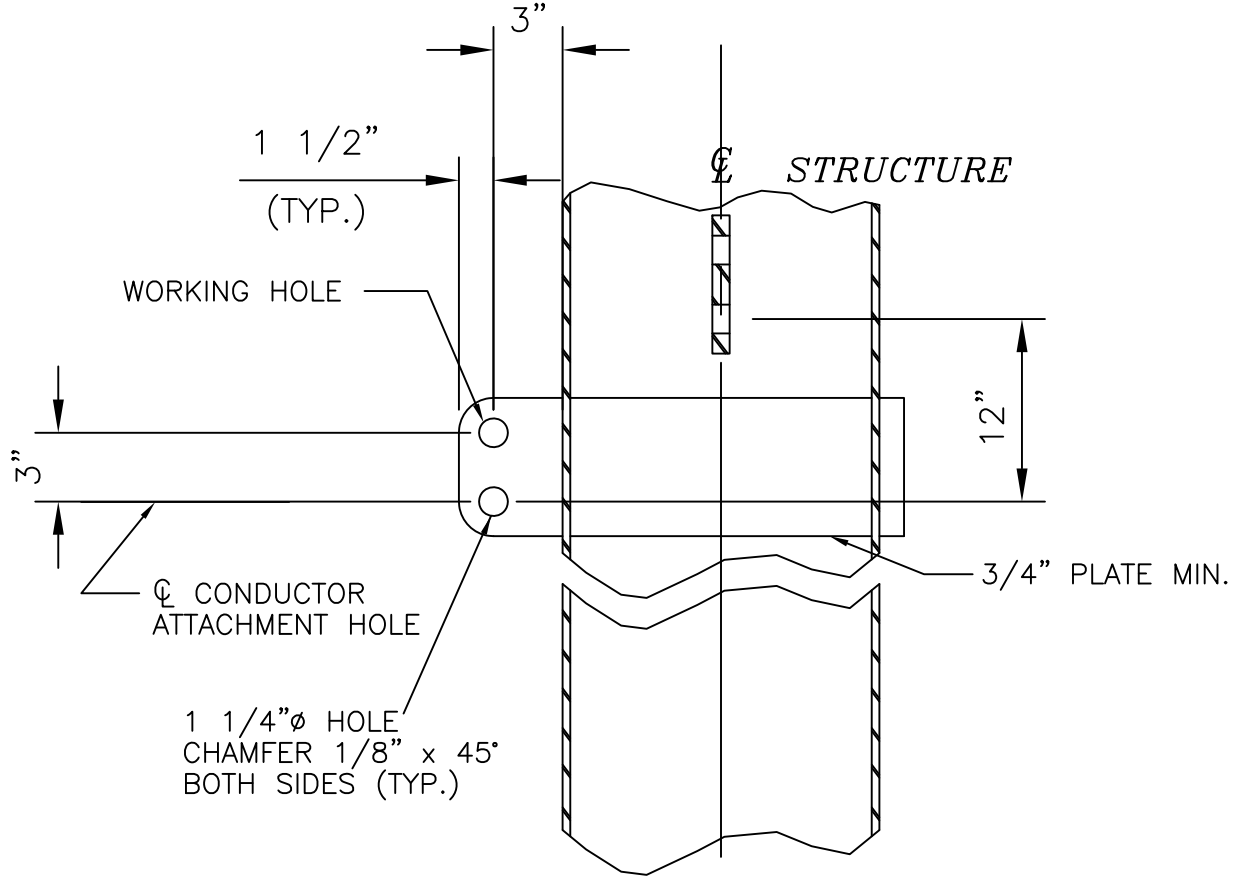
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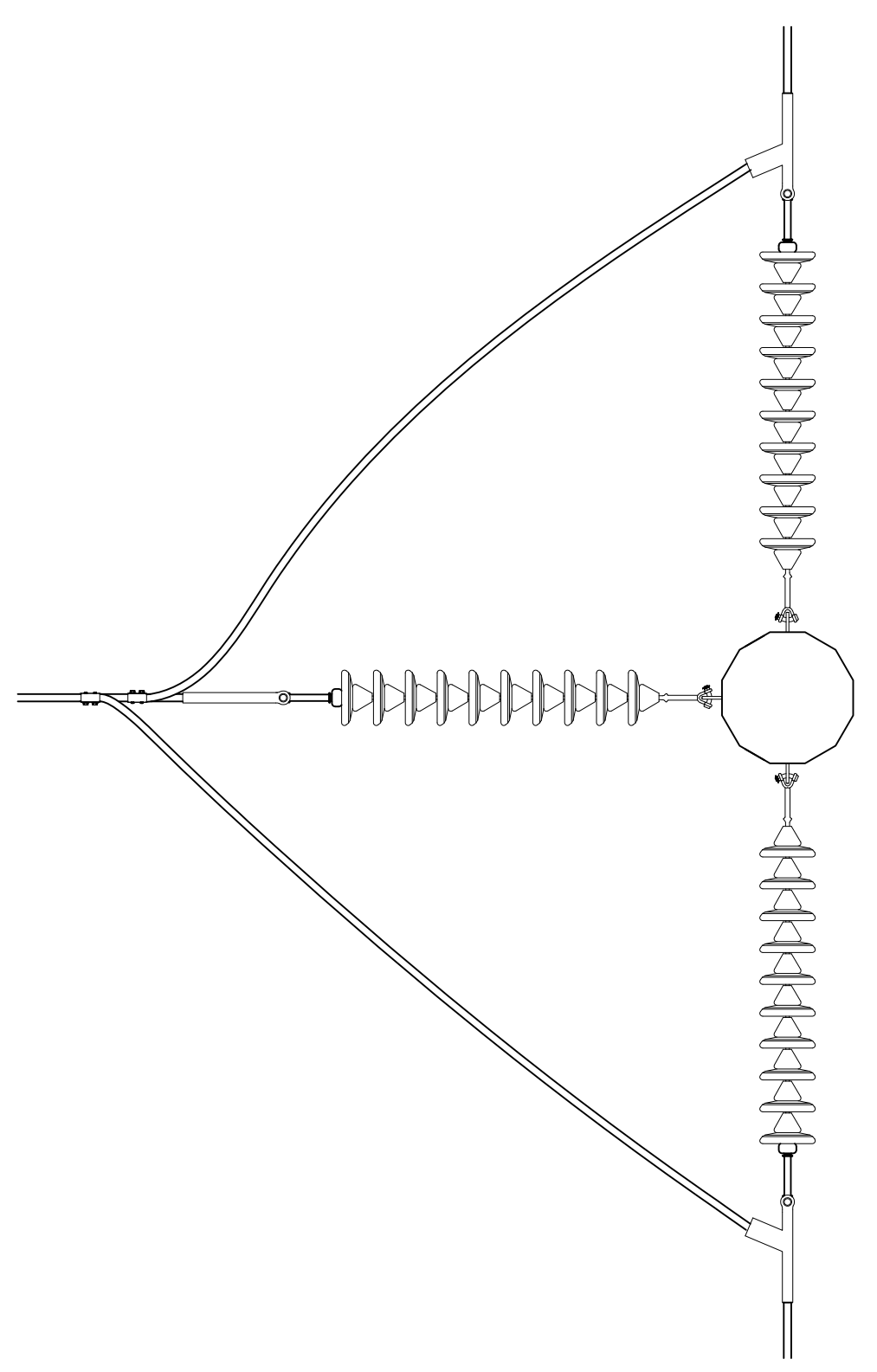
SIDE ELEVATION



SECTION C-C



SECTION D-D



SECTION E-E
CONDUCTOR HARDWARE ASSEMBLY

- NOTES:
1. REFER TO WORK LIST FOR POLE HEIGHT.
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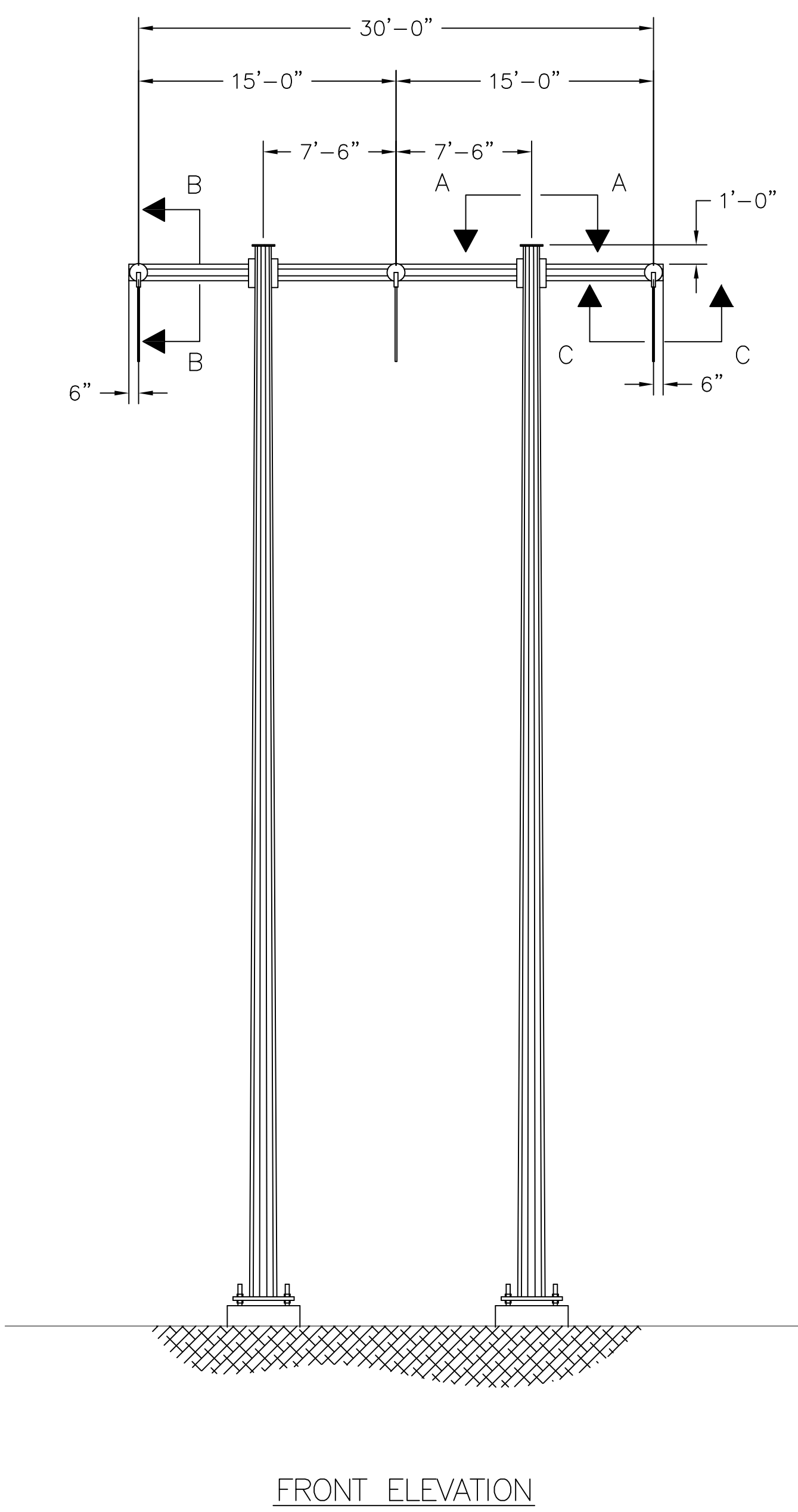
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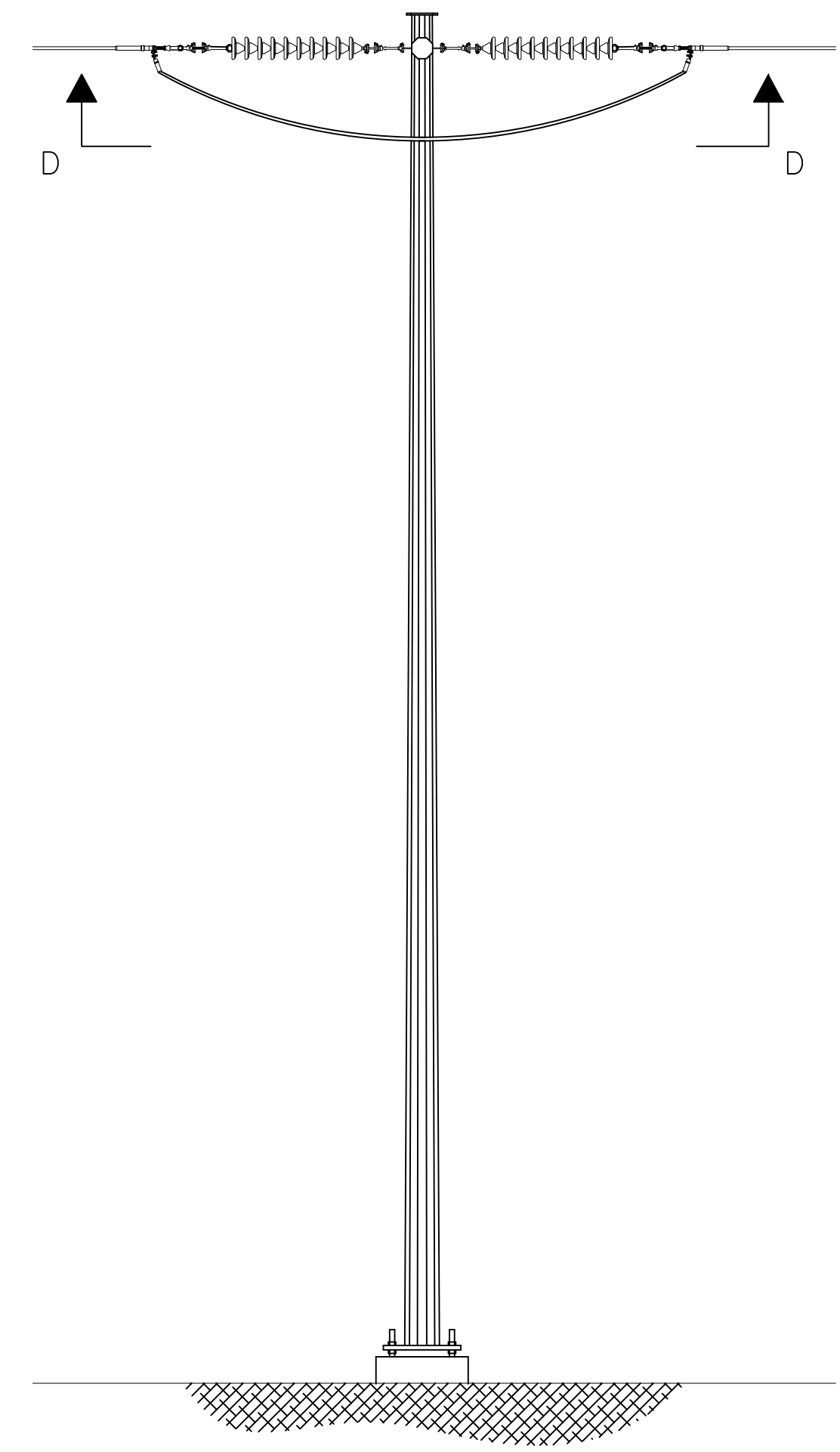
SCOBIE POND - TEWKSBURY
115KV REPLACEMENT STRUCTURE
SINGLE CIRCUIT Y151 LINE
STEEL SINGLE POLE 3-WAY DE - SINGLE INS. STRING

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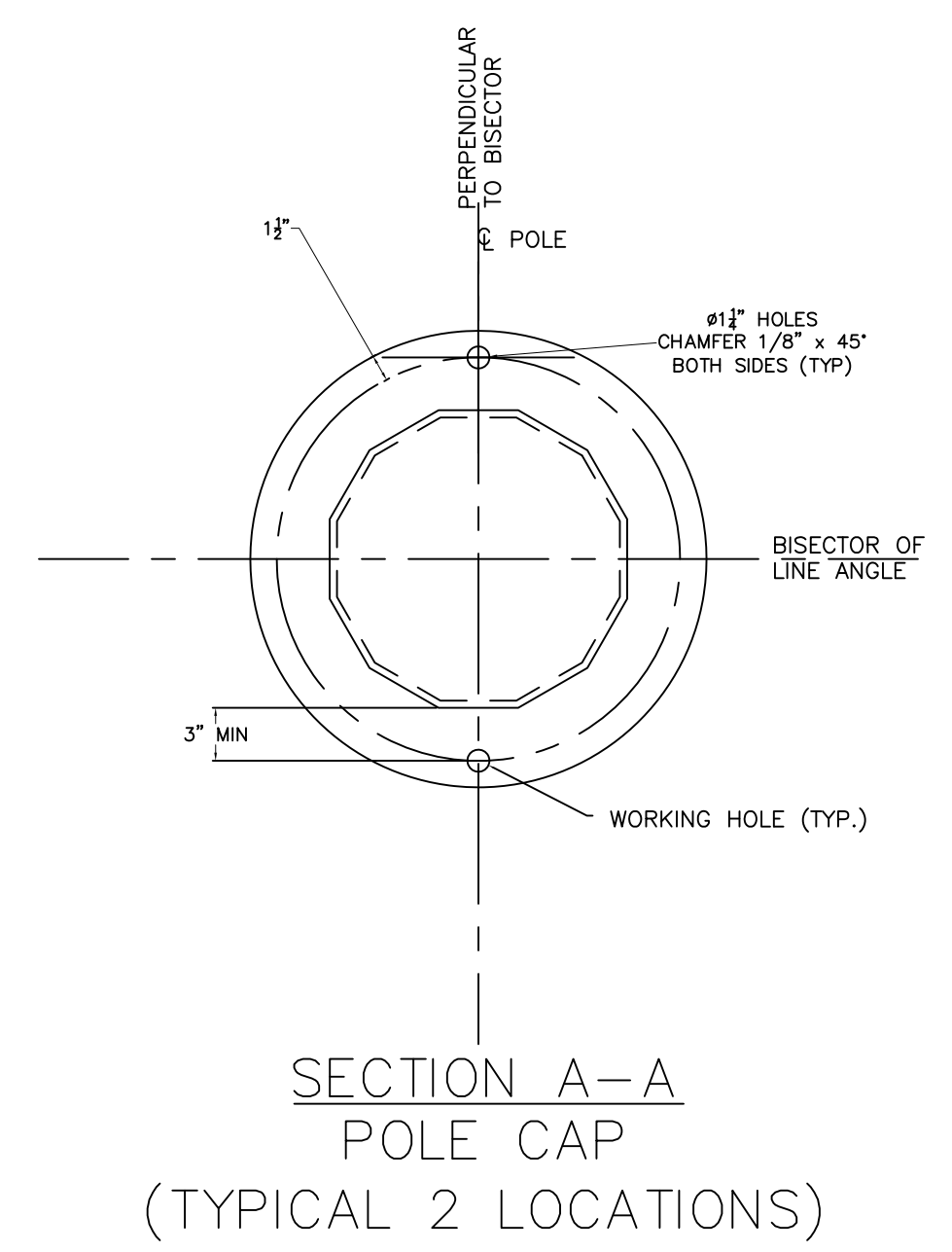
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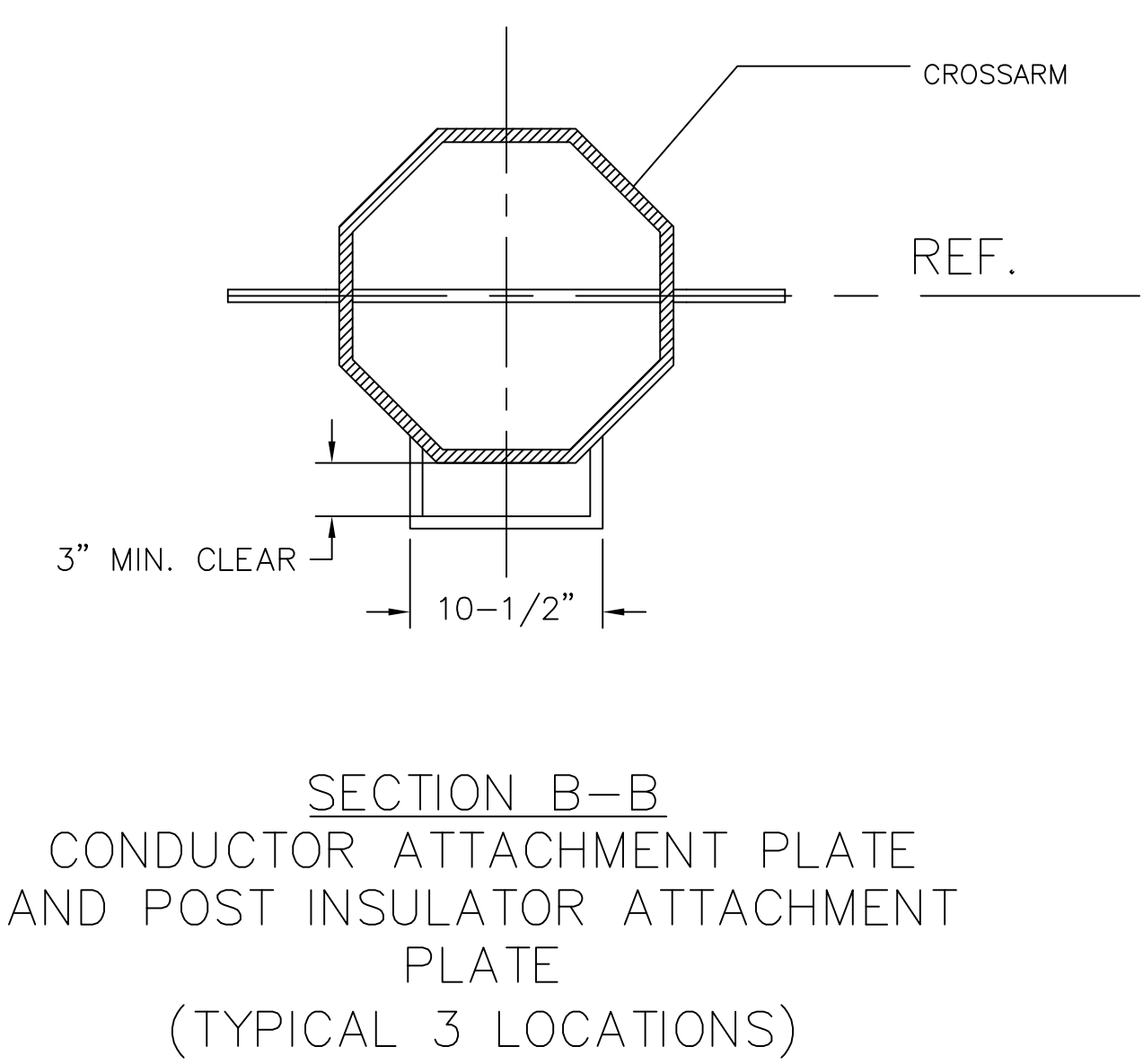
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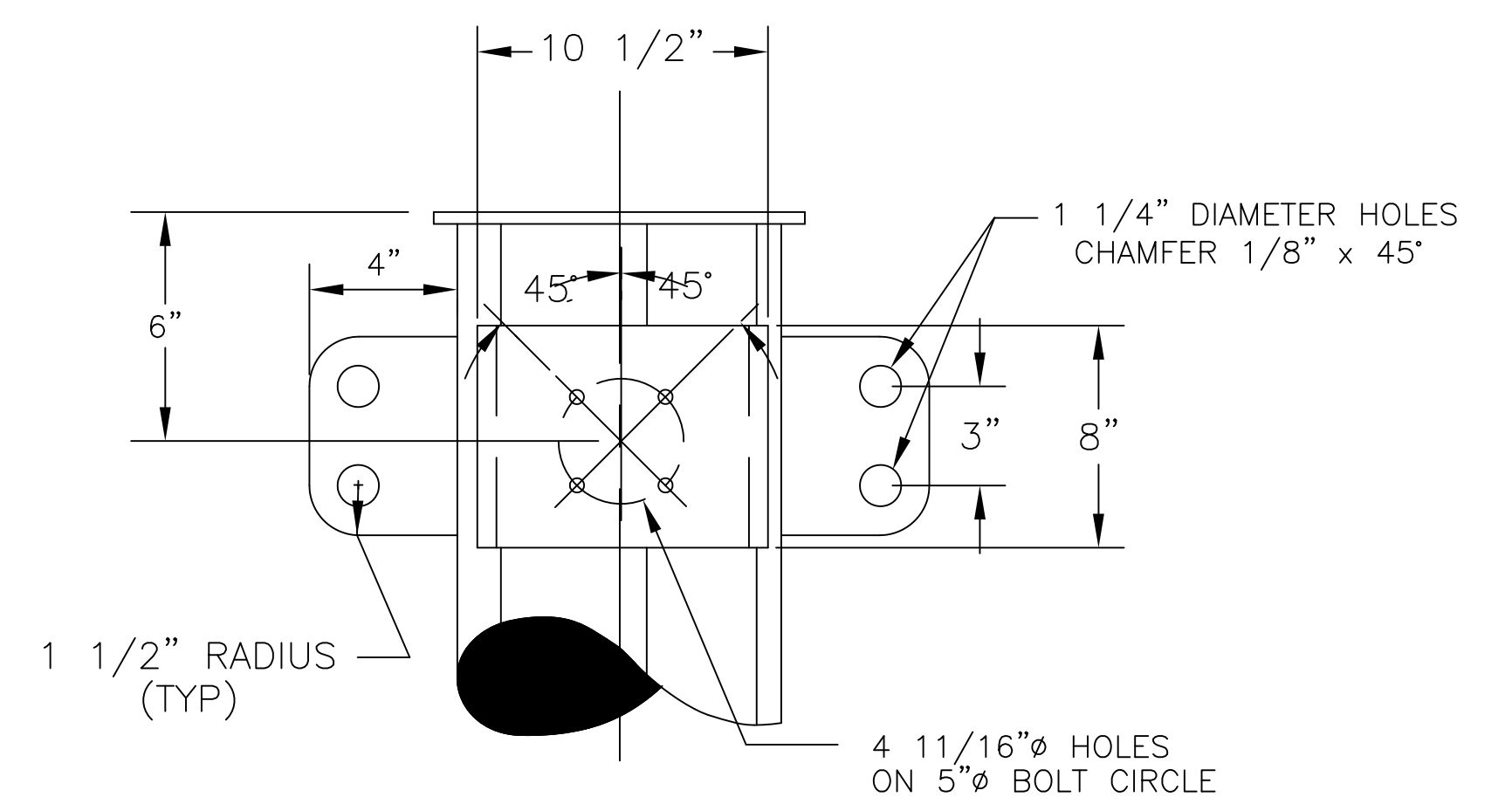
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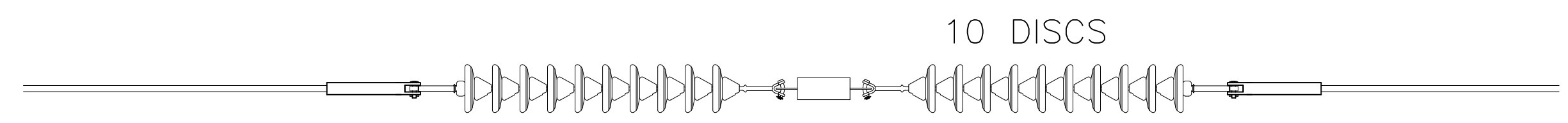
SECTION A-A
POLE CAP
(TYPICAL 2 LOCATIONS)



SECTION B-B
CONDUCTOR ATTACHMENT PLATE
AND POST INSULATOR ATTACHMENT
PLATE
(TYPICAL 3 LOCATIONS)



SECTION C-C
CONDUCTOR ATTACHMENT PLATE AND POST
INSULATOR ATTACHMENT PLATE
(TYPICAL 3 LOCATIONS)



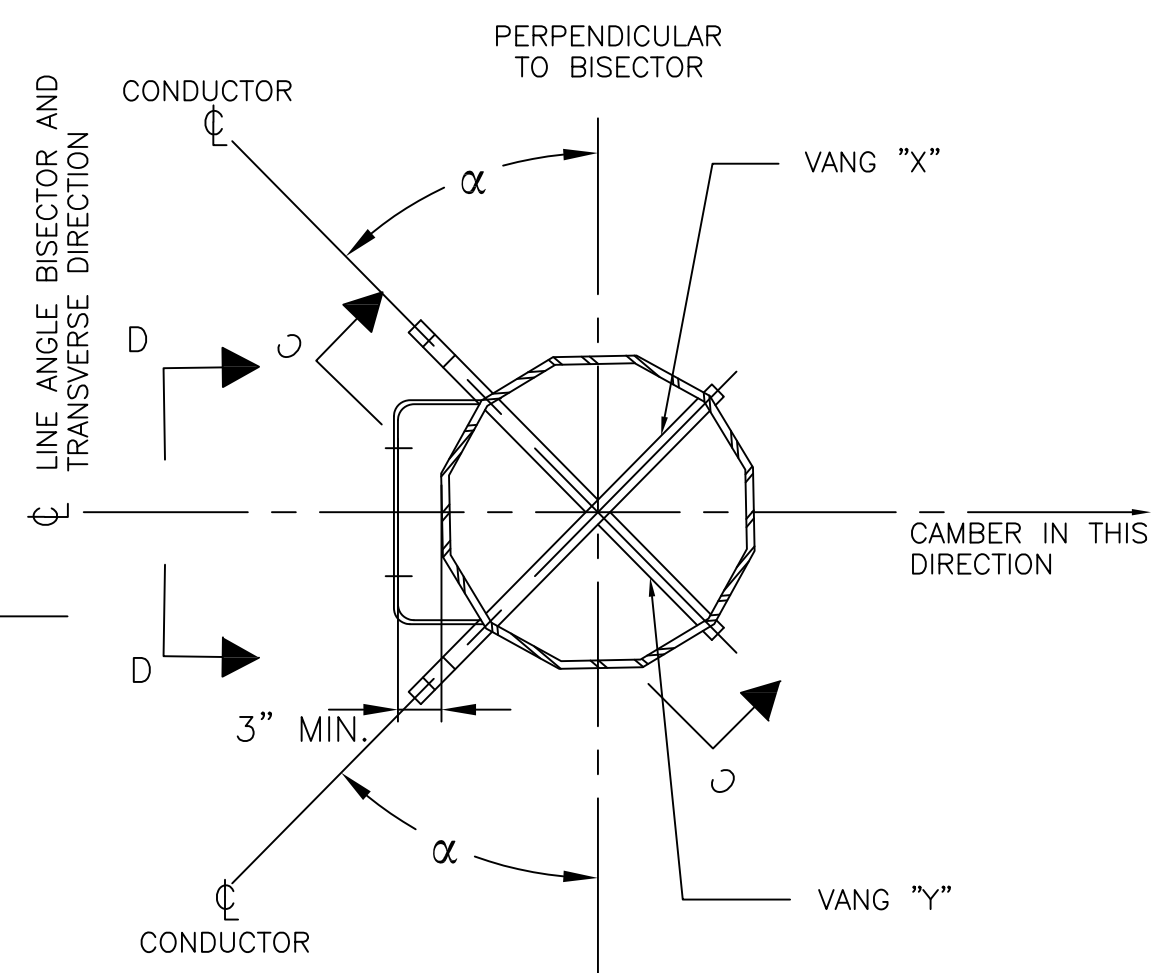
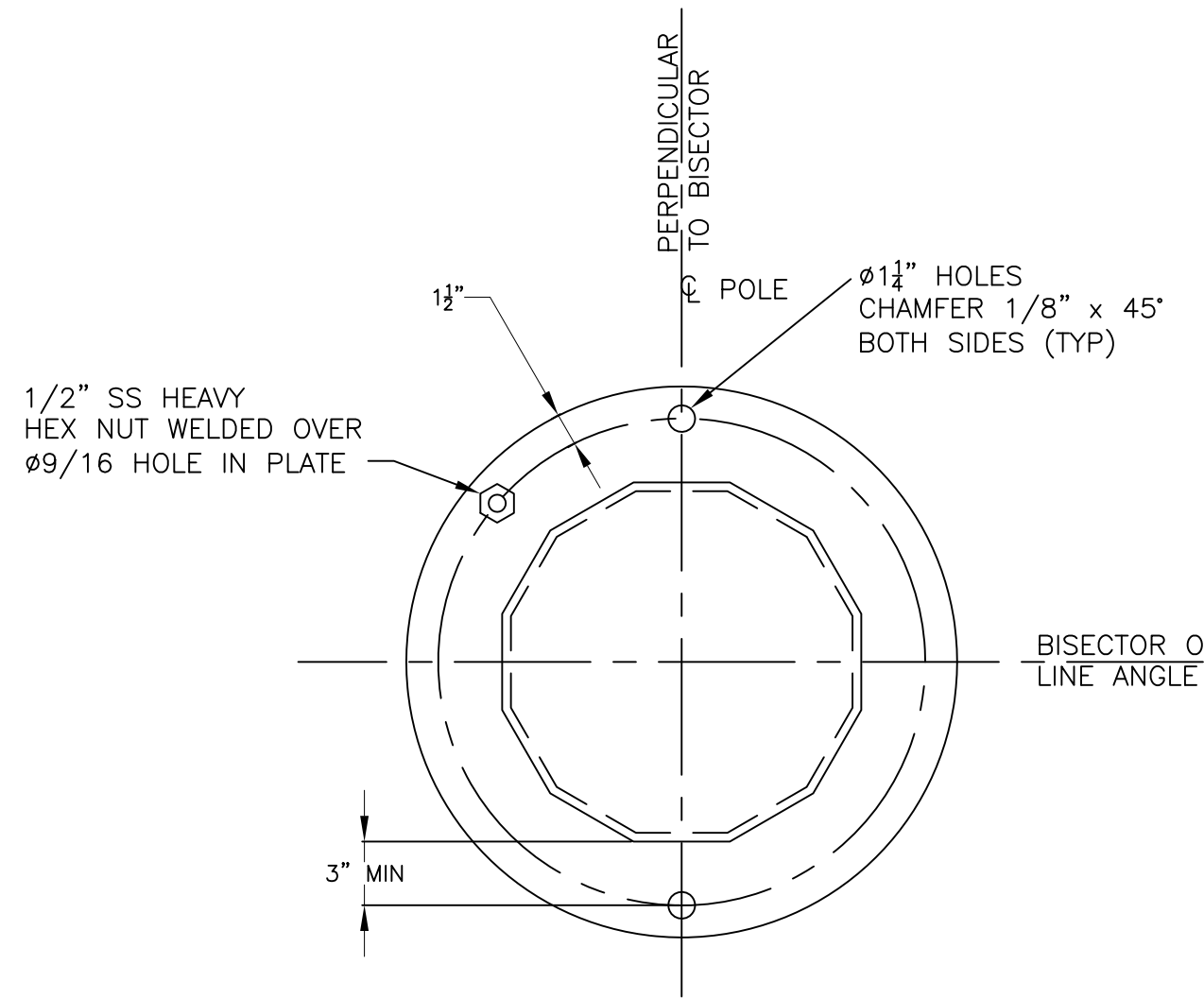
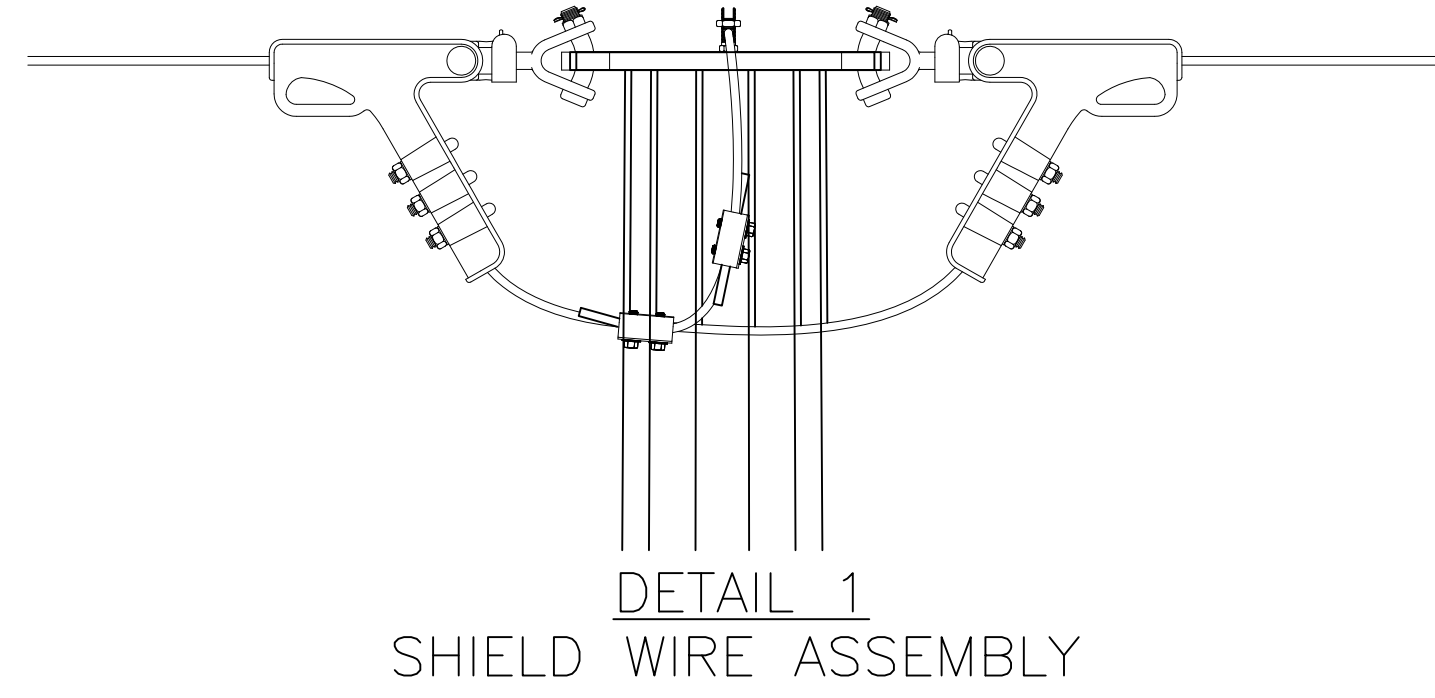
SECTION D-D
CONDUCTOR HARDWARE ASSEMBLY

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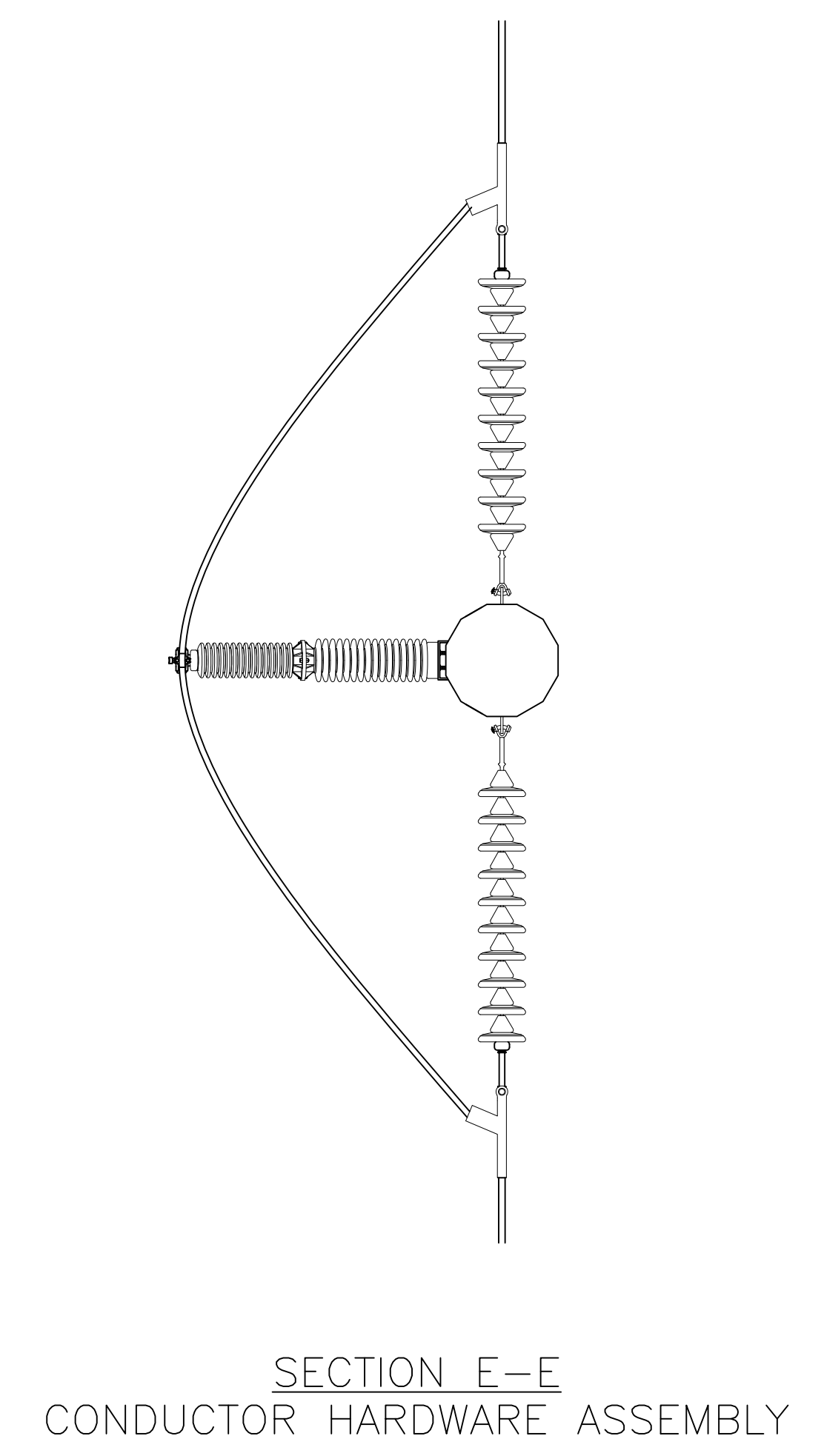
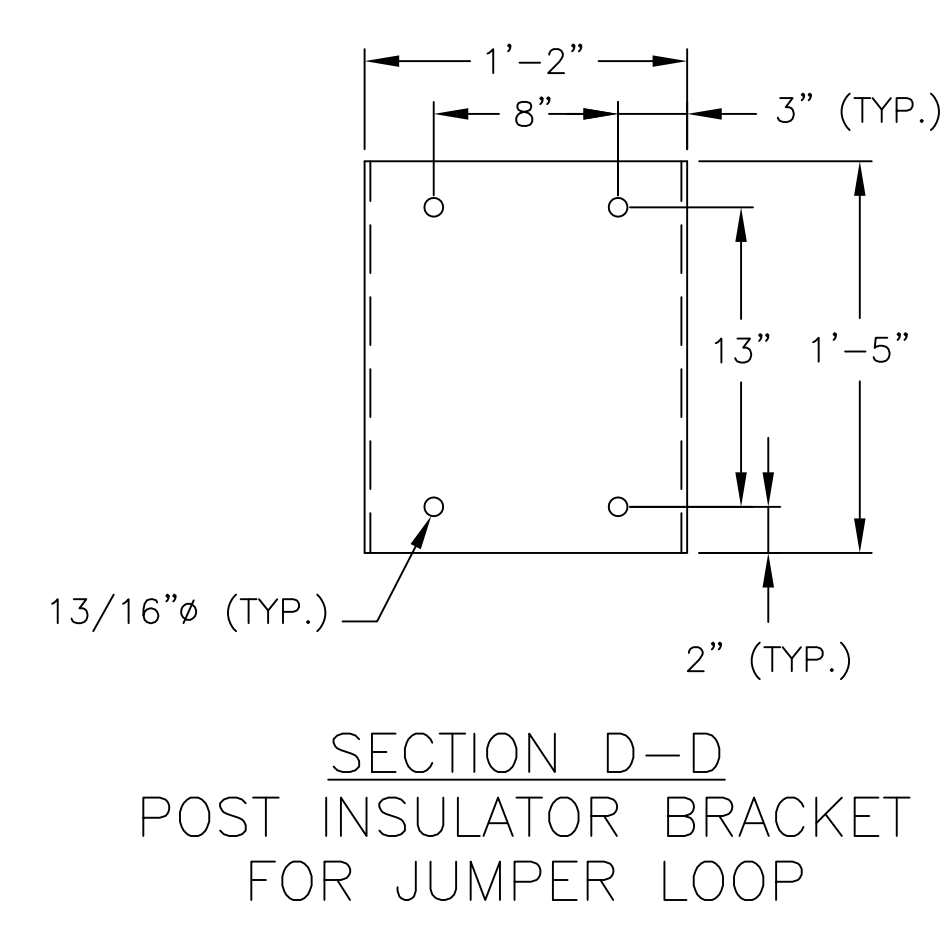
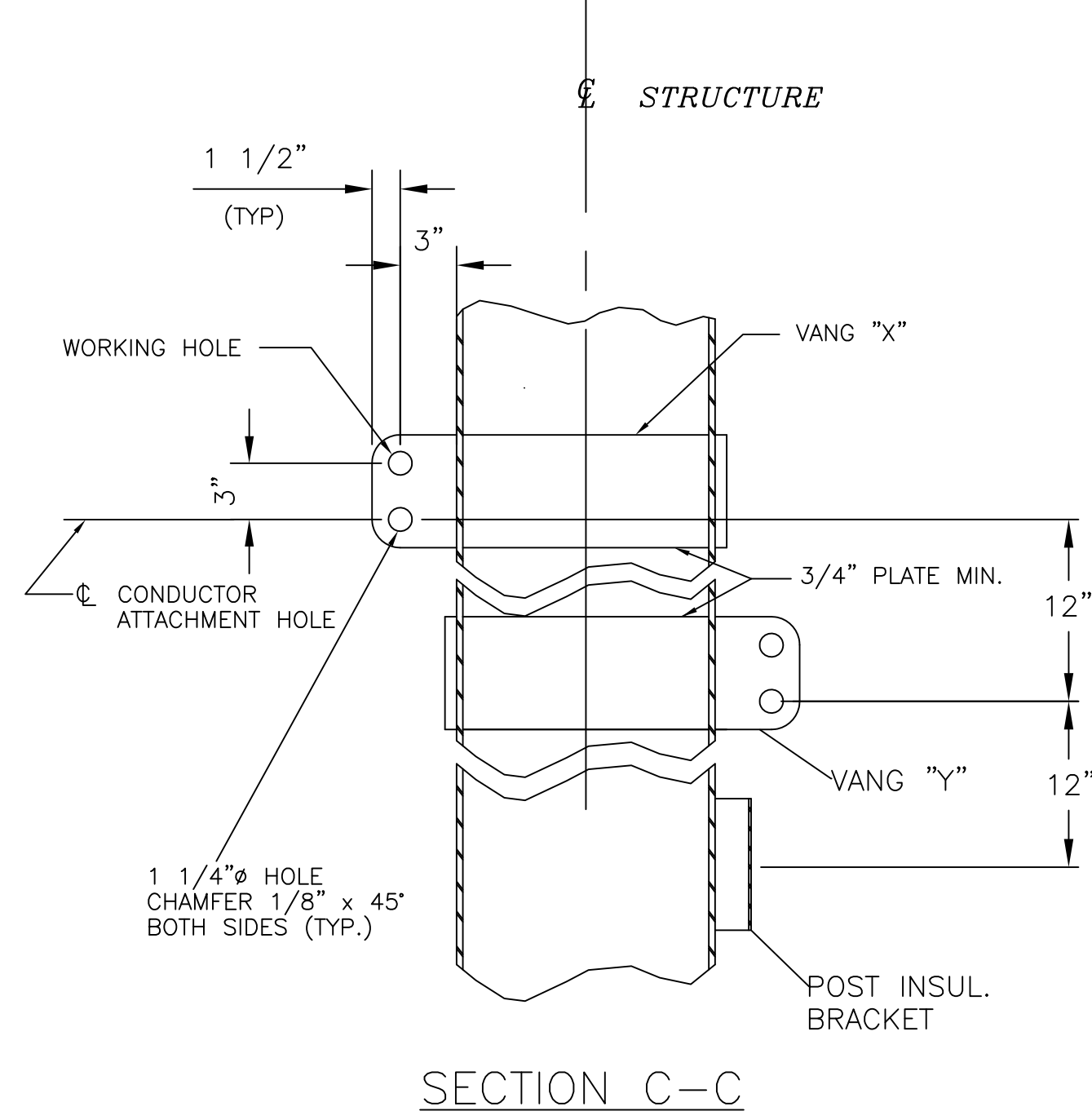
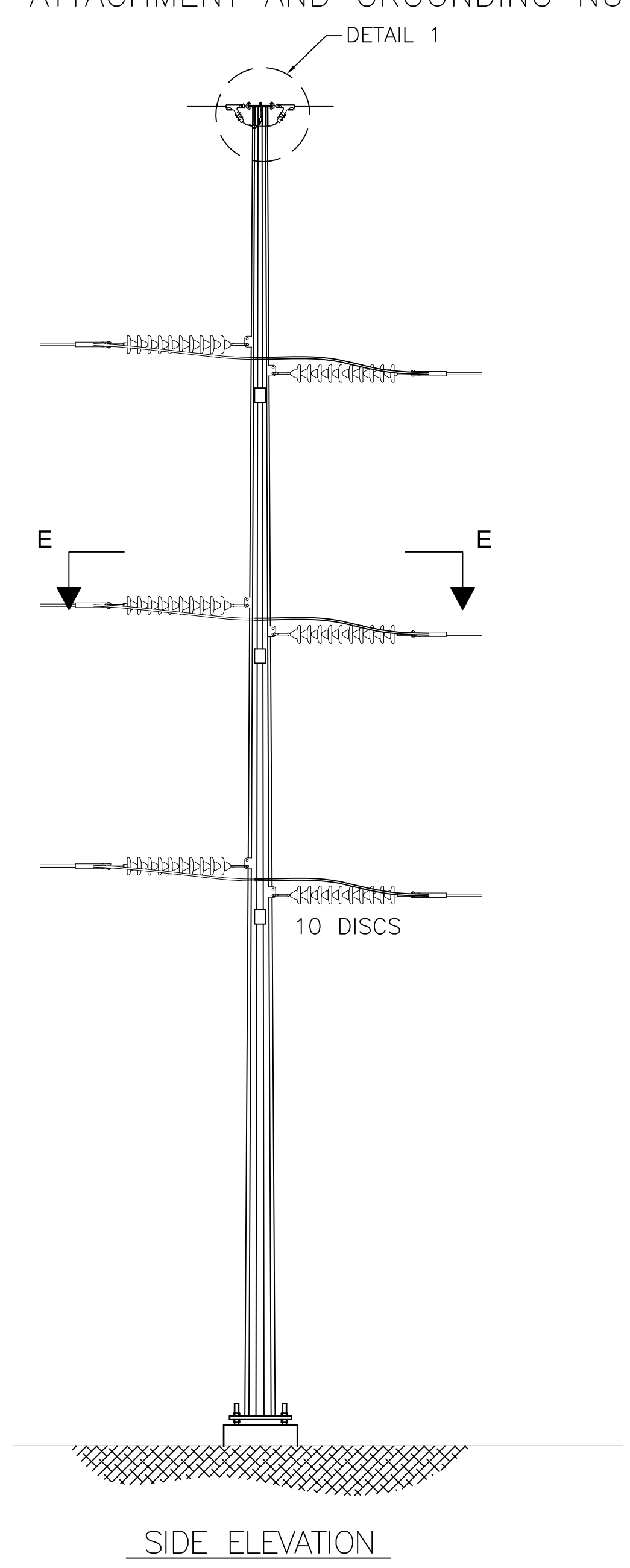
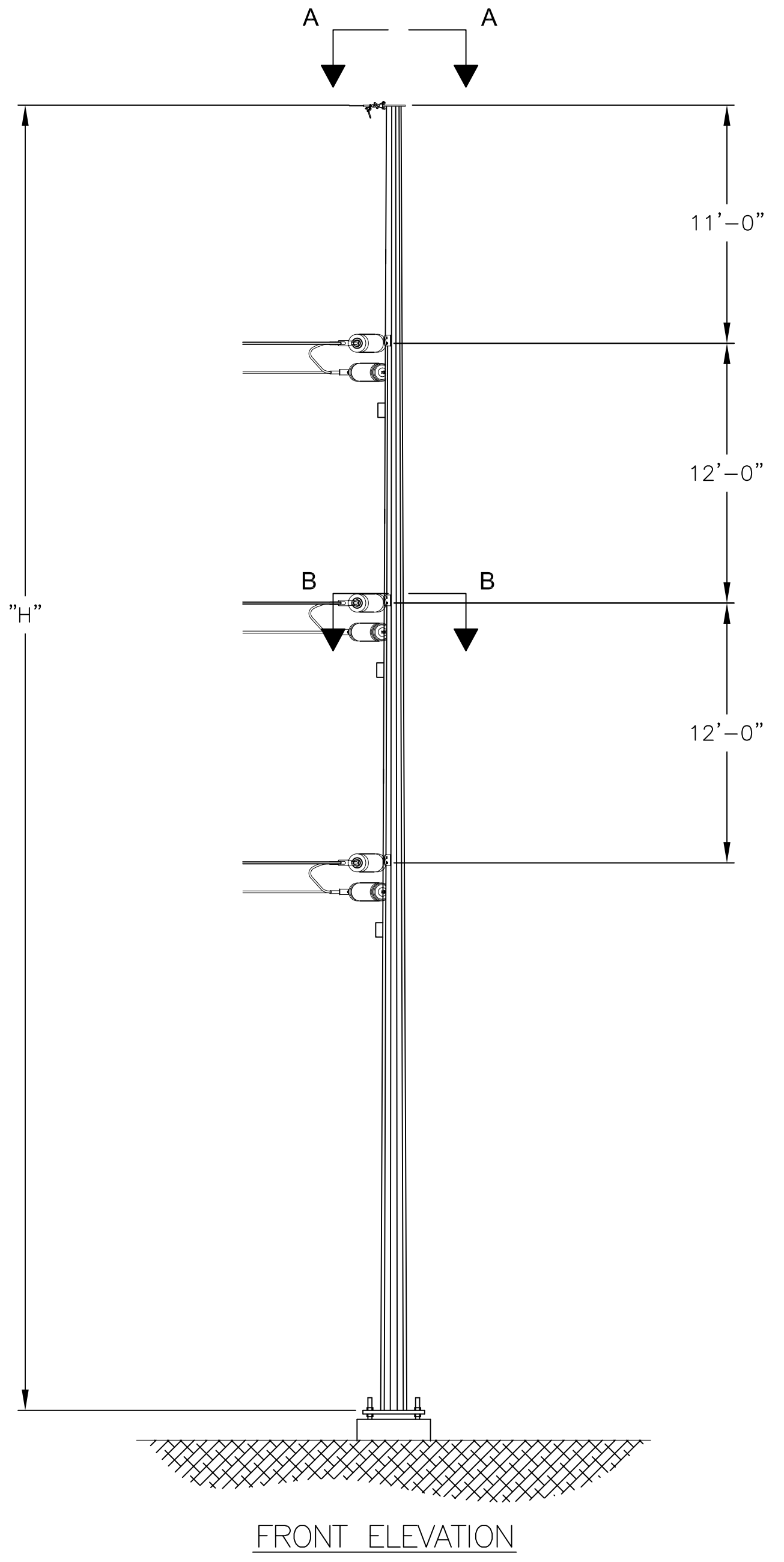
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<p>nationalgrid</p>		<p>PREPARED BY: RAM 1/30/15</p> <p>REVIEWED BY: FTX 1/30/15</p> <p>APPROVED BY: NPA 1/30/15</p> <p>SCALE: N.T.S.</p> <p>SHEET: 1 OF 1</p> <p>INDEX:</p>
<p>SCOBIE POND - TEWKSBURY</p> <p>115KV REPLACEMENT STRUCTURE</p> <p>SINGLE CIRCUIT Y151 LINE</p> <p>STEEL H-FRAME DEADEND SINGLE INSULATOR STRING</p>	<p>VERSION DESCRIPTION</p> <p>1 01/30/15 NHSEC PERMIT FILING</p>	<p>DATE</p> <p>1 01/30/15</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p>

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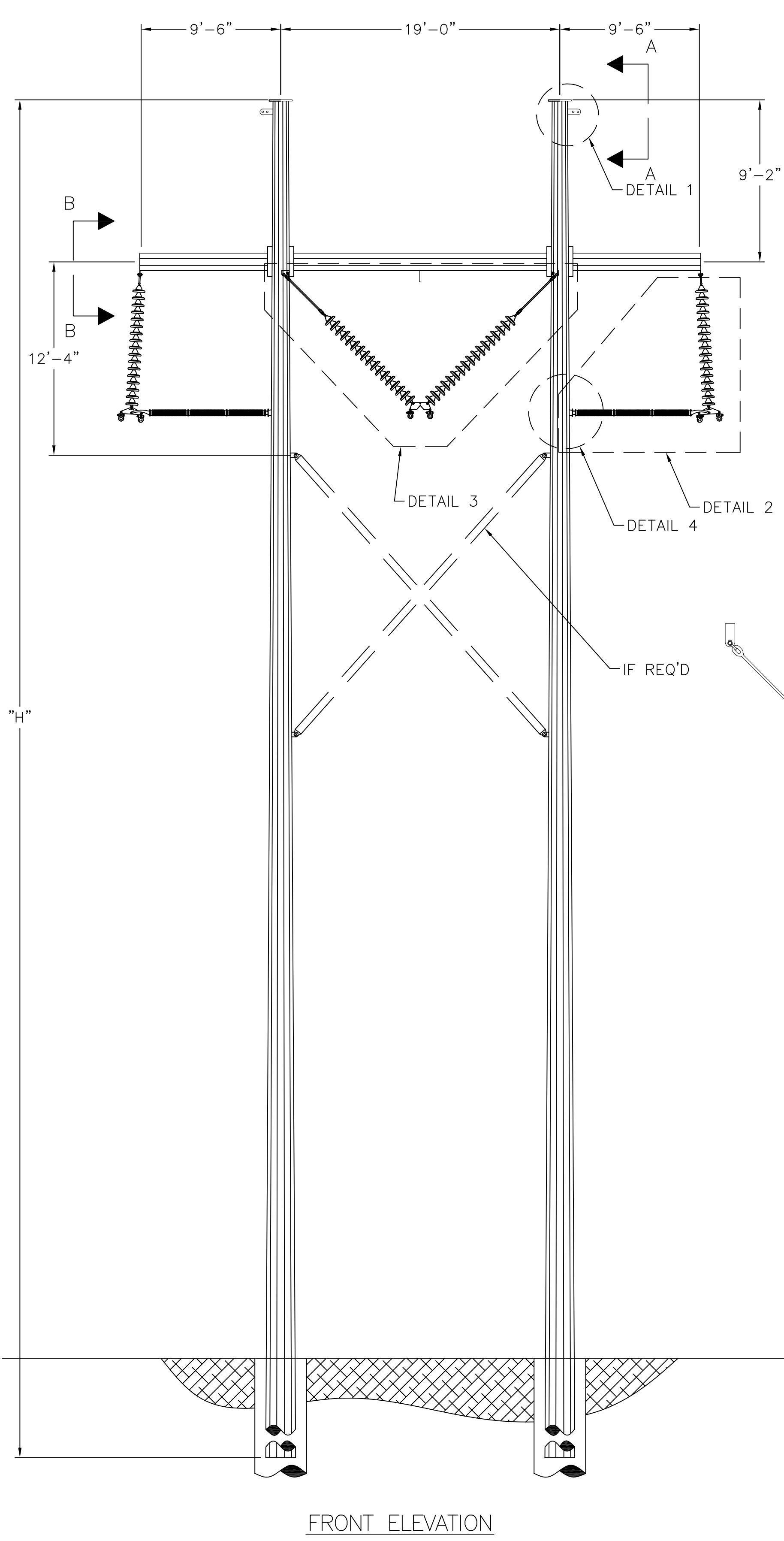
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SCOBIE POND - TEWKSBURY
115KV REPLACEMENT STRUCTURE
SINGLE CIRCUIT Y151 LINE
STEEL SINGLE POLE - SINGLE INS. STRING

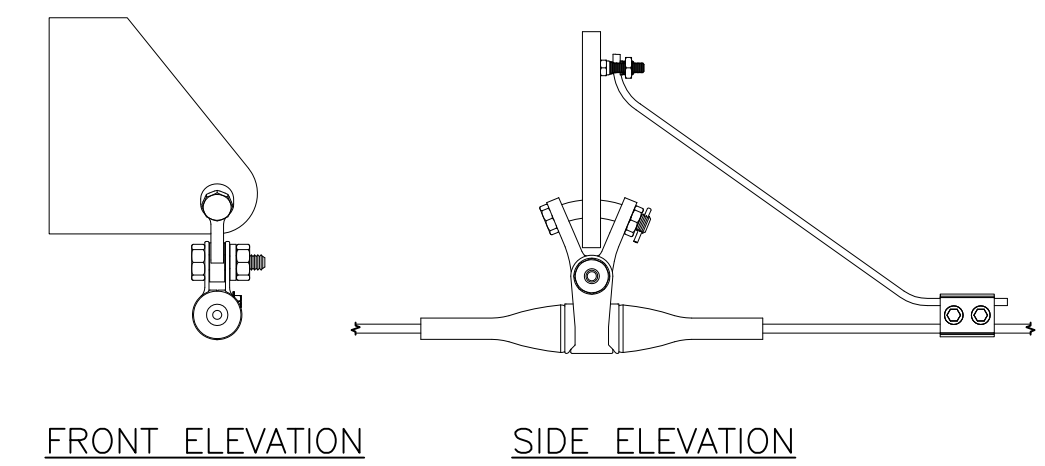
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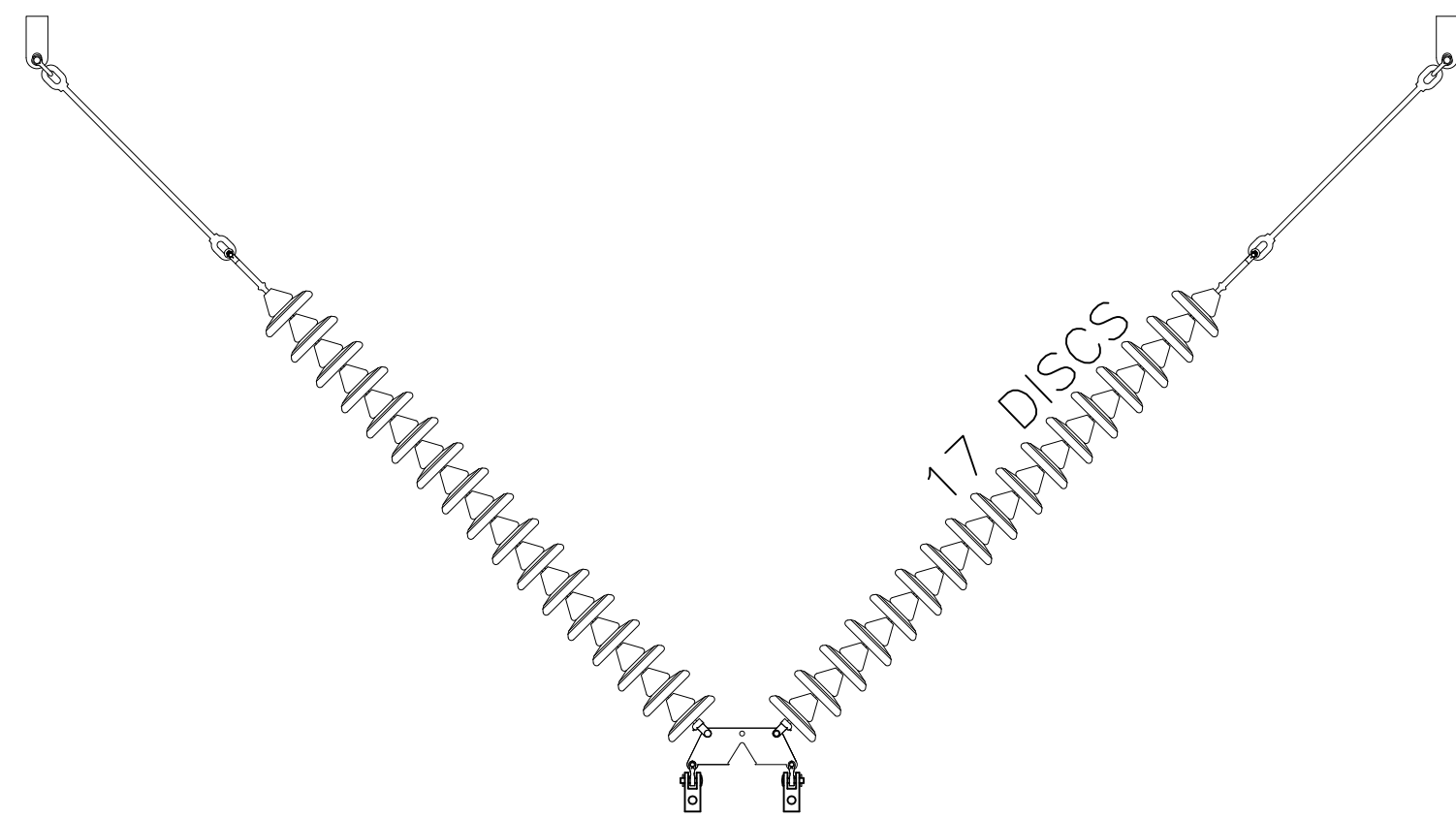


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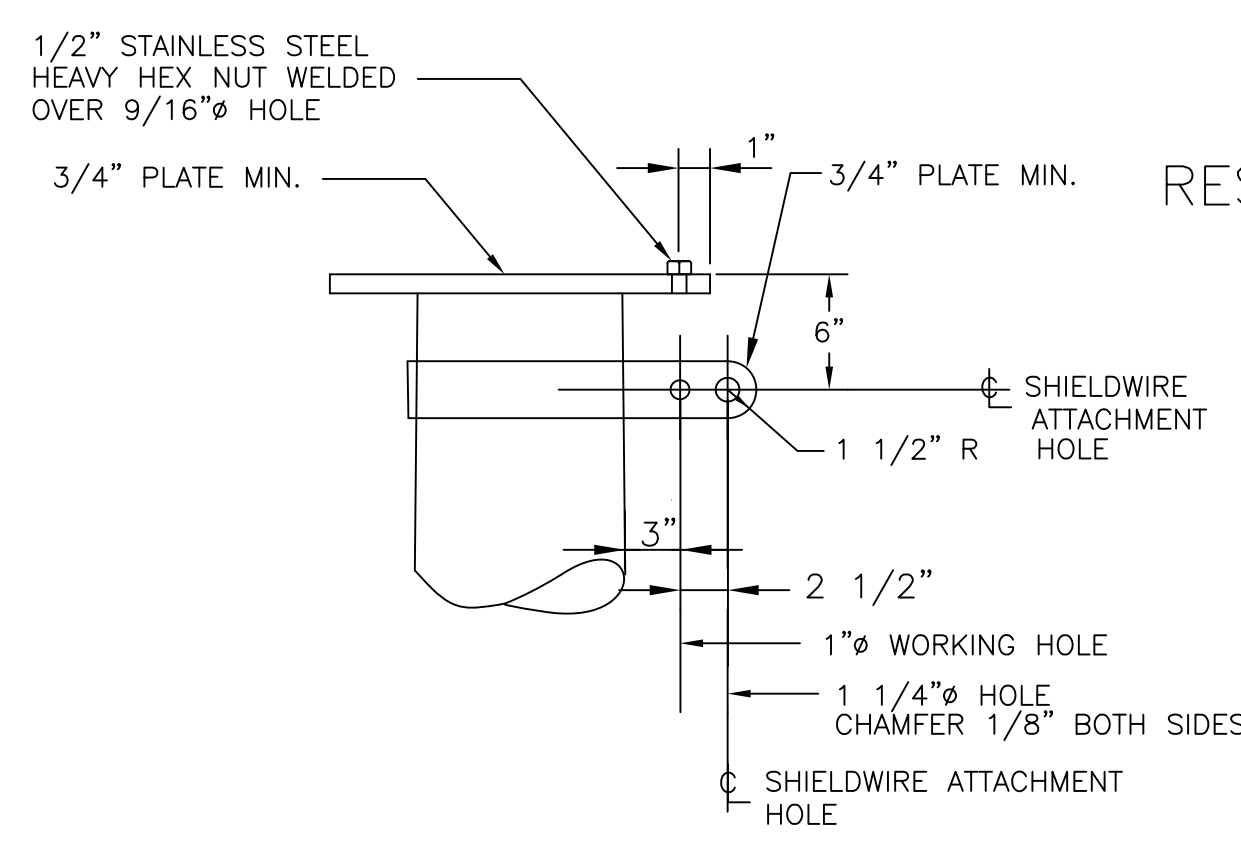
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DETAIL 1
SHIELD WIRE ASSEMBLY
(TYPICAL 2 PLACES)

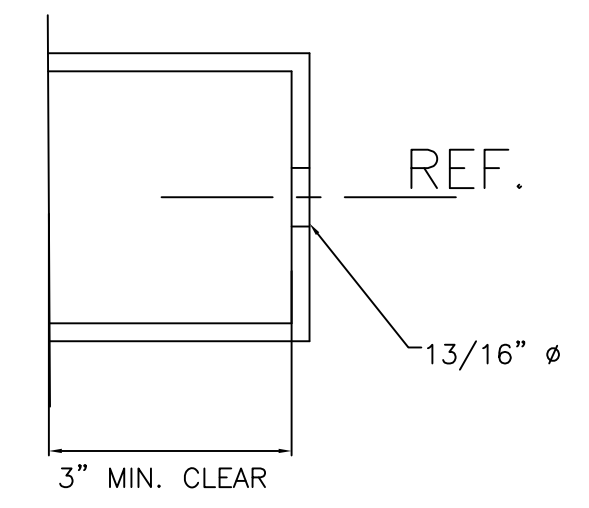


DETAIL 2
RESTRAINED SUSPENSION
INSULATOR
SINGLE STRING
(TYPICAL 3 PLACES)

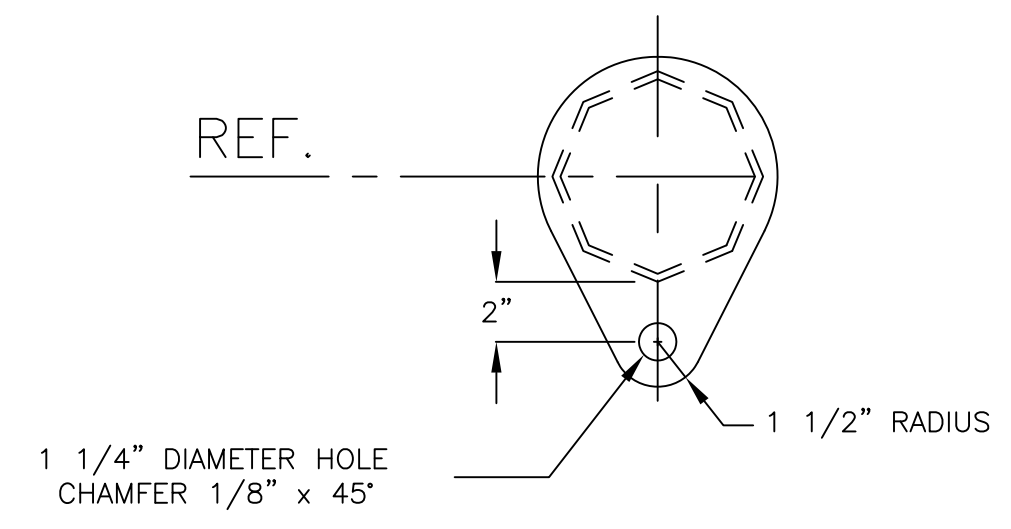
DETAIL 3
RESTRAINED SUSPENSION
INSULATOR
SINGLE STRING - VEE STRING



SECTION A-A
SHIELD WIRE SUSPENSION VANG
(TYPICAL 2 PLACES)



DETAIL 4
STRUT INSULATOR CLIP
(TYPICAL 3 LOCATIONS -
RESTRAINED SUSPENSION ONLY)



SECTION B-B
CONDUCTOR SUSPENSION VANG
(TYPICAL 3 PLACES)

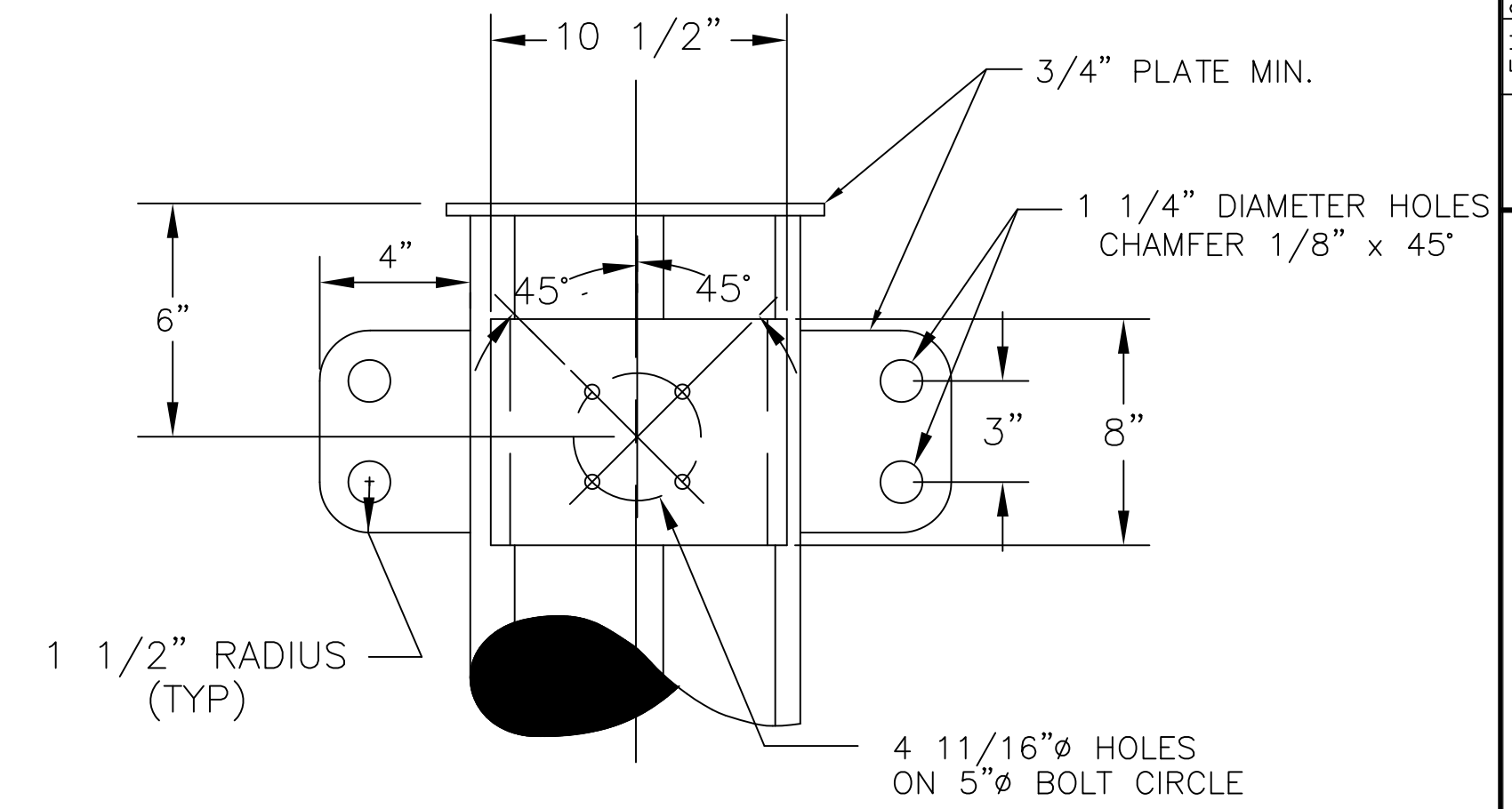
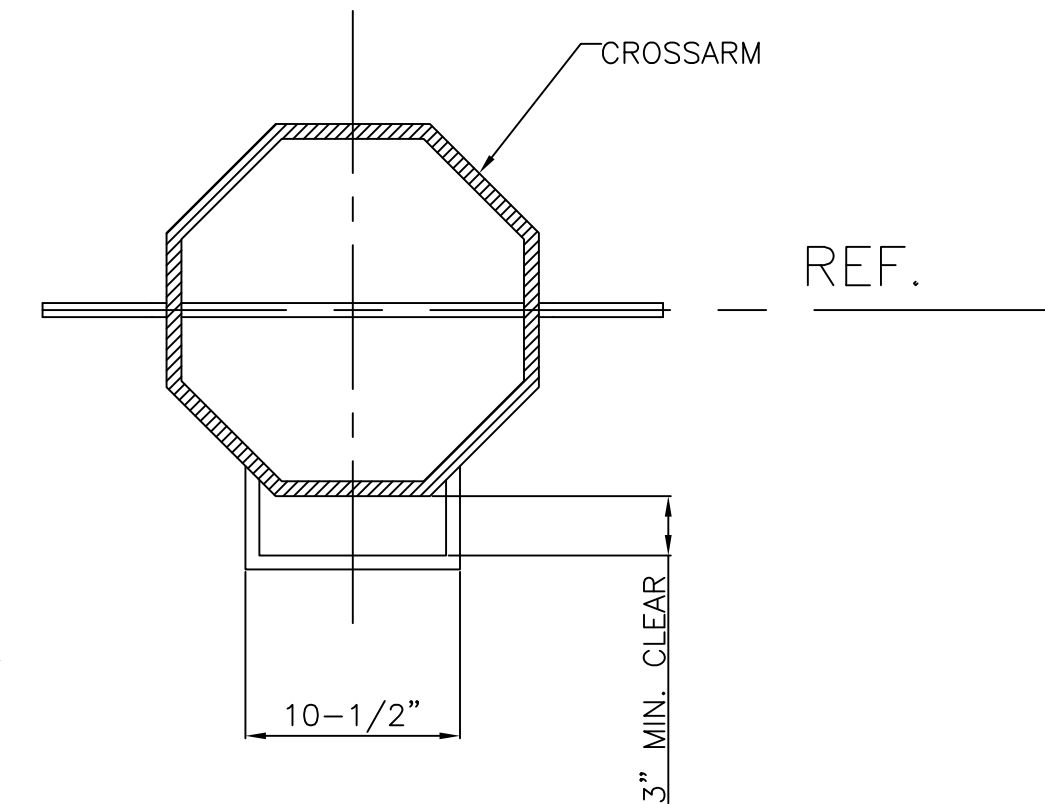
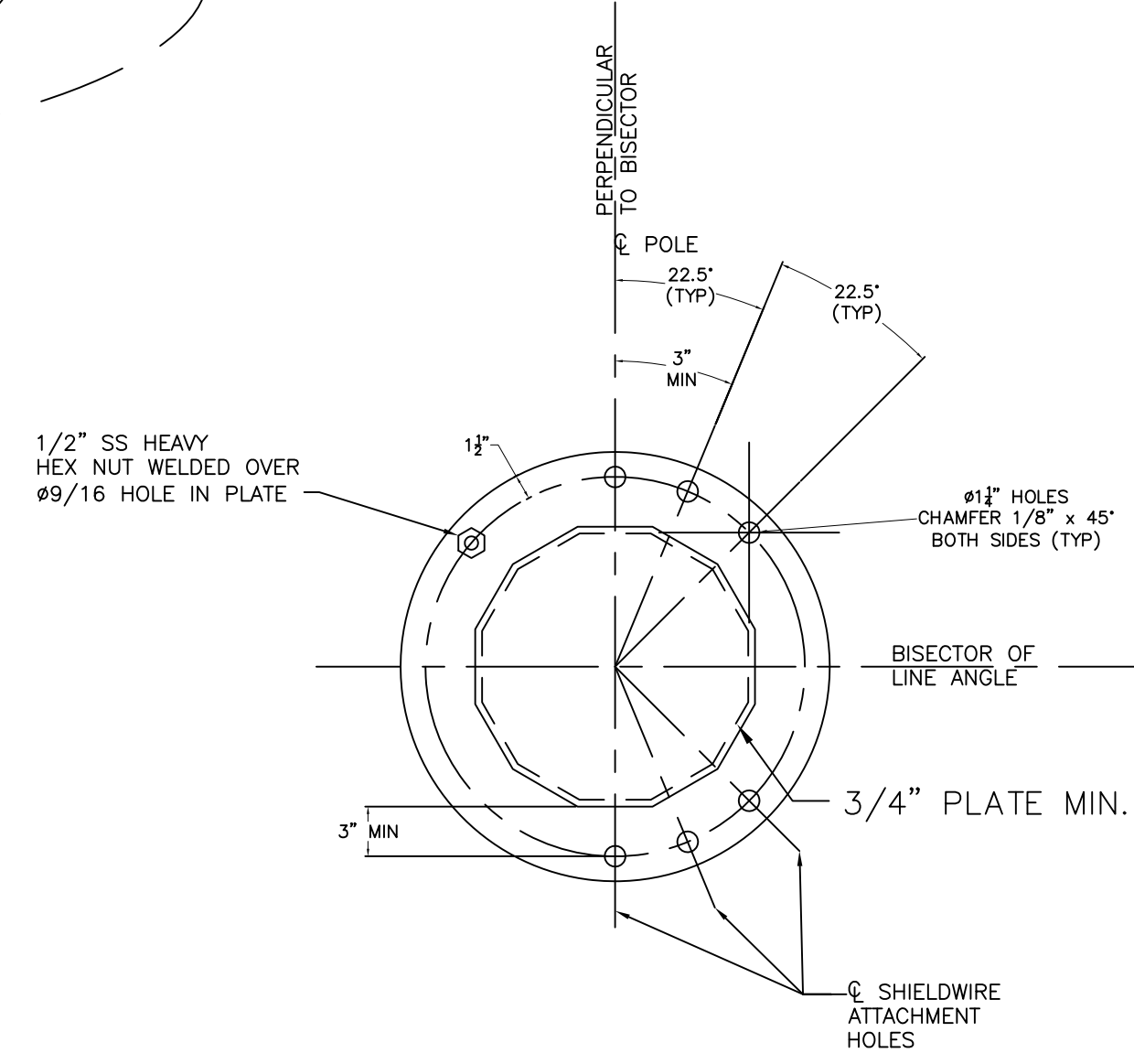
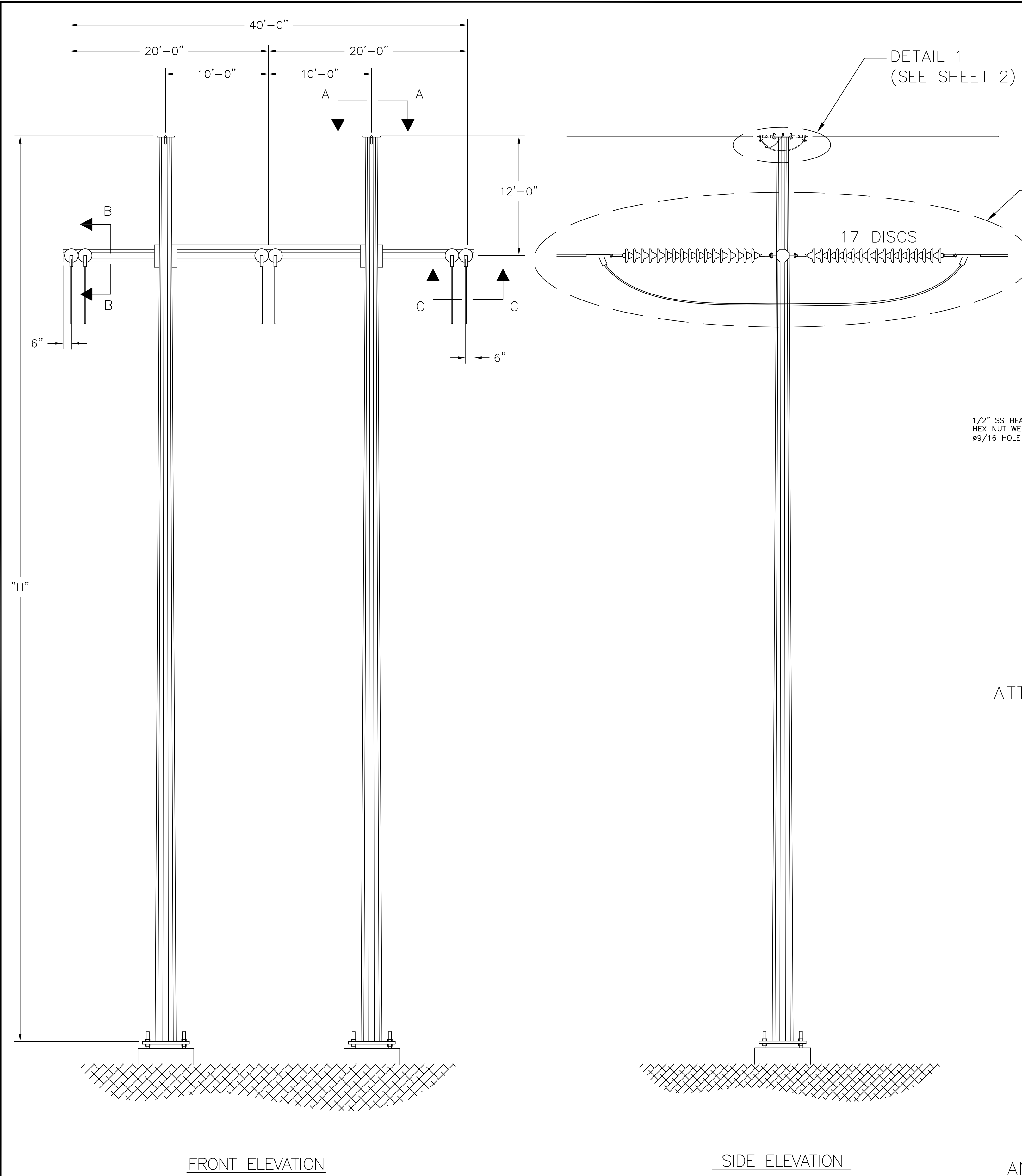
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REVIEWED BY		FTX	9/19/14
APPROVED BY		NPA	9/19/14
SCALE	N.T.S.	SHEET	1 OF 1
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SCOBIE POND - TEWKSBURY
345KV NEW STRUCTURE
SINGLE CIRCUIT 3124 LINE STEEL
H-FRAME SUSPENSION - RESTRAINED
INSULATOR ASSEMBLY

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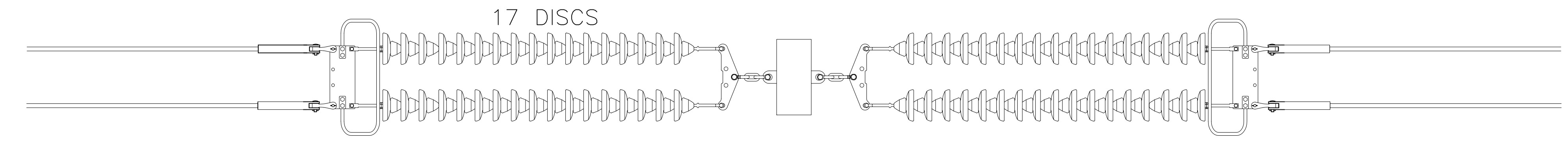
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PREPARED BY: EJJ 9/19/14 REVIEWED BY: FTX 9/19/14 APPROVED BY: NPA 9/19/14 SCALE: N.T.S. SHEET: 1 OF 2 INDEX: 400298		nationalgrid
DATE: 9/19/14 ISSUED FOR: SCOPE DOCUMENT	VERSION DESCRIPTION: 1 EJJ FTX INPA	
SCOBIE POND - TEWKSBURY 345KV NEW STRUCTURE SINGLE CIRCUIT 3124 LINE STEEL H-FRAME DEADEND (0 TO 10) DOUBLE INSULATOR ASSEMBLY		

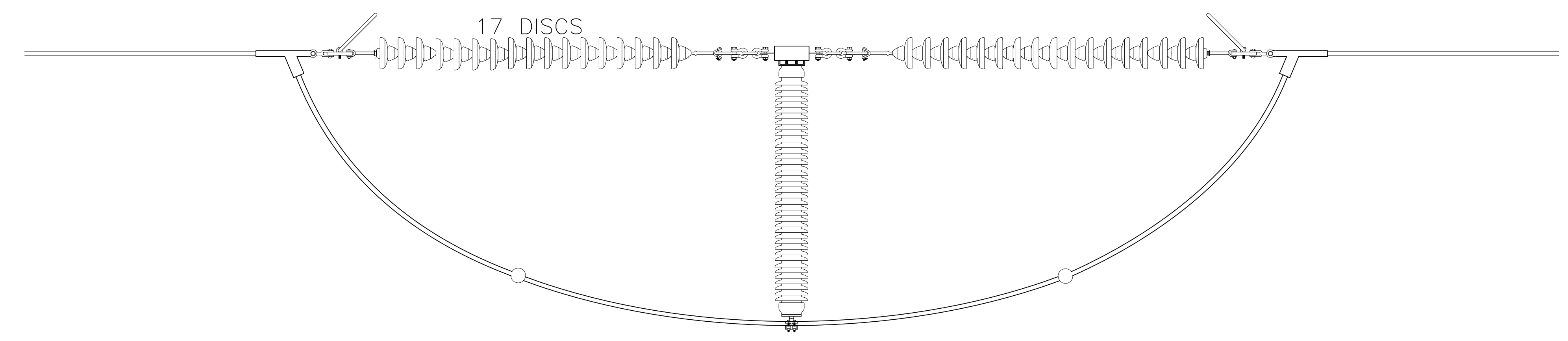
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DETAIL 1
SHIELD WIRE ASSEMBLY
(TYPICAL 2 PLACES)



DETAIL 2
CONDUCTOR HARDWARE
ASSEMBLY
(TYPICAL 2 PLACES)

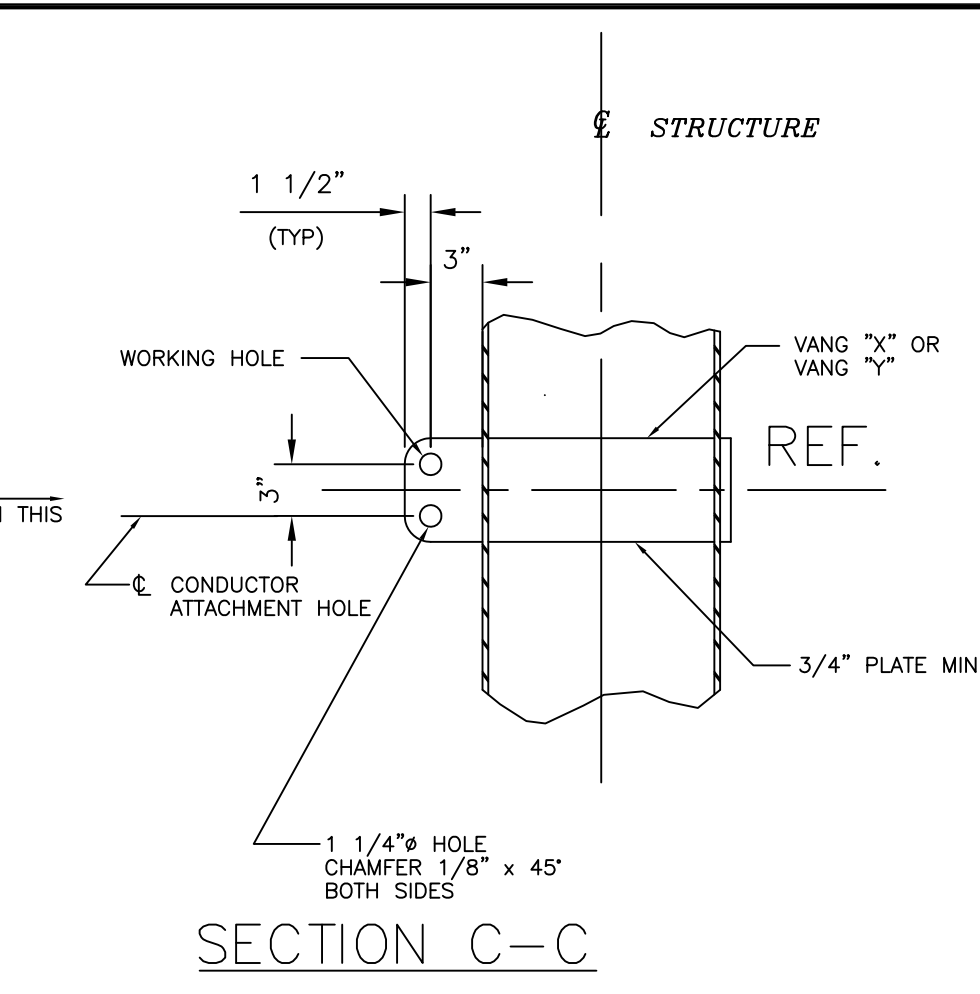
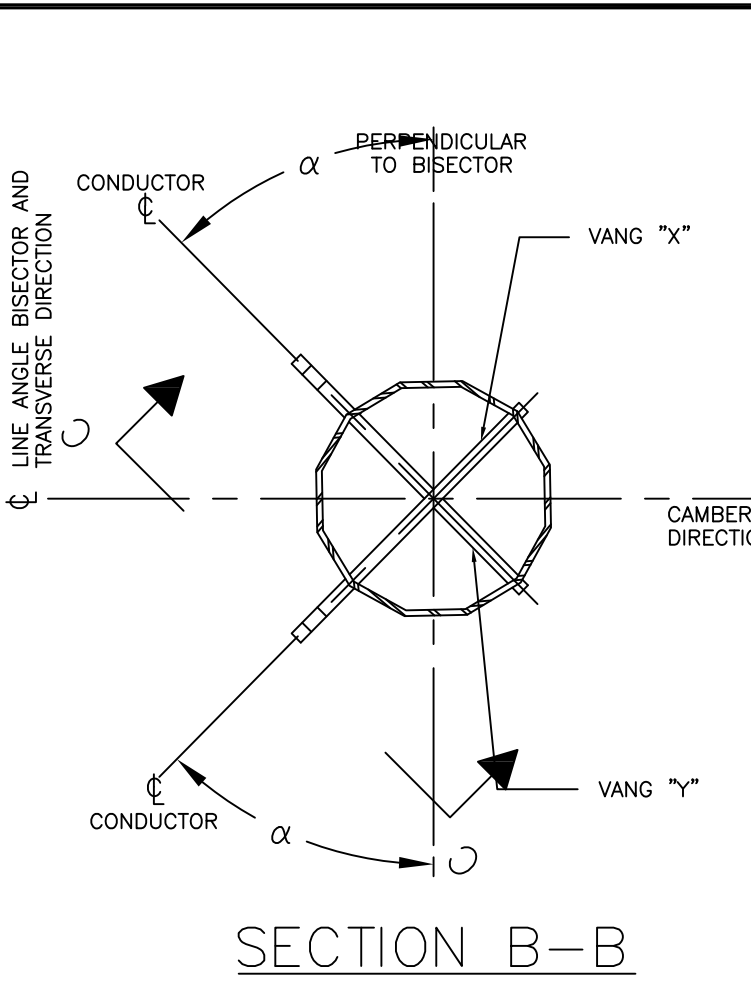
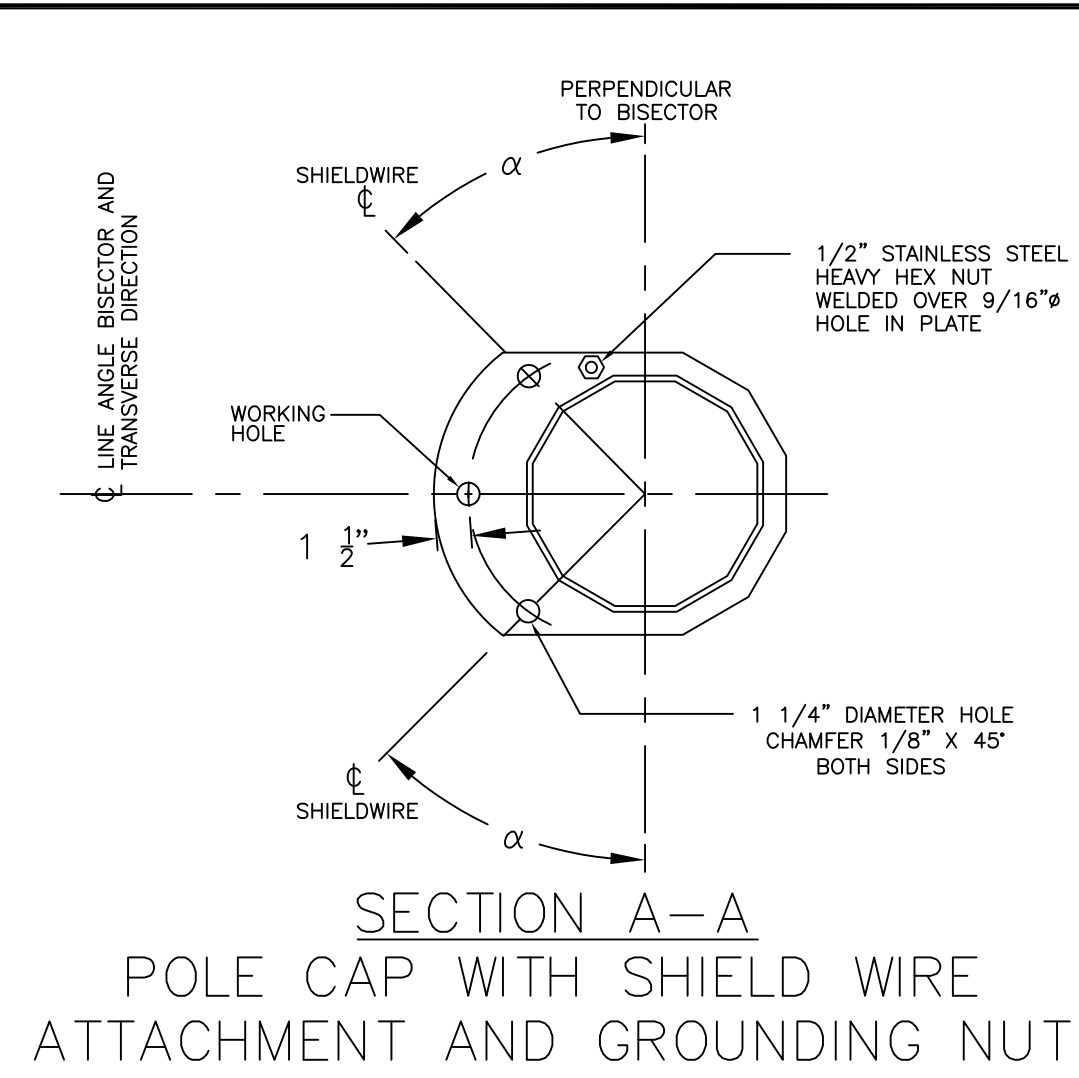
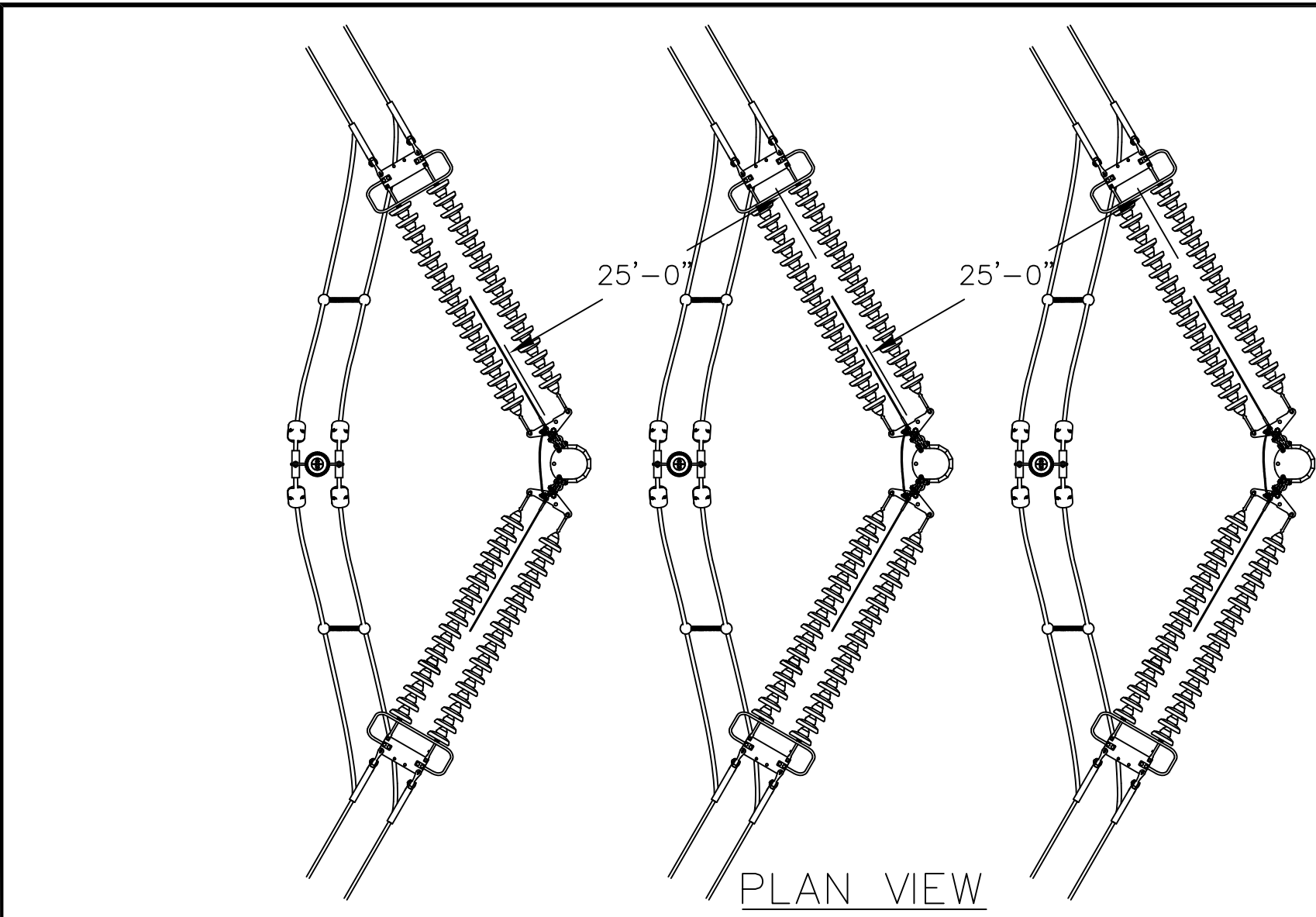


NOTES:
1. GENERAL NOTES AS PER SHEET 1.

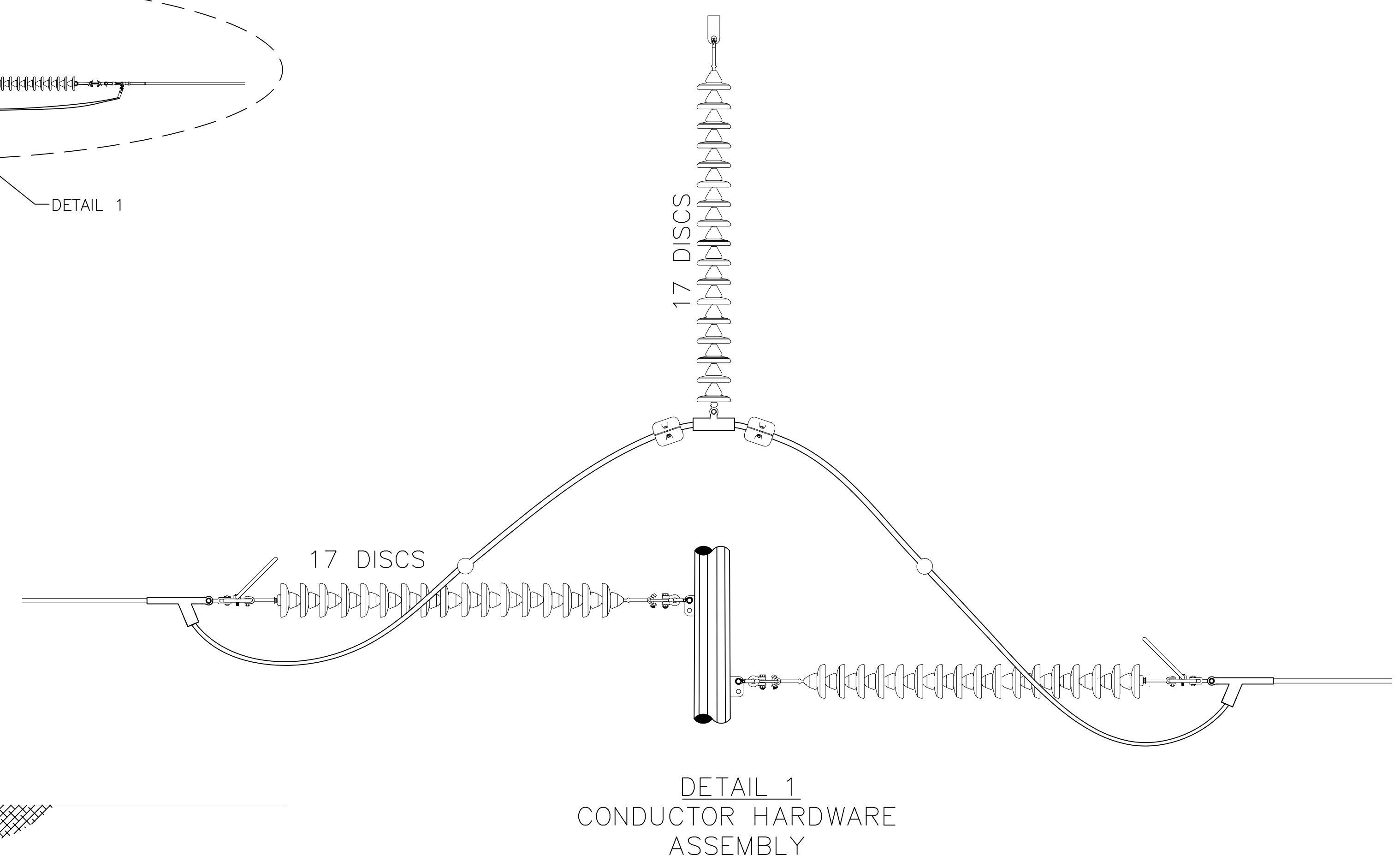
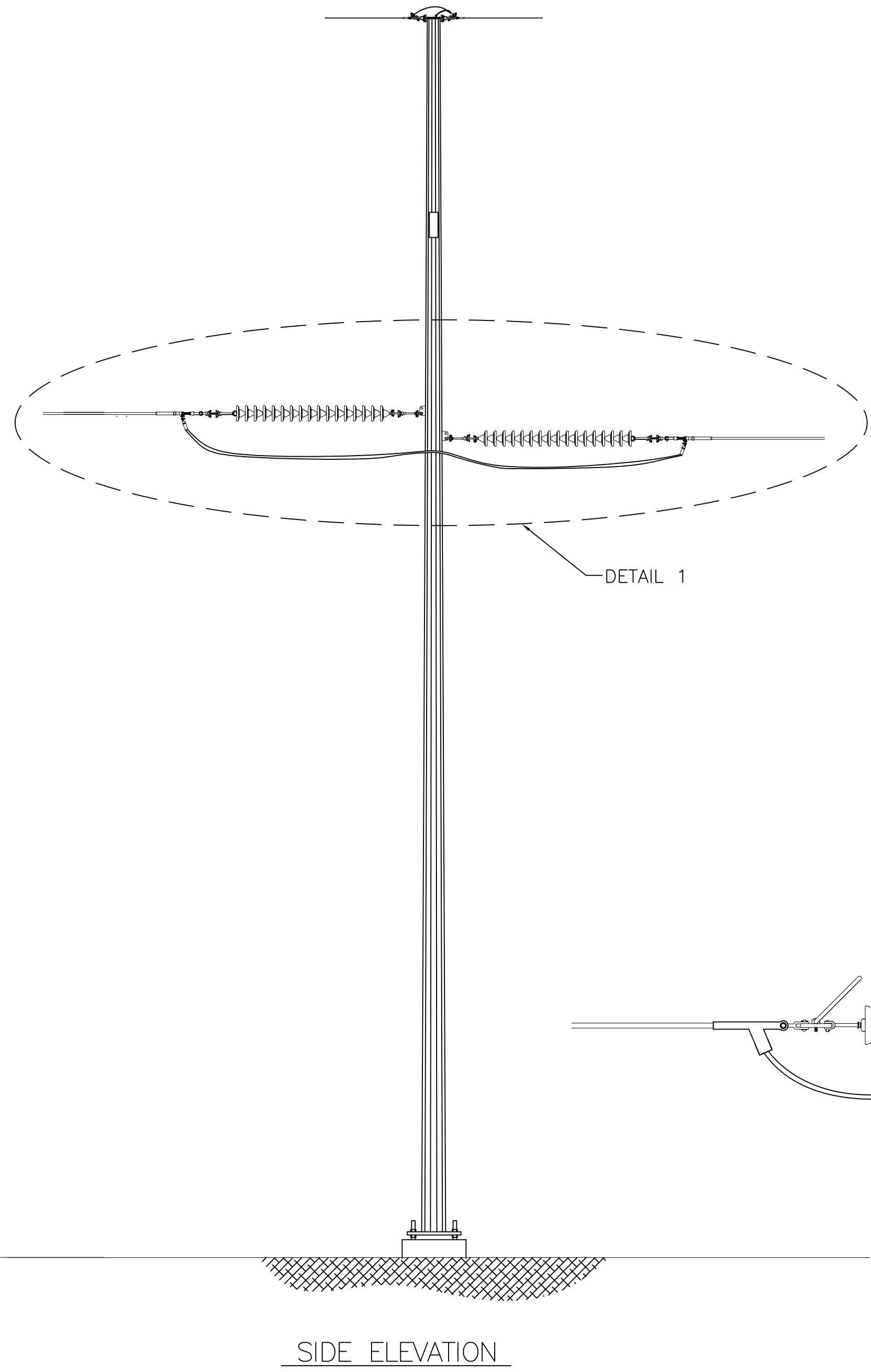
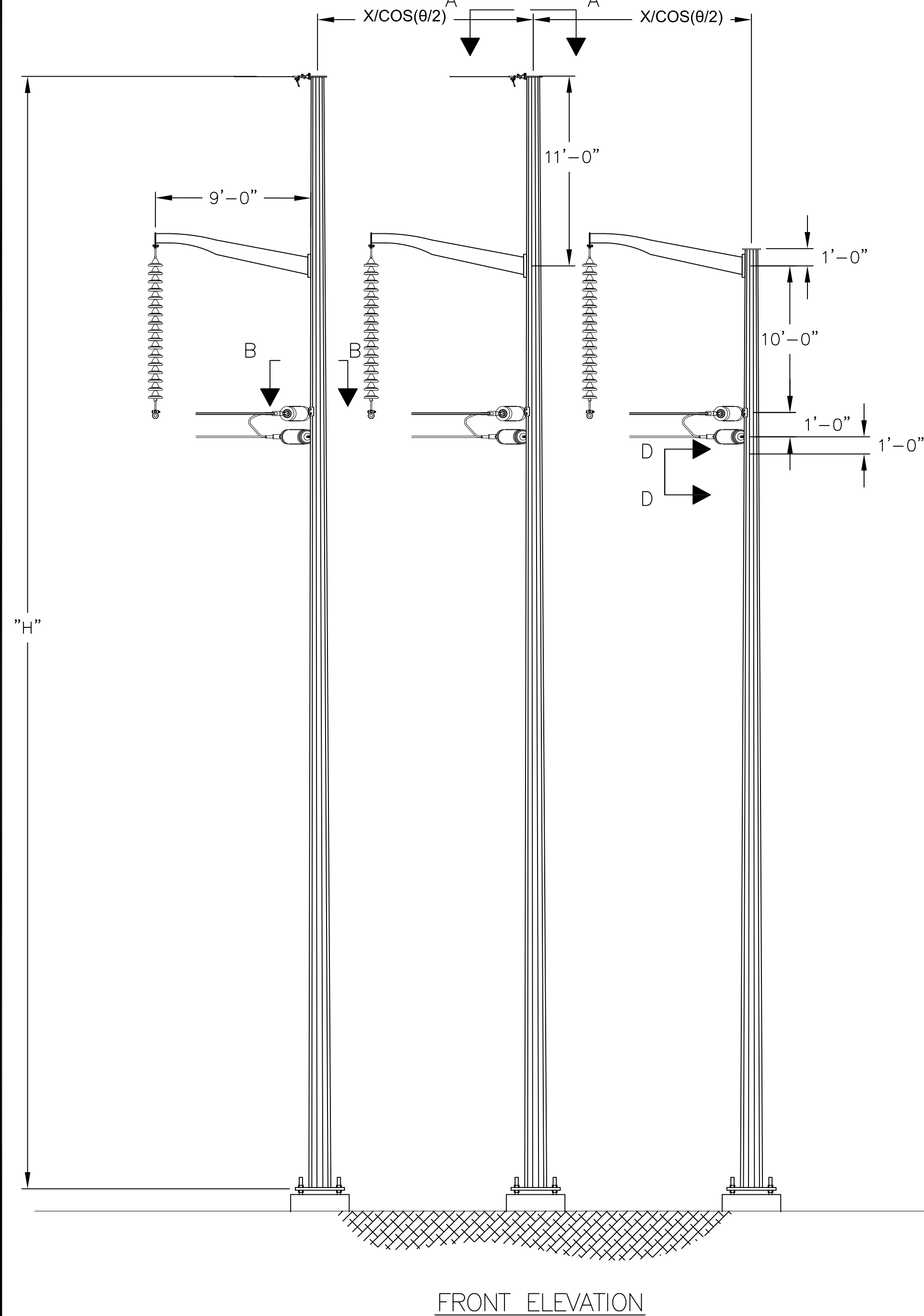
INCHES ON ORIGINAL

PREPARED BY: EJJ 9/19/14 REVIEWED BY: FTX 9/19/14 APPROVED BY: NPA 9/19/14 SCALE: N.T.S. SHEET: 2 OF 2 INDEX: 400298		nationalgrid	
SCOBIE POND - TEWKSBURY 345KV NEW STRUCTURE SINGLE CIRCUIT 3124 LINE STEEL H-FRAME DEADEND (0 TO 10) DOUBLE INSULATOR ASSEMBLY		ISSUED FOR SCOPE DOCUMENT DATE: 9/19/14 VER: 1 2 3 4 5 6 7	
		VERSION DESCRIPTION EJJ FTX INPA VERSION: 1	

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- NOTES:
1. REFER TO WORK LIST FOR POLE HEIGHT.
 2. SEE SPECIFICATION SP.06.01.301.101 FOR STRUCTURE GROUNDING DETAILS.
 3. SEE SPECIFICATION SP.06.01.301.201 FOR STRUCTURE NUMBERING AND WARNING SIGNS REQUIRED FOR ALL STRUCTURES.
 4. STEEL POLE MANUFACTURER DRAWINGS TO SUPERCEDE CONCEPT DRAWINGS AND WILL BE ISSUED FOR CONSTRUCTION AS SOON AS THEY ARE AVAILABLE.



INCHES ON ORIGINAL

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REVIEWED BY	FTX	9/19/14			
APPROVED BY	NPA	9/19/14			
SCALE	N.T.S.				
SHEET	1	OF	1		
INDEX					

SCOBIE POND - TEWKSBURY
345KV NEW STRUCTURE
SINGLE CIRCUIT 3124 LINE STEEL
3 POLE DEADEND - DOUBLE INSULATOR ASSEMBLY

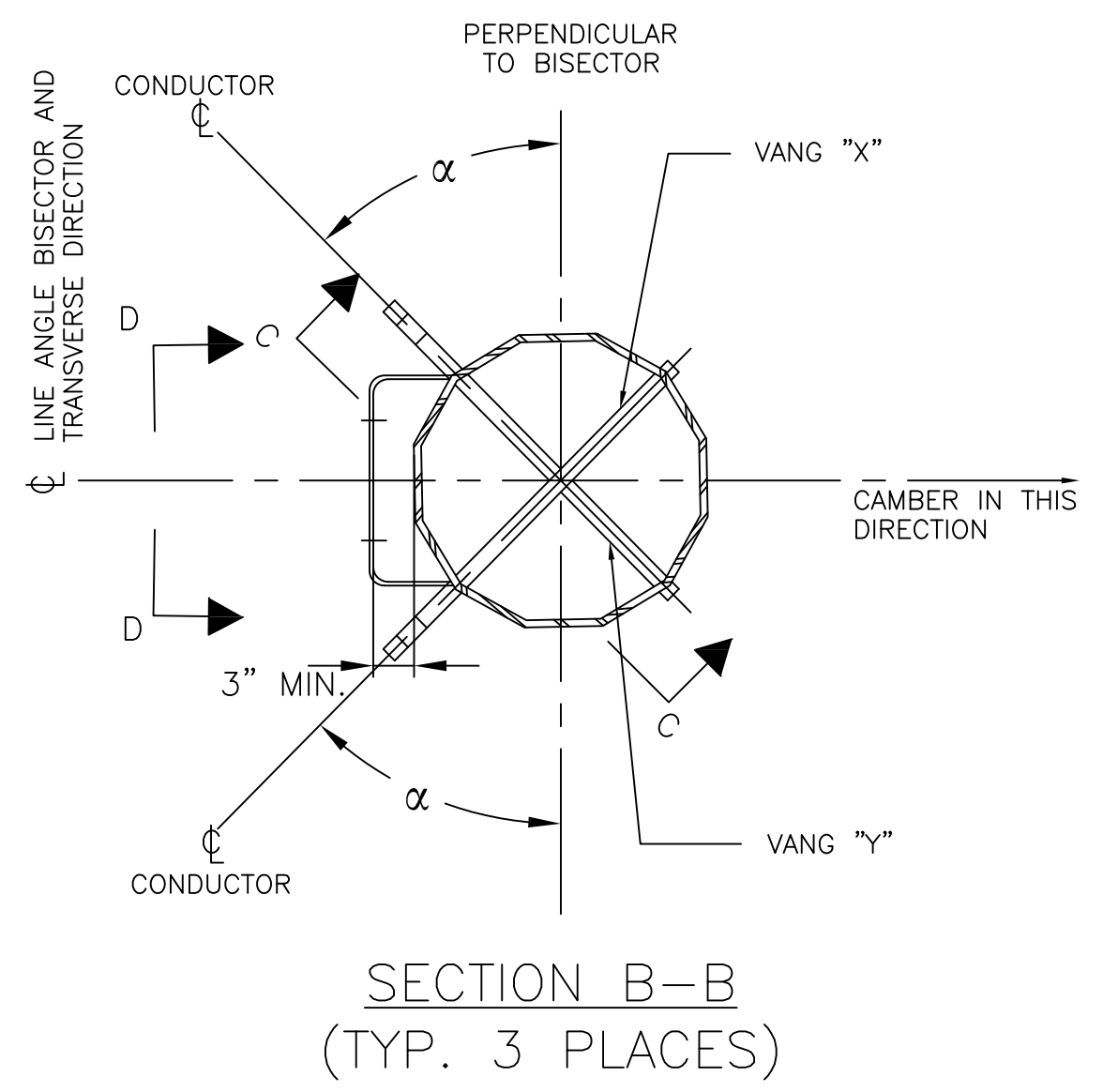
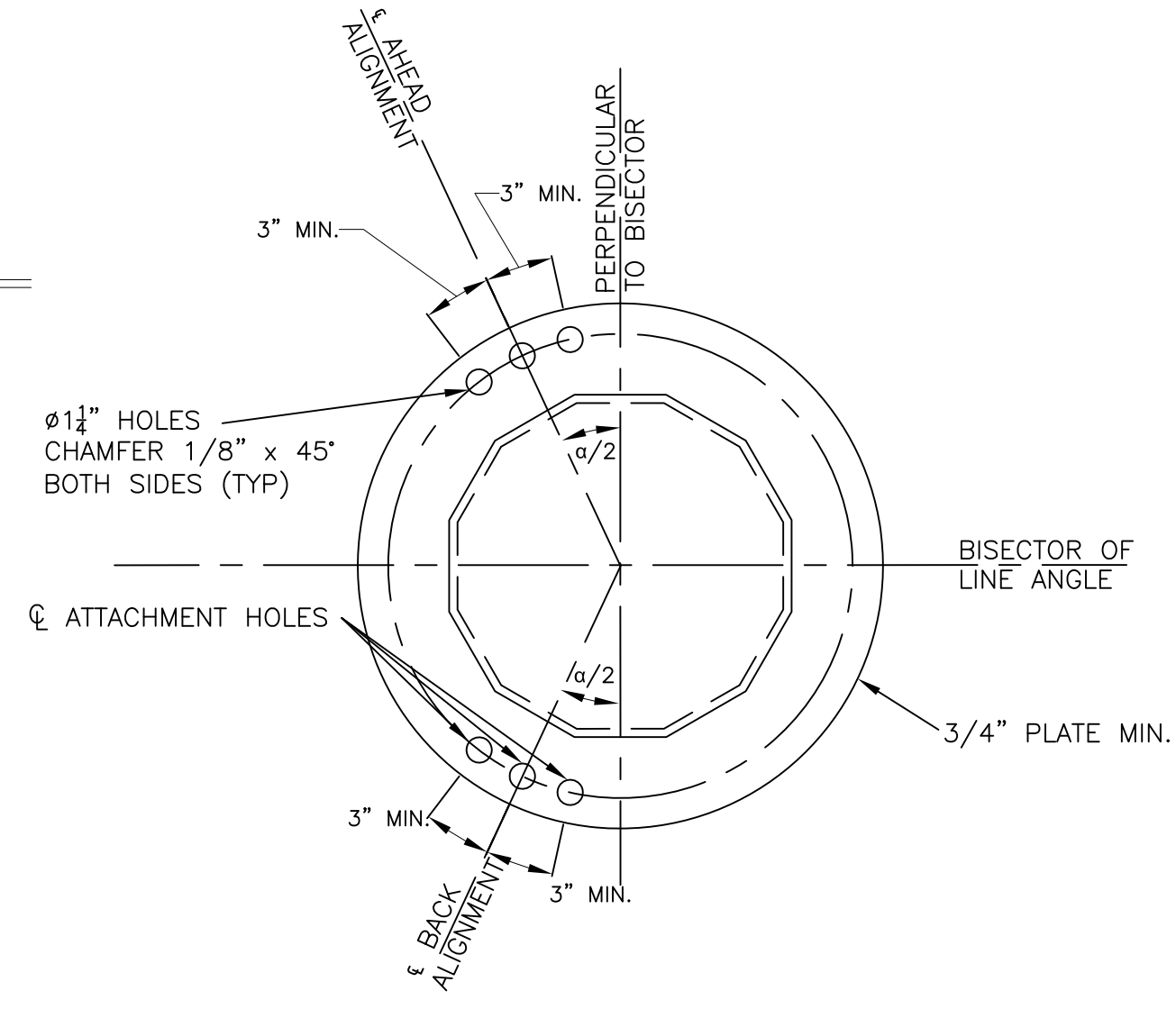
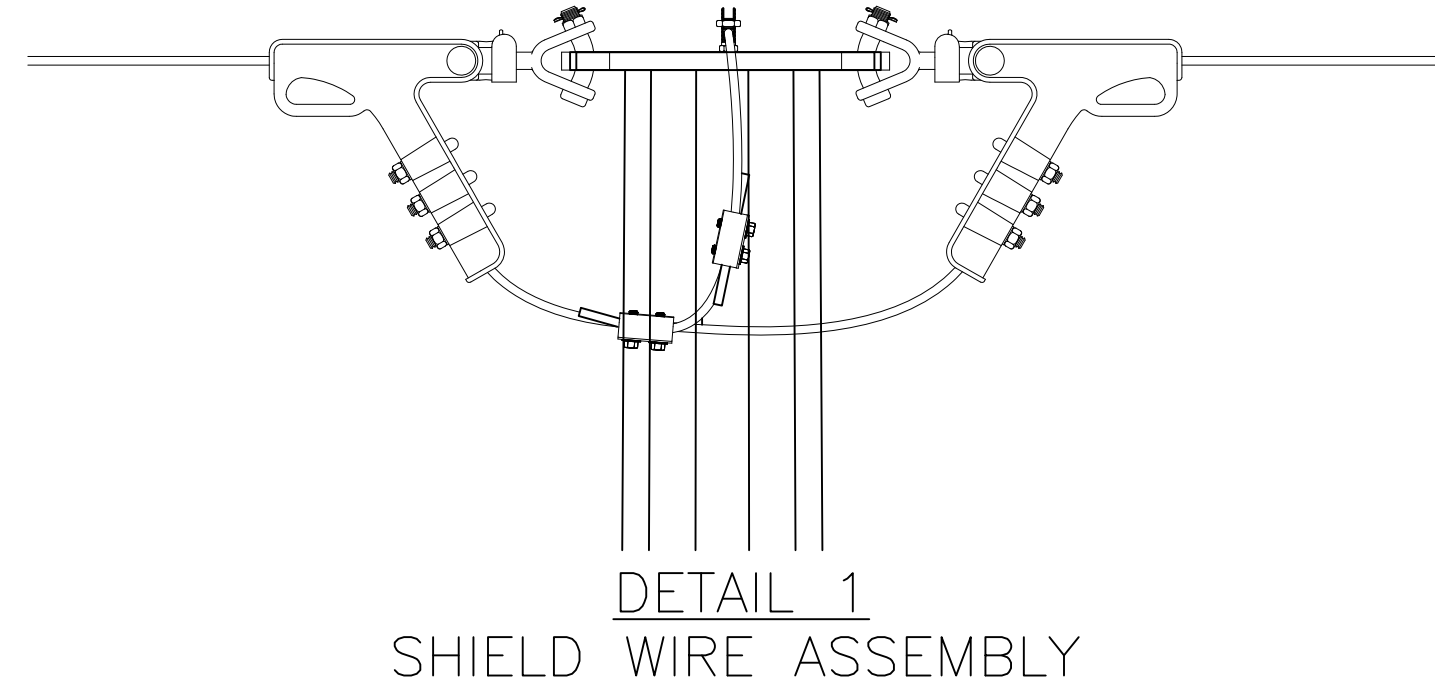
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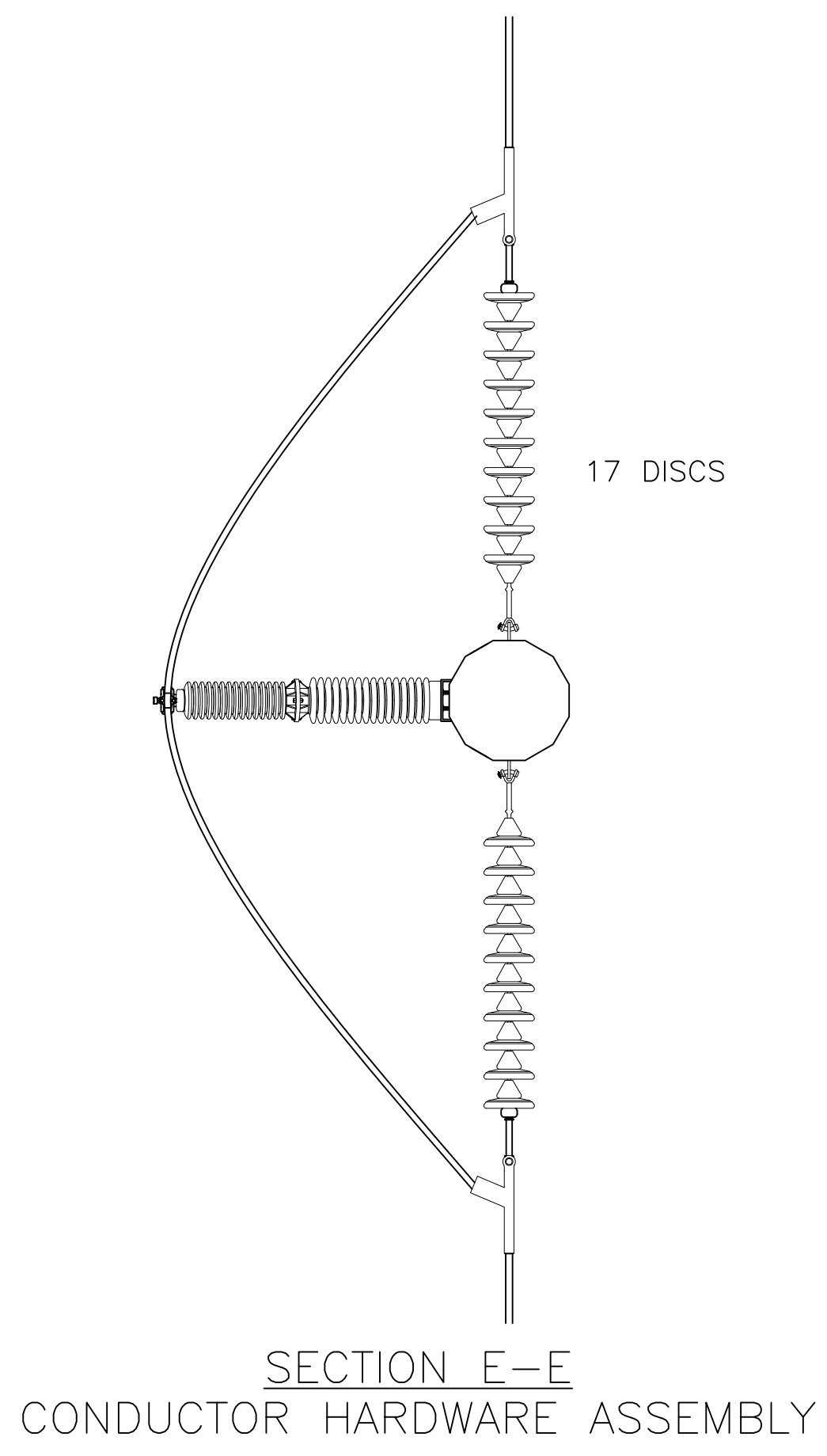
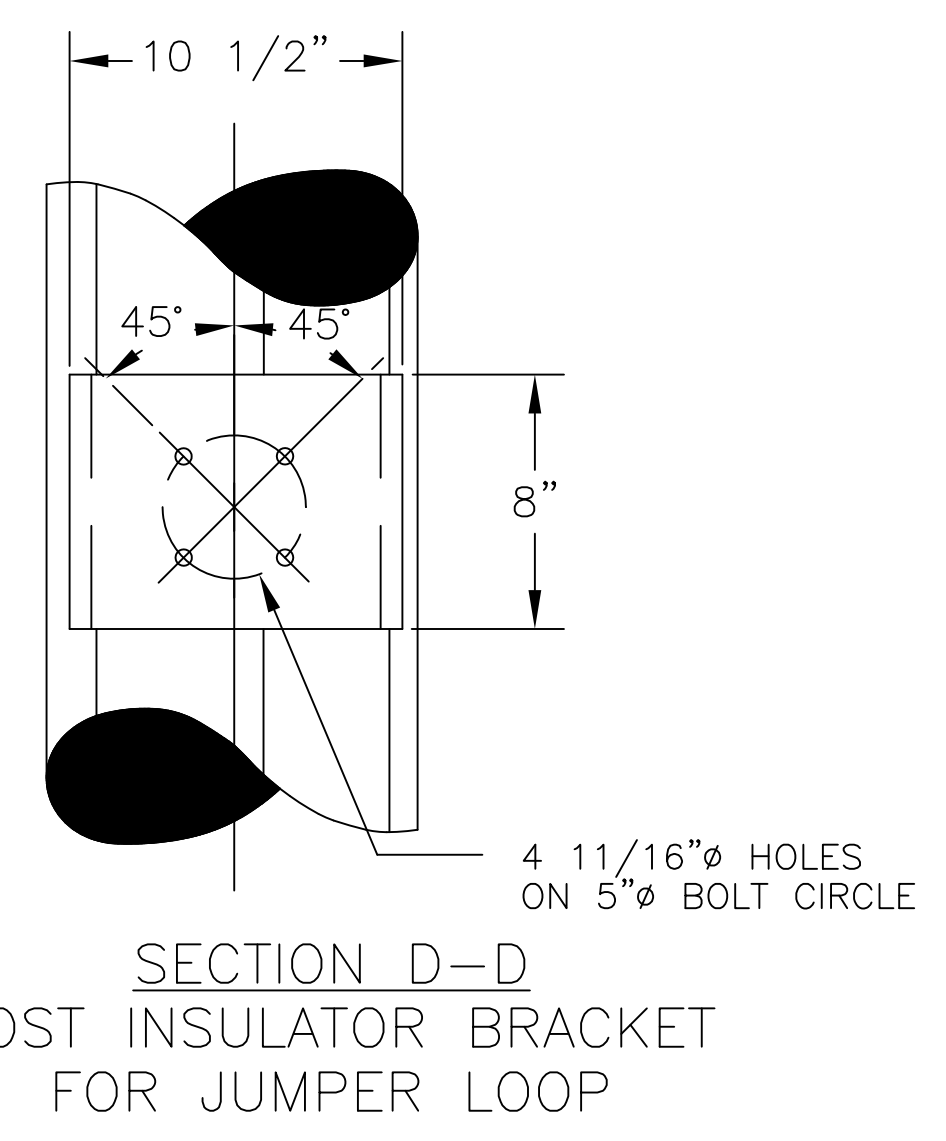
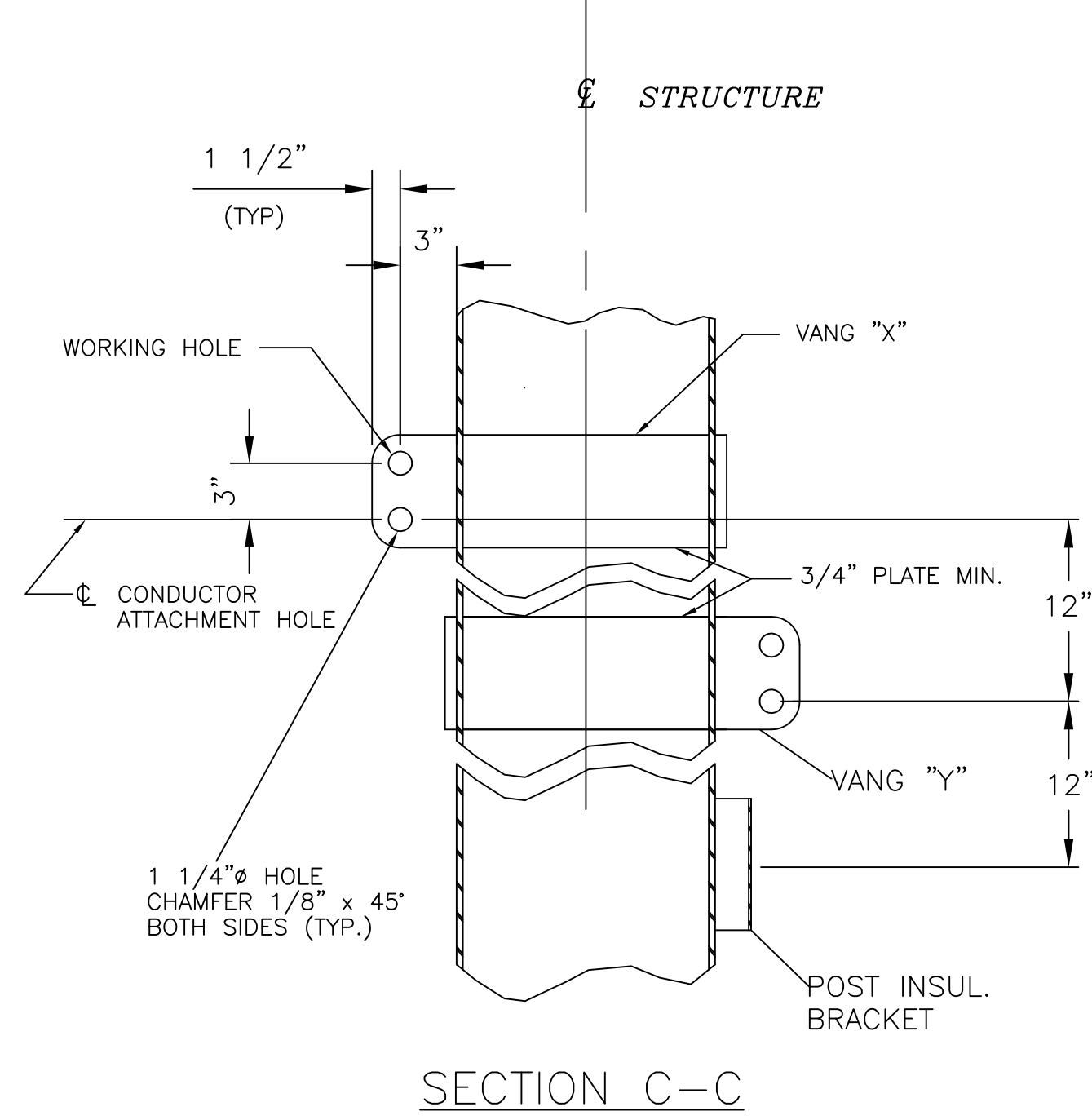
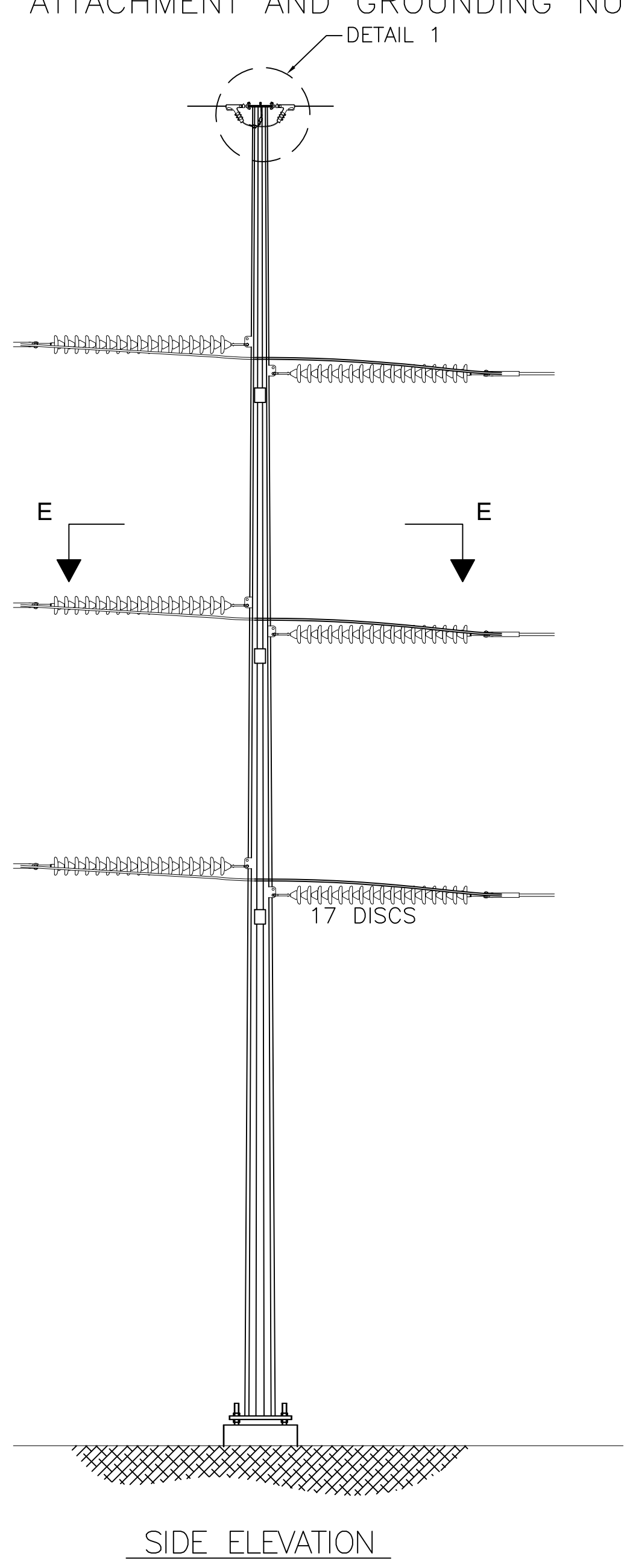
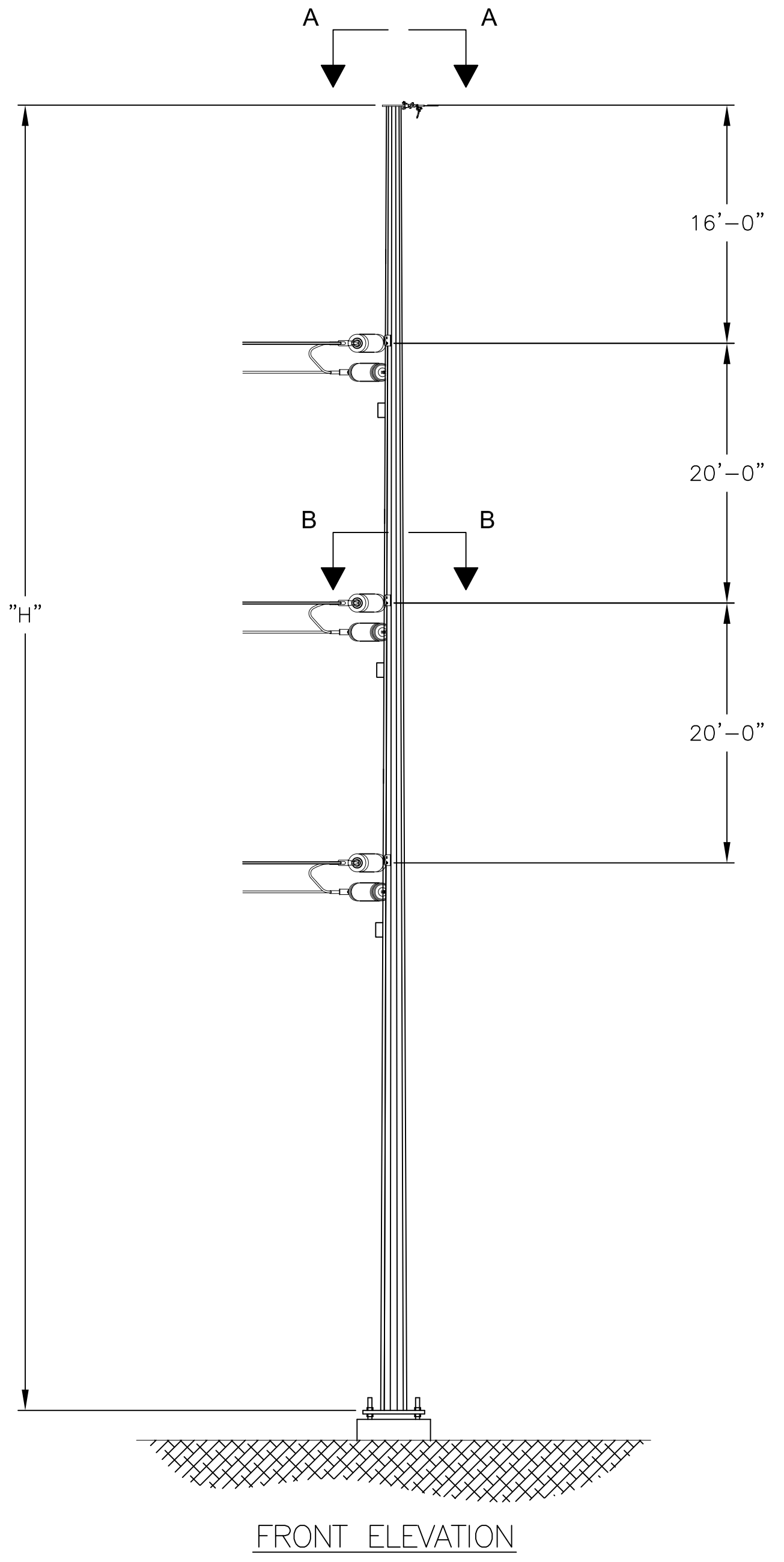
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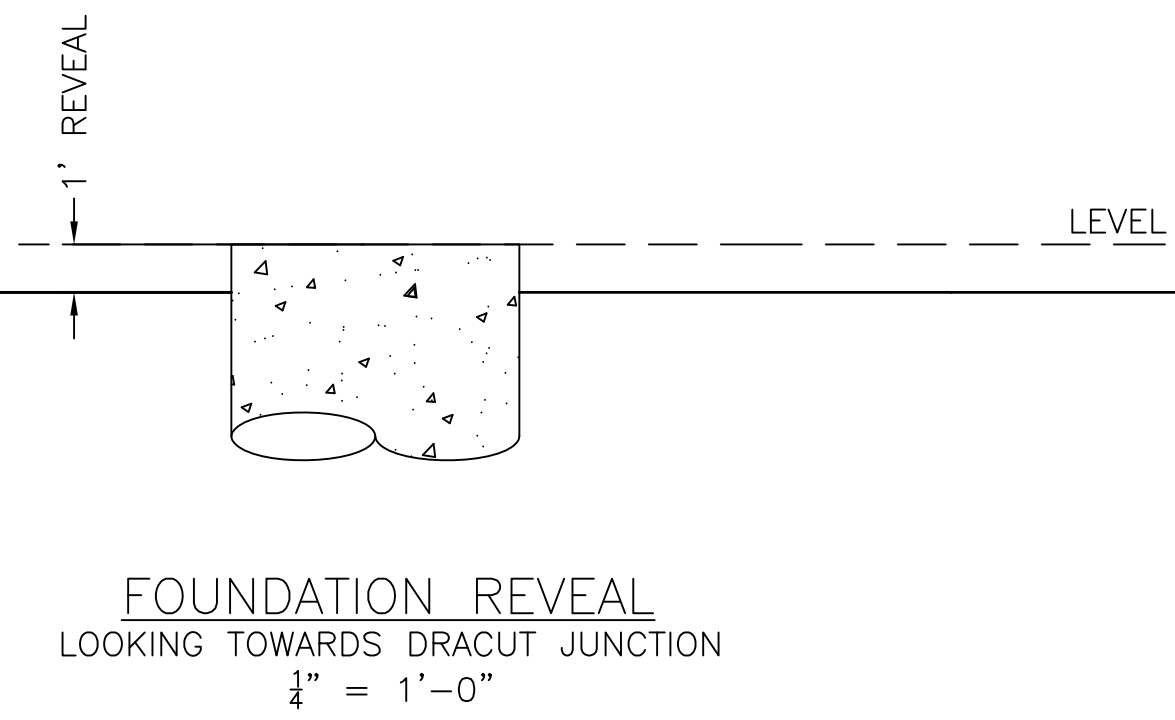


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REVIEWED BY		FTX	5/22/15
APPROVED BY		NPA	5/22/15
SCALE	SHEET	NTS	1 OF 1
INDEX	400298		

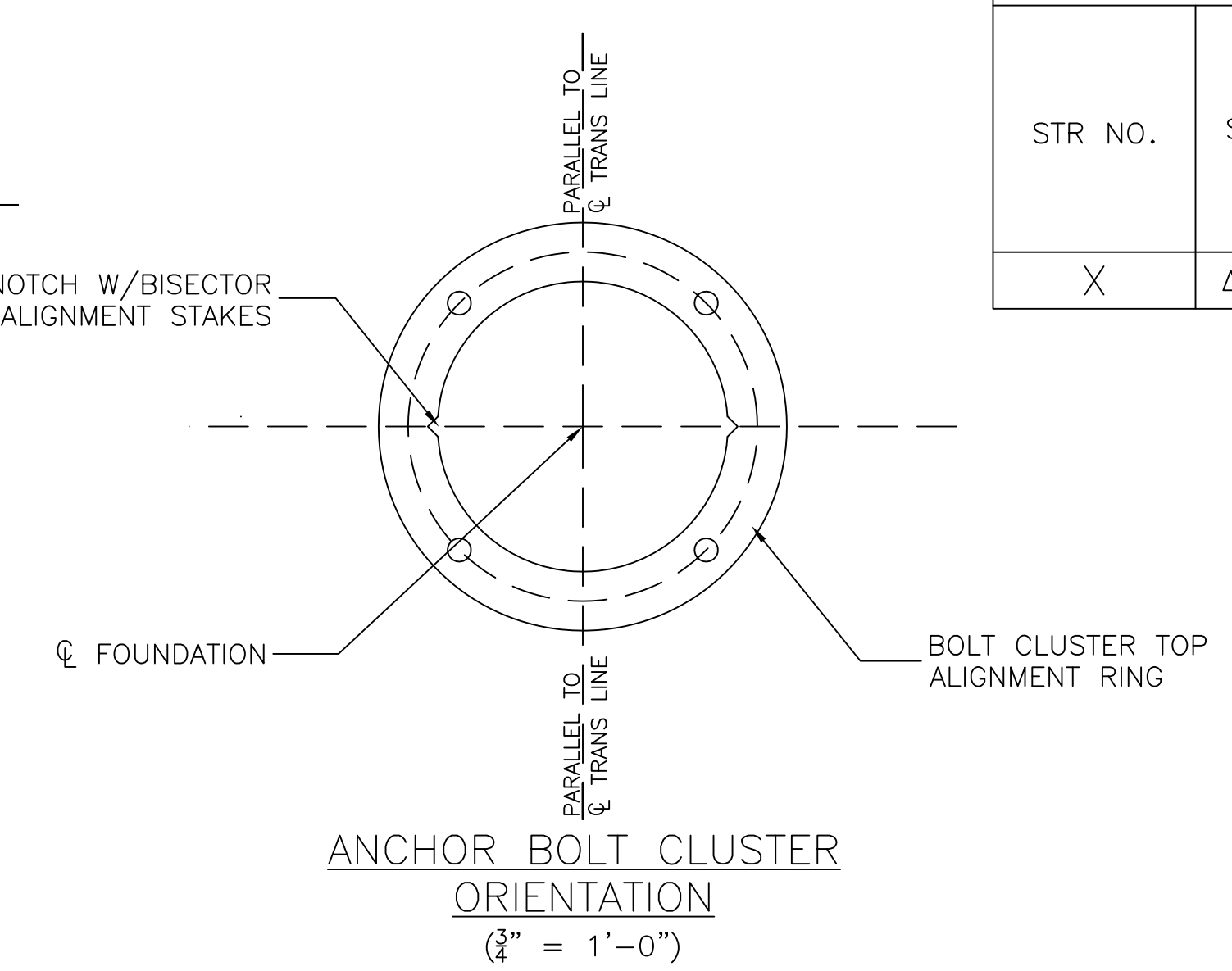
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nationalgrid	
SCOBIE POND - TEWKSBURY	
345KV NEW STRUCTURE	
SINGLE CIRCUIT 3124 LINE	
STEEL SINGLE POLE DEADEND	
DOUBLE INSULATOR ASSEMBLY	

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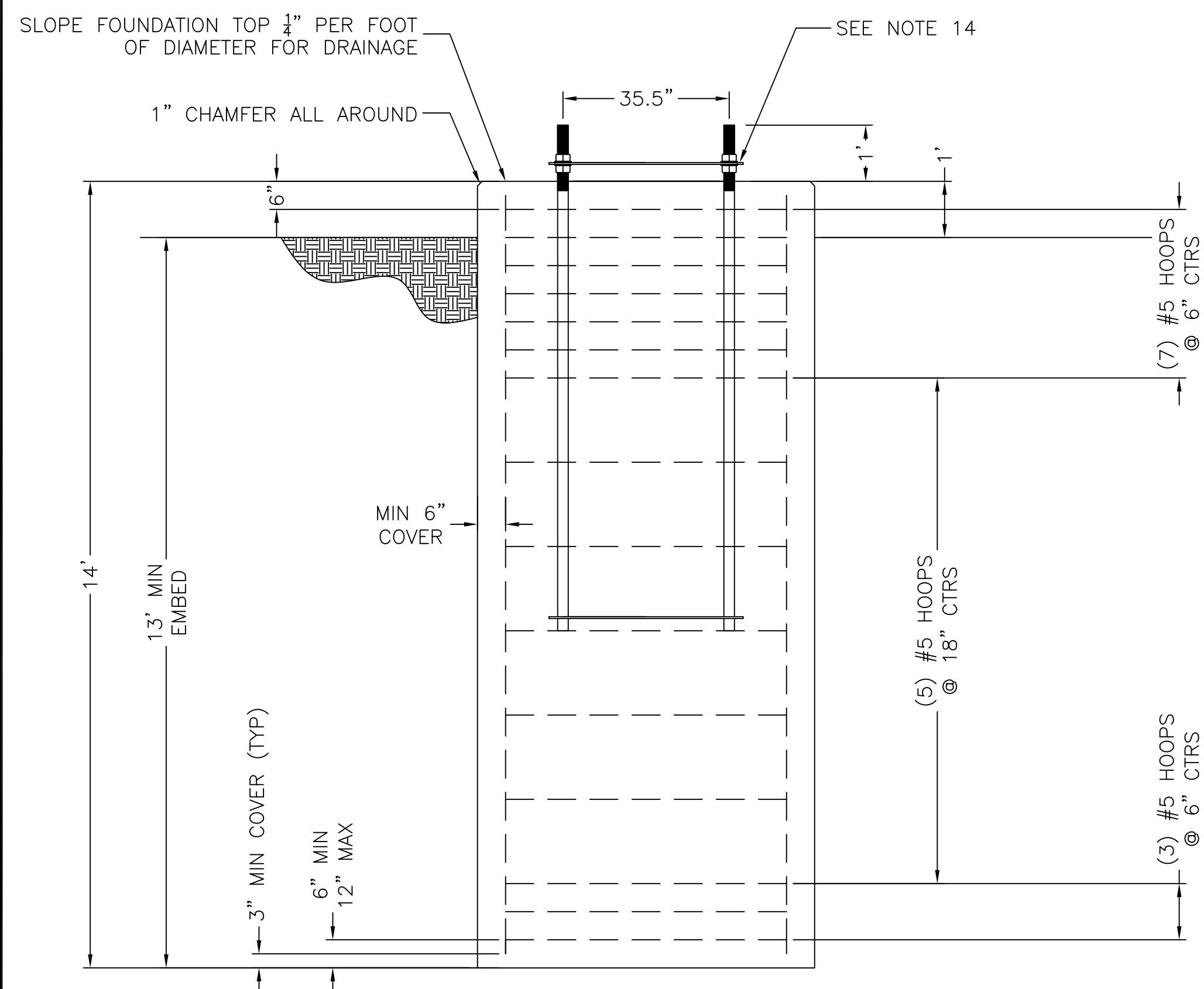


ALIGN V-NOTCH W/BISECTOR & OFFSET ALIGNMENT STAKES

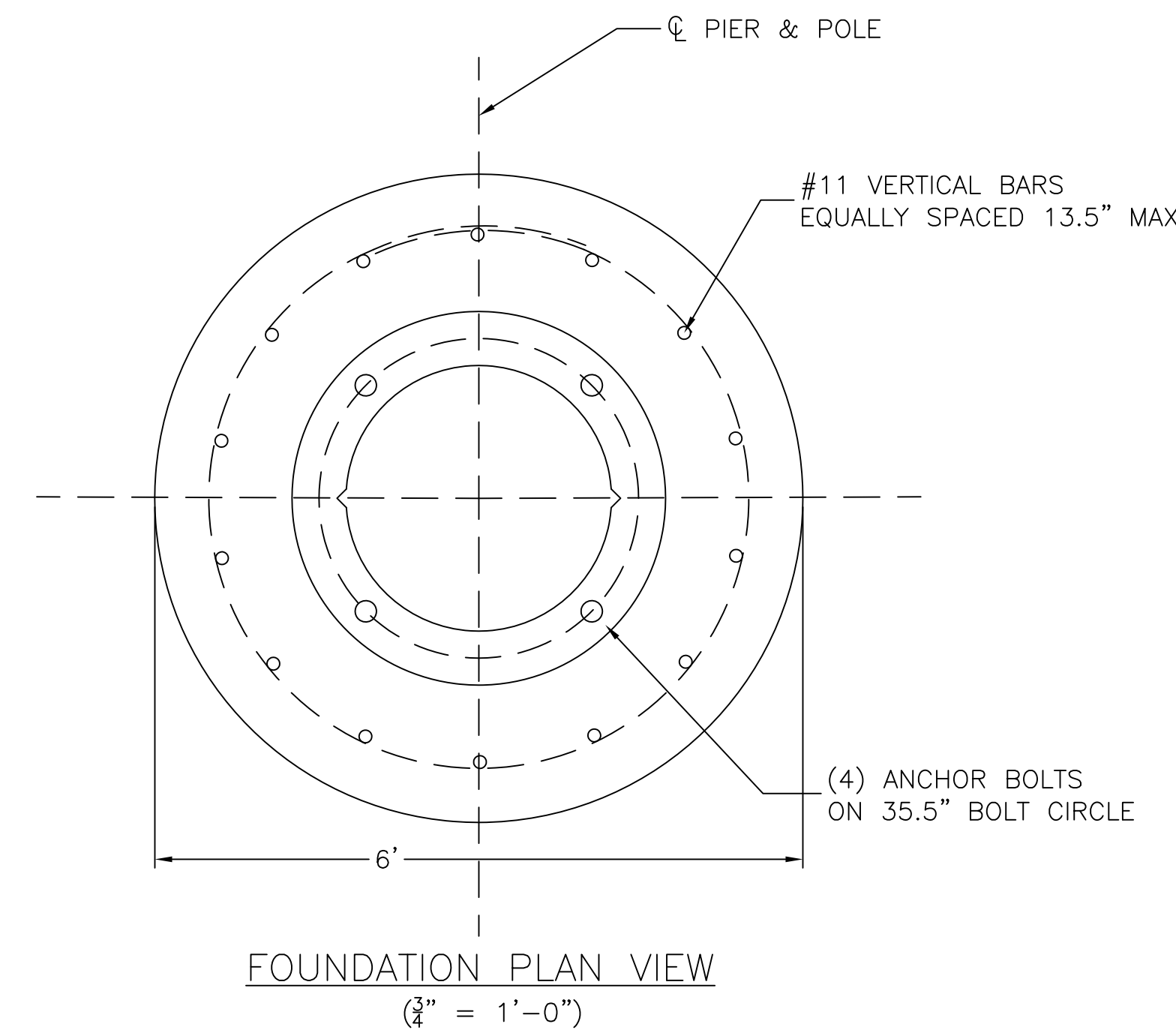


FOUNDATION DETAILS PER PIER									
STR NO.	STR TYPE	LINE ANGLE Δ	PIER DIMENSIONS			ANCHOR BOLT CIRCLE DIA (IN)	NO. OF BOLTS	"NEAT-LINE" CONCRETE VOLUME (CU YD)	ANCHOR BOLT CLUSTER WEIGHT (LBS)
			LGTH (FT)	MIN EMBED (FT)	DIA (FT)				
X	ΔDA SUSP	0.00	14'-0"	13'-0"	6'-0"	2'-11 1/2"	4	14.66	712.00

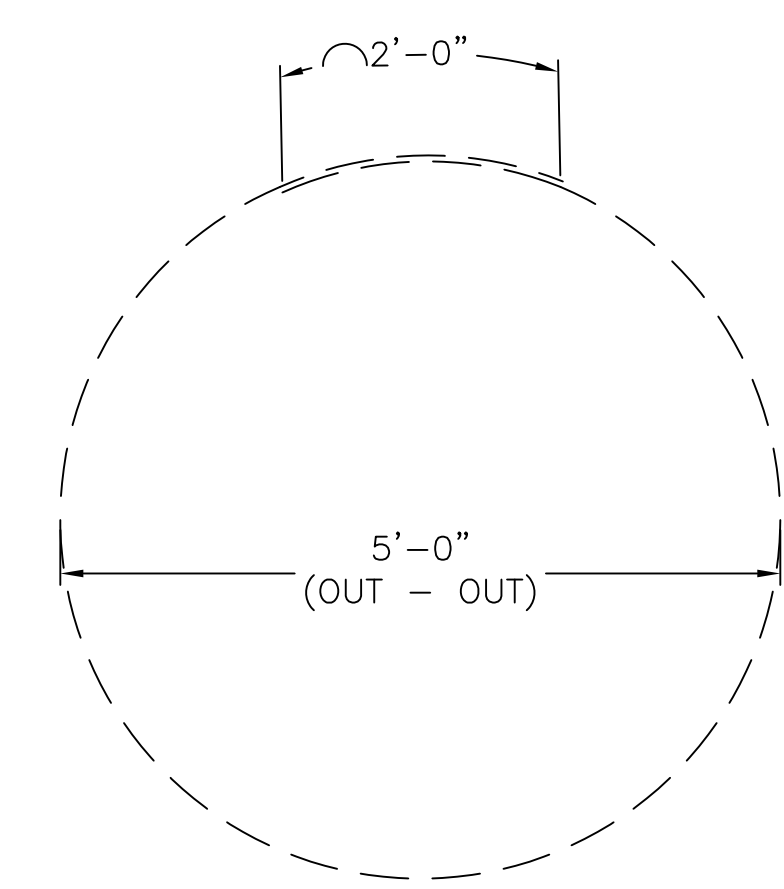
REINFORCING BAR SCHEDULE PER PIER									
STR NO.	TYPE	QUANTITY	SIZE	SPACING	LAP LENGTH	DIA (FT)	LENGTH (FT)	WEIGHT (LBS)	
56R	VERTICAL	14	#11	13.5"			13'-6"	1004	
	HOOPS	15	#5		2'-0"	5'-0"	18'-3"	286	



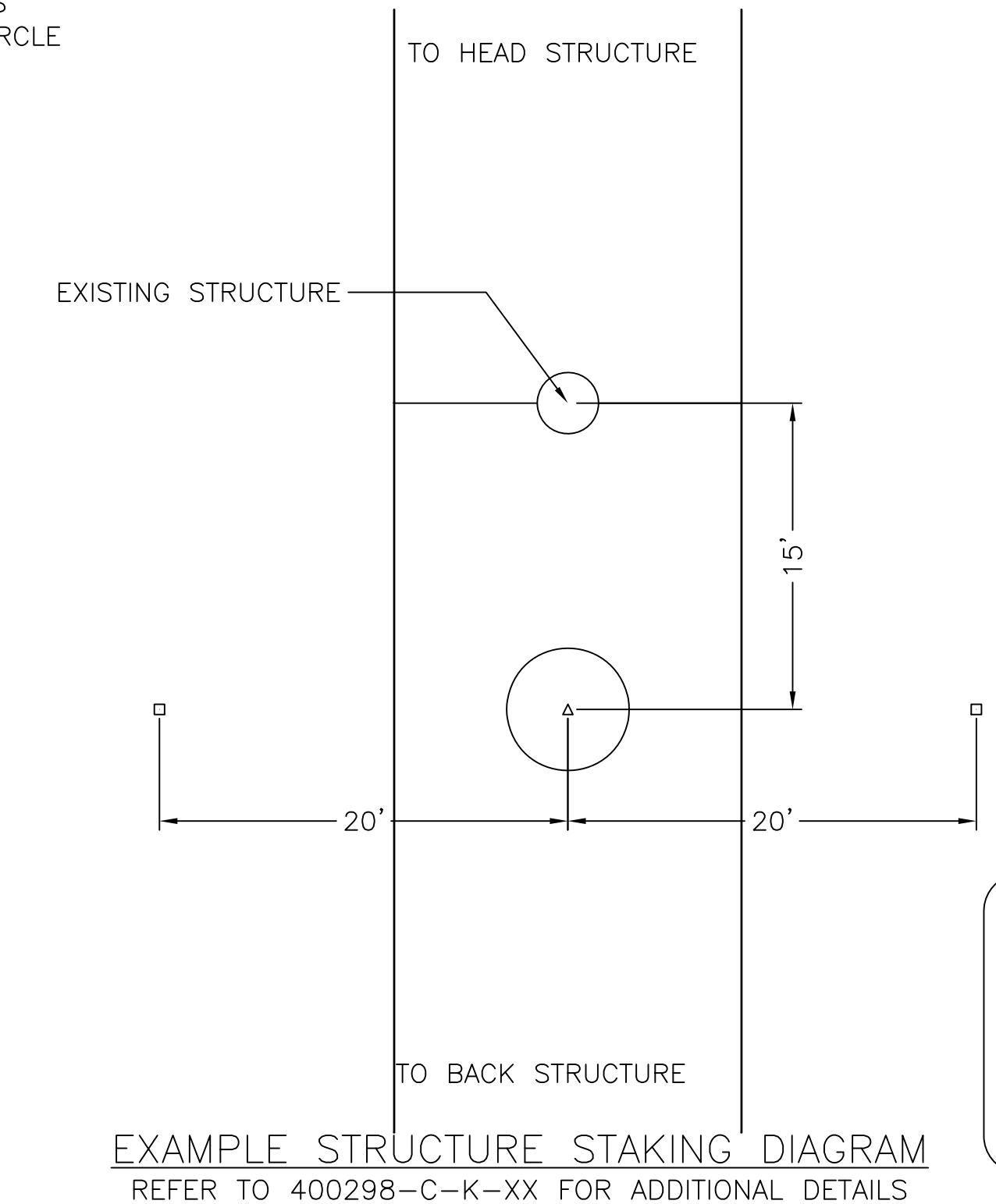
DRILLED PIER FOUNDATION
ELEVATION VIEW
1/2" = 1'-0"



FOUNDATION PLAN VIEW
3/4" = 1'-0"



BEND DIAGRAM
24" LAP FOR #5 BAR
3/4" = 1'-0"



EXAMPLE STRUCTURE STAKING DIAGRAM
REFER TO 400298-C-K-XX FOR ADDITIONAL DETAILS

- NOTES:**
- REINFORCING STEEL SHALL BE ASTM A615, GRADE 60.
 - COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 4000 PSI (MINIMUM) AT 28 DAYS.
 - ALL WORK SHALL CONFORM TO ACI 318 AND 336 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.
 - EXPOSED CONCRETE ABOVE GRADE SHALL BE FORMED FINISHED.
 - ANCHOR BOLT CLUSTERS SHALL BE BONDED TO REBAR CAGE PER DRAWING SP.06.01.301.101 SHEET 1.
 - ANCHOR BOLT CLUSTERS SHALL BE POSITIONED IN THE CULVERT OR FORM PRIOR TO PLACING CONCRETE ABOVE THE LEVEL OF THE LOWER ANCHOR ALIGNMENT RING.
 - ANCHOR BOLT CLUSTERS SHALL BE SET PLUMB.
 - ALL WORK SHALL CONFORM TO THE PROJECT CONSTRUCTION SPECIFICATION.
 - SEE DRAWING 400298-D-F-XX FOR ANCHOR BOLT CLUSTER DETAIL.
 - SEE DRAWING 400298-D-E-XX FOR SOIL BORING LOGS.
 - SEE DRAWING 400298-C-K-XX FOR STRUCTURE STAKING DIAGRAM.
 - SOIL OR ROCK CONDITIONS: WHERE SOIL DEPTHS, DEPTHS TO BEDROCK OR CONDITIONS OF THE SOIL OR BEDROCK DIFFER FROM THAT SHOWN ON THE BORING, THE ENGINEER SHALL BE CONTACTED.
 - COMMON OR SELECT BACKFILL (DEFINED PER THE CONSTRUCTION SPECIFICATION) SHALL BE PLACED AROUND THE OUTSIDE OF THE CULVERT. BACKFILL SHALL BE THOROUGHLY TAMPED USING MECHANICAL TAMPERS IN LAYERS NOT EXCEEDING 12 INCHES IN DEPTH.
 - DISCARD ANCHOR BOLT ALIGNMENT RING AFTER CONCRETE SETS.

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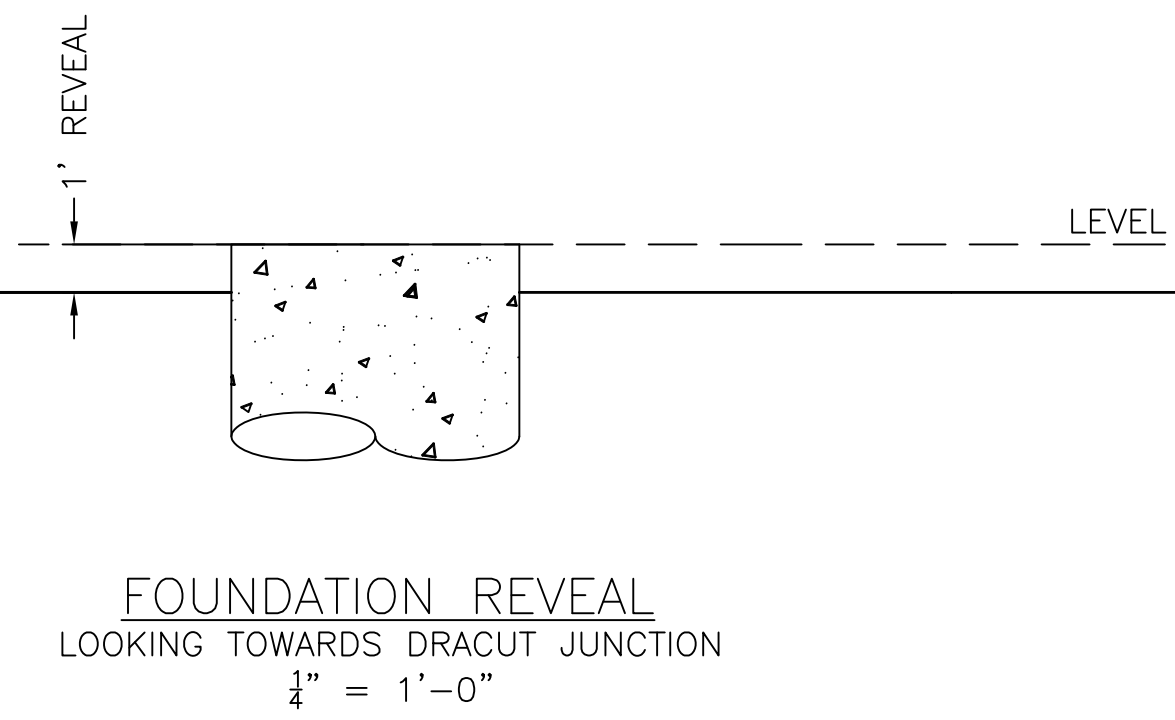
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	<p>REVIEWED BY: JTF 05/19/15</p>
<p>SCALE: AS SHOWN</p>	<p>SHEET: 1 OF 1</p>
<p>INDEX: 400298</p>	<p>VERSION: 1</p>

EXAMPLE FOUNDATION DRAWING
MERRIMACK VALLEY RELIABILITY PROJECT
REINFORCED CONCRETE CAISSON FOUNDATION
EXAMPLE DRAWING - FULL DEPTH SOILS

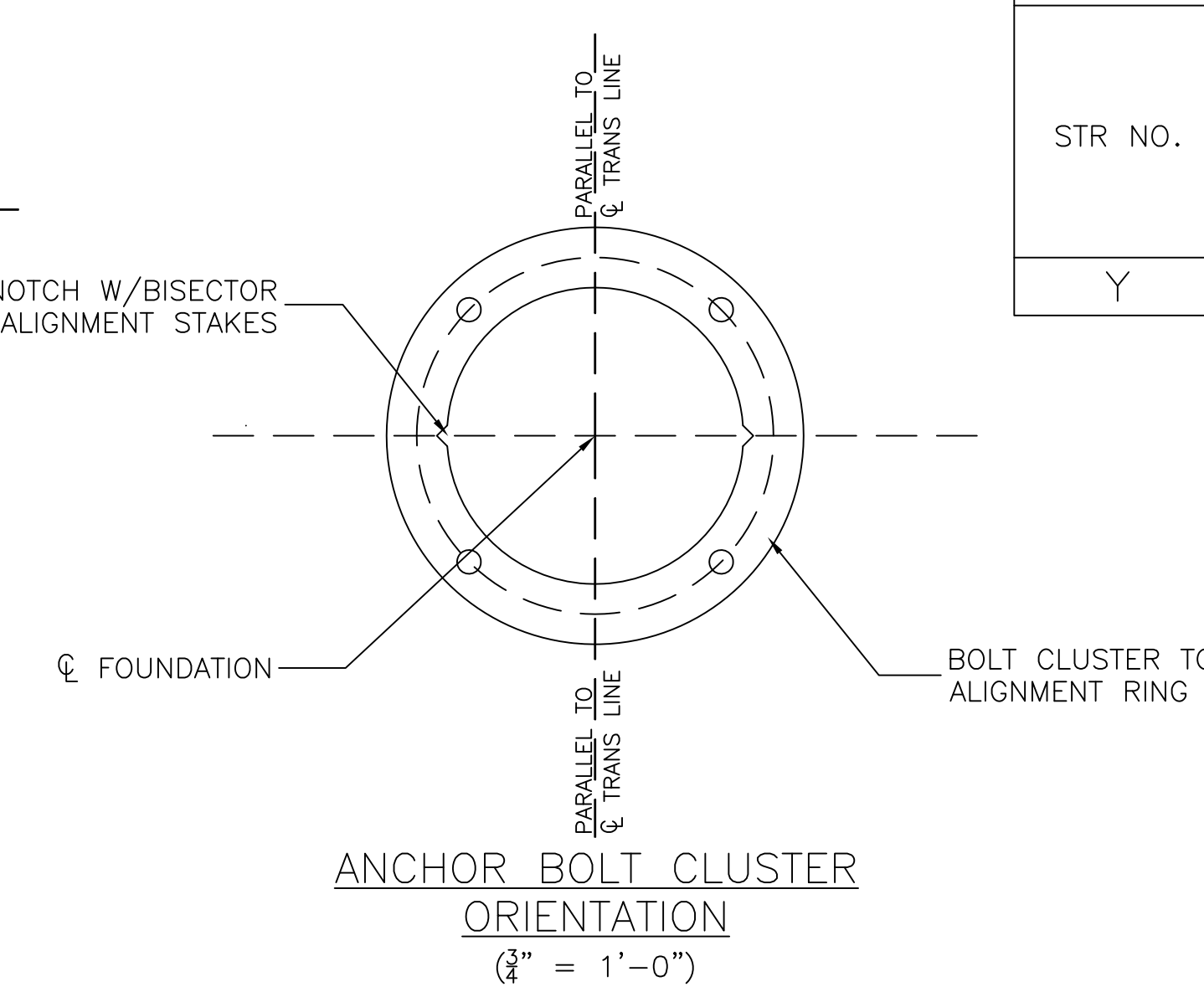
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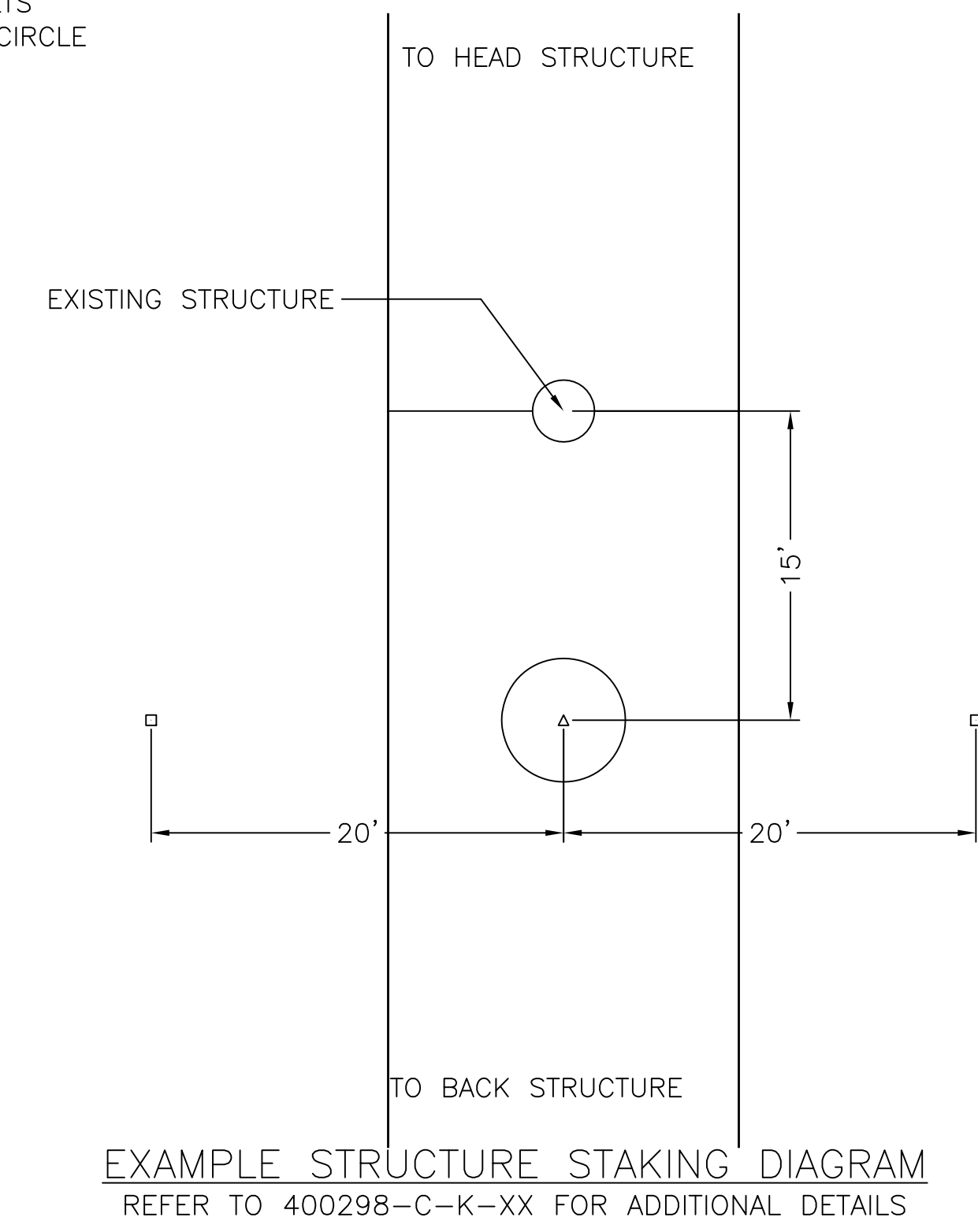
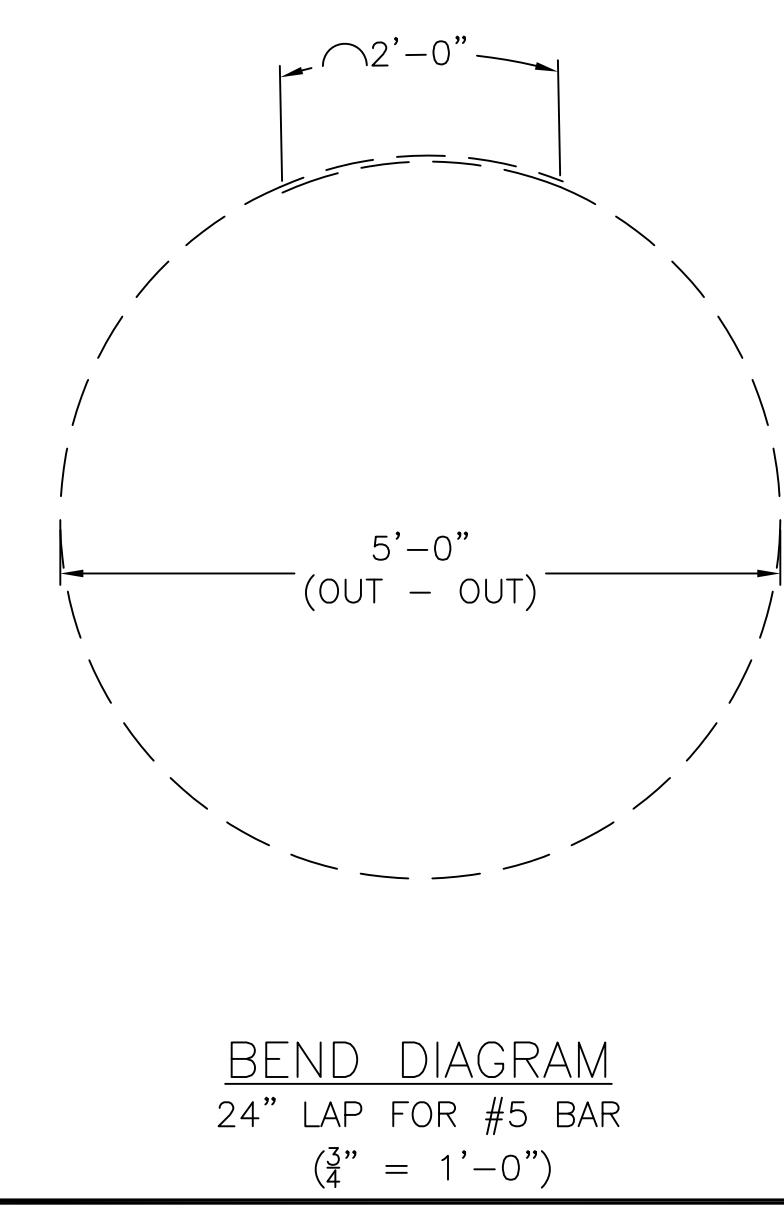
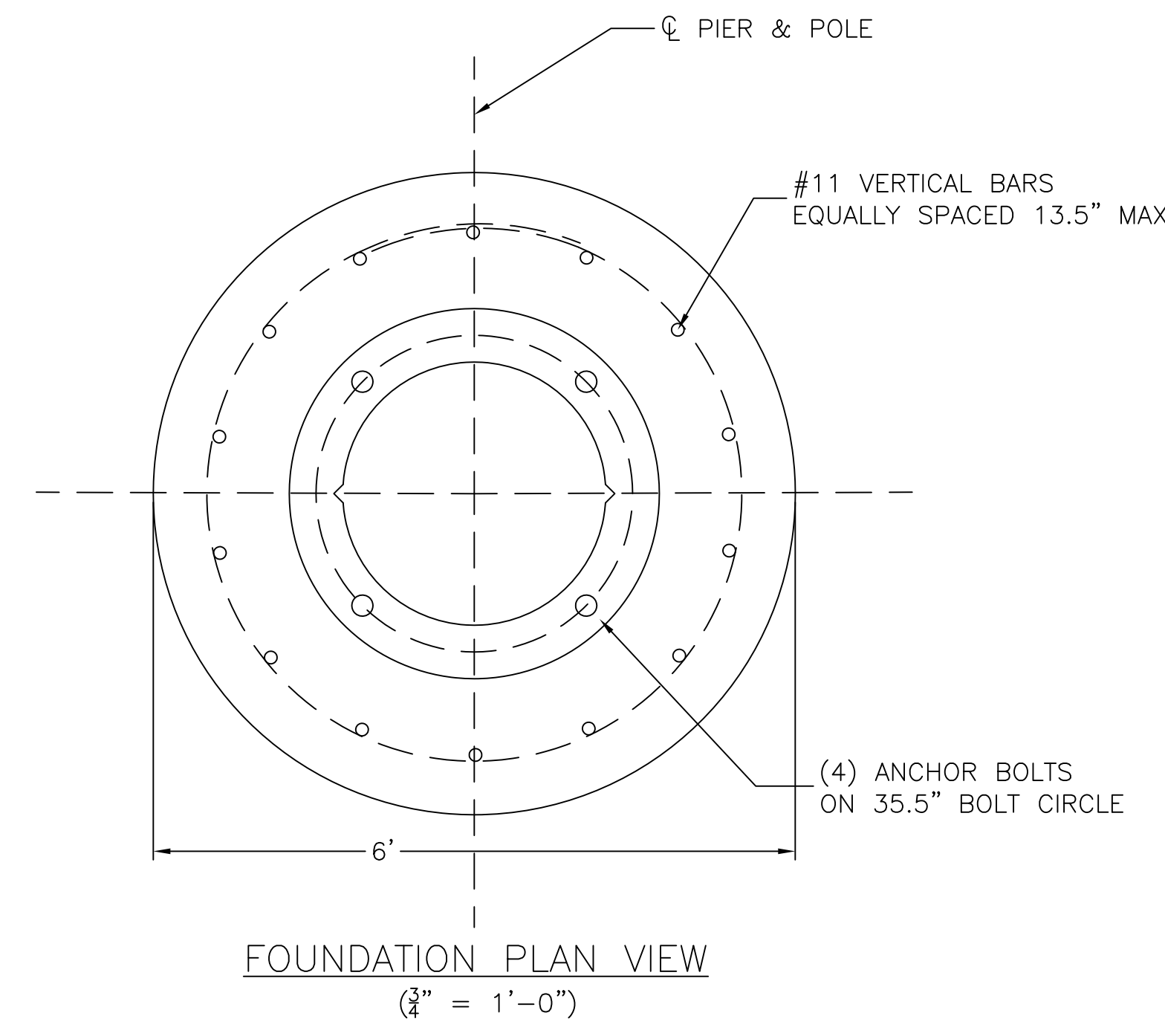
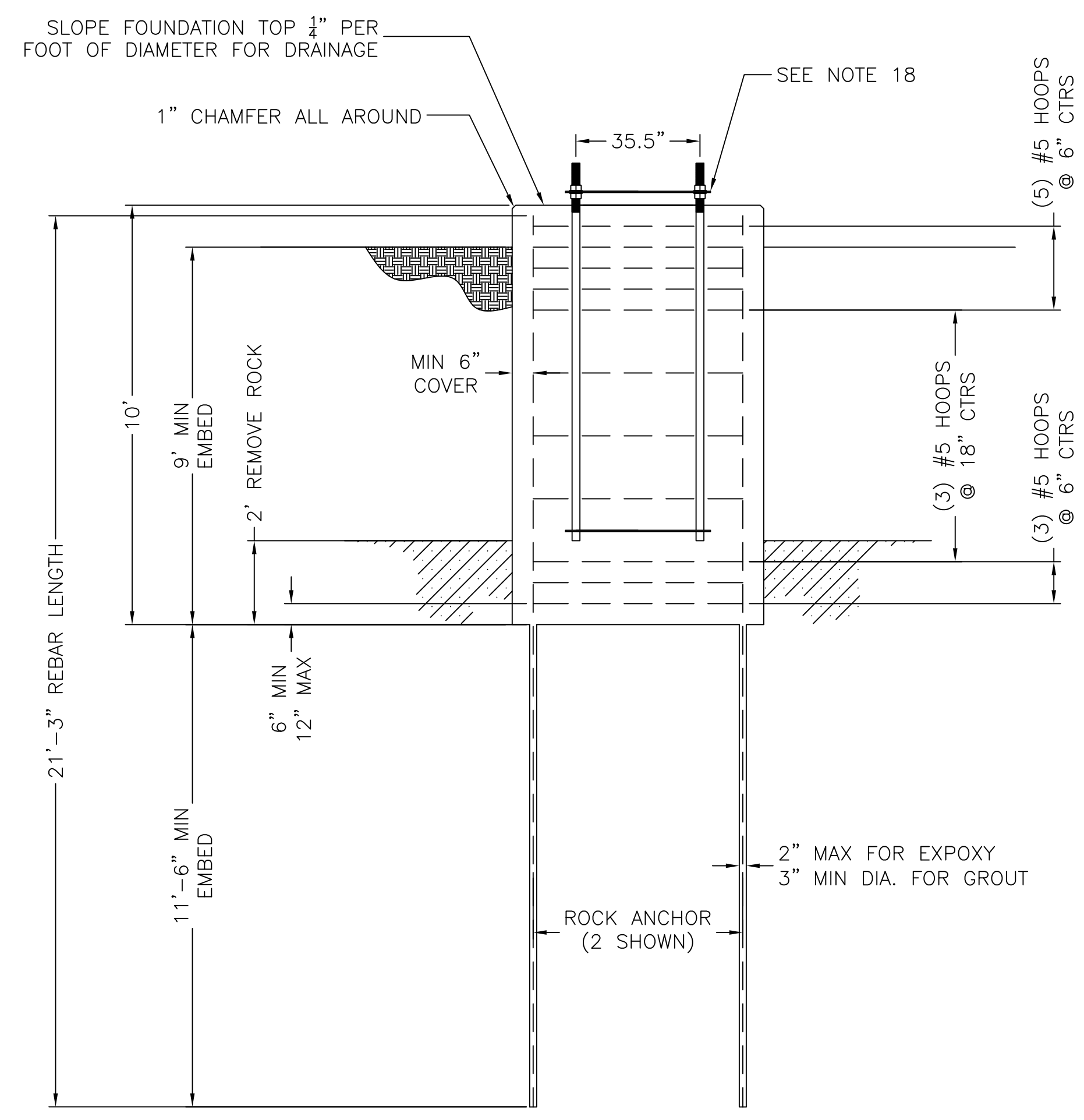
ALIGN V-NOTCH W/BISECTOR & OFFSET ALIGNMENT STAKES



FOUNDATION DETAILS PER PIER									
STR NO.	STR TYPE	LINE ANGLE Δ	PIER DIMENSIONS			ANCHOR BOLT CIRCLE DIA (IN)	NO. OF BOLTS	"NEAT-LINE" CONCRETE VOLUME (CU YD)	ANCHOR BOLT CLUSTER WEIGHT (LBS)
			LGTH (FT)	MIN EMBED (FT)	DIA (FT)				
Y	ΔDA SUSP	0.00	10'-0"	9'-0"	6'-0"	2'-11 1/2"	4	10.47	712.00

REINFORCING BAR SCHEDULE PER PIER									
STR NO.	TYPE	QUANTITY	SIZE	SPACING	LAP LENGTH	DIA (FT)	LENGTH (FT)	WEIGHT (LBS)	
Y	VERTICAL	14	#11	13.5"			21'-3"	1581	
	HOOPS	11	#5		2'-0"	5'-0"	18'-3"	209	

- NOTES:
- REINFORCING STEEL SHALL BE ASTM A615, GRADE 60.
 - COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 4000 PSI (MINIMUM) AT 28 DAYS.
 - ALL WORK SHALL CONFORM TO ACI 318 AND 336 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.
 - EXPOSED CONCRETE ABOVE GRADE SHALL BE FORMED FINISHED.
 - ANCHOR BOLT CLUSTERS SHALL BE BONDED TO REBAR CAGE PER DRAWING SP.06.01.301.101 SHEET 1.
 - ANCHOR BOLT CLUSTERS SHALL BE POSITIONED IN THE CULVERT OR FORM PRIOR TO PLACING CONCRETE ABOVE THE LEVEL OF THE LOWER ANCHOR ALIGNMENT RING.
 - ANCHOR BOLT CLUSTERS SHALL BE SET PLUMB.
 - ALL WORK SHALL CONFORM TO THE PROJECT CONSTRUCTION SPECIFICATION.
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 - SEE DRAWING 400298-D-E-XX FOR SOIL BORING LOGS.
 - SEE DRAWING 400298-C-K-XX FOR STRUCTURE STAKING DIAGRAM.
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 - PIER LENGTH IS ESTIMATED BASED ON DEPTH OF SOUND ROCK PER THE SOIL BORING. PIER TO BE KEYED INTO SOUND ROCK. ADJUST PIER LENGTH ACCORDINGLY. IN NO CASE SHALL THE PIER LENGTH BE LESS THAN REQUIRED TO SET THE ANCHOR BOLT CLUSTER TO THE SPECIFIED DEPTH.
 - ALL VERTICAL RE-BARS SHALL BE ANCHORED IN SOUND ROCK PER SECTION 17.5 OF THE CONSTRUCTION SPECIFICATION.
 - VERTICAL REINFORCING SHALL NOT BE LAP SPLICED. MECHANICAL SPLICING IS SUBJECT TO THE APPROVAL OF THE ENGINEER. WELDED SPLICES ARE NOT ALLOWED.
 - ALL #11 RE-BAR/ROCK ANCHORS SHALL BE PROOF LOAD TESTED PER SP.06.01.301.
 - COMMON OR SELECT BACKFILL (DEFINED PER THE CONSTRUCTION SPECIFICATION) SHALL BE PLACED AROUND THE OUTSIDE OF THE CULVERT. BACKFILL SHALL BE THOROUGHLY TAMPED USING MECHANICAL TAMPERS IN LAYERS NOT EXCEEDING 12 INCHES IN DEPTH.
 - DISCARD ANCHOR BOLT ALIGNMENT RING AFTER CONCRETE SETS.



ISSUED FOR PERMITTING AS EXAMPLE
MAY 19, 2015

EXAMPLE FOUNDATION DRAWING

MERRIMACK VALLEY RELIABILITY PROJECT
REINFORCED CONCRETE CAISSON FOUNDATION
EXAMPLE DRAWING - CAISSON WITH GROUTED REBAR

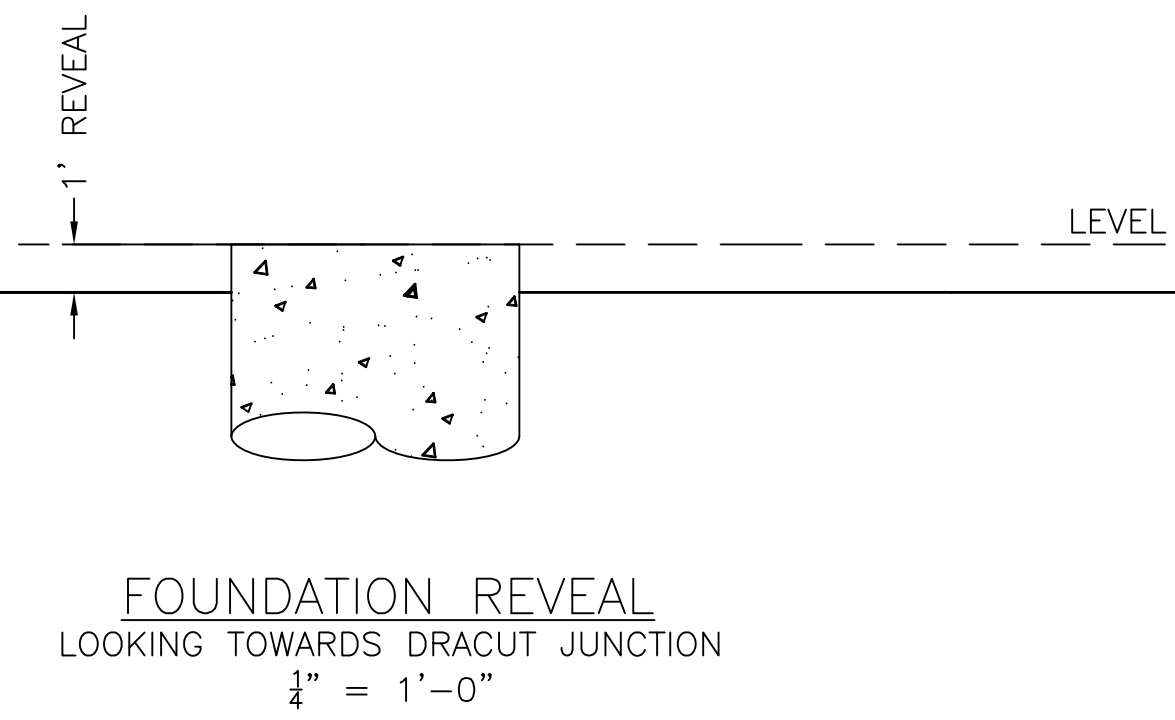
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REVIEWED BY	JTF	DATE	05/19/15
SCALE	AS SHOWN	SHEET	1 OF 1
INDEX		INDEX	400298

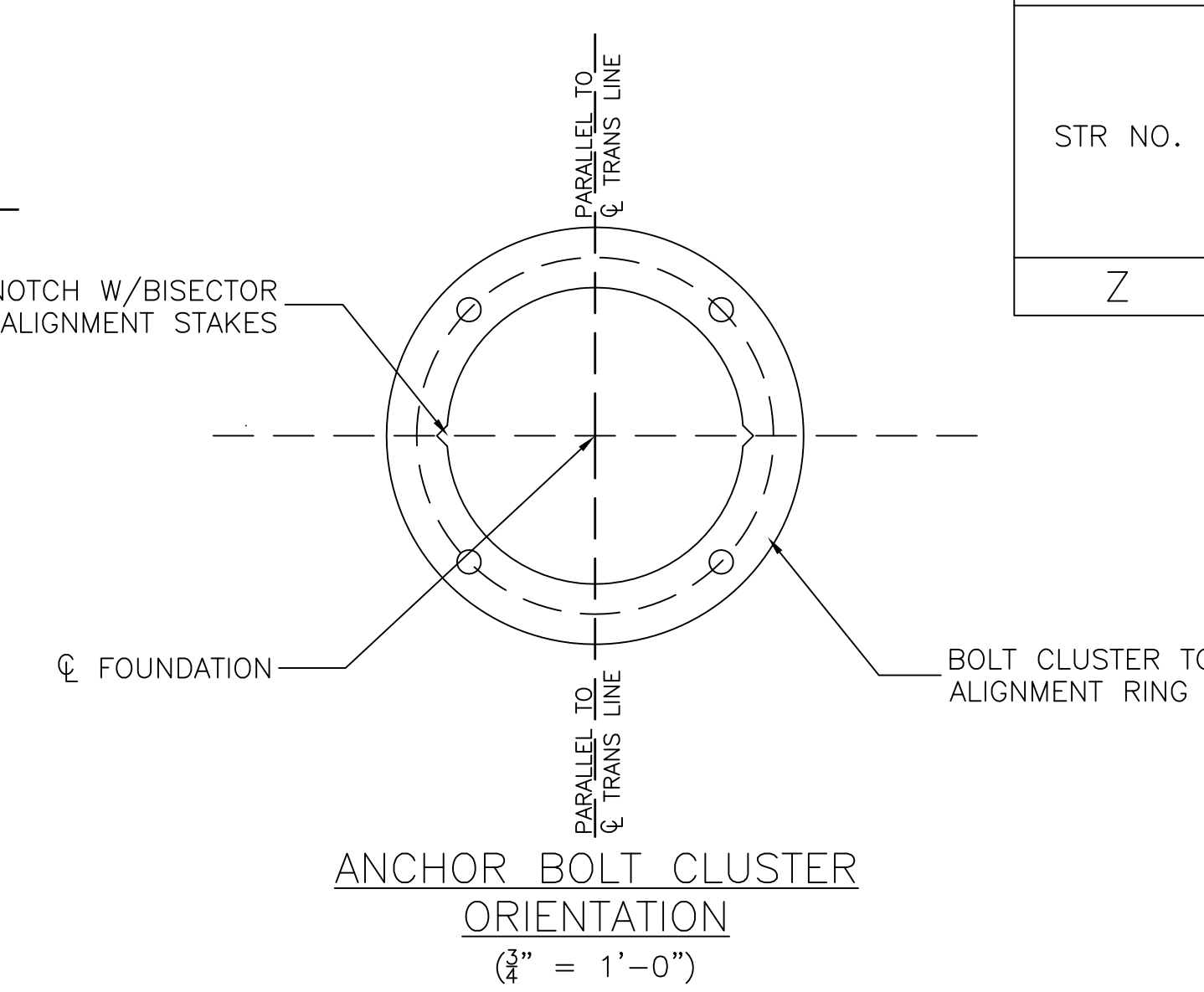
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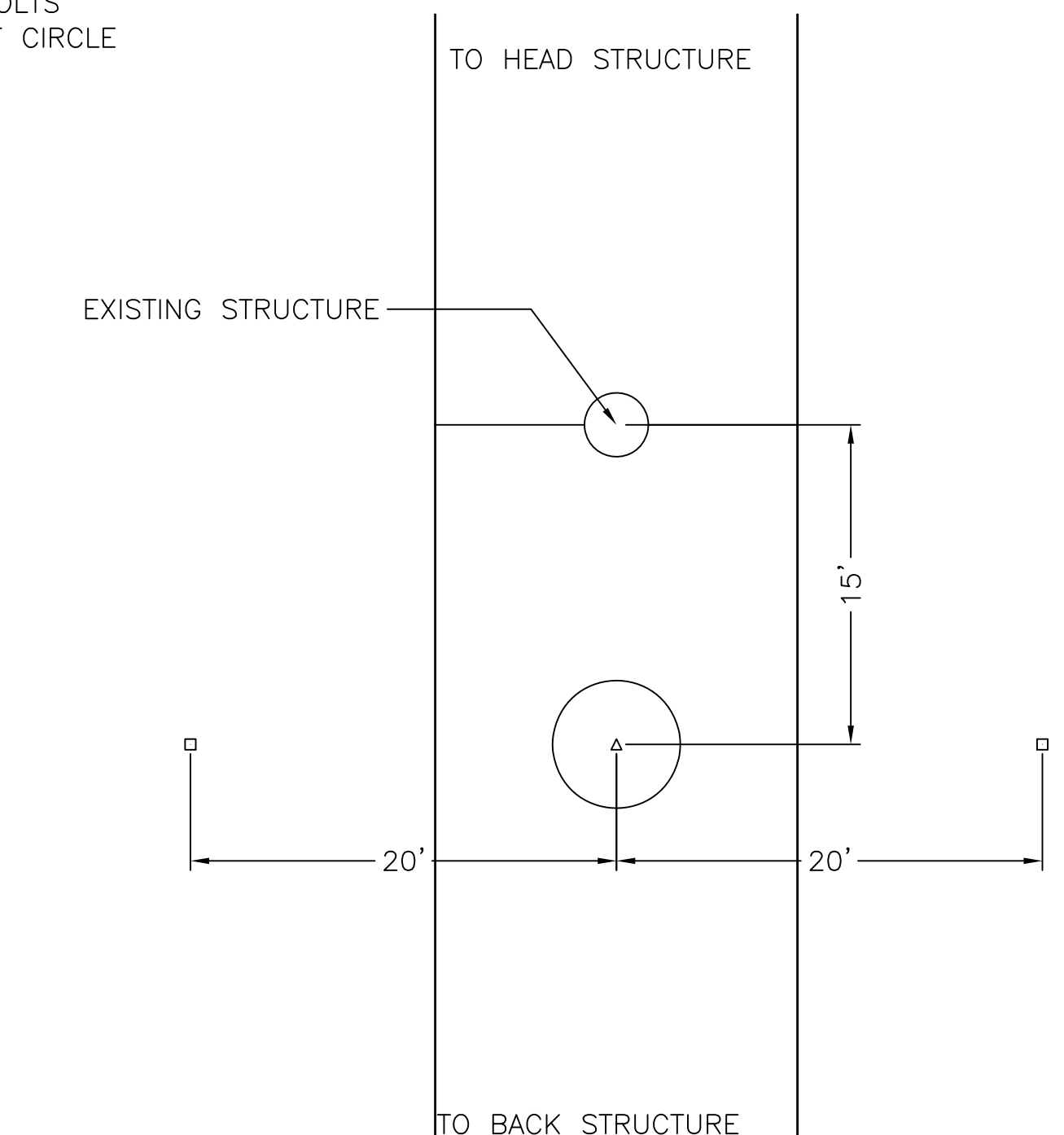
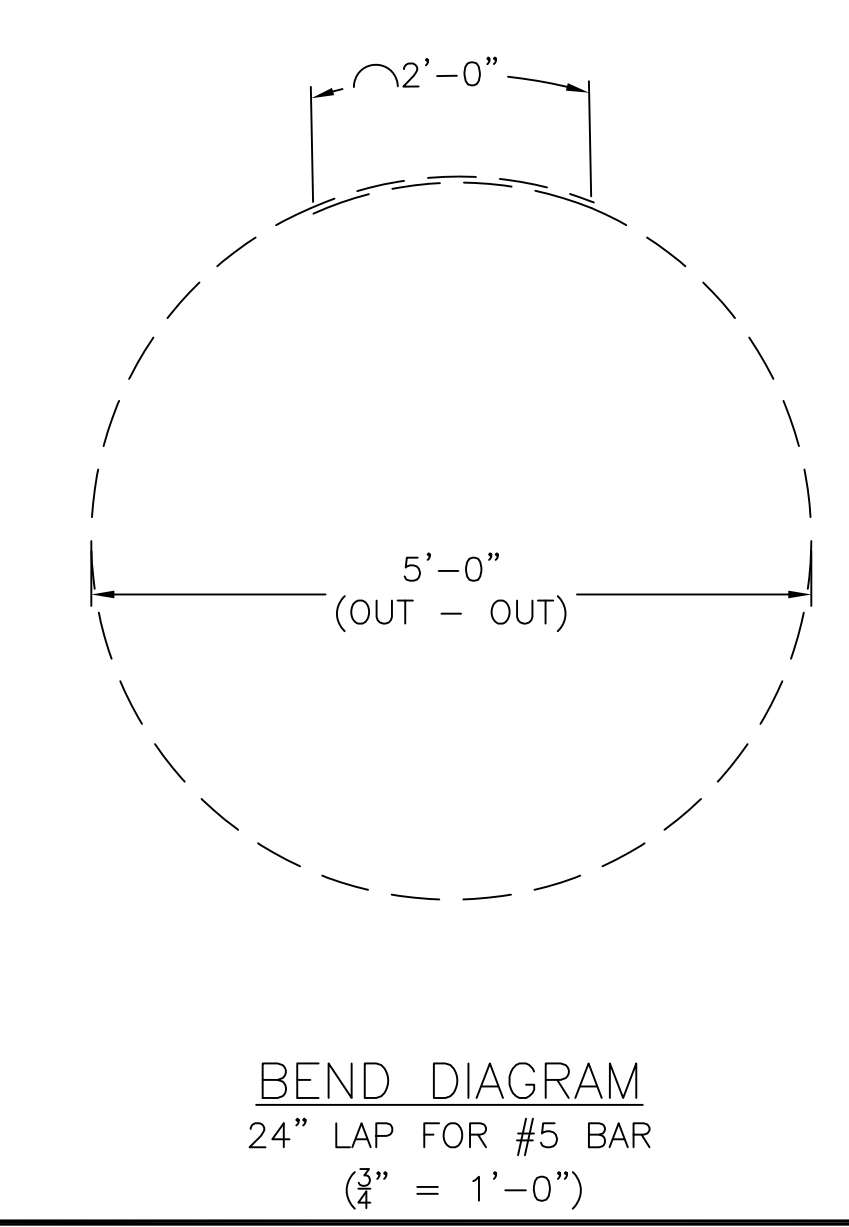
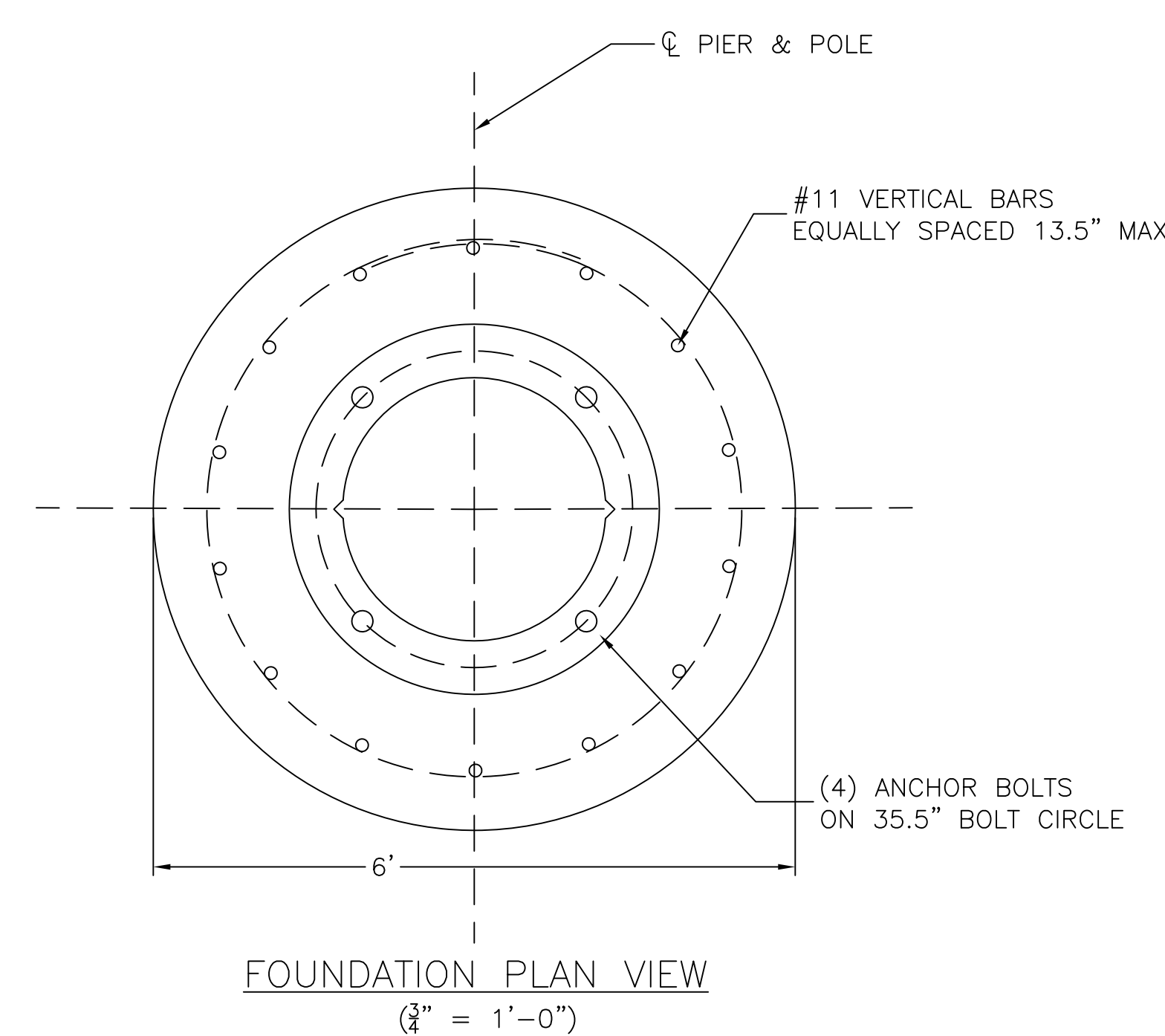
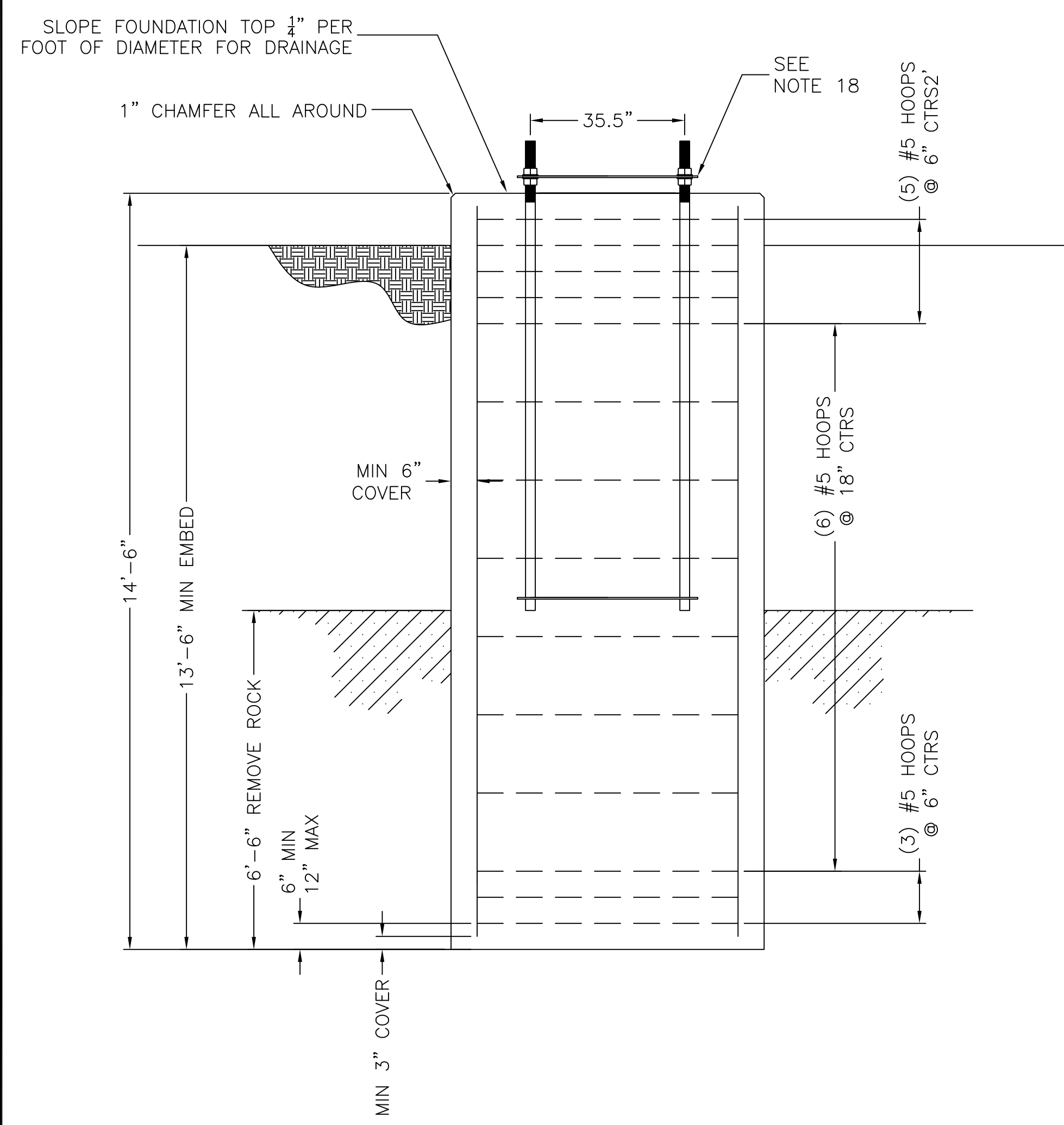
ALIGN V-NOTCH W/BISECTOR & OFFSET ALIGNMENT STAKES



FOUNDATION DETAILS PER PIER									
STR NO.	STR TYPE	LINE ANGLE Δ	PIER DIMENSIONS			ANCHOR BOLT CIRCLE DIA (IN)	NO. OF BOLTS	"NEAT-LINE" CONCRETE VOLUME (CU YD)	ANCHOR BOLT CLUSTER WEIGHT (LBS)
			LGTH (FT)	MIN EMBED (FT)	DIA (FT)				
Z	ΔDA SUSP	0.00	14'-6"	13'-6"	6'-0"	2'-11 1/2"	4	15.18	712.00

REINFORCING BAR SCHEDULE PER PIER									
STR NO.	TYPE	QUANTITY	SIZE	SPACING	LAP LENGTH	DIA (FT)	LENGTH (FT)	WEIGHT (LBS)	
Z	VERTICAL	14	#11	13.5"			14'-0"	1041	
	HOOPS	14	#5		2'-0"	5'-0"	18'-3"	266	

- NOTES:
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 - SEE DRAWING 400298-D-E-XX FOR SOIL BORING LOGS.
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 - ALL VERTICAL RE-BARS SHALL BE ANCHORED IN SOUND ROCK PER SECTION 17.5 OF THE CONSTRUCTION SPECIFICATION.
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 - DISCARD ANCHOR BOLT ALIGNMENT RING AFTER CONCRETE SETS.



ISSUED FOR PERMITTING AS EXAMPLE
MAY 19, 2015

nationalgrid PREPARED BY: JTF 05/19/15 REVIEWED BY: JTF 05/19/15 SCALE: AS SHOWN SHEET: 1 OF 1 INDEX: 400298	EXAMPLE FOUNDATION DRAWING MERRIMACK VALLEY RELIABILITY PROJECT REINFORCED CONCRETE CAISSON FOUNDATION EXAMPLE DRAWING - CAISSON WITH ROCK SOCKET
	PREPARED BY: JTF 05/19/15 REVIEWED BY: JTF 05/19/15 SCALE: AS SHOWN SHEET: 1 OF 1 INDEX: 400298

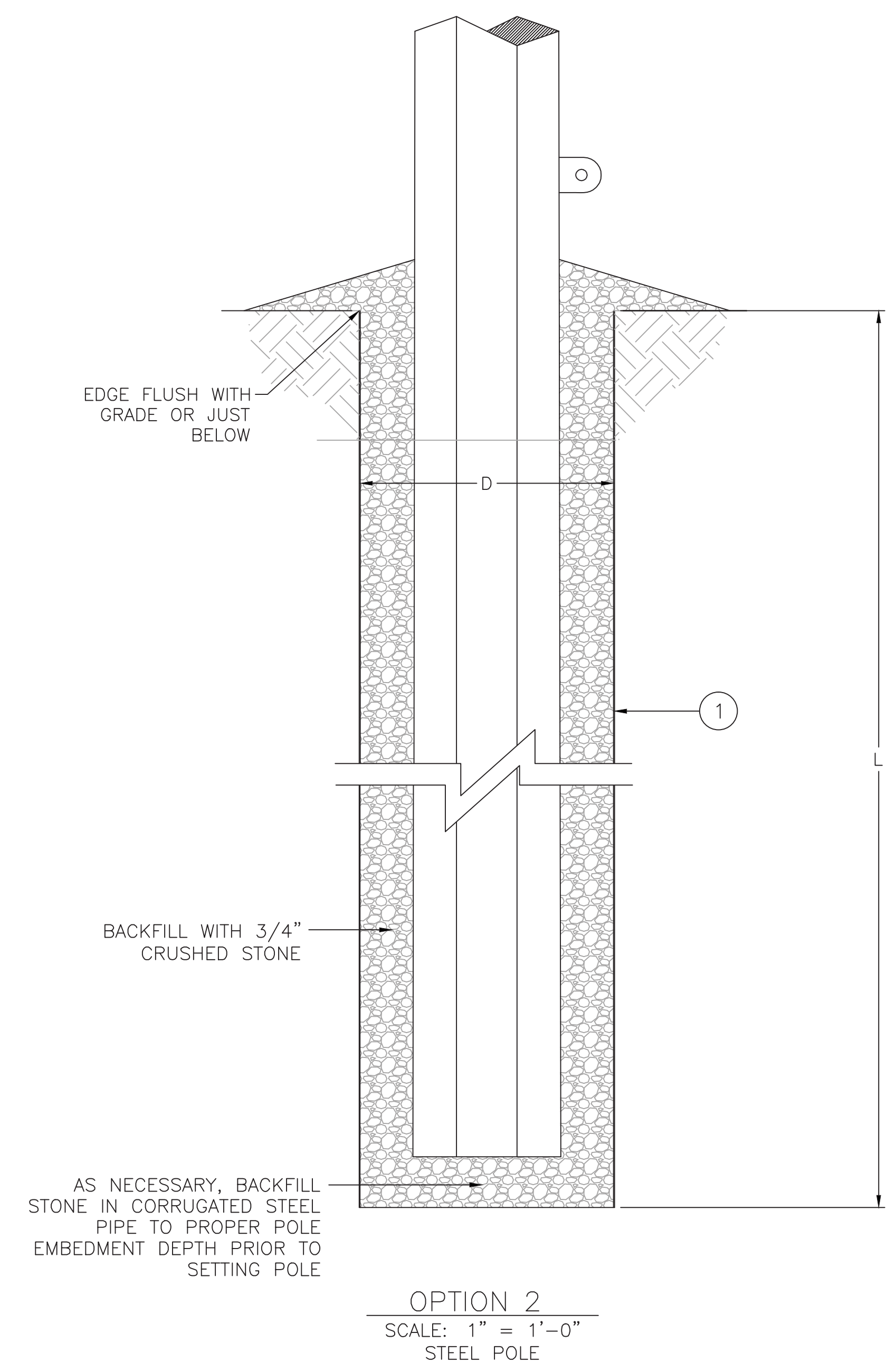
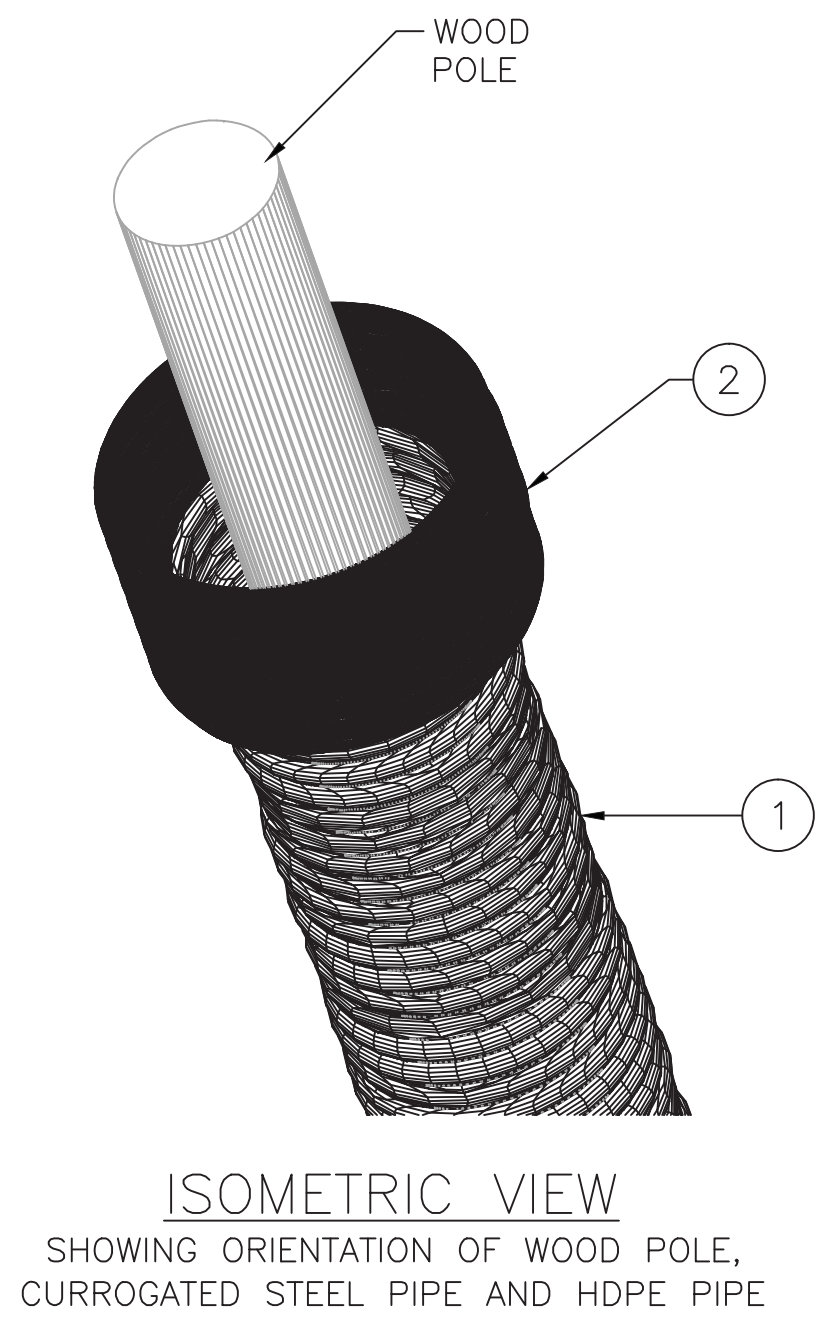
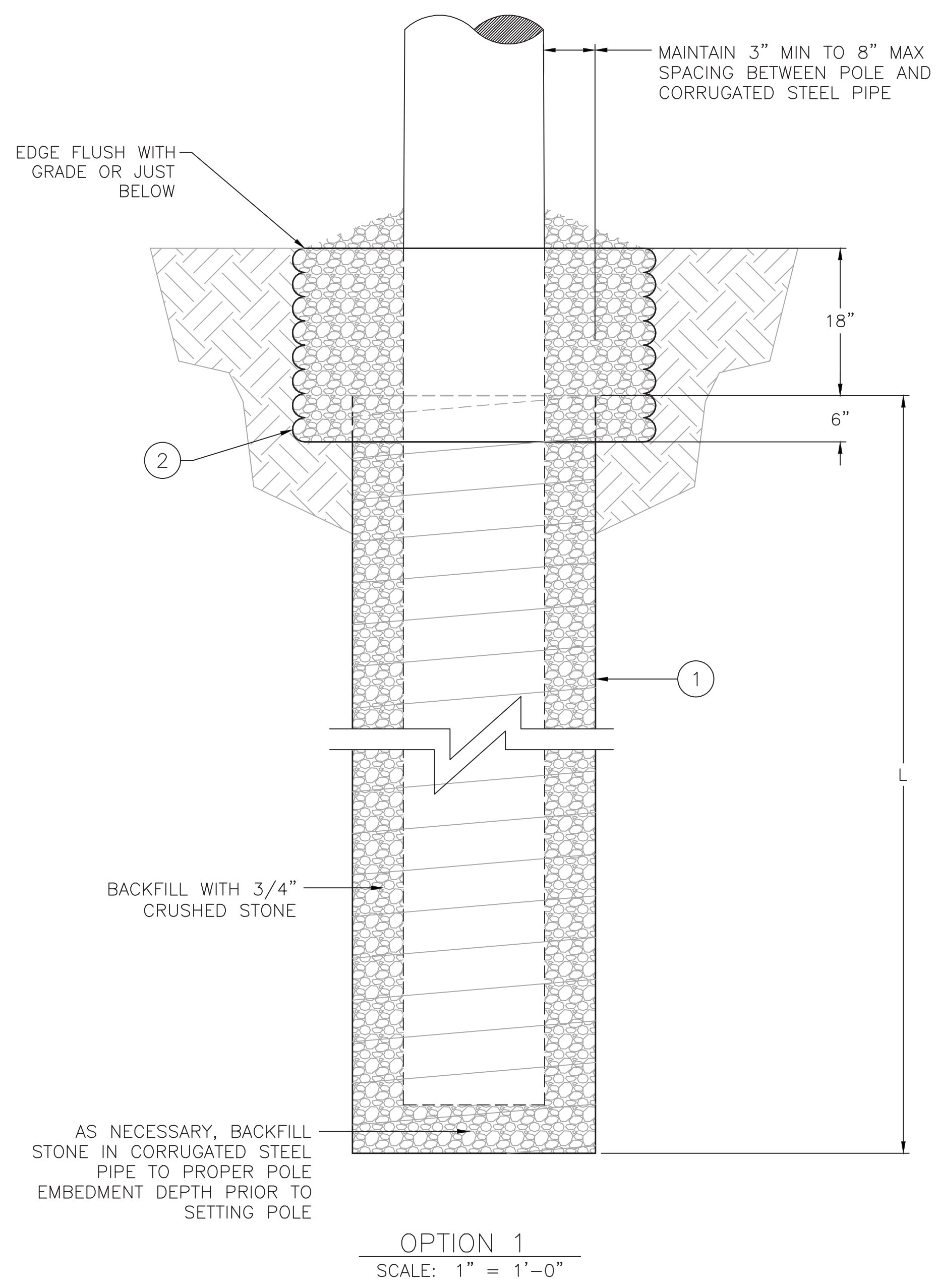
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400298-C-F-EX-03

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MATERIAL LIST					
ITEM	QUANTITY		DESCRIPTION	PS ITEM ID	SAP ITEM ID
	OPT 1	OPT 2			
1	1	1	12 GA. CORRUGATED STEEL PIPE	PO	PO
2	1	-	HDPE PIPE, 42" DIAMETER	PO	PO

- NOTES:
- SEE DRAWING SP.06.01.301.101 FOR GROUNDING DETAILS.
 - MAINTAIN 3" TO 8" SPACING BETWEEN POLE AND CORRUGATED STEEL PILE. CORRUGATED STEEL PIPE LENGTHS "L" ARE TO BE USED SUCH THAT THEY ARE BURIED AT LEAST AS DEEP AS POLES. BACKFILL INSIDE CORRUGATED STEEL PIPE AS NECESSARY TO ACHIEVE PROPER POLE EMBEDMENT DEPTH. FOR STEEL POLES, "L" AND "D" ARE SPECIFIED BY THE DESIGNER.
 - TOP EDGE OF CORRUGATED STEEL PIPE SHALL BE BURIED A MINIMUM OF 18 INCHES BELOW GRADE FOR WOOD POLES. BACKFILL STONE SHALL BE MOUNDED ABOVE GROUNDLINE.
 - WHERE CORRUGATED STEEL PIPES ARE INSTALLED IN ADVANCE OF POLE INSTALLATION, HOLE IS TO BE COVERED AND SECURED IN A METHOD ACCEPTABLE TO NATIONAL GRID.
 - HDPE PIPE IS ORDERED IN 20' LENGTHS. PIPE SHALL BE FIELD CUT TO 2' INCREMENTS.

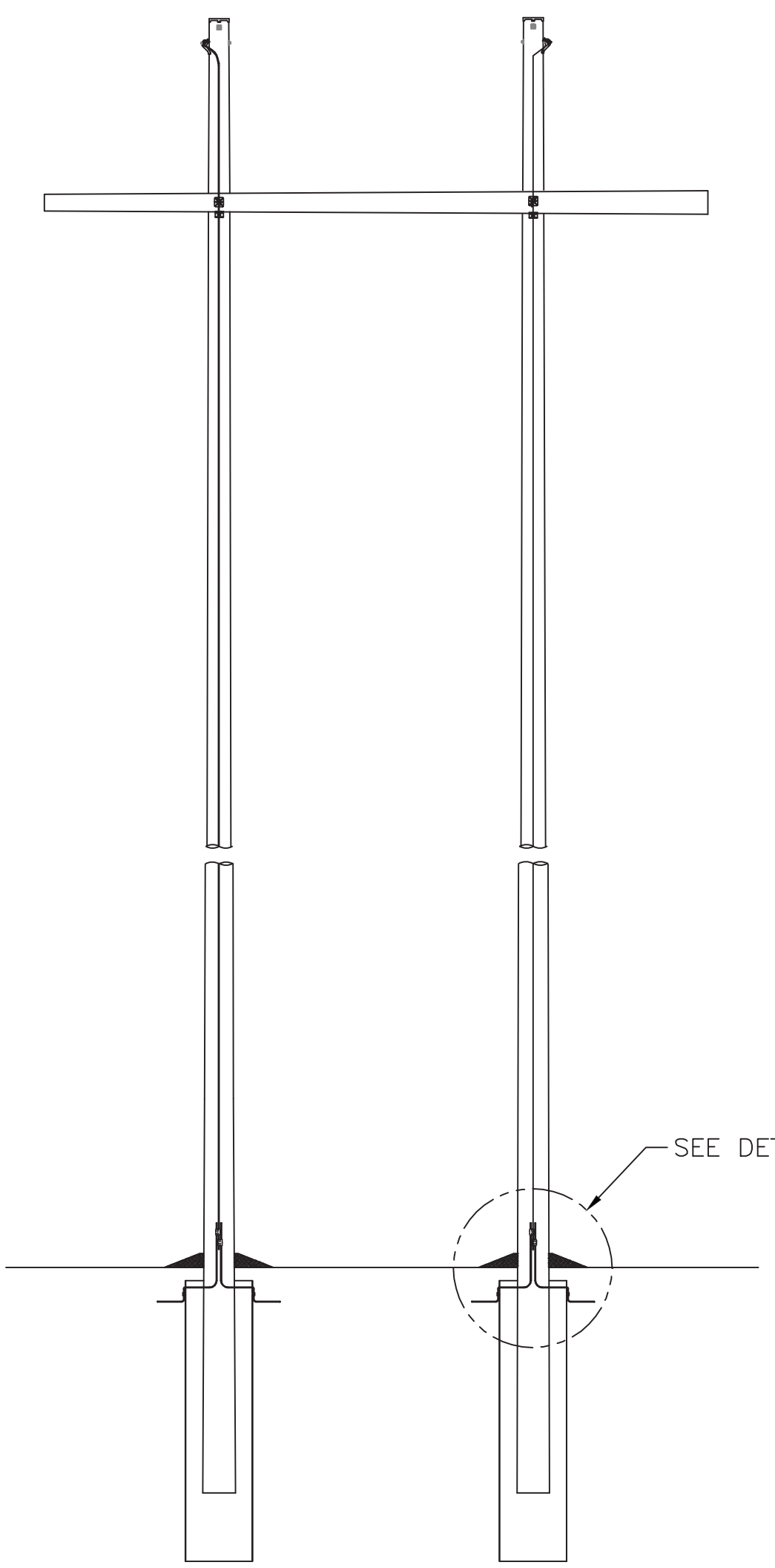


TRANSMISSION STANDARD	PREPARED BY	JLC	2/4/10
	APPROVED BY	NTS	
DETAILS FOR INSTALLATION OF WOOD AND STEEL POLES IN CORRUGATED PIPES	SCALE	1	OF 1
	SHEET		
INDEX	INDEX		

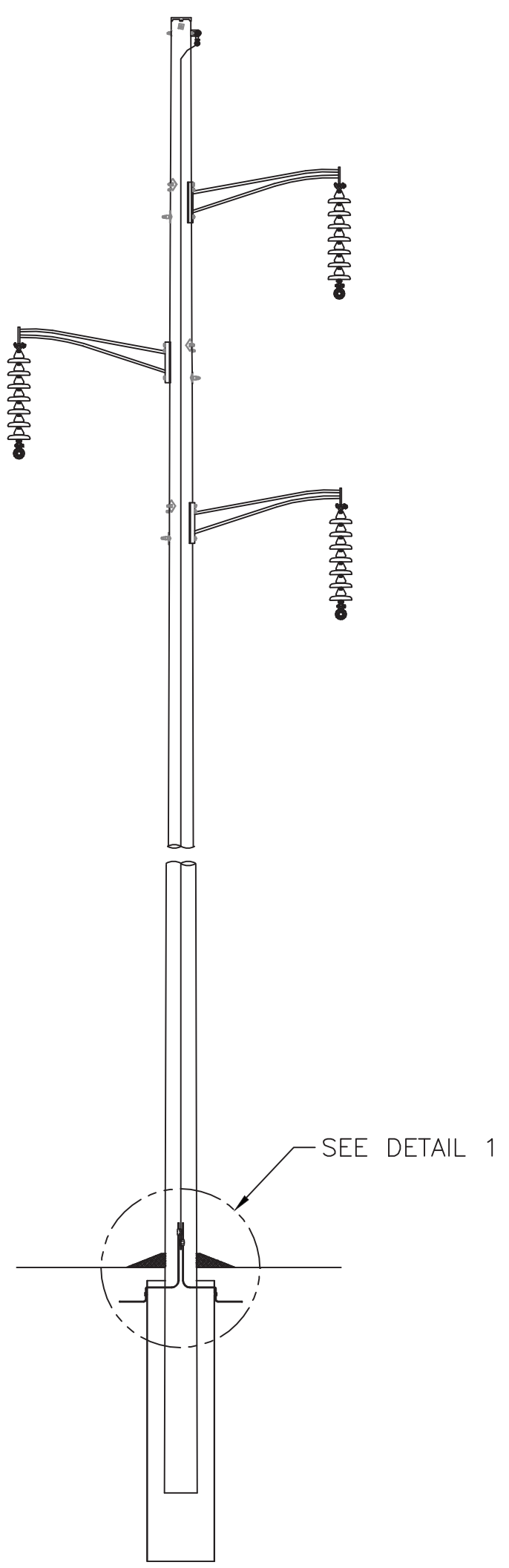
nationalgrid

VERSION DESCRIPTION
 1 02/02/10 D20995 REDESIGNED AS SP.06.01.301.401. D20995 SUPERSEDED
 2 03/31/11 REQUIRE EDGE OF CURVERT 18" BELOW GRADE FOR WOOD; D-11679 SUPERSEDED BY SP.06.01.301.101
 3 07/07/13 VARIOUS MINOR CORRECTIONS
 4 03/24/14 REMOVE GROUNDING DETAILS FROM WOOD POLE DETAILS, ADD USE HDPE PIPE
 5 03/24/14 REMOVE GROUNDING DETAILS FROM WOOD POLE DETAILS, ADD USE HDPE PIPE
 6 01/13/15 REMOVED UNNEEDED DIMENSION FOR OPTION 2 DETAIL
 7

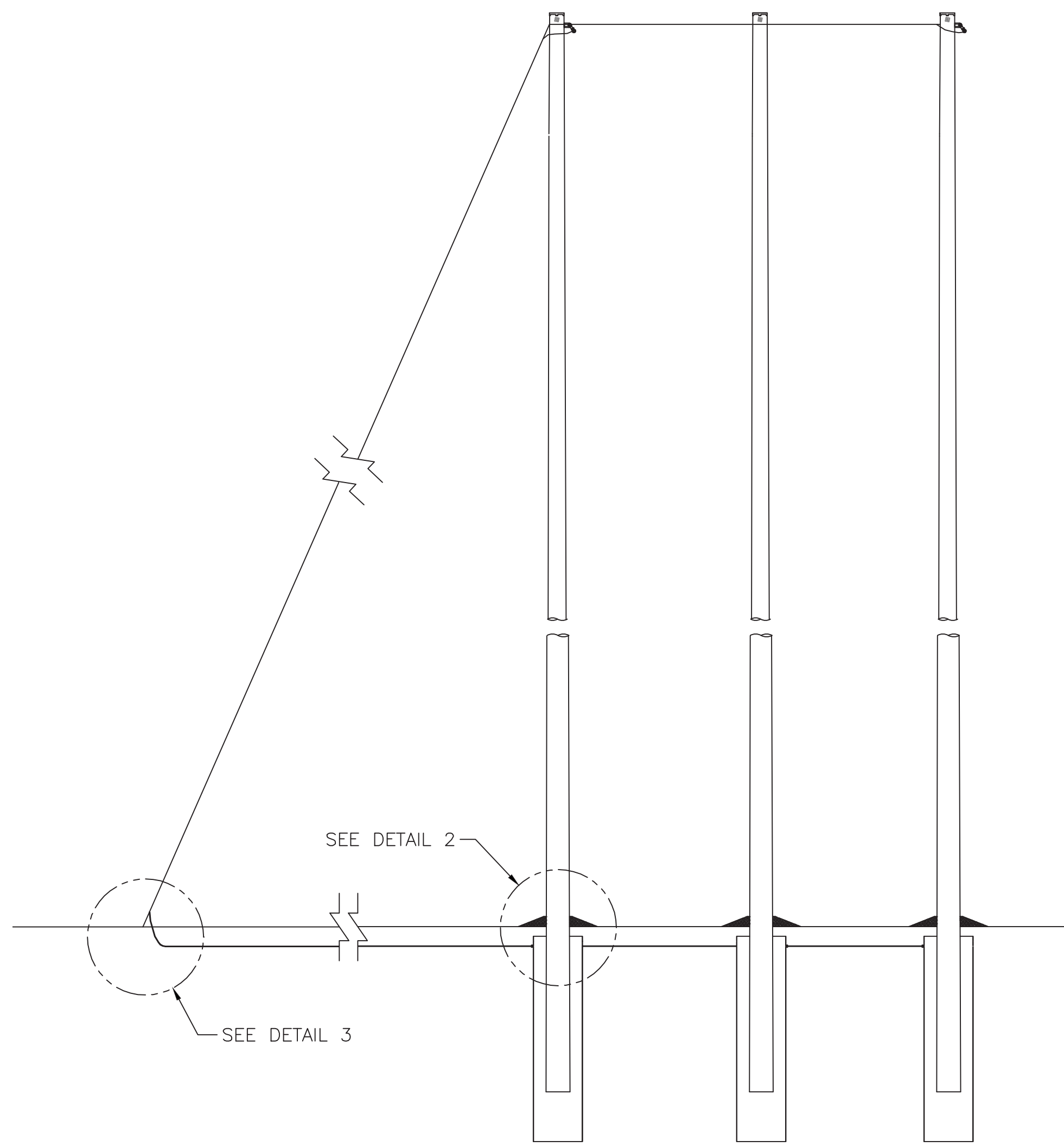
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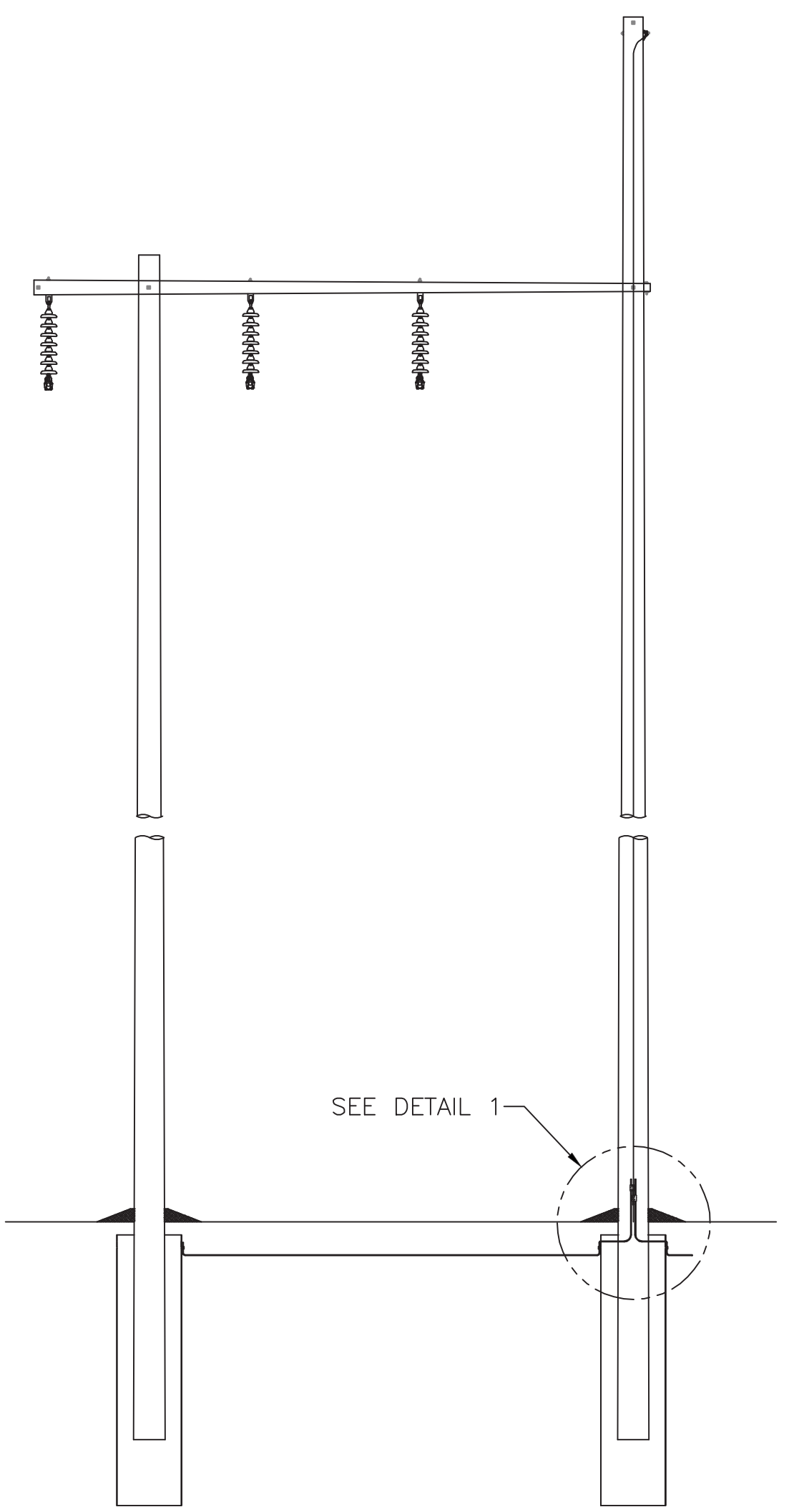
H-FRAME STRUCTURE



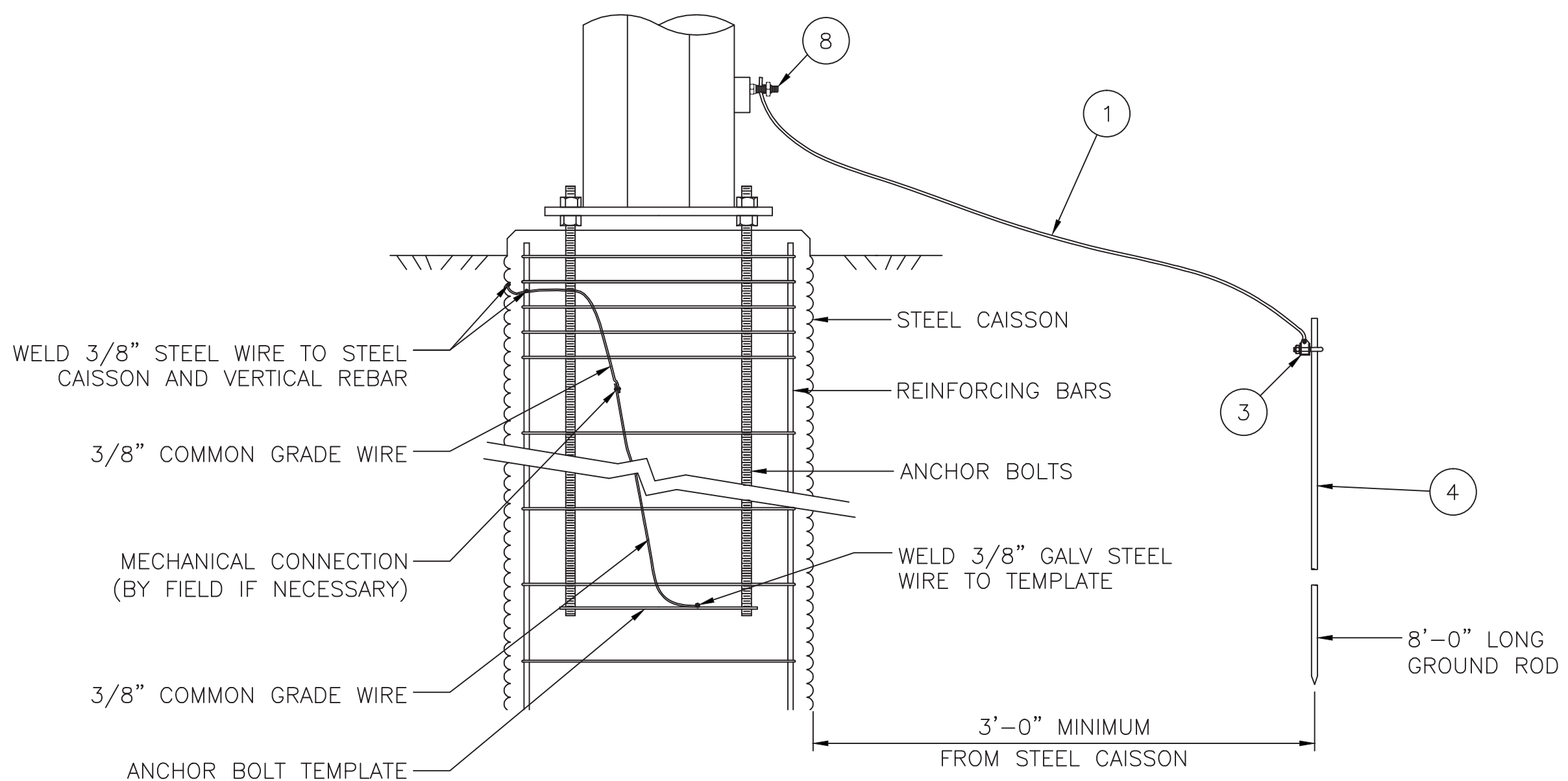
SINGLE POLE STRUCTURE



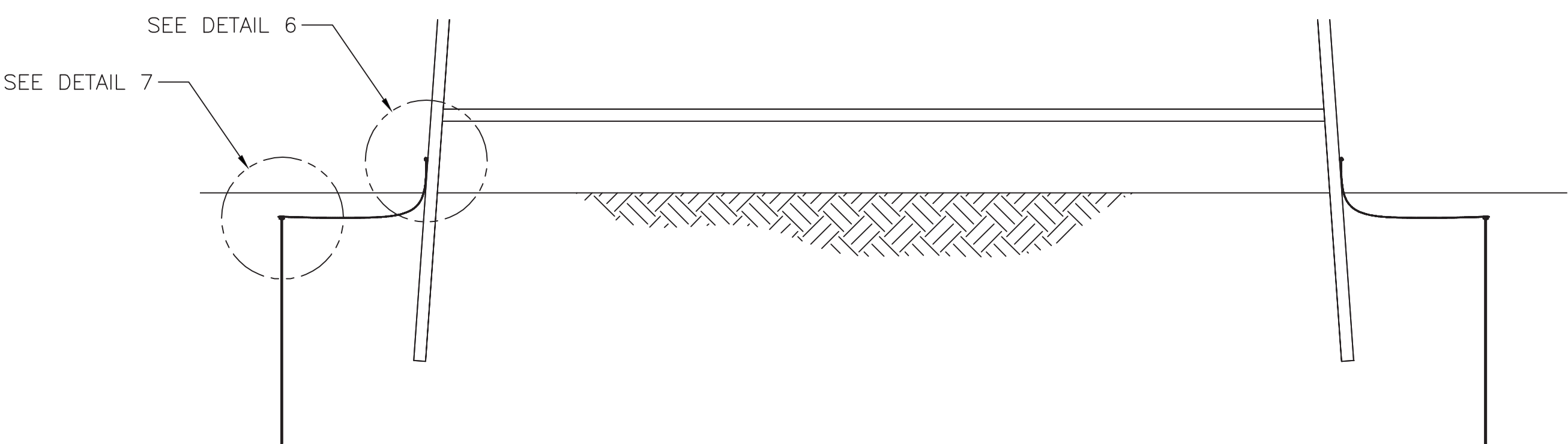
THREE POLE STRUCTURE



POLARM STRUCTURE



CAISSON

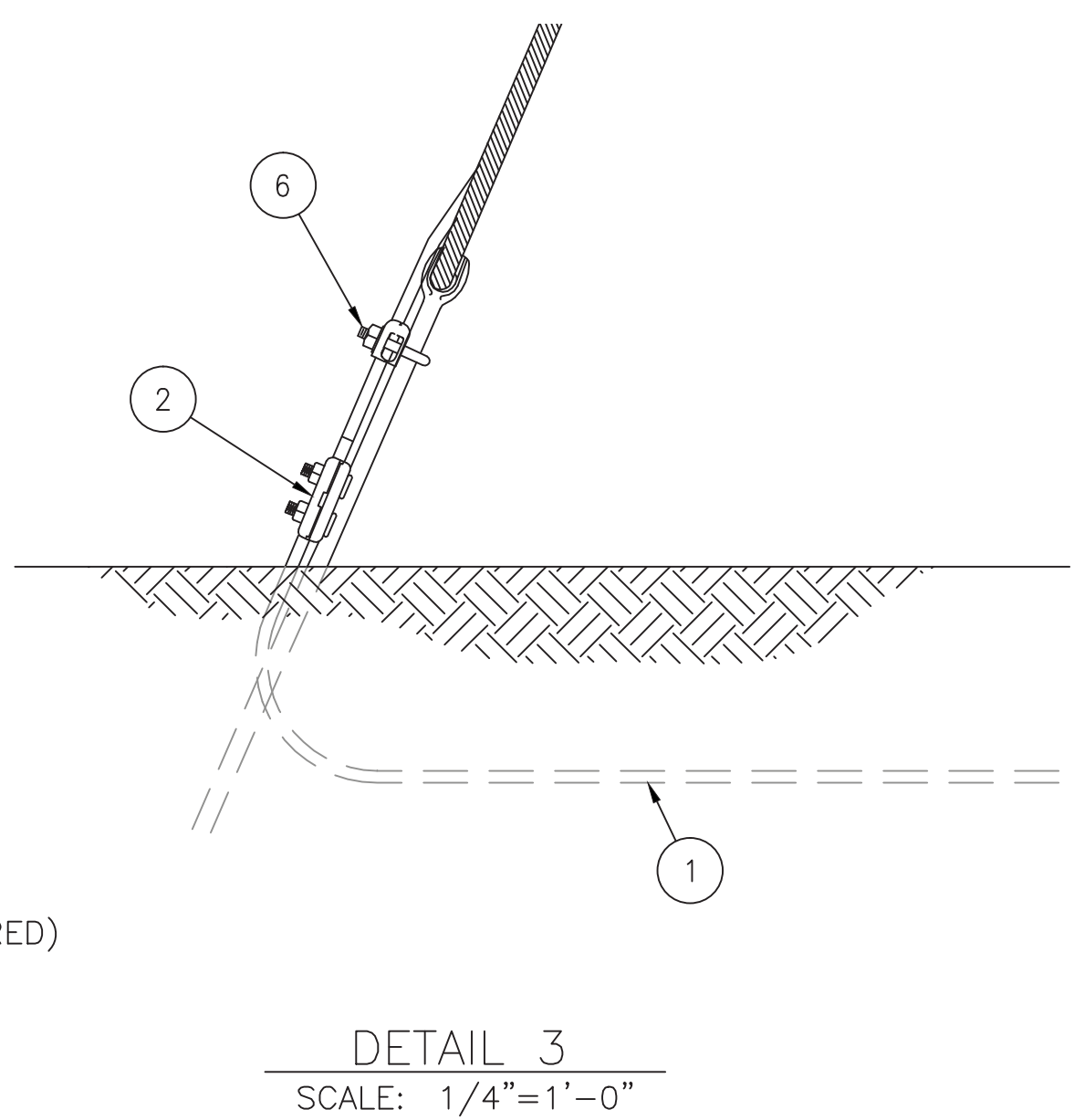
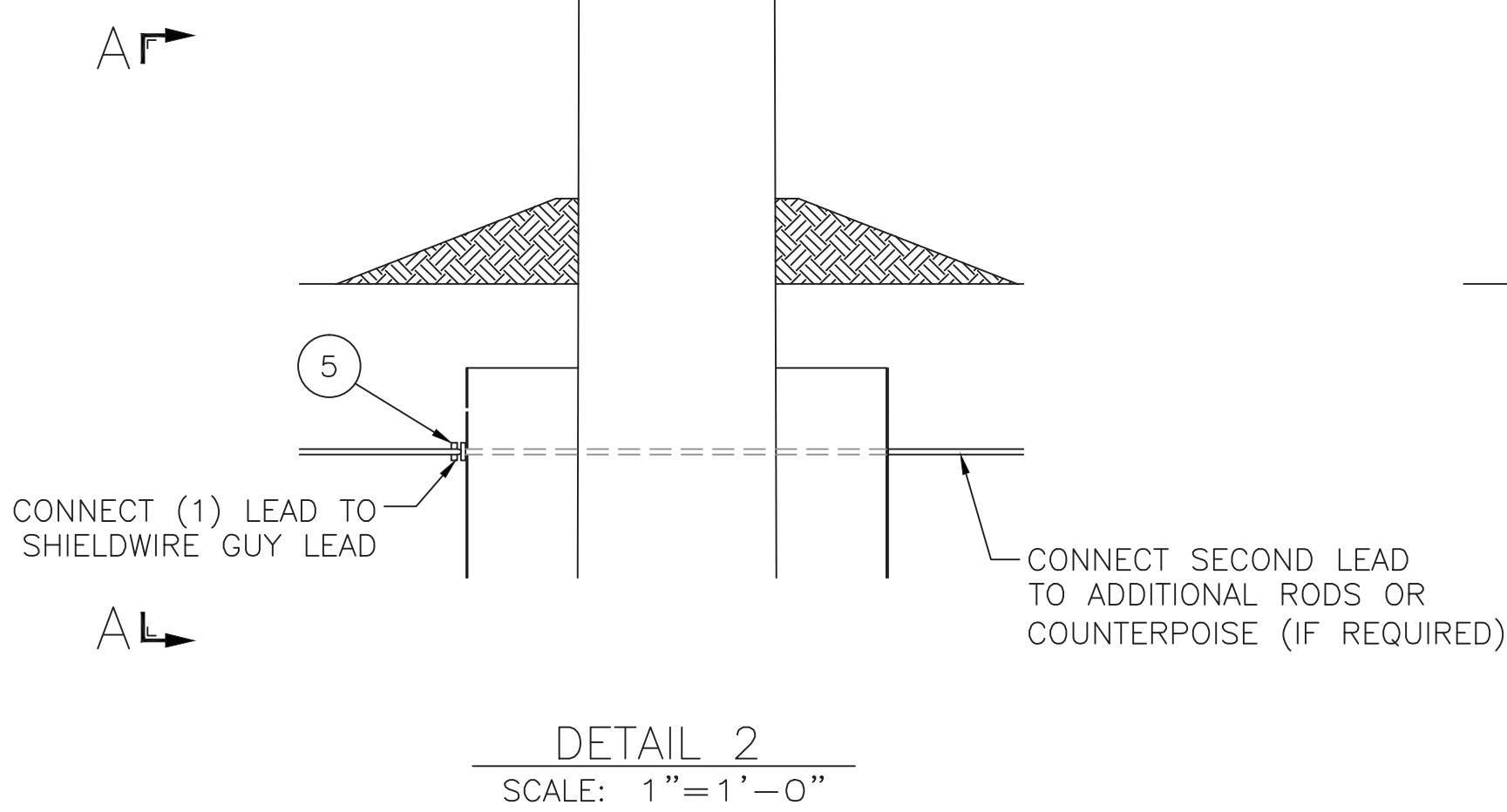
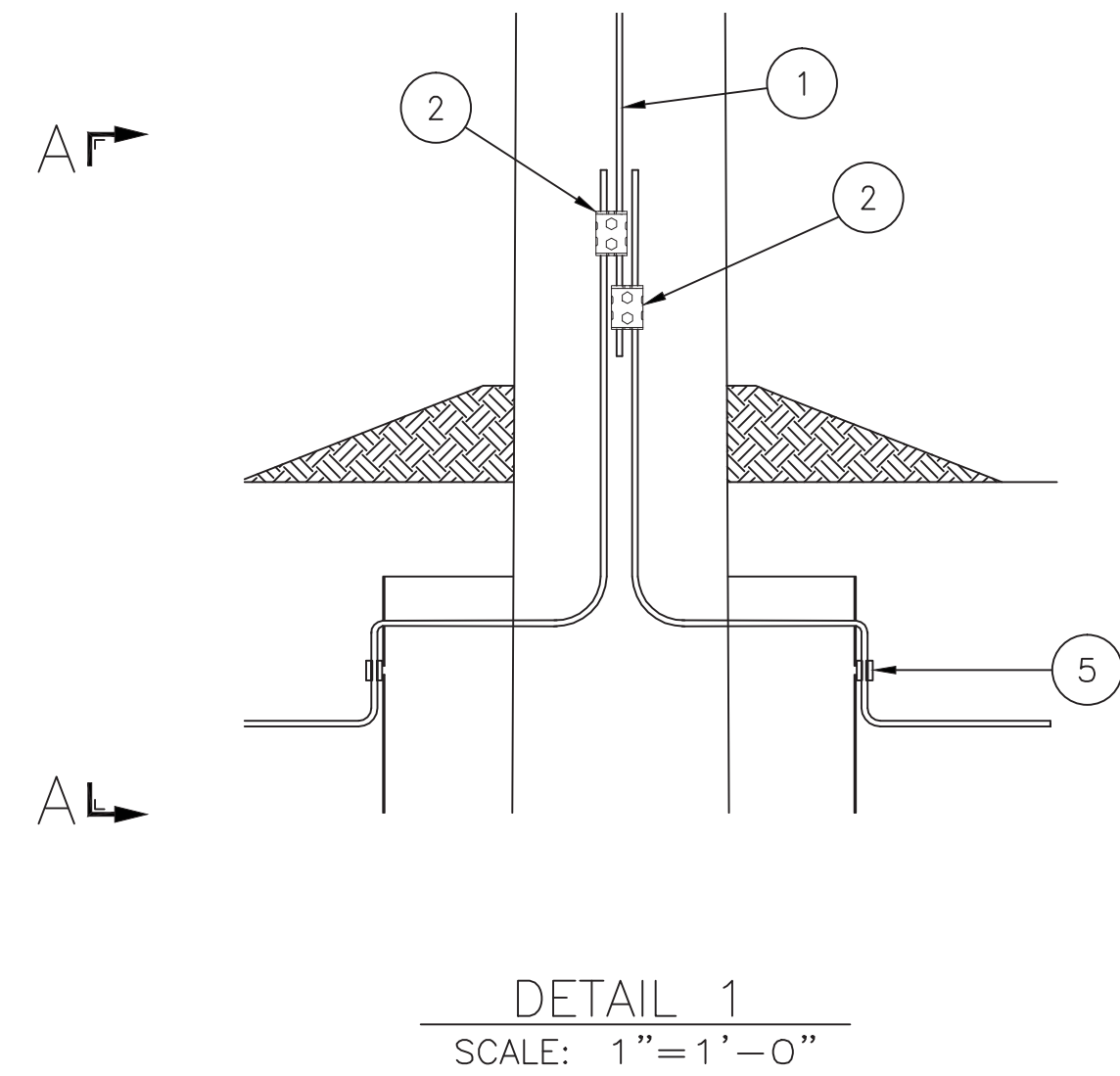


STEEL TOWER

INCHES ON ORIGINAL

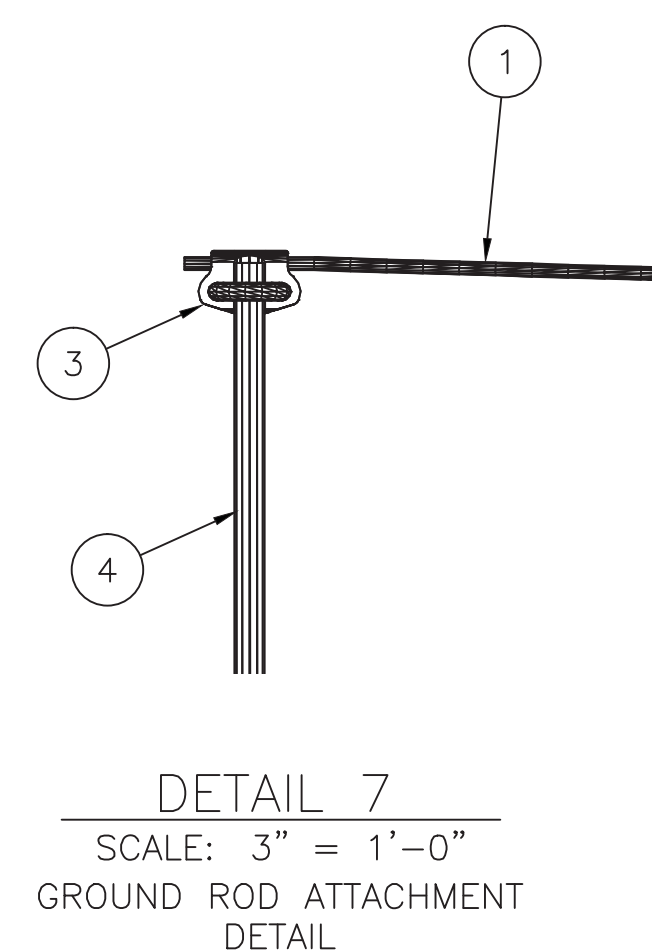
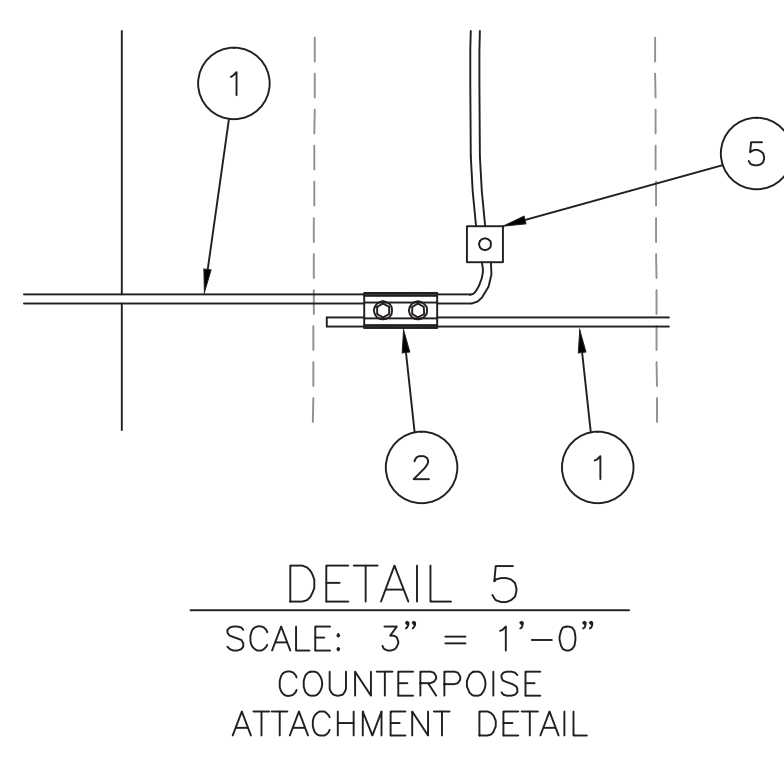
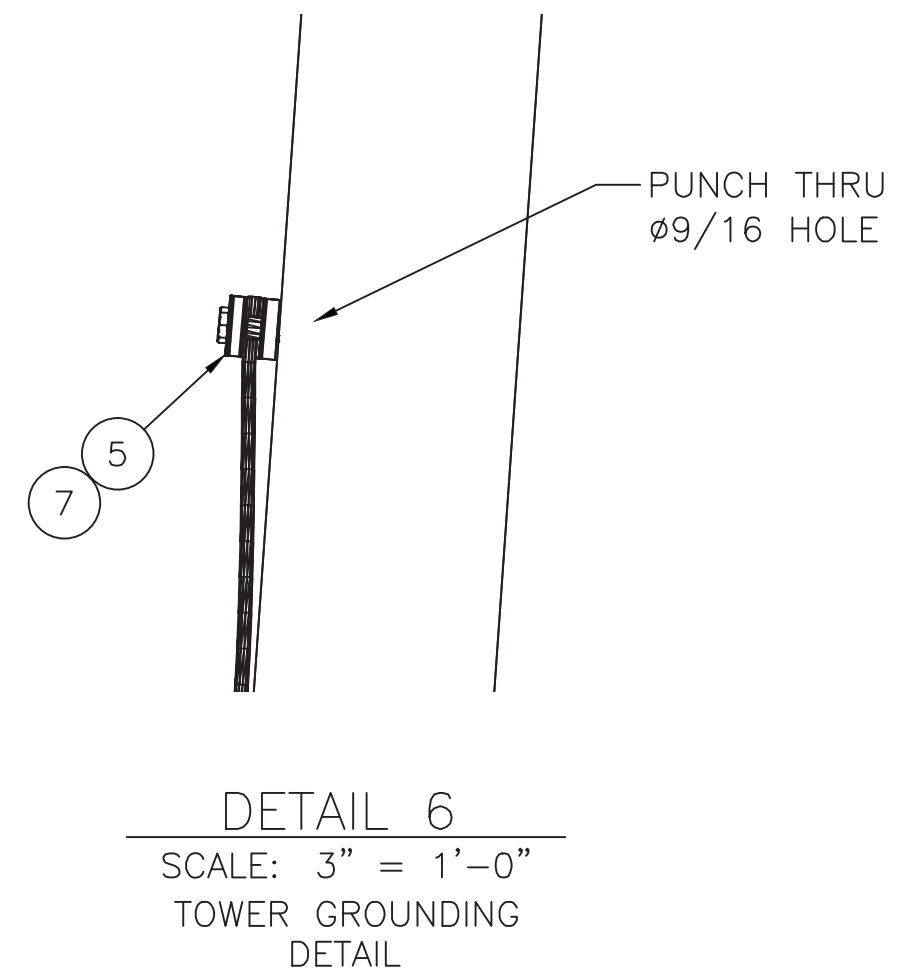
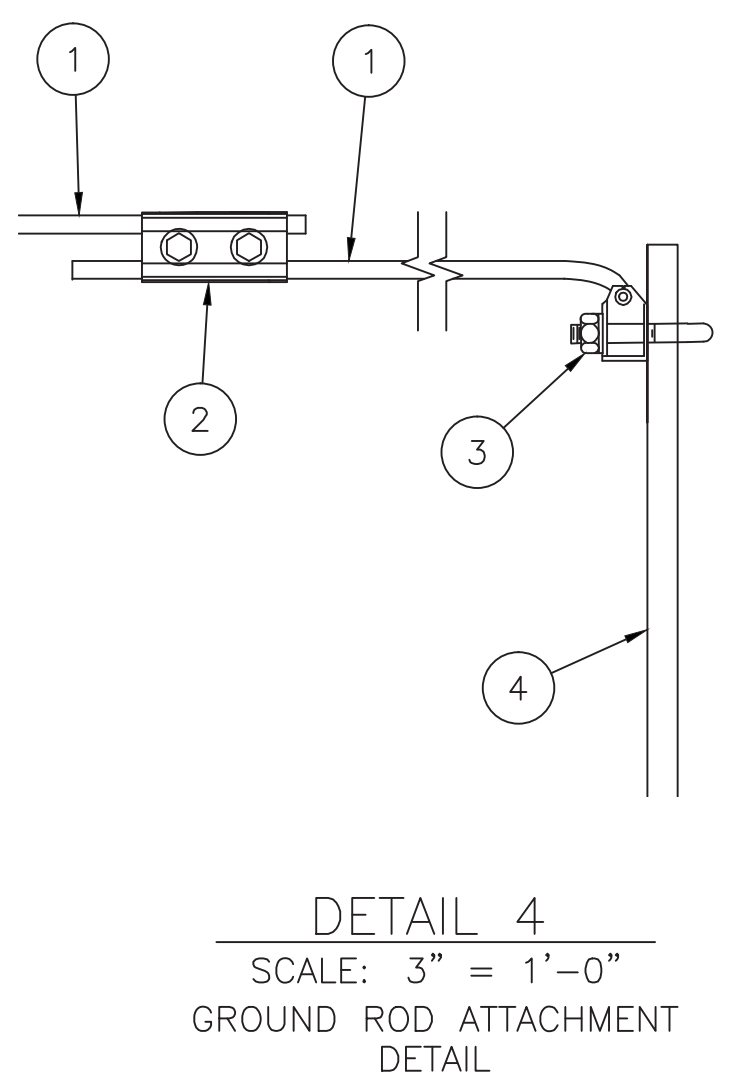
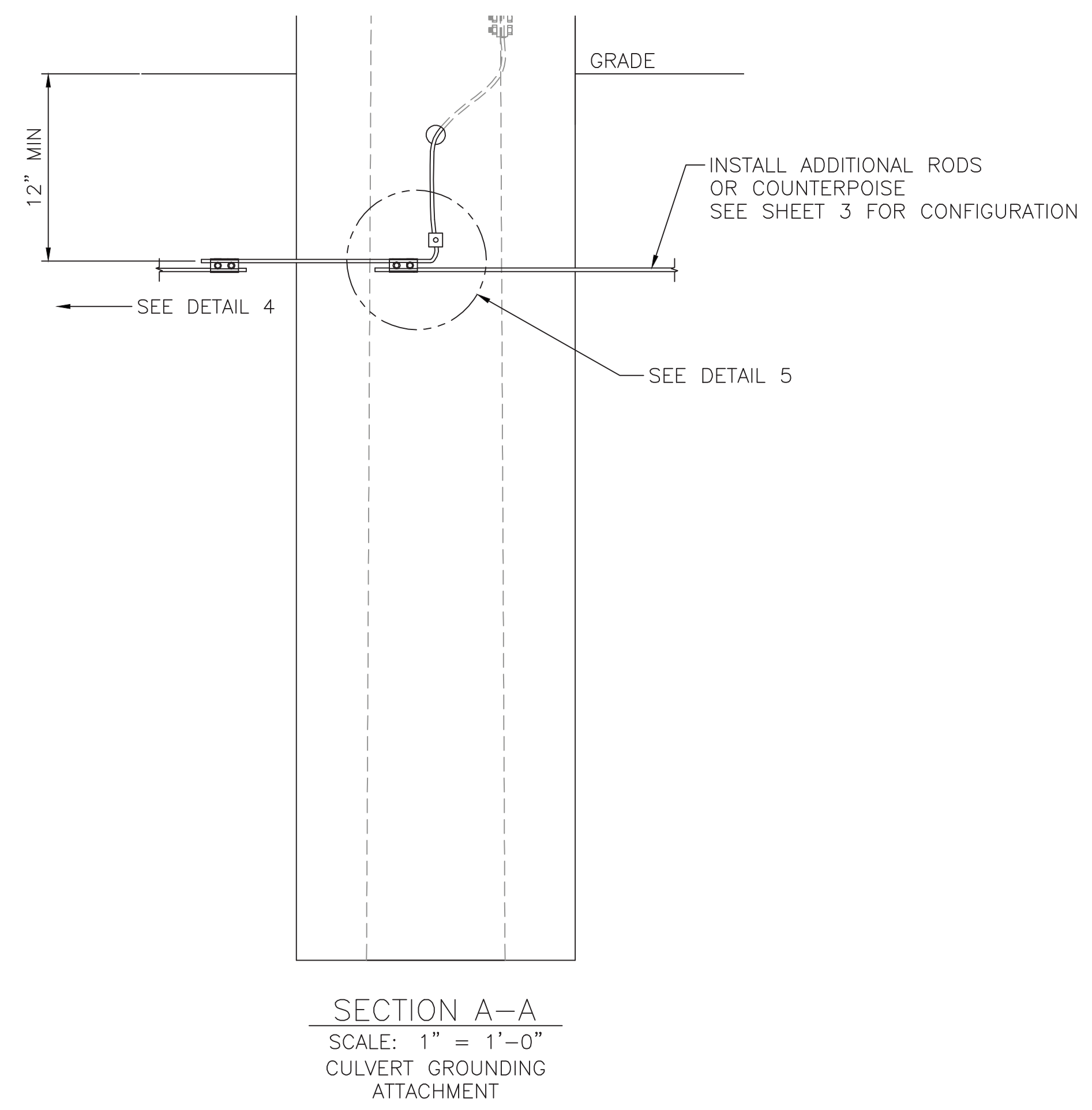
TRANSMISSION LINE STANDARD		PREPARED BY	JLC	DATE	02/02/10
GROUNDING DETAILS FOR TRANSMISSION LINE STRUCTURES		REVIEWED BY	JME	DATE	02/02/10
		SCALE	NONE		
		SHEET	1	OF	6
		INDEX	SP.06.01.301		
		FOR REVISIONS 1-7 SEE VERSION 7			
		ADD SAP ITEM ID NUMBERS			
		8 07/05/12			
		9 09/10/13			
		ADDED GROUNDING LUG, CORRECTED VIEW AND SECTION REFERENCES			
REVISION	DATE	BY	DESCRIPTION		
1		JME			
2		MSE			
3		SLB			
4		TEC			
5		KAD			
6		LGS			
		VERSION	9		

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MATERIAL LIST			
ITEM	DESCRIPTION	PS ITEM ID	SAP ITEM ID
1	3/8" Common Grade Steel Wire	5998530	9306353
2	Clamp, Parallel Groove, Bronze	5962562	9320554
3	Clamp, Ground Rod, 5/8"	3503328	9313446
4	Rod, Copperweld, Ground, 5/8" x 8'-0"	3503013	9313616
5	Clamp, Bronze	5105146	9309820
6	Ground Clamp for Anchor Rod	5986688	9320250
7	Nut, Hex 1/2" SS	7001719	9319754
8	Lug, grounding, 1/2"	5961547	9313870

- NOTES:
- TESTING OF GROUND IMPEDANCE SHALL BE PERFORMED ON EACH POLE AS SP, AND THE APPROPRIATE SUPPLEMENTARY GROUND GRIDS INSTALLED BASED ON THIS DRAWING AND AS SPECIFIED IN SP.06.01.301
 - ARRANGEMENT OF GROUND RODS AND COUNTERPOISE SHOWN IN FIGURES; CONNECTIONS SHOWN IN REFERENCED DETAIL DRAWINGS
 - STRUCTURES WHICH DO NOT REQUIRE ADDITIONAL GROUND GRID INSTALLATION SHALL HAVE EXCESS GROUNDWIRE CUT OFF 12" BELOW GROUNDLINE OR BURIED AT LEAST 12" BELOW GROUNDLINE



nationalgrid		PREPARED BY: JLC 02/02/10 REVIEWED BY: JME 02/02/10 APPROVED BY: MSE 02/02/10 SCALE: NONE SHEET: 2 OF 6 INDEX: SP.06.01.301
TRANSMISSION LINE STANDARD GROUNDING DETAILS FOR TRANSMISSION LINE STRUCTURES	VERSION 7 FOR REVISIONS 1-7 SEE VERSION 7 ADD SAP ITEM ID NUMBERS 07/05/12 09/10/13 ADDED GROUNDING LUG, CORRECTED VIEW AND SECTION REFERENCES	9

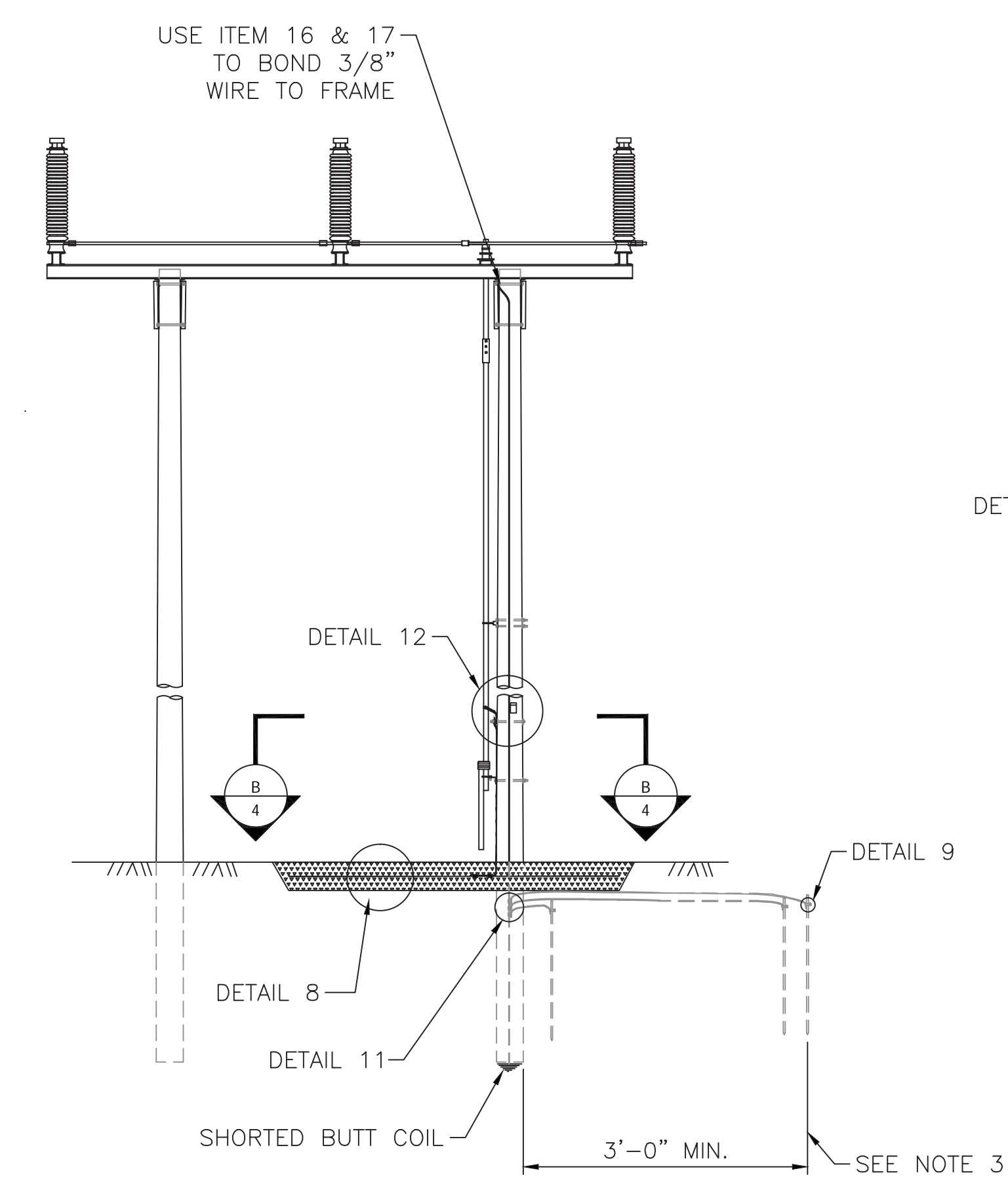
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TRANSMISSION STRUCTURE GROUND GRID CONFIGURATION PLAN VIEWS		
SINGLE POLE STRUCTURE	TWO POLE STRUCTURE	THREE POLE STRUCTURE
<p>GROUND ROD (TYPICAL 4 PLACES)</p> <p>10' FROM POLE</p>	<p>GROUND ROD (TYPICAL 6 PLACES)</p> <p>10' FROM POLE</p>	<p>GROUND ROD (TYPICAL 8 PLACES)</p> <p>10' FROM POLE</p>
INSTALL 4 GROUND RODS	INSTALL 6 GROUND RODS	INSTALL 8 GROUND RODS
<p>COUNTERPOISE (NON-CONTINUOUS) (TYPICAL 2 PLACES)</p> <p>VARIES (SEE SPECIFICATION)</p>	<p>COUNTERPOISE (NON-CONTINUOUS) (TYPICAL 2 PLACES)</p> <p>VARIES (SEE SPECIFICATION)</p>	<p>COUNTERPOISE (NON-CONTINUOUS) (TYPICAL 2 PLACES)</p> <p>VARIES (SEE SPECIFICATION)</p>
INSTALL 2 STRIPS COUNTERPOISE	INSTALL 2 STRIPS COUNTERPOISE	INSTALL 2 STRIPS COUNTERPOISE
<p>COUNTERPOISE (NON-CONTINUOUS) (TYPICAL 4 PLACES)</p> <p>SEPARATE AS FAR AS FIELD CONDITIONS ALLOW</p>	<p>COUNTERPOISE (NON-CONTINUOUS) (TYPICAL 4 PLACES)</p> <p>SEPARATE AS FAR AS FIELD CONDITIONS ALLOW</p>	<p>COUNTERPOISE (NON-CONTINUOUS) (TYPICAL 4 PLACES)</p> <p>SEPARATE AS FAR AS FIELD CONDITIONS ALLOW</p>
INSTALL 4 STRIPS COUNTERPOISE	INSTALL 4 STRIPS COUNTERPOISE	INSTALL 4 STRIPS COUNTERPOISE

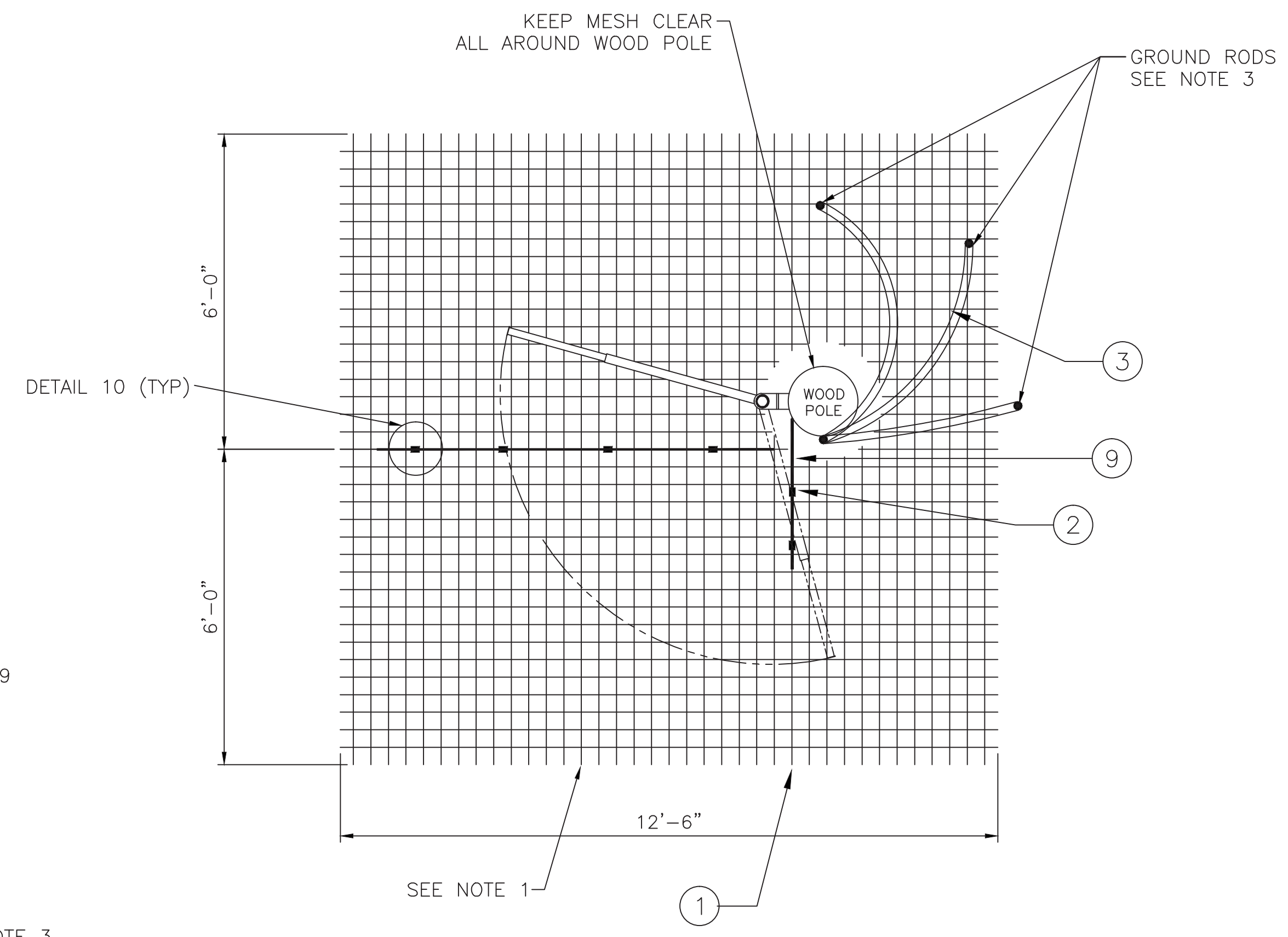
INCHES ON ORIGINAL

TRANSMISSION LINE STANDARD		nationalgrid		VERSION 9	
GROUNDING DETAILS FOR TRANSMISSION LINE STRUCTURES		FOR REVISIONS 1-7 SEE VERSION 7		DATE	
APPROVED BY JLC 02/02/10		APPROVED BY JME 02/02/10		DATE	
APPROVED BY MSE 02/02/10		APPROVED BY MSE 02/02/10		DATE	
SCALE 3 OF 6		SCALE NONE		DATE	
SHEET 3 OF 6		SHEET 3 OF 6		DATE	
INDEX SP.06.01.301		INDEX SP.06.01.301		DATE	

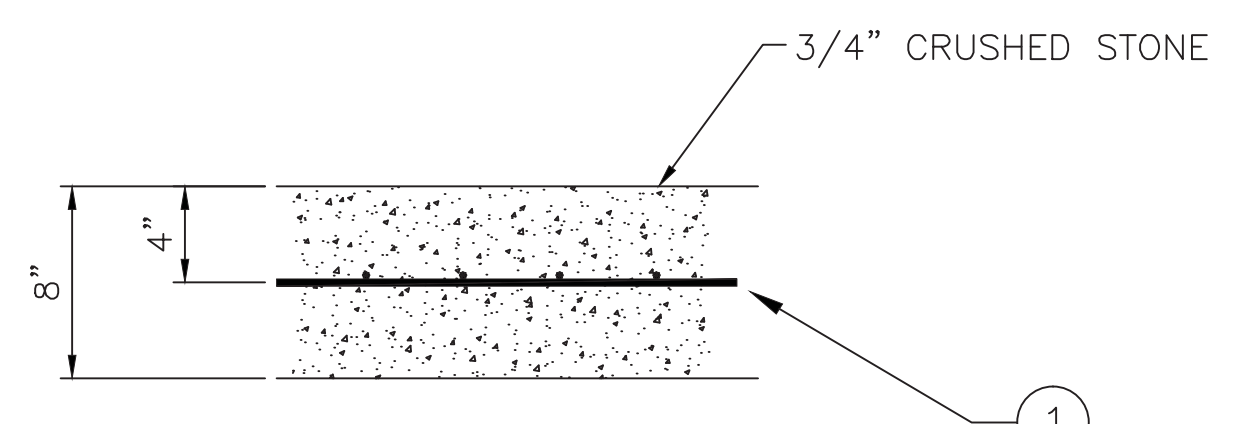
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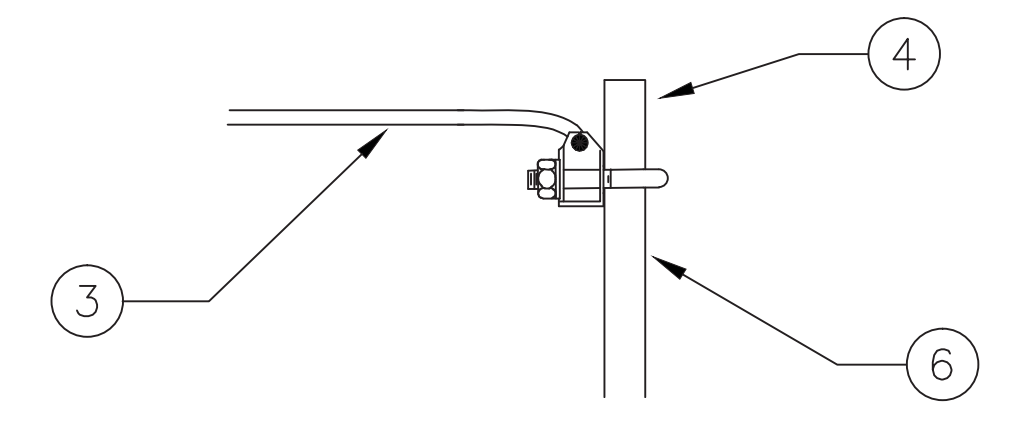
FRONT ELEVATION



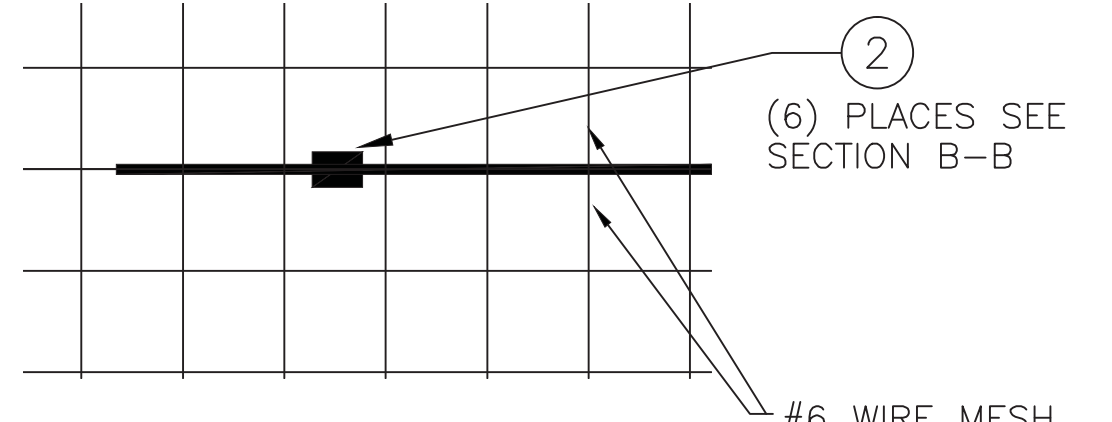
SECTION B-B



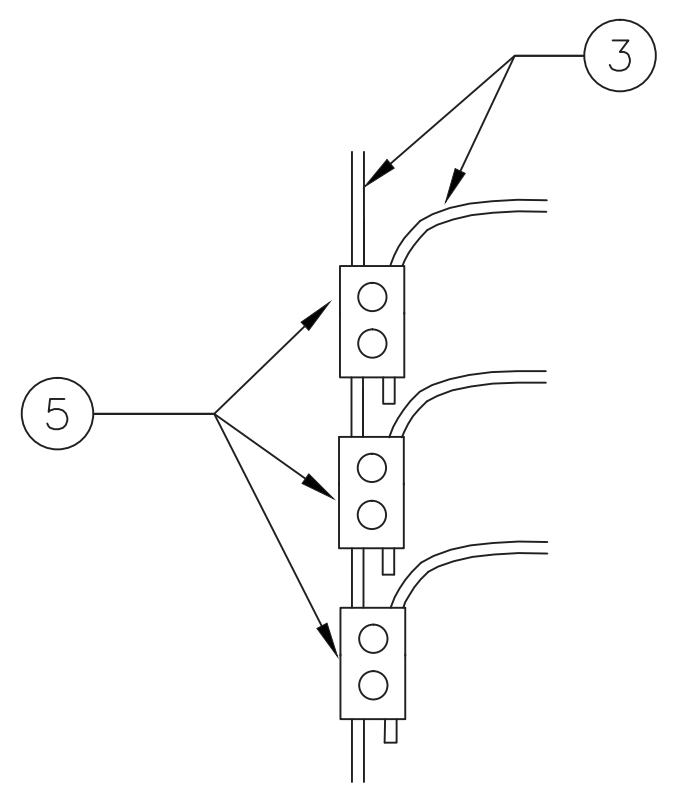
DETAIL 8



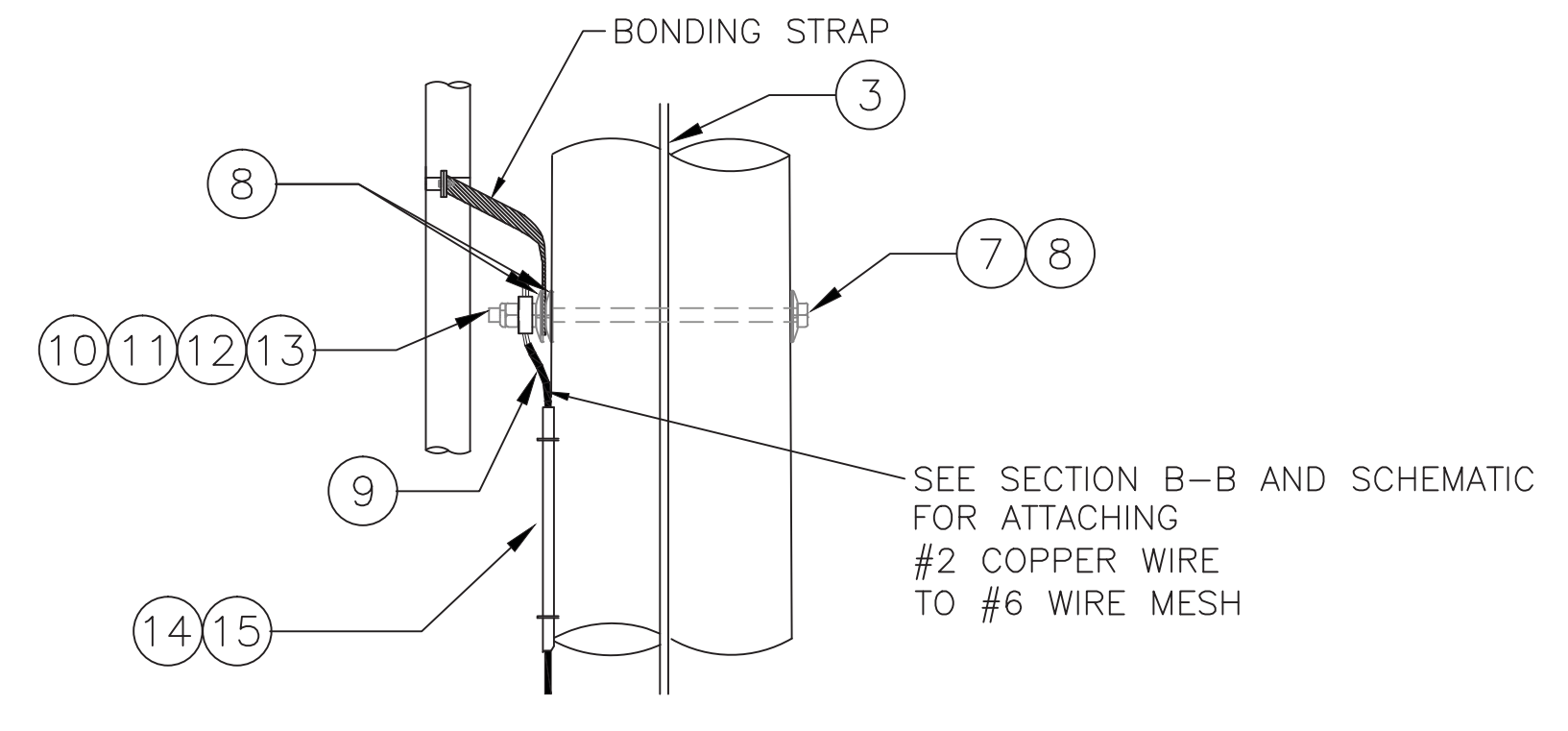
DETAIL 9



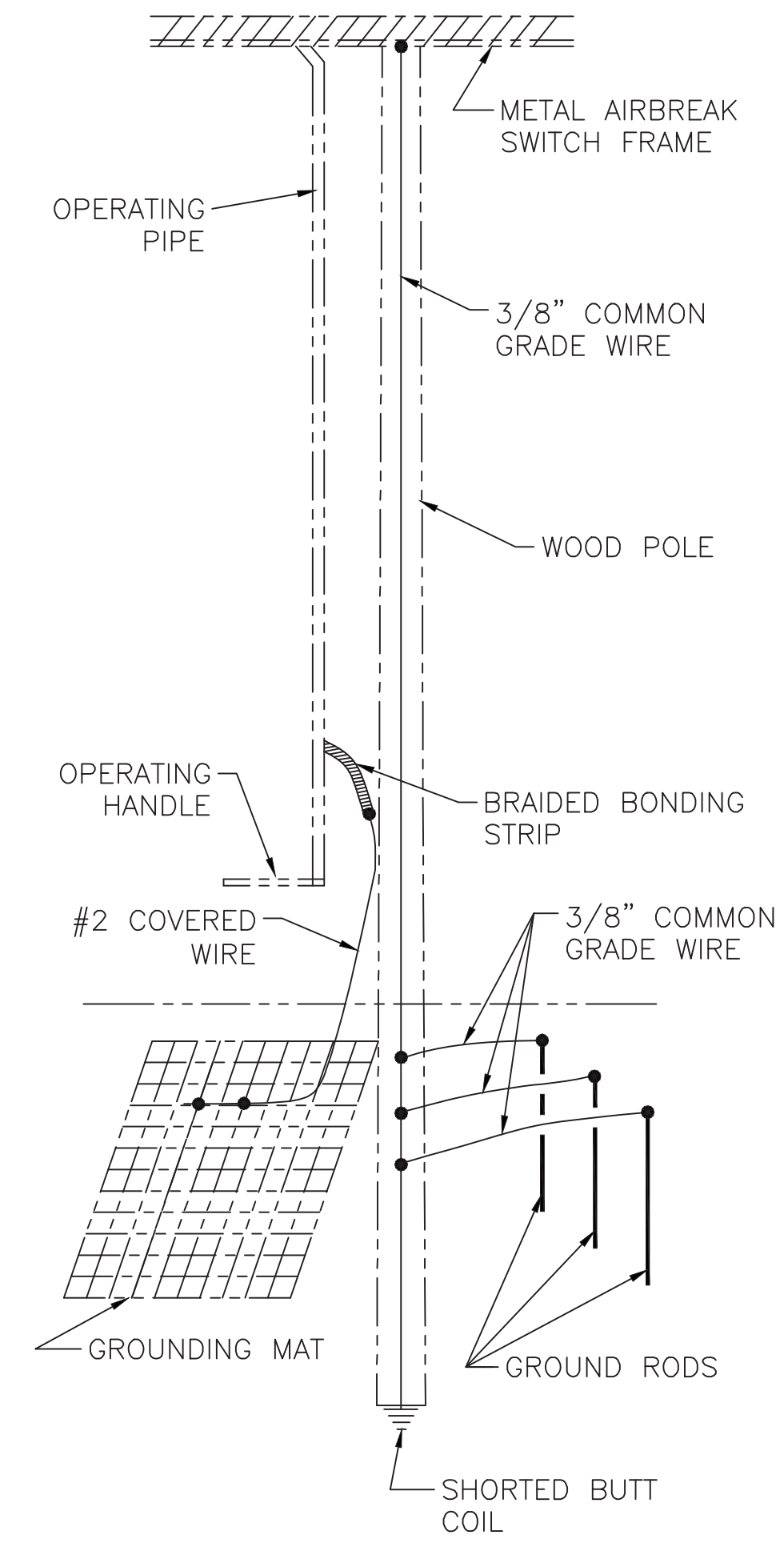
DETAIL 10



DETAIL 11



DETAIL 12



SCHEMATIC VIEW

MATERIAL LIST				
ITEM	QUAN	DESCRIPTION	PS ITEM ID	SAP ITEM ID
1	1	#6 WIRE MESH, 4" SQUARES, 40% Cu CLAD (ROLL)	5105242	9311222
2	6	COPPER CRIMPIT ("C" TYPE)	5105243	9309996
3	15	3/8" COMMON GRADE STEEL WIRE (FEET)	5998530	9306353
4	3	CLAMP, GROUND ROD	3503390	9313417
5	3	CLAMP, PARALLEL BRONZE	5962562	9320554
6	3	ROD, GROUND GALV 5/8" x 8'-0" LG	3503013	9313616
7	1	BOLT, MACHINE GALV 5/8" x 14" OR 16"	7001503 7001505	9309119 9320015
8	3	WASHER, CURVED 2 1/4" SQUARE	5997810	
9	10	WIRE, #2 7 STRAND SD COPPER, COVERED	4001042	9312556
10	1	CLIP, BONDING FOR 5/8" BOLT	5987955	9320450
11	1	NUT, SQUARE GALVANIZED 5/8"	5993400	9319911
12	1	PALNUT, GALVANIZED 5/8"	7024158	9322021
13	1	WASHER, SPRING CLIP FOR 5/8" BOLT	5997480	9319582
14	1	MOLDING, PLASTIC	3503053	9313613
15	5	STAPLES, 2" GALVANIZED	0811201	9314525
16	1	CLIP, BONDING FOR 3/4" BOLT	5987950	9313173
17	1	NUT, GALVANIZED 3/4"	5993410	9307167

- NOTES:
1. PLACE TWO SECTIONS OF WIRE MESH AS SHOWN IN RELATION TO THE FULL HANDLE SWING.
 2. DOWNLEAD WIRE AND GROUND RODS SHOULD NOT TOUCH WIRE MESH.
 3. GROUND RODS TO BE PLACED AS SHOWN IN SECTION B-B.
 4. STRIP ENOUGH OF THE #2 COPPER COVERED WIRE TO MAKE A GOOD CONNECTION.

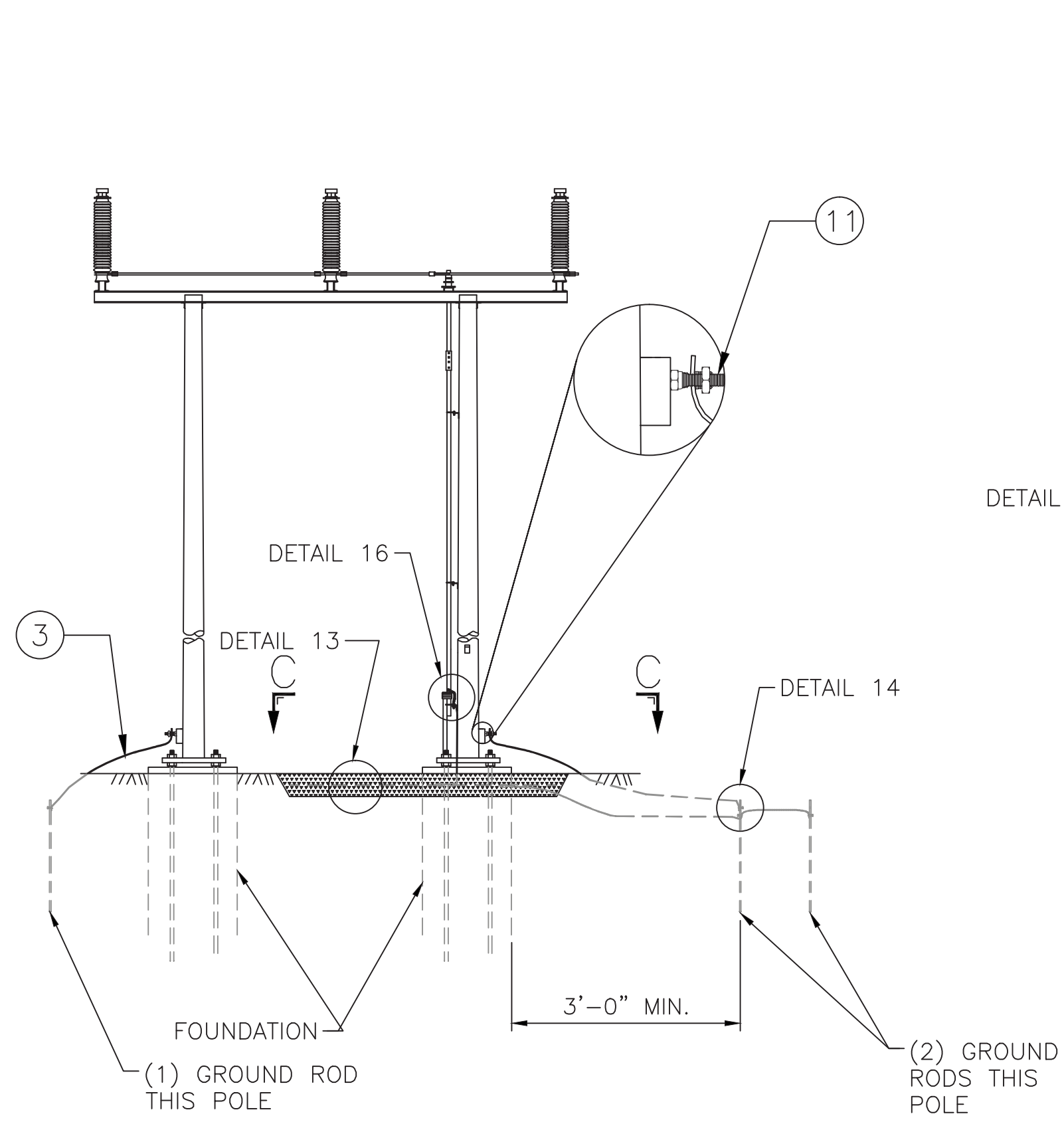
TRANSMISSION LINE STANDARD

GROUNDING DETAILS FOR WOOD SWITCH STRUCTURES

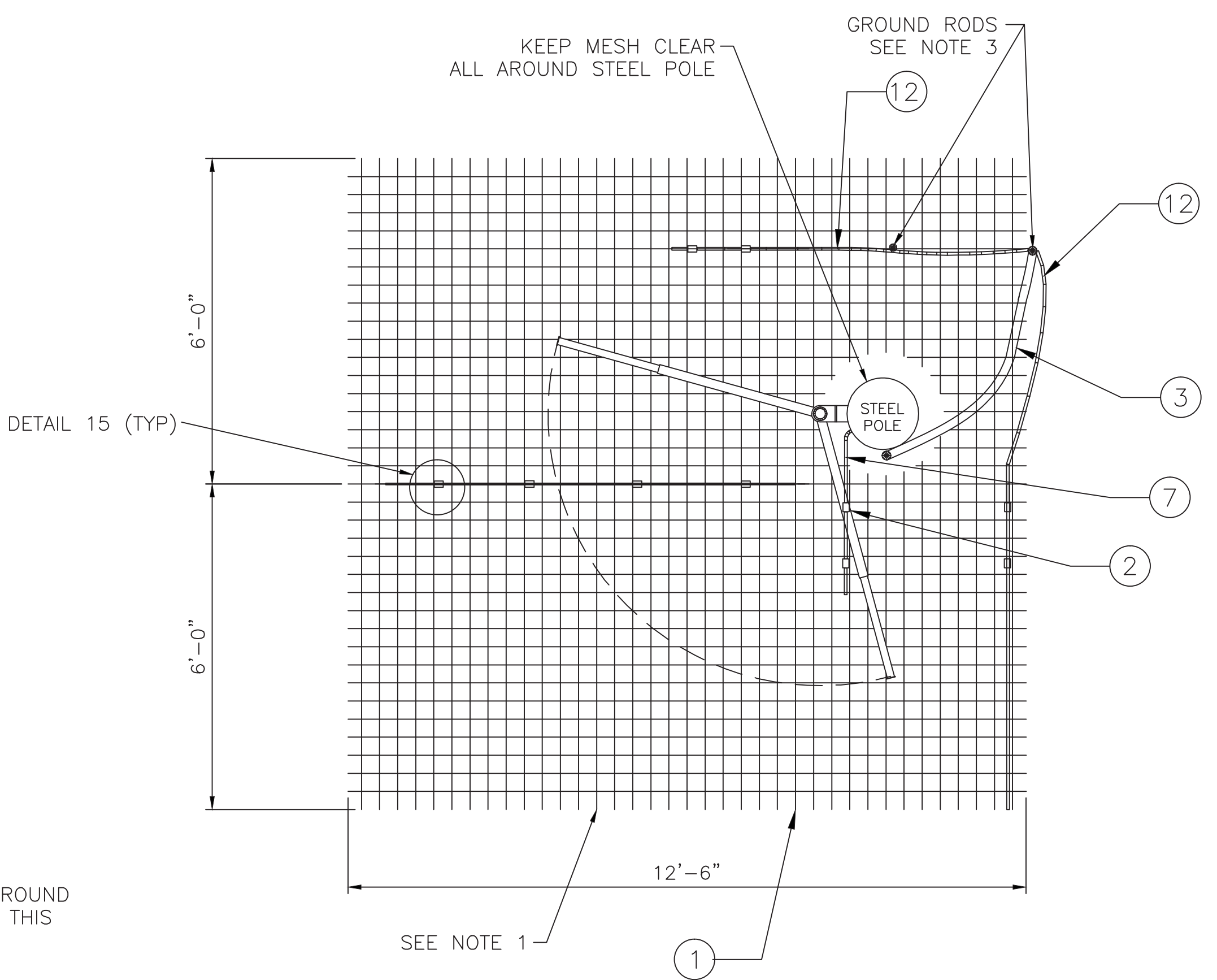
SP.06.01.301

VER	DATE	FOR REVISIONS 1-7 SEE VERSION 7	VERSION DESCRIPTION
1-7			
8	07/05/12	ADD SAP ITEM ID NUMBERS	
9	09/10/13	ADDED GROUNDING LUG, CORRECTED VIEW AND SECTION REFERENCES	

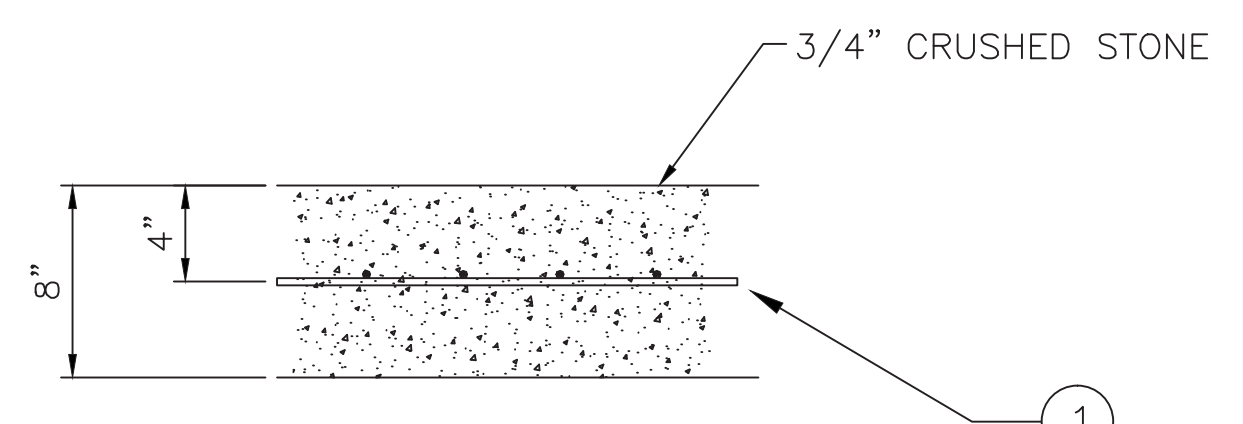
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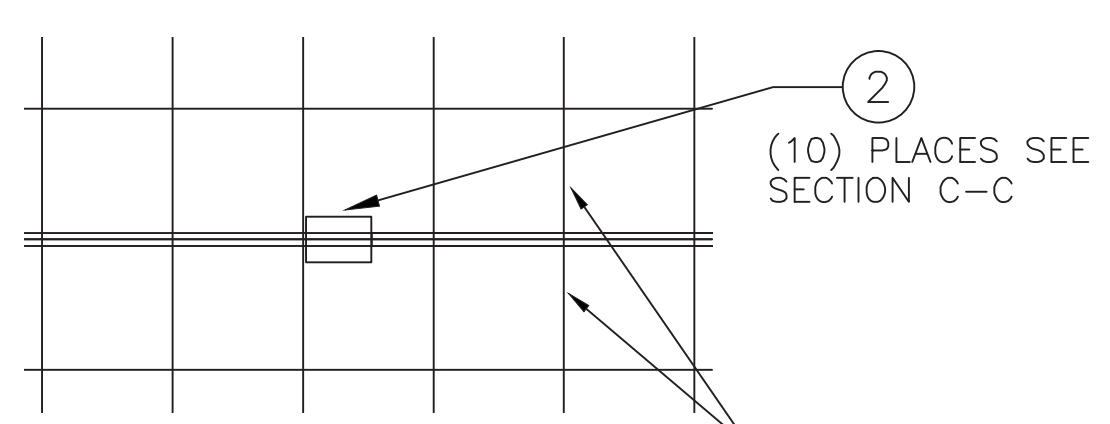
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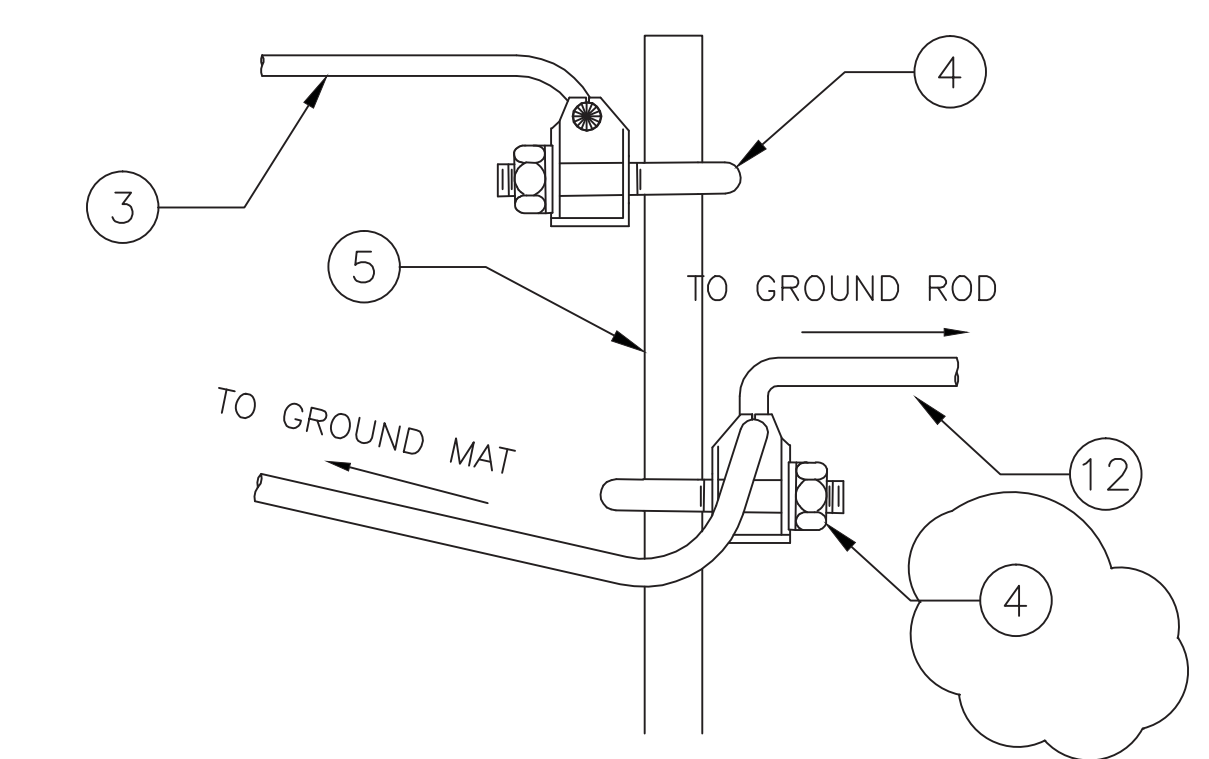
SECTION C-C



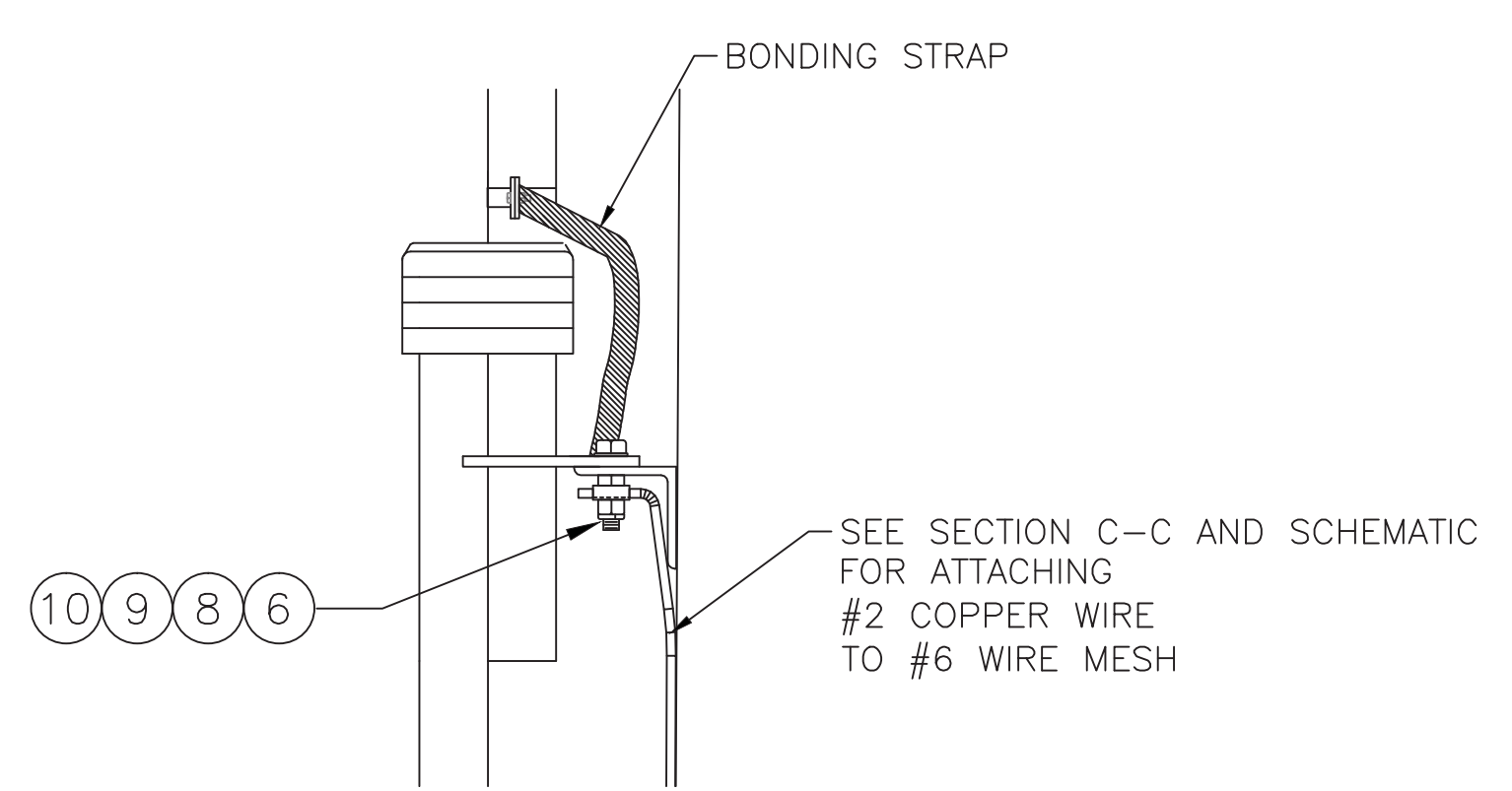
DETAIL 13



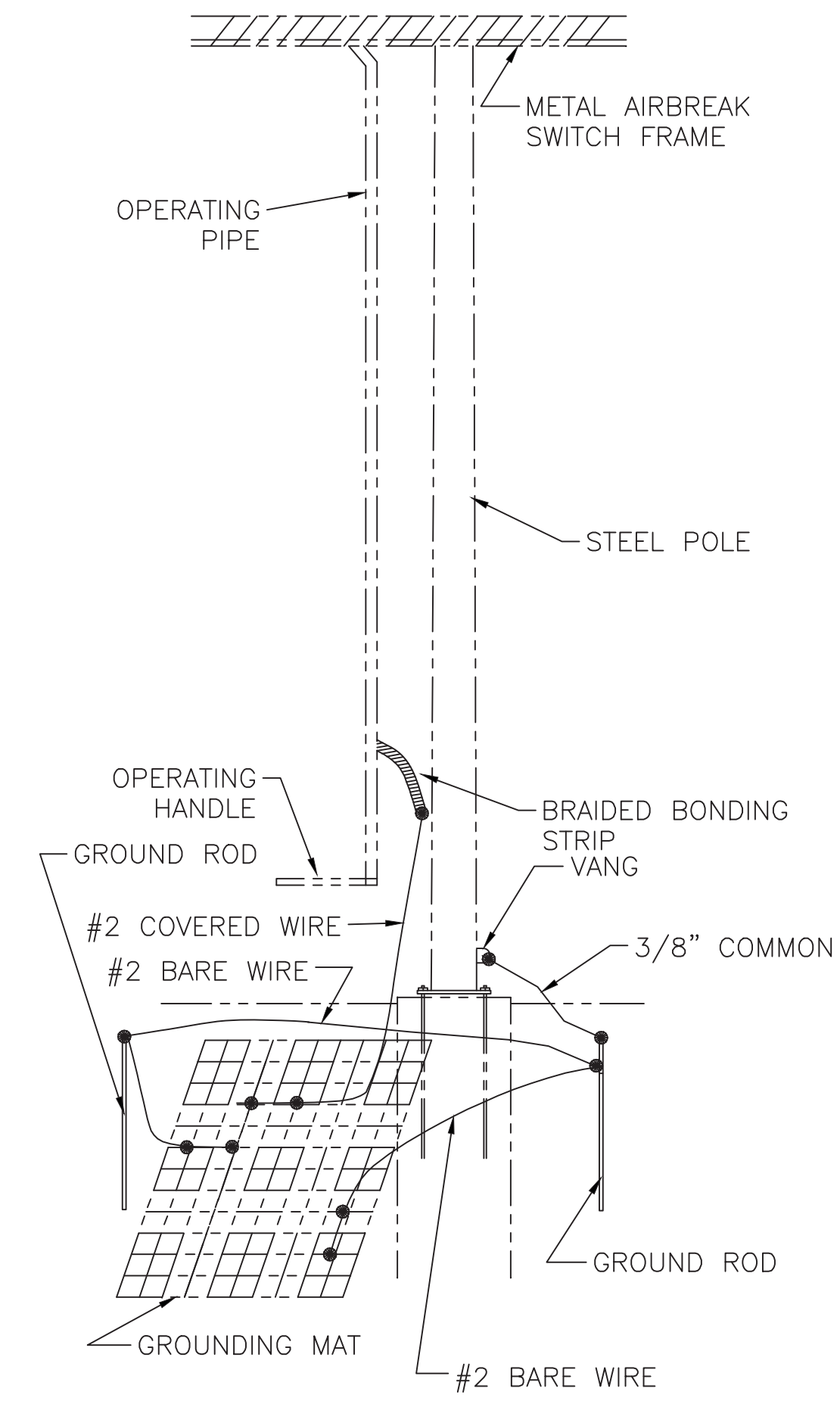
DETAIL 15



DETAIL 14



DETAIL 16



SCHEMATIC VIEW

MATERIAL LIST				
ITEM	QUAN	DESCRIPTION	PS ITEM ID	SAP ITEM ID
1	1	#6 WIRE MESH, 4" SQUARES, 40% Cu CLAD (ROLL)	5105242	9311222
2	10	COPPER CRIMPIT ("C" TYPE)	5105243	9309996
3	15	3/8" COMMON GRADE STEEL WIRE (FEET)	5998530	9306353
4	4	CLAMP, GROUND ROD	3503390	9313417
5	3	ROD, GROUND GALV 5/8" x 8'-0" LG	3503013	9313616
6	2	BOLT, MACHINE GALV 5/8" x 3"	5981388	9307344
7	10'	WIRE, #2 7 STRAND SD COPPER, COVERED	4001042	9312556
8	1	CLIP, BONDING FOR 5/8" BOLT	5987955	9320450
9	1	NUT, SQUARE GALVANIZED 5/8"	5993400	9319911
10	1	PALNUT, GALVANIZED 5/8"	7024158	9322021
11	2	LUG, GROUNDING, 1/2"	5961547	9313870
12	25	WIRE, #2 7 STRAND BARE SD COPPER	4015032	9315672

- NOTES:
1. PLACE TWO SECTIONS OF WIRE MESH AS SHOWN IN RELATION TO THE FULL HANDLE SWING.
 2. GROUNDING WIRE FROM STEEL POLE VANG SHOULD NOT TOUCH WIRE MESH.
 3. STRIP ENOUGH OF THE #2 COPPER COVERED WIRE TO MAKE A GOOD CONNECTION.

TRANSMISSION LINE STANDARD

GROUNDING DETAILS FOR STEEL SWITCH STRUCTURES

SP.06.01.301

PREPARED BY	JLC	DATE	02/02/10
REVIEWED BY	JME	DATE	02/02/10
APPROVED BY	MSE	DATE	02/02/10
SCALE	NONE	SHEET	5 OF 6
INDEX			

FOR REVISIONS 1-7 SEE VERSION 7

ADD SAP ITEM ID NUMBERS

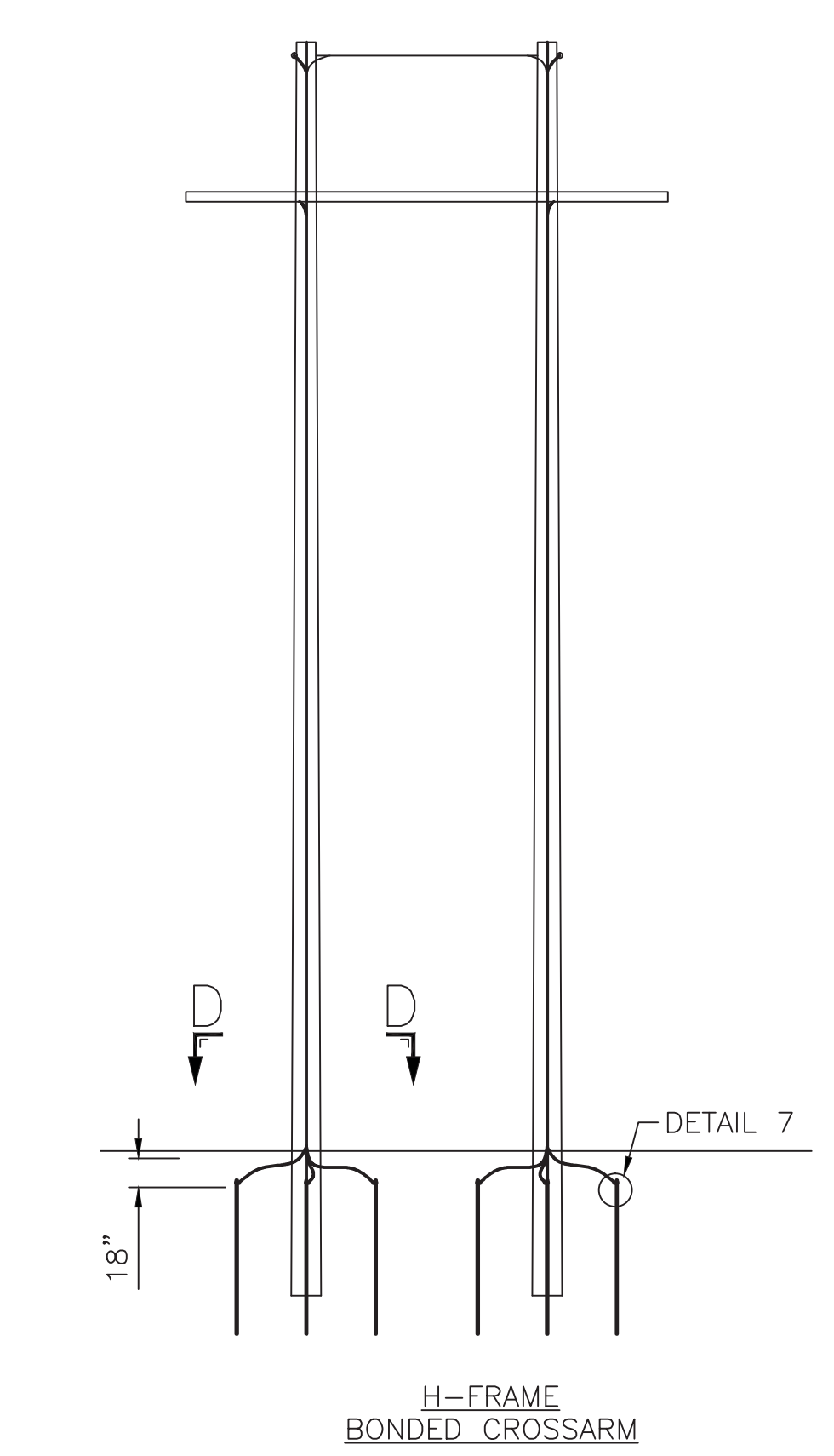
ADDED GROUNDING LUG, CORRECTED VIEW AND SECTION REFERENCES

VERSION 9

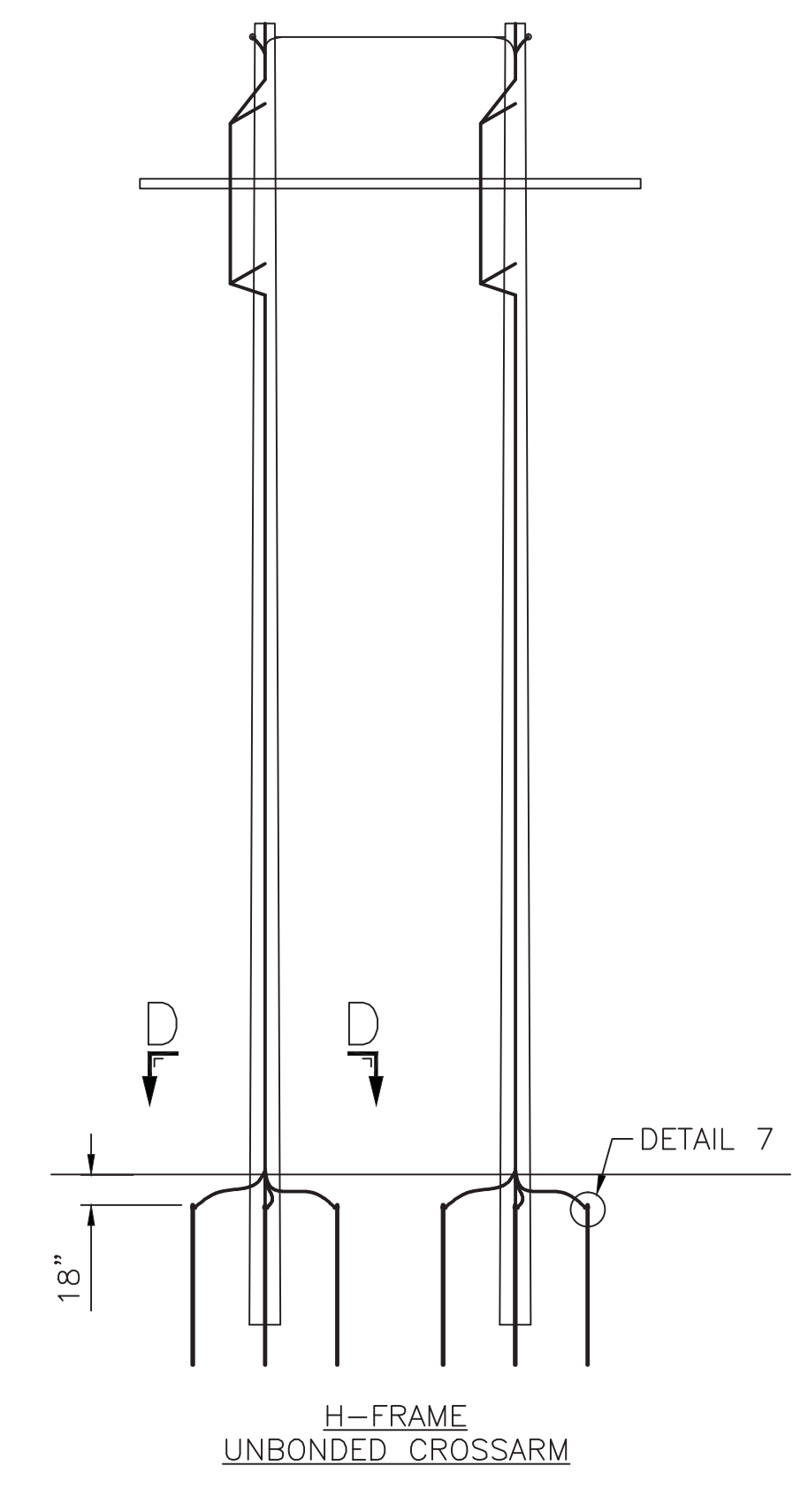
DATE 02/02/10

REVISIONS

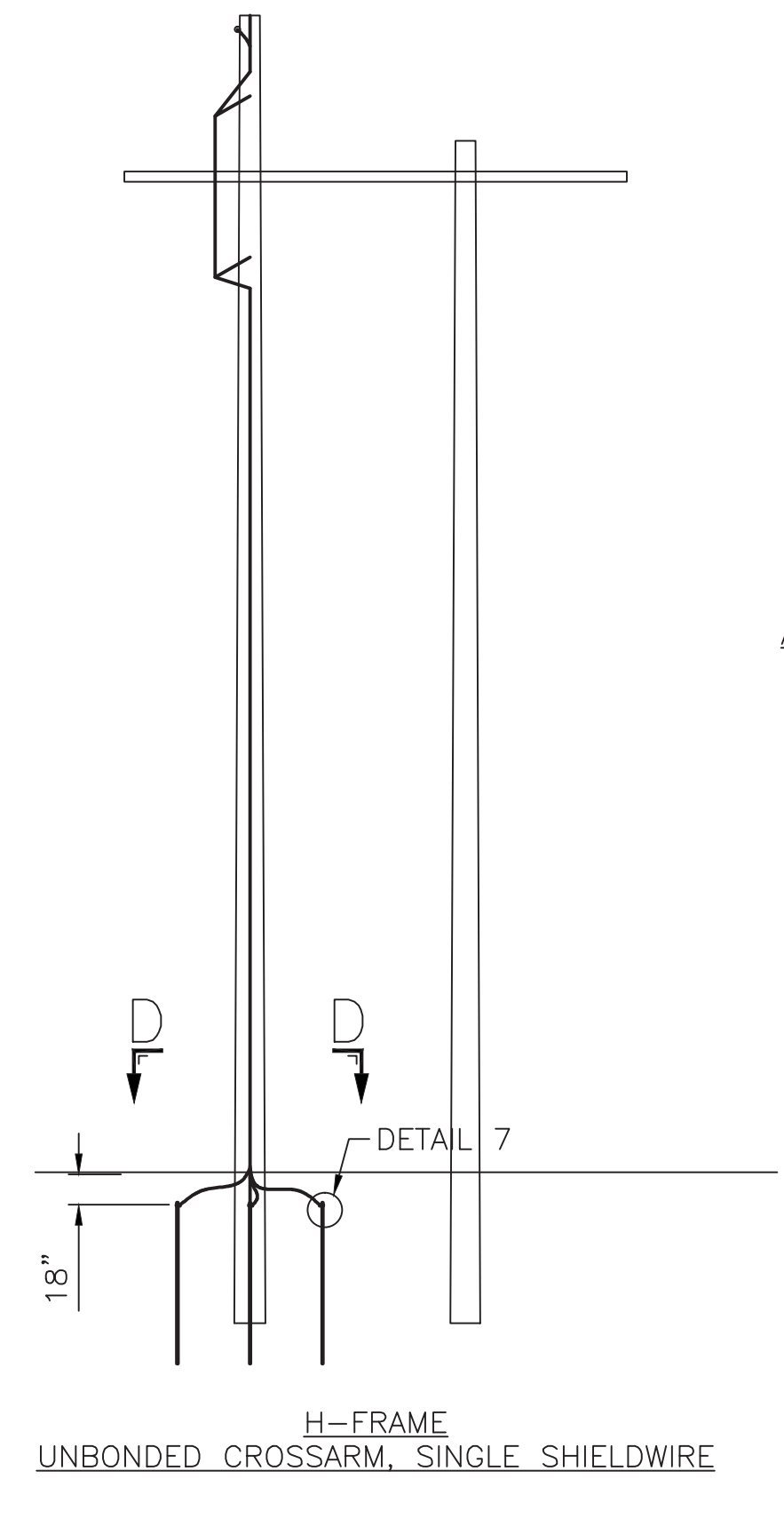
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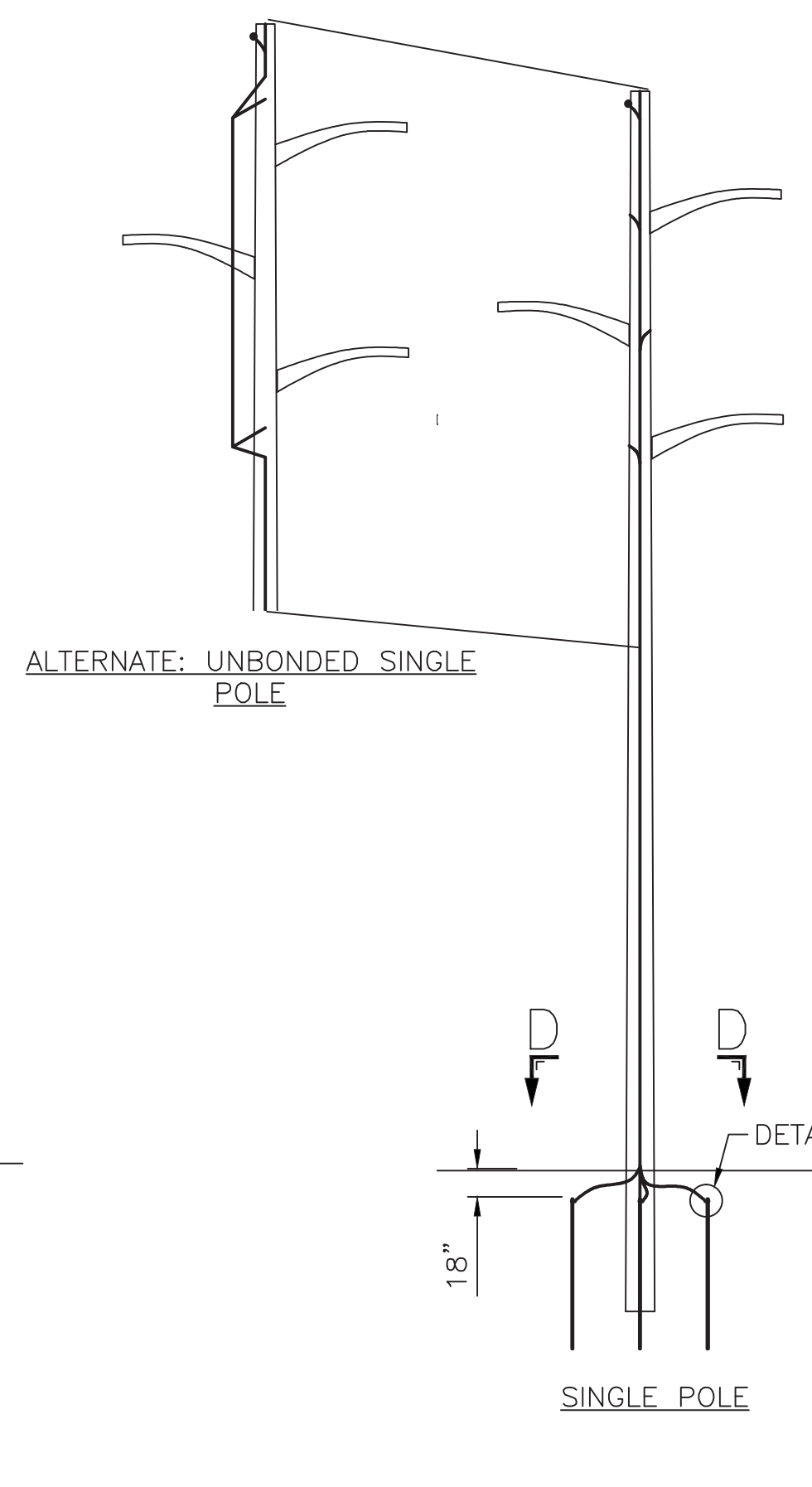
H-FRAME
BONDED CROSSARM



H-FRAME
UNBONDED CROSSARM

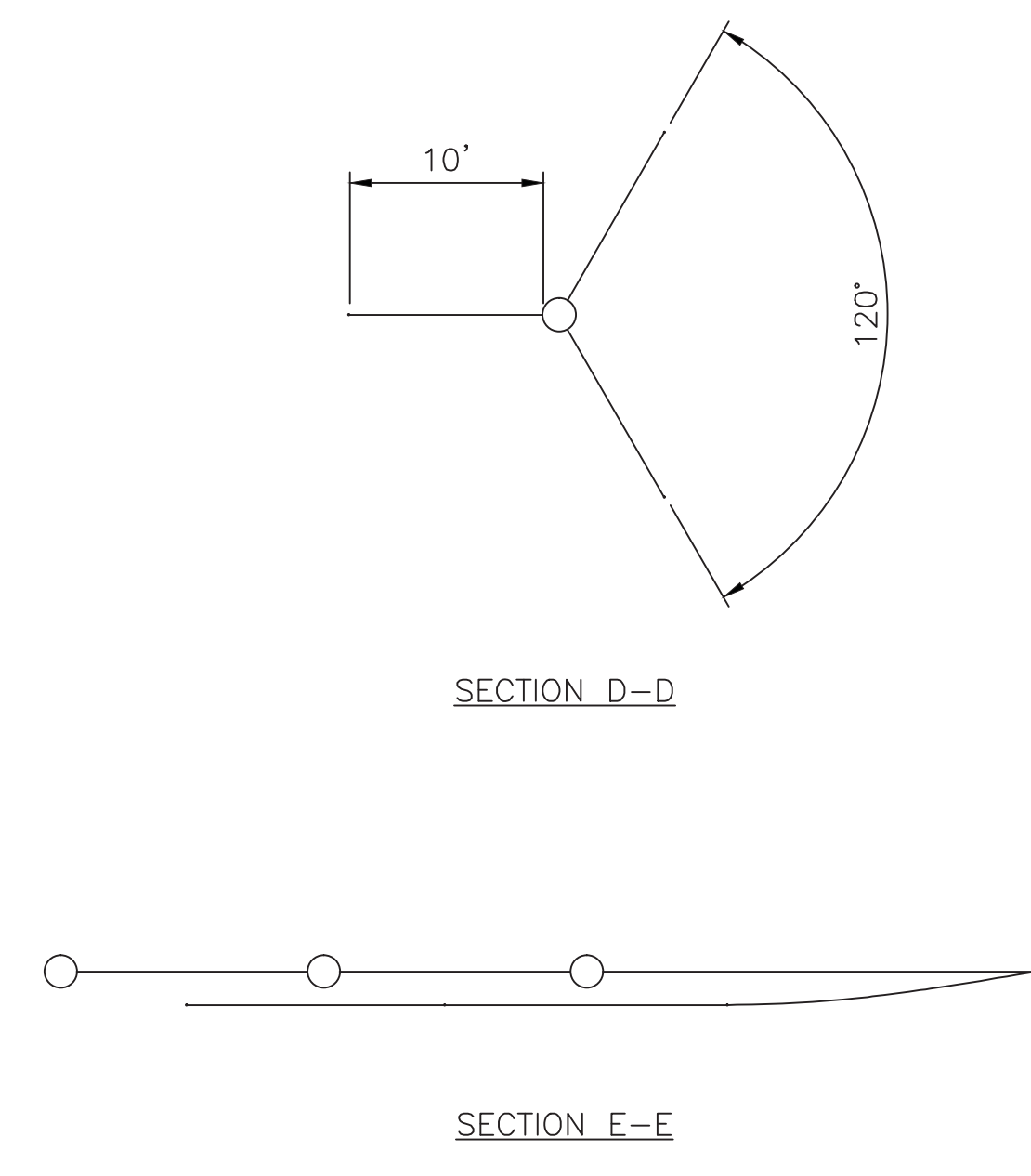


H-FRAME
UNBONDED CROSSARM, SINGLE SHIELDWIRE



SINGLE POLE

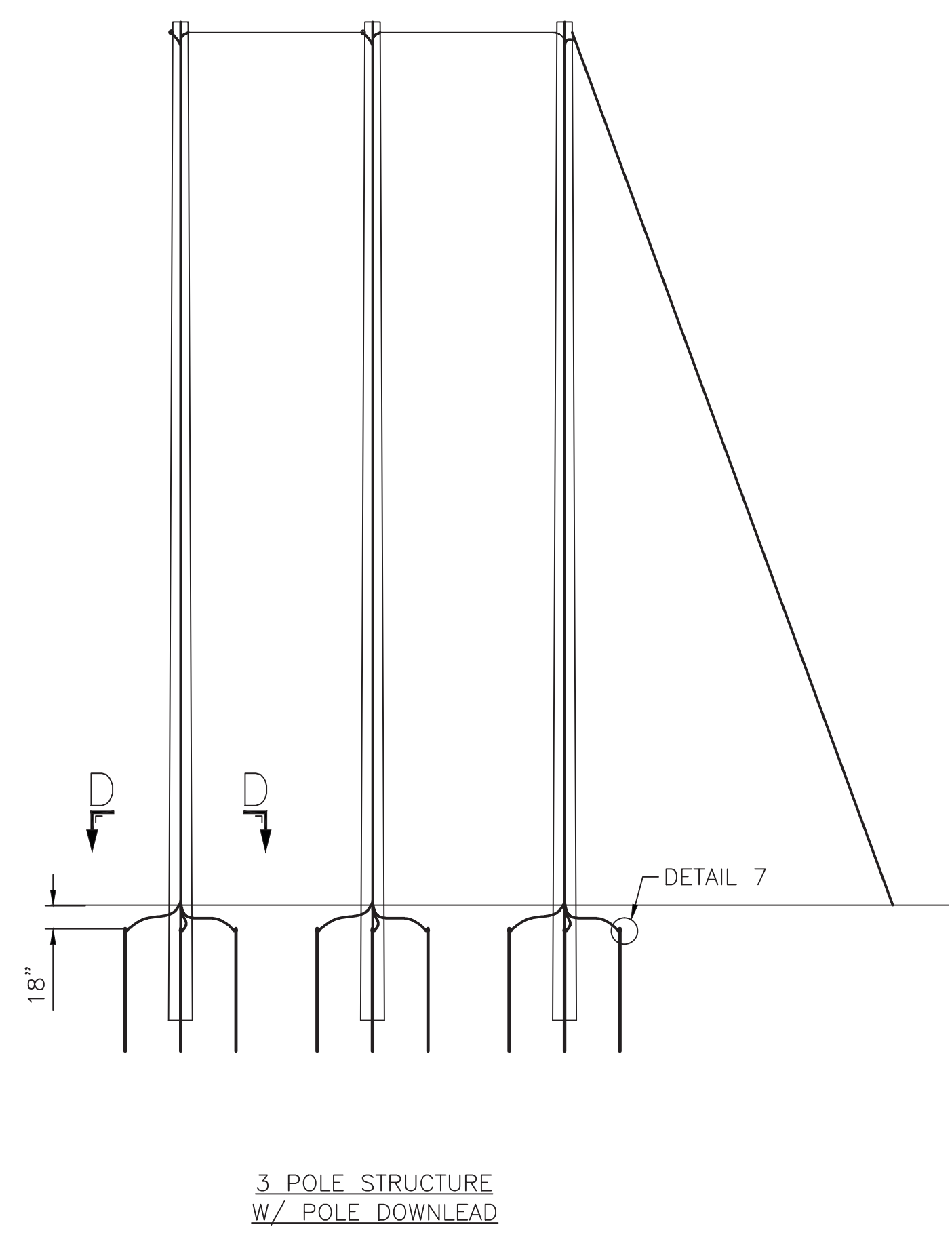
ALTERNATE: UNBONDED SINGLE POLE



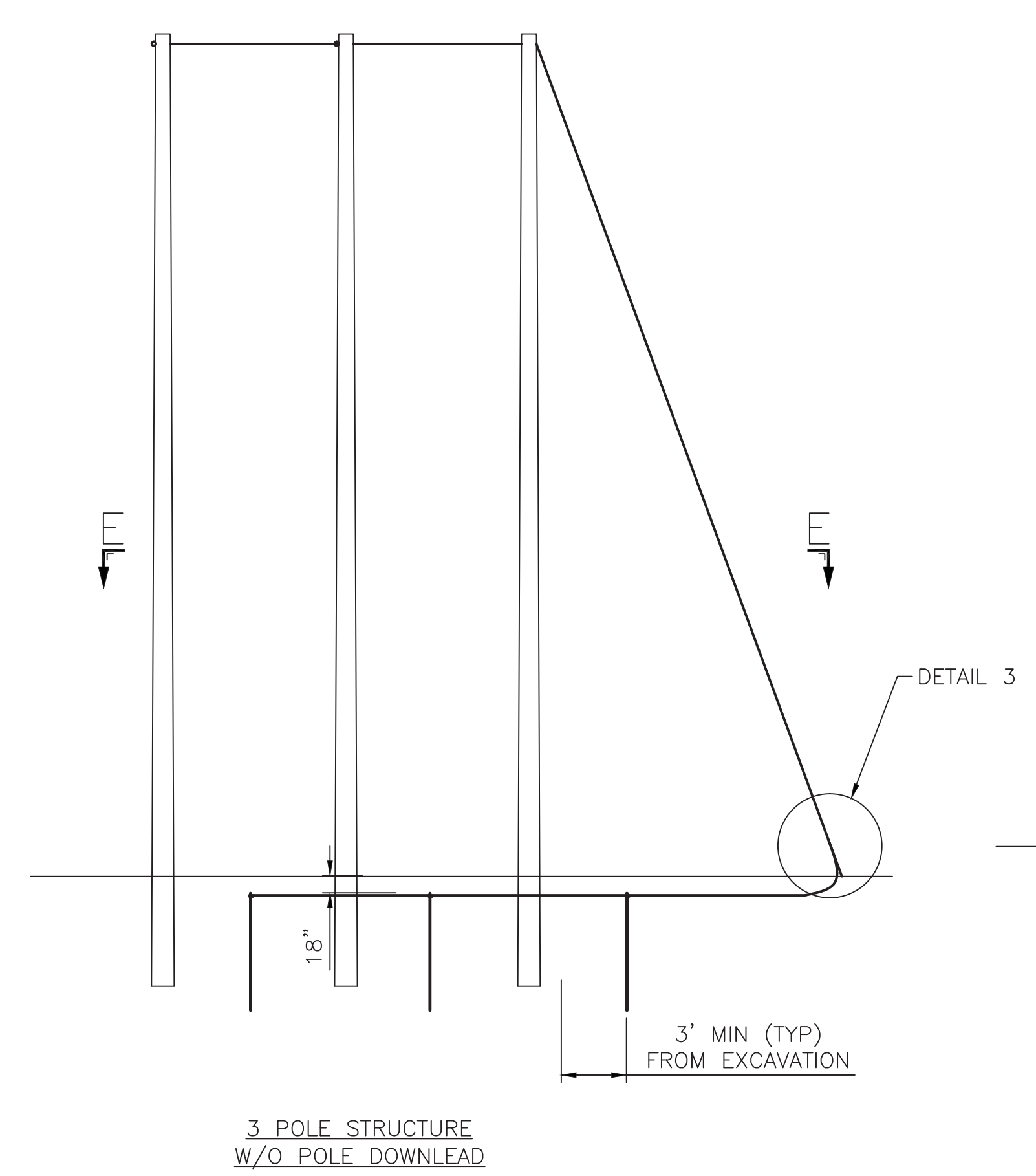
SECTION D-D

SECTION E-E

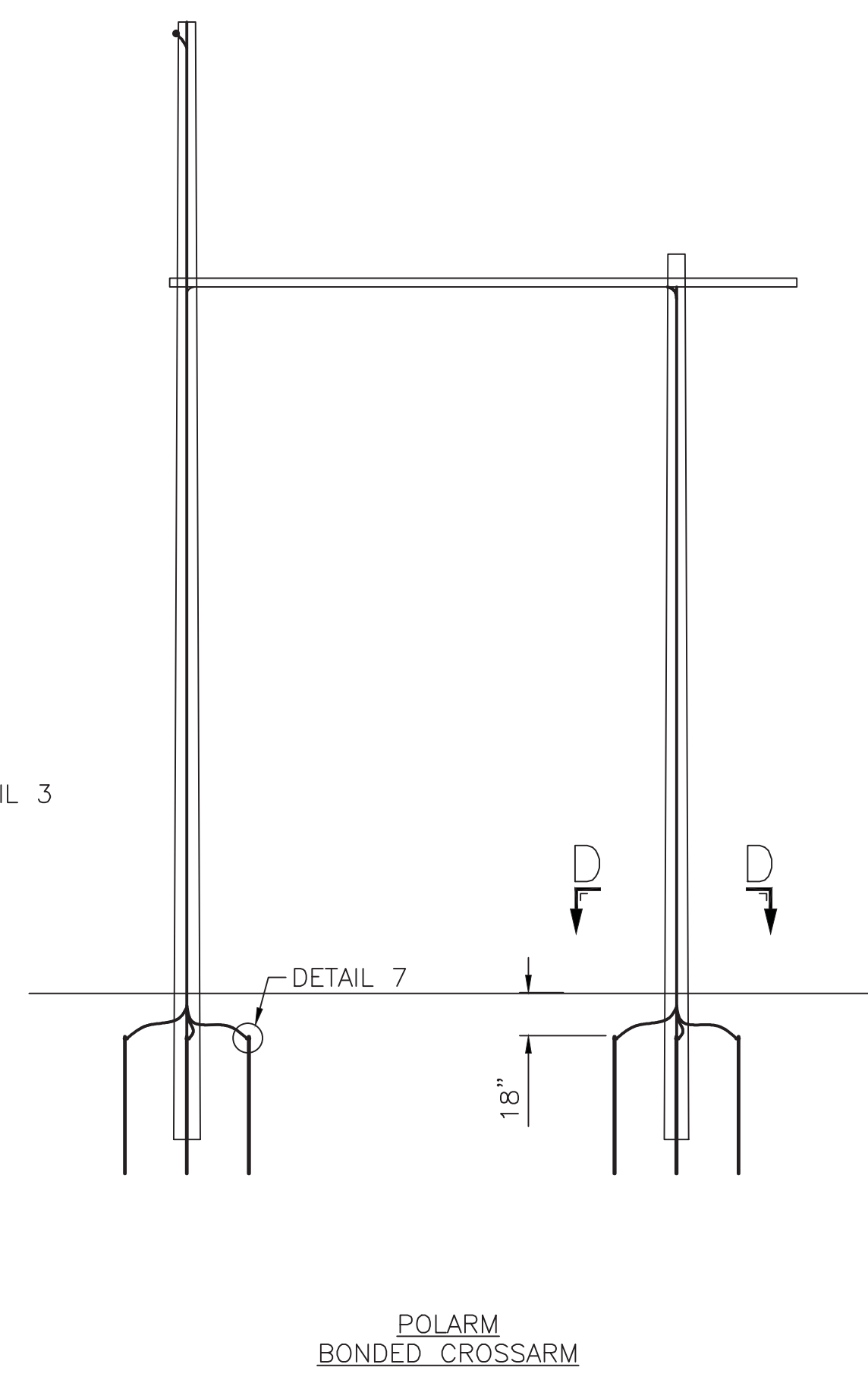
- NOTES
1. ALL WOOD POLES SHALL BE INSTALLED IN CORRUGATED METAL PIPES UNLESS STATED OTHERWISE IN THE CONSTRUCTION FIELD ISSUE, OR WHERE APPROVED ON A SITE SPECIFIC BASIS BY THE ENGINEER
 2. WHERE WOOD POLES ARE NOT INSTALLED IN CORRUGATED METAL PIPE, THE ALTERNATE GROUNDING CONFIGURATIONS IDENTIFIED IN THIS SHEET SHALL BE USED
 3. IF THESE ALTERNATE DETAILS ARE USED, TESTING OF GROUND RESISTANCE SHALL PROCEED AS NORMAL. THE INSTALLER SHALL USE THE SAME PROCEDURE AS FOR POLES INSTALLED IN CORRUGATED METAL PIPES.



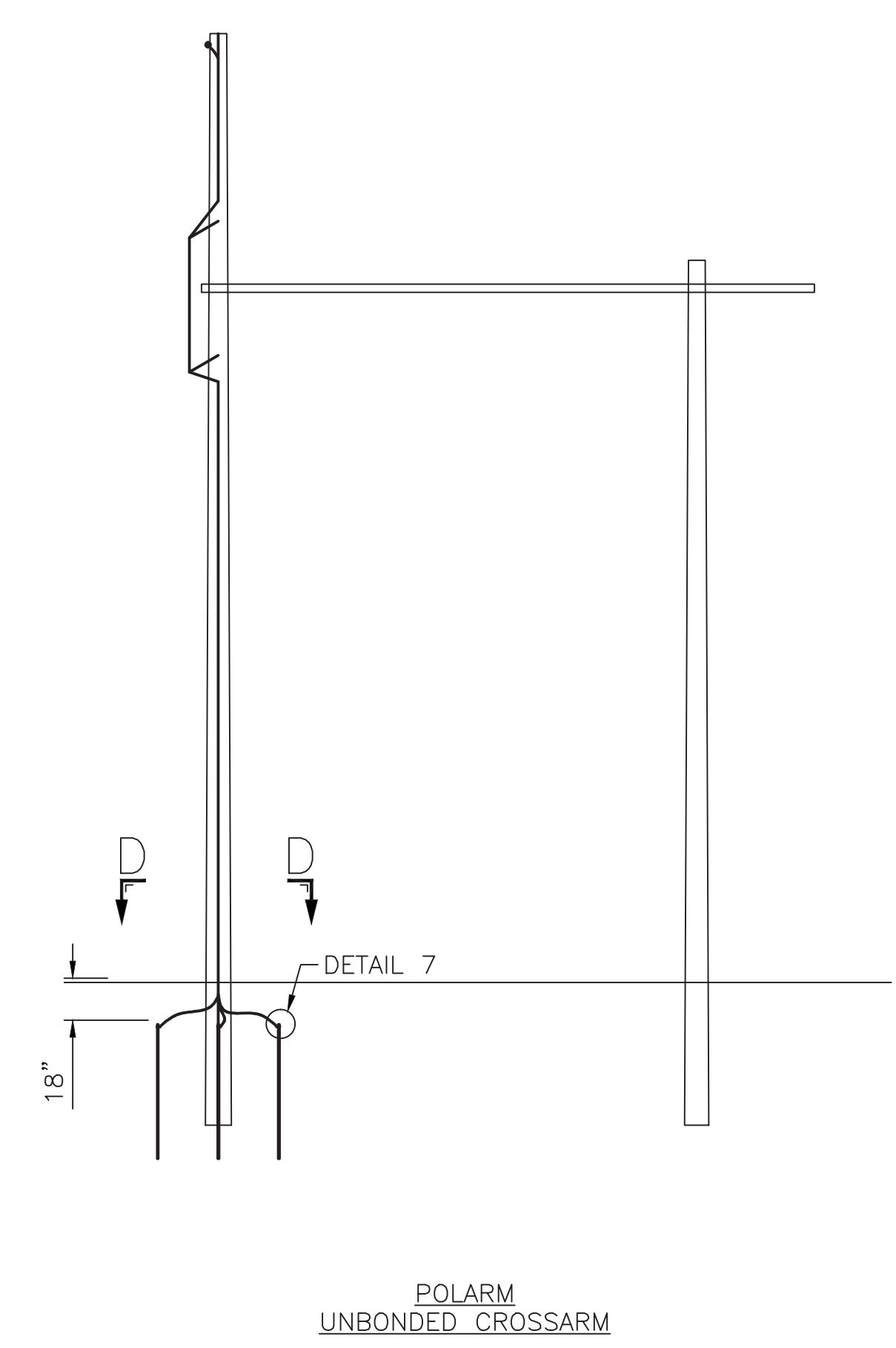
3 POLE STRUCTURE
W/ POLE DOWNLEAD



3 POLE STRUCTURE
W/O POLE DOWNLEAD



POLARM
BONDED CROSSARM



POLARM
UNBONDED CROSSARM

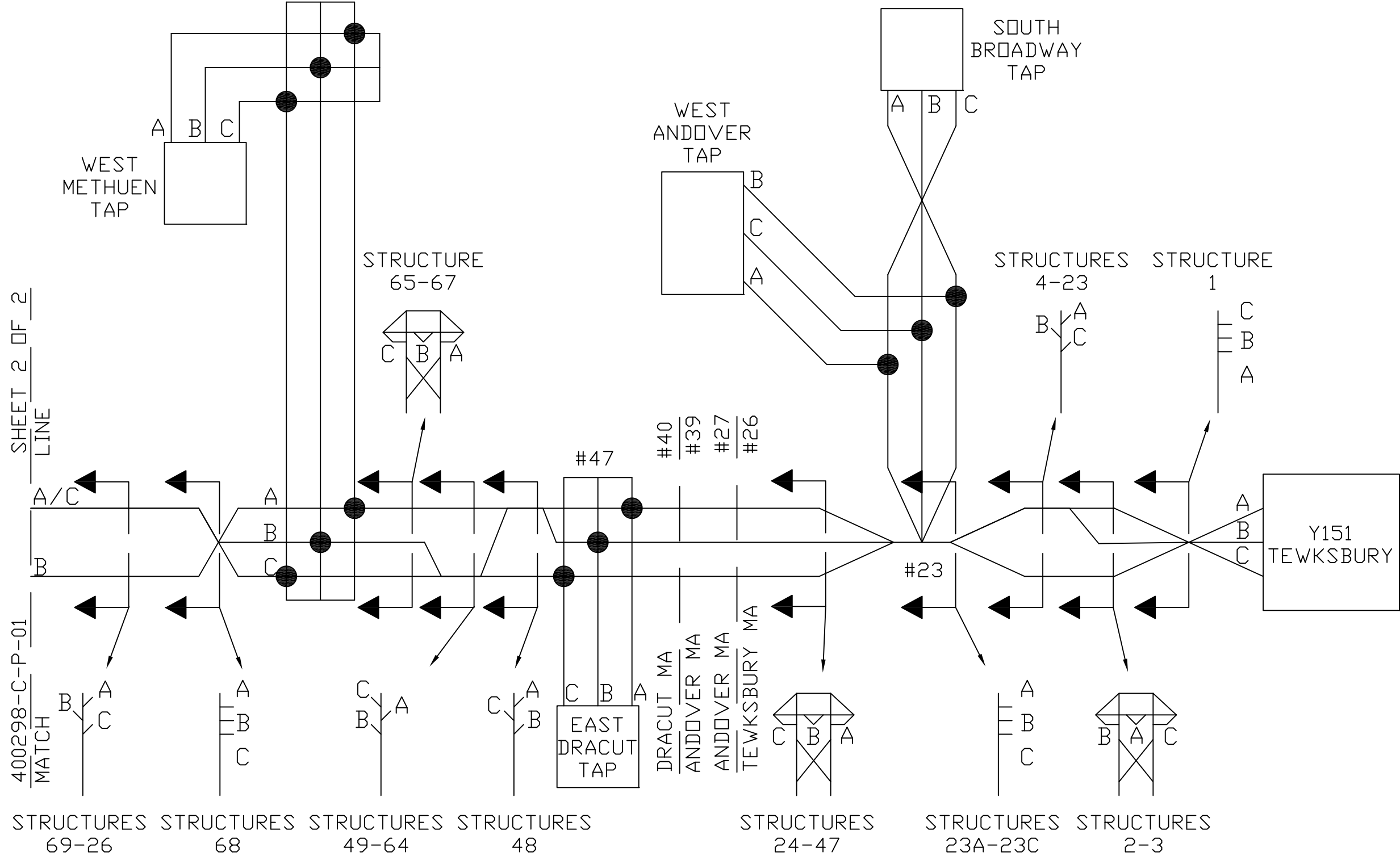
INCHES ON ORIGINAL

TRANSMISSION LINE STANDARD		PREPARED BY: JLC	DATE: 02/02/10
ALTERNATE GROUNDING DETAILS		REVIEWED BY: JME	DATE: 02/02/10
INSTALLATIONS WITHOUT STEEL CULVERT		APPROVED BY: MSE	DATE: 02/02/10
SCALE	NONE	SHEET	6 OF 6
INDEX	SP.06.01.301	VERSION	9

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VER	DATE	VERSION DESCRIPTION	PREPARED	REVIEWED	APPROVED	VERSION
1	09/19/14	ISSUED FOR SCOPE DOCUMENT	EJJ	FTX	NPA	2
2	05/22/15	ISSUED FOR PERMITTING	EJJ	FTX	NPA	
3						
4						



SHEET 2 OF 2
LINE

400298-C-P-01
MATCH

INCHES ON ORIGINAL

400298-C-P-01

PHASING DIAGRAM
115KV Y151 LINE
TEWKSBURY 22 SUBSTATION
TO EVERSOURCE TRANSFER

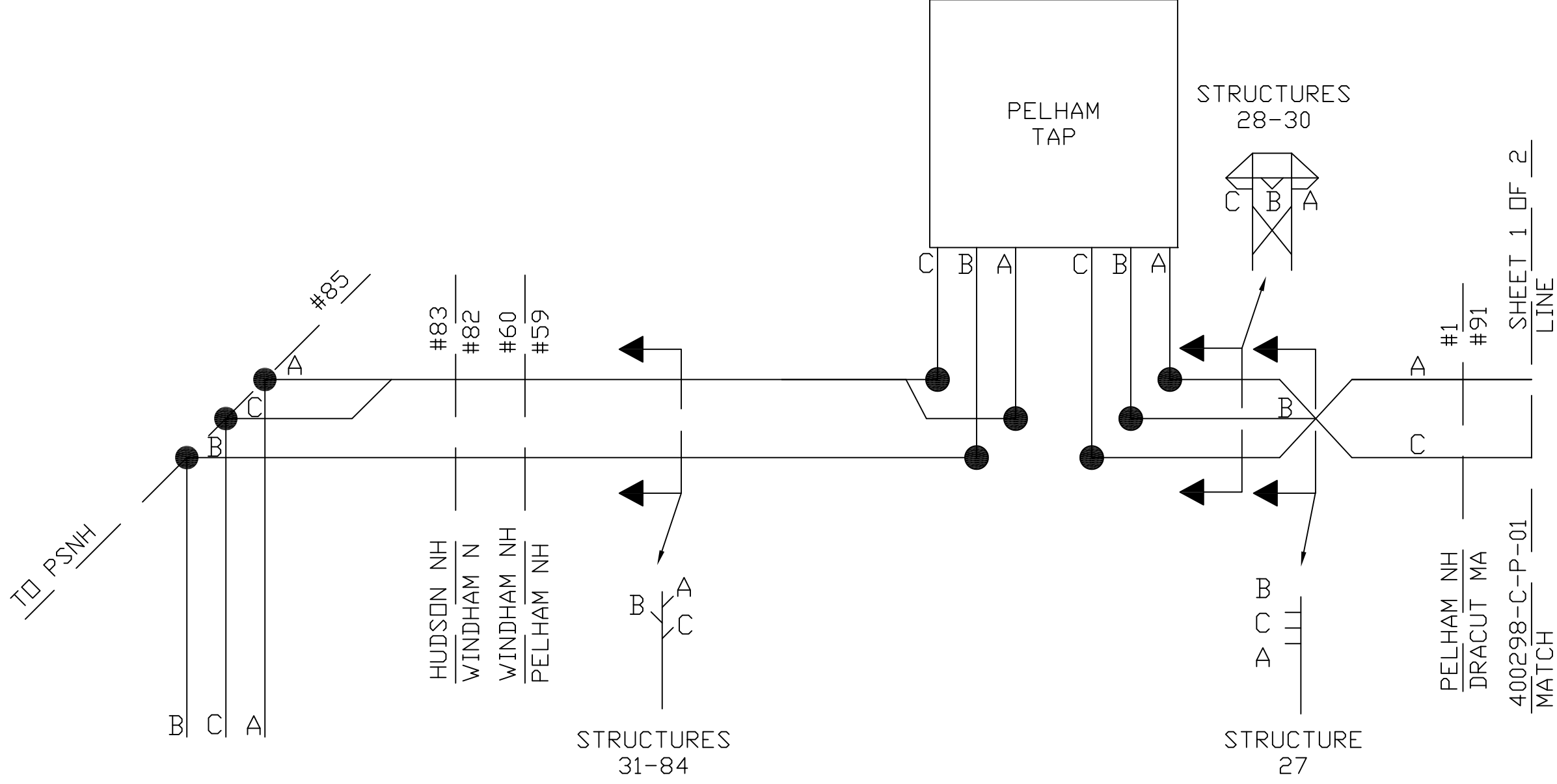
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REVIEWED BY	FTX	05/22/15
APPROVED BY	NPA	05/22/15
SCALE	N.T.S	
SHEET	1	OF 2
INDEX		

nationalgrid

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1	09/19/14	ISSUED FOR SCOPE DOCUMENT	EJJ	FTX	NPA	2
2	05/22/15	ISSUED FOR PERMITTING	EJJ	FTX	NPA	
3						
4						



400298-C-P-01 MATCH
 SHEET 1 OF 2
 LINE

PHASING DIAGRAM
 115KV Y151 LINE
 TEWKSBURY 22 SUBSTATION
 TO EVERSOURCE TRANSFER

PREPARED BY	EJJ	05/22/15
REVIEWED BY	FTX	05/22/15
APPROVED BY	NPA	05/22/15
SCALE	N.T.S	
SHEET	2	OF 2
INDEX		

nationalgrid

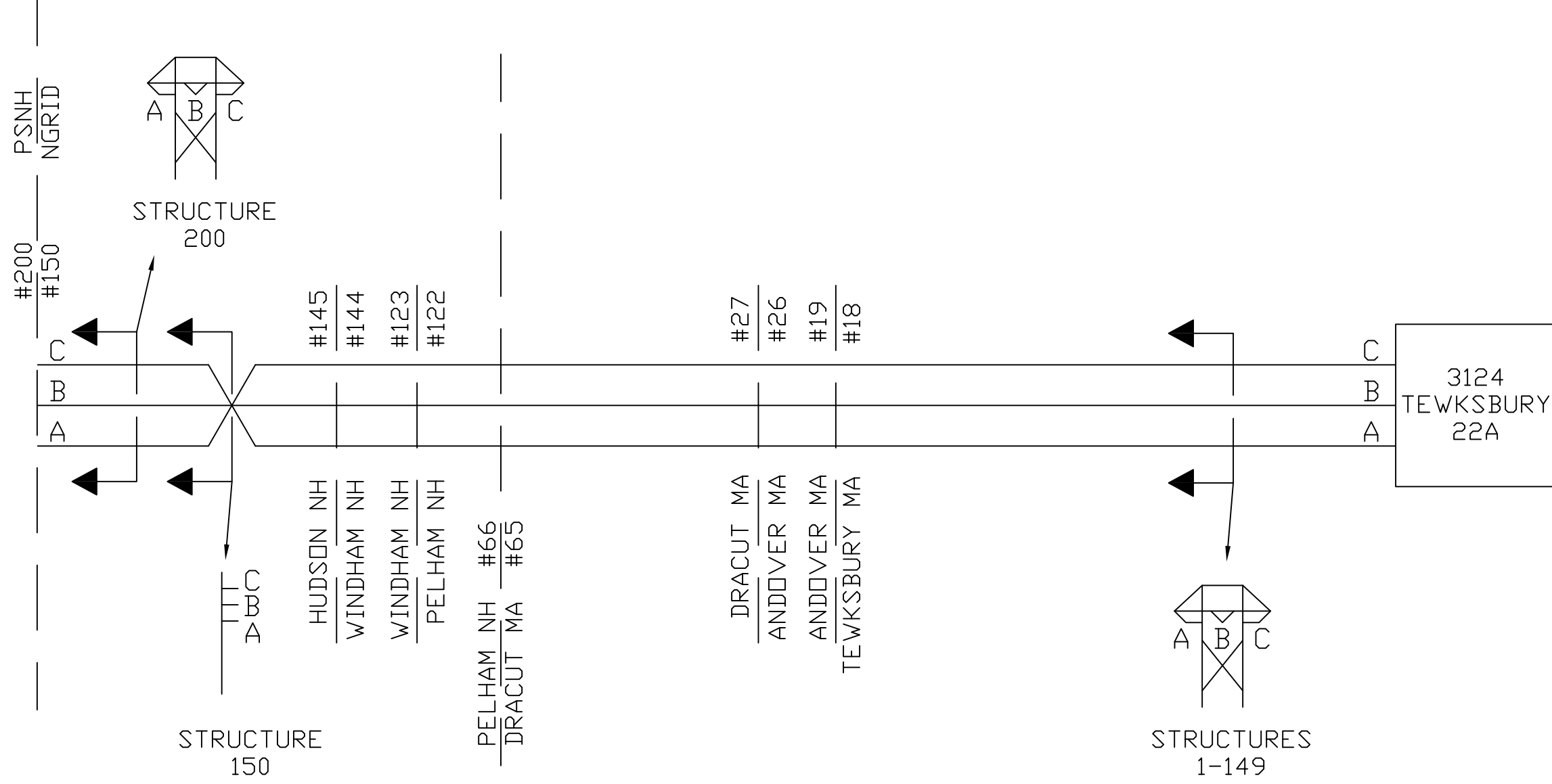
INCHES ON ORIGINAL

400298-C-P-01

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400298-C-P-05

VER	DATE	VERSION DESCRIPTION	PREPARED	REVIEWED	APPROVED	VERSION
1	09/19/14	ISSUED FOR SCOPE DOCUMENT	EJJ	FTX	NPA	2
2	05/22/15	ISSUED FOR PERMITTING	JLM	FTX	NPA	
3						
4						



INCHES ON ORIGINAL

400298-C-P-05

PHASING DIAGRAM
 345KV 3124 LINE
 TEWKSBURY 22A SUBSTATION
 TO EVERSOURCE TRANSFER

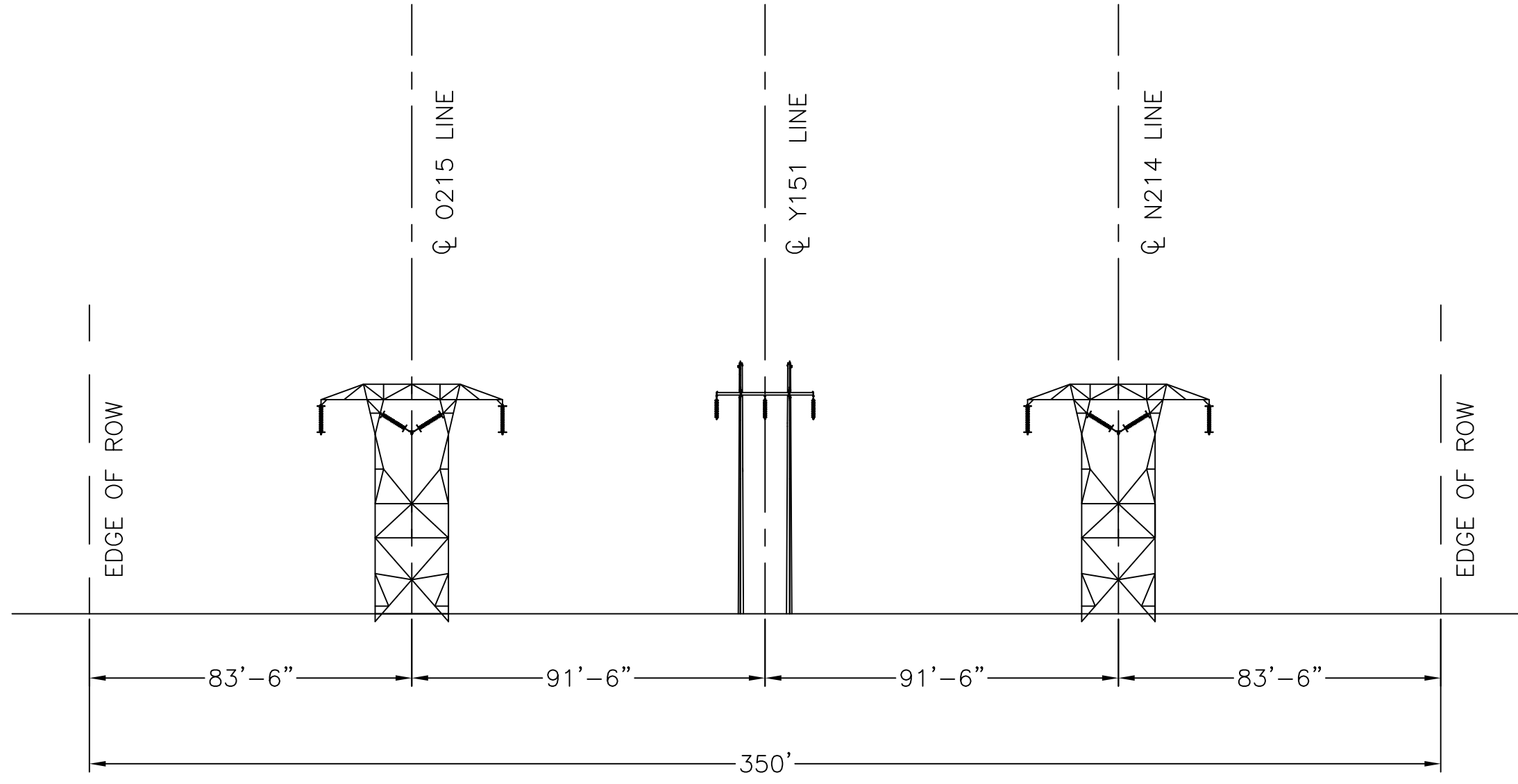
PREPARED BY	EJJ	05/22/15
REVIEWED BY	FTX	05/22/15
APPROVED BY	NPA	05/22/15
SCALE	N.T.S	
SHEET	1	OF 1
INDEX		

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400298-C-X-08(F)

VER	DATE	VERSION DESCRIPTION	PREPARED	REVIEWED	APPROVED	VERSION
1	03/18/14	ISSUED FOR CONSTRUCTABILITY MEETING	DSF	SMP	NPA	4
2	04/11/14	ISSUED AS FINAL	DSF	SMP	NPA	
3	08/01/14	ISSUED FOR SCOPE DOCUMENT	RE	FTX	NPA	
4	10/06/14	ISSUED FOR PERMITTING	DTN	FTX	NPA	



CROSS-SECTION FACING SCOBIE JUNCTION
 MILE 4.82 TO MILE 14.17
 EXISTING CONDITIONS
 T-1554 THROUGH T-1546

INCHES ON ORIGINAL

TRANSMISSION LINE X-SECTION
 SCOBIE POND (EVERSOURCE TRANS) TO TEWKSBURY
 FIFTEEN MILE FALLS TO TEWKSBURY ROW
 EXISTING CROSS SECTION 8
 MILE 4.82 TO 14.17

PREPARED BY	DTN	10/06/14
REVIEWED BY	FTX	10/06/14
APPROVED BY	NPA	10/06/14
SCALE	NONE	
SHEET	1	OF 1
INDEX	400298	

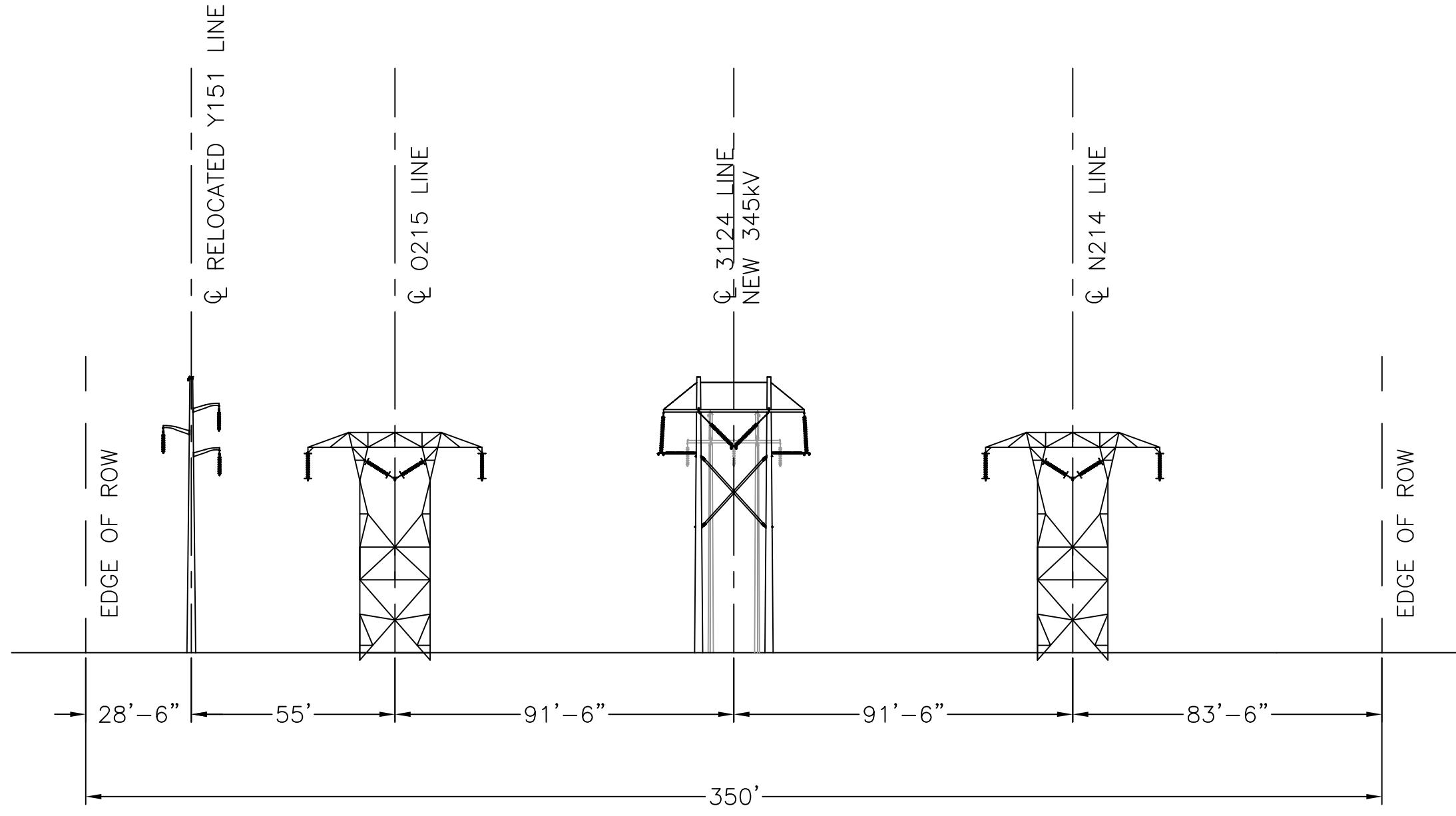


400298-C-X-08(F)

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400298-C-X-08(P)

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2	04/11/14	ISSUED AS FINAL	DSF	SMP	NPA	
3	08/01/14	ISSUED FOR SCOPE DOCUMENT	RE	FTX	NPA	
4	10/06/14	ISSUED FOR PERMITTING	DTN	FTX	NPA	



CROSS-SECTION FACING SCOBIE JUNCTION
MILE 4.82 TO MILE 14.17
PROPOSED CONDITIONS
T-1554 THROUGH T-1546

INCHES ON ORIGINAL

TRANSMISSION LINE X-SECTION
SCOBIE POND (EVERSOURCE TRANS) TO TEWKSBURY
FIFTEEN MILE FALLS TO TEWKSBURY ROW
PROPOSED CROSS SECTION 8
MILE 4.82 TO 14.17

PREPARED BY	DTN	10/06/14
REVIEWED BY	FTX	10/06/14
APPROVED BY	NPA	10/06/14
SCALE	NONE	
SHEET	1	OF 1
INDEX	400298	

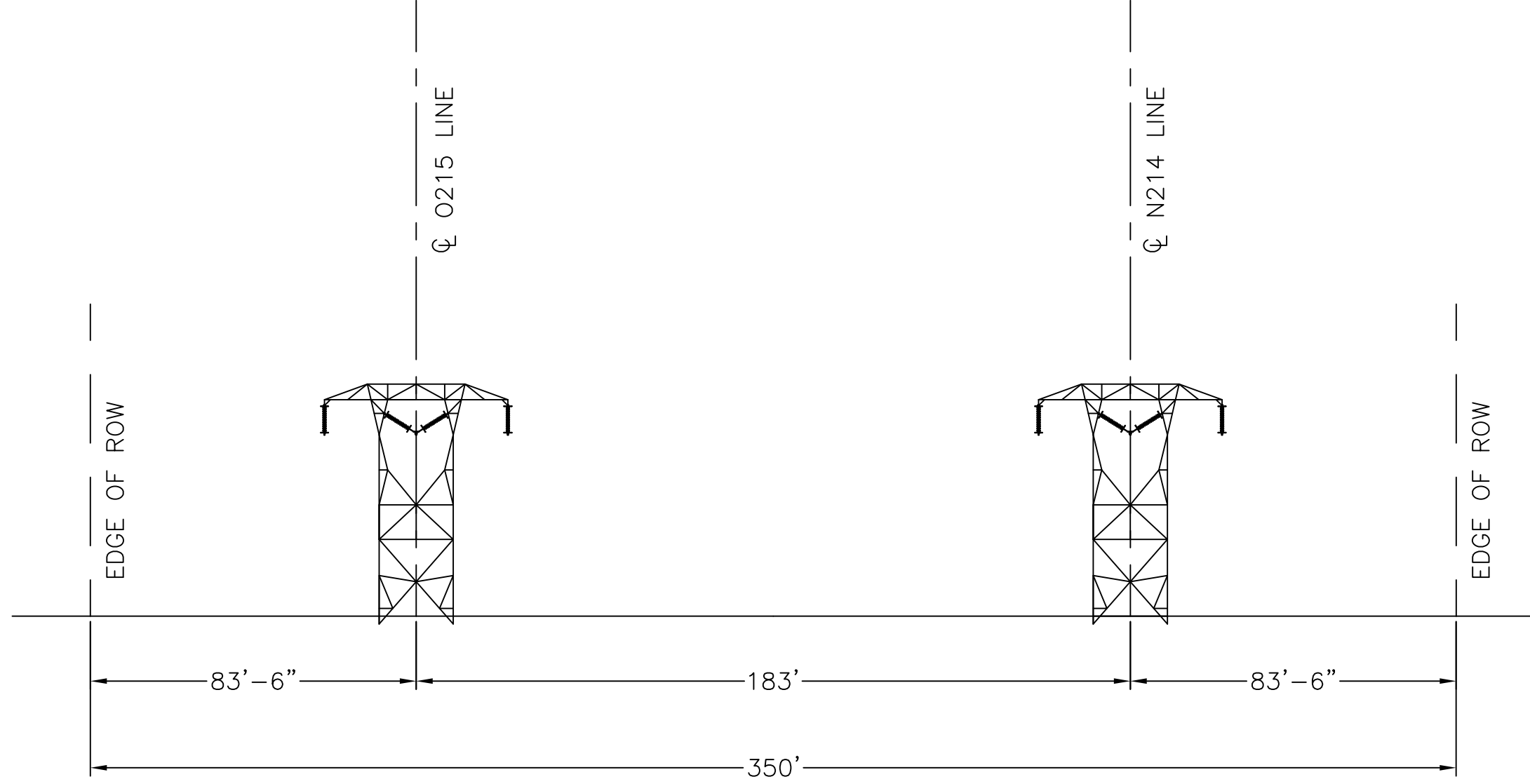


400298-C-X-08(P)

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400298-C-X-09(E)

VER	DATE	VERSION DESCRIPTION	PREPARED	REVIEWED	APPROVED	VERSION
1	03/18/14	ISSUED FOR CONSTRUCTABILITY MEETING	DSF	SMP	NPA	4
2	04/11/14	ISSUED AS FINAL	DSF	SMP	NPA	
3	08/01/14	ISSUED FOR SCOPE DOCUMENT	RE	FTX	NPA	
4	10/06/14	ISSUED FOR PERMITTING	DTN	FTX	NPA	



CROSS-SECTION FACING SCOBIE JUNCTION
MILE 14.17 TO MILE 14.6
EXISTING CONDITIONS
T-1546

INCHES ON ORIGINAL

TRANSMISSION LINE X-SECTION
SCOBIE POND (EVERSOURCE TRANS) TO TEWKSBURY
FIFTEEN MILE FALLS TO TEWKSBURY ROW
EXISTING CROSS SECTION 9
MILE 14.17 TO 14.6

PREPARED BY	DTN	10/06/14
REVIEWED BY	FTX	10/06/14
APPROVED BY	NPA	10/06/14
SCALE	NONE	
SHEET	1	OF 1
INDEX	400298	

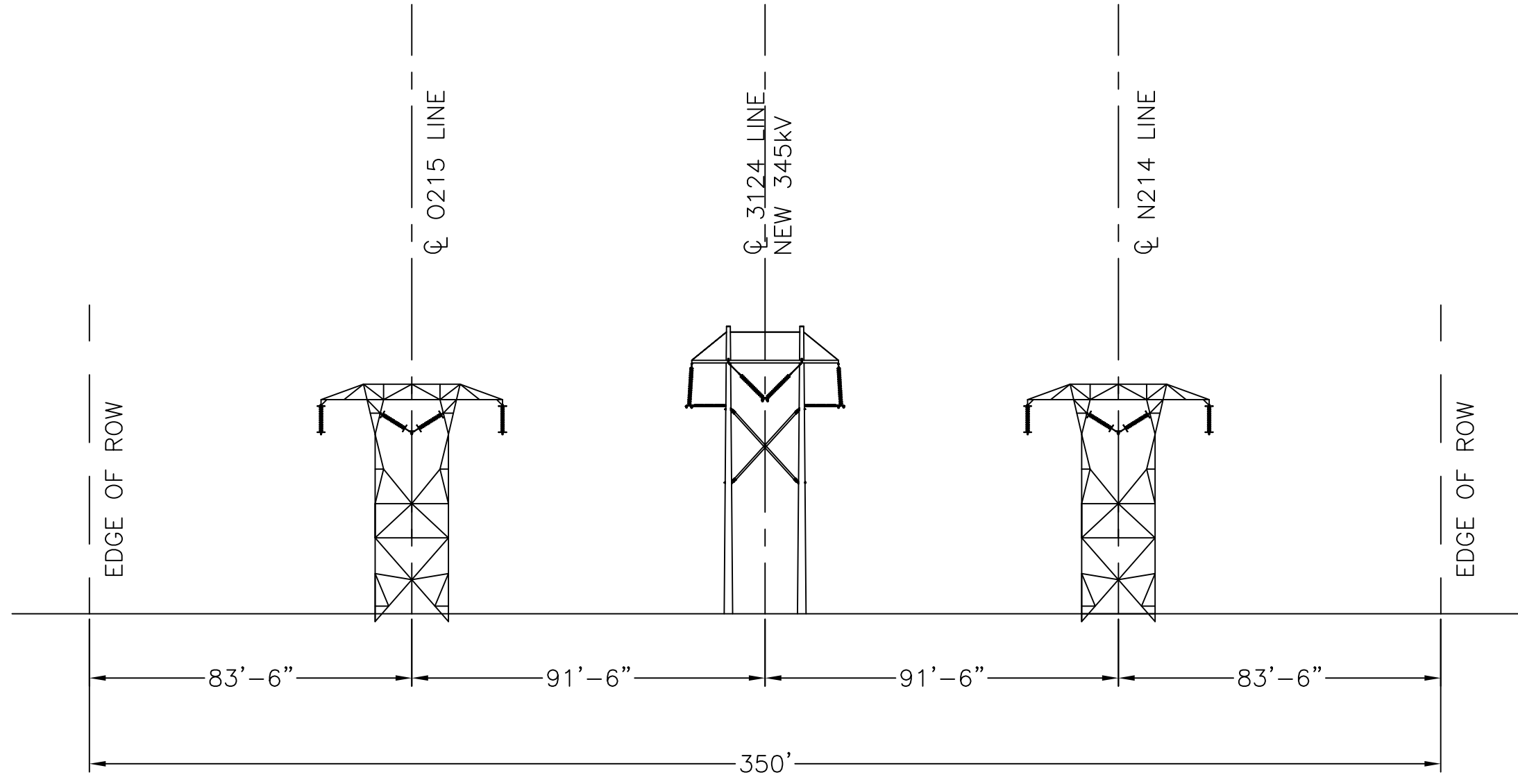
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400298-C-X-09(E)

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400298-C-X-09(P)

VER	DATE	VERSION DESCRIPTION	PREPARED	REVIEWED	APPROVED	VERSION
1	05/01/14	ISSUED AS FINAL	DSF	SMP	NPA	3
2	08/01/14	ISSUED FOR SCOPE DOCUMENT	RE	FTX	NPA	
3	10/06/14	ISSUED FOR PERMITTING	DTN	FTX	NPA	
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CROSS-SECTION FACING SCOBIE JUNCTION
 MILE 14.17 TO MILE 14.6
 PROPOSED CONDITIONS
 T-1546

INCHES ON ORIGINAL

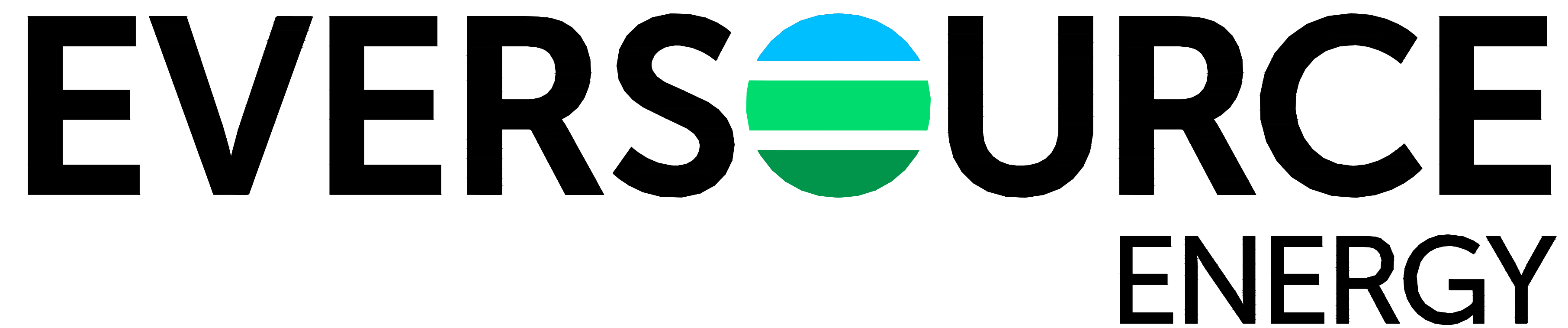
TRANSMISSION LINE X-SECTION
 SCOBIE POND (EVERSOURCE TRANS) TO TEWKSBURY
 FIFTEEN MILE FALLS TO TEWKSBURY ROW
 PROPOSED CROSS SECTION 9
 MILE 14.17 TO MILE 14.6

PREPARED BY	DTN	10/06/14
REVIEWED BY	FTX	10/06/14
APPROVED BY	NPA	10/06/14
SCALE	NONE	
SHEET	1	OF 1
INDEX	400298	



400298-C-X-09(P)

EVERSOURCE
MERRIMACK VALLEY RELIABILITY PROJECT
LINE 3124 345 kV TRANSMISSION




EVERSOURCE

MERRIMACK VALLEY RELIABILITY PROJECT

LINE 3124 345 kV TRANSMISSION

DRAWING INDEX

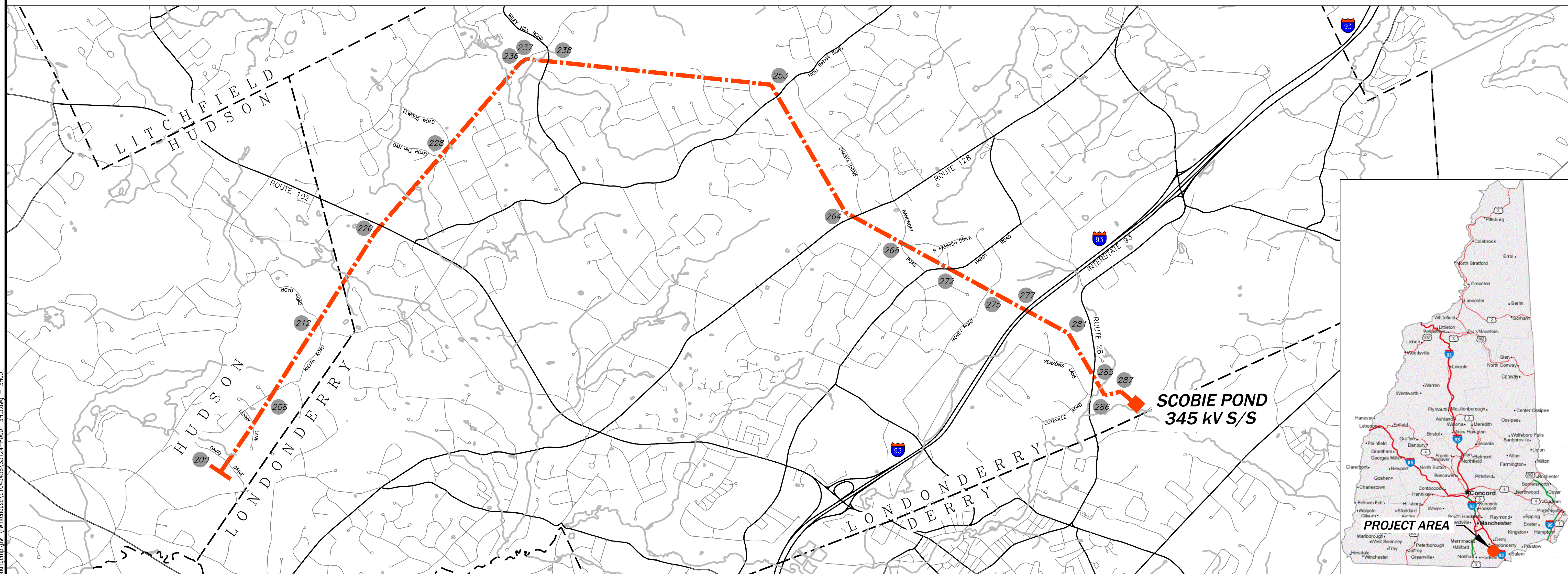
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S3124-P0001 SH.1	2	COVER SHEET	S3124-P0003 SH.1	2	SEA-HF FRAMING DETAIL
S3124-P0001 SH.2	3	DRAWING INDEX	S3124-P0003 SH.2	2	SEB-1 FRAMING DETAIL
S3124-P0001 SH.3	3	KEY SHEET	S3124-P0003 SH.3	2	SEC-1 FRAMING DETAIL
S3124-P0001 SH.4	2	STRUCTURE OUTLINE	S3124-P0003 SH.4	2	SED-1 FRAMING DETAIL
S3124-P0001 SH.5	2	LEGEND AND NOTES	S3124-P0003 SH.5	2	SED-2 FRAMING DETAIL
S3124-P0002 SH.1	3	PLAN AND PROFILE	S3124-P0003 SH.6	2	SEA-DEF FRAMING DETAIL
S3124-P0002 SH.2	2	PLAN AND PROFILE	S3124-P0003 SH.7	2	SED-2-DEF FRAMING DETAIL
S3124-P0002 SH.3	2	PLAN AND PROFILE	S3124-P0003 SH.7A	1	SEM-DEF FRAMING DETAIL
S3124-P0002 SH.4	2	PLAN AND PROFILE	S3124-P0003 SH.8	2	FOUNDATION DETAIL
S3124-P0002 SH.5	2	PLAN AND PROFILE	S3124-P0003 SH.9	2	GUYING DETAIL
S3124-P0002 SH.6	2	PLAN AND PROFILE	S3124-P0003 SH.10	2	GROUNDING DETAIL
S3124-P0002 SH.7	2	PLAN AND PROFILE	S3124-P0005 SH.1	3	R.O.W. CROSS-SECTION
S3124-P0002 SH.8	2	PLAN AND PROFILE	S3124-P0005 SH.2	2	R.O.W. CROSS-SECTION
S3124-P0002 SH.9	2	PLAN AND PROFILE	S3124-P0010 SH.1	1	S/S ONE-LINE
S3124-P0002 SH.10	2	PLAN AND PROFILE	S3124-P0010 SH.2	1	S/S GENERAL ARRANGEMENT
			S3124-P0010 SH.3	1	S/S ELEVATIONS AND SECTIONS

CONTRACT SERVICES														X	X
3	UPDATED RE-NHSEC PERMIT FILING	-	7/1/15	ROW	TSW	GEL								DRAWN	JJD/TRC
2	RE-ISSUED NHSEC PERMIT FILING	-	6/4/15	ROW	CRP	GEL								ENGINEER	GEL/TRC
1	NHSEC PERMIT FILING	-	2/27/15	JJD	CRP	GEL								CHECKED	CRP/TRC
REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR					LINE 3124 345 kV TRANSMISSION DRAWING INDEX MERRIMACK VALLEY RELIABILITY PROJECT		APPROVED	GEL/TRC	
												DATE	2/27/15		
												SCALE	N.T.S.		
												FILE: S3124-P0001_SH2.DWG	DRAWING NO.	S3124-P0001 SH.2	
												IMAGE:			
DWG REV	EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR									

EVERSOURCE MERRIMACK VALLEY RELIABILITY PROJECT

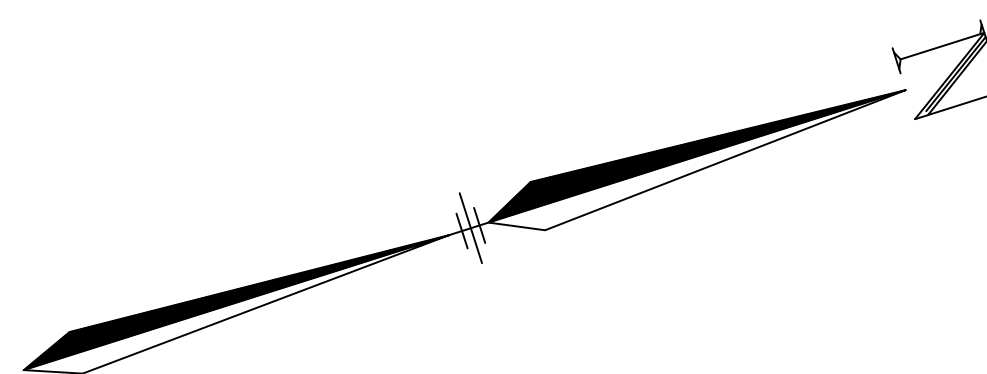
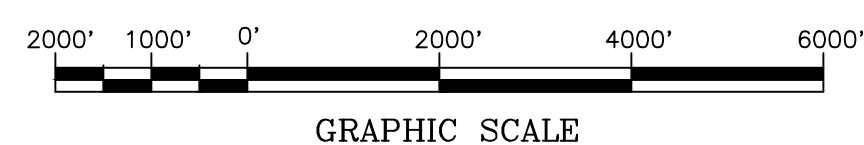
LINE 3124 345 KV TRANSMISSION

KEY SHEET



LEGEND:

- - - - - DENOTES PROPOSED TRANSMISSION LINE
- 200 DENOTES PROPOSED STRUCTURE NUMBER



CONTRACT SERVICES	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
3	UPDATED RE-NHSEC PERMIT FILING		7/01/15	ROW	TSW	GEL
2	RE-NHSEC PERMIT FILING		6/04/15	JJD	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL
REV						



LINE 3124 345 kV TRANSMISSION
KEY SHEET
MERRIMACK VALLEY RELIABILITY PROJECT

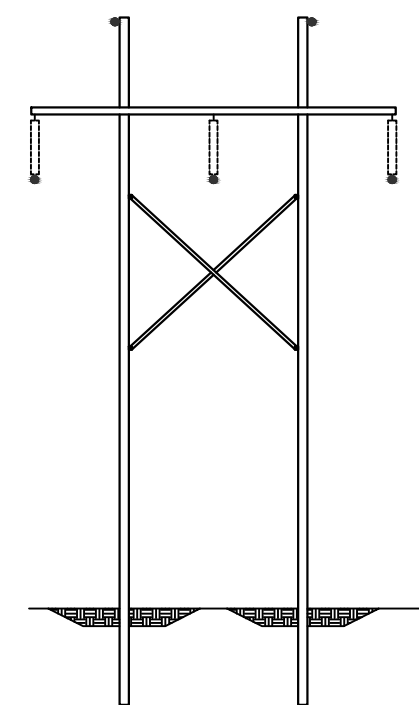
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EVERSOURCE

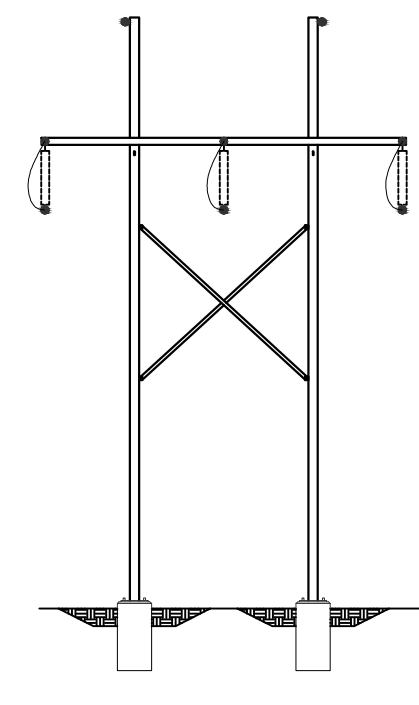
MERRIMACK VALLEY RELIABILITY PROJECT

LINE 3124 345 kV TRANSMISSION

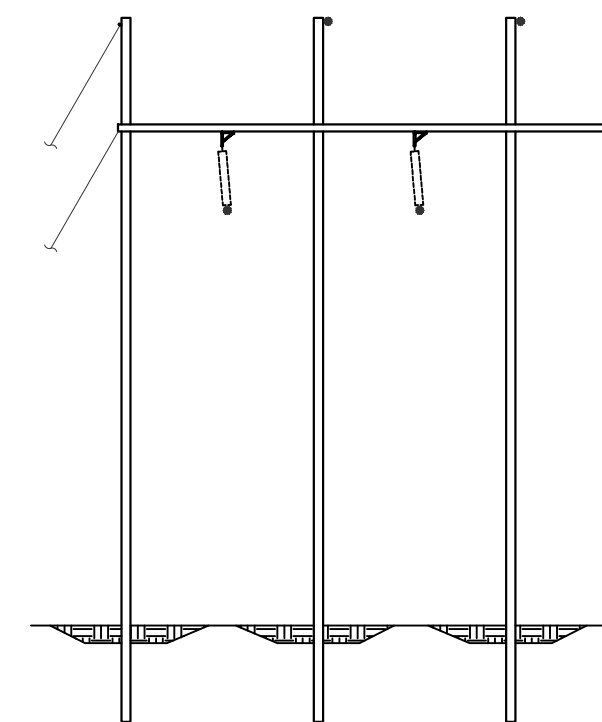
STRUCTURE OUTLINE



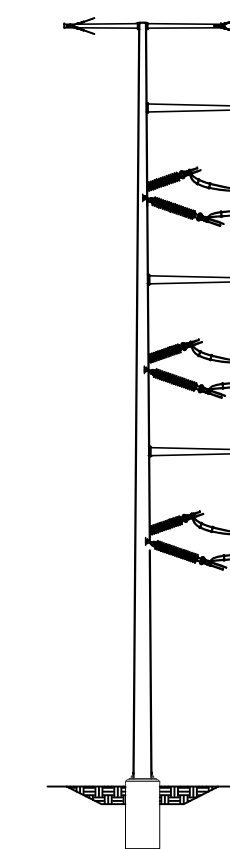
SEA-HF
STEEL POLE TANGENT
DWG. S3124-P0003 SH.1



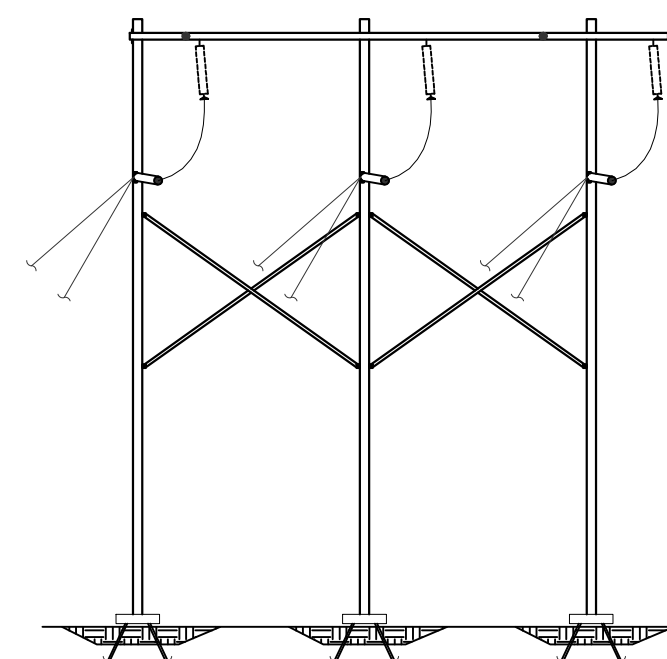
SEA-DEF
STEEL POLE
DEAD END (ON FOUNDATION)
DWG. S3124-P0003 SH.6



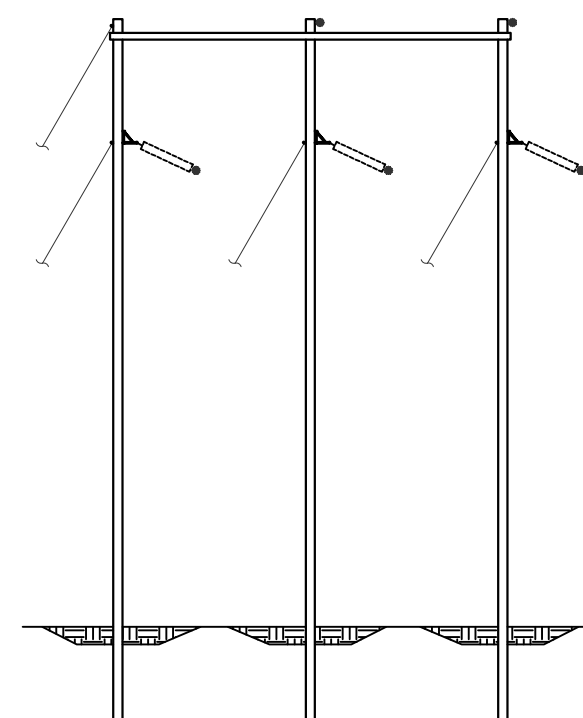
SEB-1
STEEL POLE RUNNING
ANGLE 3°-20°
DWG. S3124-P0003 SH.2



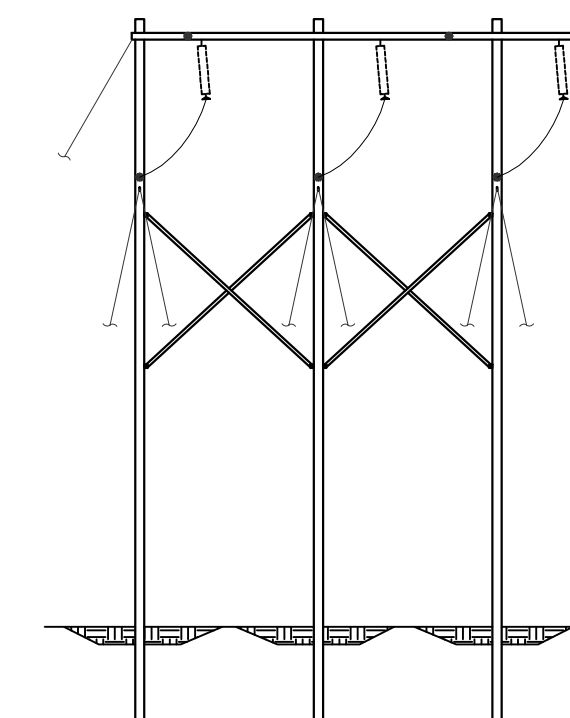
SEM-DEF
STEEL MONOPOLE
DEAD END ANGLE (ON FOUNDATION)
DWG. S3124-P0003 SH.7A



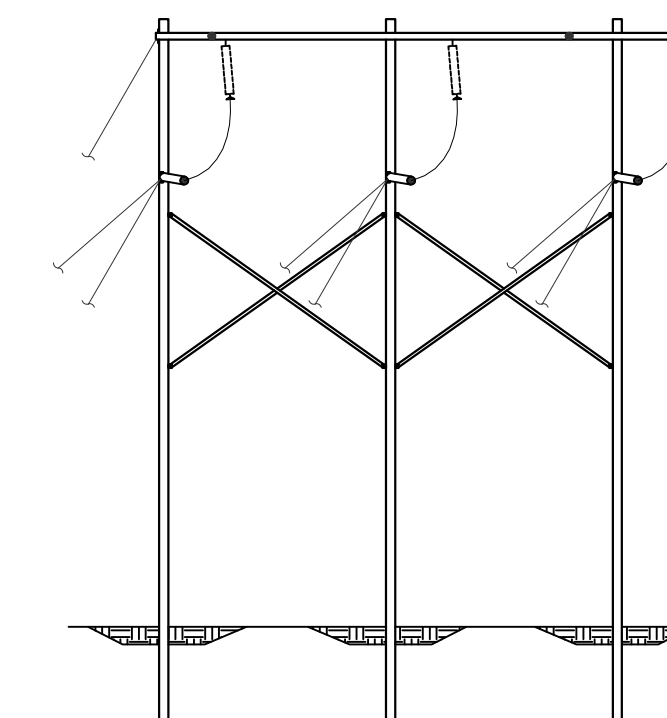
SED-2-DEF
STEEL POLE
DEAD END ANGLE (ON PILE FOUNDATION)
DWG. S3124-P0003 SH.7



SEC-1
STEEL POLE RUNNING
ANGLE 20°-45°
DWG. S3124-P0003 SH.3



SED-1
STEEL POLE
DEAD END ANGLE (0°-15°)
DWG. S3124-P0003 SH.4



SED-2
STEEL POLE
DEAD END ANGLE (15°-90°)
DWG. S3124-P0003 SH.5

CONTRACT SERVICES	REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
	2	RE-ISSUED NHSEC PERMIT FILING	-	6/4/15	ROW	CRP	GEL
	1	NHSEC PERMIT FILING	-	2/27/15	JJD	CRP	GEL

EVERSOURCE ENERGY

LINE 3124 345 kV TRANSMISSION
STRUCTURE OUTLINE
MERRIMACK VALLEY RELIABILITY PROJECT

SCALE
N.T.S.

FILE: S3124-P0001 SH.4.DWG
IMAGE:

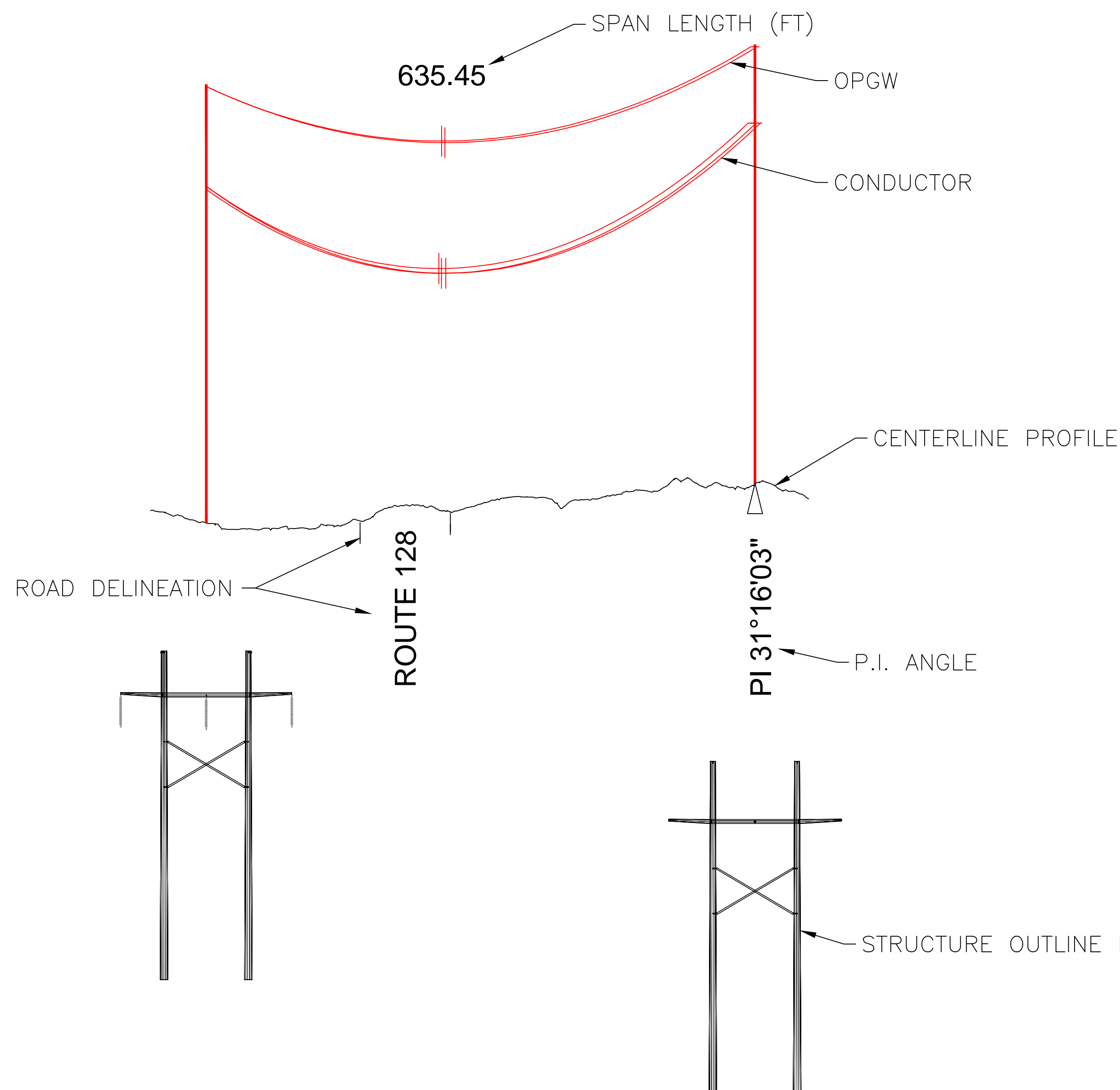
DRAWING NO.
S3124-P0001 SH.4

X	X
DRAWN JJD/TRC	
ENGINEER GEL/TRC	
CHECKED CRP/TRC	
APPROVED GEL/TRC	
DATE 2/27/15	

EVERSOURCE MERRIMACK VALLEY RELIABILITY PROJECT

LINE 3124 345 kV TRANSMISSION

LEGEND AND NOTES



PLAN LEGEND

- EXISTING STRUCTURE
- PROPOSED STRUCTURE
- WETLAND
- EVERSOURCE FEE PROPERTY
- ROW LIMITS
- ROADS
- STREAM OR BROOK
- CONTOURS
- GAS LINE ROW
- SEWER LINE ROW
- EXISTING TRANSMISSION CENTER LINE
- TOWN LINE
- PROPOSED CENTER LINE
- PROPERTY LINE

PROFILE LEGEND

- 24 ← STRUCTURE NUMBER
- STA=11+45 ← STATION
- SEA-DEF ← STRUCTURE TYPE
- 115 ← STRUCTURE HEIGHT
- STEEL ← STRUCTURE NOTES

NOTES

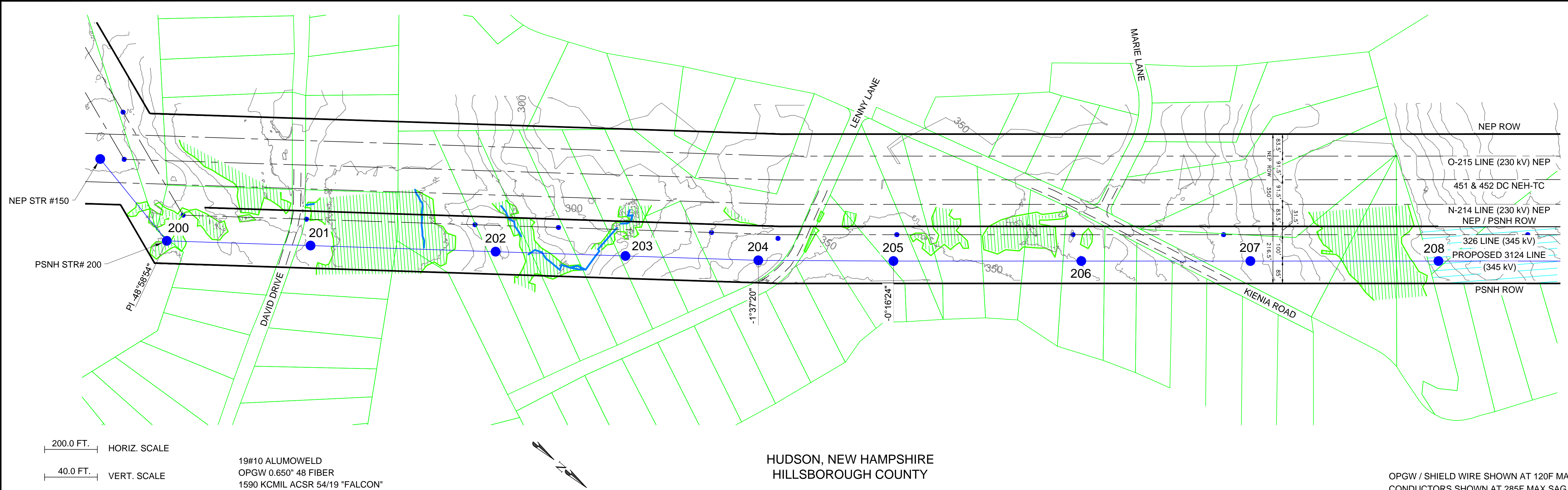
- PHYSICAL FEATURES MAPPED FROM UPDATED LINE 326 PLAN AND PROFILES 2012
- ENVIRONMENTAL DELINEATIONS CONDUCTED BY NORMANDEAU 2013
- ADDITIONAL ENVIRONMENTAL DELINEATIONS CONDUCTED BY VHB 2014
- LIDAR SURVEY CONDUCTED BY GEODIGITAL 2011
- COORDINATES BASED ON NAD83 NEW HAMPSHIRE INTERNATIONAL FOOT
- PROPERTY LINES BY CORNERSTONE 2015

WIRE DATA

WIRE	# OF CABLES	TYPE	DIA. (IN.)	WEIGHT/ 1000 FT	CABLE STRENGTH (LBS.)
NEW OPGW	2	BRUGG 48F/36SM/12TW	0.650	407	17,618
NEW STATIC WIRE	1	19#10 ALUMOWELD	0.509	449	27,190
NEW CONDUCTOR	6	1590 KCM 54/19 ACSR	1.545	2042	54,500

STRUCTURE OUTLINE FOR ADDITIONS

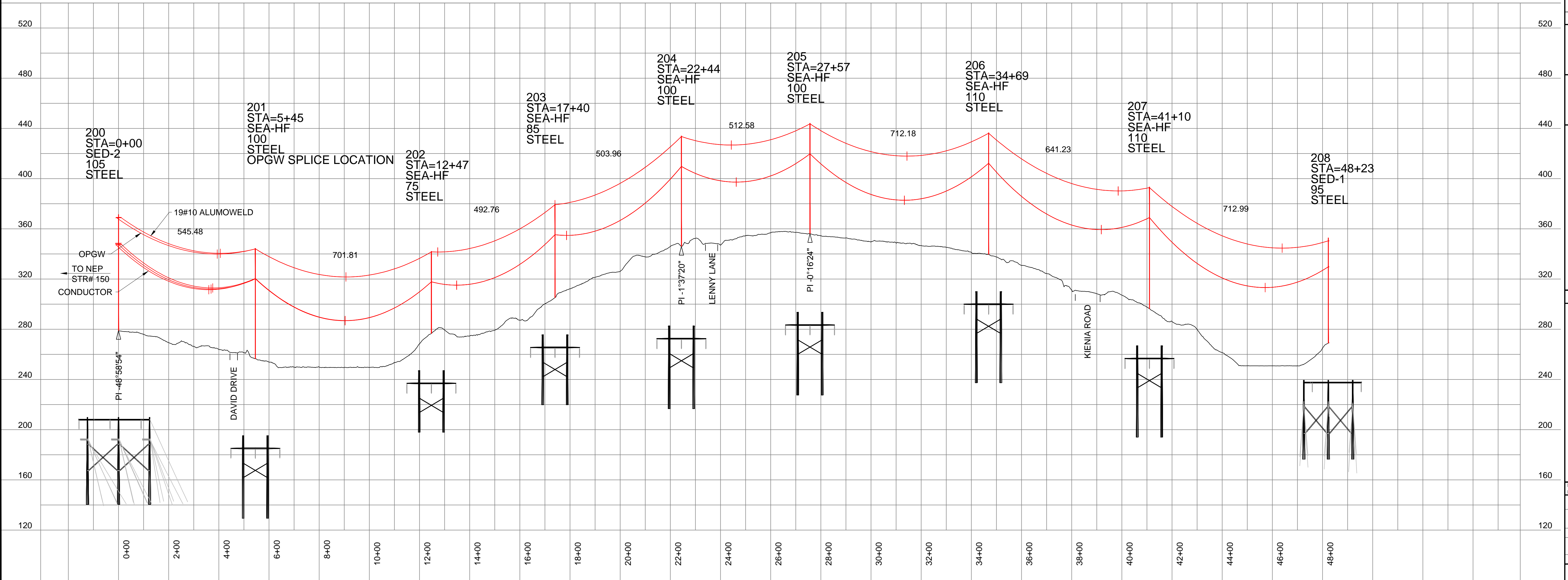
		X X DRAWN JJD/TRC ENGINEER GEL/TRC CHECKED CRP/TRC APPROVED GEL/TRC DATE 2/27/15
LINE 3124 345 kV TRANSMISSION LEGEND AND NOTES MERRIMACK VALLEY RELIABILITY PROJECT		SCALE N.T.S. FILE: S3124-P0001 SH. 5.DWG DRAWING NO. S3124-P0001 SH.5



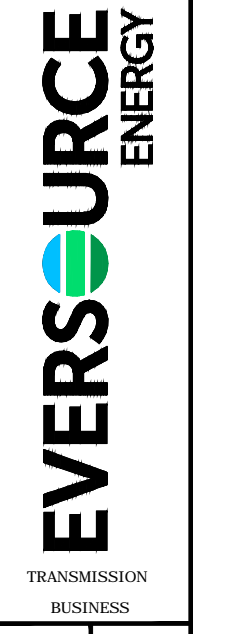
19#10 ALUMOWELD
OPGW 0.650" 48 FIBER
1590 KCMIL ACSR 54/19 "FALCON"

HUDSON, NEW HAMPSHIRE
HILLSBOROUGH COUNTY

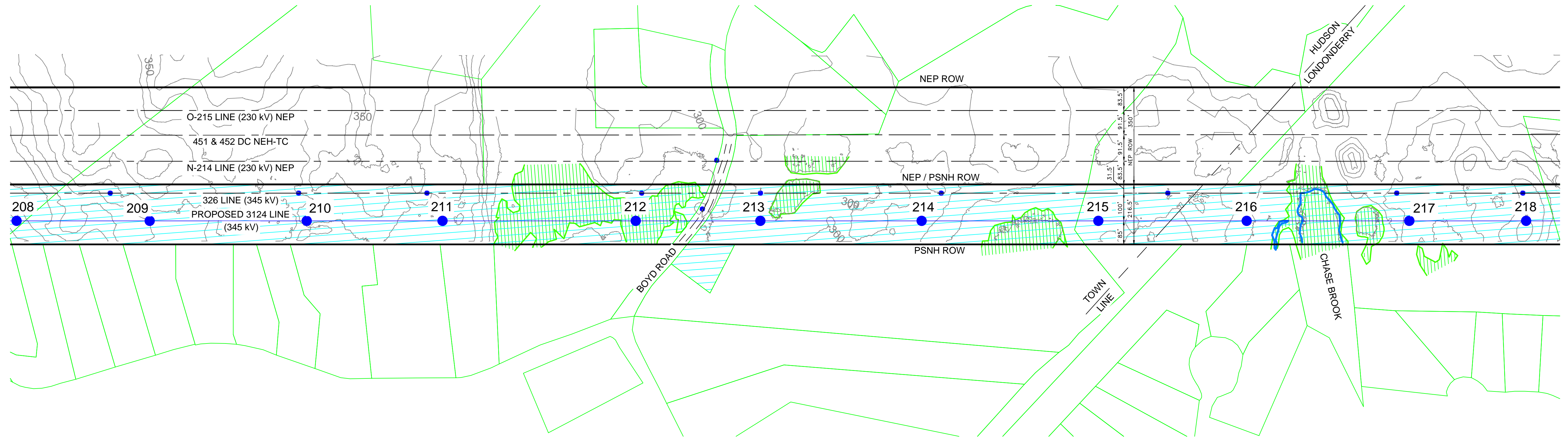
OPGW / SHIELD WIRE SHOWN AT 120F MAX SAG
CONDUCTORS SHOWN AT 285F MAX SAG



NO.	REVISION	DATE	DRWN	CHKD	APPRD
3	UPDATED PERMITS PERMIT FILING	7/20/15	ROW	TSW	GEL
2	REISSUED PERMITS PERMIT FILING	6/24/15	ROW	TSW	GEL
1	PERMITS PERMIT FILING	2/27/15	TSW	CRP	GEL



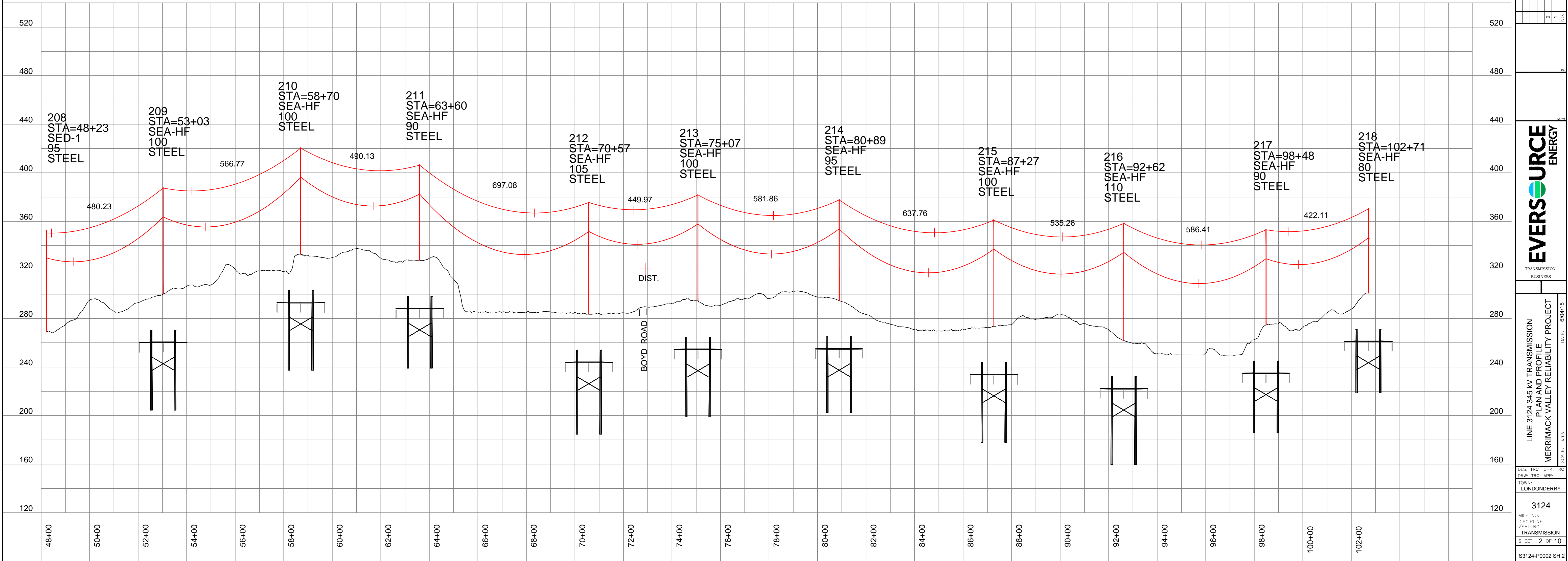
LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.
DATE: 6/24/15
DES: TRC
CHK: TRB
DRW: TRC
APR:
TOWN:
HUDSON
3124
MILE NO:
DISCIPLINE
/SHT NO:
TRANSMISSION
SHEET 1 OF 10
S3124-P0002 SH.1



200.0 FT. HORIZ. SCALE
40.0 FT. VERT. SCALE

OPGW 0.650" 48 FIBER
1590 KCMIL ACSR 54/19 "FALCON"

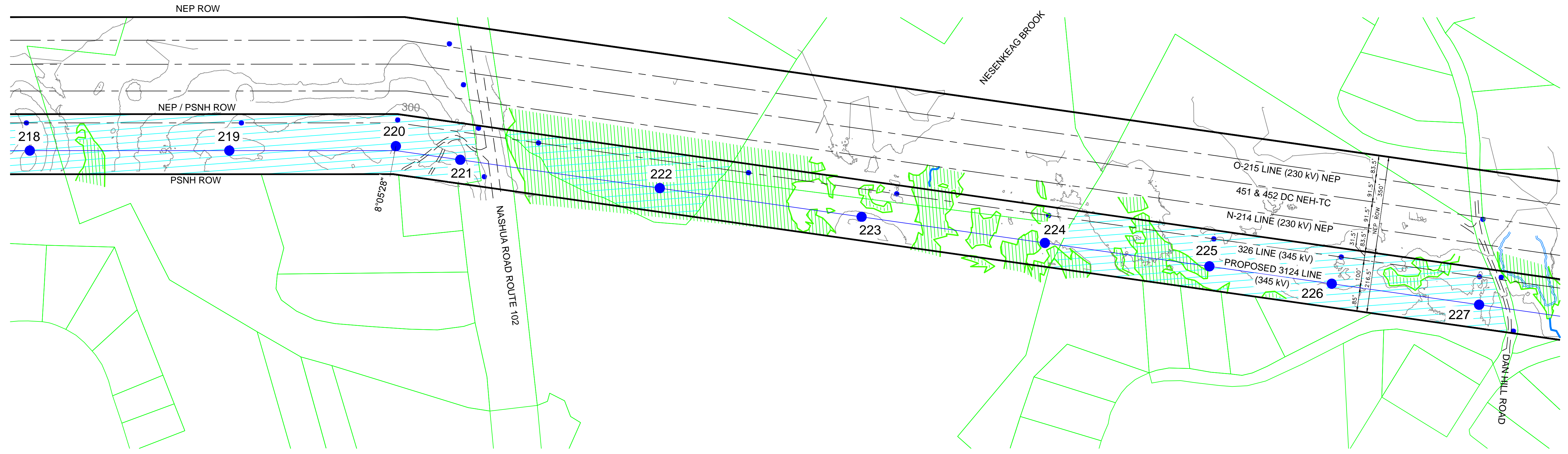
OPGW SHOWN AT 120F MAX SAG
CONDUCTORS SHOWN AT 285F MAX SAG



NO.	REVISION	DATE	DRWN	CHKD	APPRV
2	REISSUED NHSEC PERMIT FILING	6/04/15	TSW	CP	GEL
1	NHSEC PERMIT FILING	2/27/15	TSW	CP	GEL



LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.
DES: TRC
CHK: TRB
DRW: TRC
APR:
TOWN: LONDONDERRY
MILE NO: 3124
DISCIPLINE: TRANSMISSION
SHEET 2 OF 10
S3124-P0002 SH.2

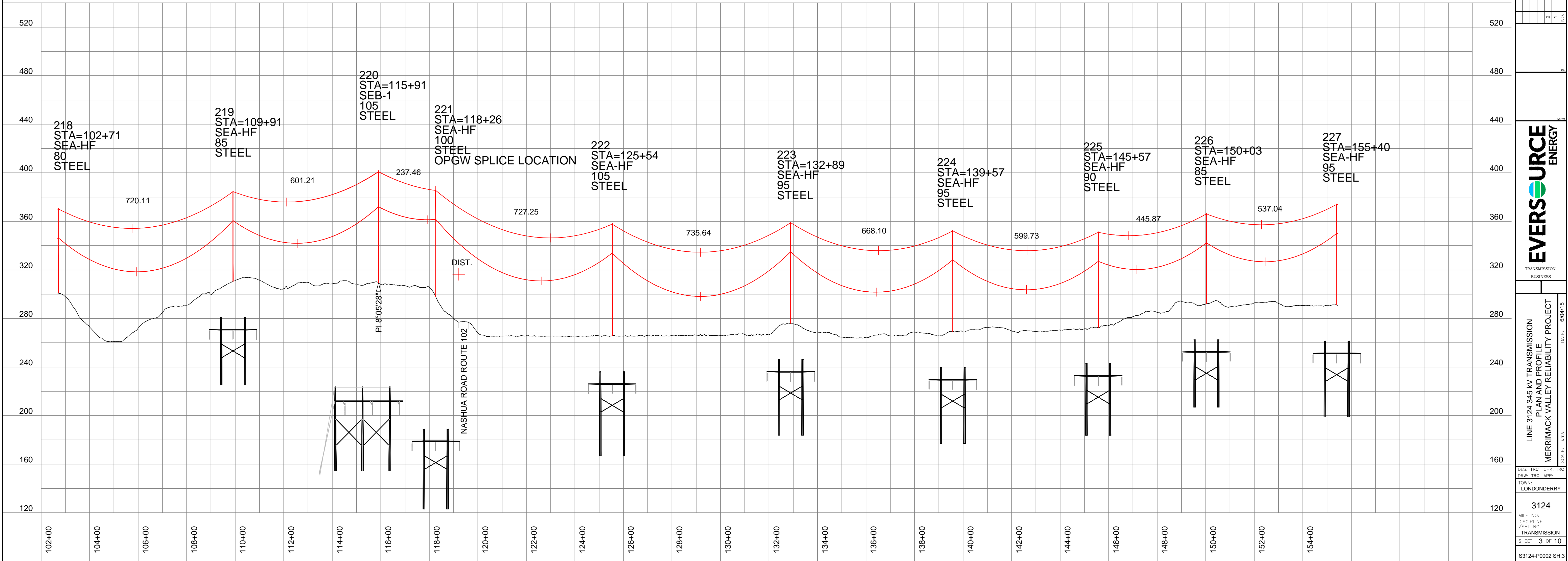


200.0 FT. HORIZ. SCALE
40.0 FT. VERT. SCALE

OPGW 0.650" 48 FIBER
1590 KCMIL ACSR 54/19 "FALCON"

LONDONDERRY, NEW HAMPSHIRE
ROCKINGHAM COUNTY

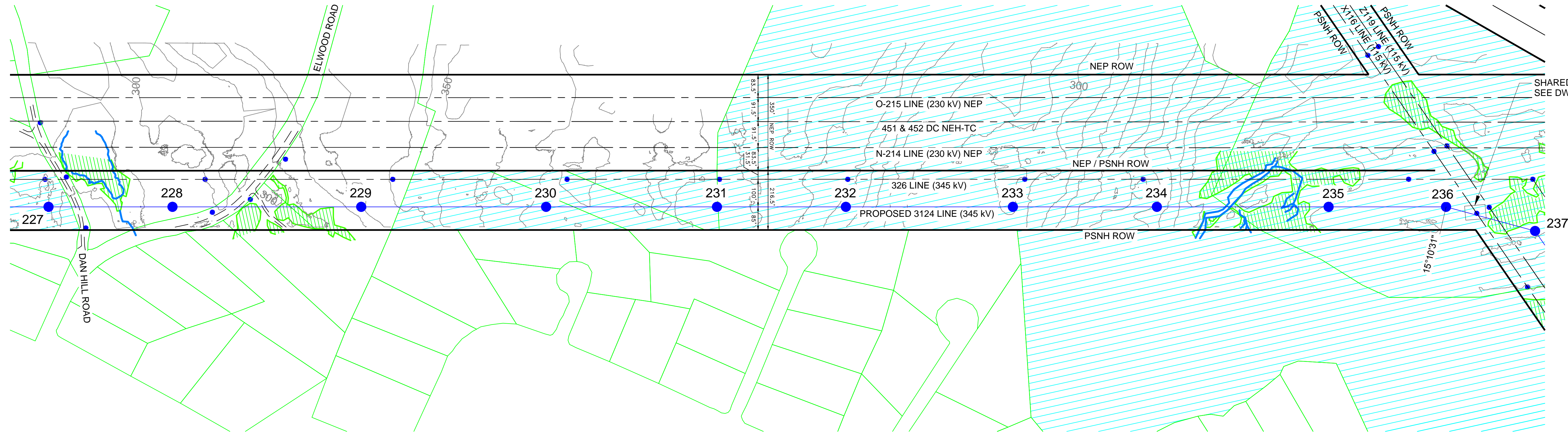
OPGW SHOWN AT 120F MAX SAG
CONDUCTORS SHOWN AT 285F MAX SAG



NO.	REVISION	DATE	DRWN	TSW	CP	GEL
1	ISSUED NHEC PERMIT FILING	2/27/15	TSW	CP	GEL	
2	REISSUED NHEC PERMIT FILING	6/04/15	TSW	CP	GEL	



LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.
DATE: 6/04/15
DES: TRC
DRW: TRC
TOWN: LONDONDERRY
MILE NO: 3124
DISCIPLINE: TRANSMISSION
SHEET 3 OF 10
S3124-P0002 SH.3



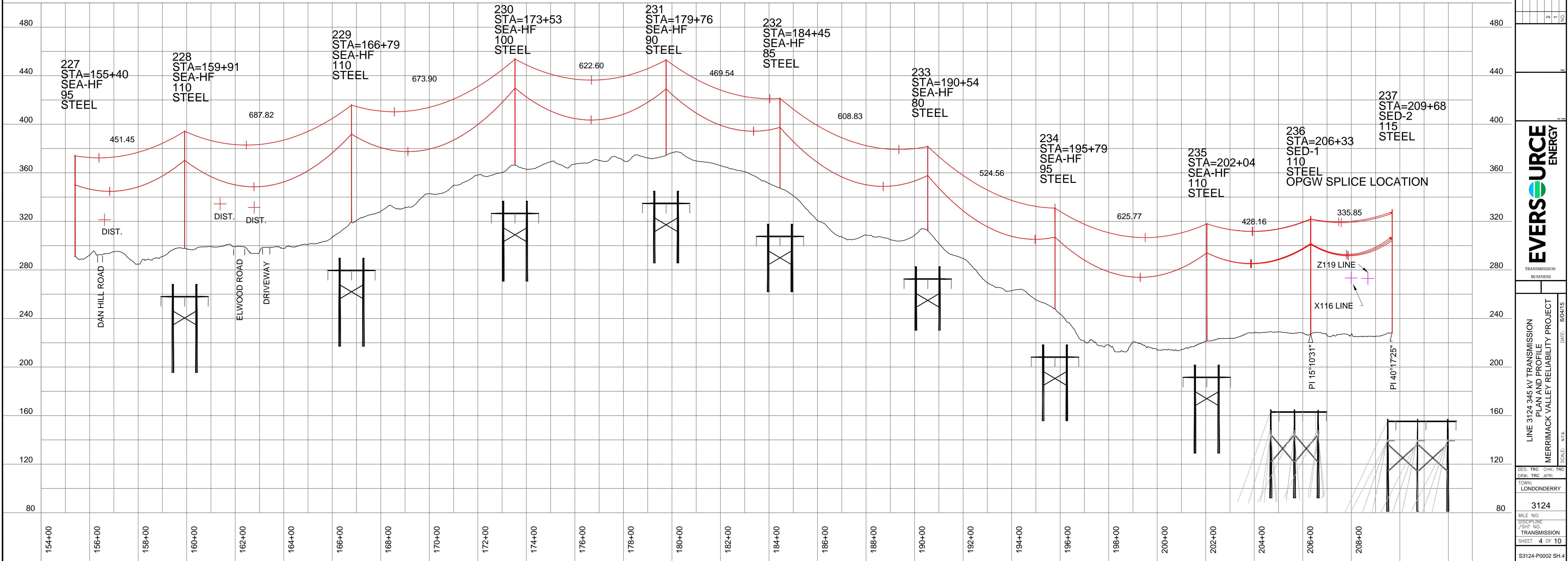
SHARED GUY ANCHOR
SEE DWG. S3124-P003 SH09

200.0 FT. HORIZ. SCALE
40.0 FT. VERT. SCALE

OPGW 0.650" 48 FIBER
1590 KCMIL ACSR 54/19 "FALCON"

LONDONDERRY, NEW HAMPSHIRE
ROCKINGHAM COUNTY

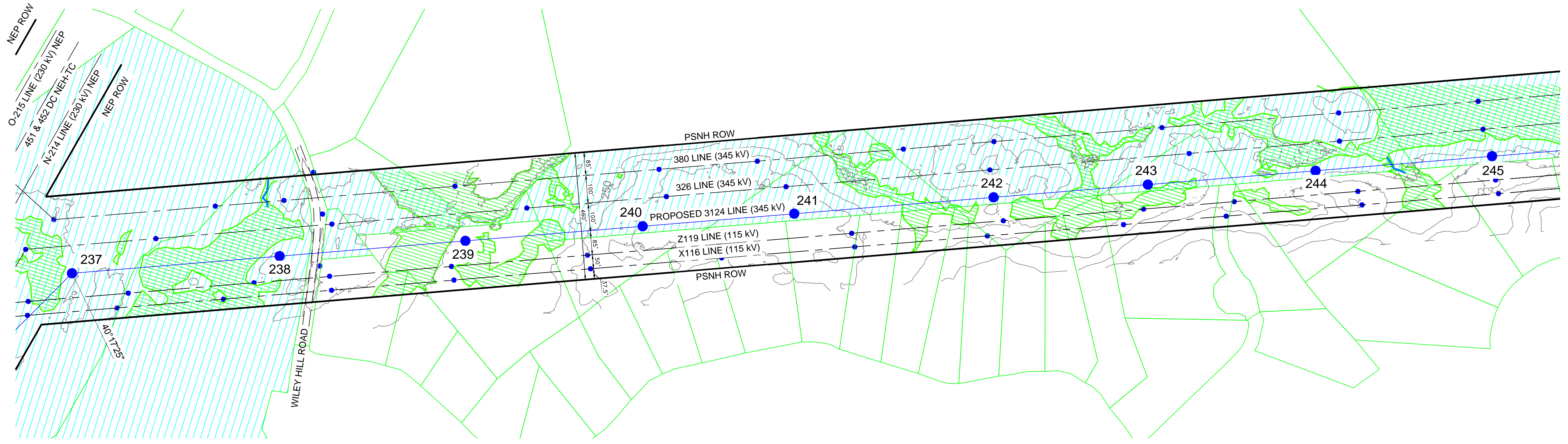
OPGW SHOWN AT 120F MAX SAG
CONDUCTORS SHOWN AT 285F MAX SAG



NO.	REVISION	DATE	TSW	CP	CHKD.	APPR.
2	REISSUED NHSEC PERMIT FILING	6/04/15	TSW	CP		GEL
1	NHSEC PERMIT FILING	2/27/15	TSW	CP		GEL



LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.
DATE: 6/04/15
DES: TRC
CHK: TRC
DRW: TRC
APR: TRC
TOWN: LONDONDERRY
3124
DISCIPLINE: TRANSMISSION
SHEET 4 OF 10
S3124-P0002 SH.4

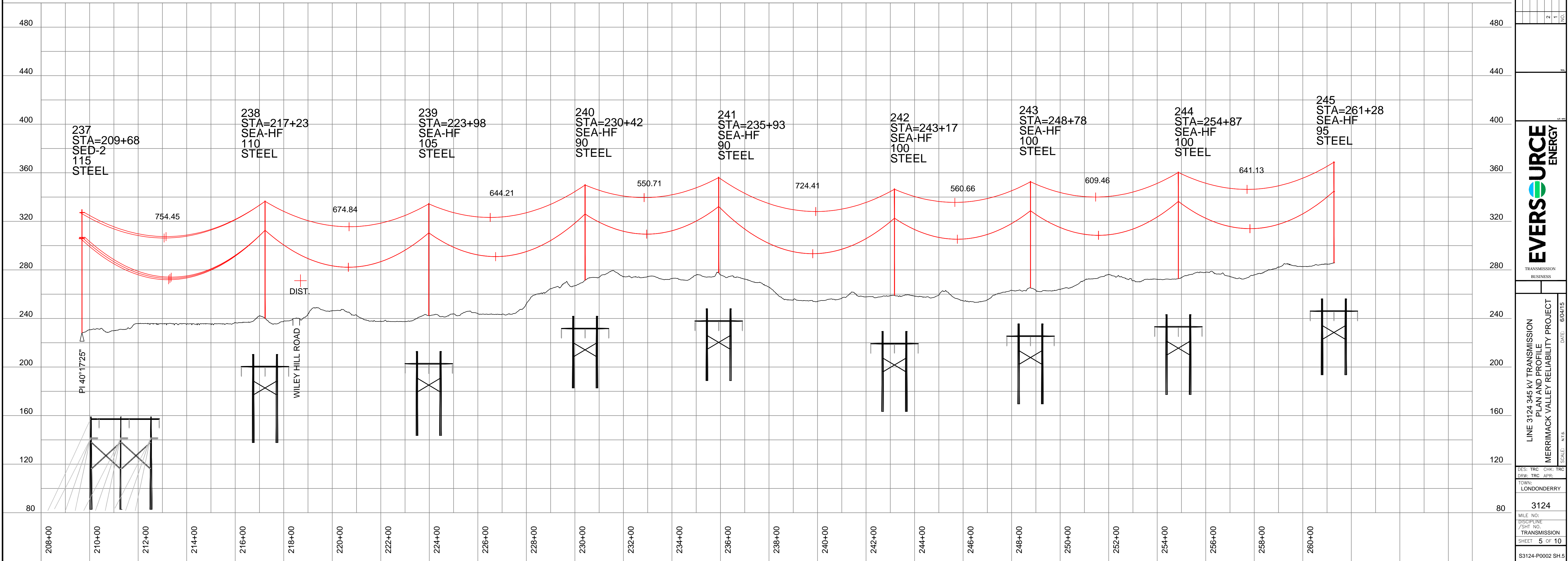


200.0 FT. HORIZ. SCALE
40.0 FT. VERT. SCALE

OPGW 0.650" 48 FIBER
1590 KCMIL ACSR 54/19 "FALCON"

LONDONDERRY, NEW HAMPSHIRE
ROCKINGHAM COUNTY

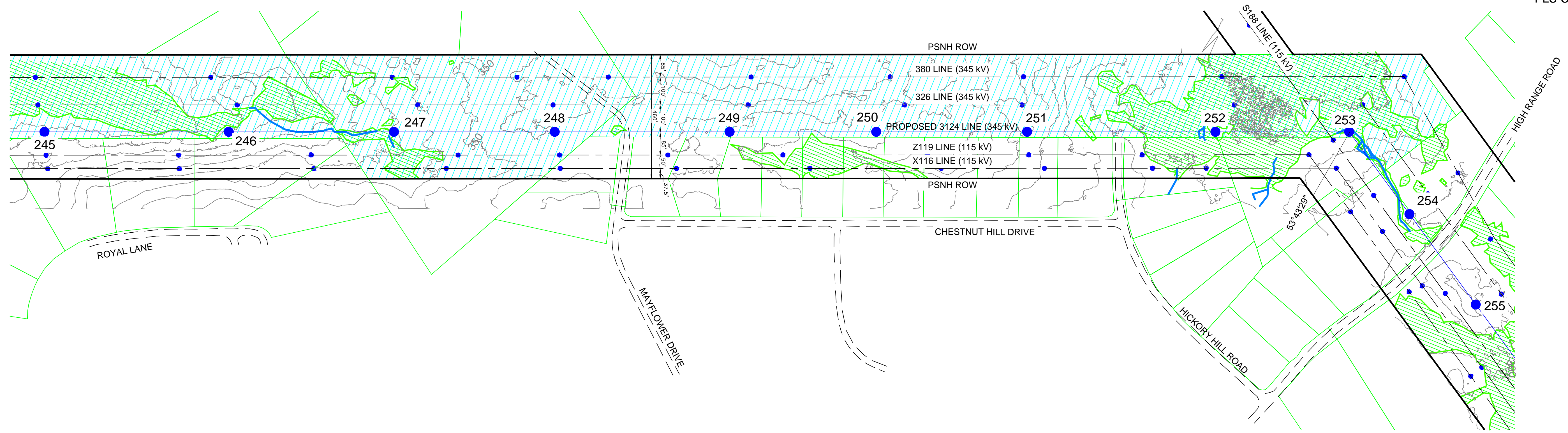
OPGW SHOWN AT 120F MAX SAG
CONDUCTORS SHOWN AT 285F MAX SAG



NO.	REVISION	DATE	BY	CHKD.	APPV.
2	REISSUED NHSEC PERMIT FILING	6/04/15	TSW	ROW	GEL
1	NHSEC PERMIT FILING	2/27/15	TSW	CRP	GEL



LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.
DATE: 6/04/15
DISCIPLINE: TRANSMISSION
SHEET 5 OF 10
S3124-P0002 SH.5

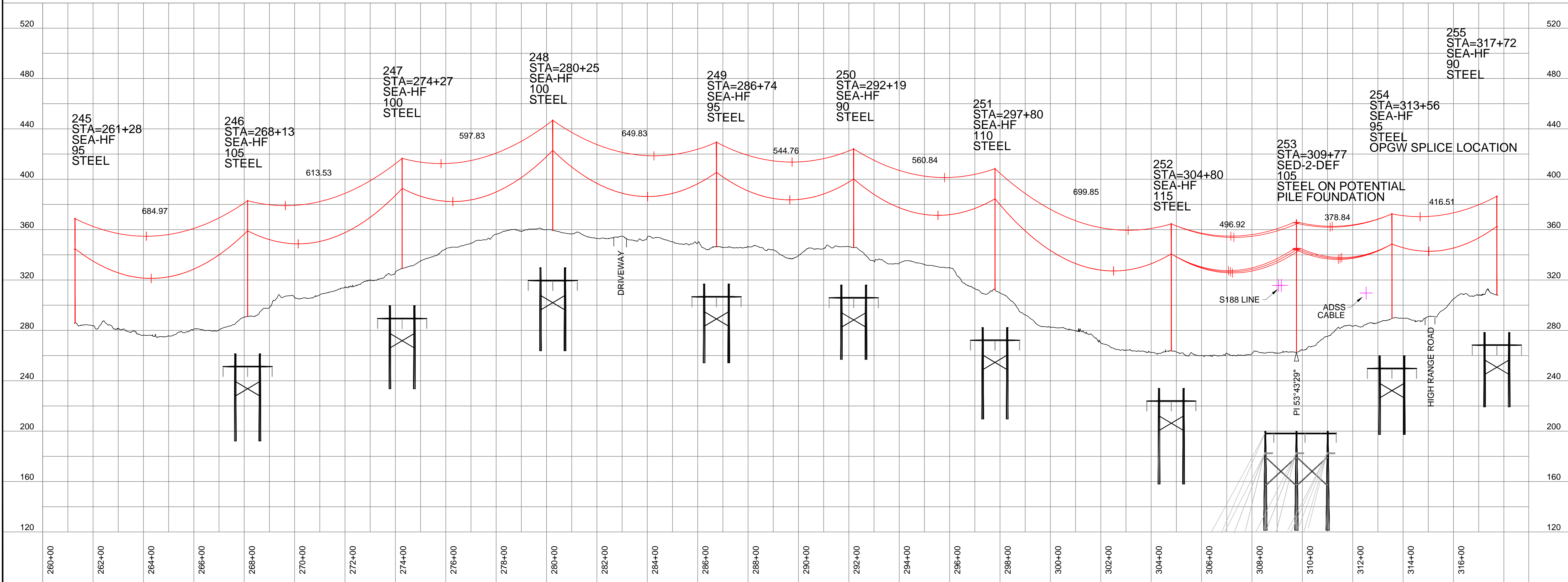


200.0 FT. HORIZ. SCALE
40.0 FT. VERT. SCALE

OPGW 0.650" 48 FIBER
1590 KCMIL ACSR 54/19 "FALCON"

LONDONDERRY, NEW HAMPSHIRE
ROCKINGHAM COUNTY

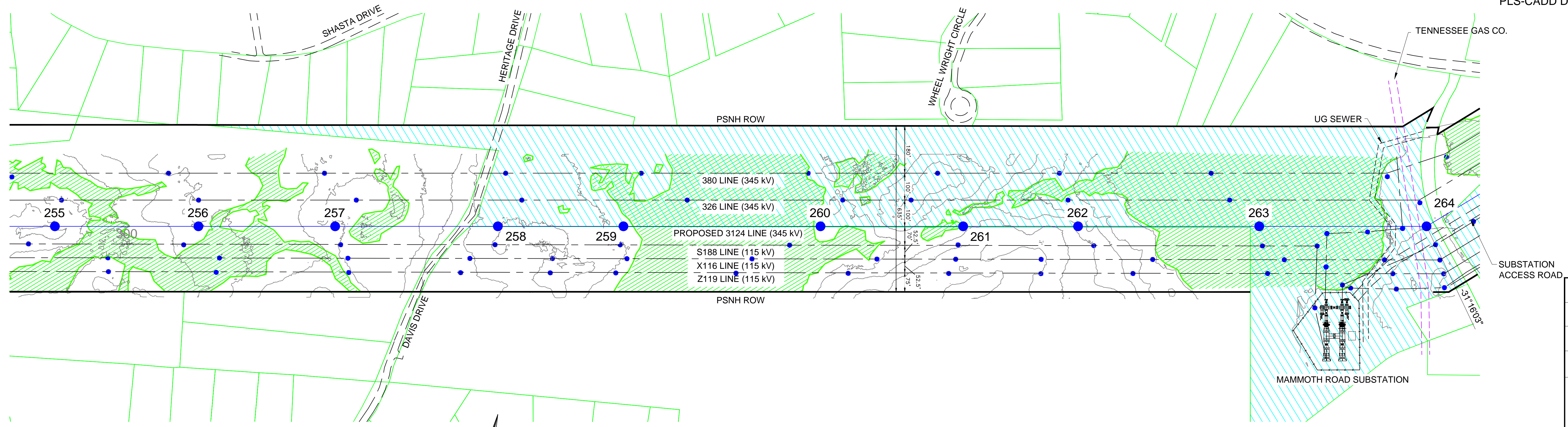
OPGW SHOWN AT 120F MAX SAG
CONDUCTORS SHOWN AT 285F MAX SAG



NO.	REVISION	DATE	TSW	CPD	ROW	GEL
1	ISSUED PERMIT FILING	2/27/15	TSW	CPD	ROW	GEL
2	REISSUED NHSEC PERMIT FILING	6/04/15	TSW	CPD	ROW	GEL



LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.
DATE: 6/04/15
DES: TRC
CHK: TRB
DRW: TRC
APP: TRB
TOWN: LONDONDERRY
3124
MILE NO.:
DISCIPLINE:
SHEET 6 OF 10
S3124-P0002 SH.6

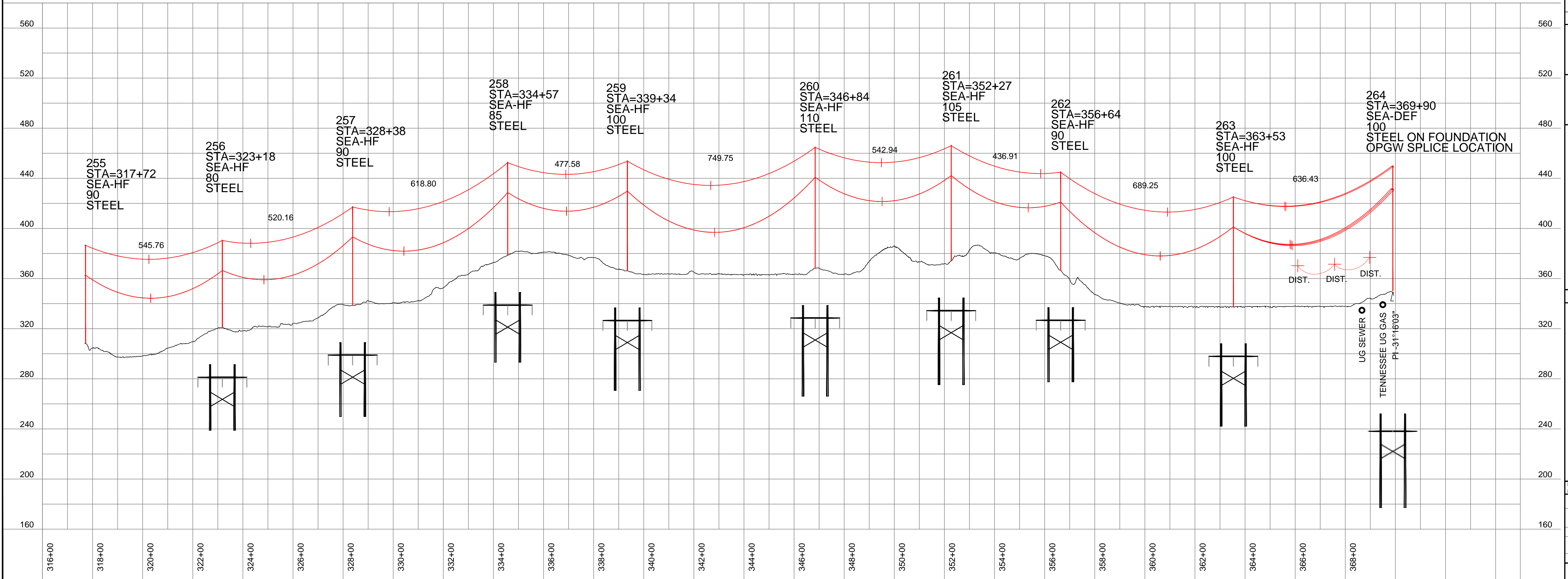


200.0 FT. HORIZ. SCALE
40.0 FT. VERT. SCALE

OPGW 0.650" 48 FIBER
1590 KCMIL ACSR 54/19 "FALCON"

LONDONDERRY, NEW HAMPSHIRE
ROCKINGHAM COUNTY

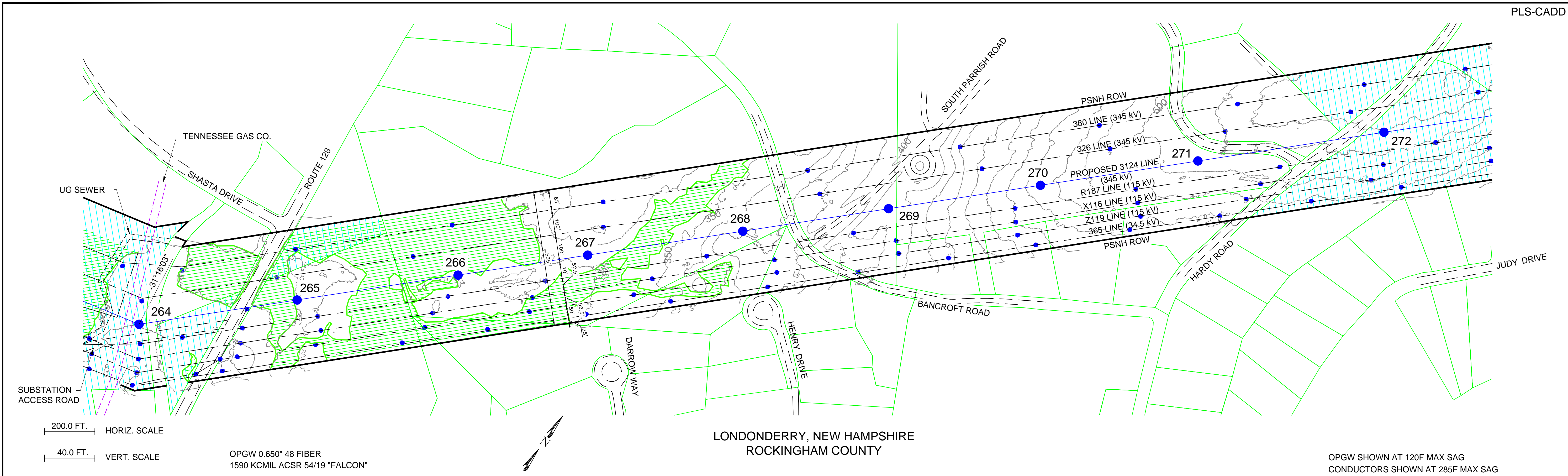
OPGW SHOWN AT 120F MAX SAG
CONDUCTORS SHOWN AT 285F MAX SAG



NO.	REVISION	DATE	BY	CHKD.	APPR.
1	ISSUED FOR PERMIT FILING	2/27/15	TSW	TSW	CP
2	REISSUED NHSEC PERMIT FILING	6/04/15	TSW	TSW	CP

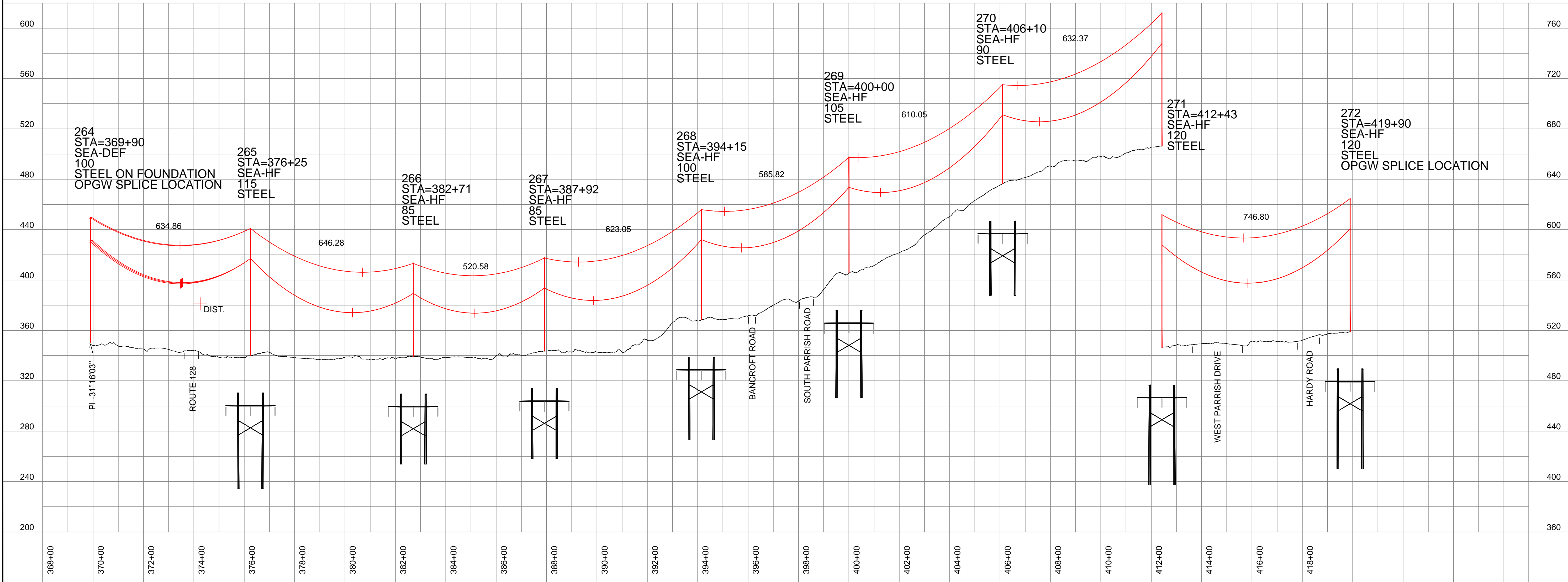
EVERSOURCE ENERGY
TRANSMISSION BUSINESS

LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.
DATE: 6/04/15
DES: TRC
CHK: TRC
DRW: TRC
APP: TRC
TOWN: LONDONDERRY
MILE NO: 3124
DISCIPLINE: TRANSMISSION
SHEET 7 OF 10
S3124-P0002 SH.7



OPGW 0.650" 48 FIBER
1590 KCMIL ACSR 54/19 "FALCON"

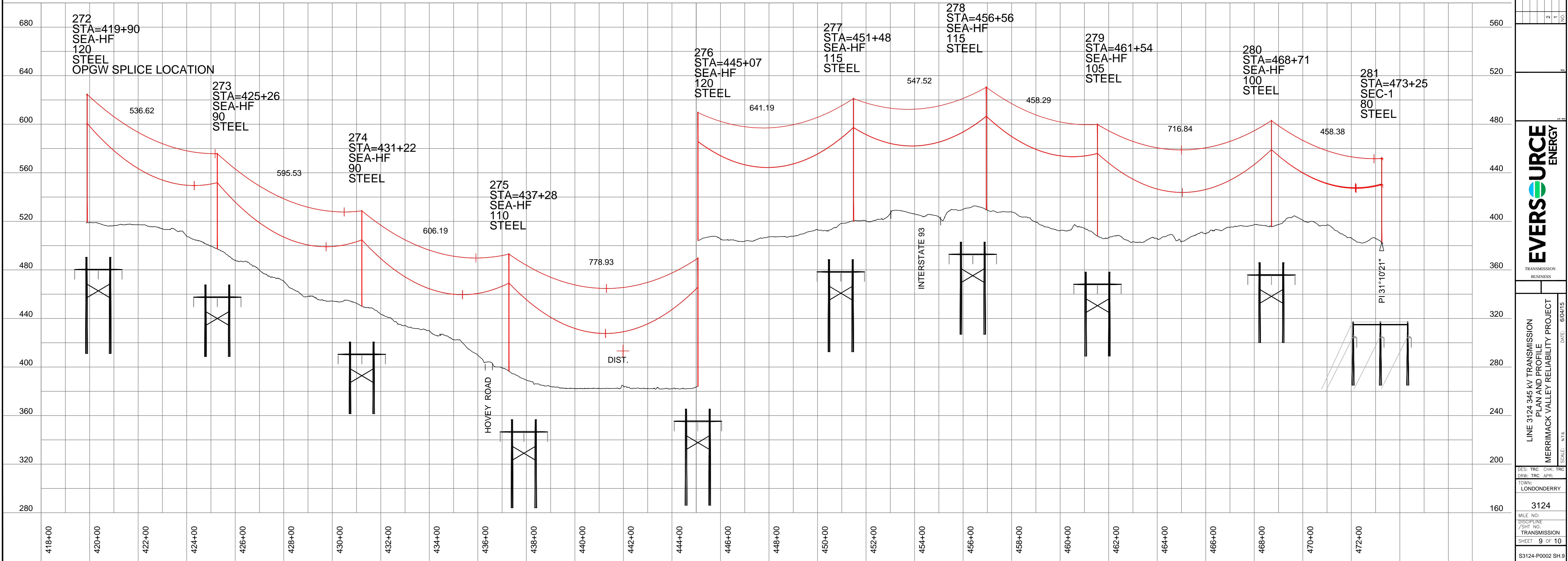
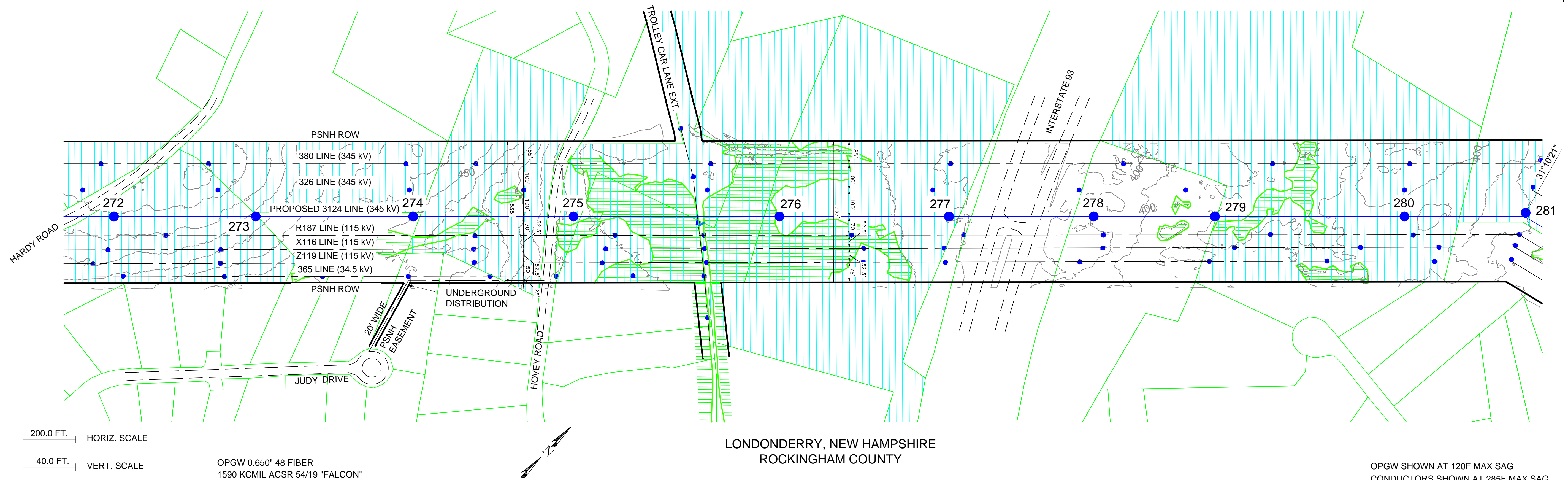
OPGW SHOWN AT 120F MAX SAG
CONDUCTORS SHOWN AT 285F MAX SAG



NO.	REVISION	DATE	BY	CHKD.	APPV.
1	ISSUED PERMIT FILING	2/27/15	TSW	CP	GEL
2	REISSUED NHSEC PERMIT FILING	6/04/15	TSW	CP	GEL



LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.
DATE: 6/04/15
DISCIPLINE: TRANSMISSION
SHEET 8 OF 10
MILE NO: 3124
TOWN: LONDONDERRY
DES. TRC
CHK. TRB
APPV. TRB



NO.	REVISION	DATE	DRWN	TSW	CPD	GEL
1	ISSUED FOR PERMIT FILING	2/27/15	TRC	TRC	TRC	TRC
2	REISSUED FOR PERMIT FILING	6/04/15	TRC	TRC	TRC	TRC



LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.

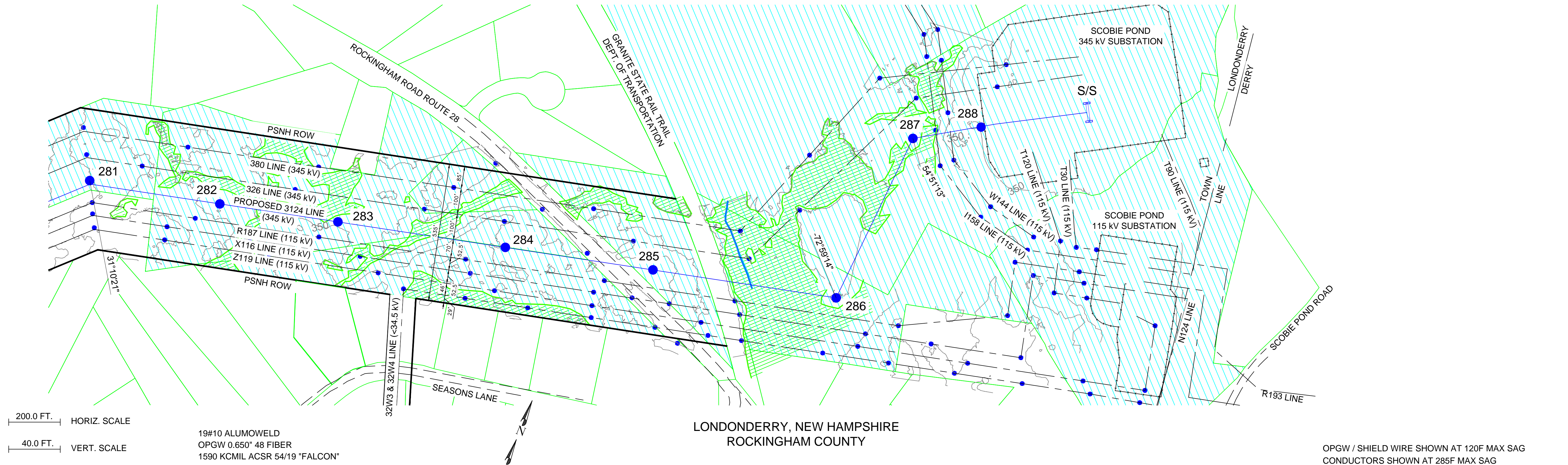
DES: TRC
CHK: TRC
DRW: TRC
TOWN: LONDONDERRY

DATE: 6/04/15

3124

DISCIPLINE: TRANSMISSION
SHEET: 9 OF 10

S3124-P0002 SH.9



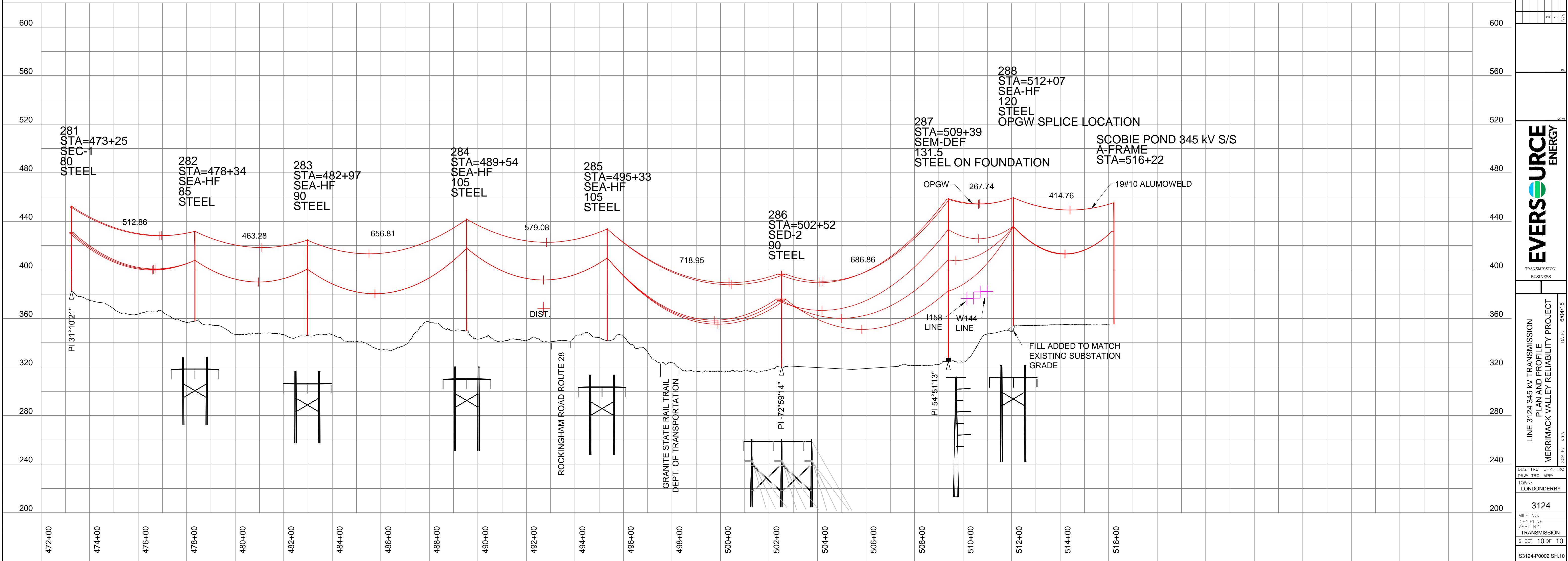
200.0 FT. HORIZ. SCALE
40.0 FT. VERT. SCALE

19#10 ALUMOWELD
OPGW 0.650" 48 FIBER
1590 KCMIL ACSR 54/19 "FALCON"

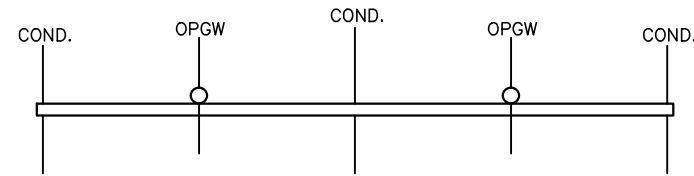
LONDONDERRY, NEW HAMPSHIRE
ROCKINGHAM COUNTY

OPGW / SHIELD WIRE SHOWN AT 120F MAX SAG
CONDUCTORS SHOWN AT 285F MAX SAG

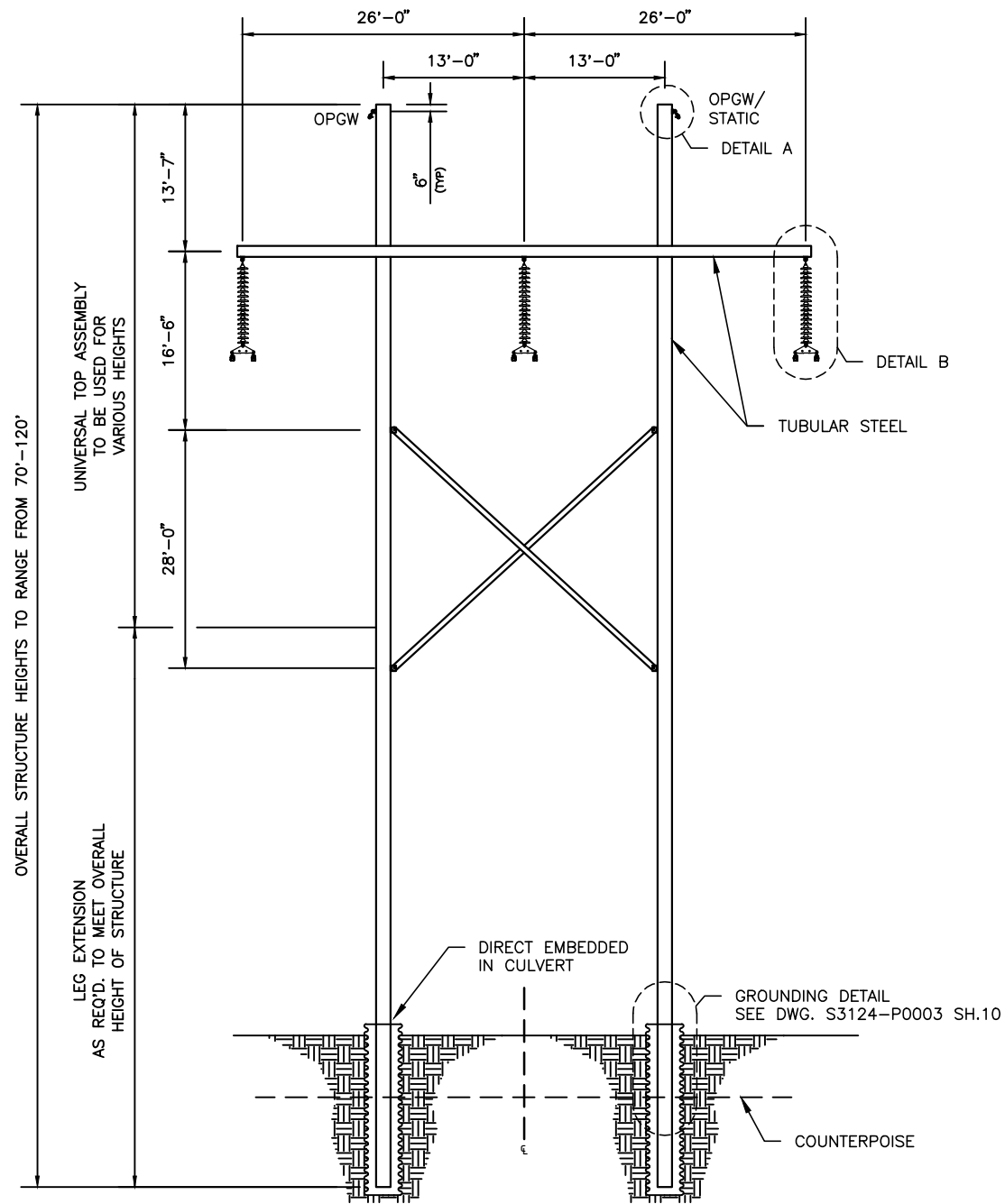
NO.	REVISION	DATE	DRWN	CHKD	APPR'D
2	REISSUED NHSEC PERMIT FILING	6/04/15	TSW	TSW	GEL
1	NHSEC PERMIT FILING	2/27/15	TSW	CFP	GEL



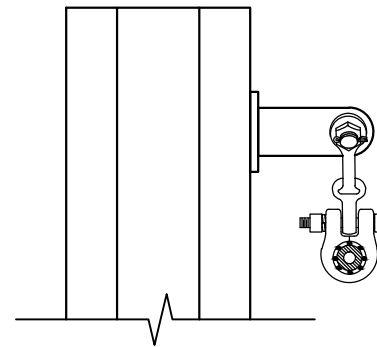
LINE 3124 345 KV TRANSMISSION
PLAN AND PROFILE
MERRIMACK VALLEY RELIABILITY PROJECT
SCALE: N.T.S.
DATE: 6/04/15
DES: TRC
DRW: TRC
TOWN: LONDONDERRY
MILE NO: 3124
DISCIPLINE: TRANSMISSION
SHEET 10 OF 10
S3124-P0002 SH-10



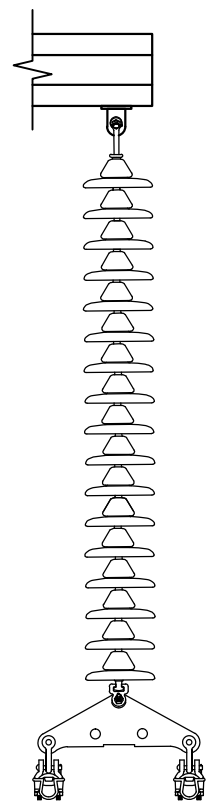
PLAN VIEW



SEA-HF
STEEL POLE TANGENT



DETAIL A
OPGW DETAIL



DETAIL B
INSULATOR DETAIL

REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2	RE-ISSUED NHSEC PERMIT FILING		6/4/15	RDW	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL



LINE 3124 345 kV TRANSMISSION
SEA-HF FRAMING DETAIL
MERRIMACK VALLEY RELIABILITY PROJECT
STEEL POLE TANGENT

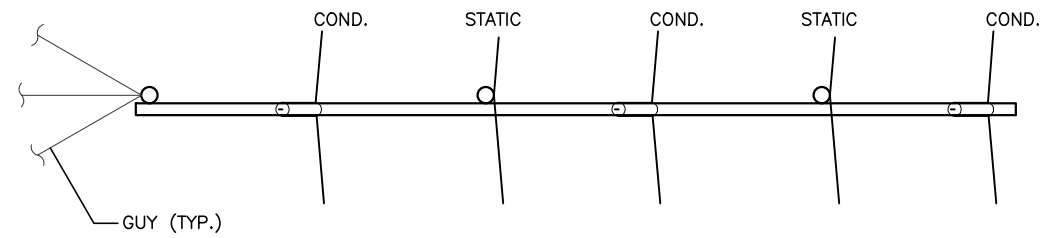
SCALE
N.T.S.

FILE: S3124-P0003 SH.1.DWG
IMAGE:

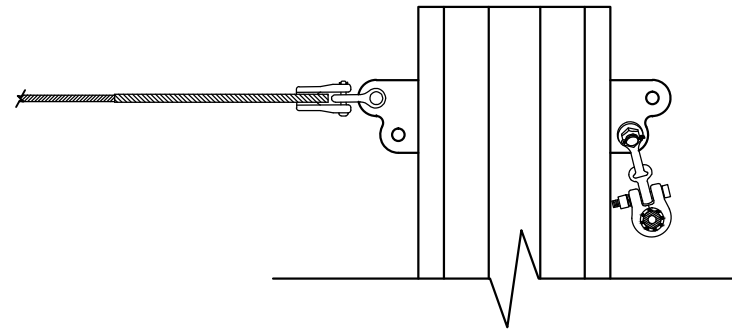
DRAWING NO.
S3124-P0003 SH01

X	#
JUD/TRC	DRAWN
GEL/TRC	ENGINEER
CRP/TRC	CHECKED
GEL/TRC	APPROVED
2/27/15	DATE

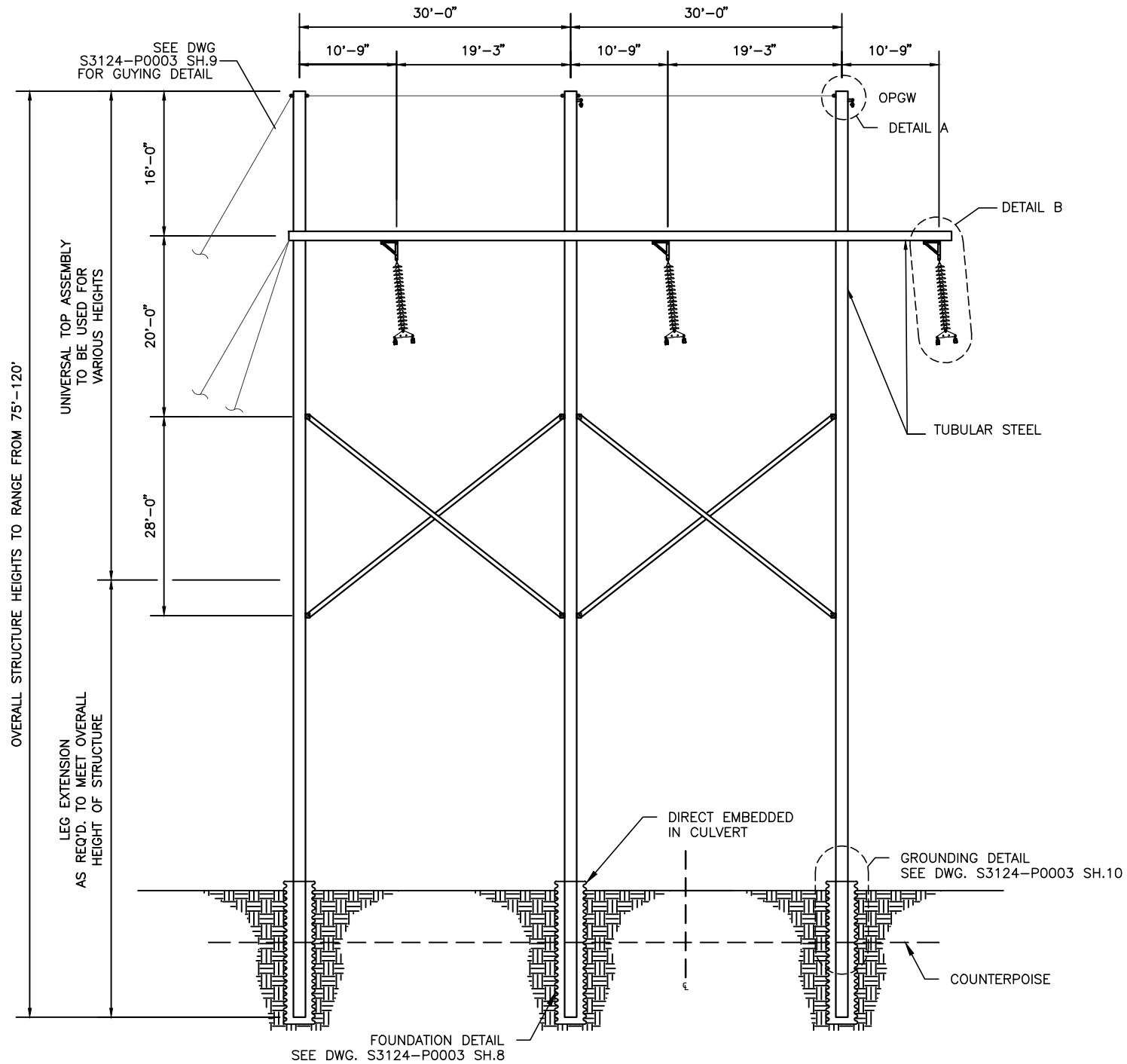
TRC 249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027



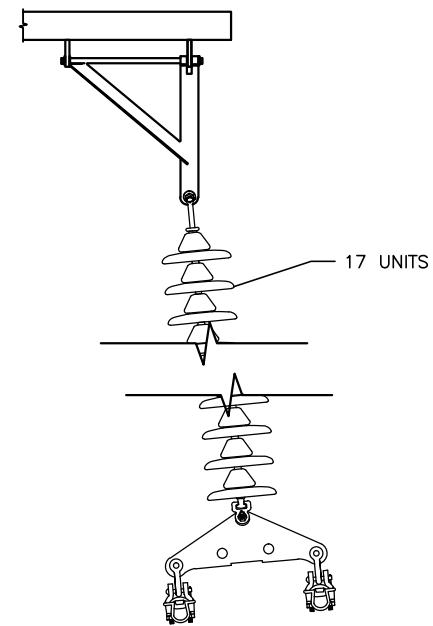
PLAN VIEW



DETAIL A
BRIDLE GUY/OPGW DETAIL



SEB-1
STEEL POLE RUNNING ANGLE



DETAIL B
CONDUCTOR DETAIL

REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2	RE-ISSUED NHSEC PERMIT FILING		6/4/15	RDW	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL

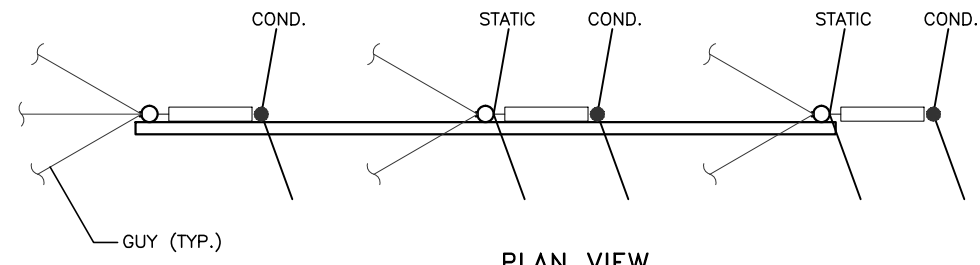


LINE 3124 345 kV TRANSMISSION
SEB-1 FRAMING DETAIL
MERRIMACK VALLEY RELIABILITY PROJECT
STEEL POLE LIGHT ANGLE (3°-20°)

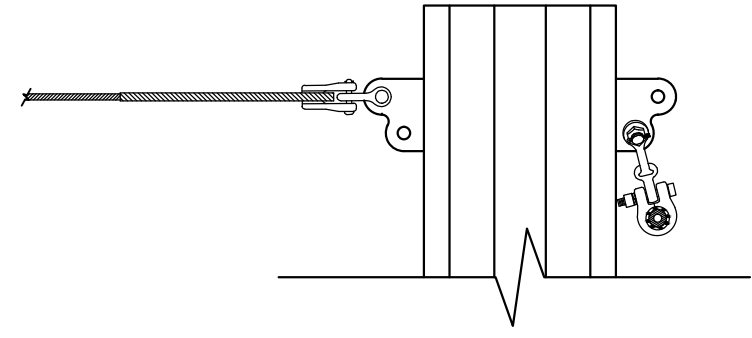
X	#
JUD/TRC	
ENGINEER	
GEL/TRC	
CHECKED	
CRP/TRC	
APPROVED	
GEL/TRC	
DATE	2/27/15

SCALE: N.T.S. FILE: S3124-P0003 SH.2.DWG DRAWING NO: S3124-P0003 SH02

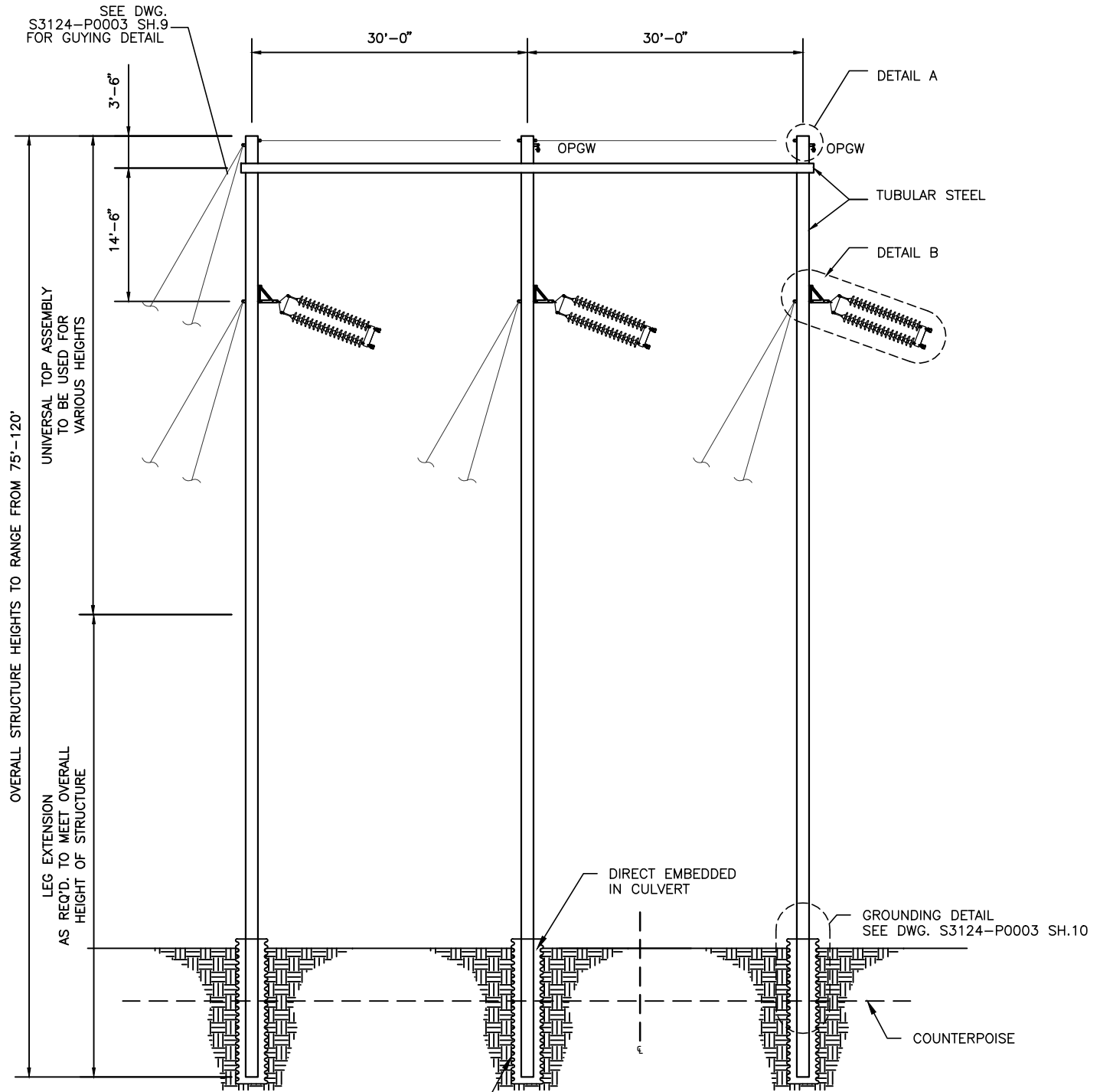
CTRC 249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027



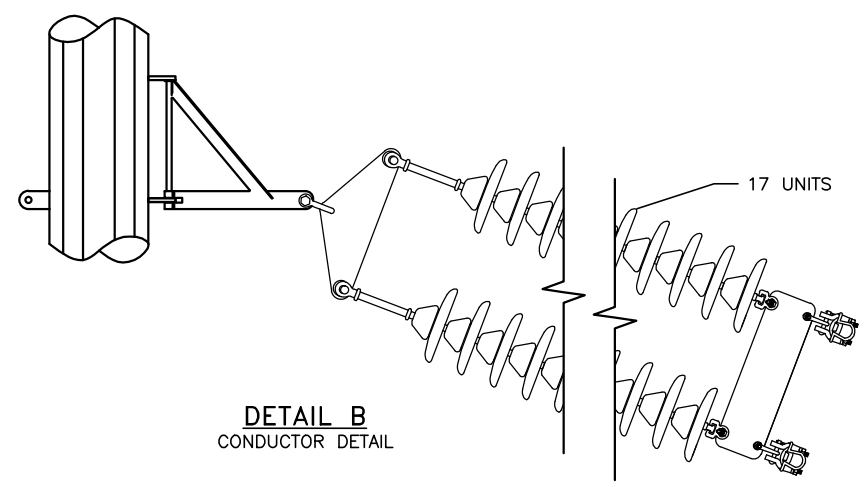
PLAN VIEW



DETAIL A
BRIDLE GUY/OPGW DETAIL



SEC-1
STEEL POLE RUNNING ANGLE



DETAIL B
CONDUCTOR DETAIL

REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2	RE-ISSUED NHSEC PERMIT FILING		8/4/15	RDW	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL

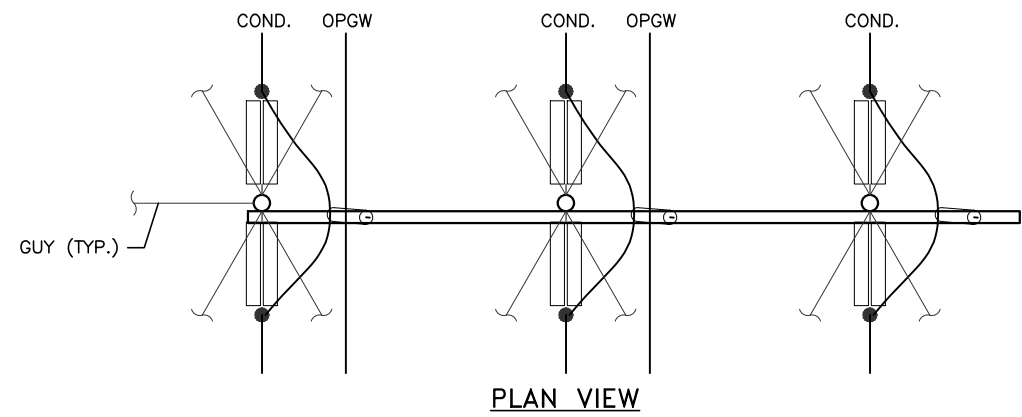


LINE 3124 345 kV TRANSMISSION
SEC-1 FRAMING DETAIL
MERRIMACK VALLEY RELIABILITY PROJECT
STEEL POLE HEAVY ANGLE (20°-45°)

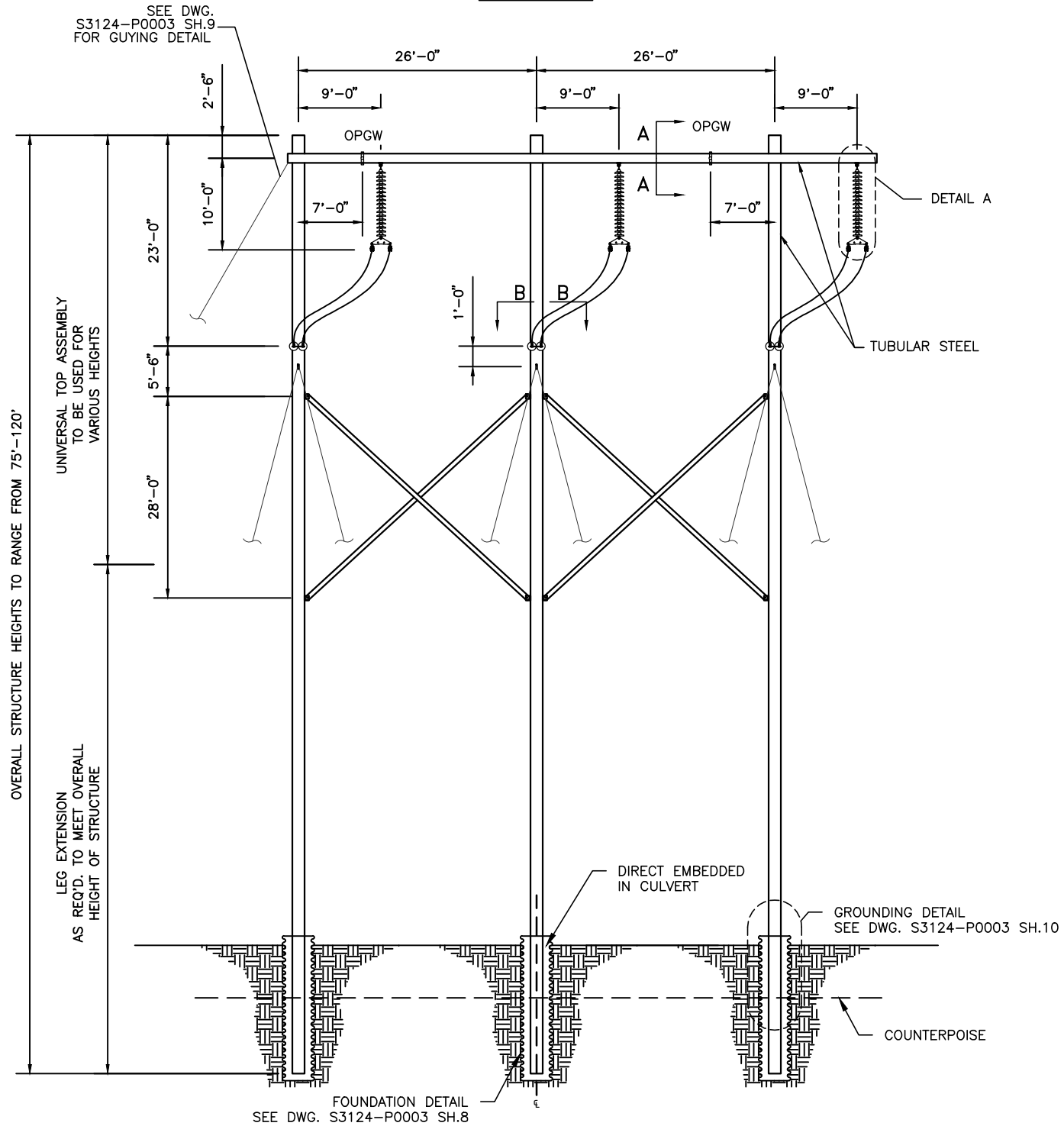
X	#
JUD/TRC	
ENGINEER	
GEL/TRC	
CHECKED	
CRP/TRC	
APPROVED	
GEL/TRC	
DATE	2/27/15

SCALE: N.T.S. FILE: S3124-P0003 SH.3.DWG DRAWING NO: S3124-P0003 SH03

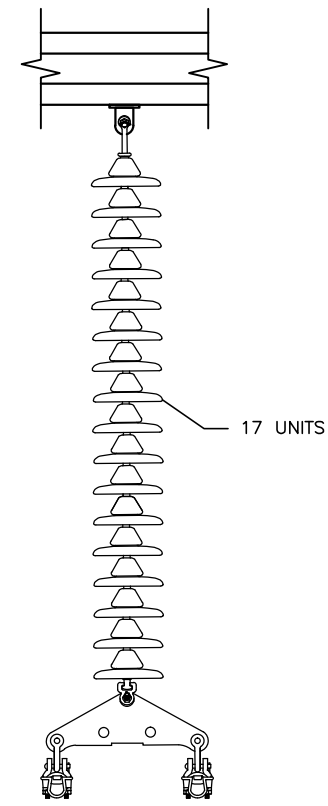
CTRC 249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027



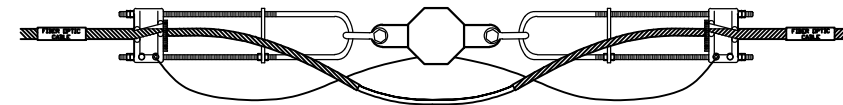
PLAN VIEW



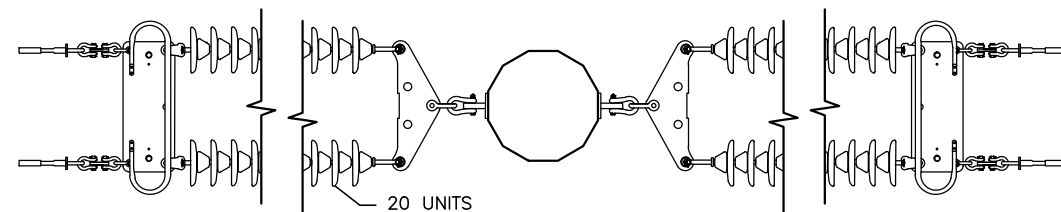
SED-1
STEEL POLE DEADEND



DETAIL A
JUMPER DETAIL



VIEW A-A
OPGW DETAIL



VIEW B-B
CONDUCTOR DETAIL

OVERALL STRUCTURE HEIGHTS TO RANGE FROM 75'-120'

UNIVERSAL TOP ASSEMBLY TO BE USED FOR VARIOUS HEIGHTS

LEG EXTENSION AS REQD. TO MEET OVERALL HEIGHT OF STRUCTURE

FOUNDATION DETAIL
SEE DWG. S3124-P0003 SH.8

GROUNDING DETAIL
SEE DWG. S3124-P0003 SH.10

CTRC 249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027

REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2	RE-ISSUED NHSEC PERMIT FILING		8/4/15	RDW	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL

EVERSOURCE ENERGY

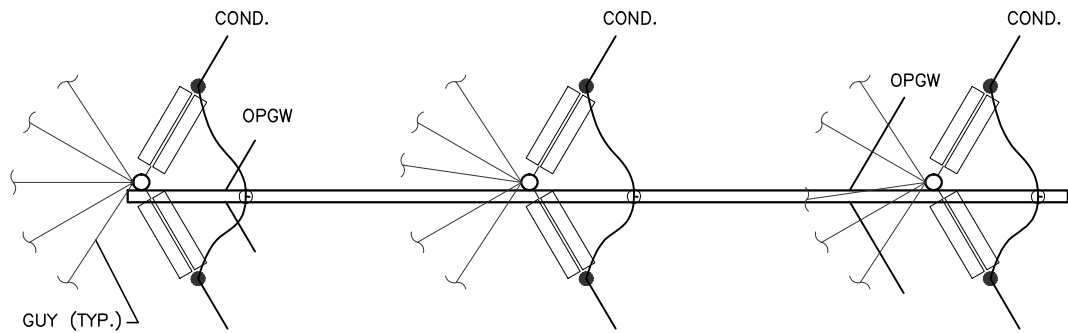
LINE 3124 345 kV TRANSMISSION
SED-1 FRAMING DETAIL
MERRIMACK VALLEY RELIABILITY PROJECT
STEEL POLE LIGHT ANGLE DE (0°-15°)

SCALE
N.T.S.

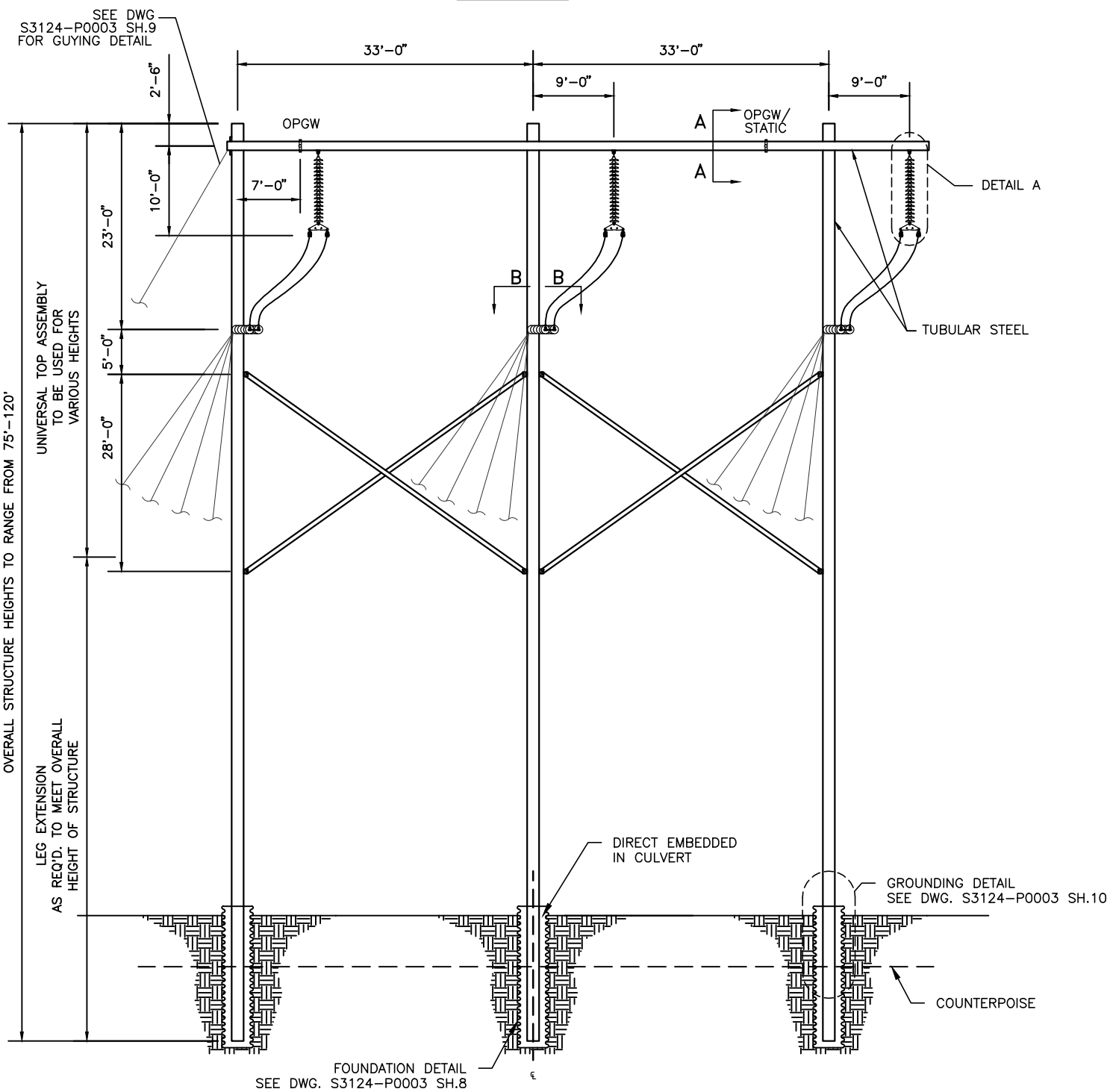
FILE: S3124-P0003 SH.4.DWG
IMAGE:

DRAWING NO.
S3124-P0003 SH04

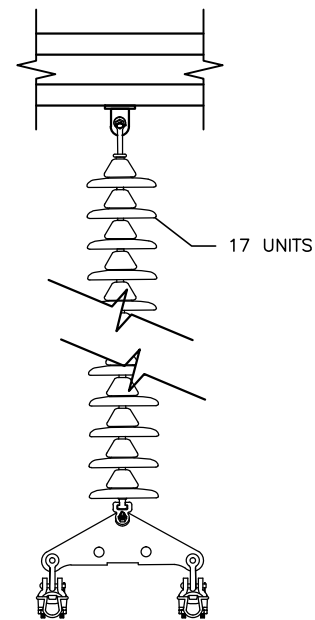
X	#
JUD/TRC	
ENGINEER	
GEL/TRC	
CHECKED	
CRP/TRC	
APPROVED	
GEL/TRC	
DATE	2/27/15



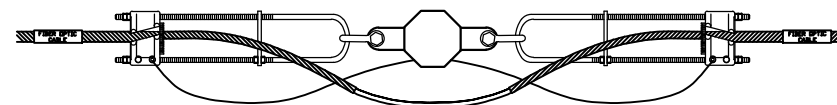
PLAN VIEW



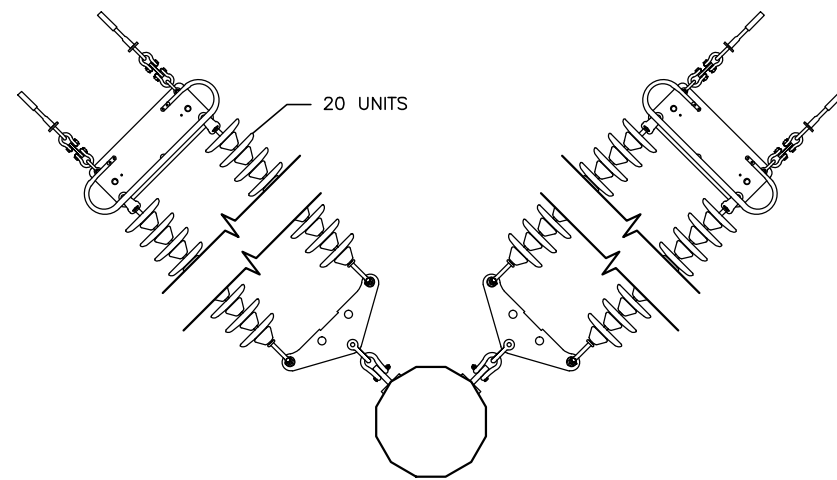
SED-2
STEEL POLE DEADEND



DETAIL A
JUMPER DETAIL



VIEW A-A
OPGW DETAIL



VIEW B-B
CONDUCTOR DETAIL

REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2	RE-ISSUED NHSEC PERMIT FILING		6/4/15	RDW	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL

EVERSOURCE ENERGY

LINE 3124 345 kV TRANSMISSION
SED-2 FRAMING DETAIL
MERRIMACK VALLEY RELIABILITY PROJECT
STEEL POLE HEAVY ANGLE DE (15°-90°)

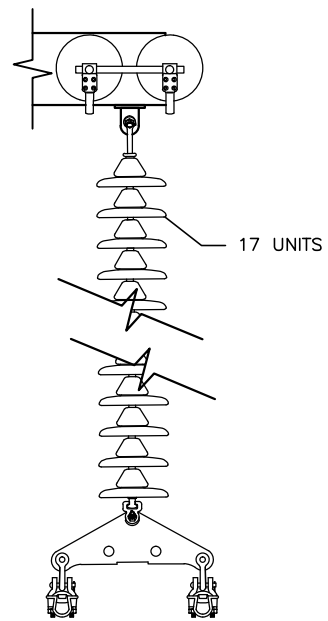
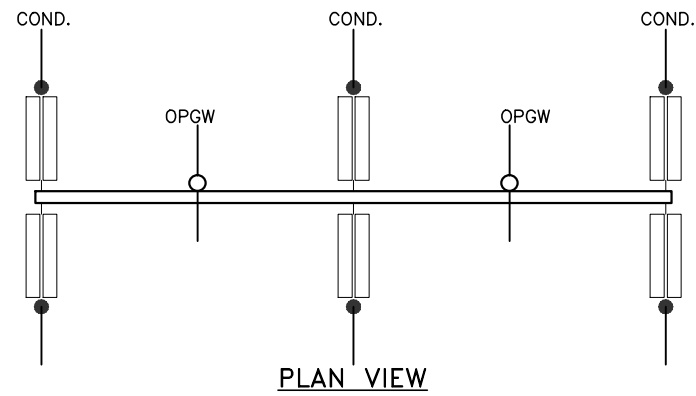
X	#
JUD/TRC	
ENGINEER	
GEL/TRC	
CHECKED	
CRP/TRC	
APPROVED	
GEL/TRC	
DATE	2/27/15

SCALE
N.T.S.

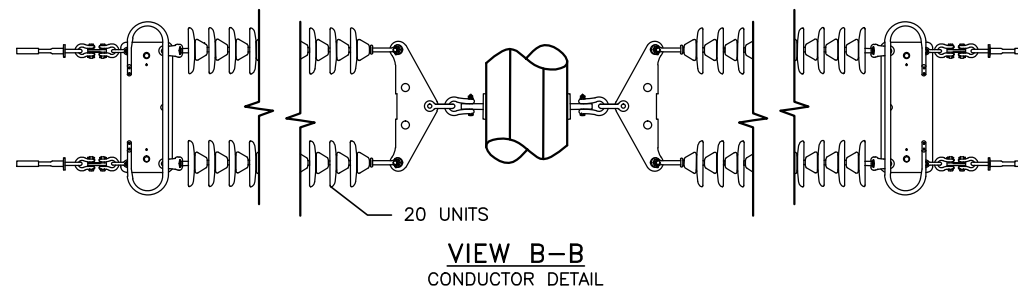
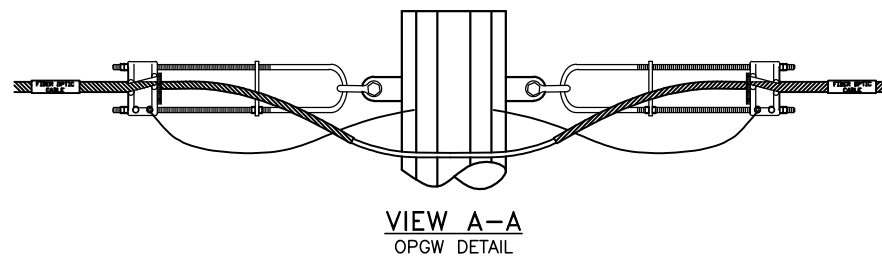
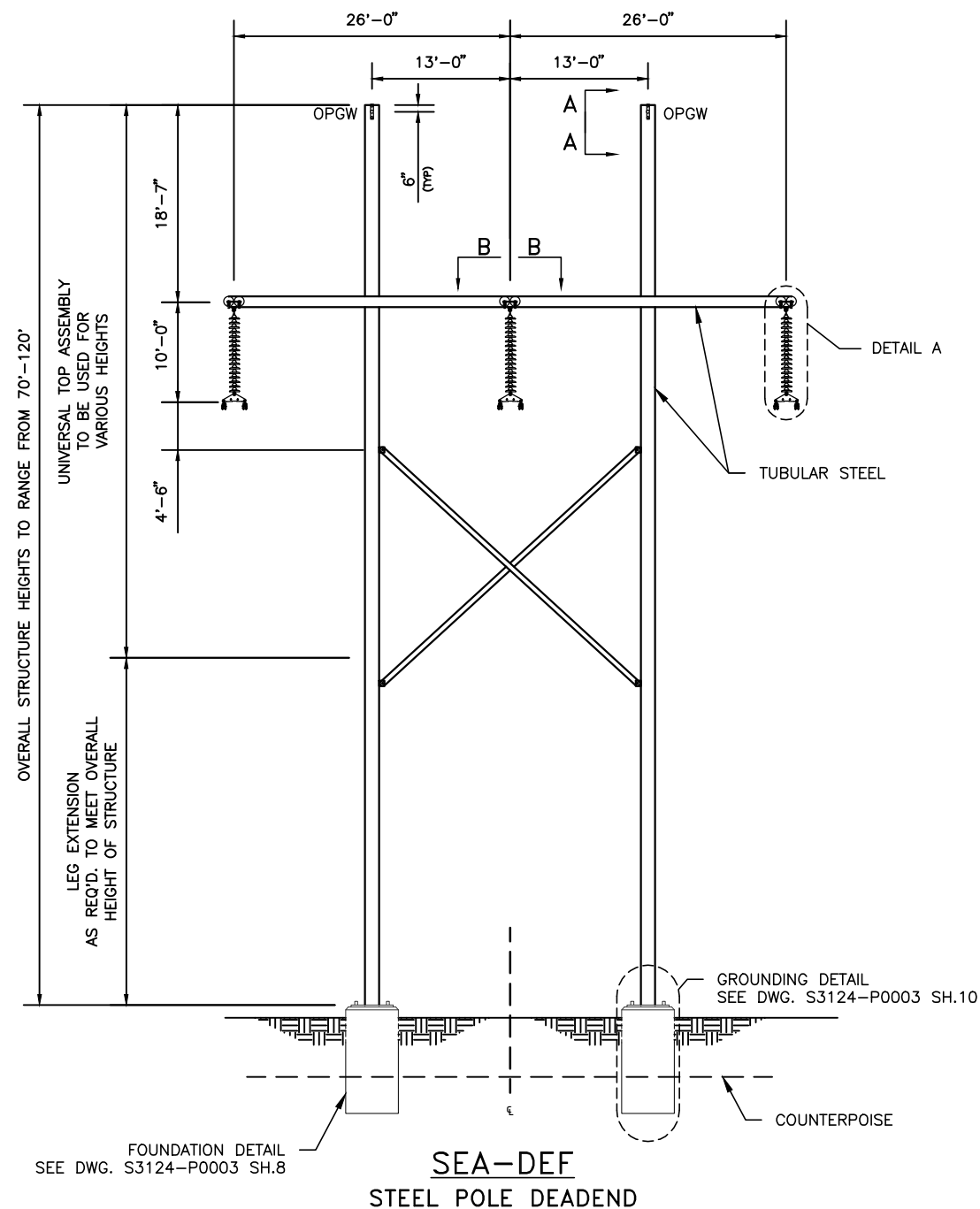
FILE: S3124-P0003 SH.5.DWG
IMAGE:

DRAWING NO.
S3124-P0003 SH05

CTRC 249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027



DETAIL A
JUMPER DETAIL



REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2	RE-ISSUED NHSEC PERMIT FILING		8/4/15	JJD	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL



LINE 3124 345 kV TRANSMISSION
SEA-DEF FRAMING DETAIL
MERRIMACK VALLEY RELIABILITY PROJECT
STEEL 2 POLE ANGLE ON FOUNDATION

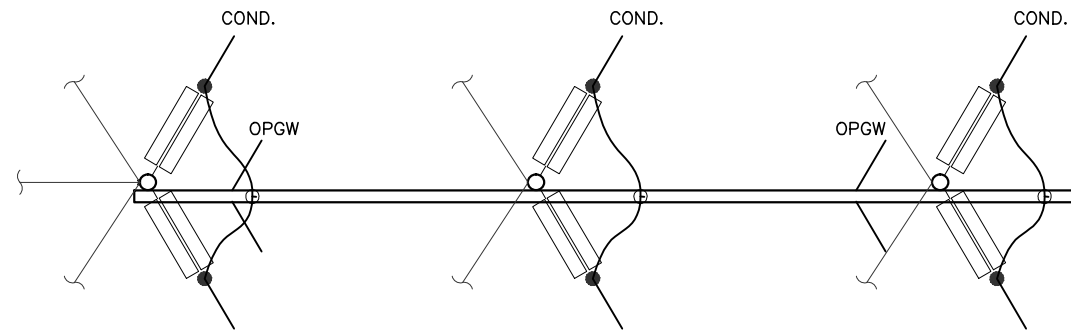
DRAWN
JJD/TRC
ENGINEER
GEL/TRC
CHECKED
CRP/TRC
APPROVED
GEL/TRC
DATE
2/27/15

SCALE
N.T.S.

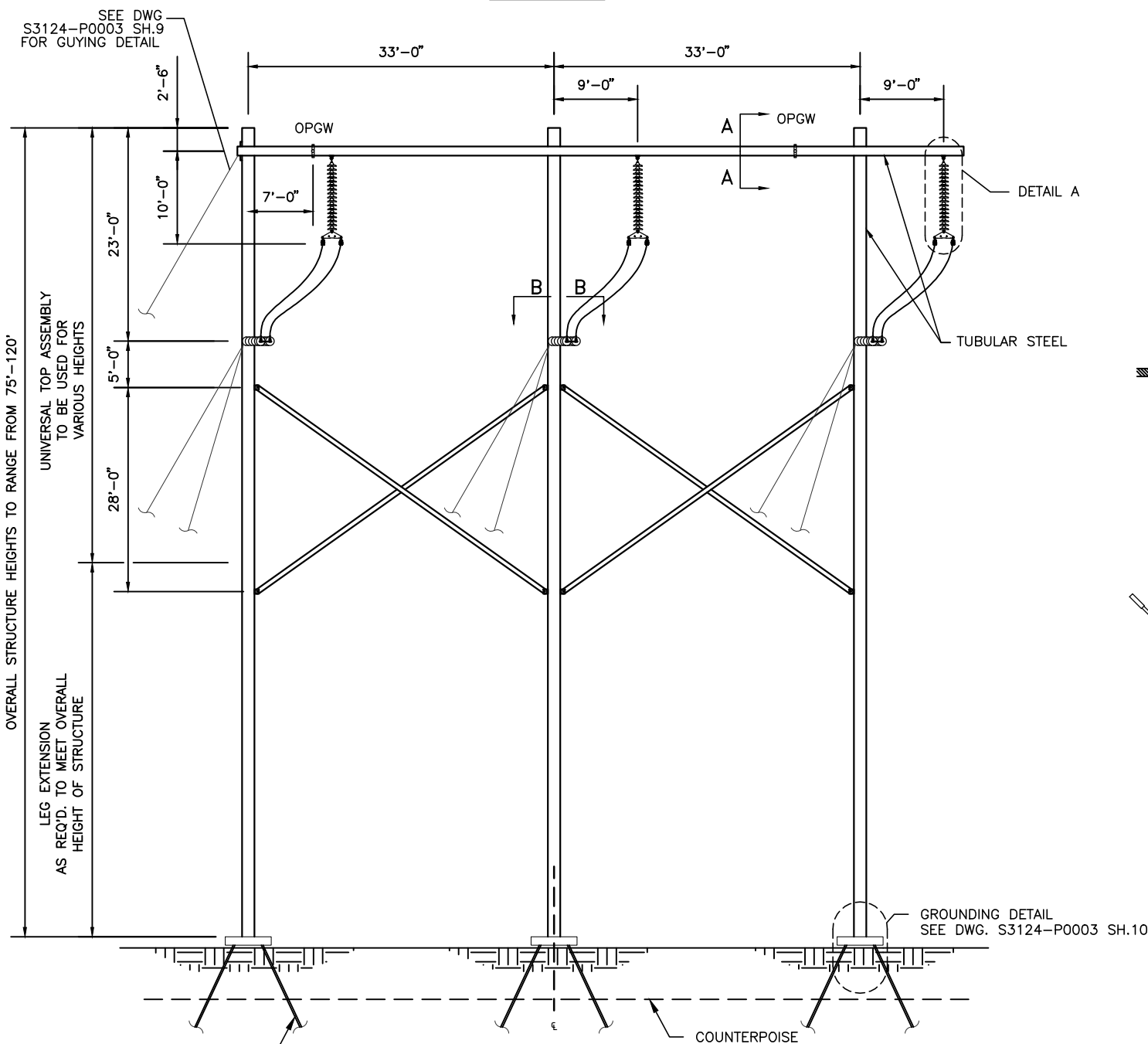
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IMAGE:

DRAWING NO.
S3124-P0003 SH06

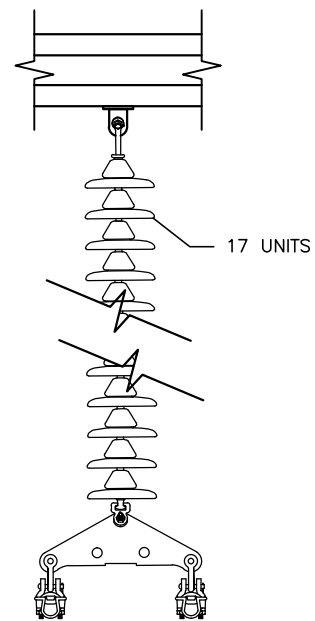
CTRC
249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027



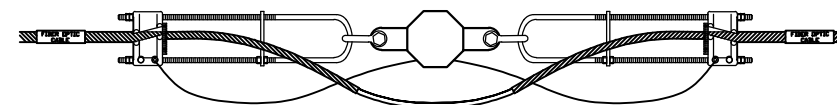
PLAN VIEW



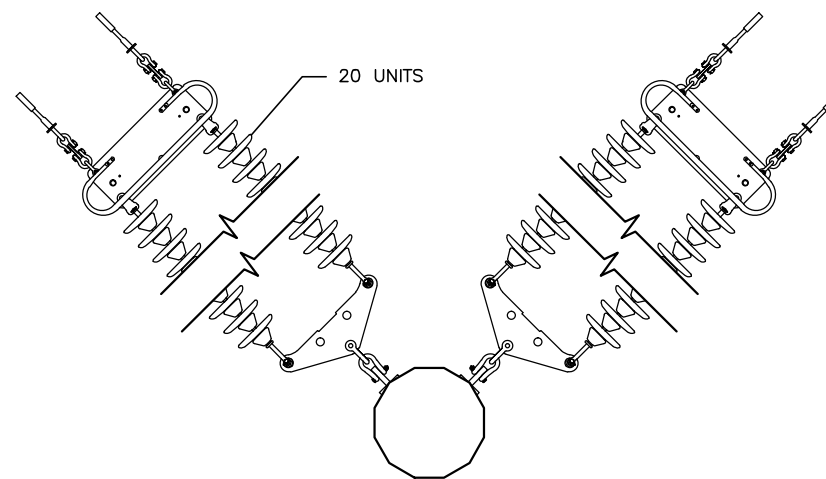
SED-2-DEF
STEEL POLE DEADEND



DETAIL A
JUMPER DETAIL



VIEW A-A
OPGW DETAIL



VIEW B-B
CONDUCTOR DETAIL

CONTRACT SERVICES	REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2		RE-ISSUED NHSEC PERMIT FILING		6/4/15	JJD	CRP	GEL
1		NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL

EVERSOURCE ENERGY

LINE 3124 345 kV TRANSMISSION
SED-2-DEF FRAMING DETAIL
MERRIMACK VALLEY RELIABILITY PROJECT
STEEL POLE HEAVY ANGLE ON FOUNDATION

X #
DRAWN
JJD/TRC
ENGINEER
GEL/TRC
CHECKED
CRP/TRC
APPROVED
GEL/TRC
DATE
2/27/15

SCALE
N.T.S.

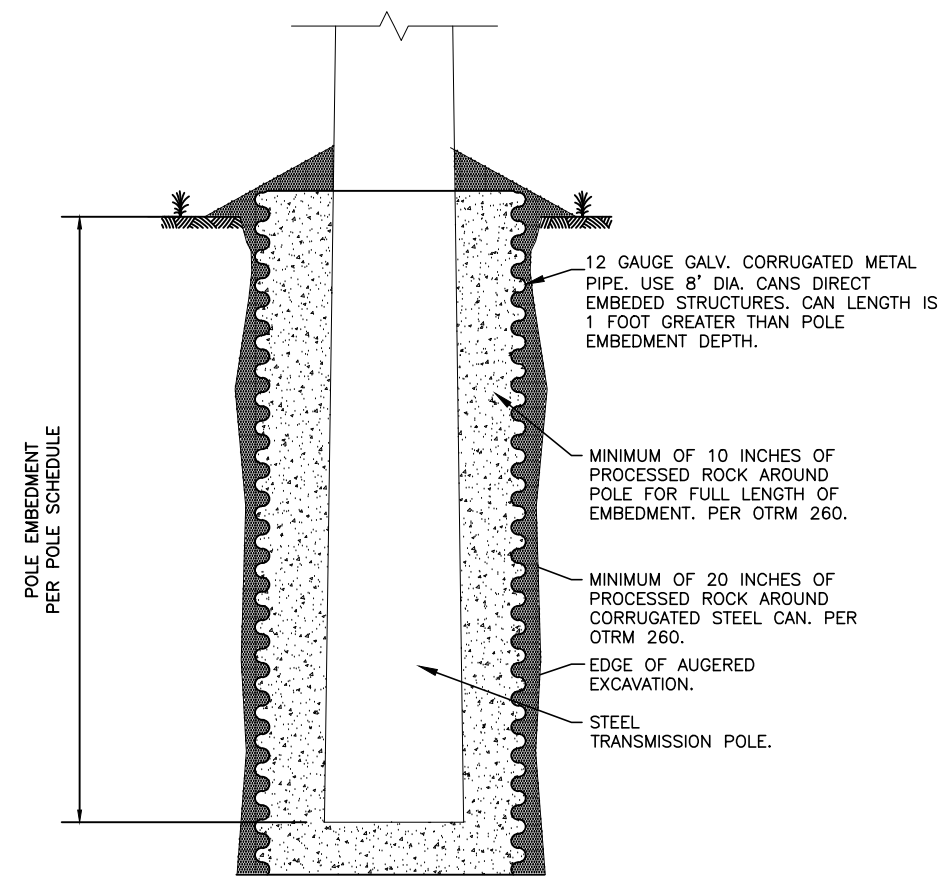
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IMAGE:

DRAWING NO.
S3124-P0003 SH07

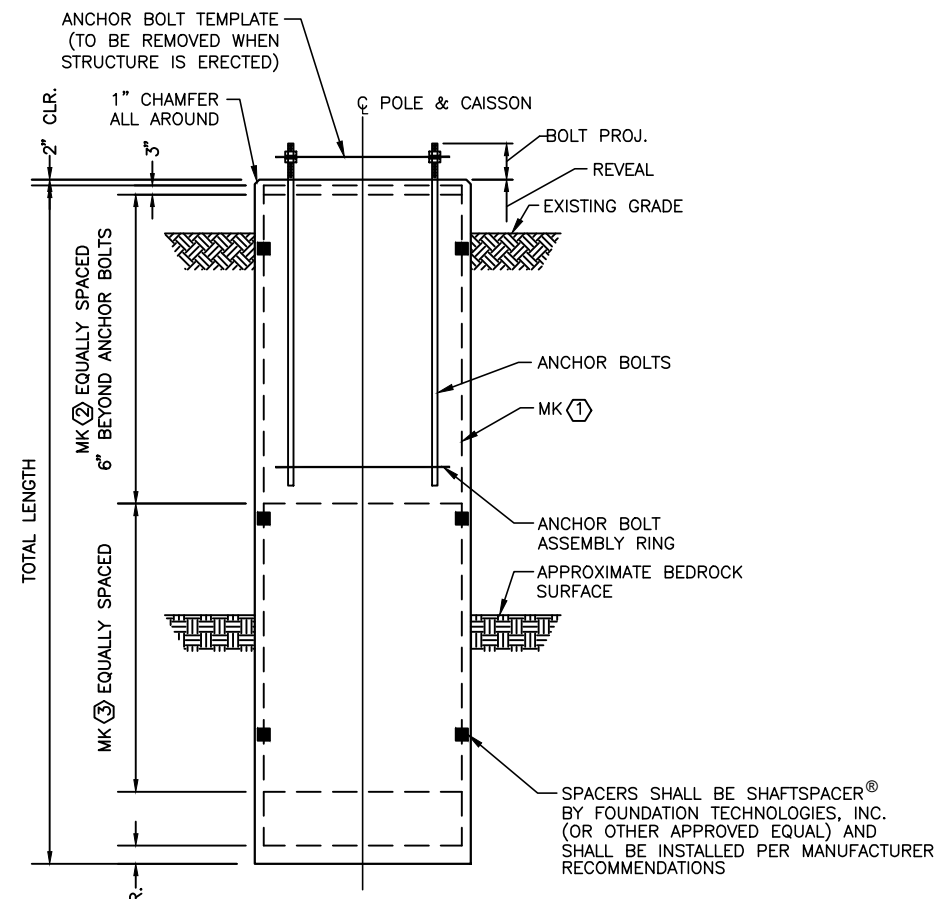


249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027

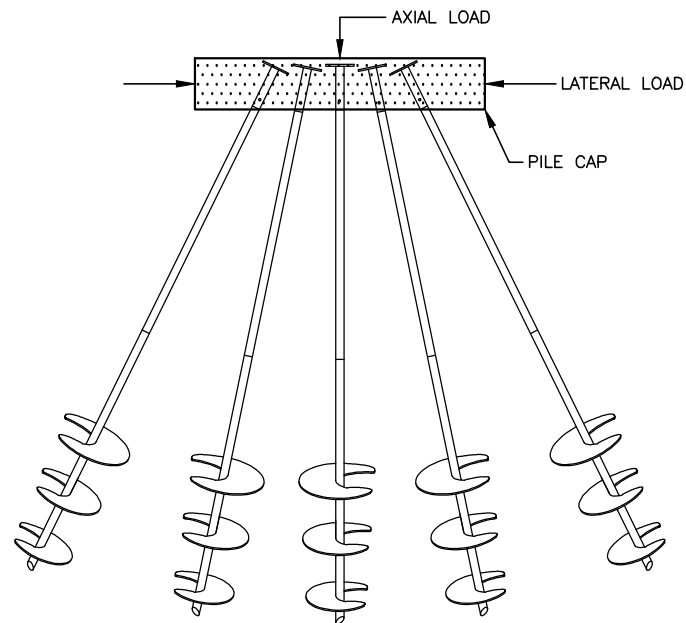
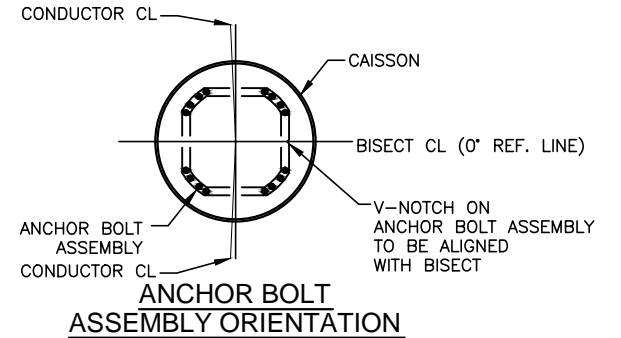
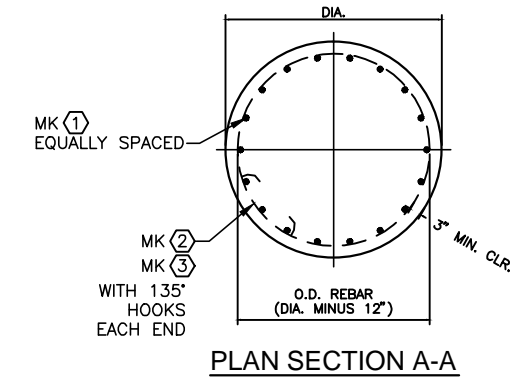
STRUCTURE						FOUNDATION												ANCHOR BOLT ASSEMBLY						COMMENTS		
						FOUNDATION DIMENSIONS					FOUNDATION REINFORCEMENT				FACTORED FOUNDATION LOADS											
STRUCTURE NUMBER	STRUCTURE TYPE	# OF FOUNDATIONS NEEDED	SPACING (FT.)	DEFLECTION ANGLE	BORING NUMBER	APPROX. TOP OF FDN. ELEV. (FT.)	REVEAL (FT.)	DIA. (FT.)	ROCK SOCKET LENGTH (FT.)	TOTAL LENGTH (FT.)	MARK 1	MARK 2	MARK 3 NOTE 5	BUNDLED VERTICAL BARS	VERTICAL (KIPS)	SHEAR (KIPS)	MOMENT (KIP*FT)	NUMBER OF ANCHOR BOLTS	ANCHOR BOLT DIA. (IN.)	BOLT CIRCLE (IN.)	ANCHOR BOLT LENGTH (IN.)	ANCHOR BOLT PROJ. (IN.)	ANCHOR BOLT SUPPLIER	ANCHOR BOLT DRAWING NO.		
XXXX	XXX	X	XX	XX	XXXX	XXX	XXXX	XXXX	XXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXX	XXXX	XXX	XXXX	XXXX	XXXX	



DIRECT EMBEDDED FOUNDATION
STANDARD FOUNDATION
N.T.S.



CONCRETE CAISSON



BATTERED PIERS

GENERAL NOTES

- 1) FOUNDATION SURVEY AND STAKING TO BE PERFORMED BY PSNH.
- 2) ANCHOR BOLTS TO BE PROVIDED AS AN ASSEMBLY BY THE STEEL POLE VENDOR.
- 3) CONTRACTOR SHALL FIELD VERIFY TOP OF FOUNDATION ELEVATION.

CONCRETE NOTES

- 1) FOUNDATION CONCRETE WORK SHALL BE PER PSNH STANDARD OTRM 051 (TRANSMISSION LINE AND SUBSTATION TERMINAL STRUCTURE & LIGHTNING MAST FOUNDATIONS), LATEST REVISION AND PSNH CONSTRUCTION STANDARD OTRM 251 (TRANSMISSION LINE SUBSTATION TERMINAL STRUCTURE, AND LIGHTNING MAST FOUNDATIONS).
- 2) WELDING OF REINFORCING IS PROHIBITED.
- 3) 1\"/>

REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2	RE-ISSUED NHSEC PERMIT FILING		8/4/15	RDW	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL

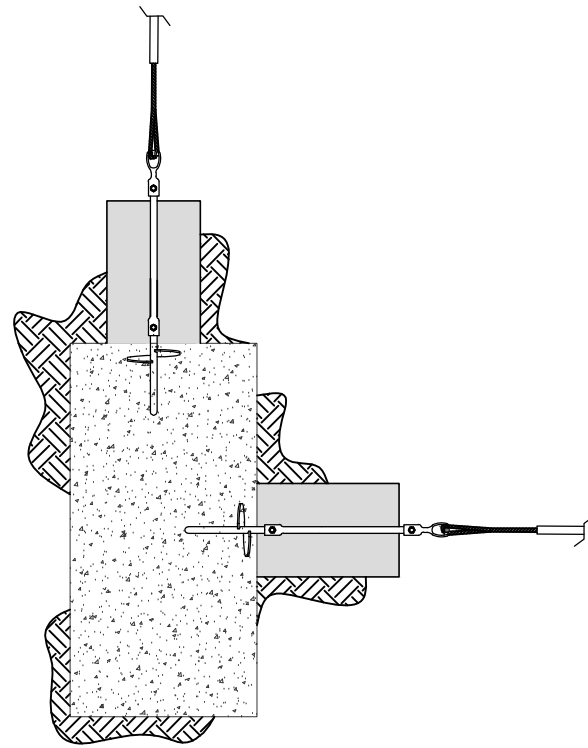


LINE 3124 345 kV TRANSMISSION
FOUNDATION DETAIL
MERRIMACK VALLEY RELIABILITY PROJECT

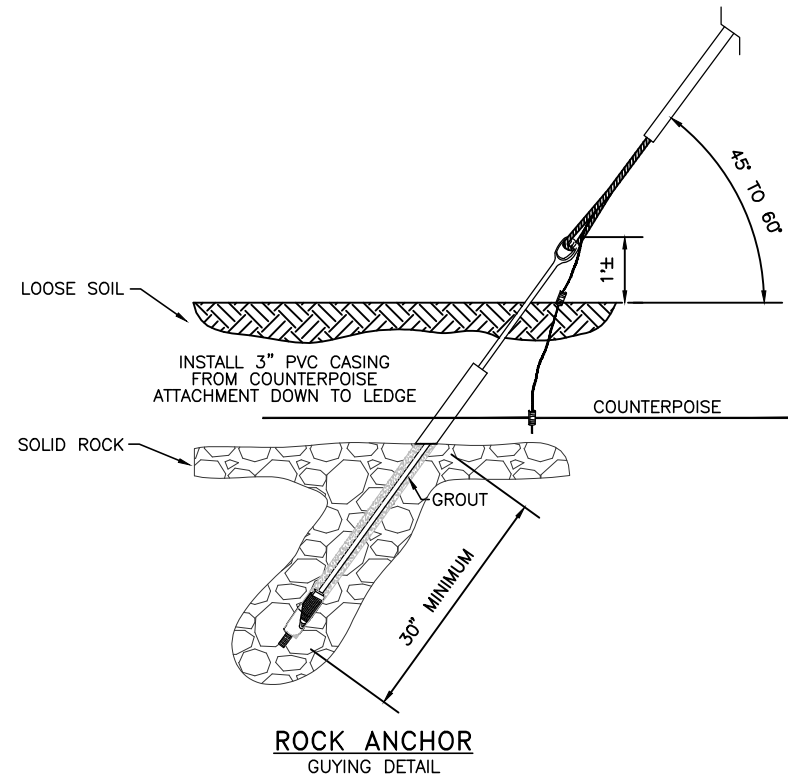
SCALE: N.T.S. FILE: S3124-P0003 SH08.DWG IMAGE: .

X	#
JUD	TRC
GEL	TRC
GEL	TRC
GEL	TRC
	2/27/15

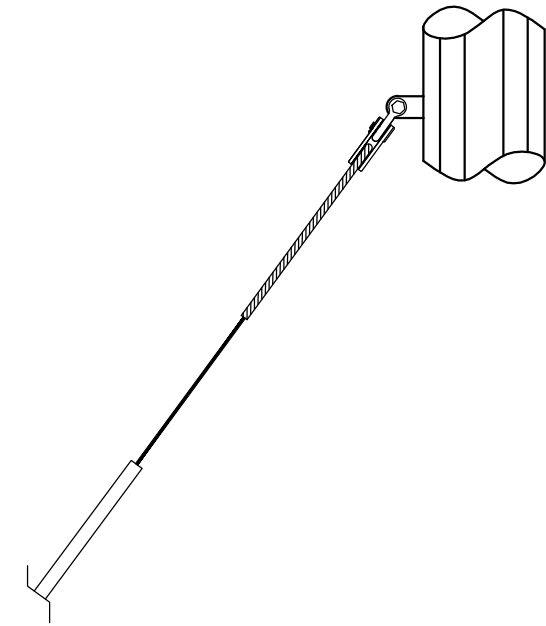
CTRC 249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027



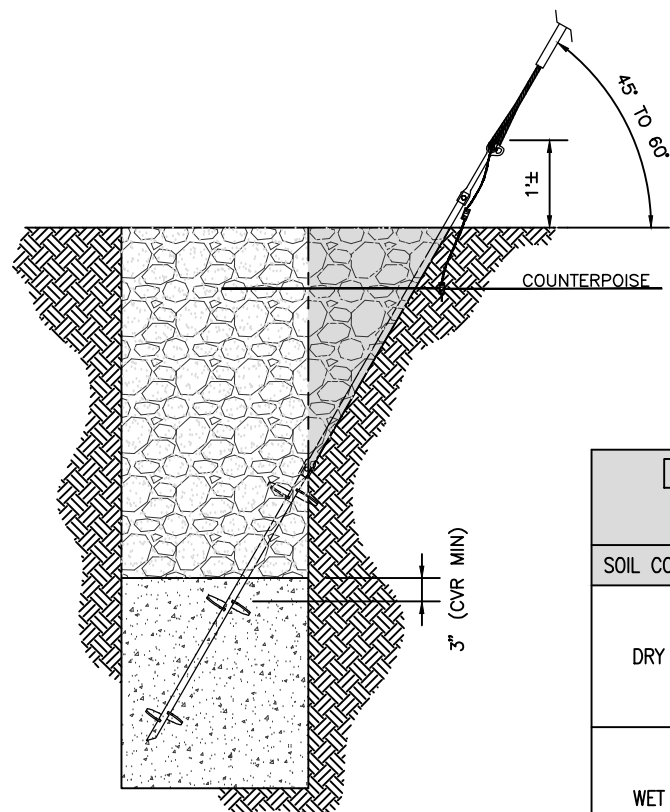
SHARED HELICAL ANCHOR PLAN VIEW
SHARED GUYING LOCATION



ROCK ANCHOR
GUYING DETAIL

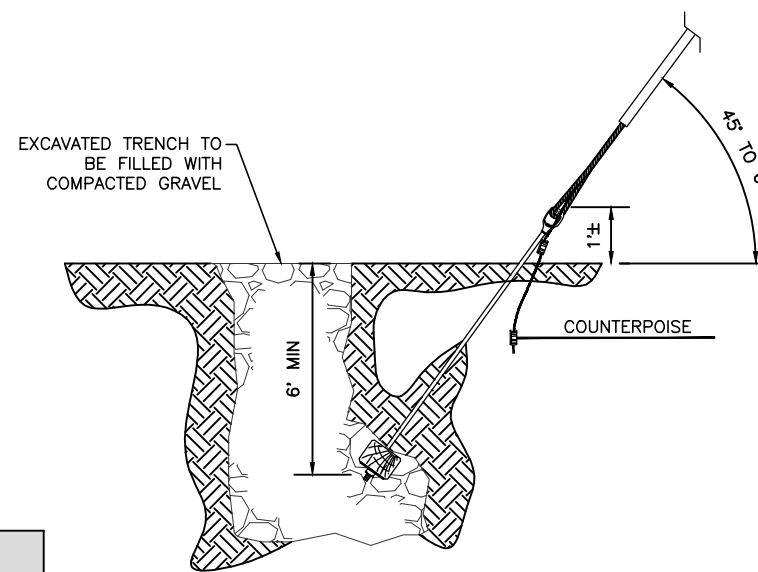


GUYING DETAIL

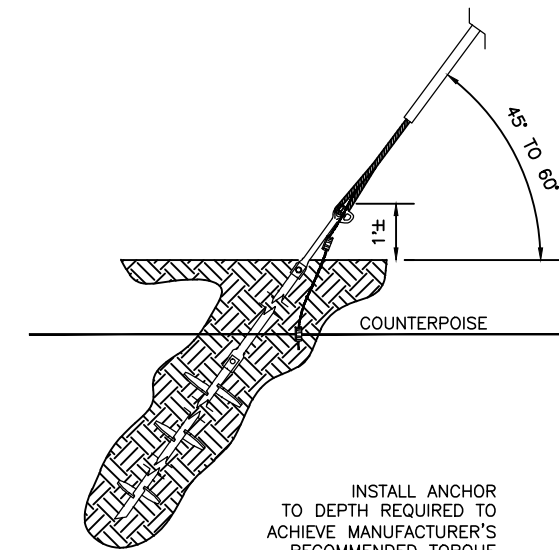


SHARED HELICAL ANCHOR PROFILE VIEW
GUYING DETAIL

DIMENSION TABLE ANCHOR IN CONCRETE		
SOIL CONDITIONS	GUY SLOPE	OVERALL DEPTH (FT)
DRY SAND	1/4	12'-0"
	10/8	12'-6"
	10/6	13'-0"
WET SAND	1/4	17'-0"
	10/8	18"-0"
	10/6	18'-6"



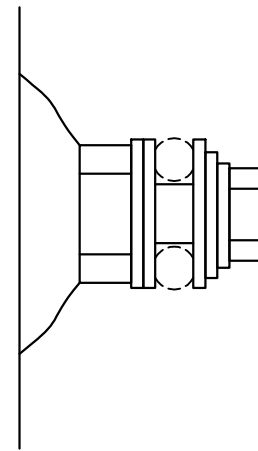
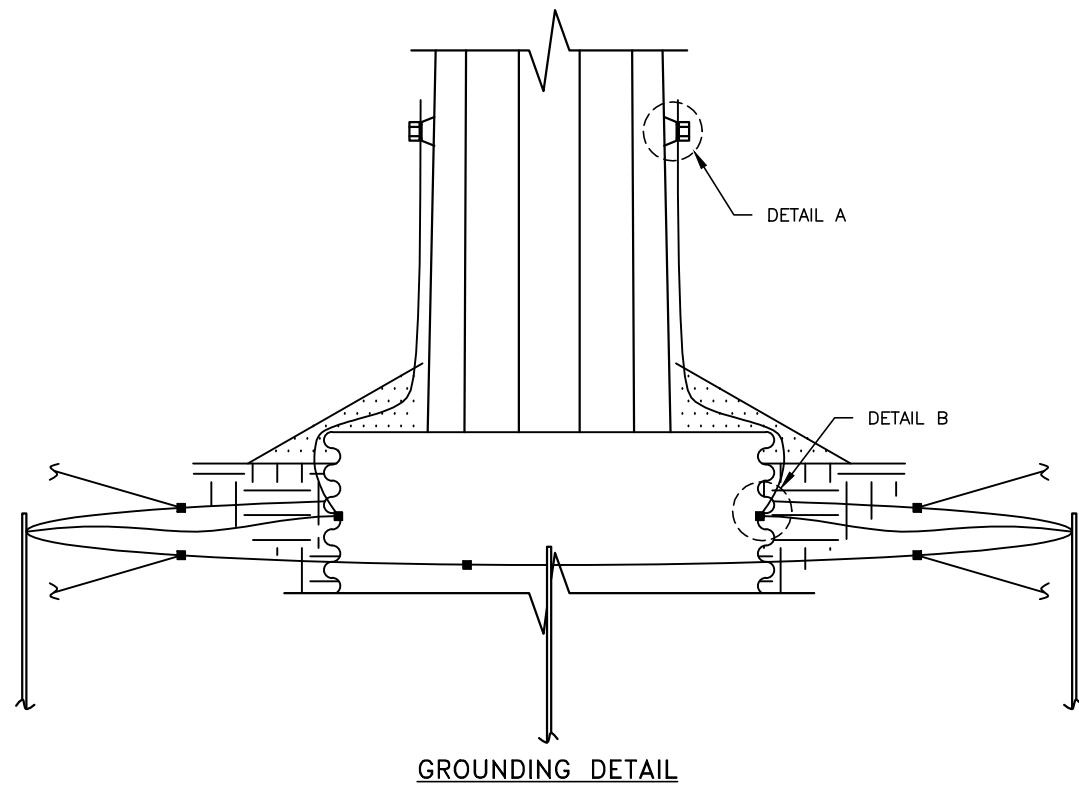
LOG ANCHOR
GUYING DETAIL



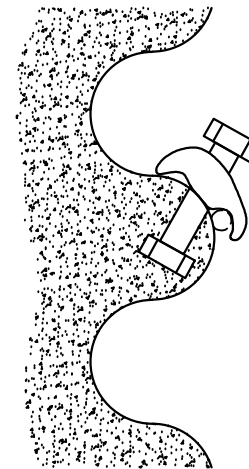
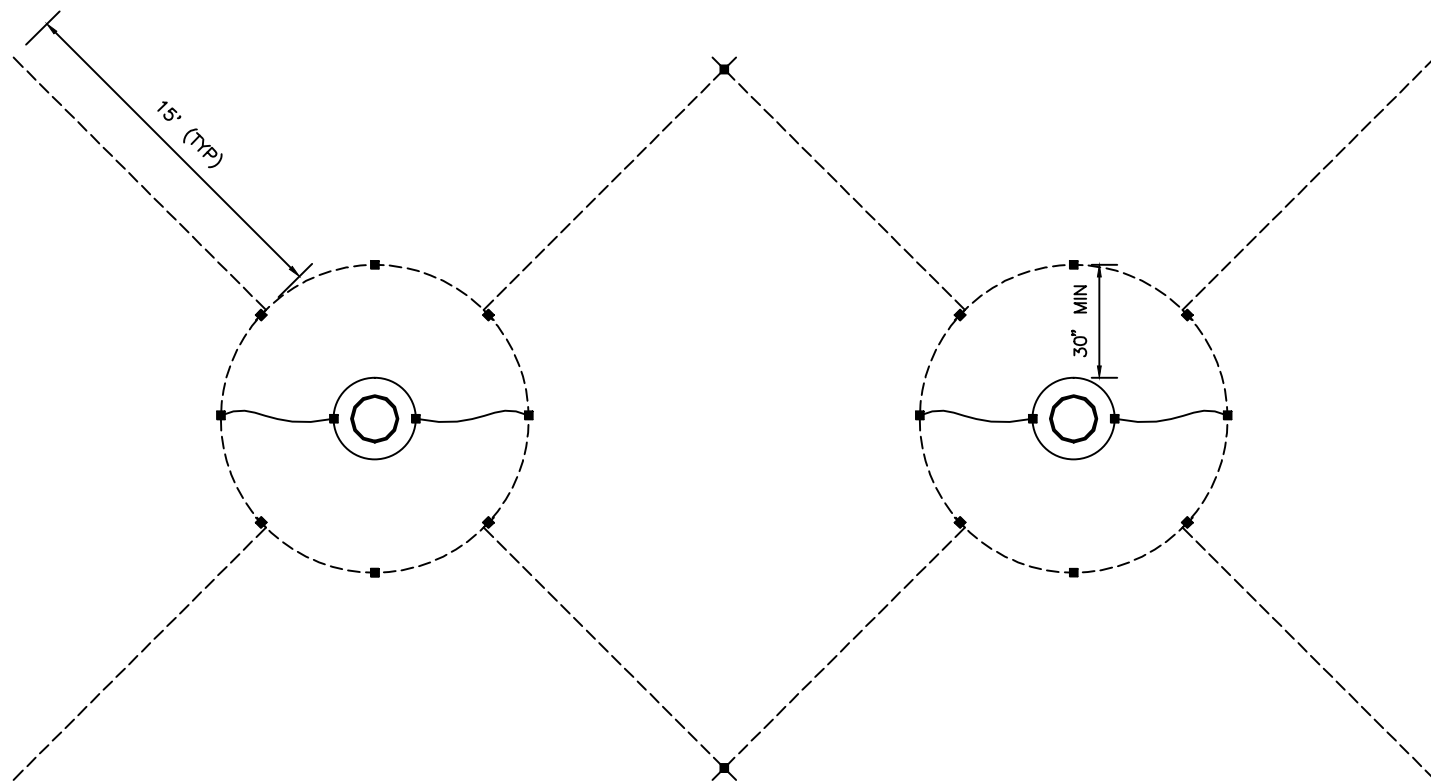
HELICAL ANCHOR
GUYING DETAIL

CONTRACT SERVICES	2	RE-ISSUED NHSEC PERMIT FILING	8/4/15	RDW	CRP	GEL	X #	DRAWN JJD/TRC
	1	NHSEC PERMIT FILING	2/27/15	JJD	CRP	GEL		
REV		DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR	CHECKED CRP/TRC
<p>EVERSOURCE ENERGY</p> <p>LINE 3124 345 kV TRANSMISSION GUYING DETAIL MERRIMACK VALLEY RELIABILITY PROJECT</p>								APPROVED GEL/TRC
<p>SCALE: N.T.S.</p> <p>FILE: S3124-P0003 SH.DWG</p> <p>IMAGE:</p>								DATE 2/27/15
<p>DWG REV</p>								
<p>DRAWING NO. S3124-P0003 SH09</p>								

CTRC 249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027



DETAIL A
GROUNDING NUT



DETAIL B
CAISSON BOND

NOTES:
SEE NU STANDARD DRAWING 09000-60000 FOR
ADDITIONAL DETAILS REGARDING FOUNDATION
DESIGN, INSTALLATION AND BONDING.

REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2	RE-ISSUED NHSEC PERMIT FILING		6/4/15	RDW	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL

EVERSOURCE ENERGY

LINE 3124 345 kV TRANSMISSION
GROUNDING DETAIL
MERRIMACK VALLEY RELIABILITY PROJECT

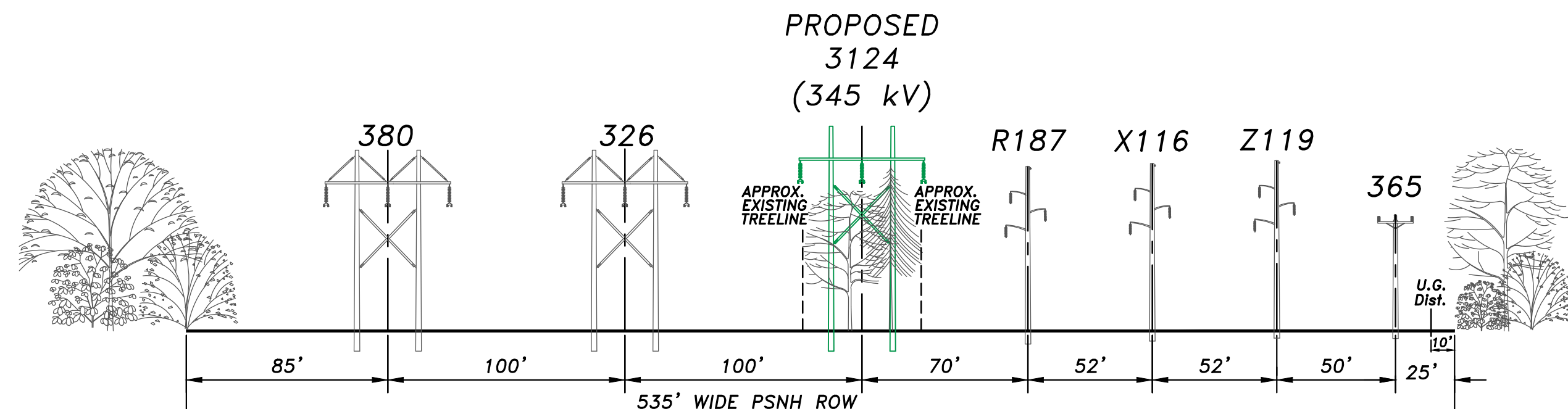
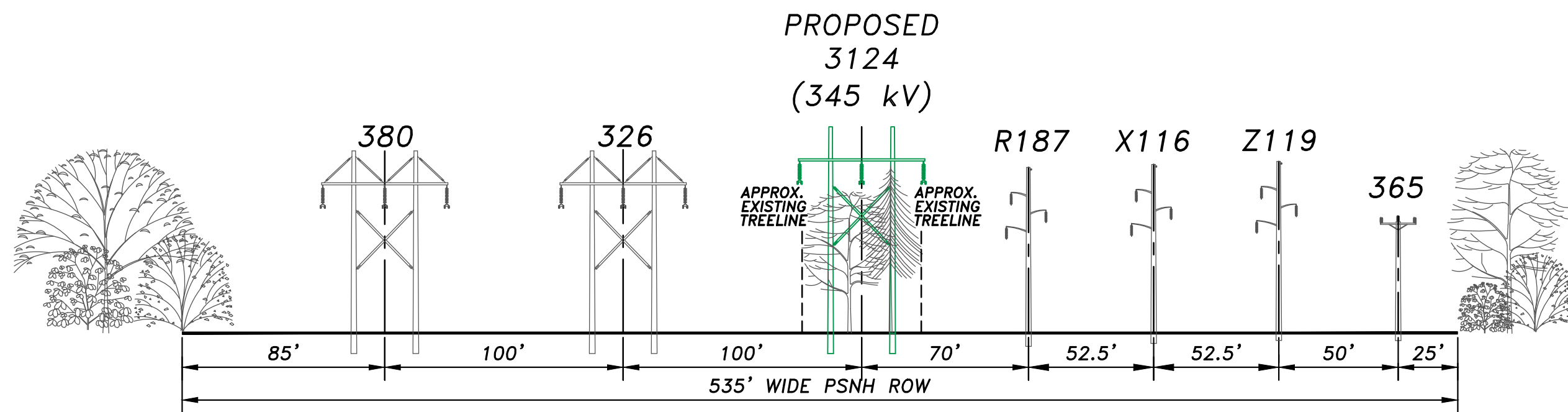
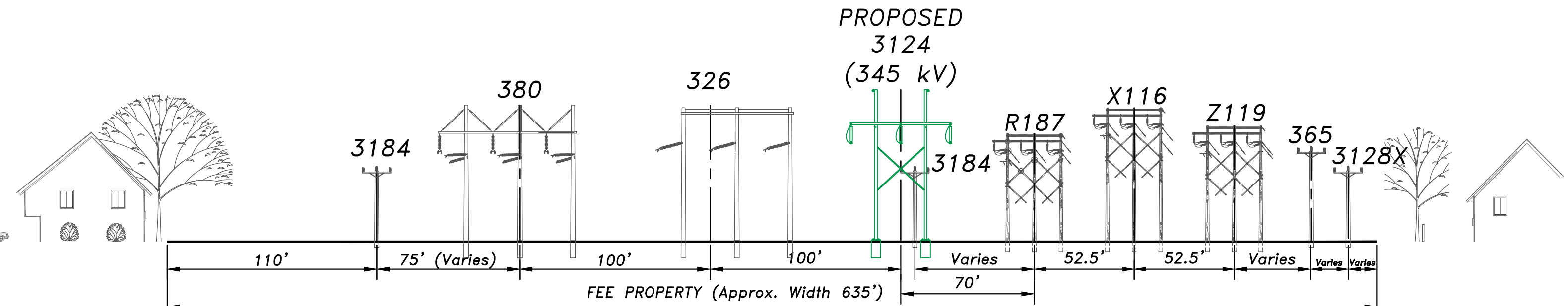
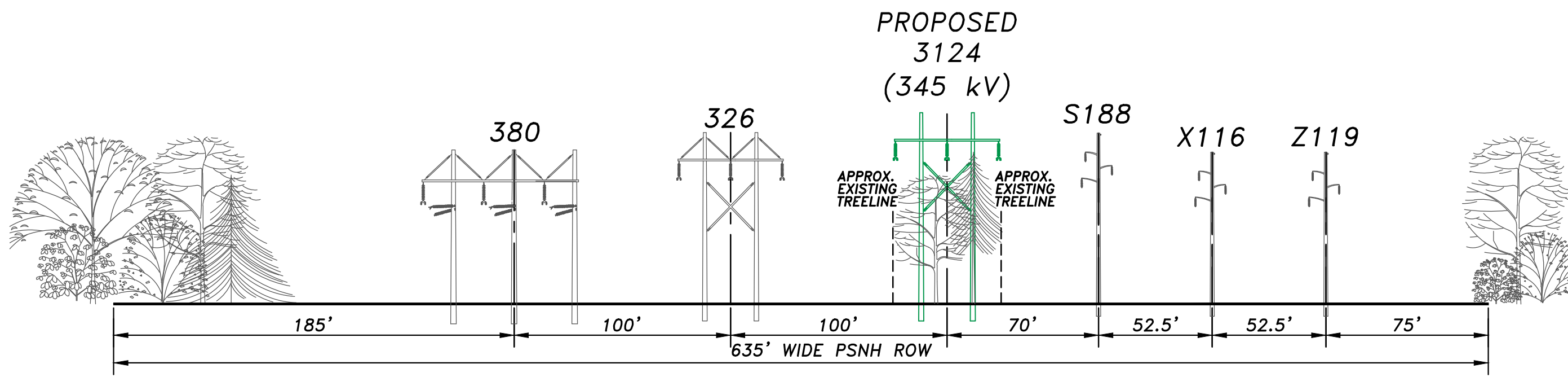
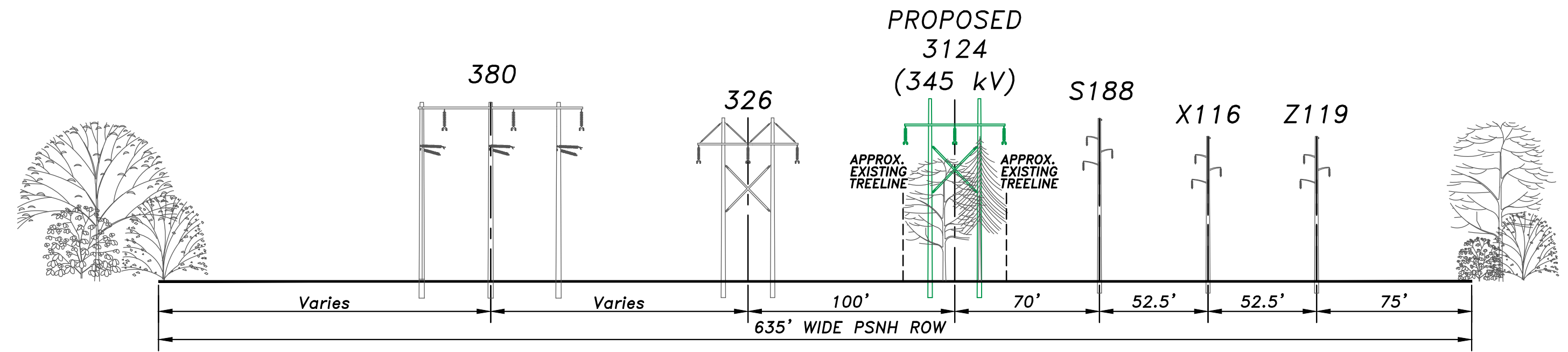
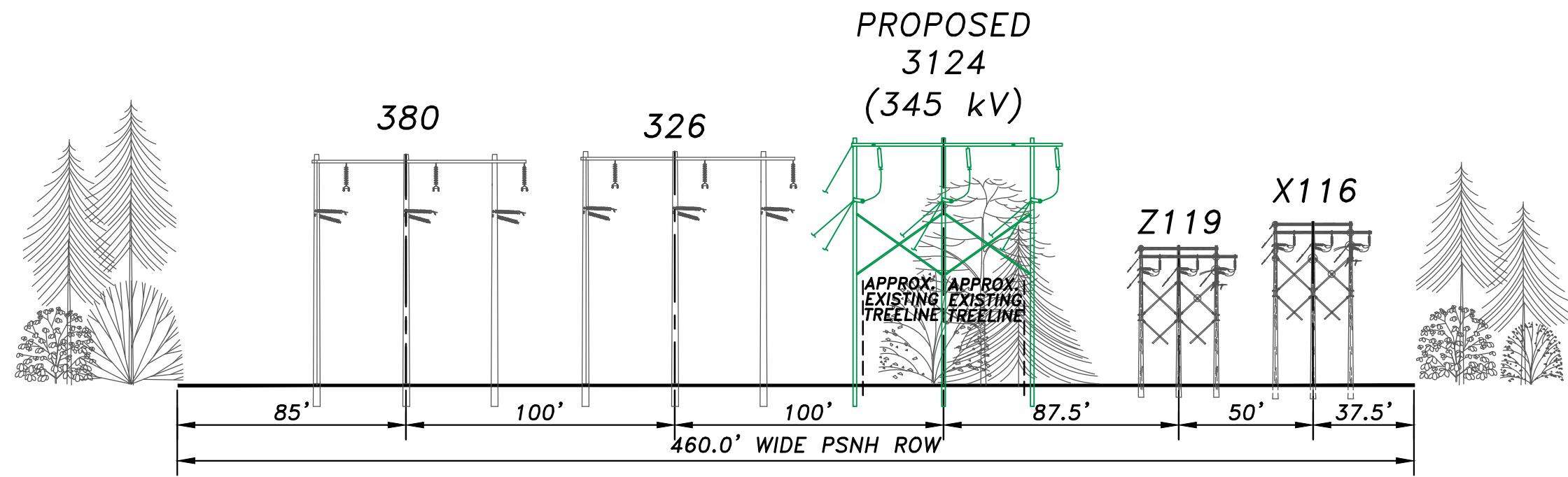
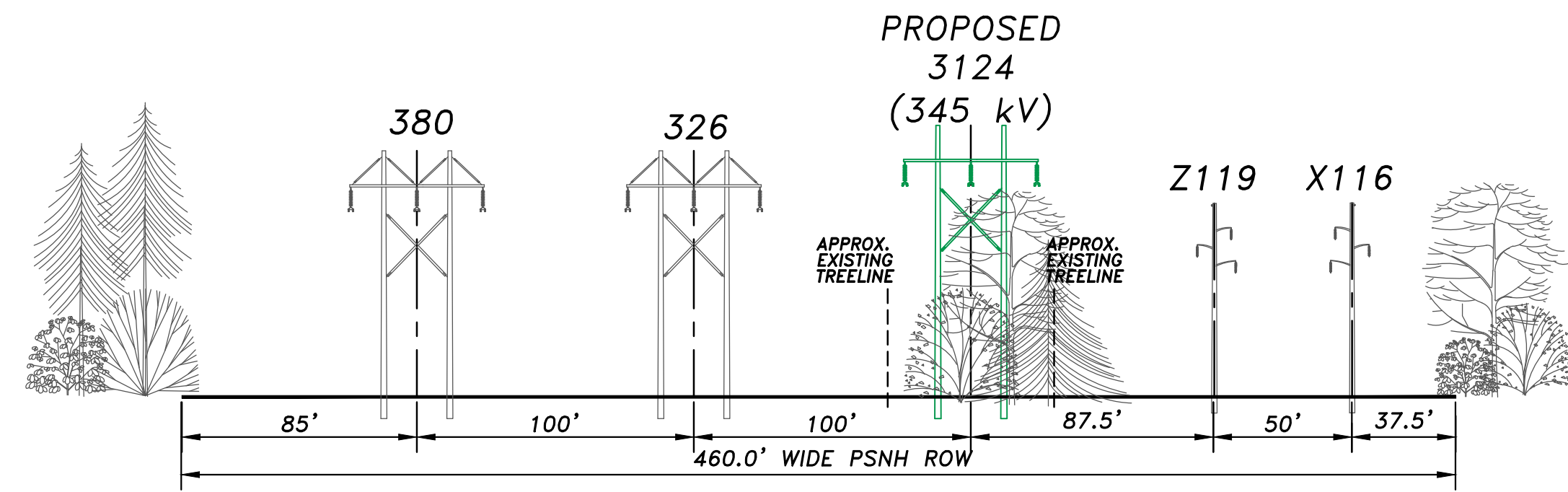
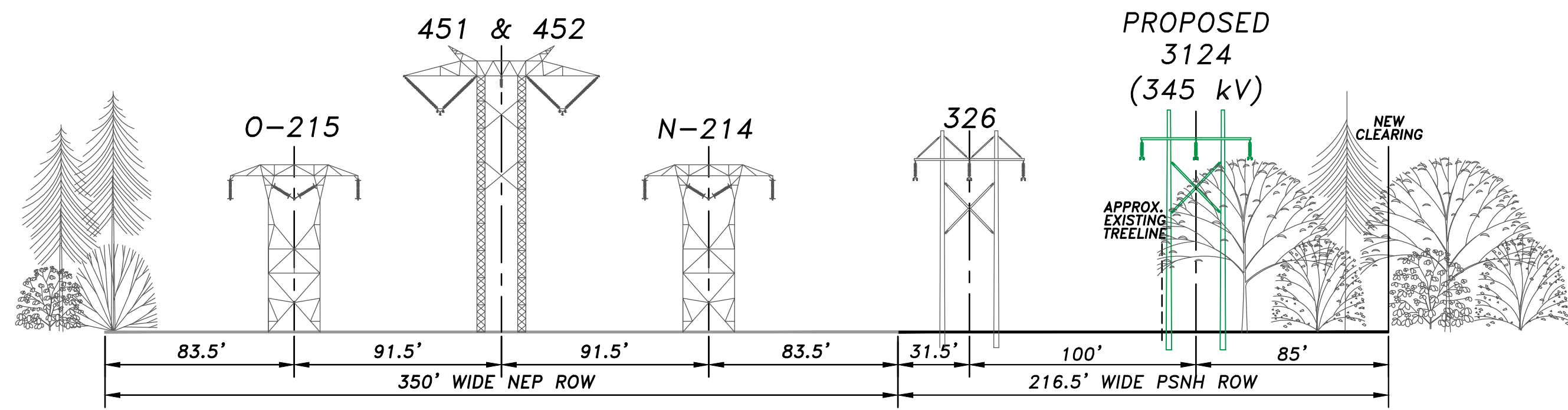
SCALE
N.T.S.

FILE: S3124-P0003 SH10.DWG
IMAGE: .

DRAWING NO.
S3124-P0003 SH10

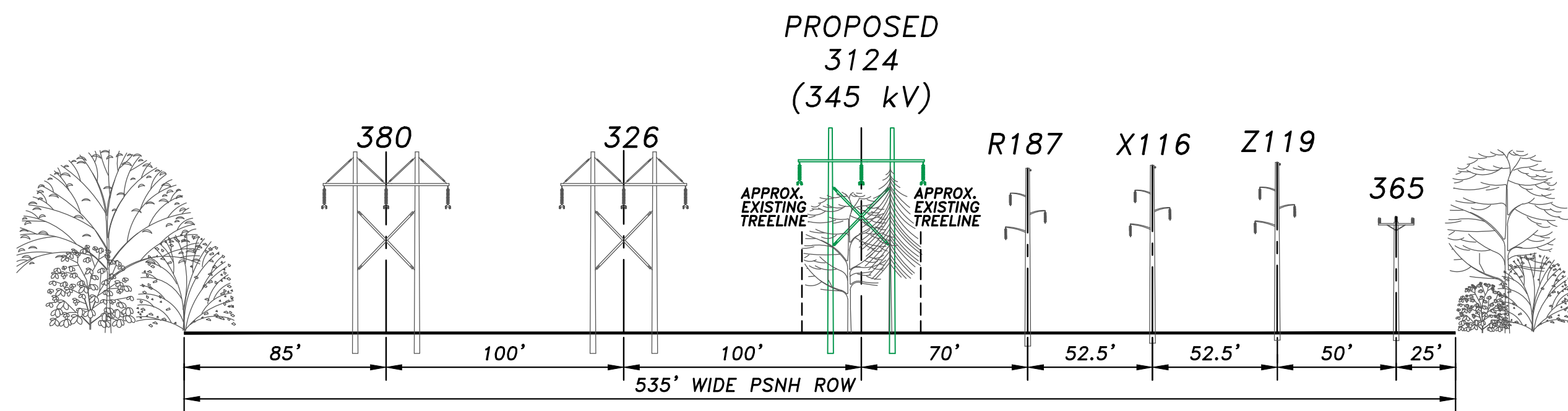
X	#
	DRAWN
	JJD/TRC
	ENGINEER
	GEL/TRC
	CHECKED
	CRP/TRC
	APPROVED
	GEL/TRC
	DATE
	2/27/15

CTRC
249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 223027

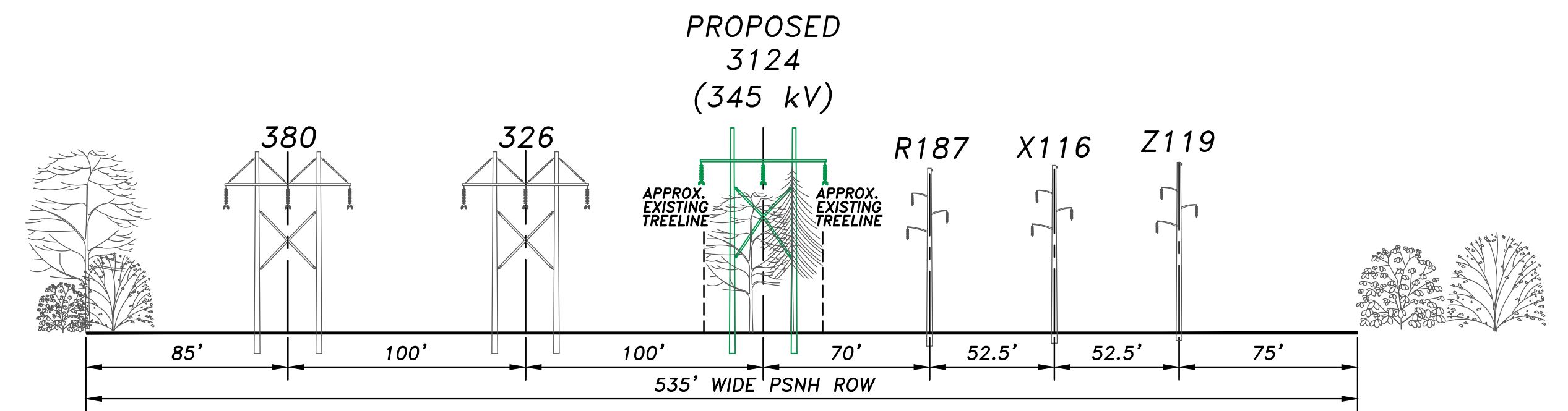


REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
3	UPDATED RE-NHSEC PERMIT FILING		7/1/15	RDW	TSW	GEL
2	RE-ISSUED NHSEC PERMIT FILING		6/4/15	RDW	CRP	GEL
1	NHSEC PERMIT FILING		2/27/15	JJD	CRP	GEL

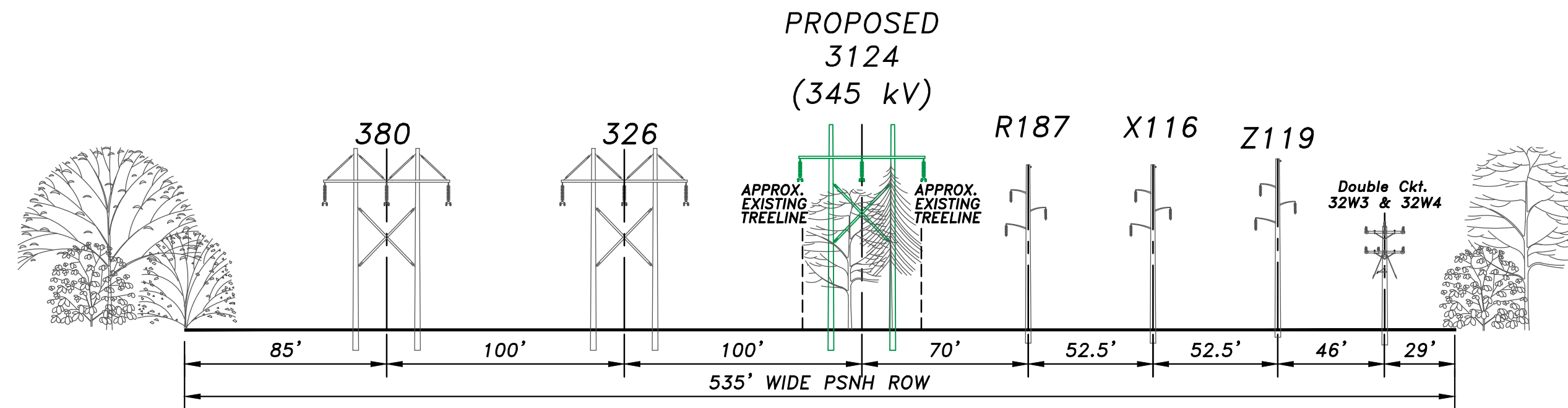
		T	0
		DRAWN	JJD/TRC
LINE 3124 345 kV TRANSMISSION RIGHT OF WAY CROSS SECTIONS MERRIMACK VALLEY RELIABILITY PROJECT SHEET 1 OF 2		ENGINEER	GEL/TRC
		CHECKED	CRP/TRC
SCALE: 1"=50' FILE: S3124-P0005-SH.1&Z.DWG IMAGE:		APPROVED	GEL/TRC
		DATE	2/27/15
DWS REV		DRAWING NO. S3124-P0005 SH.1	



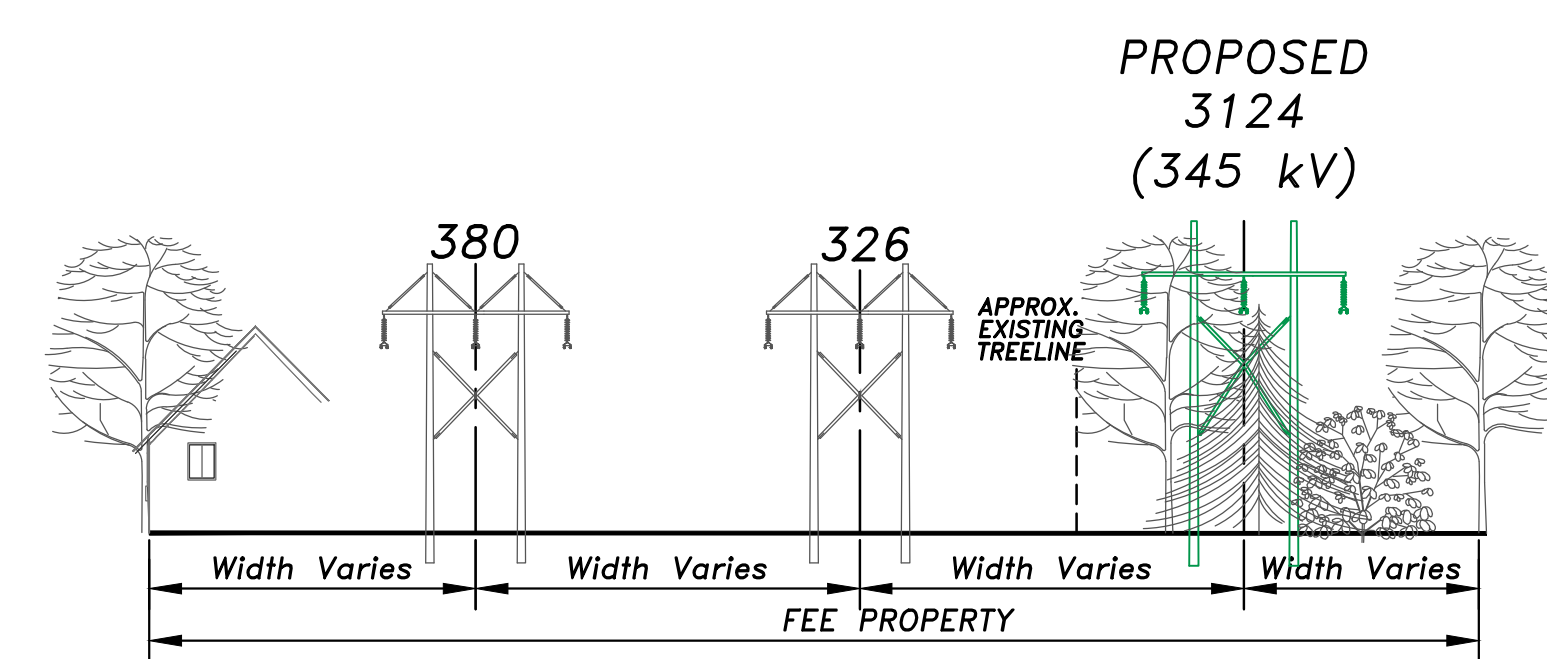
SECTION IX
HOVEY ROAD TO STR. 276
STA. 438+14 TO STA. 445+07



SECTION X
STR. 276 TO DEPARTURE OF 34.5KV
STA. 445+07 TO STA 485+84 +/-

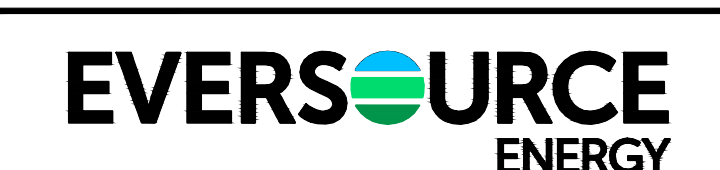


SECTION XI
DEPARTURE OF 34.5KV TO STR. 286
STA. 485+84 +/- TO STA. 502+53

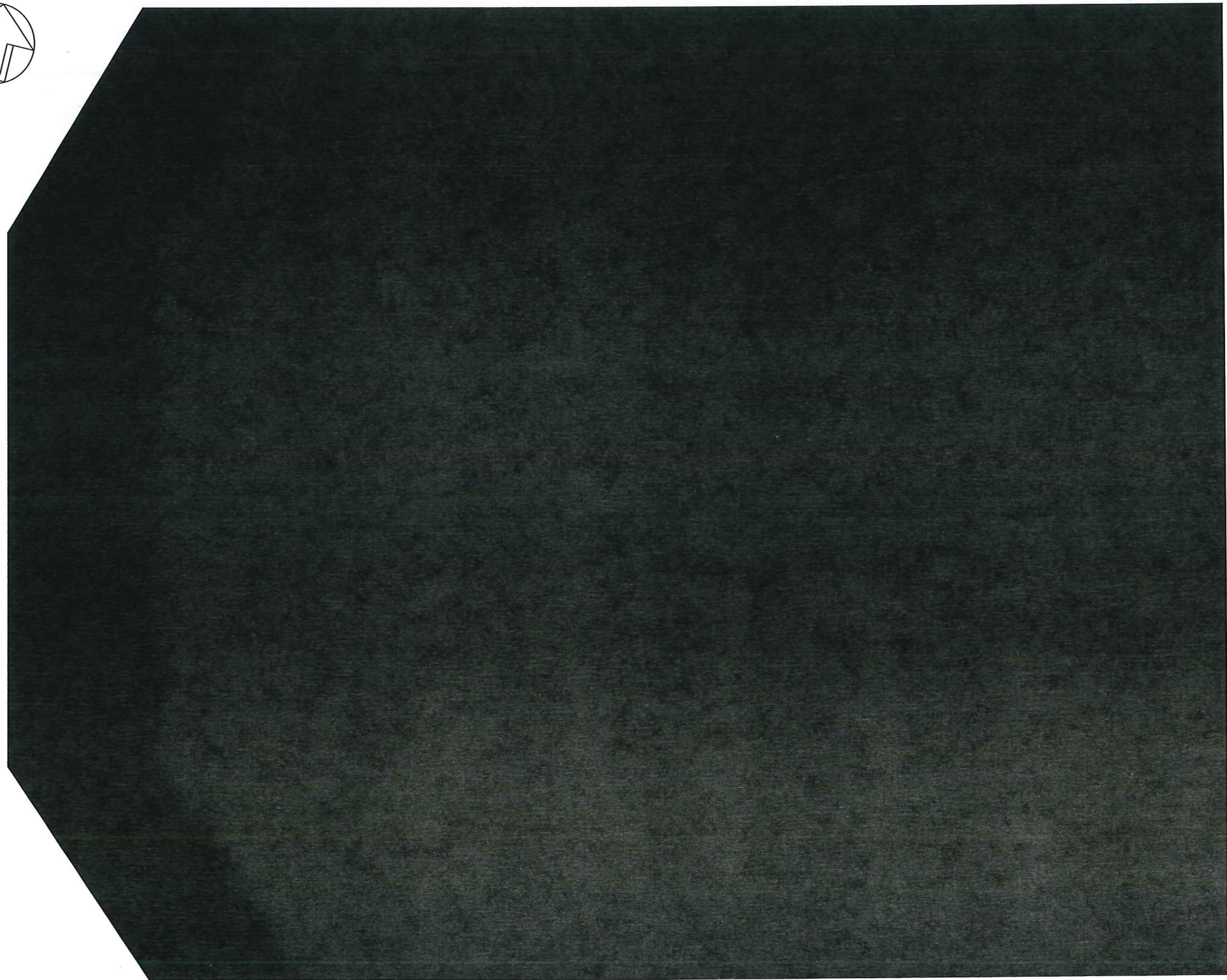


SECTION XII
STR. 286 TO SCOBIE POND 345 kV S/S
STA. 502+53 TO STA. 516+20

CONTRACT SERVICES												T 0	
2	RE-ISSUED NHSEC PERMIT FILING	-	6/4/15	RDW	CRP	GEL			DRAWN		JJD/TRC		
1	NHSEC PERMIT FILING	-	2/27/15	JJD	CRP	GEL			ENGINEER		GEL/TRC		
REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR			CHECKED		CRP/TRC		
										APPROVED		GEL/TRC	
										DATE		2/27/15	
										SCALE		1"=50'	
										FILE: S3124-P0005-SH.1&2.DWG		DRAWING NO. S3124-P0005 SH.2	
										IMAGE:			



LINE 3124 345 kV TRANSMISSION
RIGHT OF WAY CROSS SECTIONS
MERRIMACK VALLEY RELIABILITY PROJECT
SHEET 2 OF 2



THIS DOCUMENT HAS BEEN REDACTED FOR CRITICAL ENERGY INFRASTRUCTURE INFORMATION (CEII), JULY 13, 2015

REFERENCE ONLY
NOT FOR CONSTRUCTION

PRELIMINARY
DESIGN FOR CLIENT REVIEW
NOT FOR CONSTRUCTION

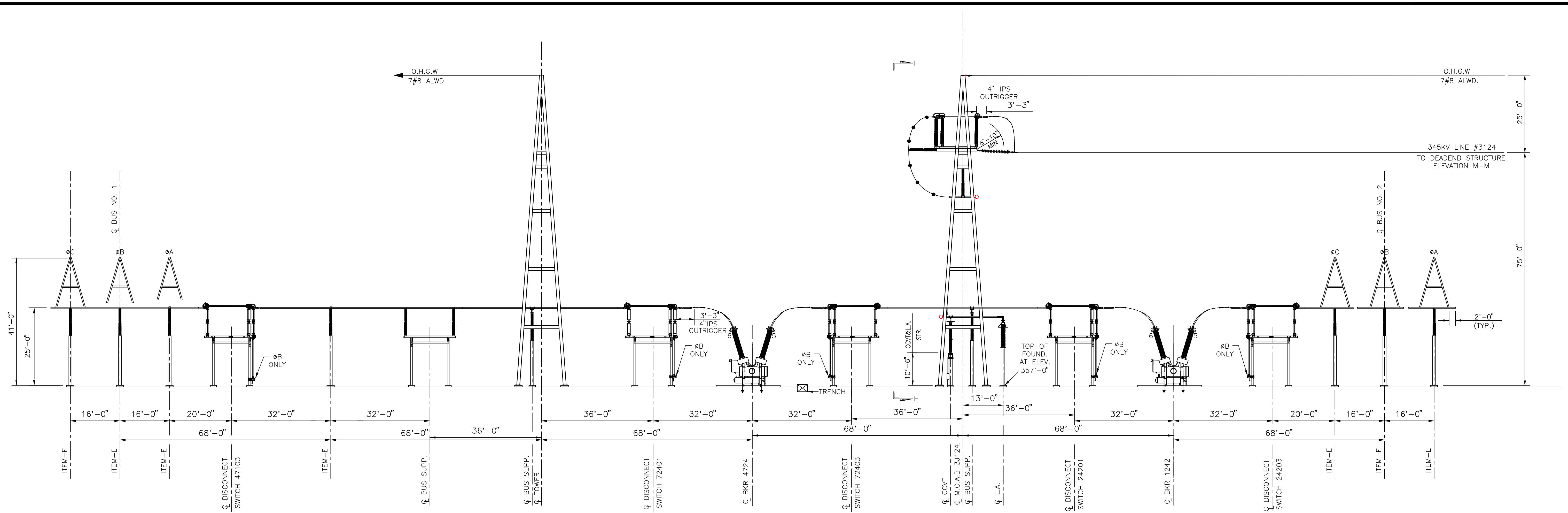
NO REMOVALS
DRAWING
REQUIRED

ADDITIONS

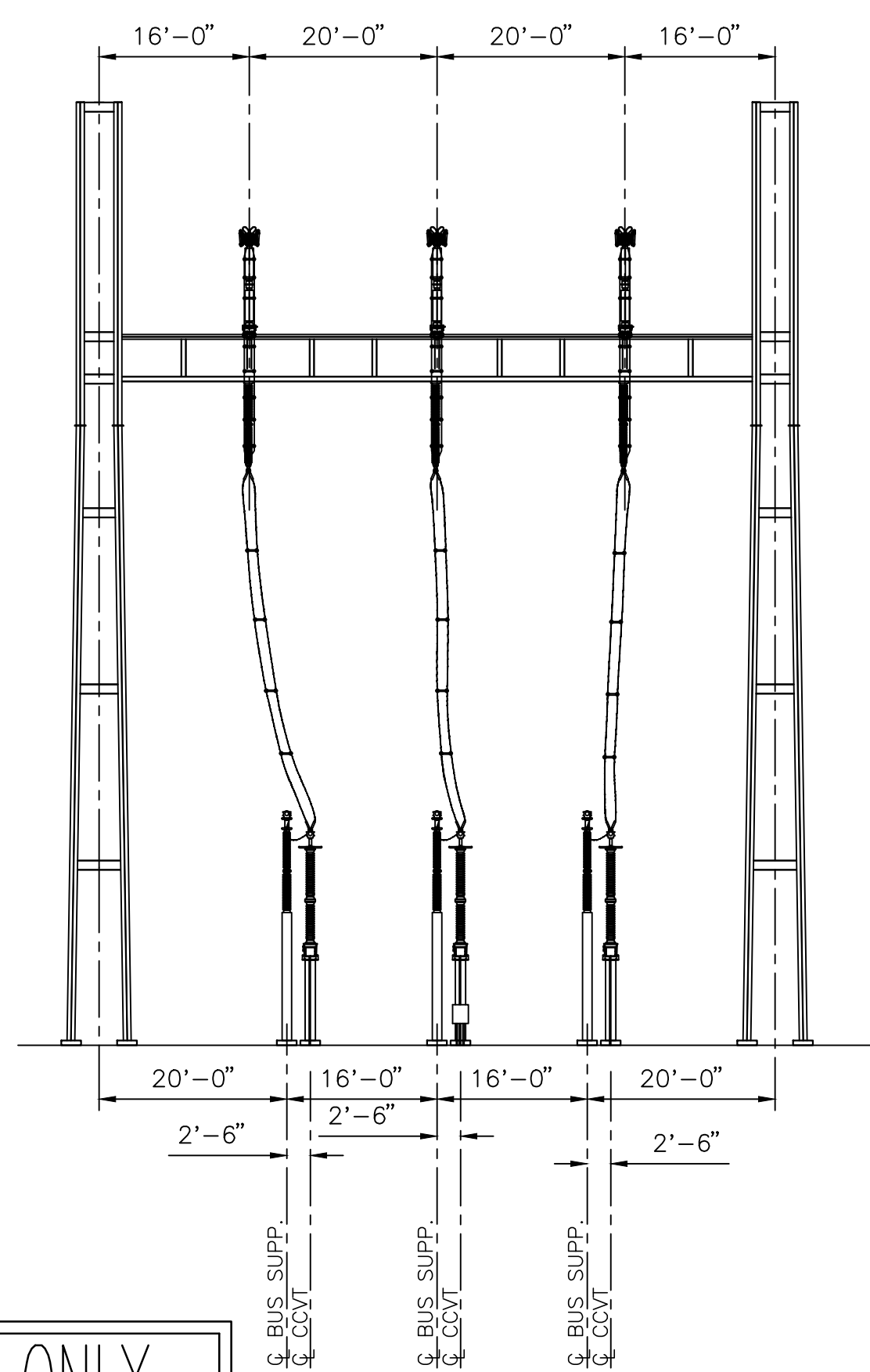


670 N. COMMERCIAL ST.
MANCHESTER, NH 03101
PROJECT NO: 223593

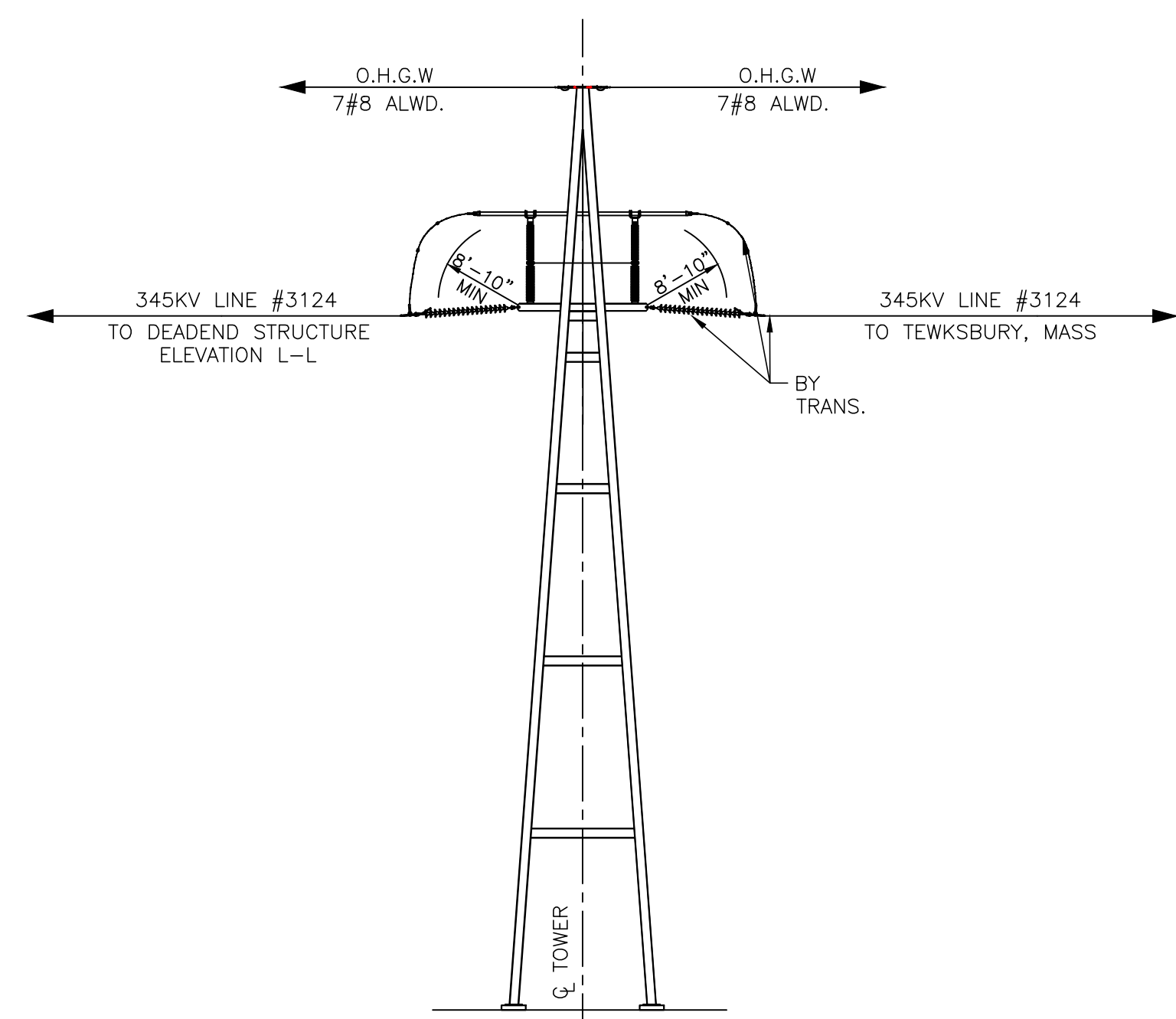
CONTRACT SERVICES		3124 LINE TERMINAL PROPOSAL						T	O
1	NHEC PERMIT FILING		6/4/15	TRC	TRC	TRC	DRWN	TRC	
REV	DESCRIPTION	ENG/PEE	DATE	DRN	CHKD	APPR	ENGINEER	TRC	
							CHECKED	TRC	
							APPROVED		
							DATE	1/21/15	
EVERSOURCE ENERGY LINE 3124 345 kV TRANSMISSION S/S GENERAL ARRANGEMENT MERRIMACK VALLEY RELIABILITY PROJECT SCOBIE POND 345 kV S/S							SCALE: 1"=40' FILE: S3124-P0010_SH2.DWG MAKE: N/A		
DWG REV							DRAWING NO. S3124-P0010 SH.2		



ELEVATION L-L



ELEVATION H-H



ELEVATION M-M

NOTES:

1. PHASE TO GROUND CLEARANCE SHALL BE 8'-10" MINIMUM FOR 345KV.
2. PHASE TO PHASE CLEARANCE SHALL BE 14'-6" MINIMUM FOR 345KV.
3. MINIMUM CONDUCTOR BEND RADIUS: 1272 KCM ACSR = 19" MINIMUM.
4. MINIMUM CONDUCTOR BEND RADIUS: 795 KCM ACSR = 14" MINIMUM.
5. CABLE SPACERS ARE SHOWN IN ARBITRARY LOCATIONS. ACTUAL LOCATIONS MAY HAVE TO BE MODIFIED IF DRAWING PLACEMENT IS NOT FEASIBLE.
6. ALL BUS TUBING SHALL HAVE A 795kcmil 26/7 STRAND ACSR "DRAKE" DAMPENING WIRE INSTALLED INSIDE AND TACK WELDED TO ONE END TO CONTROL AEOLIAN VIBRATION.
7. DRILL DRAIN HOLES INTO ALL BUS TUBING AT MIDSPAN USING A 1/4" DRILL.
8. ALL COMPRESSION TERMINAL CONNECTORS WITH BARREL FACING UPWARD, SHALL HAVE A 1/4" DIA. WEEP HOLE DRILLED AT THE BASE OF THE BARREL.

REFERENCES:

SKT02-PLAN GENERAL PLAN

NO REMOVALS
DRAWING
REQUIRED

PRELIMINARY
DESIGN FOR CLIENT REVIEW
NOT FOR CONSTRUCTION

ADDITIONS

REFERENCE ONLY
NOT FOR CONSTRUCTION

CONTRACT SERVICES		DRAWING FOR EPN 8595				T	#
1	NHSEC PERMIT FILING	6/4/15	TRC	TRC	TRC	DRAWN	TRC
REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR	ENGINEER
							TRC
							CHECKED
							TRC
							APPROVED
							DATE
							1/21/15

EVERSOURCE ENERGY
 LINE 3124 345 kV TRANSMISSION
 S/S ELEVATIONS & SECTIONS
 MERRIMACK VALLEY RELIABILITY PROJECT
 SCOBIE POND 345 kV S/S

SCALE: 1/16" = 1'-0"
 FILE: S3124-P0010 SH.3.DWG
 DRAWING NO.: S3124-P0010 SH.3