

Grand River Dam Authority

FEEDER 9G REBUILD 161kV TRANSMISSION LINES

STEEL STRUCTURE BID PACKAGE

JULY 2026

185619

REV	DATE	BY	CKD	DESCRIPTION
0	06/24/2026	WCB	EPB	ISSUED FOR BID
1	07/16/2026	WCB	EPB	QTY UPDATE
CVR-01				

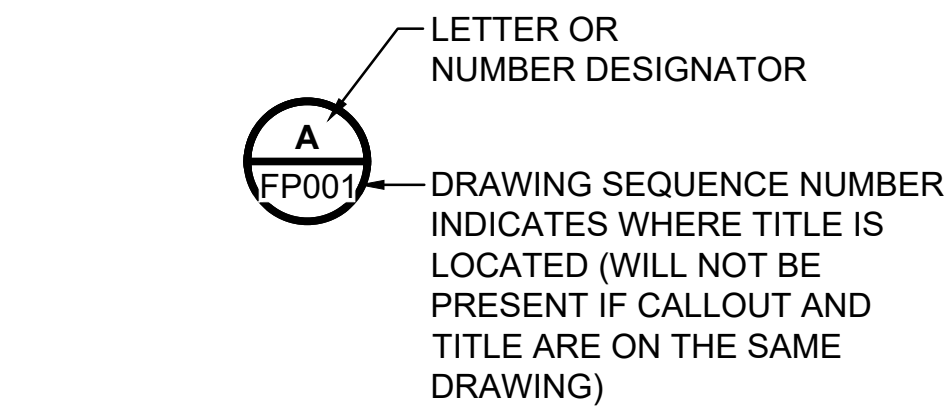


FEEDER 9G REBUILD
161kV TRANSMISSION LINE
JUNE 2026
185619

CONTRACT DRAWINGS

CONTRACT DRAWING LIST

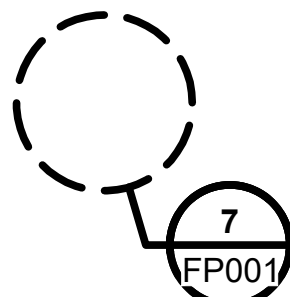
DWG. NO.	REV	TITLE
CVR-01	0	COVER SHEET
IDX-01	0	DRAWING INDEX
DTL-01	0	STRUCTURE DETAILS
TP-01	0	161kV SINGLE CIRCUIT 0° - 2° MOD DELTA TANGENT STEEL POLE
TP-02	0	161KV SINGLE CIRCUIT 0° - 3° TANGENT STEEL H-FRAME
TP-03	0	161KV SINGLE CIRCUIT 0° - 2° TANGENT STEEL 2-POLE
TP-04	0	161KV SINGLE CIRCUIT 5° - 45° VERTICAL SUSPENSION STEEL POLE
TP-05	0	161KV SINGLE CIRCUIT 0° - 30° VERTICAL DEADEND STEEL POLE
TP-06	0	161KV SINGLE CIRCUIT 85° - 95° VERTICAL DEADEND STEEL POLE
TP-07	0	161KV SINGLE CIRCUIT 3-WAY DEADEND STEEL POLE
TP-08	0	161KV SINGLE CIRCUIT 55° - 75° DEADEND STEEL POLE W/ HORIZONTAL ARMS
TP-09	0	161KV SINGLE CIRCUIT 0° - 10° DEADEND STEEL 3-POLE (UNDER-CROSSING)
TP-10	0	161KV SINGLE CIRCUIT 0° - 10° DEADEND STEEL 3-POLE
TP-11	0	161KV SINGLE CIRCUIT 65° - 75° DEADEND STEEL 3-POLE
TP-12	0	161KV SINGLE CIRCUIT 0° - 15° SWITCH STEEL POLE
TP-13	0	161KV SINGLE CIRCUIT 0° - 90° DEADEND STEEL POLE
TP-14	0	161KV SINGLE CIRCUIT 0° - 3° TANGENT STEEL H-FRAME, DRILLED SHAFT



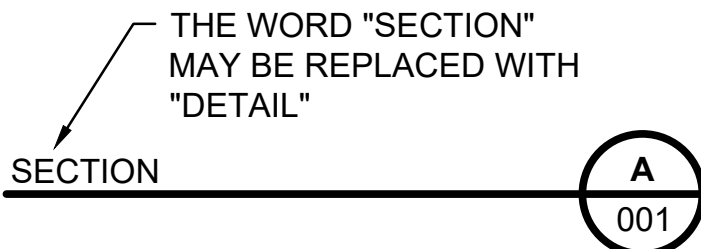
SECTION, DETAIL, AND ELEVATION
SYMBOL IDENTIFIERS



SECTION CALLOUT EXAMPLE



DETAIL CALLOUT EXAMPLE



SECTION OR DETAIL TITLE EXAMPLE

SECTION AND DETAIL
IDENTIFICATION SYSTEM

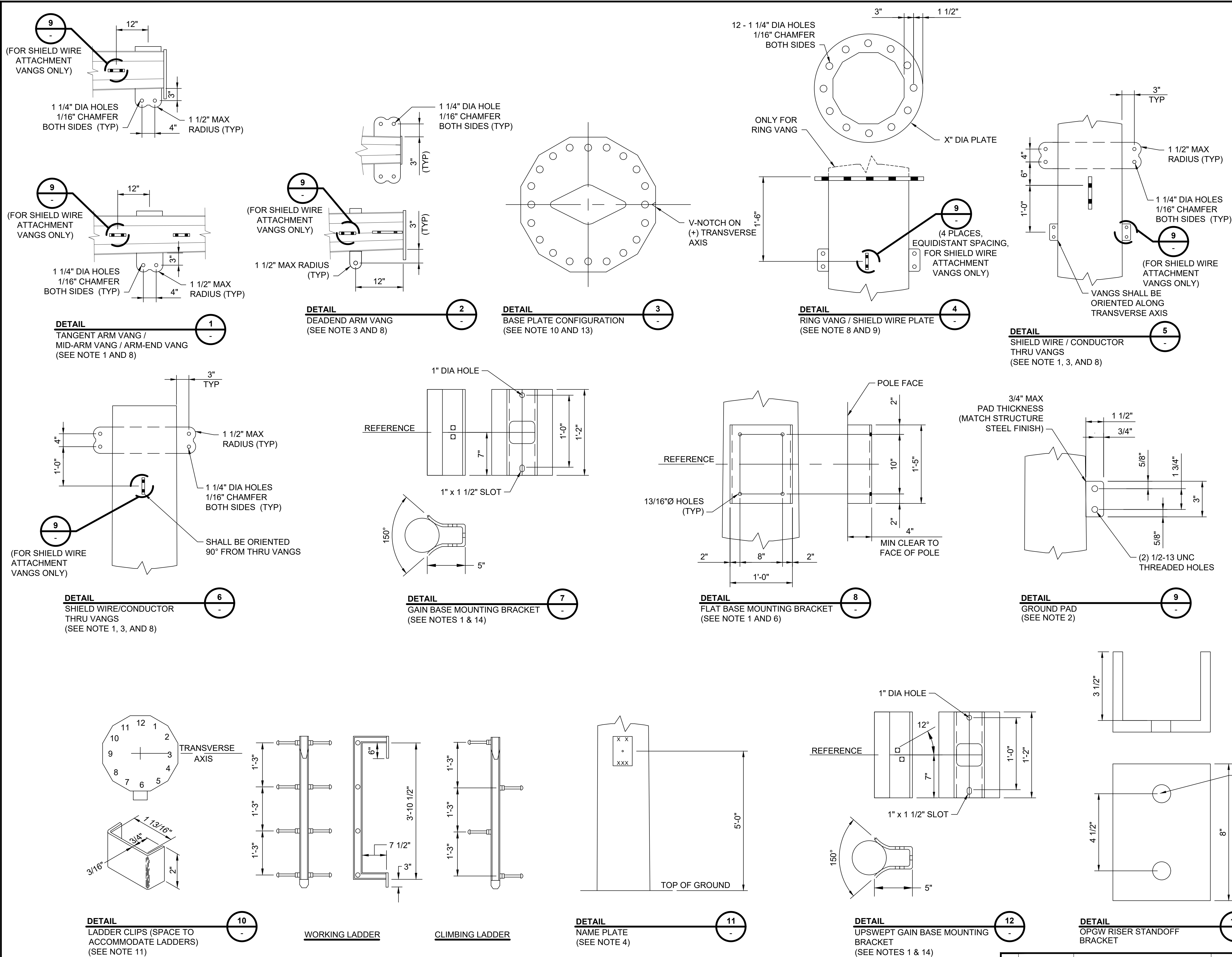
RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD
NO.	DATE	DESCRIPTION	BY	CHK	APP

GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV			
DRAWING INDEX			
SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
CH: H. DROLLETT		DATE: 06/24/2026	
DRAWING No. IDX-01		REV. 0	

COPYRIGHT © 2025 BURNS & MCDONNELL ENGINEERING COMPANY, INC.



- NOTES:**
1. MANUFACTURER SHALL REFER TO SECTION VIEWS FOR VANG, MOUNTING BRACKET AND THRU HOLE ORIENTATIONS.
 2. GROUNDING PADS SHALL BE WELDED TO THE POLE FACE. GROUNDING PAD HOLES SHALL BE THREADED AS SHOWN. GROUNDING PAD STEEL FINISH SHALL MATCH POLE SHAFT STEEL FINISH.
 3. VANGS SHALL BE DESIGNED TO WITHSTAND UP TO ± 7.5 DEGREE PULL OFF, UNLESS OTHERWISE NOTED ON STRUCTURE DRAWING.
 4. NAME PLATE SHALL ATTACH AT 5'-0" ABOVE GROUND LINE. ASSUME 2'-0" FOUNDATION REVEAL ON BASE PLATED STRUCTURES. NAME PLATE SHALL INDICATE STRUCTURE TYPE, STRUCTURE HEIGHT, ULTIMATE GROUND-LINE MOMENT, MANUFACTURER'S NAME, MANUFACTURING SITE, AND DATE OF MANUFACTURE.
 5. MANUFACTURER SHALL DETERMINE AND DESIGN ARM CONNECTION DETAILS. MANUFACTURER SHALL PROVIDE ALL BOLTS, NUTS AND WASHERS FOR ALL ARM CONNECTION ASSEMBLIES.
 6. MANUFACTURER SHALL PROVIDE 7/8" DIA X REQUIRED LENGTH MOUNTING BOLTS, NUTS, WASHERS AND LOCK WASHERS FOR FLAT BASE MOUNTING DETAILS. THICKNESS OF INSULATOR BASE SHALL BE ASSUMED TO BE 3/4".
 7. STRUCTURE SHALL BE DESIGNED FOR ERECTION BY CRANE. LIFT POINTS SHALL BE DESIGNATED FOR CRANE PICKUP. MANUFACTURER SHALL UTILIZE VANGS FOR EACH LIFTING POINT.
 8. MANUFACTURER SHALL DETERMINE PLATE THICKNESS TO MATCH LOADING. MAXIMUM MATERIAL THICKNESS FOR PLATE SHALL BE 3/4".
 9. MANUFACTURER SHALL DESIGN SHIELD WIRE PLATE TO BE USED BY CRANE FOR LIFTING.
 10. FOR ALL STRUCTURES, MANUFACTURER SHALL UTILIZE A 12-SIDED BASE PLATE WITH EQUAL AND SYMMETRICAL SPACING BETWEEN ALL BOLTS. THE NUMBER OF BOLTS SHALL BE DETERMINED BY THE MANUFACTURER.
 11. MANUFACTURER SHALL PROVIDE PERMANENT LADDER CLIPS SUITABLE FOR USE WITH MACGREGOR TYPE (3'-10 1/2") CLIMBING LADDERS. CLIPS SHALL BE WELDED TO THE FACE OF THE PLATE BEGINNING 8'-0". ABOVE GROUND LEVEL AND EXTENDING TO THE TOP OF THE STRUCTURE. MANUFACTURER SHALL ENSURE CLIPS PROVIDE ADEQUATE CLEARANCE BETWEEN CLIMBER AND ENERGIZED PARTS. CLIPS MUST CONFORM TO LOADING AS STATED IN OSHA 3124-12R. LADDERS SHOWN FOR DIMENSIONING ONLY AND SHALL NOT BE PROVIDED BY MANUFACTURER.
 12. MANUFACTURER SHALL INCLUDE POLE TOP PLATE FOR EACH POLE.
 13. MANUFACTURER SHALL DESIGN ALL POLES TO HAVE ADEQUATE VENTILATION AND DRAINING. CORROSION RESISTANT COATING SHALL BE APPLIED TO THE EXTERIOR OF GALVANIZED STEEL POLES AS SHOWN ON STRUCTURE DRAWINGS.
 14. MANUFACTURER SHALL PRE-DRILL 1" THRU HOLES & PROVIDE MOUNTING BOLTS 7/8" $\varnothing$ X REQUIRED LENGTH, INCLUDING NUTS, WASHERS AND LOCK WASHERS FOR GAIN BASE DETAIL. ON DOUBLE SIDED BRACKET LOCATIONS, ADDITIONAL NUTS, WASHERS AND LOCK WASHERS SHALL BE PROVIDED TO ALLOW REMOVAL OF ONE SIDE OF GAIN BASES WITHOUT AFFECTING THE OTHERSIDE. GAIN BASE DETAIL SHOWN FOR DIMENSION PURPOSES ONLY AND SHALL NOT BE PROVIDED BY POLE MANUFACTURER.

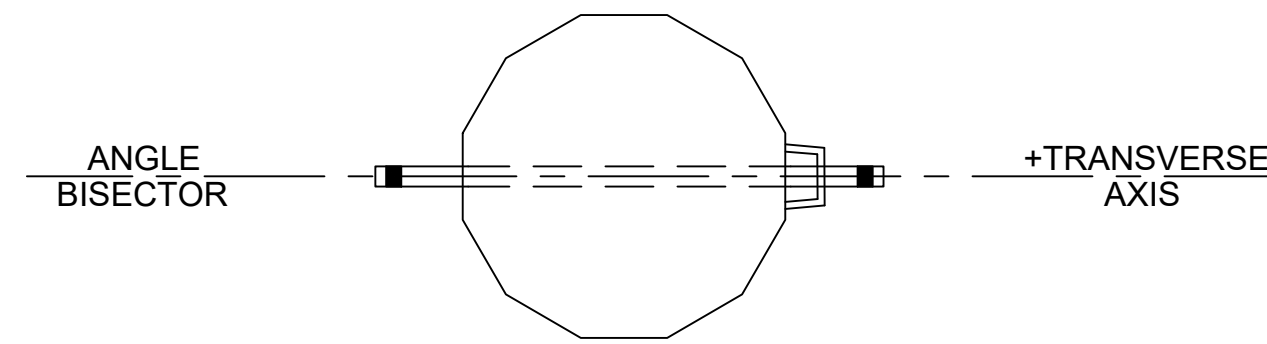
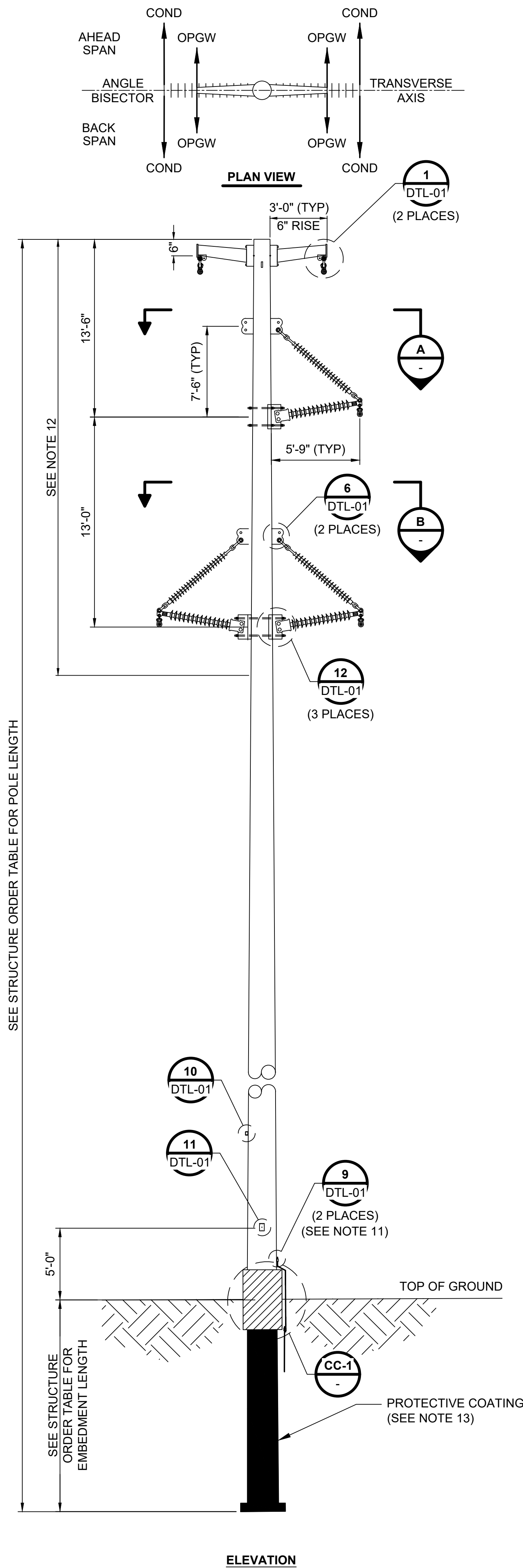
RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



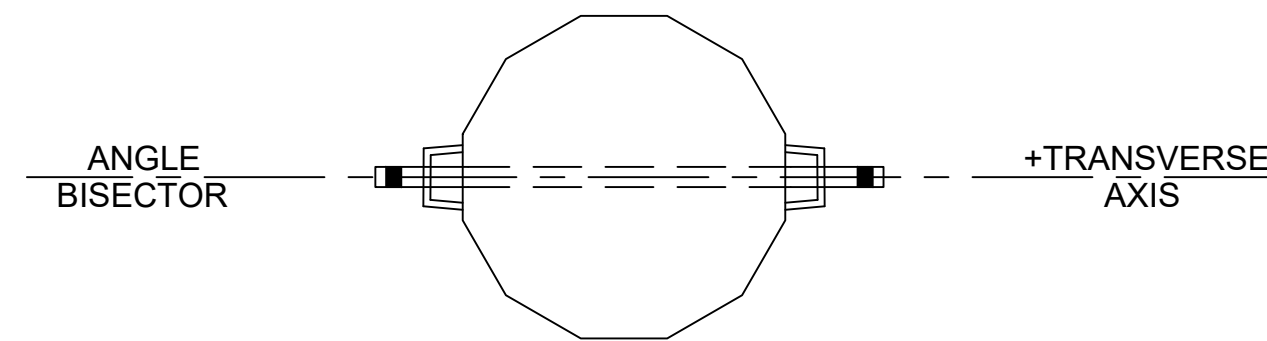
OK CERT. OF AUTH. NO. 421

NO.	DATE	DESCRIPTION	BY	CHK	APP
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD

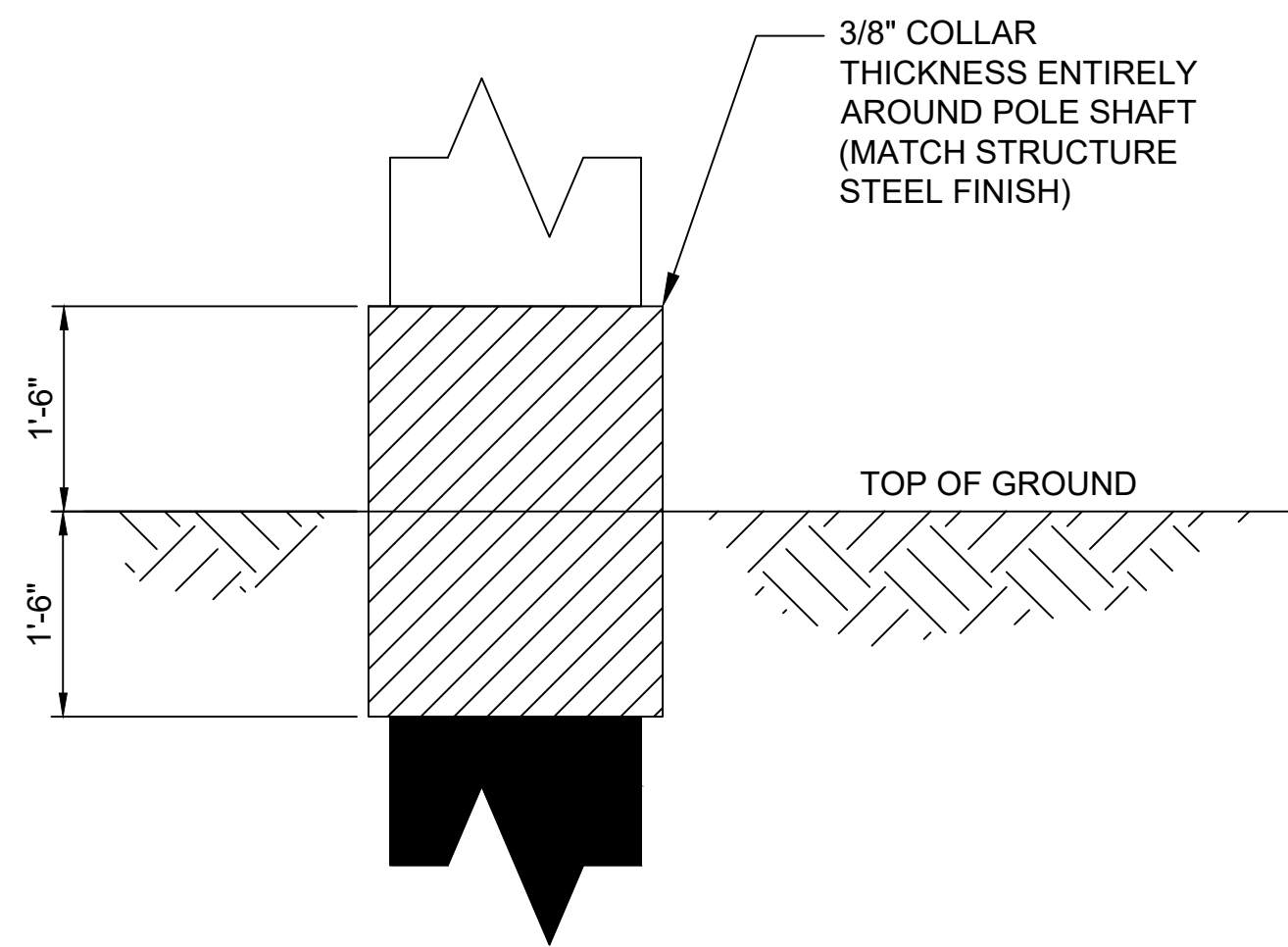
GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV STRUCTURE DETAILS			
SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
CH: H. DROLLETT	DATE: 06/24/2026	DRAWING No.	REV.
		DTL-1	0



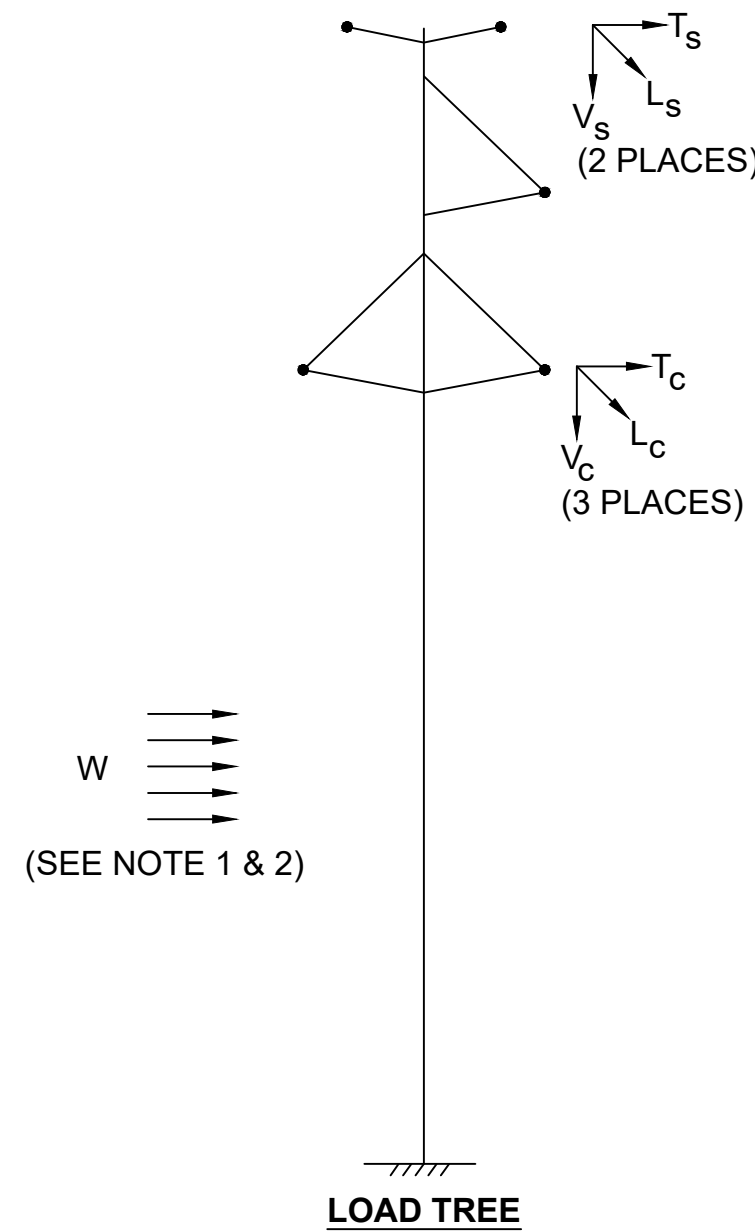
SECTION
CONDUCTOR THRU VANG &
UPSWEPT GAIN BASE
MOUNTING BRACKET



SECTION
CONDUCTOR THRU VANG &
UPSWEPT GAIN BASE
MOUNTING BRACKETS



DETAIL
CORROSION COLLAR



LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR (KIPS)			OPGW (KIPS)			W (PSF)	REMARKS
			Vc	Tc	Lc	Vs	Ts	LS		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.10 WIND: 2.50	4.3	2.6	0.0	2.0	1.8	0.0	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	2.4	3.3	0.0	1.1	1.5	0.0	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	5.5	1.9	0.0	3.3	1.4	0.0	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	5.5	0.6	0.0	3.3	0.4	0.0	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	1.6	0.3	0.0	0.5	0.1	0.0	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	5.9	0.7	1.0	2.5	0.3	0.5	3.0	SEE NOTES

STRUCTURE DESIGN CRITERIA STR. TYPE: 161kV MONOPOLE TANGENT 0-2" CONDUCTOR: (3) 795 KCMIL ACSR "DRAKE" OPGW: (2) AFL DNO-12606	MAX INITIAL TENSION NESC HEAVY (LBS)	ANGLE	WIND SPAN (FT)	WEIGHT SPAN (FT)
	11,000 5,300	0-2° 0-2°	1,100 1,100	1,300 1,300

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. ALL WIRES INSTALLED AS SHOWN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 10% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE GROUNDLINE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS. GROUNDING PAD HOLES SHALL BE PLUGGED DURING GALVANIZING.
- POLE TOP SECTIONS SHALL BE INTERCHANGEABLE BETWEEN ALL HEIGHT CLASSES FOR THIS STRUCTURE.
- PROTECTIVE COATING SHALL BE EVENLY APPLIED FROM THE TOP OF THE CORROSION COLLAR TO THE BASE OF THE POLE. SURFACE PREPARATION AND THICKNESS ARE TO MANUFACTURER'S RECOMMENDATION.
- STRUCTURE SEGMENTS SHALL BE JOINED USING SLIP-JOINT CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

STRUCTURE ORDER TABLE: TP-01				
POLE LENGTH (FT)	ABOVE GROUND HEIGHT (FT)	EMBED LENGTH (FT)	STRUCTURE NUMBER	QTY
87	72.5	14.5	18, 21, 68, 76	4
95	77	18	22, 32, 56, 62, 63, 71, 72, 78	8
97	81.5	15.5	23, 26, 27, 29, 30, 77, 79	7
100	81.5	18.5	47, 49, 59	3
102	86	16	33, 92, 94, 99, 101	5
107	86	21	5, 46, 55, 57, 61, 64, 103	7
110	90.5	19.5	9, 17, 25, 28, 48, 50, 58, 66, 70, 95, 102	11
112	90.5	21.5	4, 104, 106, 116	4
115	95	20	11, 12, 31, 51, 52, 75, 96, 107, 108	9
123	104	19	8, 10, 45, 53, 54, 93, 98	7
126	104	22	105	1
130	113	17	20, 24, 97, 100	4
140	122	18	14, 19	2

REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

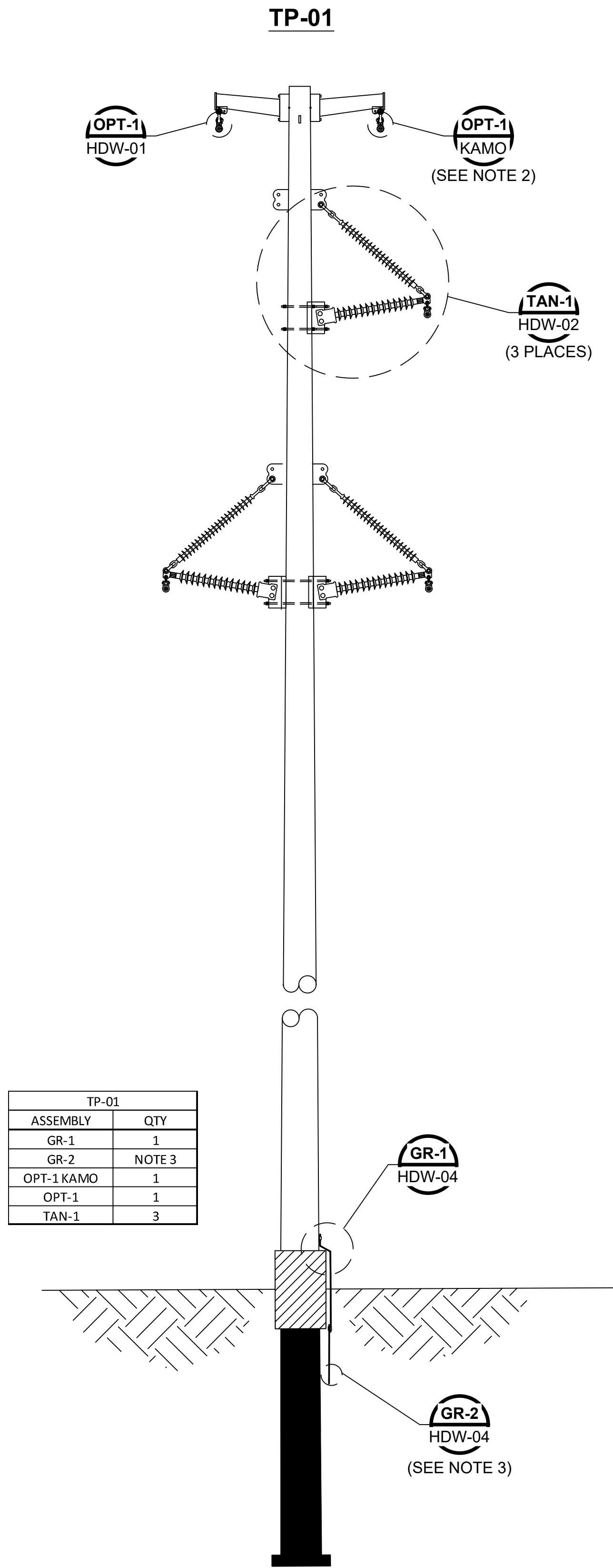
DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

					GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV 161kV SINGLE CIRCUIT 0° - 2° MOD DELTA TANGENT STEEL POLE SHEET 1			
					SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
					CH: H. DROLLETT DATE: 06/24/2026			
					DRAWING No. REV. TP-01 0			
0	06/24/2026	ISSUED FOR BID	WCB	HCD				
NO.	DATE	DESCRIPTION	BY	CHK	APP			

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES

**BURNS
MCDONNELL**
OK CERT. OF AUTH. NO. 421

COPYRIGHT © 2025 BURNS & McDONNELL ENGINEERING COMPANY, INC.



TP-01	
ASSEMBLY	QTY
GR-1	1
GR-2	NOTE 3
OPT-1 KAMO	1
OPT-1	1
TAN-1	3

NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



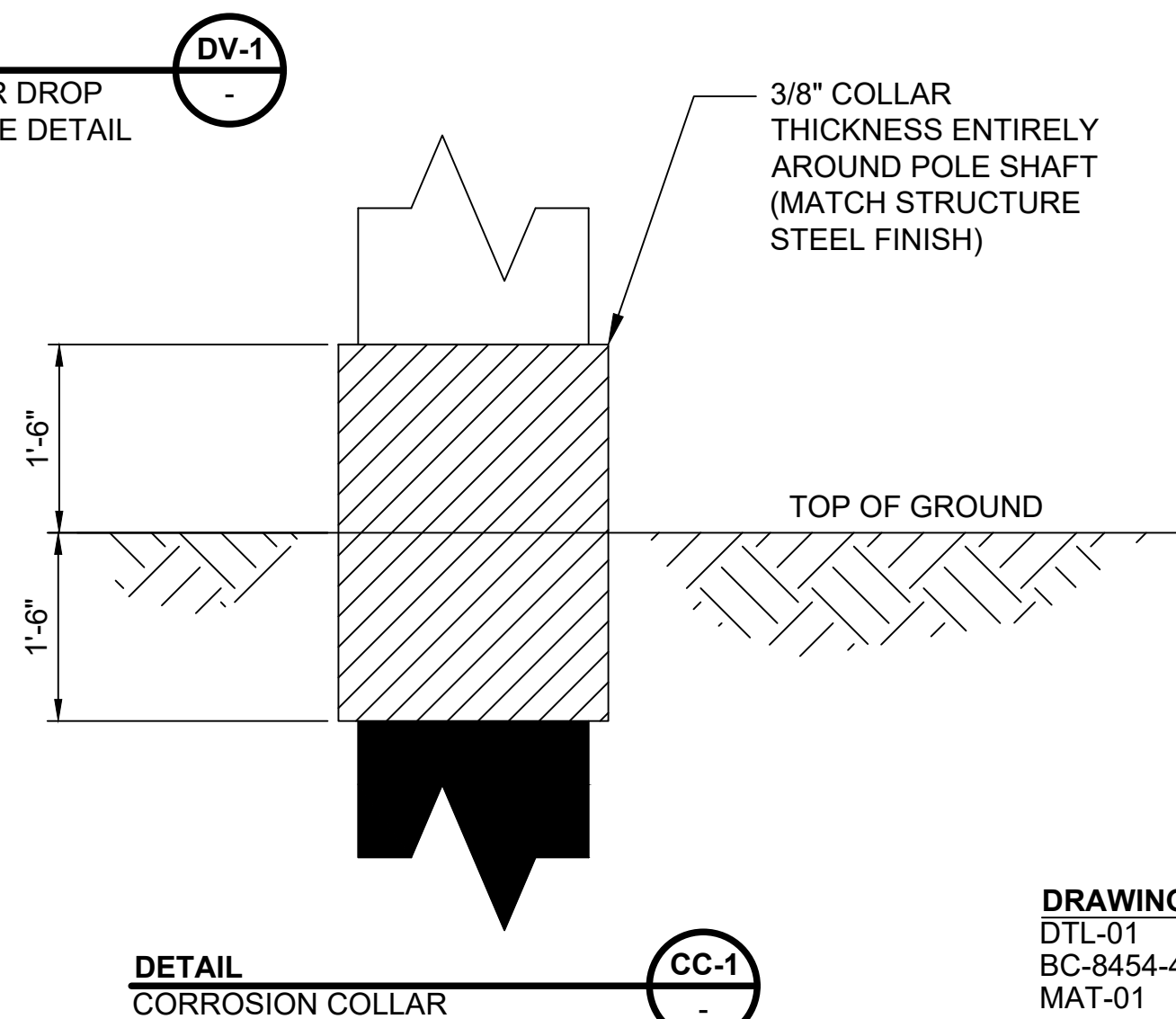
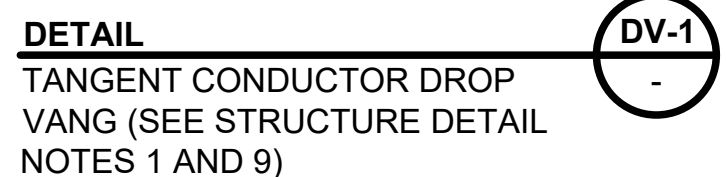
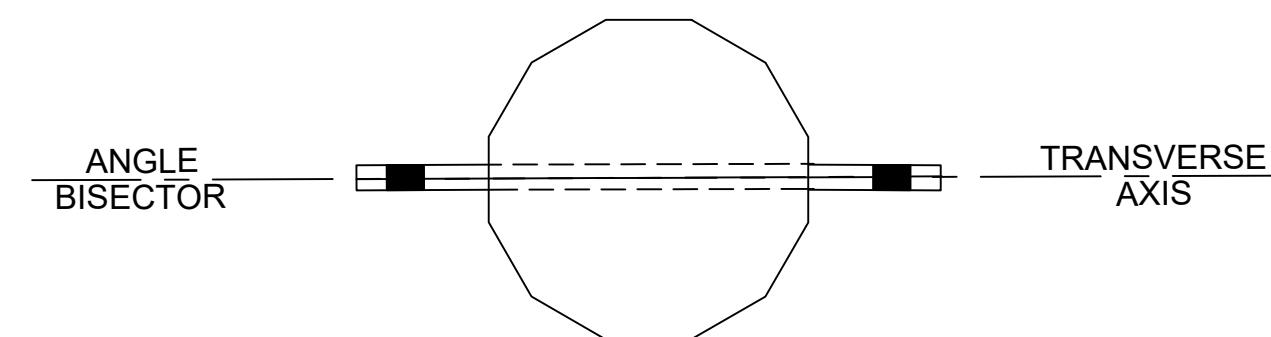
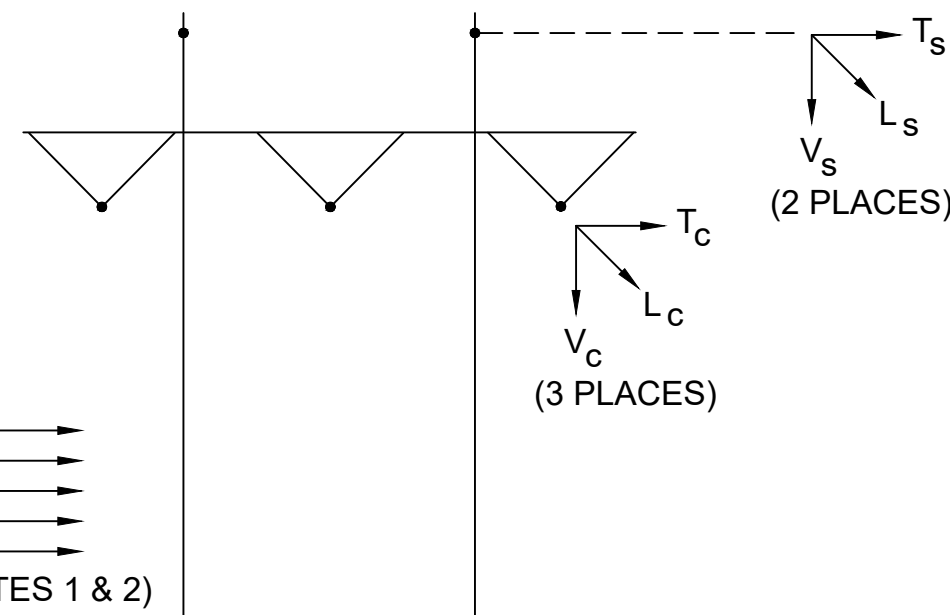
OK CERT. OF AUTH. NO. 421

REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA>		
						161kV 161kV SINGLE CIRCUIT 0° - 2° MOD DELTA TANGENT STEEL POLE SHEET 2		
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN
						CH: H. DROLLETT		DATE: 06/24/2026
						DRAWING No.		REV.
						TP-01		0
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD			
NO.	DATE	DESCRIPTION	BY	CHK	APP			



STRUCTURE DESIGN CRITERIA	MAX INITIAL TENSION	ANGLE	WIND SPAN	WEIGHT SPAN
STR. TYPE: 161KV H-FRAME TANGENT 0-3°	NESC HEAVY (LBS)		(FT)	(FT)
CONDUCTOR: (3) 795 KCMIL ACSR "DRAKE"	11,000	0-3°	1,600	1,600
OPGW: (2) AFL DNO-12606	5,300	0-3°	1,600	1,600

1. W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
2. INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
 - 1.1 = 12 SIDED
 - 1.4 = 8 SIDED
 - 1.6 = LATTICE AND FLAT SURFACES
3. STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
 - A. ALL WIRES INSTALLED AS SHOWN.
 - B. FOR LOAD CASE 7 ONLY, ALL WIRES ATTACHED WITH A LONGITUDINAL LOAD (L_c) OF 11.3 KIPS ON ANY SINGLE CONDUCTOR ATTACHMENT POSITION WHICH MAY GOVERN.
 - C. FOR LOAD CASE 7 ONLY, ALL WIRES ATTACHED WITH A LONGITUDINAL LOAD (L_s) OF 3.6 KIPS ON ANY SINGLE SHIELD WIRE ATTACHMENT POSITION WHICH MAY GOVERN.
4. V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
6. CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
7. FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 5% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
8. FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
9. STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
10. STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
11. GROUNDING PADS SHALL BE PLACED AT 2'-0" ABOVE THE GROUNDLINE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS. GROUNDING PAD HOLES SHALL BE PLUGGED DURING GALVANIZING.
12. PROTECTIVE COATING SHALL BE EVENLY APPLIED FROM THE TOP OF THE CORROSION COLLAR TO 4 FEET ABOVE THE BASE OF THE POLE. SURFACE PREPARATION AND THICKNESS ARE TO MANUFACTURER'S RECOMMENDATION.
13. MID-ARM VANG SHALL BE PLACED DIRECTLY ABOVE V-STRING LOAD POINT. MID-ARM VANG SHALL BE DESIGNED FOR CONSTRUCTION LOADING (LOAD CASE 6). MID-ARM VANG LOADS SHALL NOT BE APPLIED CONCURRENTLY WITH LOADS APPLIED TO INSULATOR V-STRING ASSEMBLY.
14. STRUCTURE CROSSARMS SHALL BE DESIGNED TO BE HORIZONTAL WITH NO RISE UNDER NORMAL CONDITIONS (LOAD CASE 5).
15. STRUCTURE SEGMENTS SHALL BE JOINED USING FLANGED CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

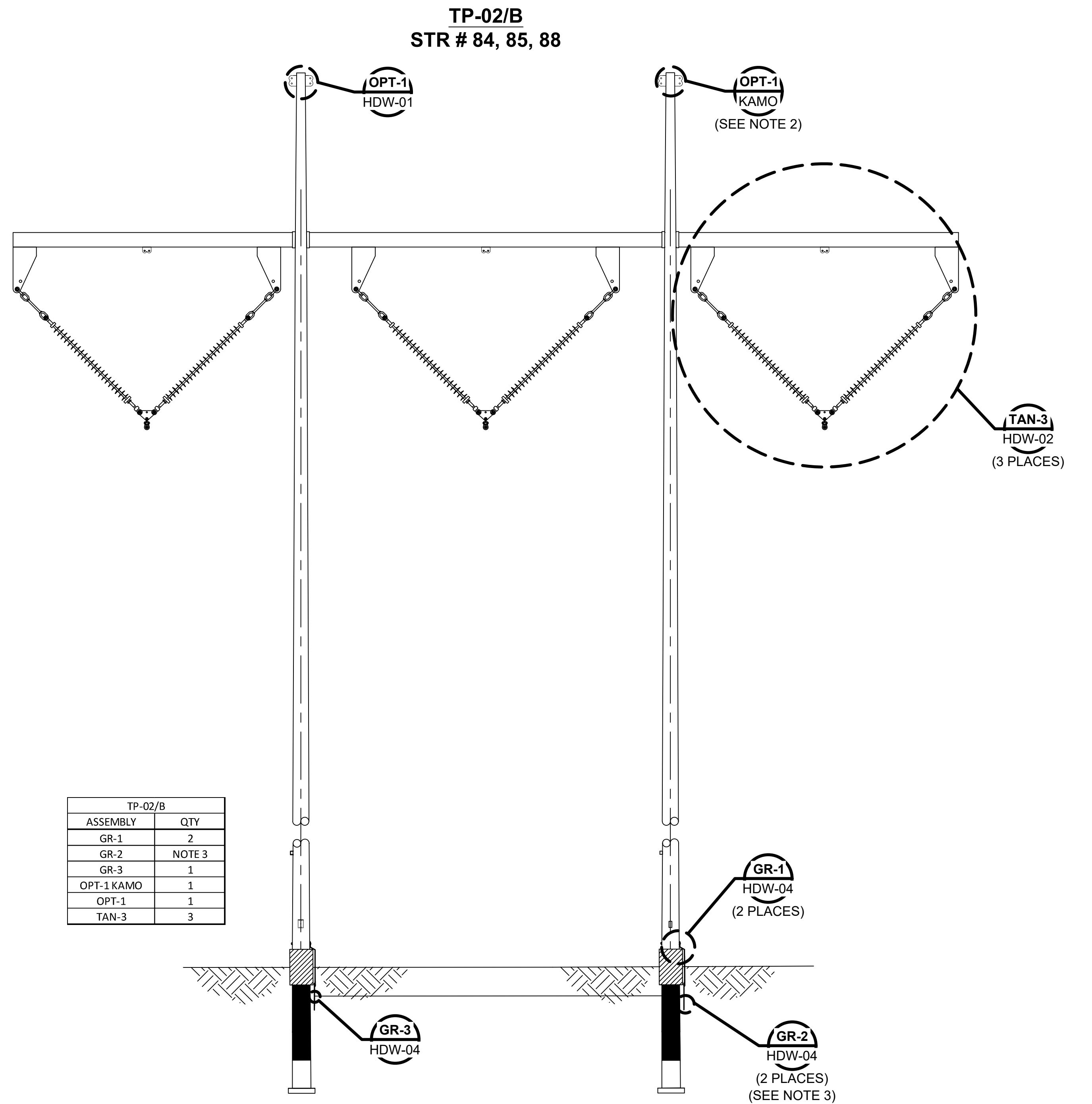
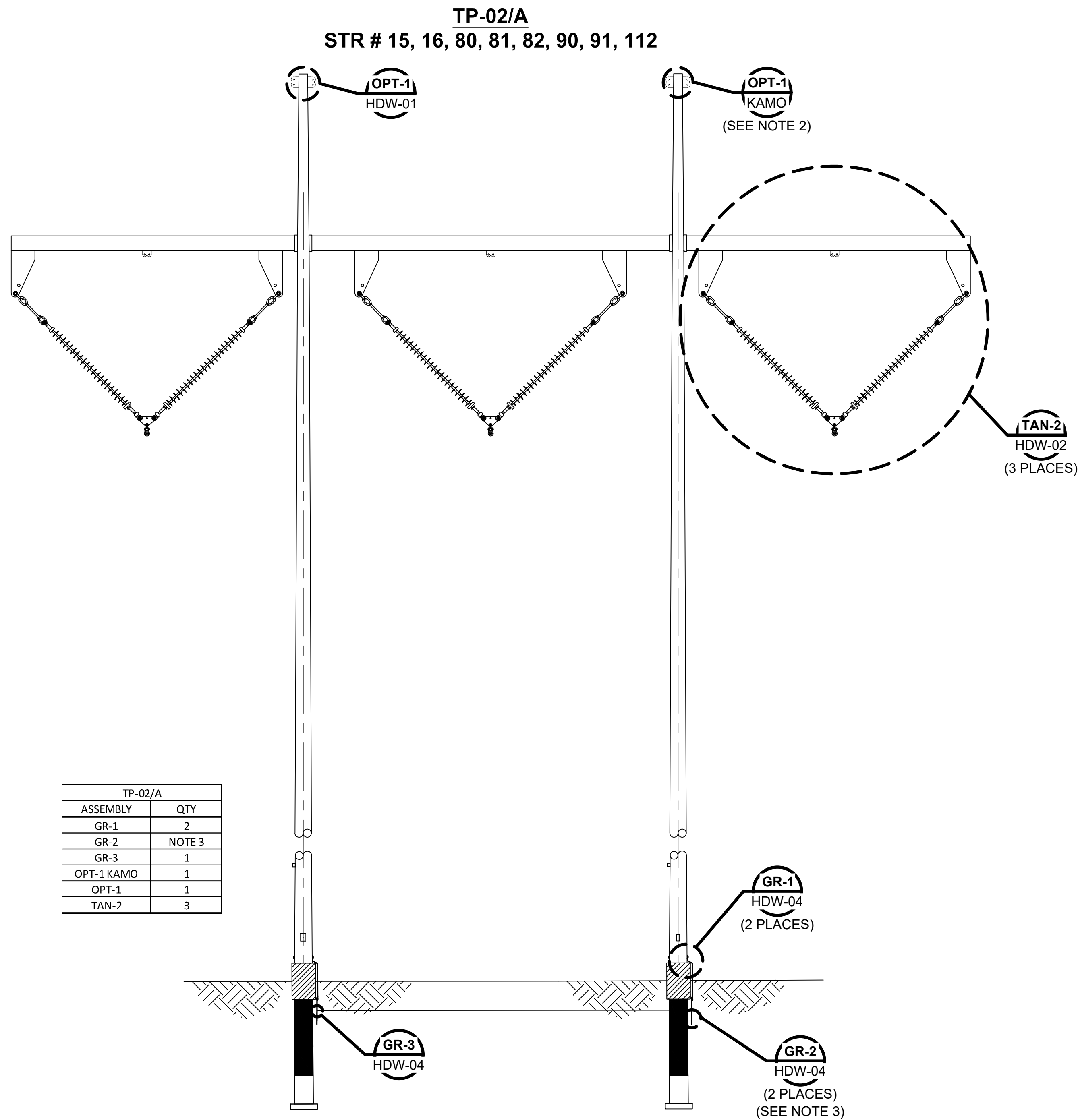
STRUCTURE ORDER TABLE: TP-02				
POLE LENGTH (FT)	ABOVE GROUND HEIGHT (FT)	EMBED LENGTH (FT)	STRUCTURE NUMBER	QTY
85	72.5	12.5	81, 84	2
95	81.5	13.5	80, 91	2
102	86	16	16	1
110	95	15	15, 85	2
124	104	20	82, 90	2
140	118	22	88, 112	2

DRAWING #
DTL-01
BC-8454-4
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
V-STRING HARDWARE DETAIL
STRUCTURE MATERIAL ASSEMBLY LIST

[illegible]

COPYRIGHT © 2026 BURNS & MCDONNELL ENGINEERING COMPANY, INC.



NOTES

1. FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
2. ASSEMBLY TO BE PROVIDED BY KAMO.
3. GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



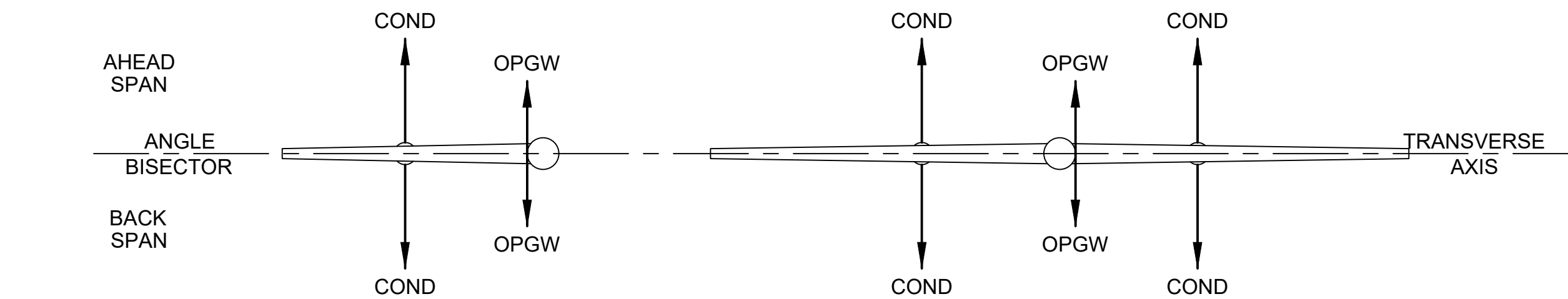
OK CERT. OF AUTH. NO. 421

REFERENCE DRAWINGS

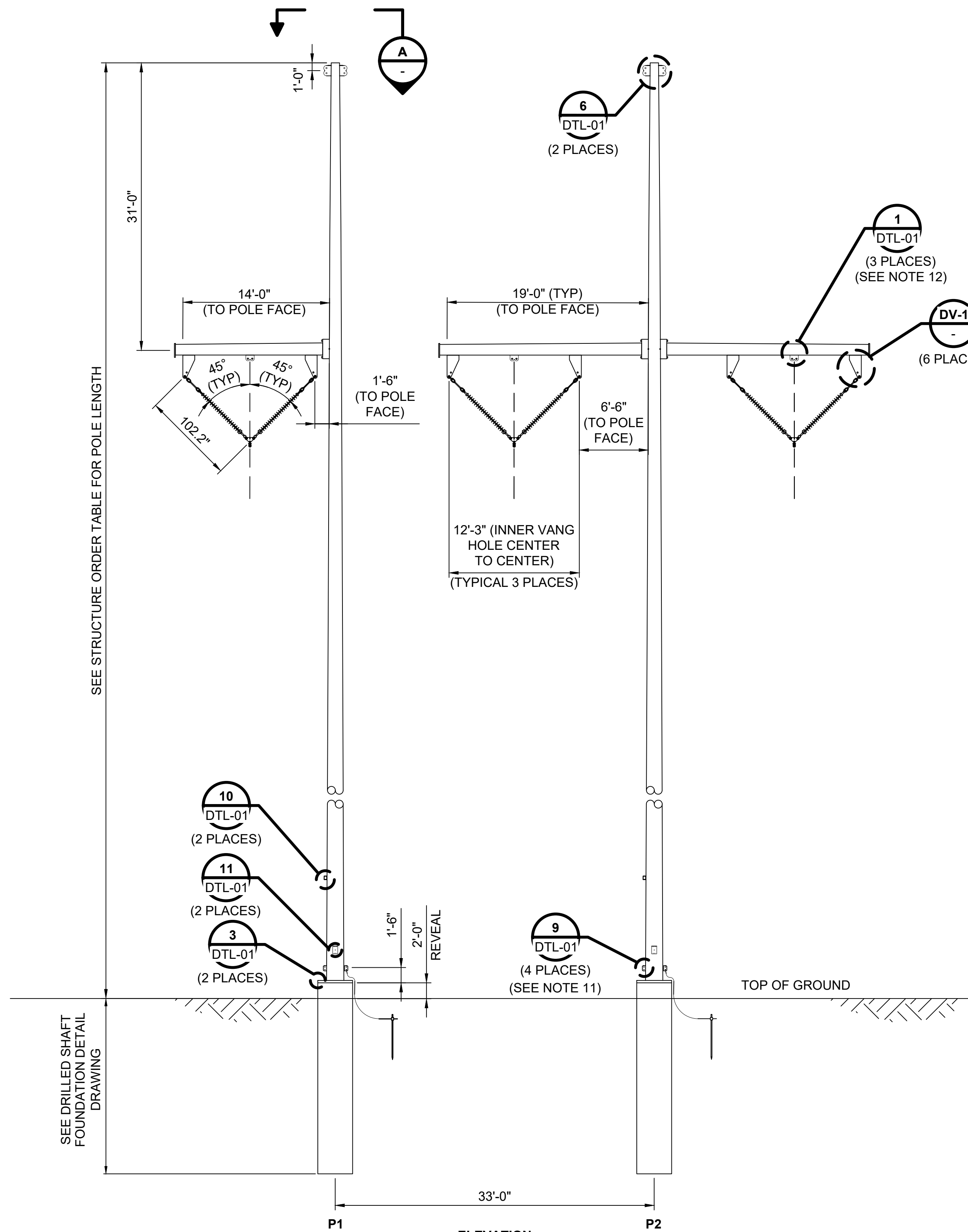
DRAWING #
DTL-01
BC-8454-4
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
V-STRING HARDWARE DETAIL
STRUCTURE MATERIAL ASSEMBLY LIST

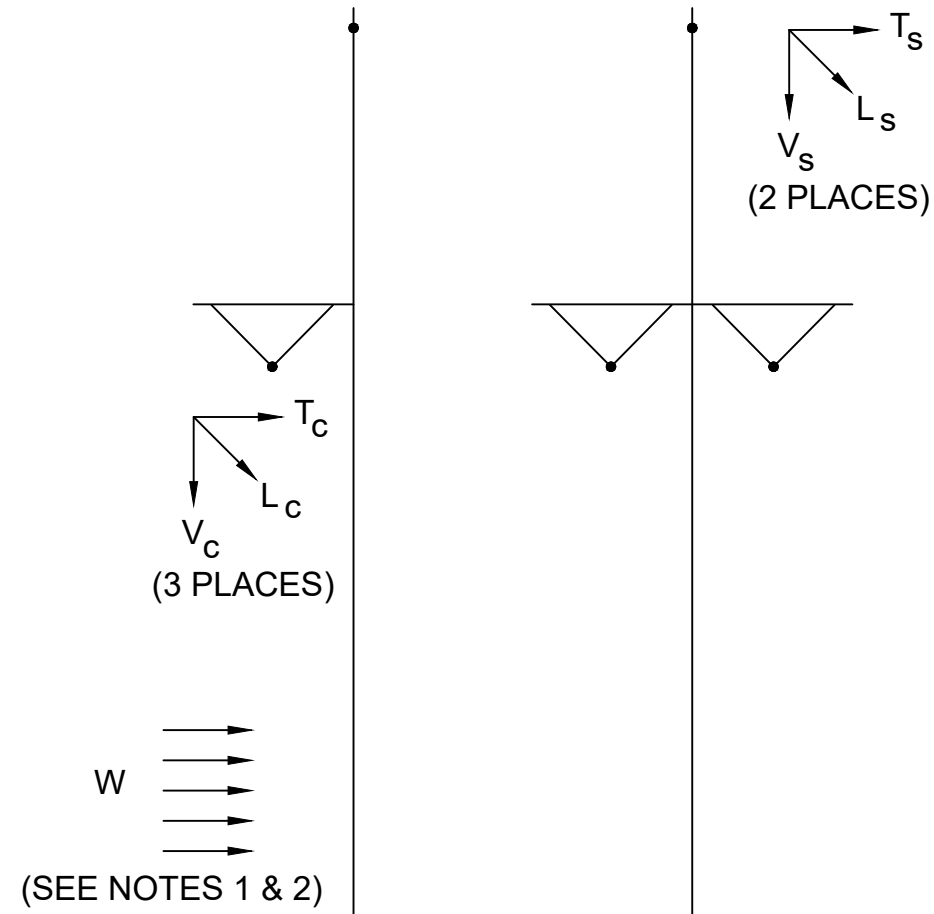
						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV		
						161kV SINGLE CIRCUIT 0° – 3° TANGENT STEEL H-FRAME SHEET 2		
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN
								APPD: H. DROLLETT
						CH: H. DROLLETT		
						DATE: 06/24/2026		
						DRAWING No.		
						TP-02		
						REV.		
						0		



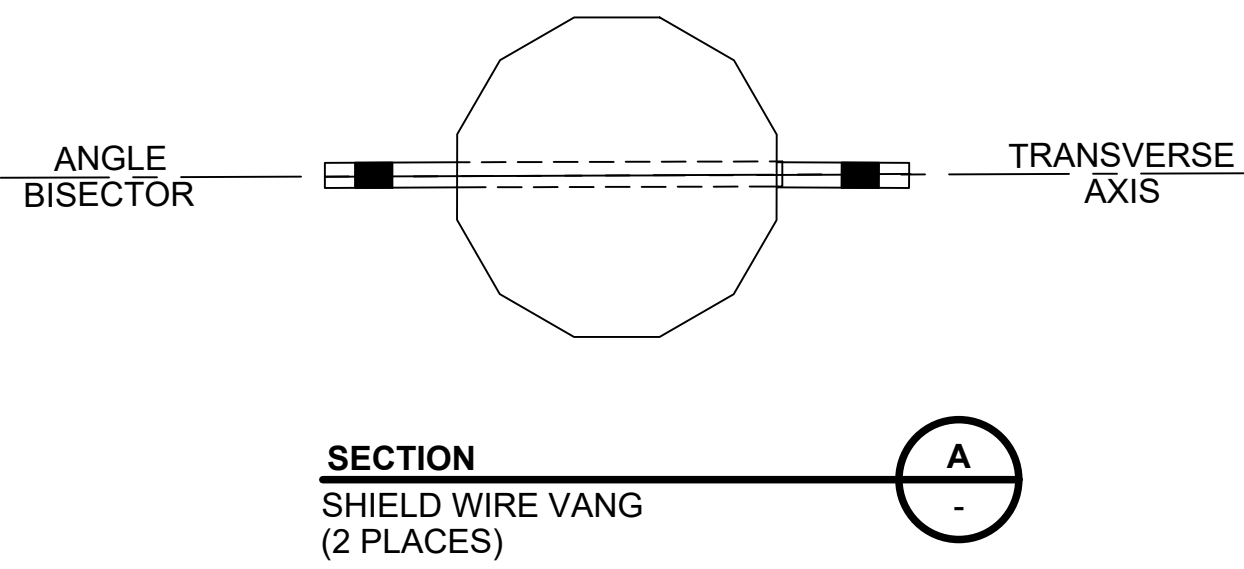
PLAN VIEW



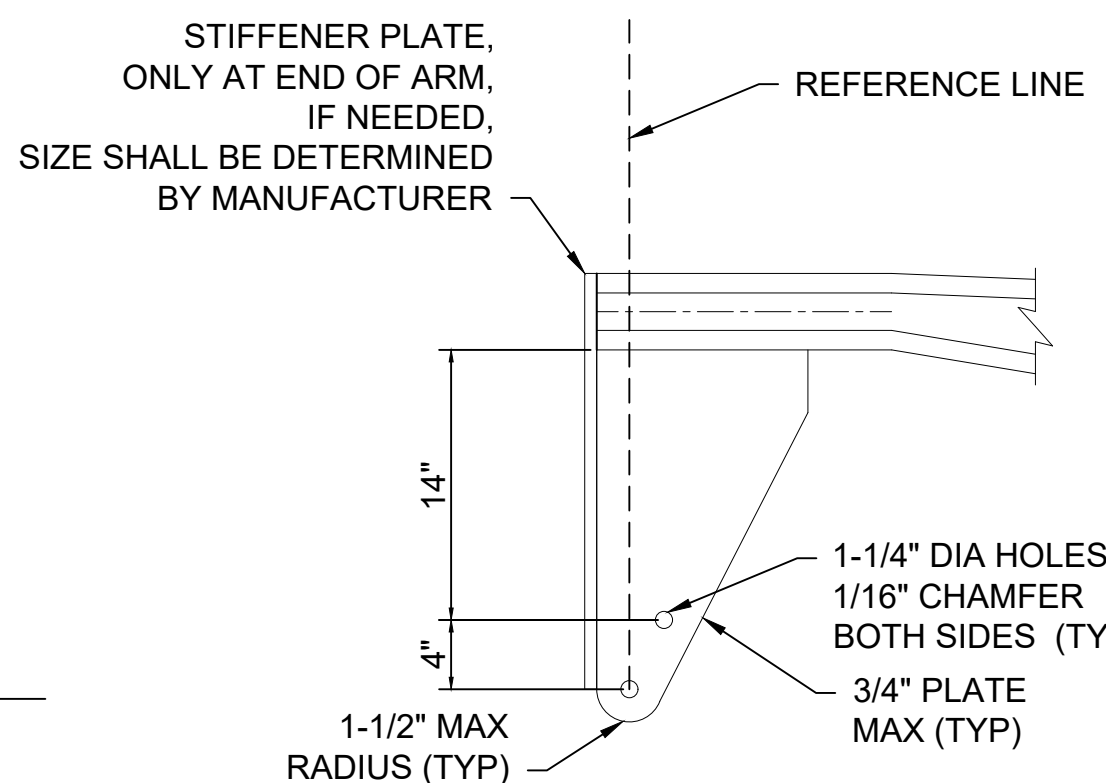
ELEVATION



LOAD TREE



SECTION



DETAIL

LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR (KIPS)			OPGW (KIPS)			W (PSF)	REMARKS
			Vc	Tc	Lc	Vs	Ts	Ls		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.10 WIND: 2.50	7.8	4.5	0.0	3.8	3.0	0.0	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	4.4	5.7	0.0	2.0	2.5	0.0	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	10.3	3.1	0.0	6.2	2.3	0.0	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	10.3	0.9	0.0	6.2	0.5	0.0	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	2.7	0.9	0.0	1.2	0.2	0.0	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	11.5	1.6	1.0	4.2	0.5	0.5	3.0	SEE NOTES
7	UNEQUAL ICE (1.0" / 0.5" ICE, NO WIND, 15°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	7.1	1.3	4.9	4.1	0.4	4.8	0.0	SEE NOTES
8	BROKEN WIRE (NO ICE, 12.5 PSF WIND, 0°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	3.5	0.9	0.0	1.3	0.1	0.0	12.5	SEE NOTES

STRUCTURE DESIGN CRITERIA
STR. TYPE: 161kV H-FRAME TANGENT 0-2°
CONDUCTOR: (3) 1027 KCMIL AECC - TS "GOULD"
OPGW: (2) AFL DNO-12806

MAX INITIAL TENSION
NESC HEAVY (LBS)
18,500
9,300

ANGLE
0-2°
0-2°

WIND SPAN
(FT)
1,900
1,900

WEIGHT SPAN
(FT)
2,500
2,500

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. ALL WIRES INSTALLED AS SHOWN.
B. ONE (1) CONDUCTOR WIRE BROKEN.
C. FOR LOAD CASE 8 ONLY, ALL WIRES ATTACHED WITH A LONGITUDINAL LOAD (Lc) OF 11.3 KIPS ON ANY SINGLE CONDUCTOR ATTACHMENT POSITION WHICH MAY GOVERN.
D. FOR LOAD CASE 8 ONLY, ALL WIRES ATTACHED WITH A LONGITUDINAL LOAD (Ls) OF 3.6 KIPS ON ANY SINGLE SHIELD WIRE ATTACHMENT POSITION WHICH MAY GOVERN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 5% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE BASEPLATE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS.
- MID-ARM VANG SHALL BE PLACED DIRECTLY ABOVE V-STRING LOAD POINT. MID-ARM VANG SHALL BE DESIGNED FOR CONSTRUCTION LOADING (LOAD CASE 6). MID-ARM VANG LOADS SHALL NOT BE APPLIED CONCURRENTLY WITH LOADS APPLIED TO INSULATOR V-STRING ASSEMBLY.
- STRUCTURE CROSSARMS SHALL BE DESIGNED TO BE HORIZONTAL WITH NO RISE UNDER NORMAL CONDITIONS (LOAD CASE 5).
- STRUCTURE SEGMENTS SHALL BE JOINED USING SLIP-JOINT CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

STRUCTURE ORDER TABLE: TP-03		
POLE LENGTH (FT)	STRUCTURE NUMBER	QTY
100	35	1
145	86	1
175	36	1
190	38, 39, 87	3

REFERENCE DRAWINGS

DRAWING #
DTL-01
BC-8809-1
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
V-STRING HARDWARE DETAIL
STRUCTURE MATERIAL ASSEMBLY LIST

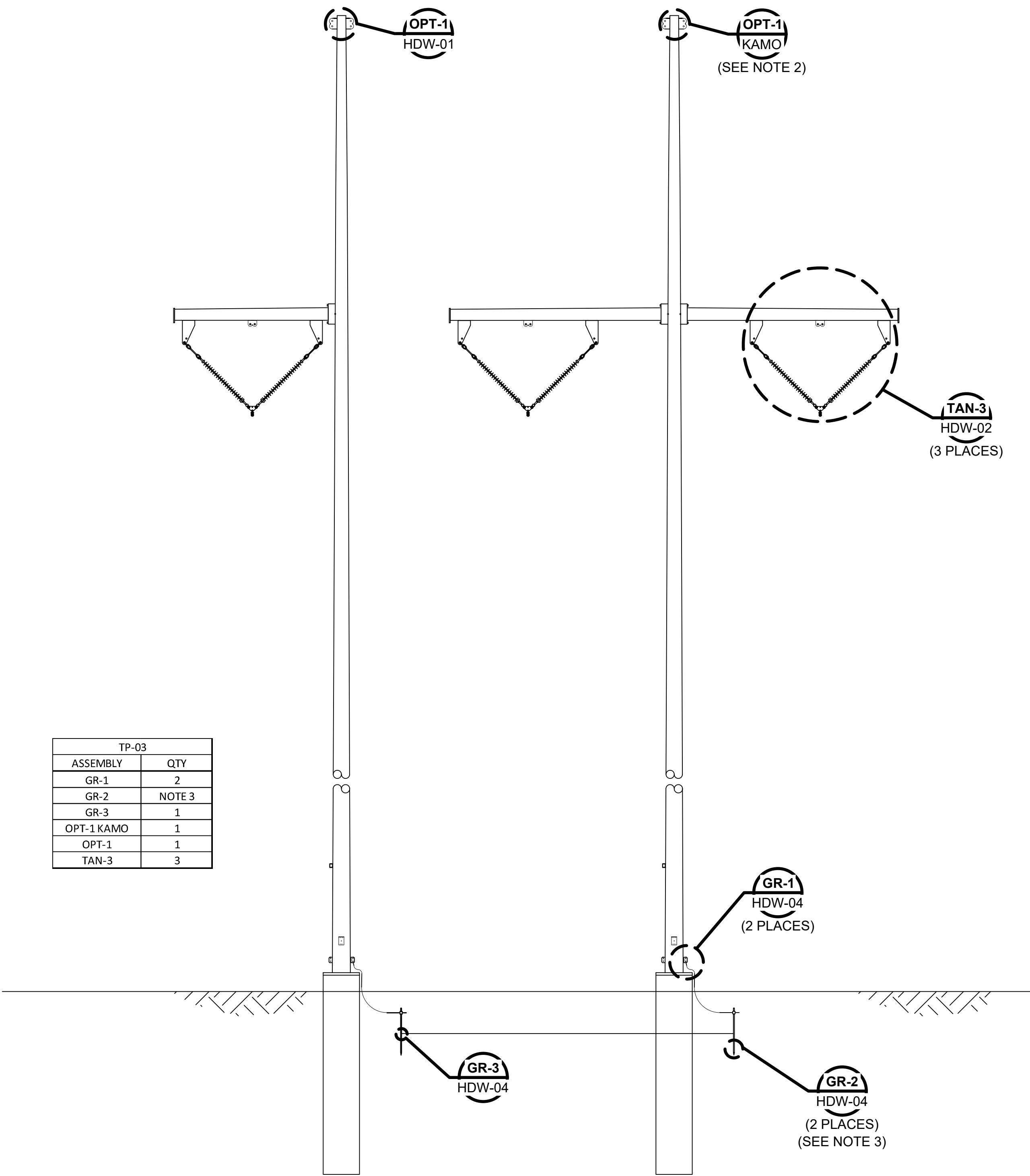
						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV			
						161kV SINGLE CIRCUIT 0° - 2° TANGENT STEEL 2-POLE SHEET 1			
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
						CH: H. DROLLETT DATE: 06/24/2026			
						DRAWING No. REV. TP-03 0			
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD				
NO.	DATE	DESCRIPTION	BY	CHK	APP				

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES

**BURNS
MCDONNELL**
OK CERT. OF AUTH. NO. 421

COPYRIGHT © 2026 BURNS & MCDONNELL ENGINEERING COMPANY, INC.

TP-03



NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



OK CERT. OF AUTH. NO. 421

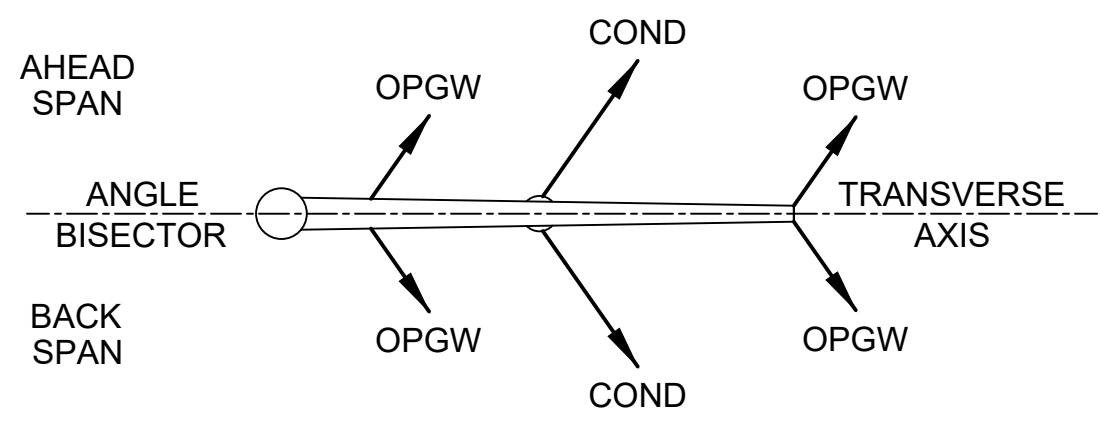
REFERENCE DRAWINGS

DRAWING #
DTL-01
BC-8809-1
MAT-01

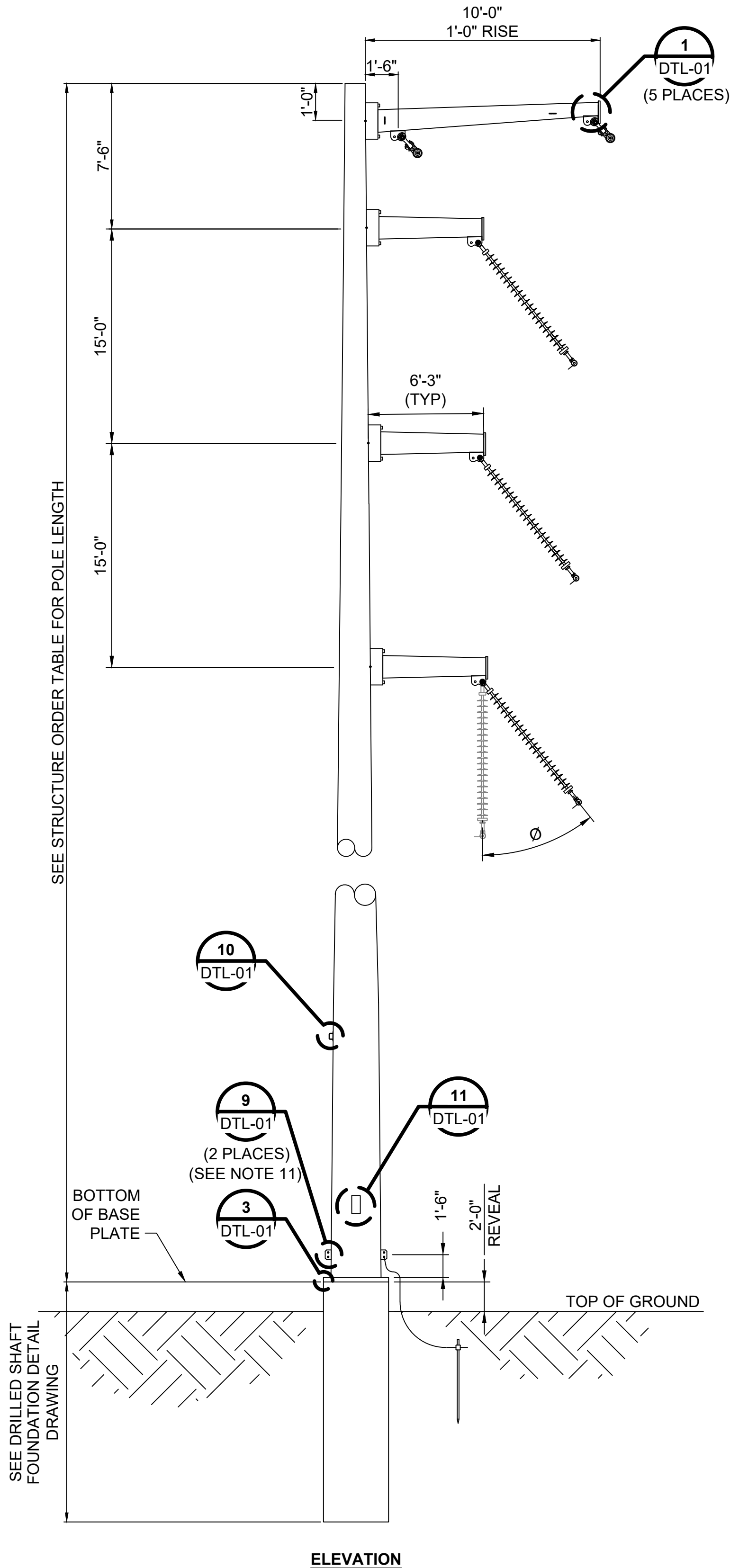
DRAWING NAME:
STRUCTURE DETAILS
V-STRING HARDWARE DETAIL
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV 161kV SINGLE CIRCUIT 0° – 2° TANGENT STEEL 2-POLE SHEET 2				
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT	
								DRAWING No.	REV.	
									TP-03	0
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD					
NO.	DATE	DESCRIPTION	BY	CHK	APP					

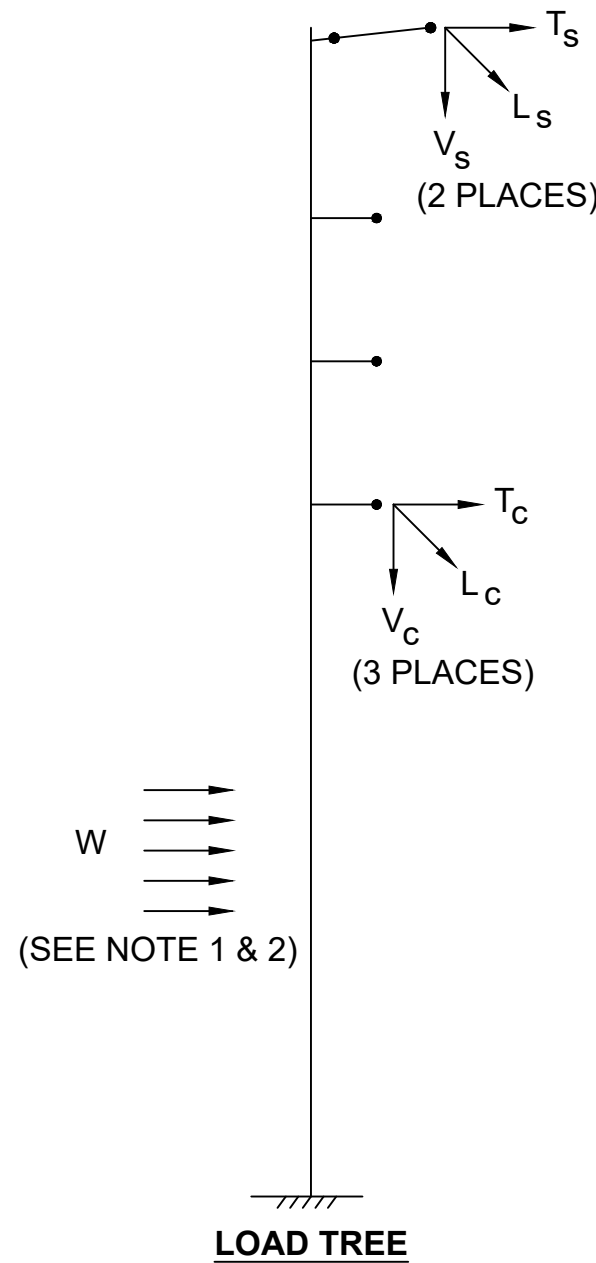
COPYRIGHT © 2025 BURNS & McDONNELL ENGINEERING COMPANY, INC.



PLAN VIEW



ELEVATION



RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR (KIPS)			OPGW (KIPS)			W (PSF)	REMARKS
			Vc	Tc	Lc	Vs	Ts	LS		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.10 WIND: 2.50	3.3	15.5	0.0	1.6	8.6	0.0	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	1.6	9.7	0.0	0.7	4.7	0.0	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	4.2	13.0	0.0	2.5	7.6	0.0	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	4.2	11.8	0.0	2.5	6.6	0.0	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	1.2	4.5	0.0	0.5	1.9	0.0	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	5.3	8.1	1.0	2.3	3.2	0.5	3.0	SEE NOTES
7	BROKEN WIRE (NO ICE, 12.5 PSF WIND, 0°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	0.4	1.6	0.0	1.0	4.0	0.0	12.5	SEE NOTES

STRUCTURE DESIGN CRITERIA
STR. TYPE: 161KV MONOPOLE RUNNING ANGLE, 5-45°
CONDUCTOR: (3) 795 KCMIL ACSR "DRAKE"
OPGW: (2) AFL DNO-12606

MAX INITIAL TENSION
NESC HEAVY (LBS)
11,000
6,000

ANGLE
5-45°
5-45°

WIND SPAN
(FT)
800
800

WEIGHT SPAN
(FT)
900
900

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. ALL WIRES INSTALLED AS SHOWN.
B. FOR LOAD CASE 7 ONLY, ALL WIRES ATTACHED WITH A LONGITUDINAL LOAD (Lc) OF 2.3 KIPS ON ANY SINGLE CONDUCTOR ATTACHMENT POSITION WHICH MAY GOVERN.
C. FOR LOAD CASE 7 ONLY, ALL WIRES ATTACHED WITH A LONGITUDINAL LOAD (Ls) OF 2.1 KIPS ON ANY SINGLE SHIELD WIRE ATTACHMENT POSITION WHICH MAY GOVERN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 10% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE BASEPLATE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS.
- STRUCTURE SEGMENTS SHALL BE JOINED USING SLIP-JOINT CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

STRUCTURE ORDER TABLE: TP-04		
POLE LENGTH (FT)	STRUCTURE NUMBER	QTY
100	3, 7, 69	3

5-45° RUNNING ANGLE INSULATOR SWING TABLE		
WEATHER CASE	CLEARANCE	THETA
NO WIND	5'-0"	-7
NESC 6 PSF WIND	2'-11"	-21
EXTREME 21 PSF WIND	1'-2"	-36

REFERENCE DRAWINGS

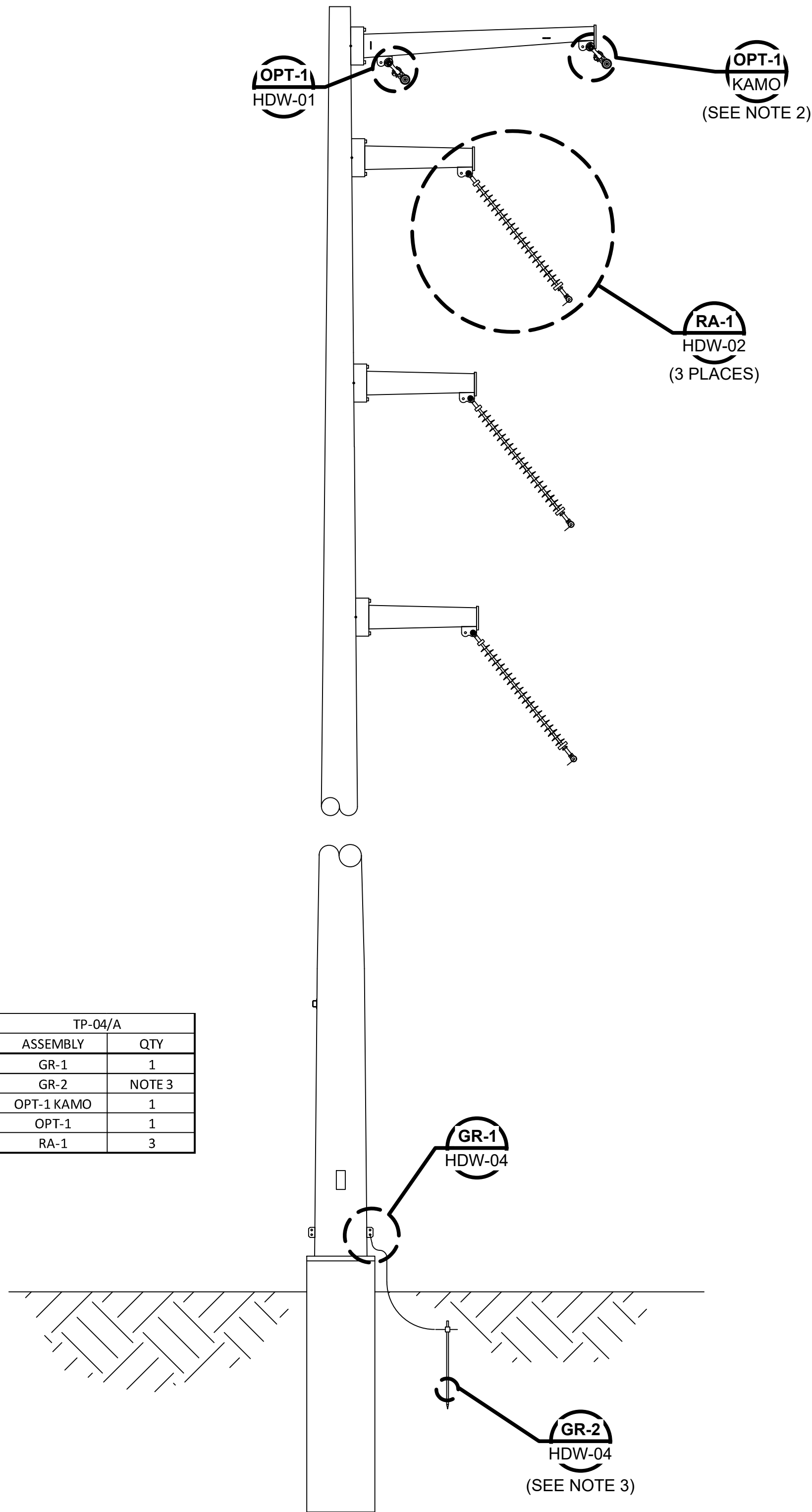
DRAWING #
DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV 161kV SINGLE CIRCUIT 5° – 45° VERTICAL SUSPENSION STEEL POLE SHEET 1			
SCALE: NONE		DRAWN BY: W. BOLING		ENGR: E. BARBIN		APPD: H. DROLLETT			
0		06/24/2026		ISSUED FOR BID		WCB		HCD	
NO.		DATE		DESCRIPTION		BY		CHK	

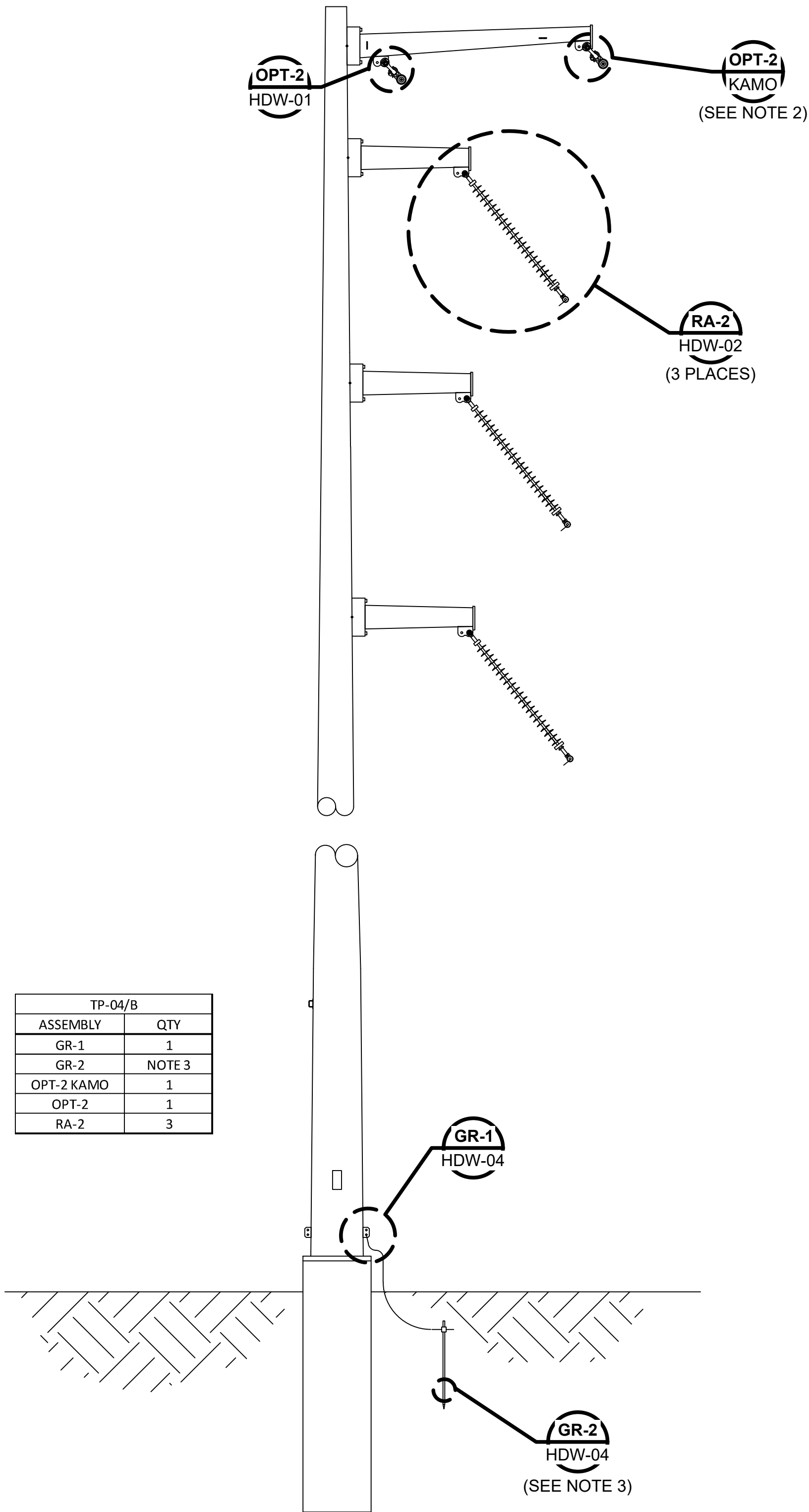
COPYRIGHT © 2025 BURNS & MCDONNELL ENGINEERING COMPANY, INC.

TP-04/A
STR # 7, 69



TP-04/A	
ASSEMBLY	QTY
GR-1	1
GR-2	NOTE 3
OPT-1 KAMO	1
OPT-1	1
RA-1	3

TP-04/B
STR # 3



TP-04/B	
ASSEMBLY	QTY
GR-1	1
GR-2	NOTE 3
OPT-2 KAMO	1
OPT-2	1
RA-2	3

NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34658
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



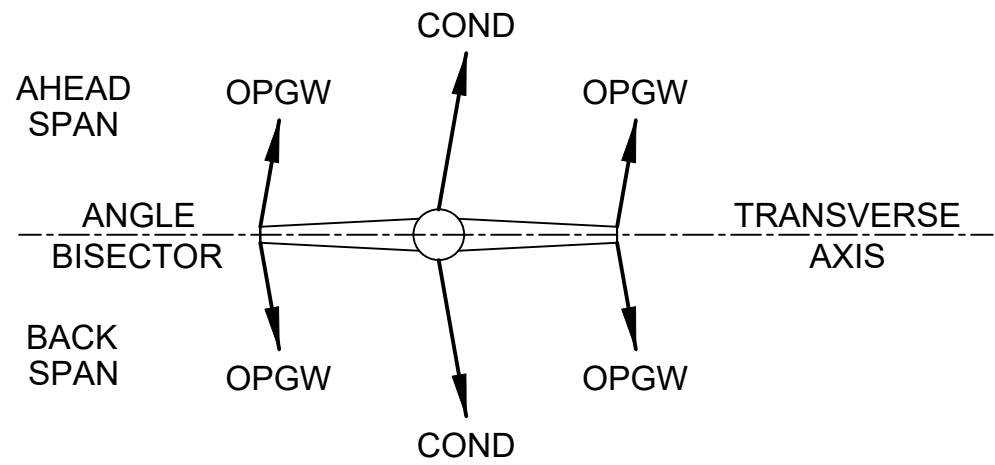
OK CERT. OF AUTH. NO. 421

REFERENCE DRAWINGS

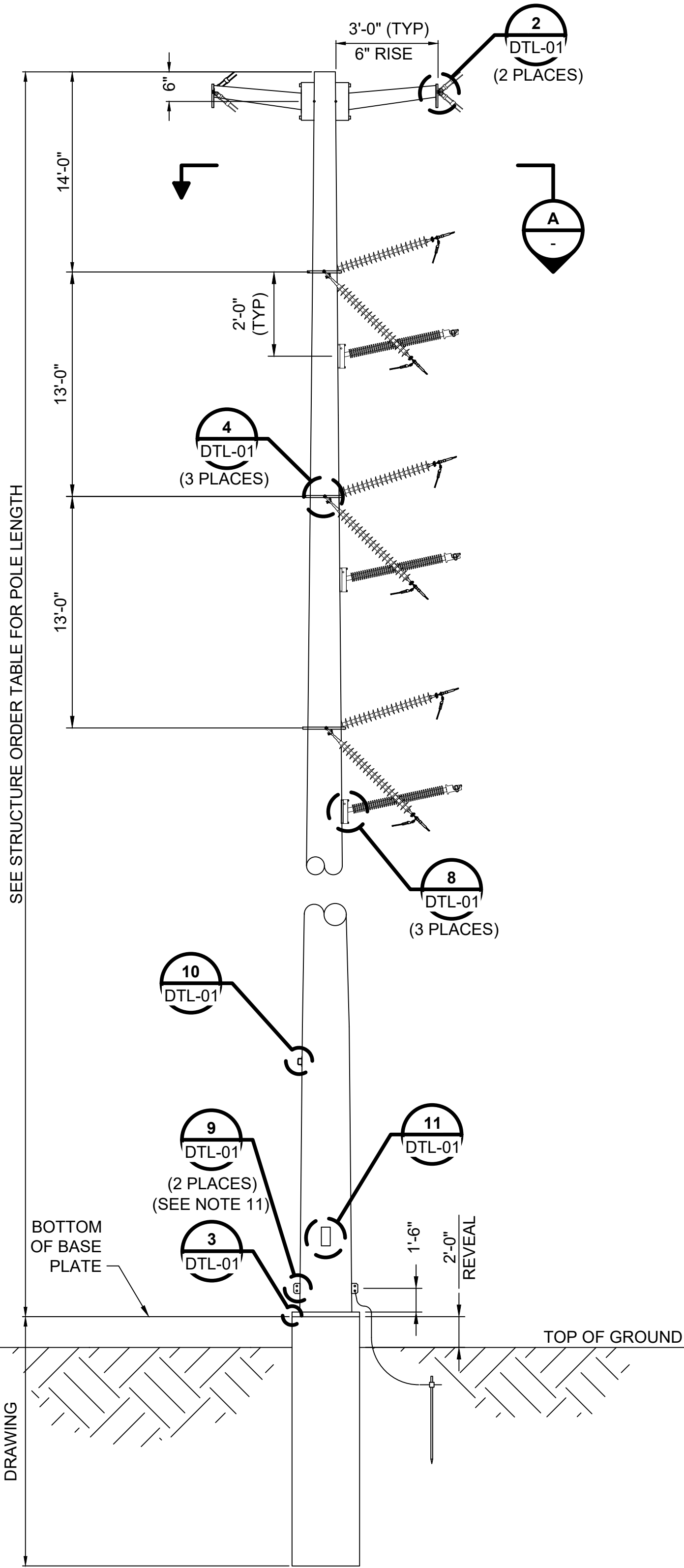
DRAWING #
DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

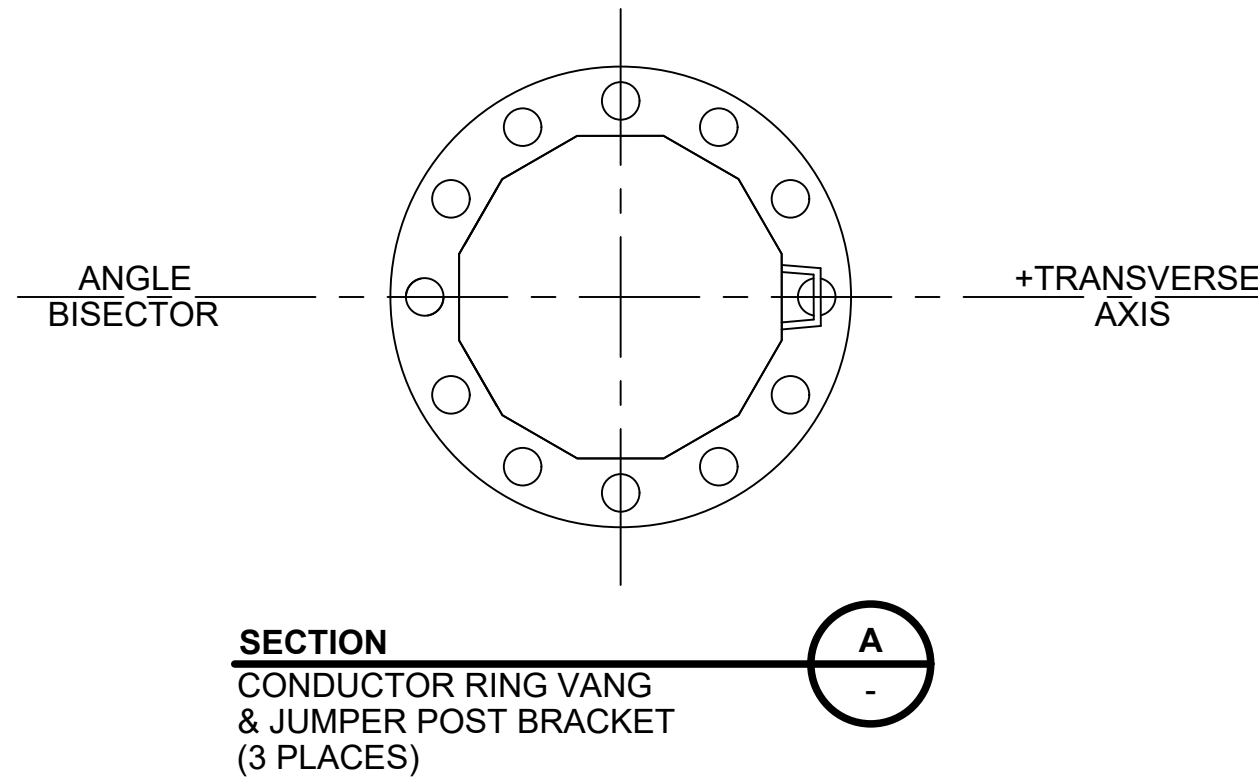
						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161KV		
						161KV SINGLE CIRCUIT 5" - 45" VERTICAL SUSPENSION STEEL POLE SHEET 2		
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN
						CH: H. DROLLETT		DATE: 06/24/2026
						DRAWING No. REV. TP-04 0		
						GRDA GRAND RIVER DAM AUTHORITY P.O. BOX 409 VINITA, OK 74301		
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD			
NO.	DATE	DESCRIPTION	BY	CHK	APP			



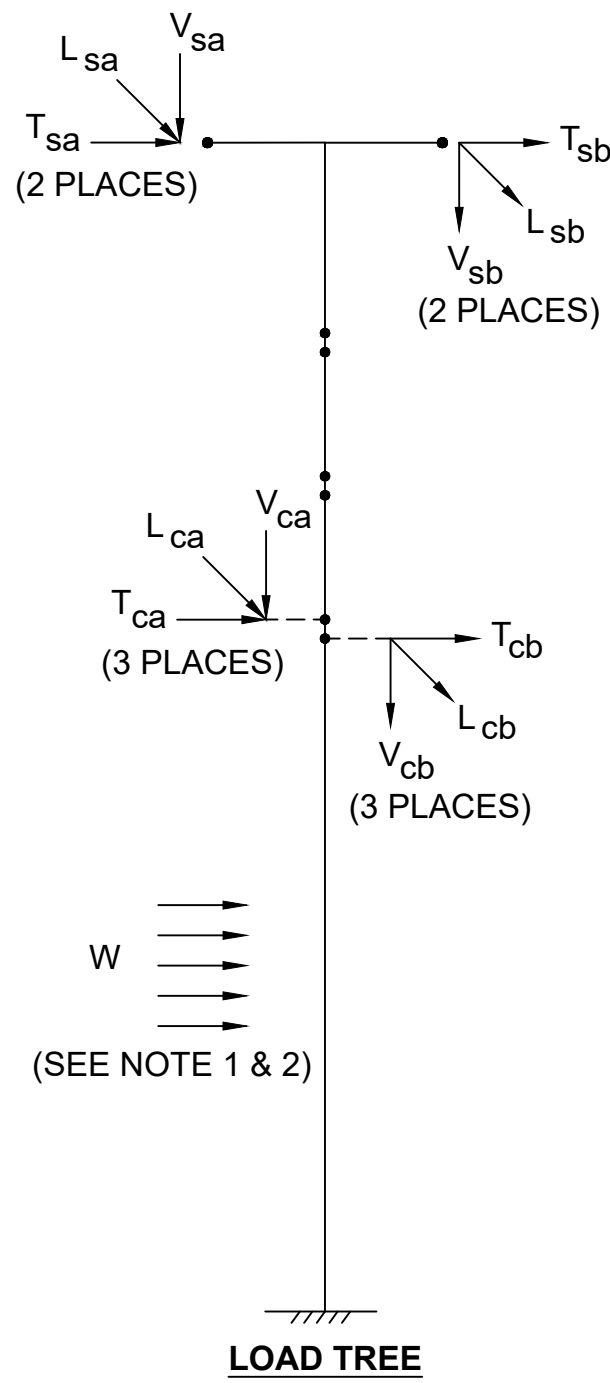
PLAN VIEW



ELEVATION



SECTION
CONDUCTOR RING VANG
& JUMPER POST BRACKET
(3 PLACES)



LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR AHEAD (KIPS)			CONDUCTOR BACK (KIPS)			OPGW AHEAD (KIPS)			OPGW BACK (KIPS)			W (PSF)	REMARKS
			Vca	Tca	Lca	Vcb	Tcb	Lcb	Vsa	Tsa	Lsa	Vsb	Tsb	Lsb		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.65 WIND: 2.50	2.7	4.1	-18.4	2.7	4.1	18.4	1.3	2.9	-12.9	1.3	2.9	12.9	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	1.1	3.1	-9.9	1.1	3.1	9.9	0.4	1.7	-6.0	0.4	1.7	6.0	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	3.4	3.4	-15.8	3.4	3.4	15.8	2.0	2.6	-11.8	2.0	2.6	11.8	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	3.4	2.7	-15.4	3.4	2.7	15.4	2.0	2.0	-11.3	2.0	2.0	11.3	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	1.0	1.1	-6.1	1.0	1.1	7.1	0.4	0.6	-3.0	0.4	0.6	4.0	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	5.5	2.2	-11.7	1.9	2.2	11.7	2.4	0.9	-4.8	1.0	0.9	4.8	3.0	SEE NOTES

STRUCTURE DESIGN CRITERIA
STR. TYPE: 161KV MONOPOLE DEADEND, 0-30°
CONDUCTOR AHEAD: (3) 795 KCMIL ACSR "DRAKE"
CONDUCTOR BACK: (3) 795 KCMIL ACSR "DRAKE"
OPGW AHEAD: (2) AFL DNO-12606
OPGW BACK: (2) AFL DNO-12606

MAX INITIAL TENSION
NESC HEAVY (LBS)

ANGLE

WIND SPAN
(FT)

WEIGHT SPAN
(FT)

11,000	0-30°	500	800
11,000	0-30°	500	800
7,800	0-30°	500	800
7,800	0-30°	500	800

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. ALL WIRES ATTACHED.
B. ALL WIRES AHEAD ONLY.
C. ALL WIRES BACK ONLY.
D. ALL COMBINATIONS OF AHEAD AND BACK WIRES THAT MAY GOVERN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 10% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE BASEPLATE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS.
- STRUCTURE SEGMENTS SHALL BE JOINED USING SLIP-JOINT CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

STRUCTURE ORDER TABLE: TP-05		
POLE LENGTH (FT)	STRUCTURE NUMBER	QTY
80	2, 44, 60	3
95	65, 67, 109	3
105	13	1

REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

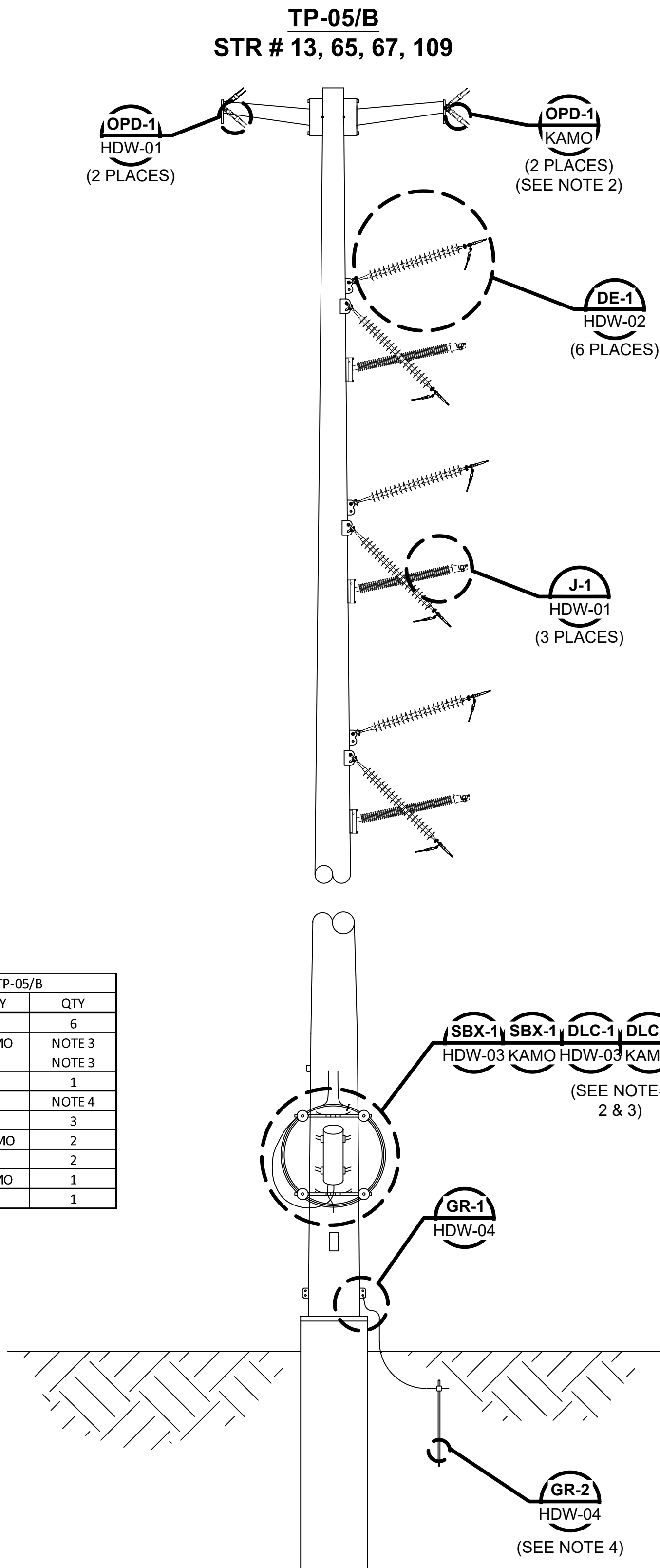
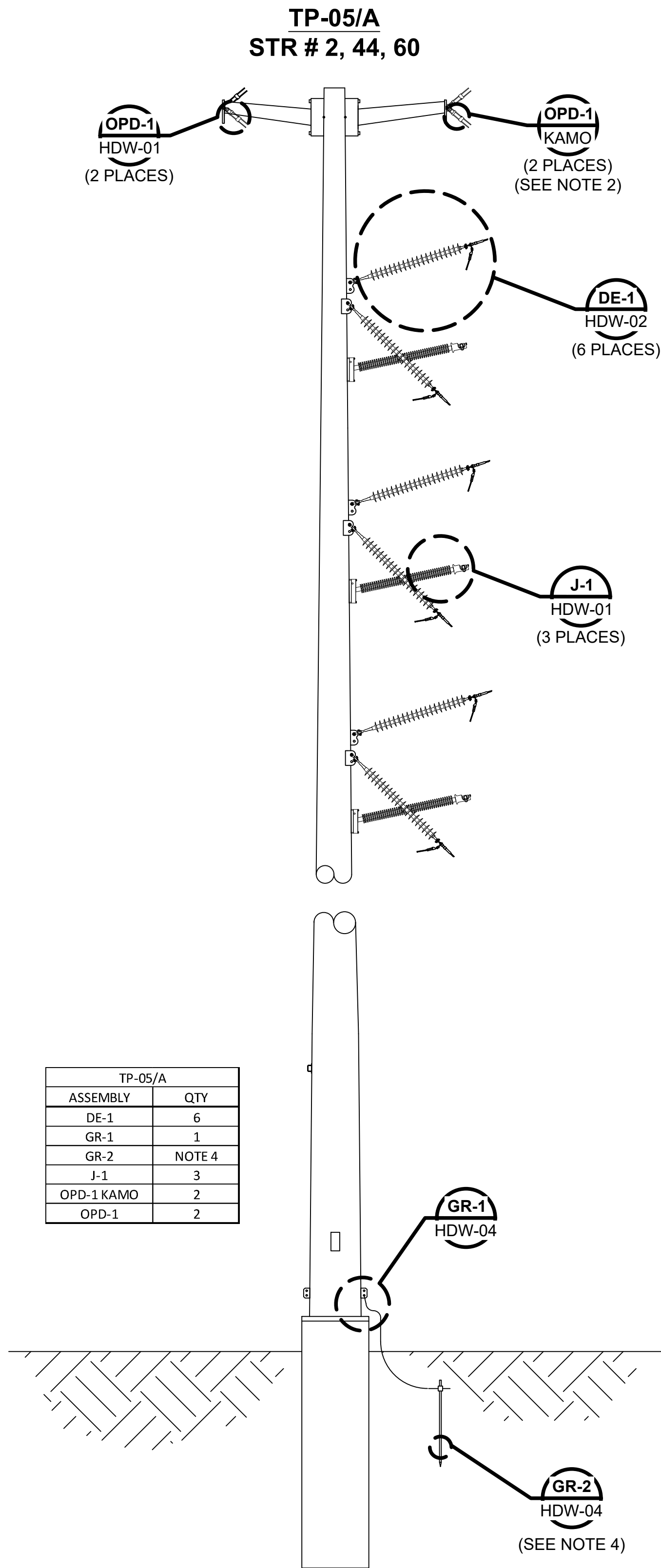
DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161KV 161KV SINGLE CIRCUIT 0° - 30° VERTICAL DEADEND STEEL POLE SHEET 1			
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
						CH: H. DROLLETT DATE: 06/24/2026			
						DRAWING No. REV. TP-05 0			
						GRDA GRAND RIVER DAM AUTHORITY P.O. BOX 409 VINETA, OK 74301			

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES

**BURNS
MCDONNELL**
OK CERT. OF AUTH. NO. 421

COPYRIGHT © 2025 BURNS & MCDONNELL ENGINEERING COMPANY, INC.



NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- REFER TO HDW-03 FOR DLC-1 DOWNLEAD CLAMP ASSEMBLY INSTALLATION GUIDELINES.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



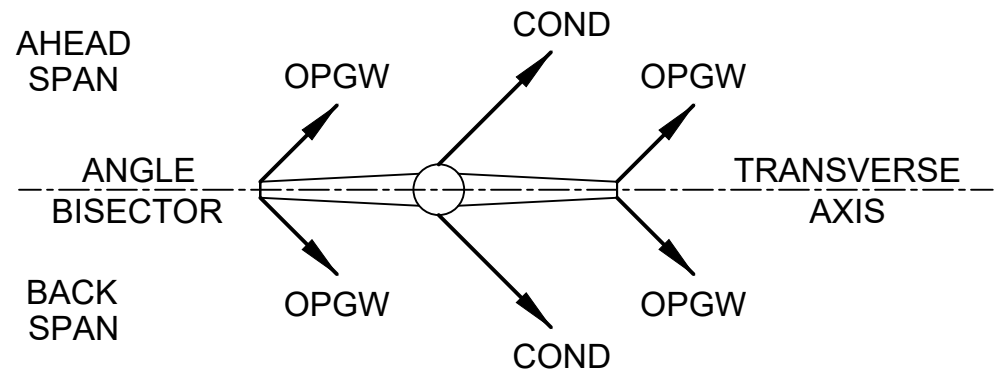
OK CERT. OF AUTH. NO. 421

REFERENCE DRAWINGS

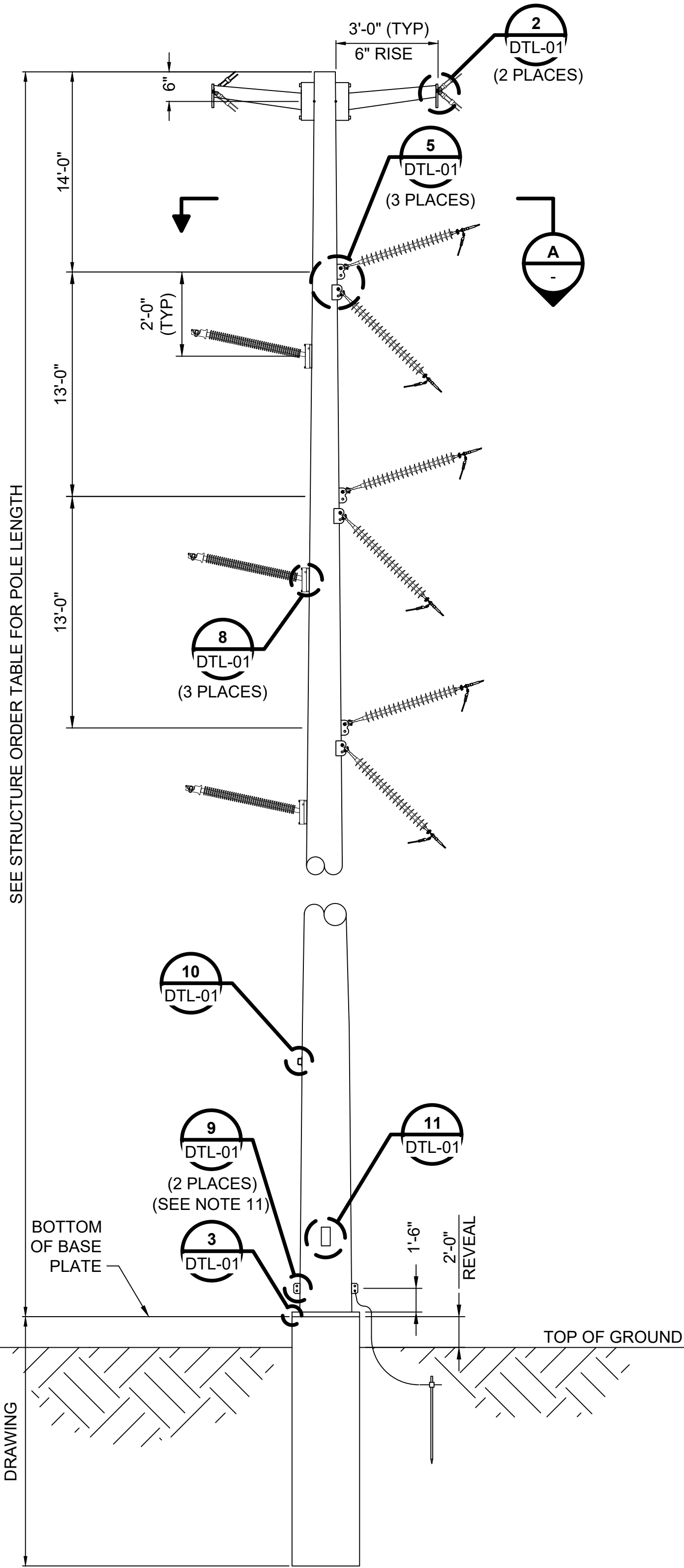
DRAWING #
DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

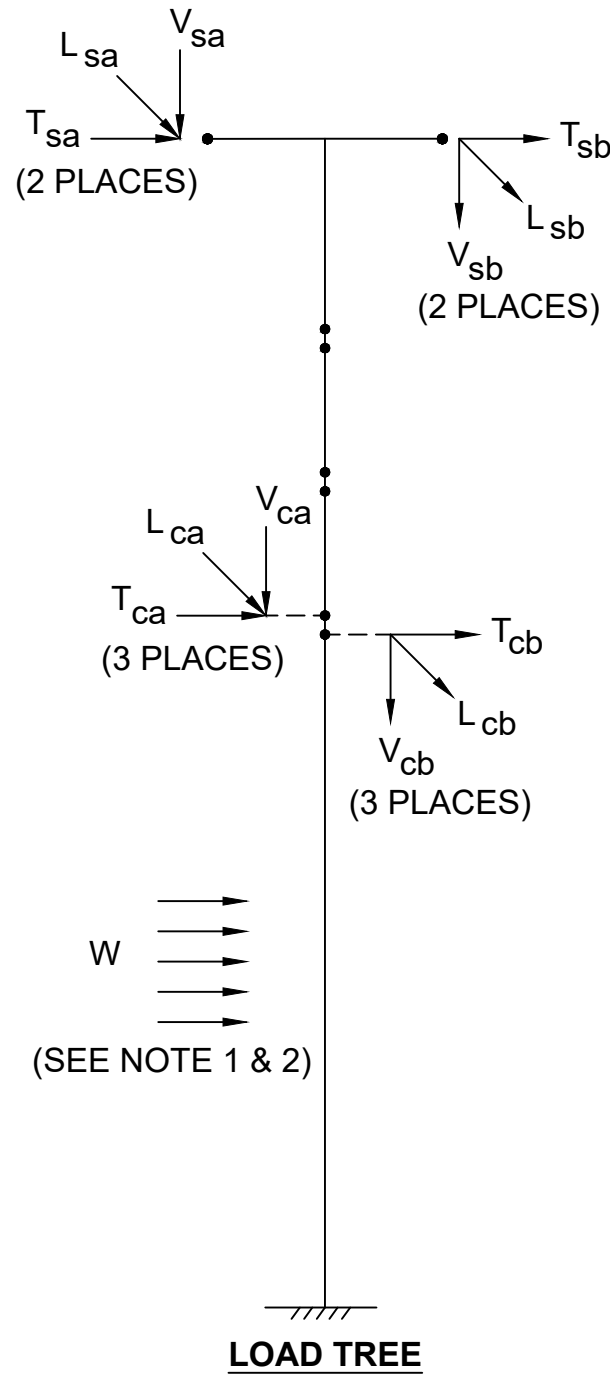
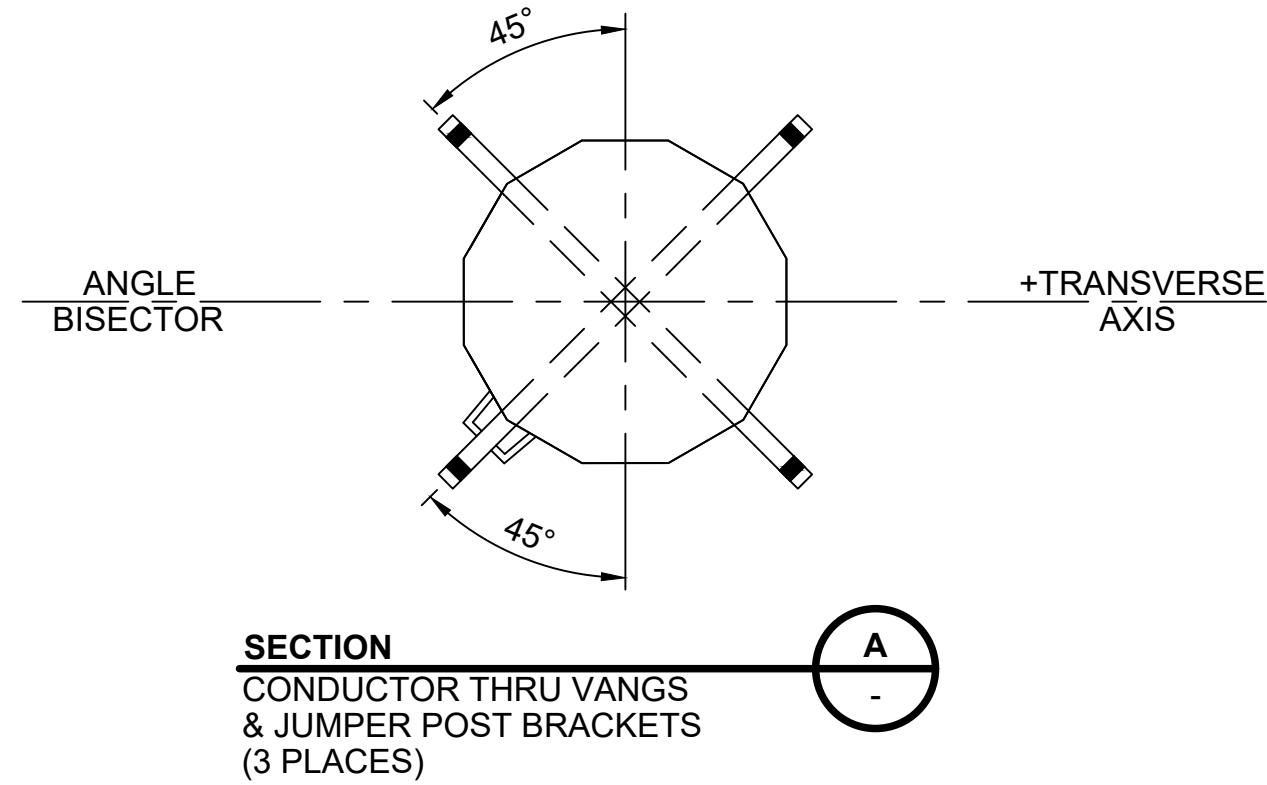
						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161KV		
						161KV SINGLE CIRCUIT 0° - 30° VERTICAL DEADEND STEEL POLE SHEET 2		
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN
						APPD: H. DROLLETT		
						CH: H. DROLLETT		
						DATE: 06/24/2026		
						DRAWING No. TP-05		
						REV. 0		
						GRDA GRAND RIVER DAM AUTHORITY P.O. BOX 409 VINITA, OK 74301		



PLAN VIEW



ELEVATION



LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR AHEAD (KIPS)			CONDUCTOR BACK (KIPS)			OPGW AHEAD (KIPS)			OPGW BACK (KIPS)			W (PSF)	REMARKS
			Vca	Tca	Lca	Vcb	Tcb	Lcb	Vsa	Tsa	Lsa	Vsb	Tsb	Lsb		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.65 WIND: 2.50	1.8	14.1	-13.6	1.8	14.1	13.6	0.8	7.6	-7.2	0.8	7.6	7.2	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	0.7	7.9	-7.1	0.7	8.1	7.4	0.3	4.0	-3.6	0.3	4.0	3.6	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	2.2	11.3	-10.9	2.2	12.1	11.7	1.3	6.8	-6.5	1.3	6.8	6.5	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	2.2	10.7	-10.7	2.2	11.4	11.4	1.3	6.3	-6.3	1.3	6.3	6.3	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	0.7	4.3	-4.3	0.7	4.3	4.3	0.2	1.8	-1.8	0.2	1.8	1.8	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	4.6	7.7	-7.6	1.4	7.7	7.6	2.0	3.1	-3.0	0.8	3.1	3.0	3.0	SEE NOTES

STRUCTURE DESIGN CRITERIA STR. TYPE: 161KV MONOPOLE DEADEND, 85-95° CONDUCTOR AHEAD: (3) 795 KCMIL ACSR "DRAKE" CONDUCTOR BACK: (3) 795 KCMIL ACSR "DRAKE" OPGW AHEAD: (2) AFL DNO-12606 OPGW BACK: (2) AFL DNO-12606	MAX INITIAL TENSION NESC HEAVY (LBS)		ANGLE		WIND SPAN (FT)		WEIGHT SPAN (FT)	
	11,000		85-95°		300		500	
	5,700		85-95°		300		500	
	5,700		85-95°		300		500	

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. ALL WIRES ATTACHED.
B. ALL WIRES AHEAD ONLY.
C. ALL WIRES BACK ONLY.
D. ALL COMBINATIONS OF AHEAD AND BACK WIRES THAT MAY GOVERN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 10% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE BASEPLATE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS.
- STRUCTURE SEGMENTS SHALL BE JOINED USING SLIP-JOINT CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

STRUCTURE ORDER TABLE: TP-06		
POLE LENGTH (FT)	STRUCTURE NUMBER	QTY
80	6	1

REFERENCE DRAWINGS

DRAWING # DTL-01
MAT-01

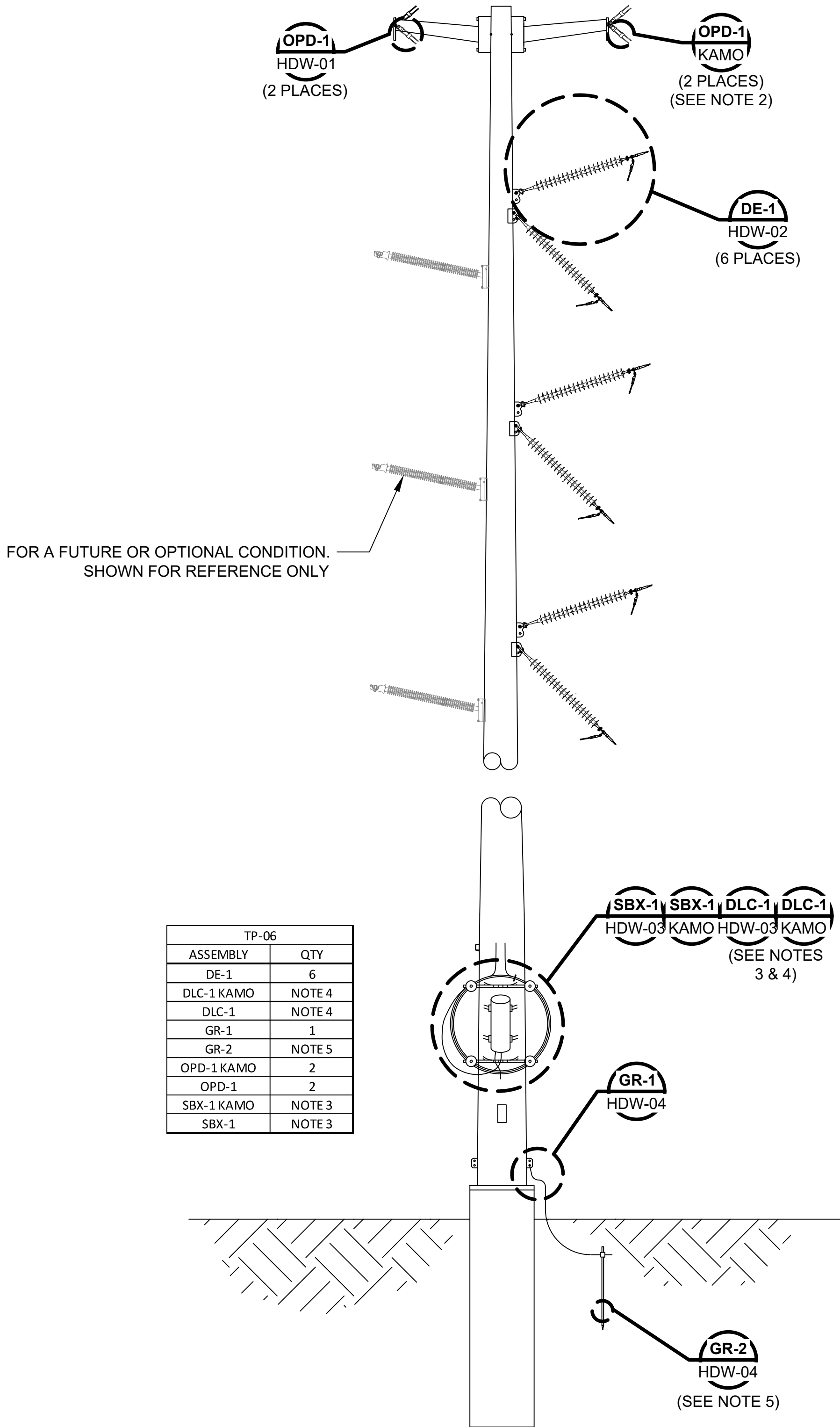
DRAWING NAME: STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV 161kV SINGLE CIRCUIT 85° – 95° VERTICAL DEADEND STEEL POLE SHEET 1							
						SCALE: NONE		DRAWN BY: W. BOLING		ENGR: E. BARBIN		APPD: H. DROLLETT	
										DRAWING No.		REV.	
										CH: H. DROLLETT		DATE: 06/24/2026	
										TP-06		0	

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES

**BURNS
MCDONNELL**
OK CERT. OF AUTH. NO. 421

TP-06



REFERENCE DRAWINGS

DRAWING # DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV			
						161kV SINGLE CIRCUIT 85° – 95° VERTICAL DEADEND STEEL POLE SHEET 2			
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
						CH: H. DROLLETT		DATE: 06/24/2026	
						DRAWING No.		REV.	
						TP-06		0	

NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- SPLICE BOX AND DOWNLEAD CLAMPS SHALL BE USED ONLY IF REQUIRED. SEE DRAWING RLS-01 FOR MORE INFORMATION.
- REFER TO HDW-03 FOR DLC-1 DOWNLEAD CLAMP ASSEMBLY INSTALLATION GUIDELINES.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES

**BURNS
MCDONNELL**
OK CERT. OF AUTH. NO. 421



- | STRUCTURE ORDER TABLE: TP-07 | | |
|------------------------------|---------------------|-----|
| POLE LENGTH
(FT) | STRUCTURE
NUMBER | QTY |
| 75 | 1, 42 | 2 |

REFERENCE DRAWINGS

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

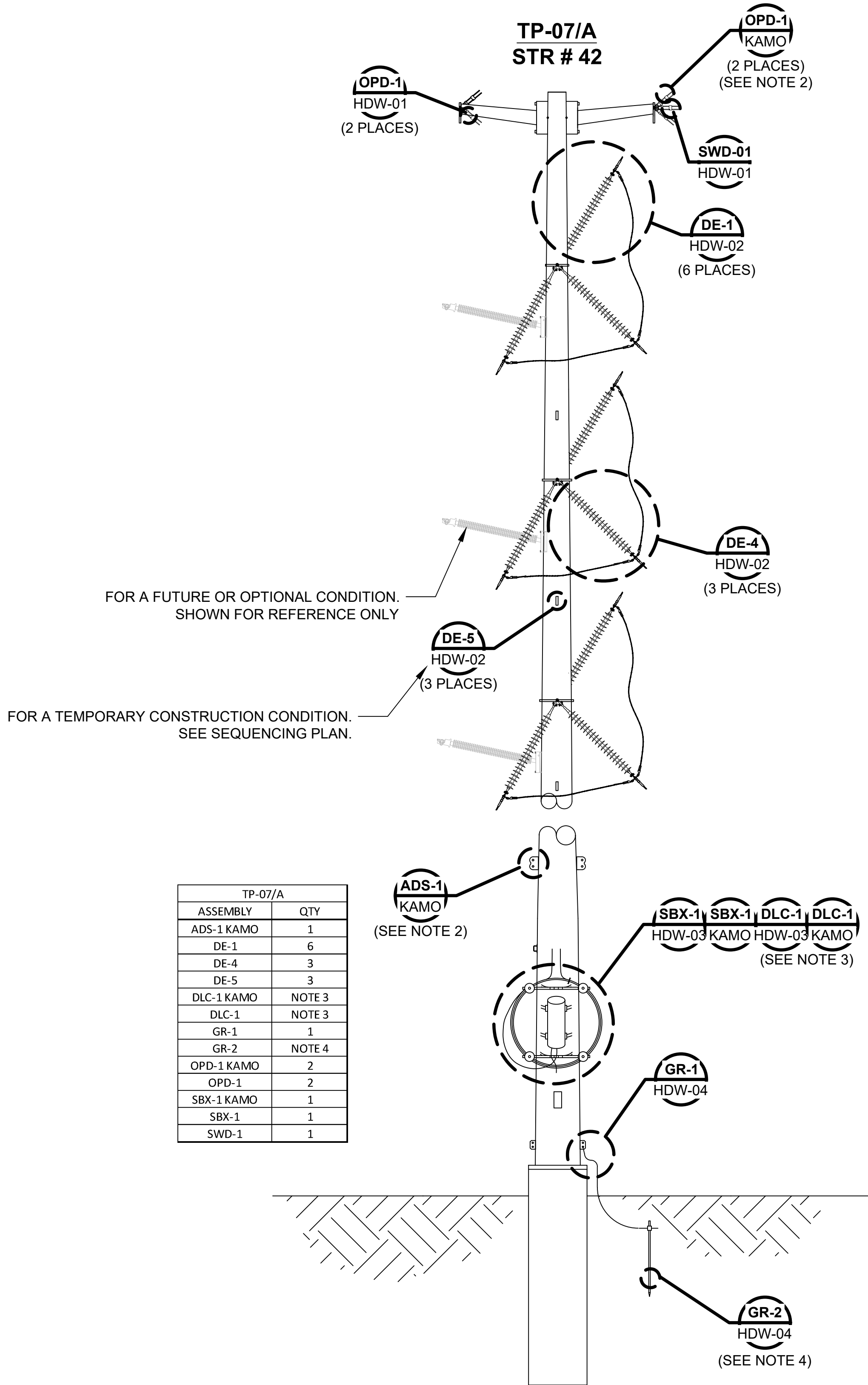
[illegible]

OK CERT. OF AUTH. NO. 421

OK CERT. OF AUTH. NO. 421

COPYRIGHT © 2025 BURNS & MCDONNELL ENGINEERING COMPANY, INC.

COPYRIGHT © 2025 BURNS & MCDONNELL ENGINEERING COMPANY, INC.



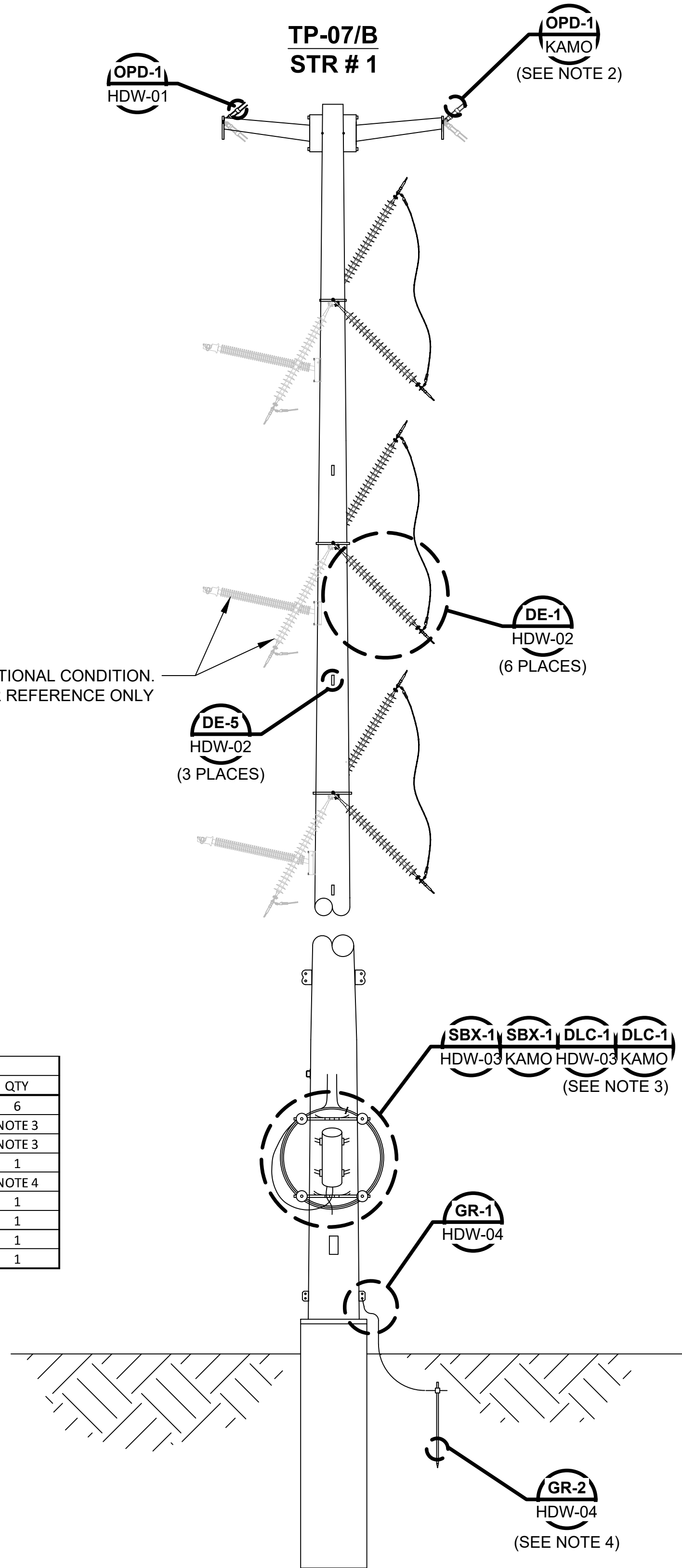
NOTES

1. FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
2. ASSEMBLY TO BE PROVIDED BY KAMO.
3. REFER TO HDW-03 FOR DLC-1 DOWNLEAD CLAMP ASSEMBLY INSTALLATION GUIDELINES.
4. GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



OK CERT. OF AUTH. NO. 421

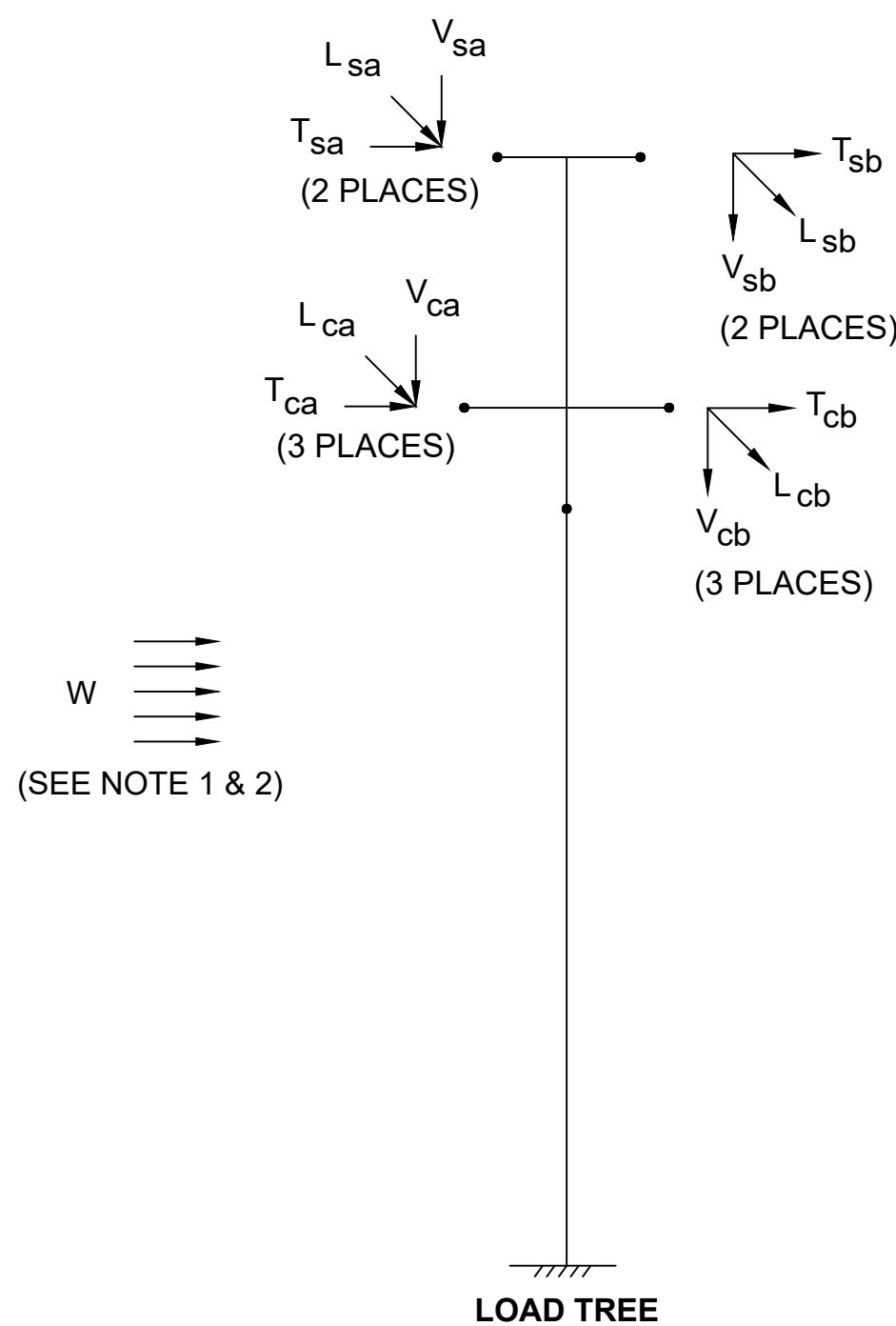
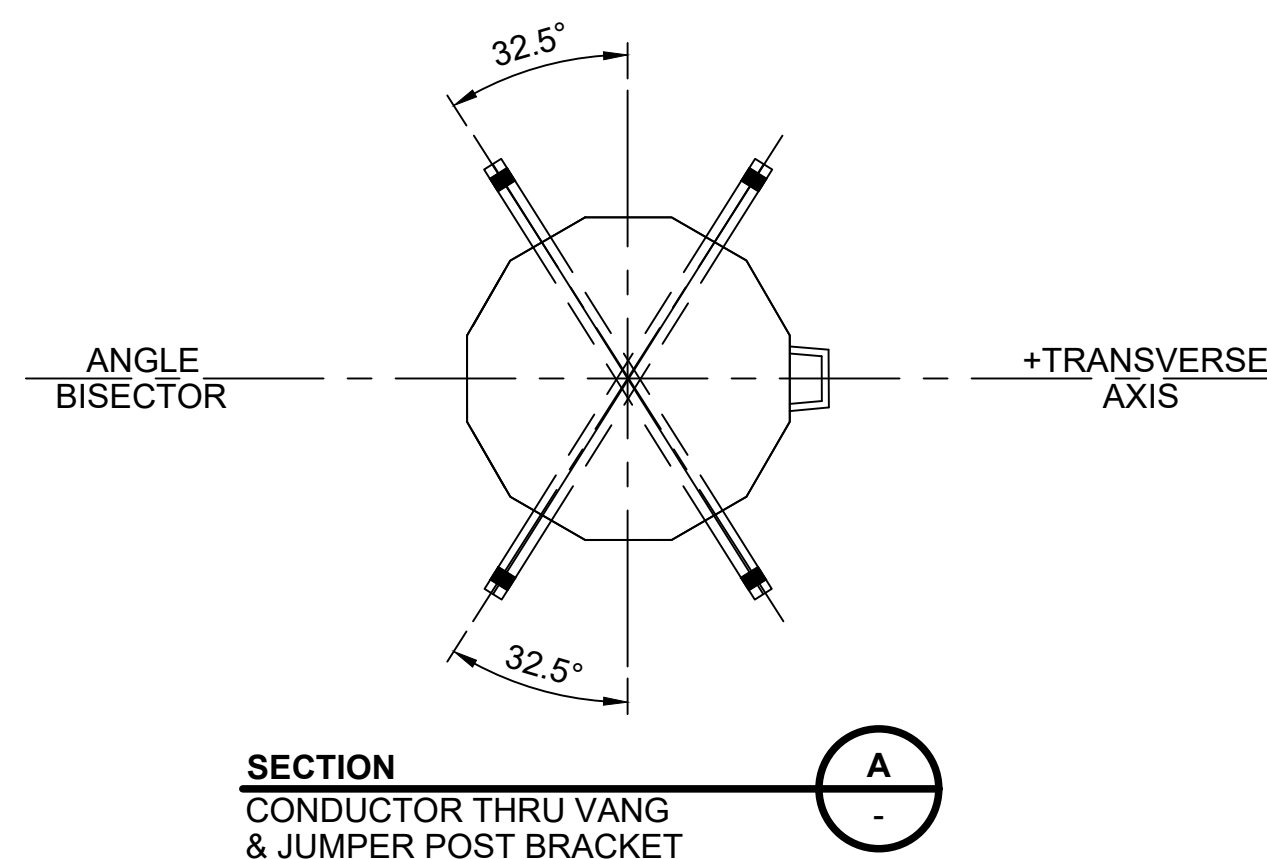


REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV		
						161kV SINGLE CIRCUIT 3-WAY DEADEND STEEL POLE SHEET 2		
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN
						APPD: H. DROLLETT		
						CH: H. DROLLETT		
						DATE: 06/24/2026		
						DRAWING No. REV.		
						TP-07 0		
						GRDA GRAND RIVER DAM AUTHORITY P.O. BOX 409 VINETA, OK 74301		
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD			
NO.	DATE	DESCRIPTION	BY	CHK	APP			



LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR AHEAD (KIPS)			CONDUCTOR BACK (KIPS)			OPGW AHEAD (KIPS)			OPGW BACK (KIPS)			W (PSF)	REMARKS
			Vca	Tca	Lca	Vcb	Tcb	Lcb	Vsa	Tsa	Lsa	Vsb	Tsb	Lsb		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.65 WIND: 2.50	2.3	12.1	-16.3	0.8	2.3	3.1	1.1	7.1	-9.4	0.3	1.3	1.7	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	1.0	7.2	-8.6	0.4	1.6	2.0	0.3	3.6	-4.4	0.1	0.8	0.9	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	3.0	10.6	-14.6	1.0	2.2	3.1	1.8	6.5	-8.8	0.5	1.3	1.7	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	3.0	9.8	-14.2	1.0	2.1	3.0	1.8	5.8	-8.4	0.5	1.1	1.6	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	0.8	3.6	-5.2	0.3	0.6	0.8	0.3	1.5	-2.2	0.1	0.3	0.4	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	4.8	6.4	-9.1	0.9	1.0	1.4	2.1	2.6	-3.6	0.6	0.4	0.6	3.0	SEE NOTES

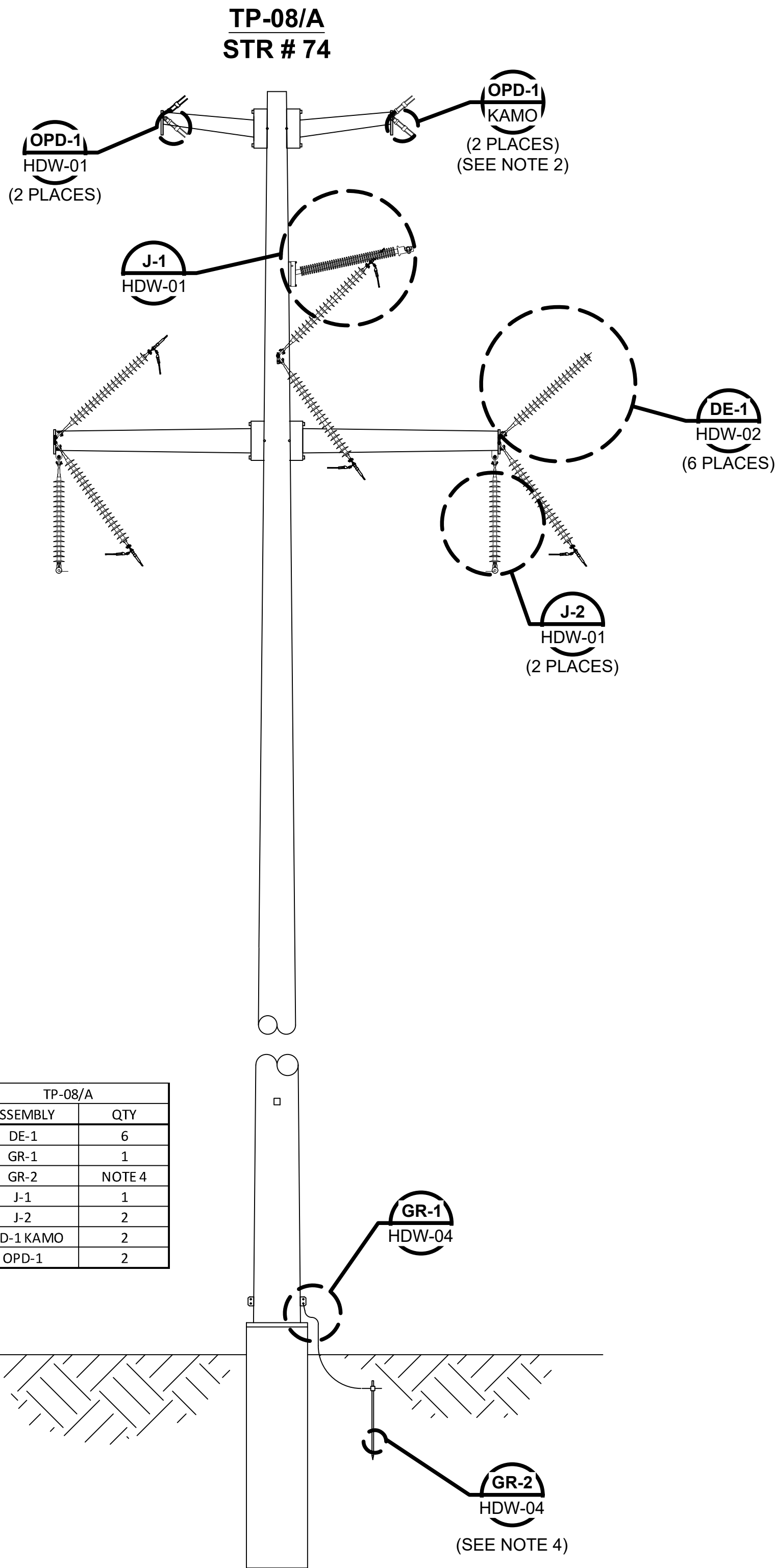
MAX INITIAL TENSION	ANGLE	WIND SPAN	WEIGHT SPAN
NESC HEAVY (LBS)		(FT)	(FT)
11,000	55-75°	500	700
2,000	55-75°	100	200
6,300	55-75°	500	700
1,000	55-75°	100	200

1. W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
2. INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
 - 1.1 = 12 SIDED
 - 1.4 = 8 SIDED
 - 1.6 = LATTICE AND FLAT SURFACES
3. STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
 - A. ALL WIRES ATTACHED.
 - B. ALL WIRES AHEAD ONLY.
 - C. ALL WIRES BACK ONLY.
 - D. ALL COMBINATIONS OF AHEAD AND BACK WIRES THAT MAY GOVERN.
4. V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
5. THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
6. CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
7. FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 10% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
8. FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
9. STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
10. STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
11. GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE BASEPLATE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS.
12. STRUCTURE SEGMENTS SHALL BE JOINED USING FLANGED CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

STRUCTURE ORDER TABLE: TP-08		
POLE LENGTH (FT)	STRUCTURE NUMBER	QTY
100	73, 74	2

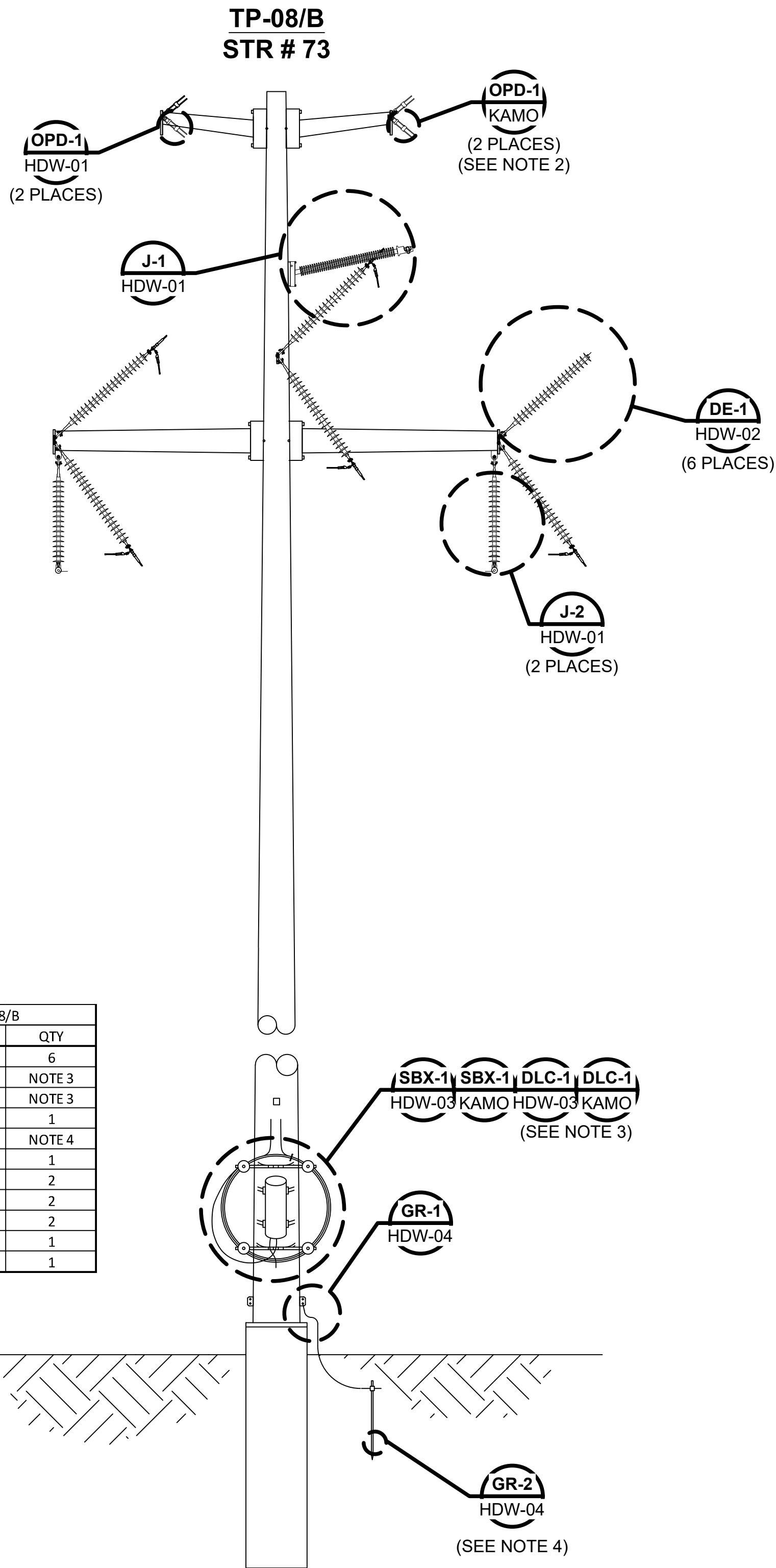
[illegible]

COPYRIGHT © 2025 BURNS & MCDONNELL ENGINEERING COMPANY, INC.



NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- REFER TO HDW-03 FOR DLC-1 DOWNLEAD CLAMP ASSEMBLY INSTALLATION GUIDELINES.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.



REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

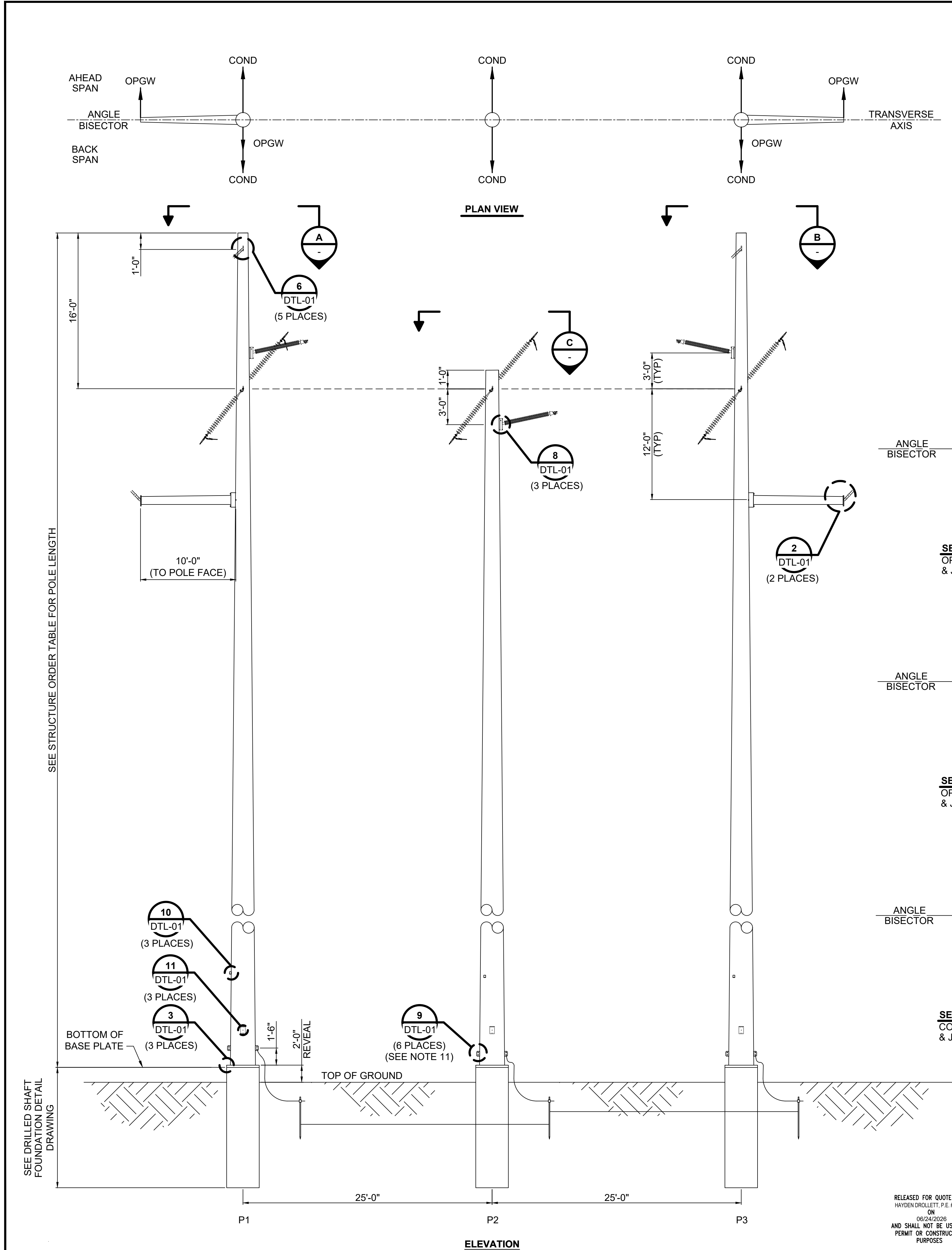
DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV			
						161kV SINGLE CIRCUIT 55° – 75° DEADEND STEEL POLE W/ HORIZONTAL ARMS SHEET 2			
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
						CH: H. DROLLETT		DATE: 06/24/2026	
						DRAWING No.		REV.	
						TP-08		0	

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



OK CERT. OF AUTH. NO. 421

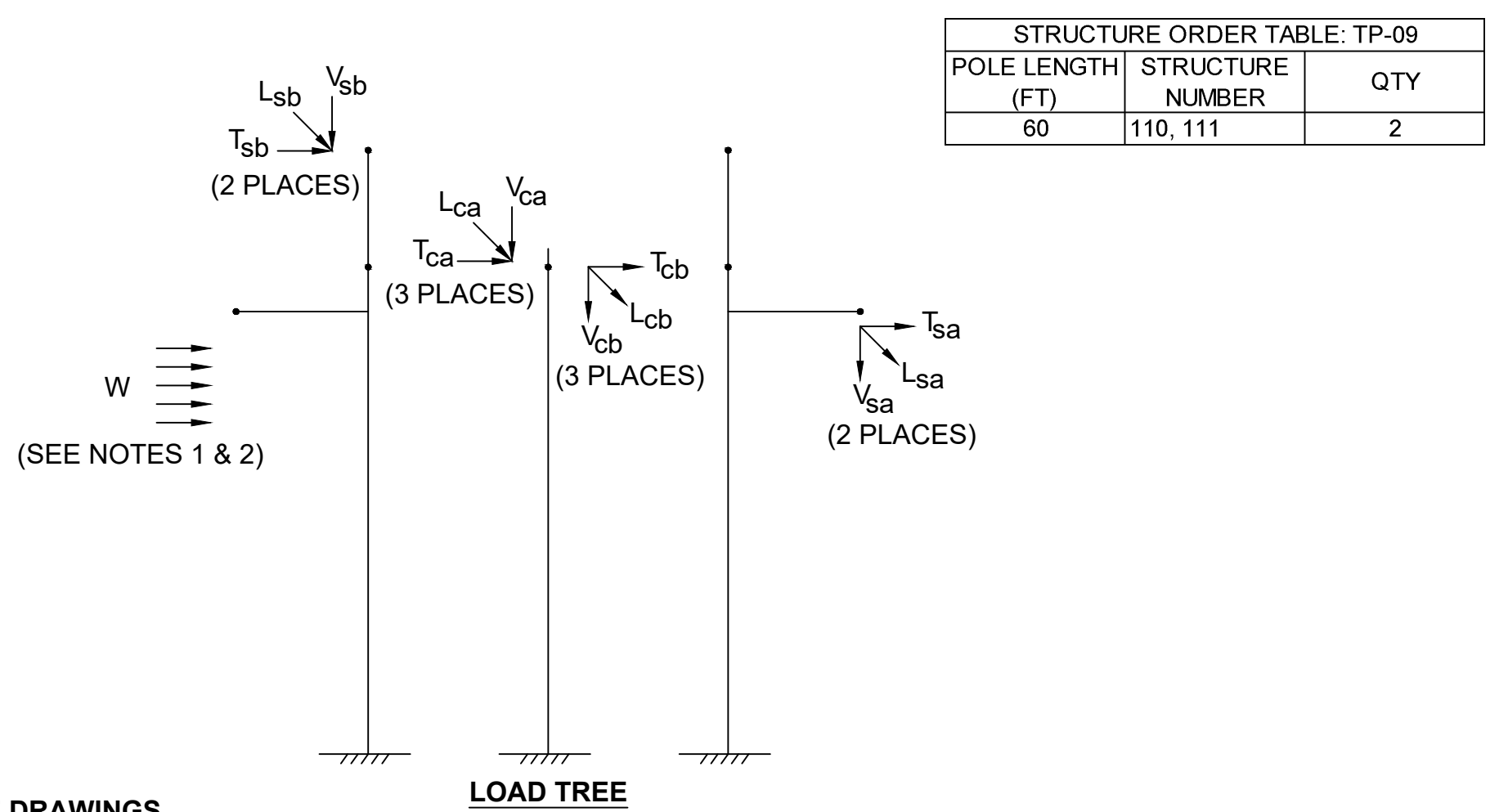
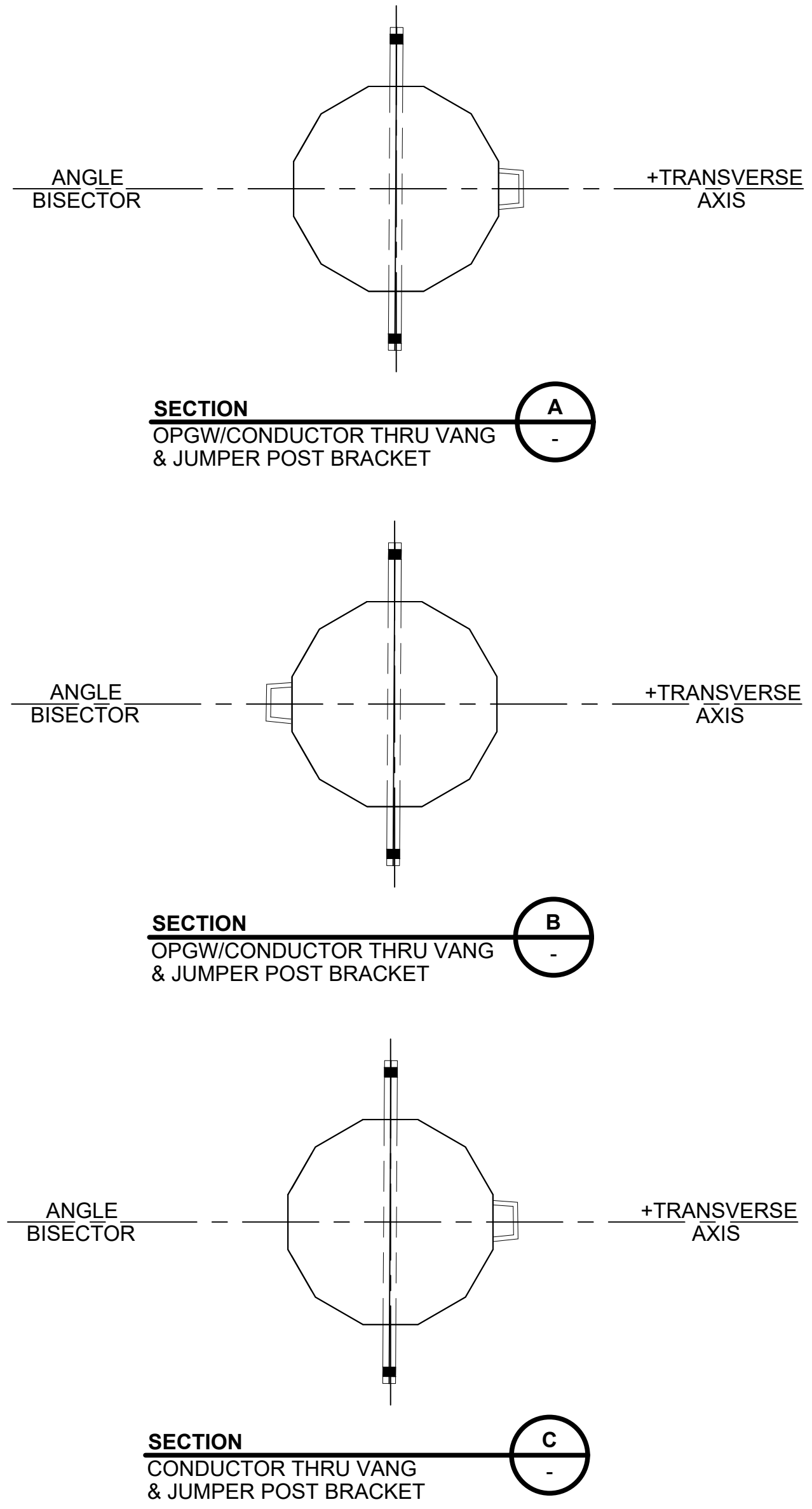


LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR AHEAD (KIPS)			CONDUCTOR BACK (KIPS)			OPGW AHEAD (KIPS)			OPGW BACK (KIPS)			W (PSF)	REMARKS
			Vca	Tca	Lca	Vcb	Tcb	Lcb	Vsa	Tsa	Lsa	Vsb	Tsb	Lsb		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.65 WIND: 2.50	1.1	1.6	-10.1	1.1	2.3	18.4	0.5	1.0	-5.0	0.5	1.3	8.8	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	0.5	1.5	-5.2	0.5	2.0	9.9	0.2	0.7	-2.1	0.2	0.9	4.3	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	1.4	1.3	-9.1	1.4	1.8	14.3	0.8	0.8	-4.8	0.8	1.1	7.7	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	1.4	0.8	-8.7	1.4	1.3	14.1	0.8	0.4	-4.6	0.8	0.7	7.4	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	0.4	0.3	-2.7	0.4	0.6	6.0	0.2	0.1	-1.0	0.2	0.3	2.5	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	1.1	0.6	-4.5	4.4	1.1	10.8	0.7	0.2	-1.7	2.0	0.5	4.2	3.0	SEE NOTES
7	UPLIFT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.65 WIND: 2.50	1.1	1.6	-10.1	-1.5	2.3	18.4	0.5	1.0	-5.0	-0.7	1.3	8.8	10.0	SEE NOTES

STRUCTURE DESIGN CRITERIA	MAX INITIAL TENSION NESC HEAVY (LBS)	ANGLE	WIND SPAN (FT)	WEIGHT SPAN (FT)
STR. TYPE: 161kV 2-POLE DEADEND, 0-10"	6,000	0-10°	400	300
CONDUCTOR AHEAD: (3) 795 KCMIL ACSR "DRAKE"	11,000	0-10°	400	300
CONDUCTOR BACK: (3) 795 KCMIL ACSR "DRAKE"	3,000	0-10°	400	300
OPGW AHEAD: (2) AFL DNO-12606	5,300	0-10°	400	300
OPGW BACK: (2) AFL DNO-12606				

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. ALL WIRES ATTACHED.
B. ALL WIRES AHEAD ONLY.
C. ALL WIRES BACK ONLY.
D. ALL COMBINATIONS OF AHEAD AND BACK WIRES THAT MAY GOVERN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 10% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE BASEPLATE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS.
- STRUCTURE SEGMENTS SHALL BE JOINED USING SLIP-JOINT CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.



REFERENCE DRAWINGS

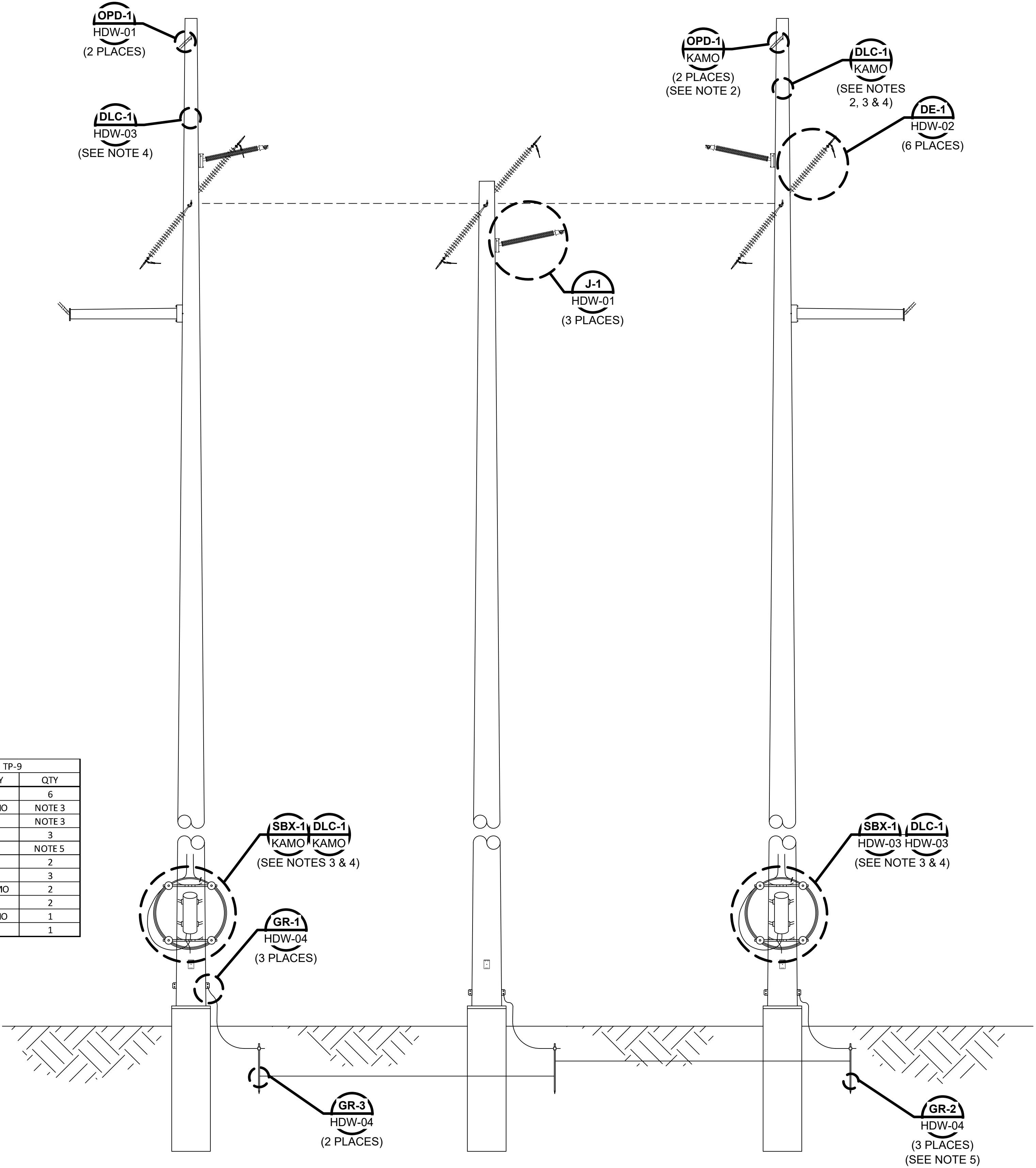
DRAWING # DTL-01 MAT-01
DRAWING NAME: STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV 161kV SINGLE CIRCUIT 0° - 10° DEADEND STEEL 3-POLE (UNDER-CROSSING) SHEET 1			
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
						CH: H. DROLLETT DATE: 06/24/2026			
						DRAWING No. TP-09 REV. 0			
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD				
NO.	DATE	DESCRIPTION	BY	CHK	APP				

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



TP-09



TP-9	
ASSEMBLY	QTY
DE-1	6
DLC-1 KAMO	NOTE 3
DLC-1	NOTE 3
GR-1	3
GR-2	NOTE 5
GR-3	2
J-1	3
OPD-1 KAMO	2
OPD-1	2
SBX-1 KAMO	1
SBX-1	1

NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- SPLICE BOX AND DOWNLEAD CLAMPS SHALL BE USED ONLY IF REQUIRED. SEE DRAWING RLS-01 FOR MORE INFORMATION.
- REFER TO HDW-03 FOR DLC-1 DOWNLEAD CLAMP ASSEMBLY INSTALLATION GUIDELINES.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



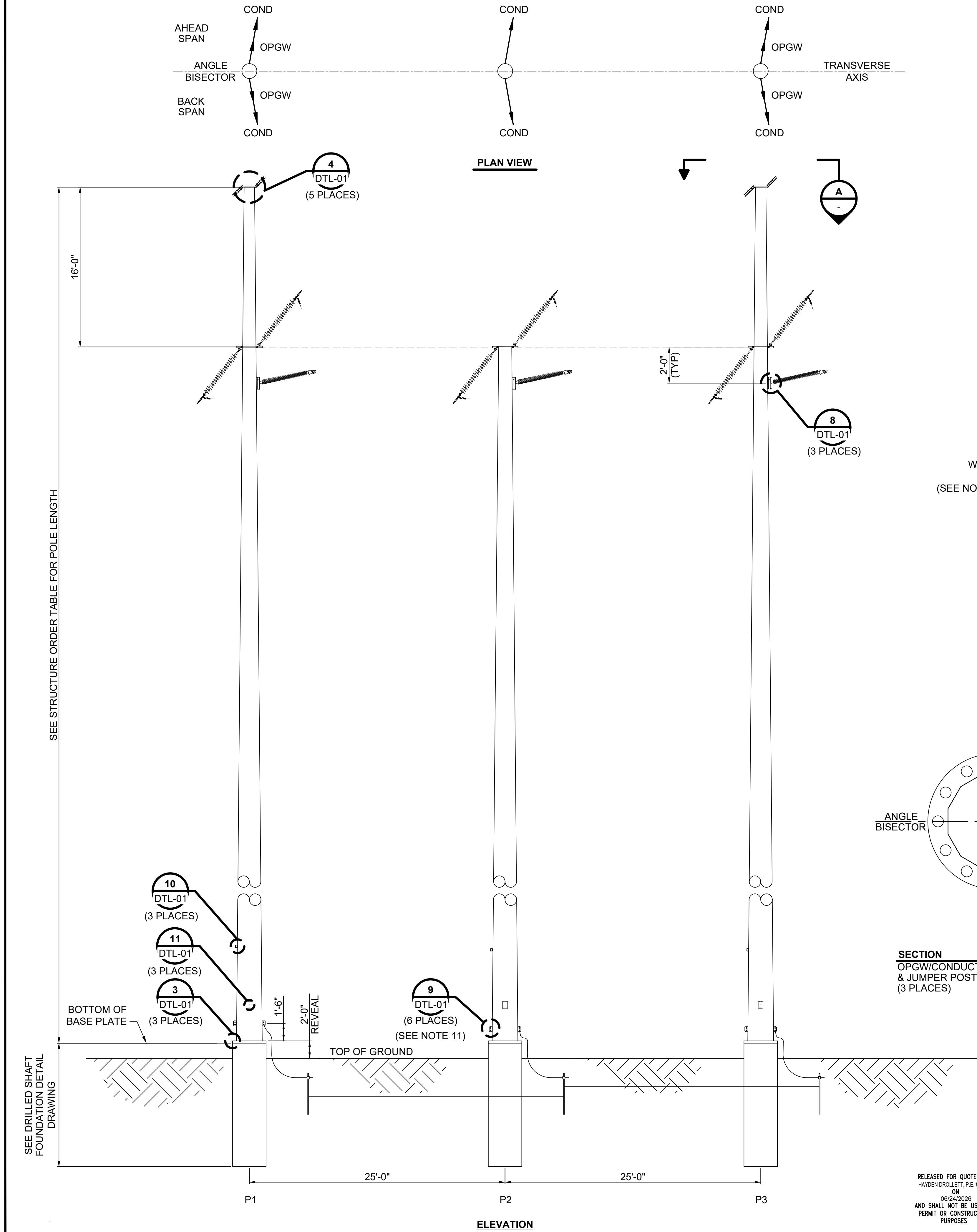
OK CERT. OF AUTH. NO. 421

REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

							GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV 161kV SINGLE CIRCUIT 0° – 10° DEADEND STEEL 3-POLE (UNDER-CROSSING) SHEET 2			
							SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
									CH: H. DROLLETT	DATE: 06/24/2026
									DRAWING No.	REV.
									TP-09	0



LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR AHEAD (KIPS)			CONDUCTOR BACK (KIPS)			OPGW AHEAD (KIPS)			OPGW BACK (KIPS)			W (PSF)	REMARKS
			Vca	Tca	Lca	Vcb	Tcb	Lcb	Vsa	Tsa	Lsa	Vsb	Tsb	Lsb		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.65 WIND: 2.50	2.9	6.8	-30.6	2.9	6.8	30.6	1.4	3.7	-15.4	1.4	3.7	15.4	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	1.4	5.5	-19.4	1.4	5.5	19.4	0.4	2.4	-8.0	0.4	2.4	8.0	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	3.8	5.3	-25.0	3.8	5.3	25.0	2.3	3.2	-14.0	2.3	3.2	14.0	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	3.8	4.3	-24.5	3.8	4.3	24.5	2.3	2.4	-13.5	2.3	2.4	13.5	0.0	SEE NOTES
5	DEFLECTION / NORMAL 1 (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	1.1	2.6	-14.8	1.1	2.6	14.8	0.4	0.8	-4.5	0.4	0.8	4.5	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	9.0	4.2	-22.5	2.0	4.2	22.5	3.3	1.4	-7.4	1.0	1.4	7.4	3.0	SEE NOTES

STRUCTURE DESIGN CRITERIA
STR. TYPE: 161KV 3-POLE DEADEND, 0-20°
CONDUCTOR AHEAD: (3) 1027 KCMIL AECC - TS "GOULD"
CONDUCTOR BACK: (3) 1027 KCMIL AECC - TS "GOULD"
OPGW AHEAD: (2) AFL DNO-12606
OPGW BACK: (2) AFL DNO-12606

MAX INITIAL TENSION NESC HEAVY (LBS)	ANGLE	WIND SPAN (FT)	WEIGHT SPAN (FT)
18,500	0-20°	800	900
18,500	0-20°	800	900
9,300	0-20°	800	900
9,300	0-20°	800	900

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. ALL WIRES ATTACHED.
B. ALL WIRES AHEAD ONLY.
C. ALL WIRES BACK ONLY.
D. ALL COMBINATIONS OF AHEAD AND BACK WIRES THAT MAY GOVERN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 10% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE BASEPLATE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS.
- STRUCTURE SEGMENTS SHALL BE JOINED USING FLANGED CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

STRUCTURE ORDER TABLE: TP-10		
POLE LENGTH (FT)	STRUCTURE NUMBER	QTY
70	37, 40	2
85	34, 89, 115	3

REFERENCE DRAWINGS

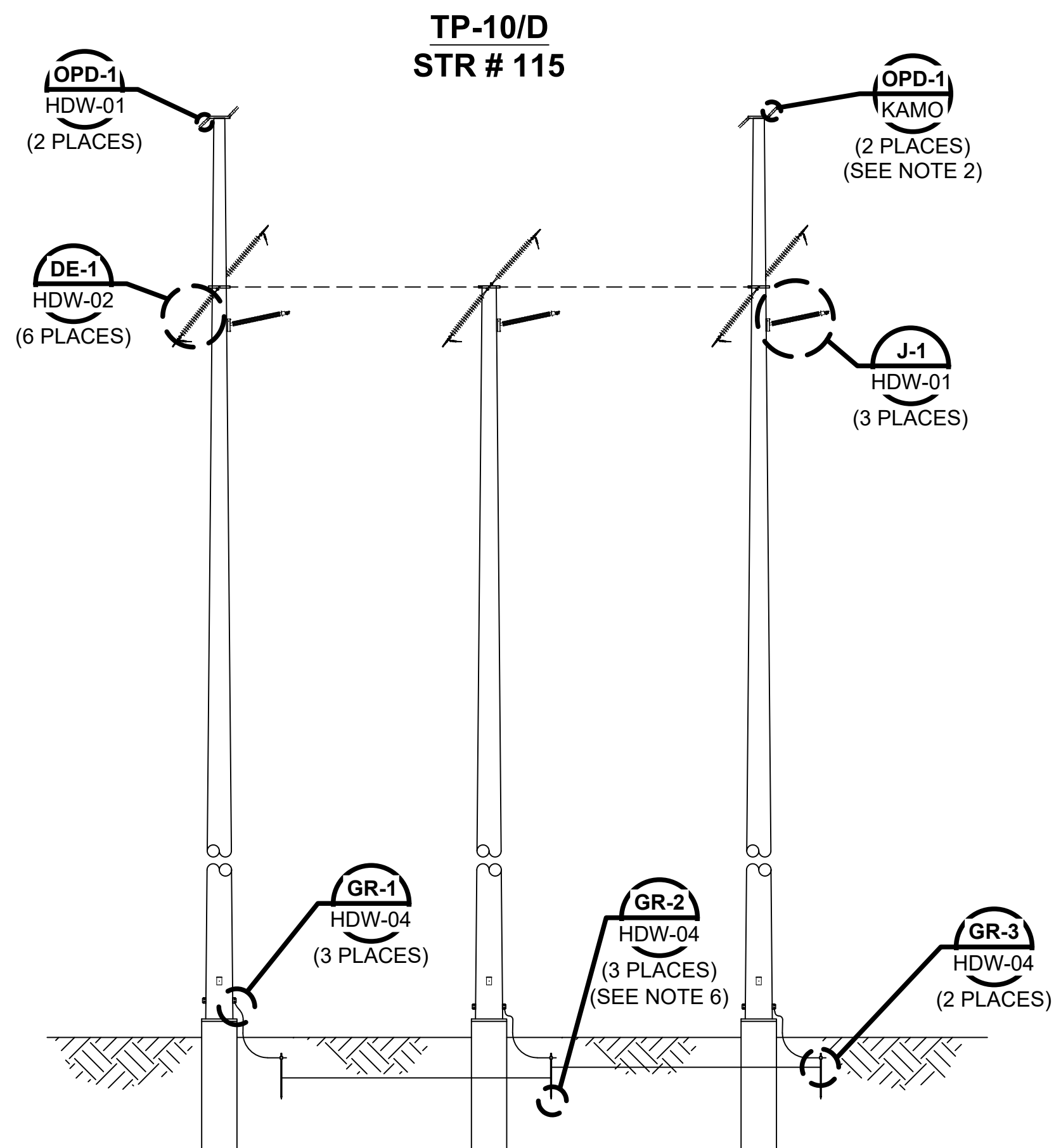
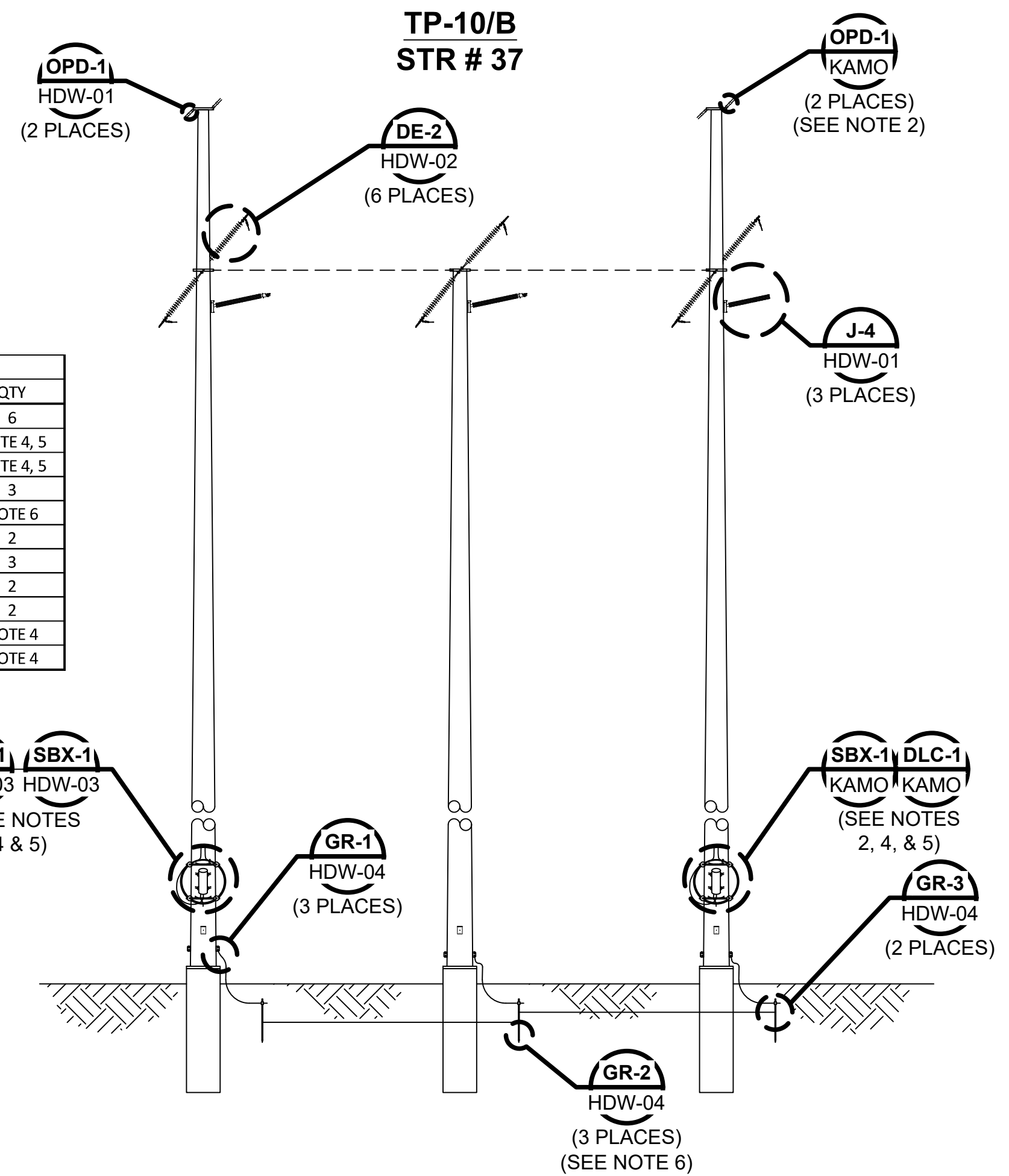
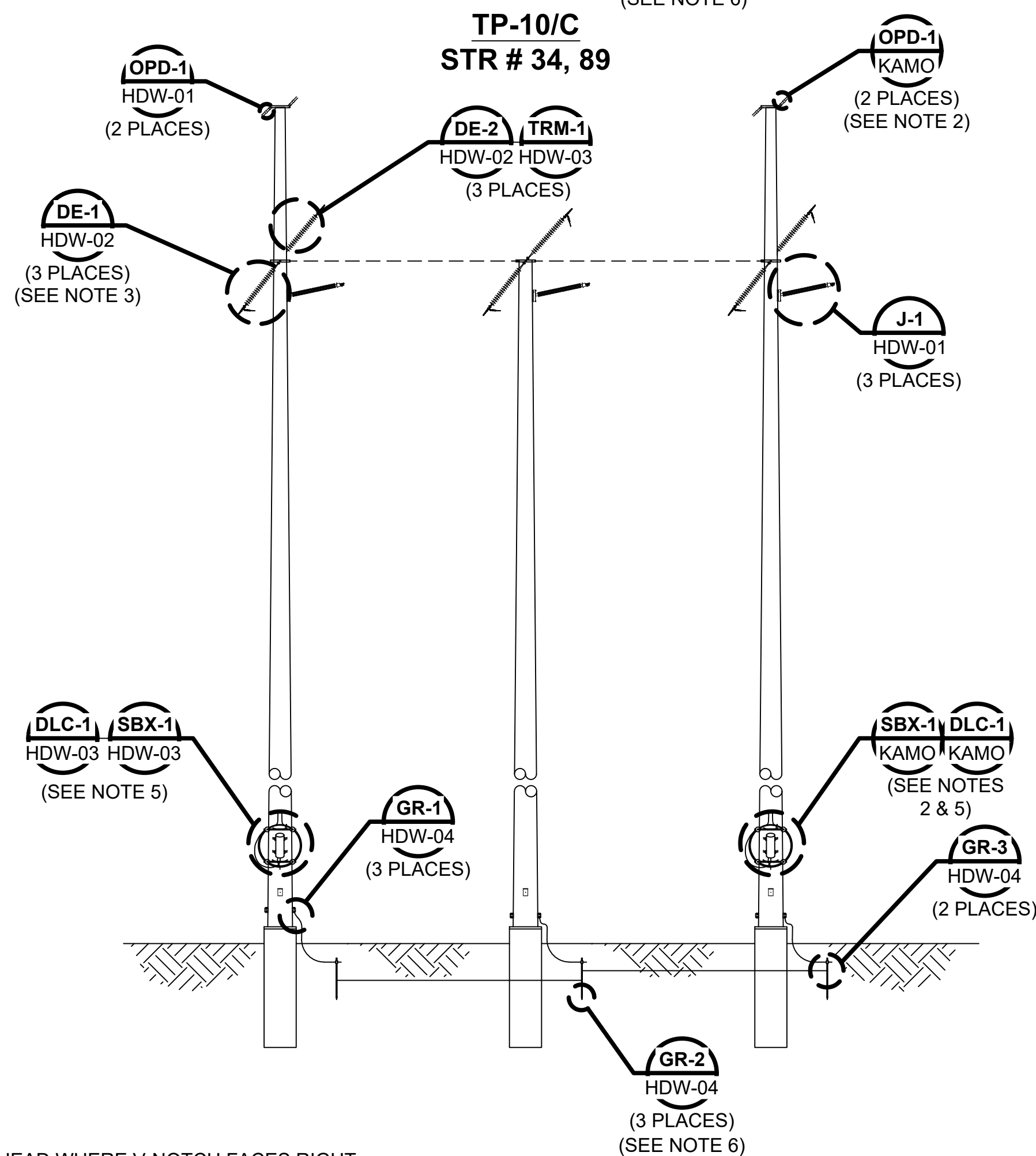
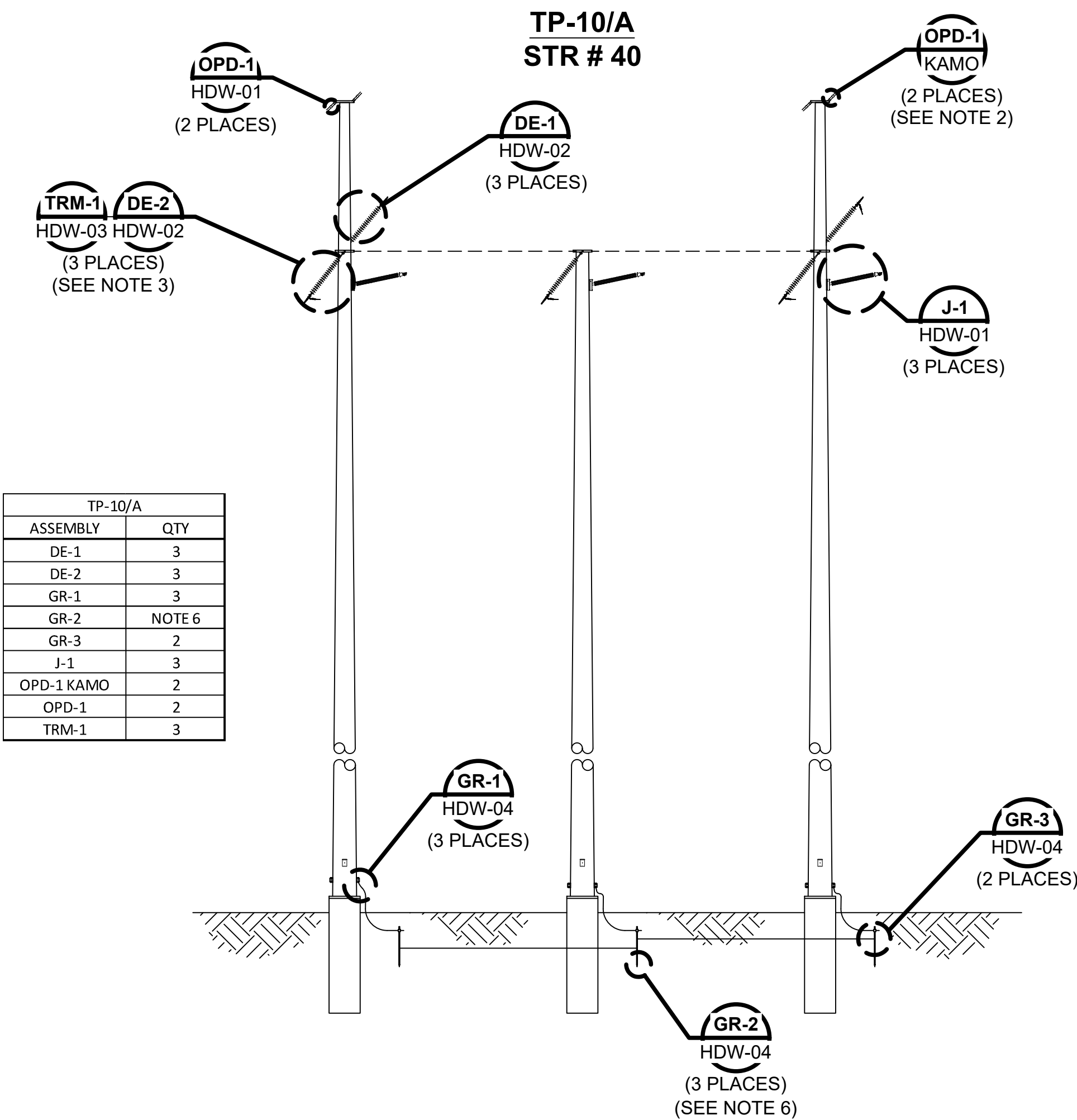
DRAWING # DTL-01
MAT-01

DRAWING NAME: STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161KV 161KV SINGLE CIRCUIT 0° - 20° DEADEND STEEL 3-POLE SHEET 1			
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
						CH: H. DROLLETT DATE: 06/24/2026			
						DRAWING No. REV. TP-10 0			
						GRDA GRAND RIVER DAM AUTHORITY P.O. BOX 409 VINETA, OK 74301			

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES

**BURNS
MCDONNELL**
OK CERT. OF AUTH. NO. 421



NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- FOR STRUCTURE 89 ONLY, DE-1 AND DE-2 ASSEMBLIES WILL BE SWAPPED, SO THAT DE-1 ASSEMBLIES WILL ATTACH THE AHEAD SPAN, AND DE-2 WILL ATTACH THE BACK SPAN TO THE STRUCTURE.
- SPLICE BOX AND DOWNLEAD CLAMPS SHALL BE USED ONLY IF REQUIRED. SEE DRAWING RLS-01 FOR MORE INFORMATION.
- REFER TO HDW-03 FOR DLC-1 DOWNLEAD CLAMP ASSEMBLY INSTALLATION GUIDELINES.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

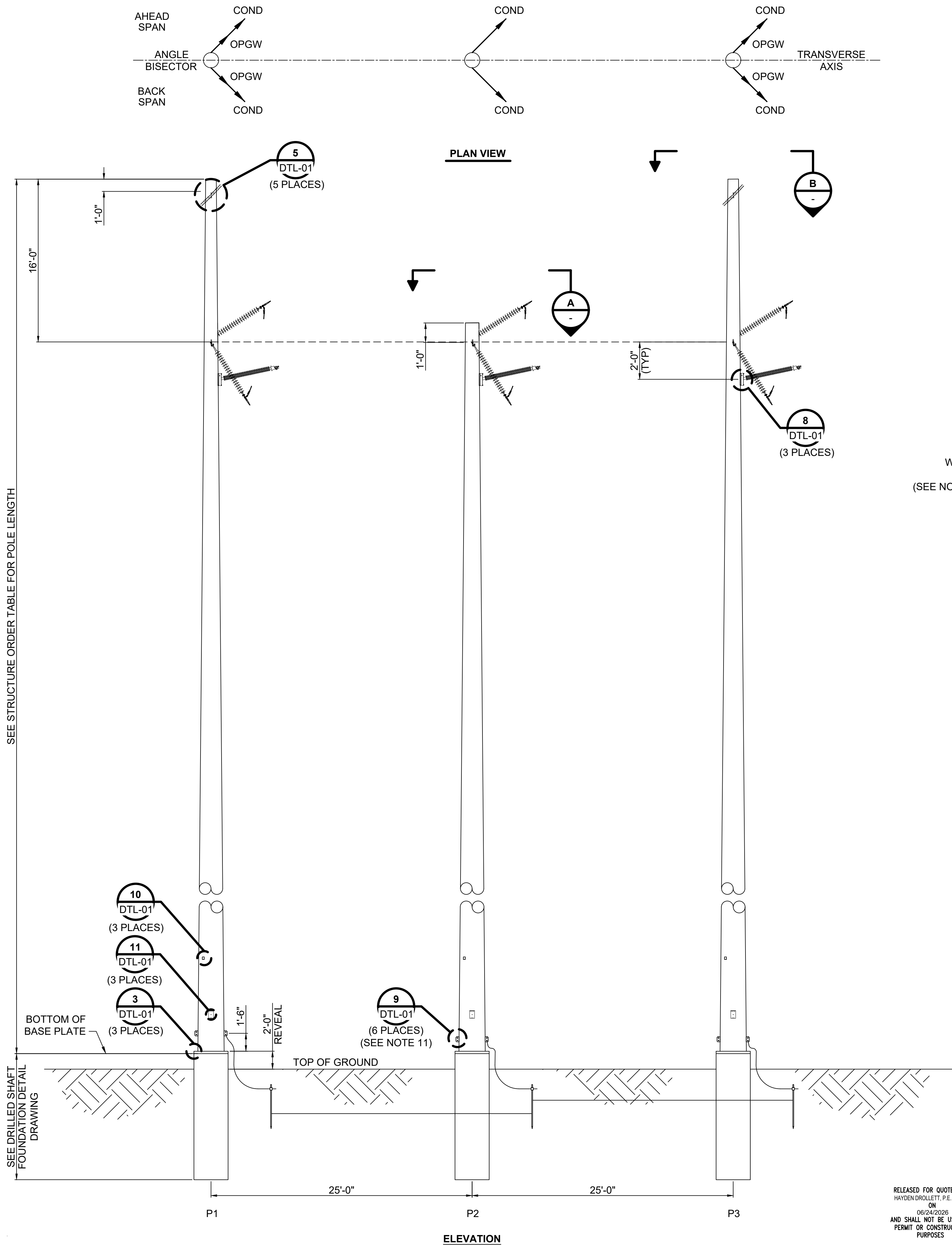
DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34658
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES

**BURNS
MCDONNELL**
OK CERT. OF AUTH. NO. 421

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA>			
						161KV SINGLE CIRCUIT 0° - 20° DEADEND STEEL 3-POLE SHEET 2			
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
						CH: H. DROLLETT DATE: 06/24/2026			
						DRAWING No. REV. TP-10 0			
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD				
NO.	DATE	DESCRIPTION	BY	CHK	APP				

COPYRIGHT © 2026 BURNS & MCDONNELL ENGINEERING COMPANY, INC.



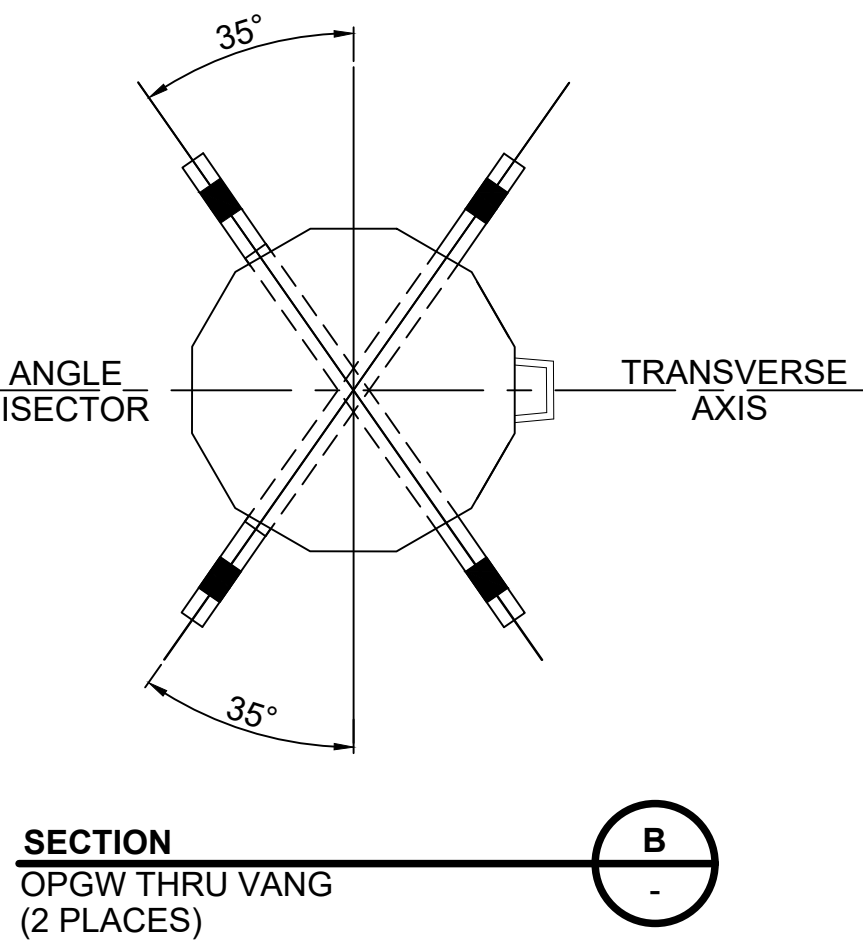
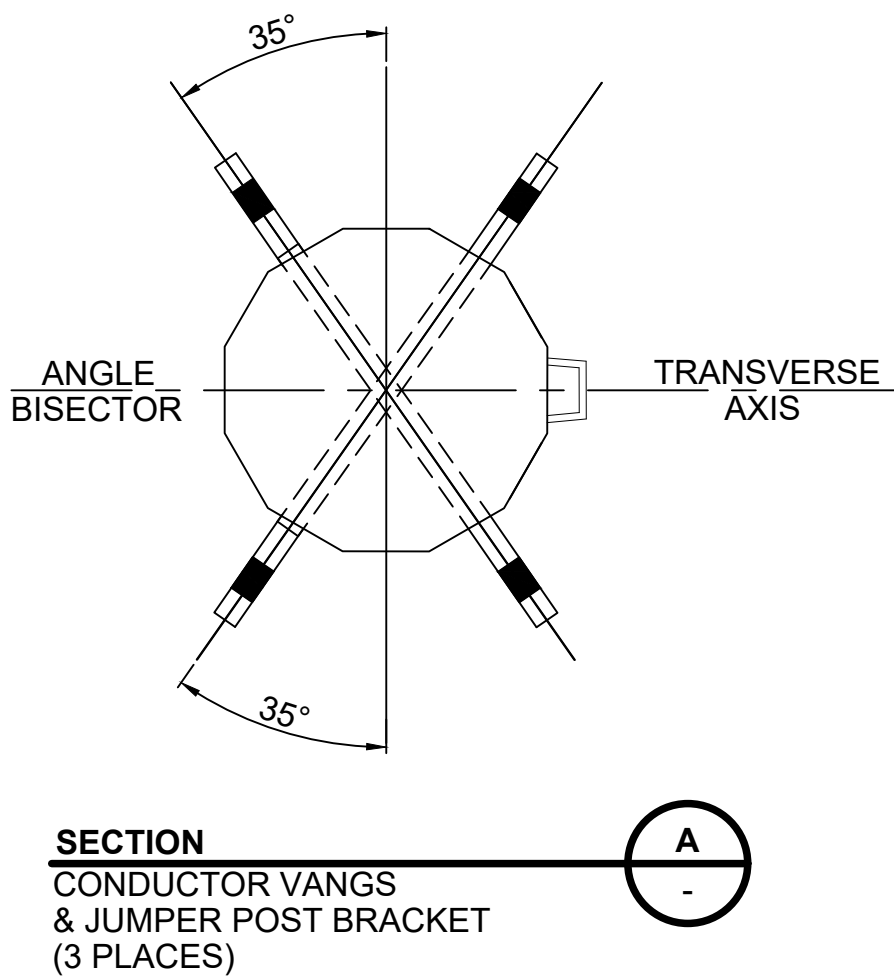
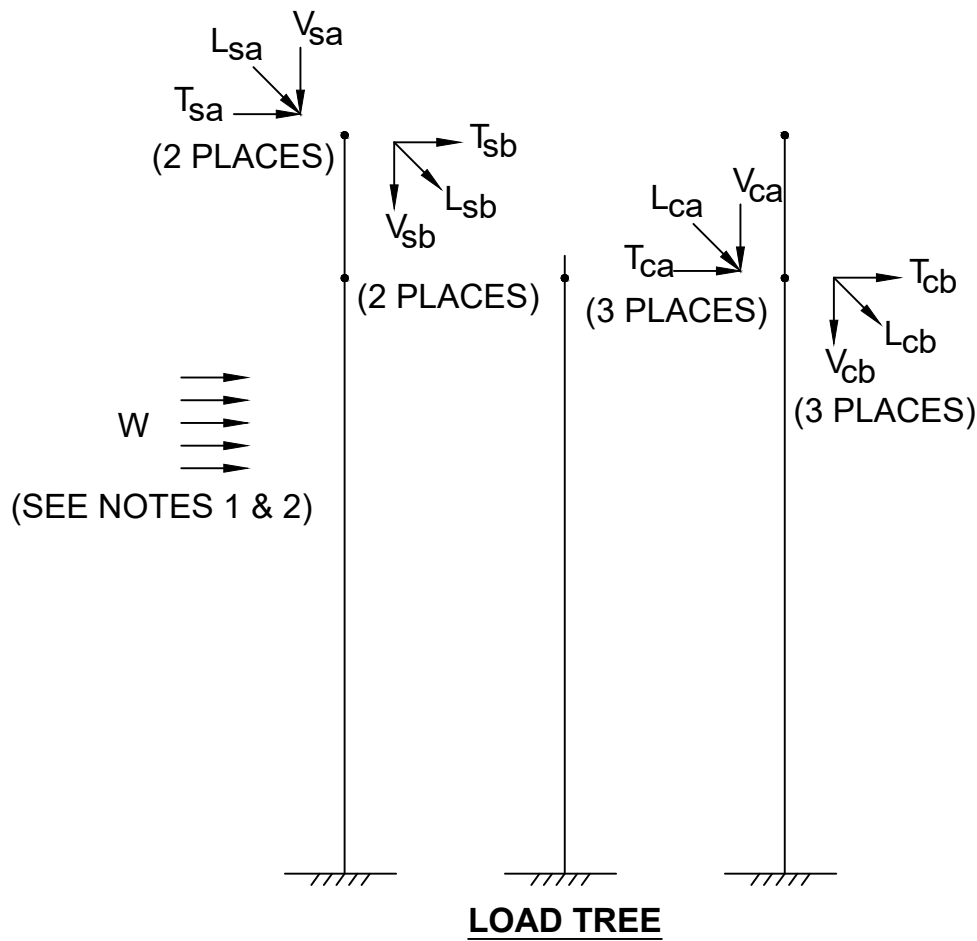
LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR AHEAD (KIPS)			CONDUCTOR BACK (KIPS)			OPGW AHEAD (KIPS)			OPGW BACK (KIPS)			W (PSF)	REMARKS
			Vca	Tca	Lca	Vcb	Tcb	Lcb	Vsa	Tsa	Lsa	Vsb	Tsb	Lsb		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.65 WIND: 2.50	1.7	19.6	-25.9	3.0	12.0	15.0	0.8	9.9	-12.9	1.4	7.1	9.0	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	0.7	13.1	-16.4	1.2	6.4	8.3	0.3	5.4	-6.6	0.4	3.6	4.2	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	2.2	15.4	-20.6	3.9	10.1	13.6	1.3	8.6	-11.2	2.3	6.4	8.2	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	2.2	14.6	-20.2	3.9	9.8	13.2	1.3	7.8	-10.8	2.3	5.7	7.9	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	0.6	9.1	-12.5	1.1	3.2	4.3	0.2	2.8	-3.8	0.4	1.5	2.1	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	8.4	14.0	-19.2	2.1	5.2	6.9	3.1	4.6	-6.2	1.0	2.5	3.3	3.0	SEE NOTES

STRUCTURE DESIGN CRITERIA
STR. TYPE: 161KV 3-POLE DEADEND, 65-75°
CONDUCTOR AHEAD: (3) 1027 KCMIL AECC - TS "GOULD"
CONDUCTOR BACK: (3) 795 KCMIL ACSR "DRAKE"
OPGW AHEAD: (2) AFL DNO-12606
OPGW BACK: (2) AFL DNO-12606

MAX INITIAL TENSION NESC HEAVY (LBS)	ANGLE	WIND SPAN (FT)	WEIGHT SPAN (FT)
18,500	65-75°	500	500
11,000	65-75°	500	900
9,200	65-75°	500	500
6,300	65-75°	500	900

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
 - 1.1 = 12 SIDED
 - 1.4 = 8 SIDED
 - 1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
 - A. ALL WIRES ATTACHED.
 - B. ALL WIRES AHEAD ONLY.
 - C. ALL WIRES BACK ONLY.
 - D. ALL COMBINATIONS OF AHEAD AND BACK WIRES THAT MAY GOVERN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 10% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE BASEPLATE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS.
- STRUCTURE SEGMENTS SHALL BE JOINED USING SLIP-JOINT CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.



STRUCTURE ORDER TABLE: TP-11		
POLE LENGTH (FT)	STRUCTURE NUMBER	QTY
65	83	1

REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

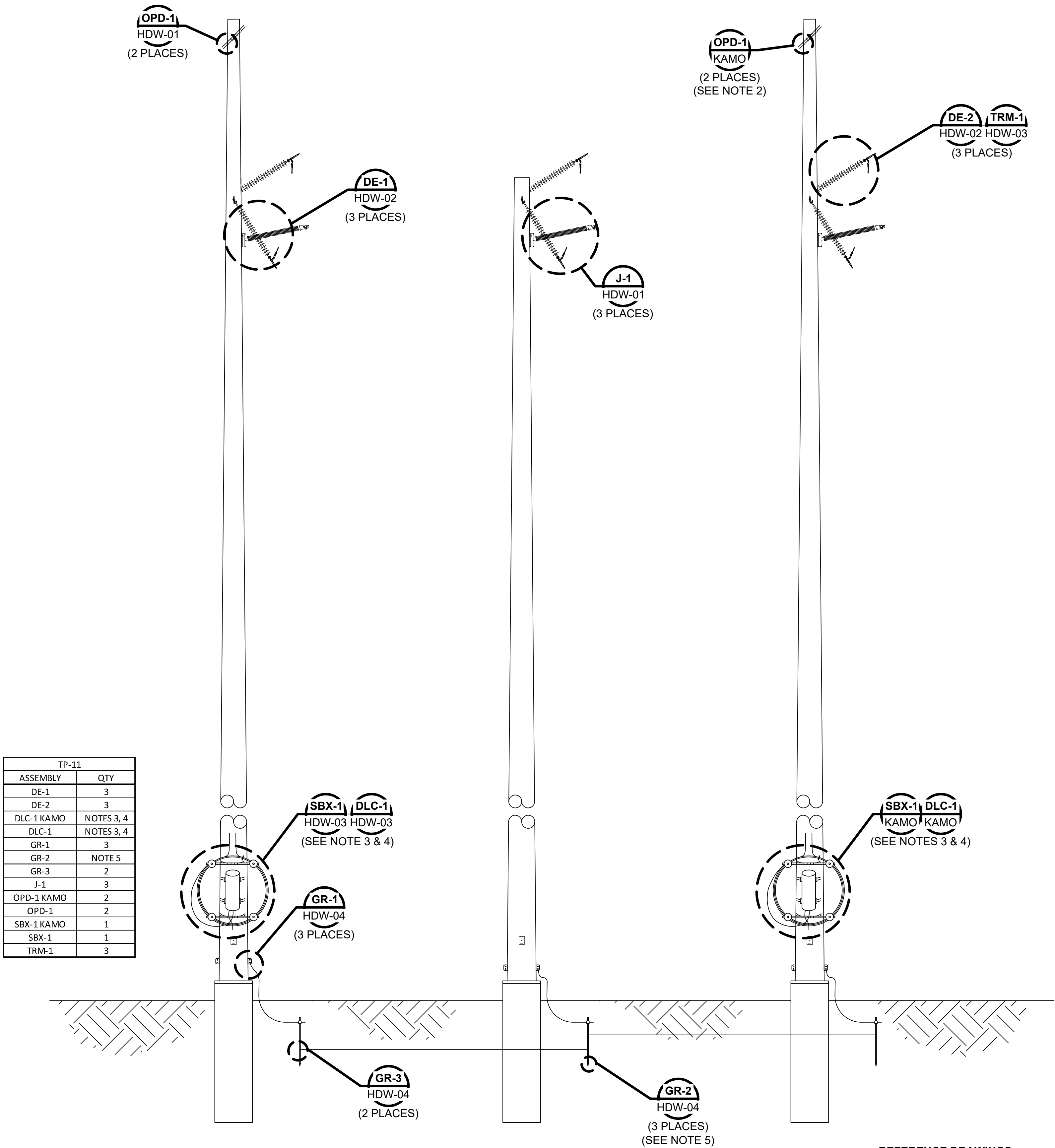
DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

						RELEASED FOR QUOTE ONLY			
						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161KV 161KV SINGLE CIRCUIT 65° - 75° DEADEND STEEL 3-POLE SHEET 1			
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
						CH: H. DROLLETT DATE: 06/24/2026			
						DRAWING No. REV. TP-11 0			
						GRDA GRAND RIVER DAM AUTHORITY P.O. BOX 409 VINETA, OK 74301			
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD				
NO.	DATE	DESCRIPTION	BY	CHK	APP				

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. #34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES

**BURNS
MCDONNELL**
OK CERT. OF AUTH. NO. 421

TP-11



NOTES

1. FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
2. ASSEMBLY TO BE PROVIDED BY KAMO.
3. SPLICE BOX AND DOWNLEAD CLAMPS SHALL BE USED ONLY IF REQUIRED. SEE DRAWING RLS-01 FOR MORE INFORMATION.
4. REFER TO HDW-03 FOR DLC-1 DOWNLEAD CLAMP ASSEMBLY INSTALLATION GUIDELINES.
5. GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



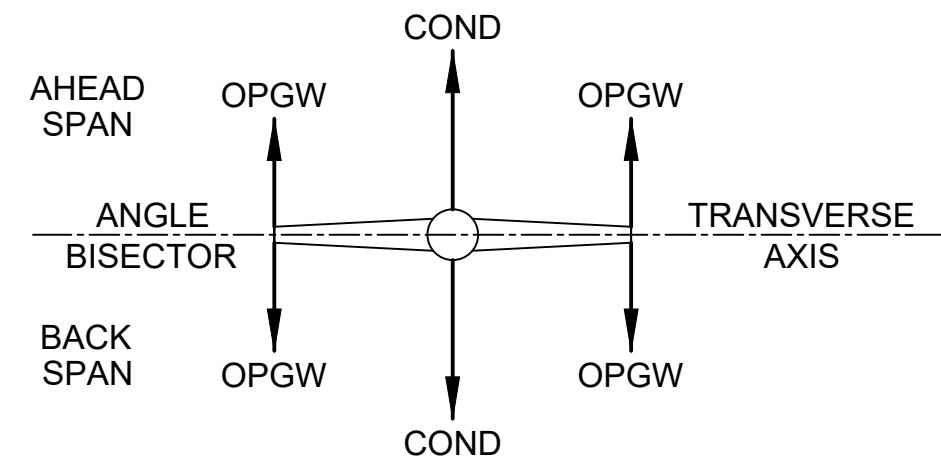
OK CERT. OF AUTH. NO. 421

REFERENCE DRAWINGS

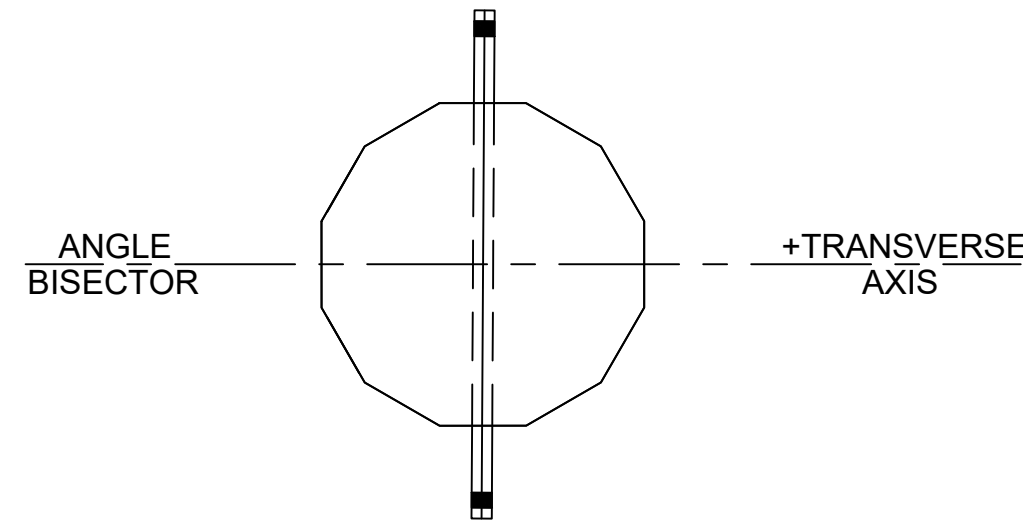
DRAWING #
DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

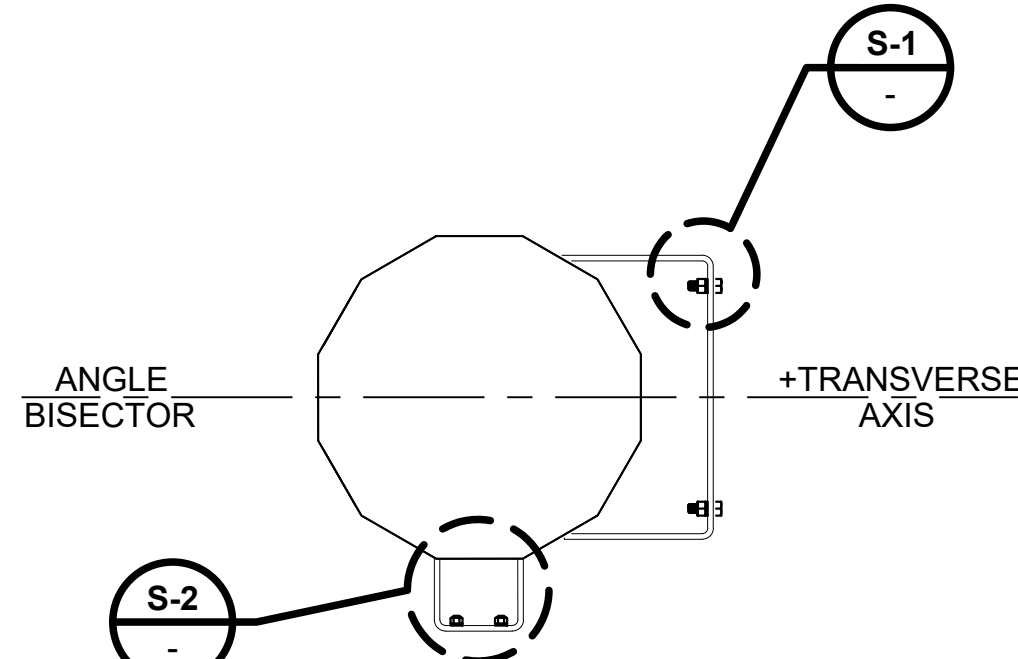
							GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV 161kV SINGLE CIRCUIT 65° – 75° DEADEND STEEL 3-POLE SHEET 2			
							SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
							GRDA GRAND RIVER DAM AUTHORITY P.O. BOX 409 VINITA, OK 74301			
									DRAWING No. TP – 11	REV. 0
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD					
NO.	DATE	DESCRIPTION	BY	CHK	APP					



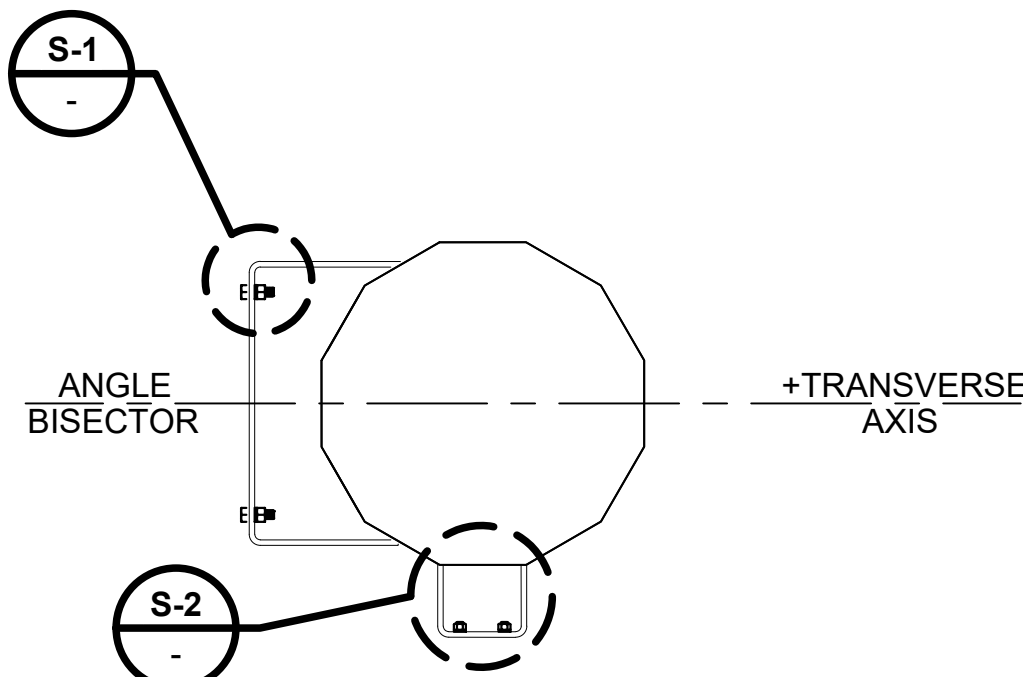
PLAN VIEW



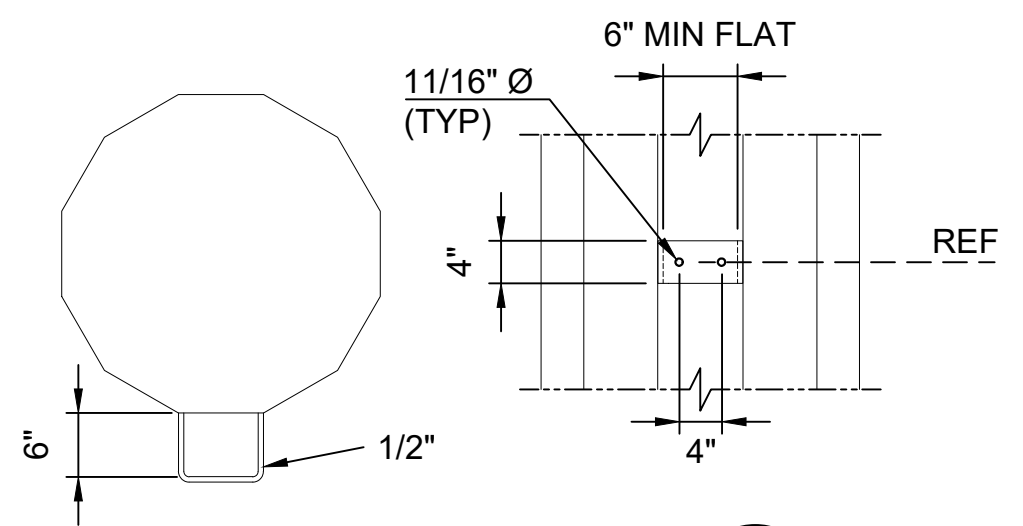
SECTION
CONDUCTOR THRU VANGS
(3 PLACES)



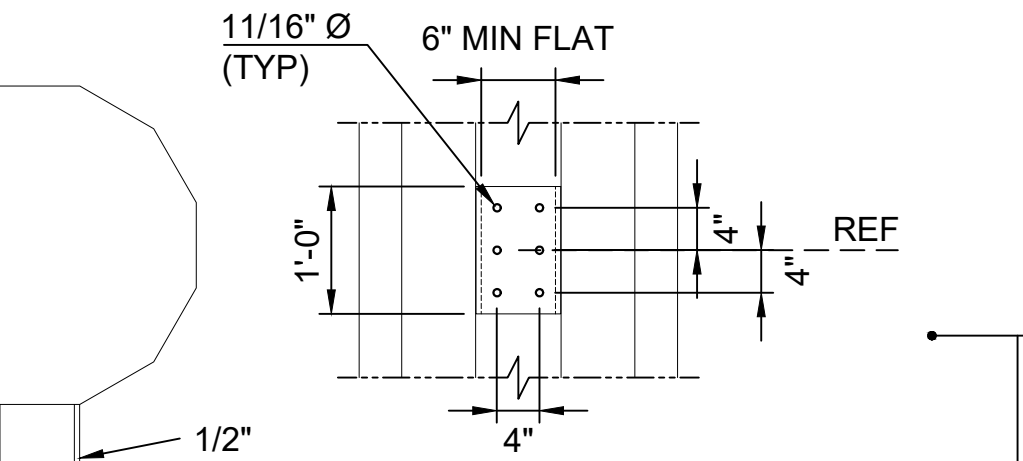
SECTION
FRAME & PIPE GUIDE MOUNTING
BRACKET



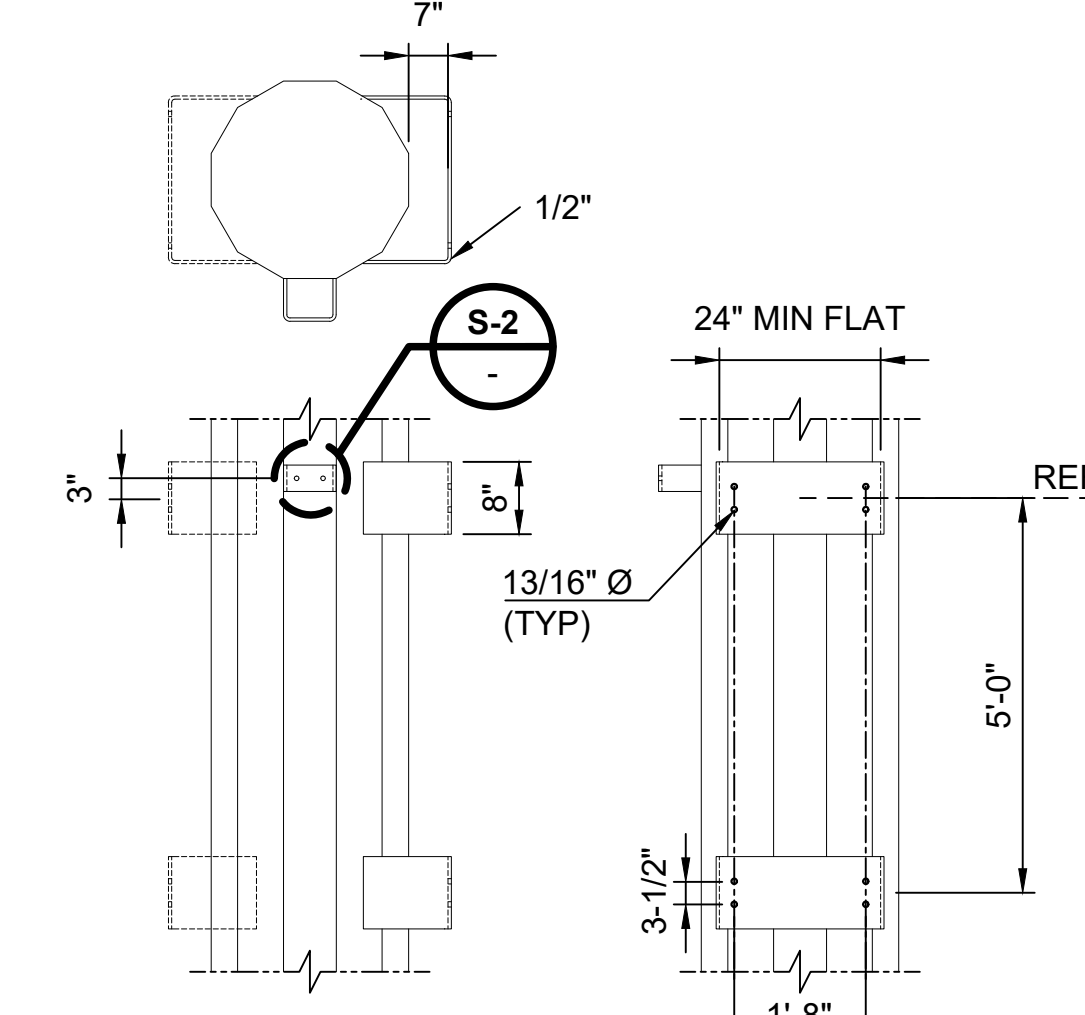
SECTION
FRAME & PIPE GUIDE MOUNTING
BRACKET



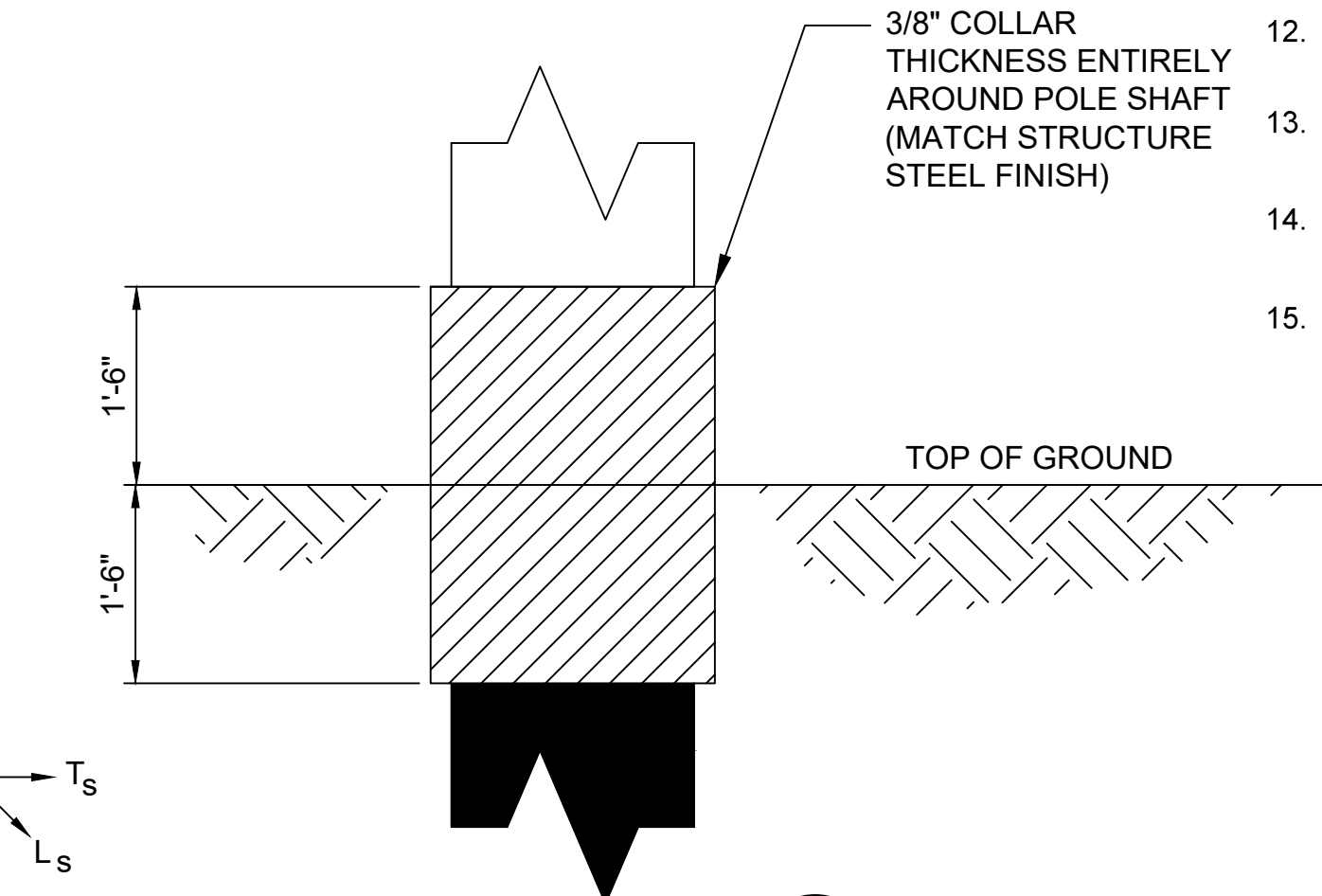
DETAIL
PIPE GUIDE MOUNTING BRACKET
DETAIL



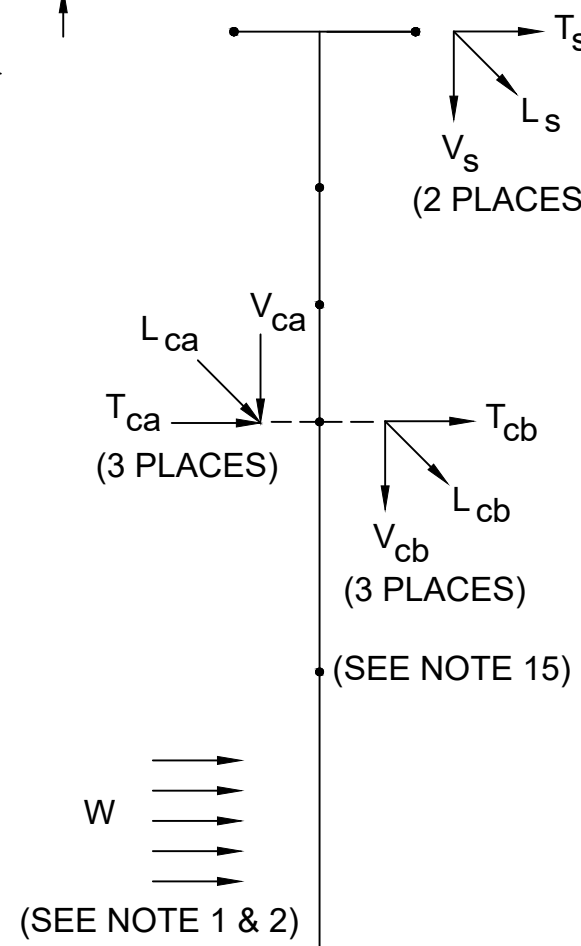
DETAIL
OPERATOR MOUNTING BRACKET
DETAIL



DETAIL
FRAME & PIPE GUIDE MOUNTING
BRACKET



DETAIL
CORROSION COLLAR



LOAD TREE

LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR AHEAD			CONDUCTOR BACK			OPGW			W (PSF)	REMARKS
			V _{ca}	T _{ca}	L _{ca}	V _{cb}	T _{cb}	L _{cb}	V _{sa}	T _{sa}	L _{sa}		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.65 WIND: 2.50	0.8	1.0	-3.5	0.8	0.8	3.5	0.7	0.9	0.0	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	0.4	1.1	-2.0	0.4	0.7	2.0	0.4	0.6	0.0	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	1.0	0.8	-3.5	1.0	0.7	3.5	0.8	0.8	0.0	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	1.0	0.5	-3.3	1.0	0.5	3.3	0.8	0.5	0.0	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	0.3	0.2	-0.9	0.9	0.2	2.0	0.1	0.2	0.0	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	1.4	0.3	-1.5	0.9	0.3	1.5	0.8	0.2	0.5	3.0	SEE NOTES

STRUCTURE DESIGN CRITERIA
STR. TYPE: 161KV MONOPOLE SWITCH, 0-15"
CONDUCTOR AHEAD: (3) 795 KCMIL ACSR "DRAKE"
CONDUCTOR BACK: (3) 795 KCMIL ACSR "DRAKE"
OPGW AHEAD: (2) AFL DNO-12606
OPGW BACK: (2) AFL DNO-12606

MAX INITIAL TENSION NESC HEAVY (LBS)	ANGLE	WIND SPAN (FT)	WEIGHT SPAN (FT)
2,000	0-15°	150	200
2,000	0-15°	150	200
1,000	0-15°	150	200
1,000	0-15°	150	200

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. ALL WIRES ATTACHED.
B. CONDUCTOR WIRES AHEAD ONLY.
C. CONDUCTOR WIRES BACK ONLY.
D. ALL COMBINATIONS OF AHEAD AND BACK WIRES THAT MAY GOVERN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED 0.5% OF ABOVE-GROUND POLE LENGTH UNDER NORMAL LOAD CASE 5, AND 2% OF ABOVE-GROUND POLE LENGTH UNDER ALL OTHER LOAD CASES.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 2'-0" ABOVE GROUNDLINE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS. ONE GROUNDING PAD SHALL BE PLACED 3'-6" ABOVE GROUND, AS SHOWN IN DETAIL F.
- PROTECTIVE COATING SHALL BE EVENLY APPLIED FROM THE TOP OF THE CORROSION COLLAR TO THE BASE OF THE POLE. SURFACE PREPARATION AND THICKNESS ARE TO MANUFACTURER'S RECOMMENDATION.
- STRUCTURE SEGMENTS SHALL BE JOINED USING FLANGED CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.
- FOR SWITCH BRACKET DESIGNS, MANUFACTURER SHALL CONSIDER AN ECCENTRIC VERTICAL LOAD OF 1.0 KIP ACTING 4' FROM POLE FACE.
- STRUCTURE SHALL BE DESIGNED FOR AN ADDITIONAL SINGLE LOAD EQUIVALENT TO OPGW AT THIS LOCATION.

STRUCTURE ORDER TABLE: TP-12				
POLE LENGTH (FT)	ABOVE GROUND HEIGHT (FT)	EMBED LENGTH (FT)	STRUCTURE NUMBER	QTY
98	80	18	41, 43, 42A	3

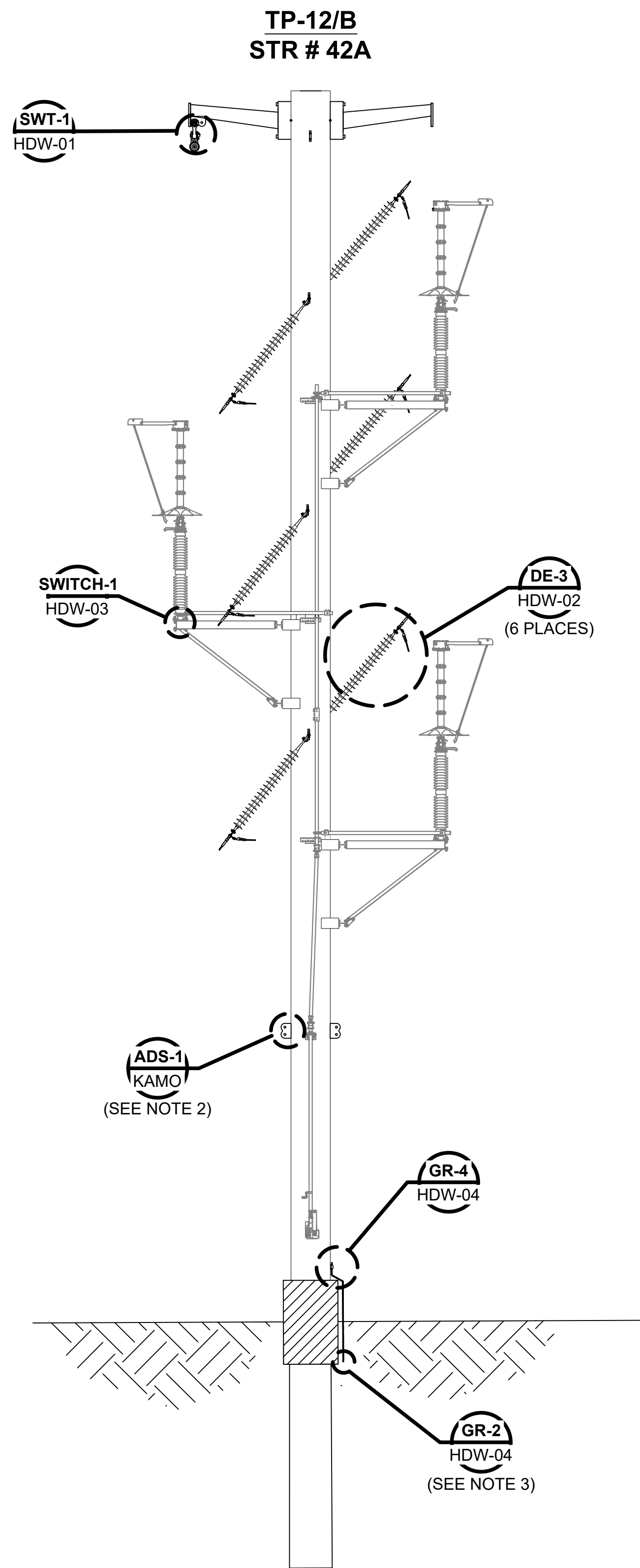
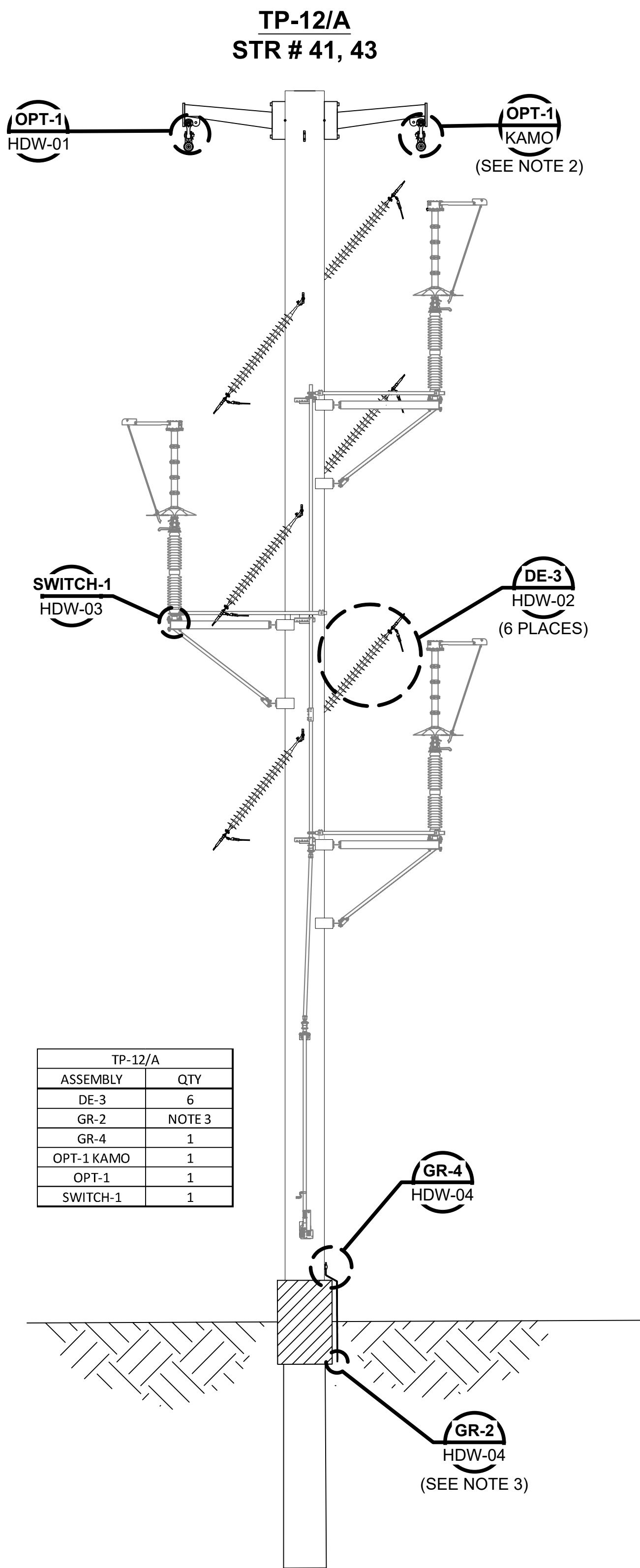
REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----

COPYRIGHT © 2025 BURNS & MCDONNELL ENGINEERING COMPANY, INC.



NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



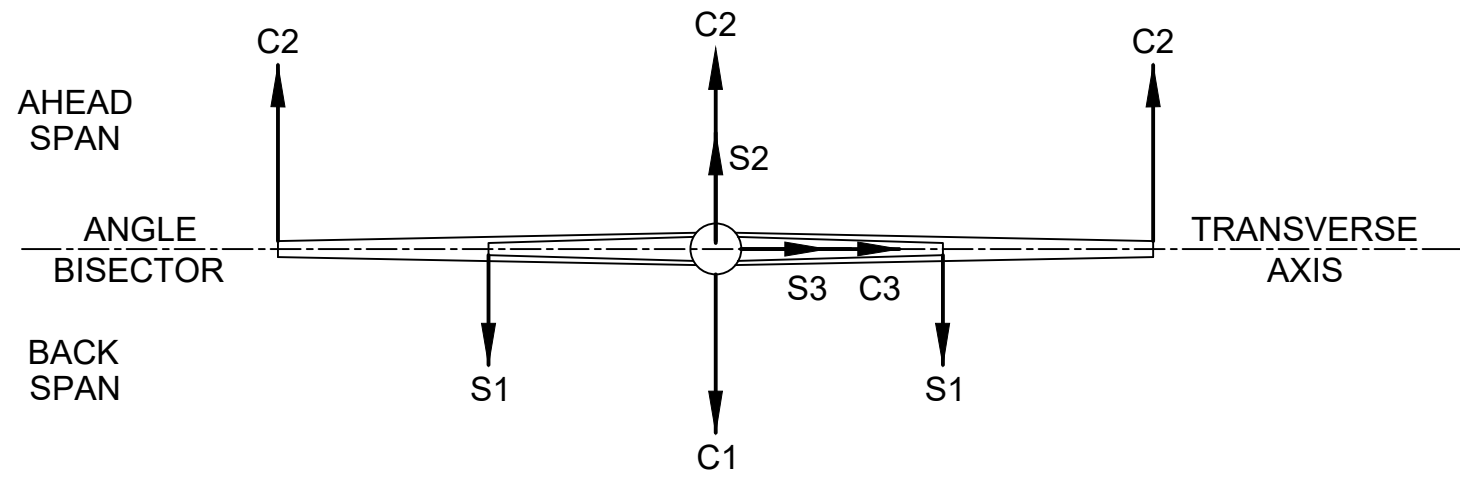
OK CERT. OF AUTH. NO. 421

REFERENCE DRAWINGS

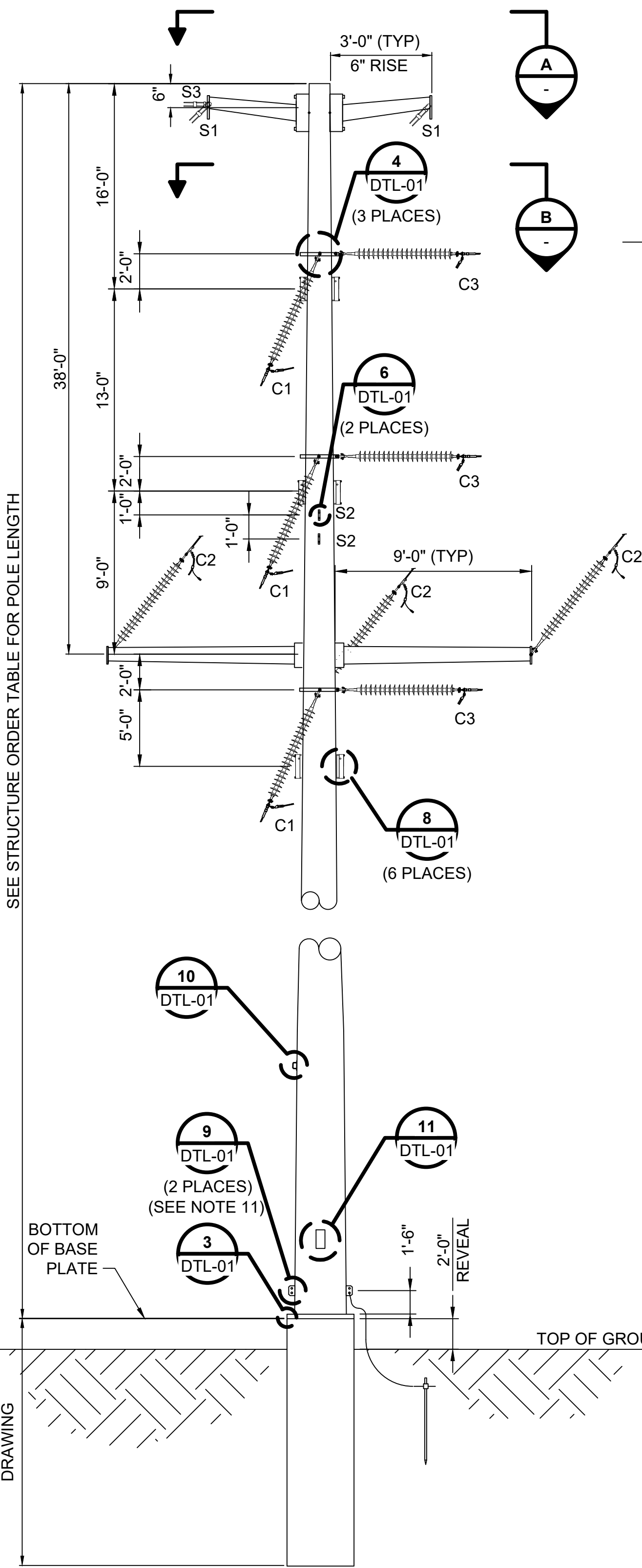
DRAWING #
DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

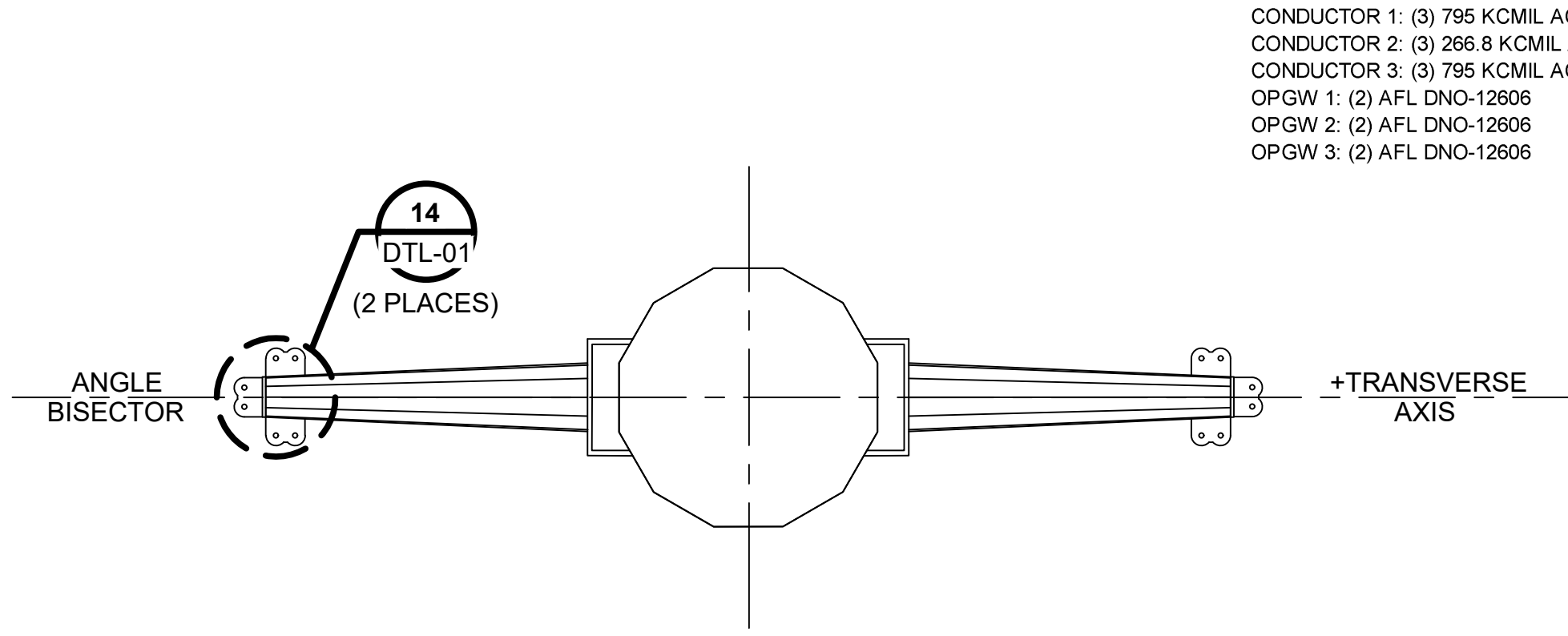
						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV		
						161kV SINGLE CIRCUIT 0° – 15° SWITCH STEEL POLE SHEET 2		
		SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT			
				CH: H. DROLLETT	DATE: 06/24/2026			
				DRAWING No.		REV.		
				TP-12		0		



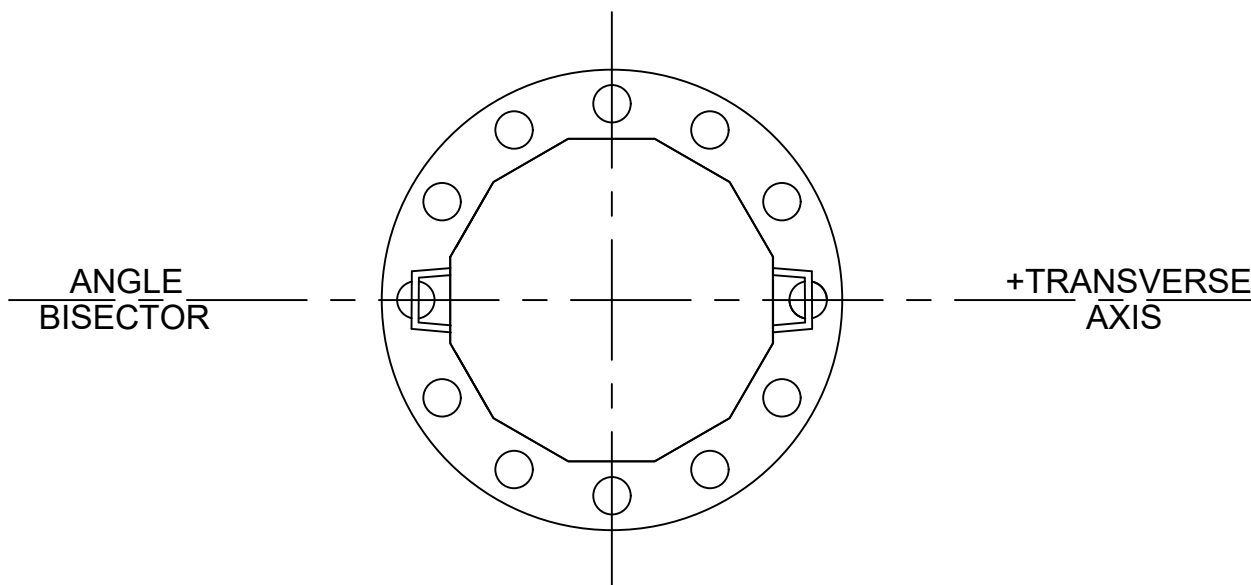
PLAN VIEW



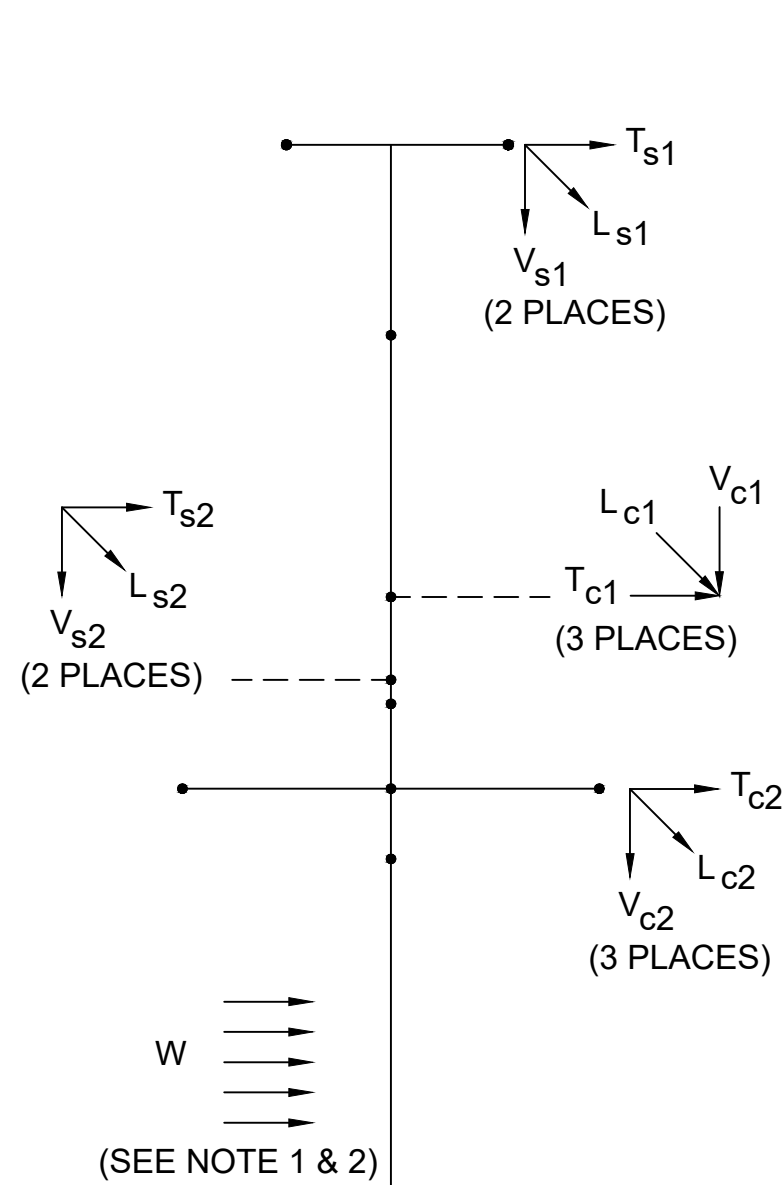
ELEVATION



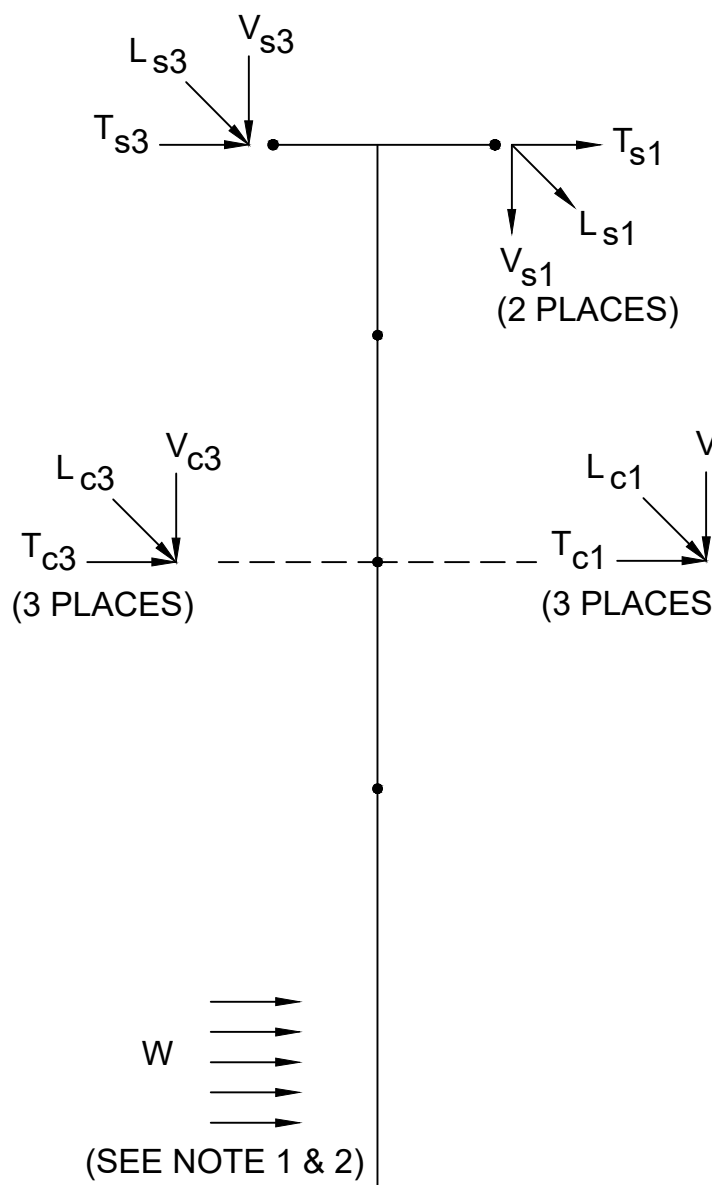
SECTION A
SHIELD WIRE ARM ATTACHMENTS



SECTION B
CONDUCTOR RING VANG & JUMPER POST BRACKETS (3 PLACES)



LOAD TREE INITIAL



LOAD TREE FINAL

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34958
ON 07/16/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



MAX INITIAL TENSION NESC HEAVY (LBS)
9,300
5,700
9,300
5,300
5,300
5,300

WIND SPAN (FT)	WEIGHT SPAN (FT)
400	500
400	500
400	500
400	500
400	500
400	500

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. S1 AND C1 ONLY.
B. S2 AND C2 ONLY.
C. S1, S2, C1, AND C2 ONLY.
D. S1, S3, C1, AND C3 ONLY.
E. ALL WIRES ATTACHED.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 3, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 10% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 1'-6" ABOVE THE BASEPLATE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS.
- STRUCTURE SEGMENTS SHALL BE JOINED USING SLIP-JOINT CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

STRUCTURE ORDER TABLE: TP-13		
POLE LENGTH (FT)	STRUCTURE NUMBER	QTY
75	117	1

SECTION C
SHIELD WIRE THRU VANGS & CONDUCTOR 2 ARMS

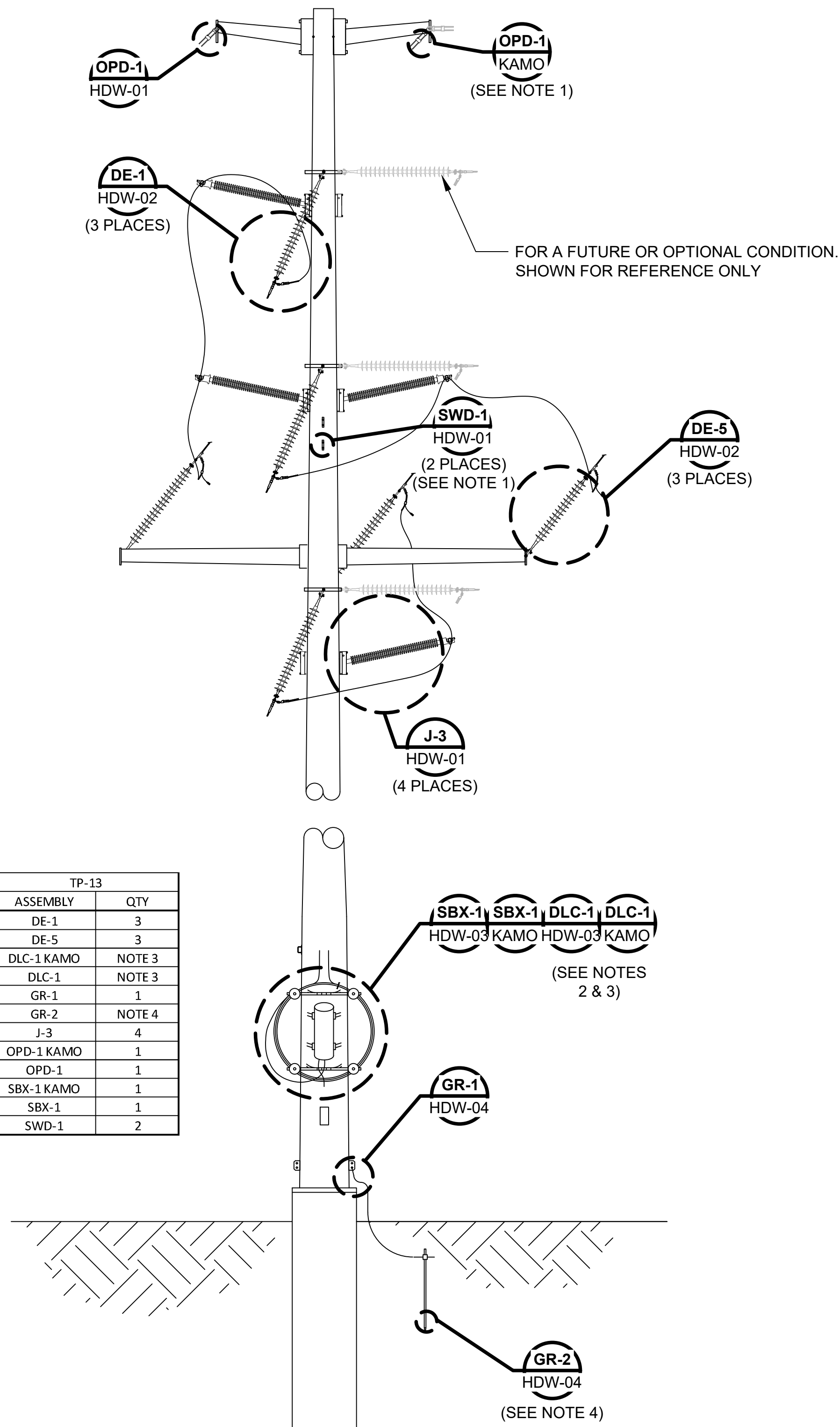
REFERENCE DRAWINGS

DRAWING # DTL-01
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161KV 161KV SINGLE CIRCUIT 0° - 90° DEADEND STEEL POLE SHEET 1					
1	07/16/2026	QTY UPDATE	WCB	HCD	HCD
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD
NO.	DATE	DESCRIPTION	BY	CHK	APP
SCALE: NONE DRAWN BY: W. BOLING ENGR: E. BARBIN APPD: H. DROLLETT CH: H. DROLLETT DATE: 07/16/2026 DRAWING No. TP-13 REV. 1					

TP-13



TP-13	
ASSEMBLY	QTY
DE-1	3
DE-5	3
DLC-1 KAMO	NOTE 3
DLC-1	NOTE 3
GR-1	1
GR-2	NOTE 4
J-3	4
OPD-1 KAMO	1
OPD-1	1
SBX-1 KAMO	1
SBX-1	1
SWD-1	2

NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- REFER TO HDW-03 FOR DLC-1 DOWNLEAD CLAMP ASSEMBLY INSTALLATION GUIDELINES.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



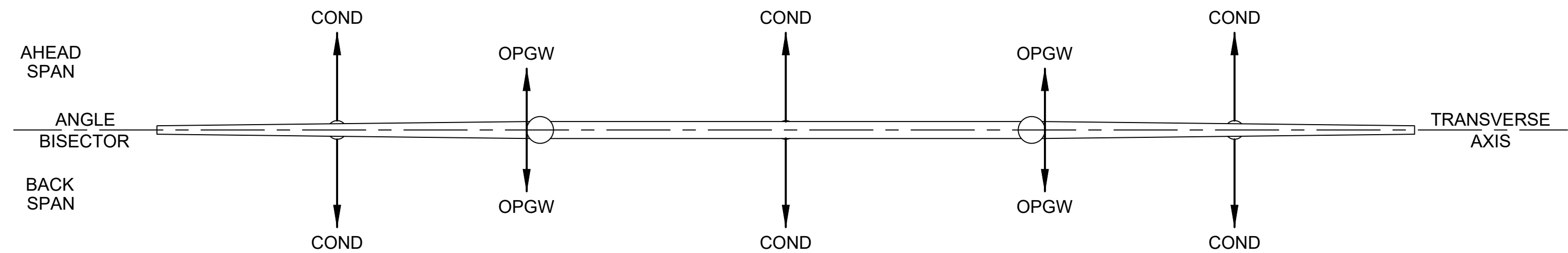
REFERENCE DRAWINGS

DRAWING #
DTL-01
MAT-01

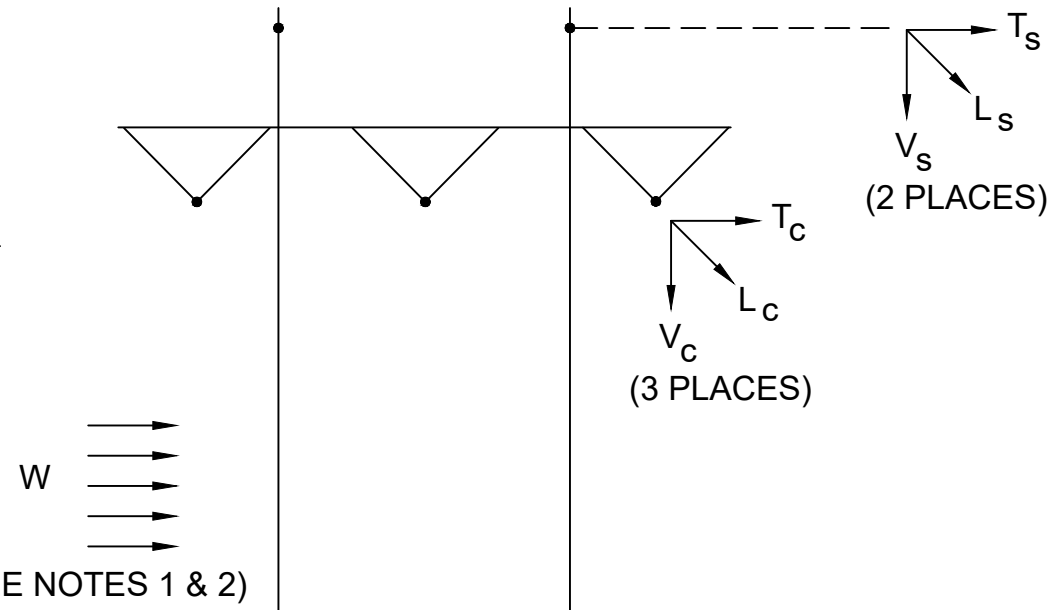
DRAWING NAME:
STRUCTURE DETAILS
STRUCTURE MATERIAL ASSEMBLY LIST

NO.	DATE	DESCRIPTION	BY	CHK	APP
0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD

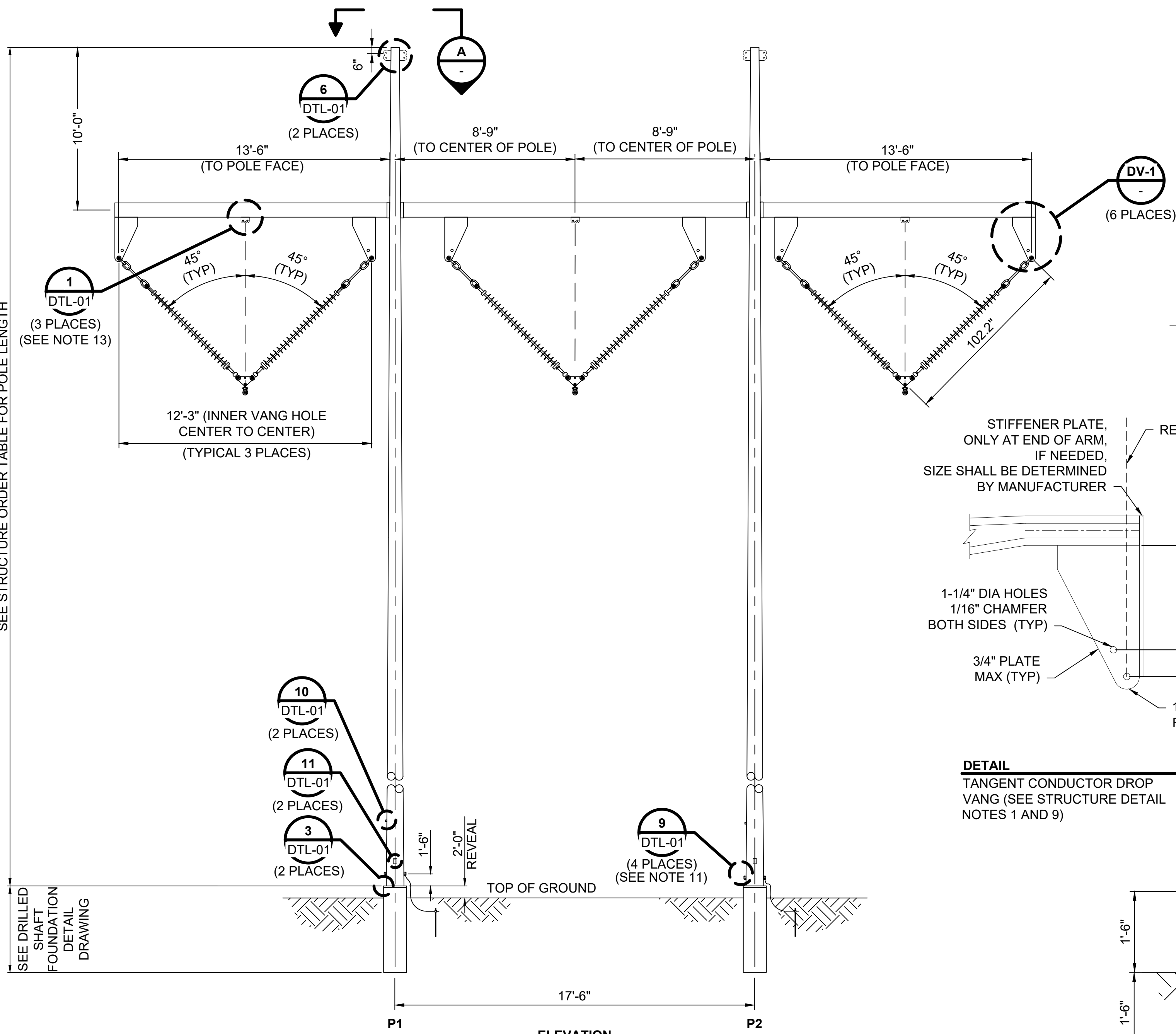
GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA>			
161KV SINGLE CIRCUIT 0° - 90° DEADEND STEEL POLE SHEET 2			
SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
CH: H. DROLLETT	DATE: 06/24/2026	DRAWING No. TP-13	REV. 0



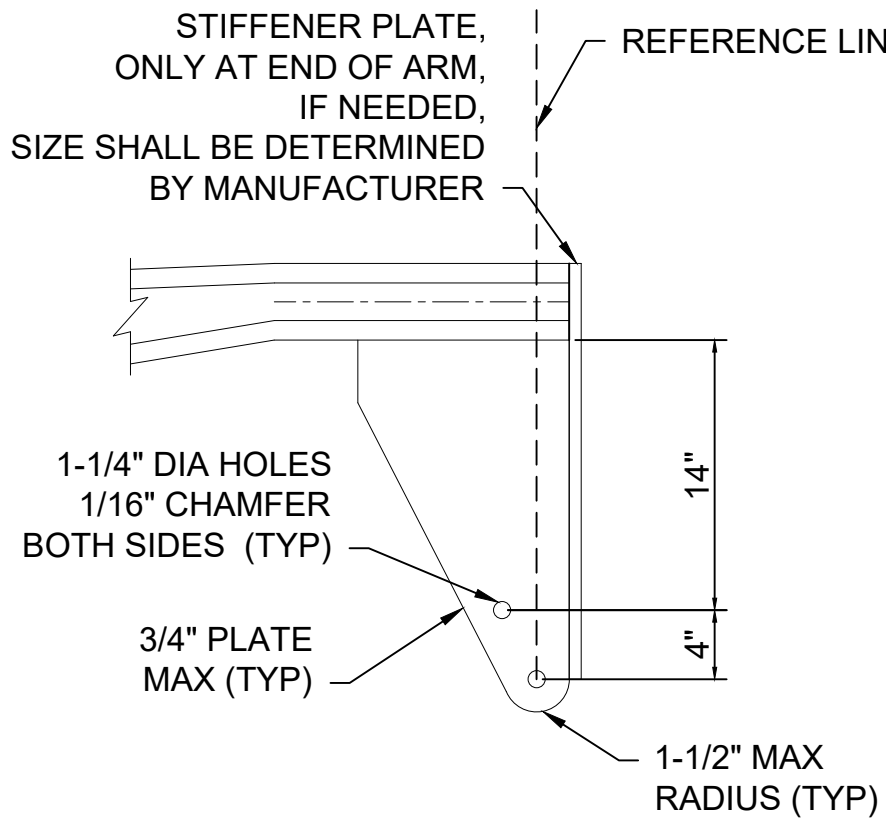
PLAN VIEW



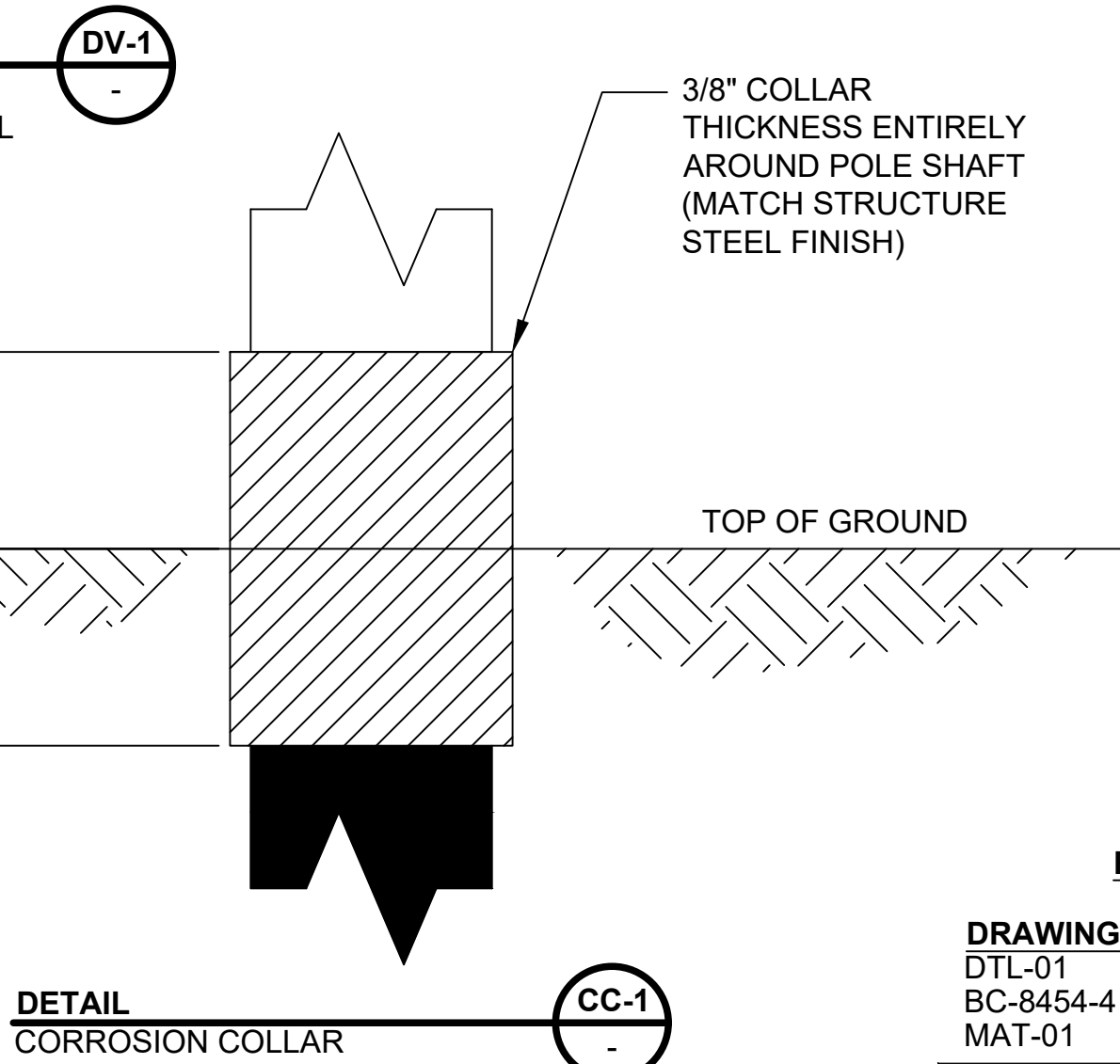
LOAD TREE



ELEVATION



DETAIL
TANGENT CONDUCTOR DROP VANG (SEE STRUCTURE DETAIL NOTES 1 AND 9)



DETAIL
CORROSION COLLAR

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES



OK CERT. OF AUTH. NO. 421

LOAD CASE	DESCRIPTION	OVERLOAD CAPACITY FACTORS	CONDUCTOR (KIPS)			OPGW (KIPS)			W (PSF)	REMARKS
			Vc	Tc	Lc	Vs	Ts	Ls		
1	NESC HEAVY DISTRICT (0.5" ICE, 4 PSF WIND, 0°F)	VERTICAL: 1.50 TENSION: 1.10 WIND: 2.50	4.0	2.1	0.0	2.4	1.3	0.0	10.0	SEE NOTES
2	GRDA EXTREME WIND (NO ICE, 25.6 PSF WIND, 60°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	2.1	2.1	0.0	0.9	1.0	0.0	28.2	SEE NOTES
3	CONCURRENT ICE AND WIND (1" ICE, 4.1 PSF WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	4.5	1.5	0.0	3.0	1.0	0.0	4.6	SEE NOTES
4	GRDA EXTREME ICE (1" ICE, NO WIND, 15°F)	VERTICAL: 1.10 TENSION: 1.10 WIND: 1.10	4.5	0.8	0.0	3.0	0.4	0.0	0.0	SEE NOTES
5	DEFLECTION / NORMAL (NO ICE, NO WIND, 60°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	1.9	0.4	1.0	0.7	0.2	0.5	0.0	SEE NOTES
6	CONSTRUCTION (NO ICE, 2 PSF WIND, 30°F)	VERTICAL: 1.50 TENSION: 1.50 WIND: 1.50	2.6	0.8	1.0	1.0	0.3	0.5	3.0	SEE NOTES
7	BROKEN WIRE (NO ICE, 12.5 PSF WIND, 0°F)	VERTICAL: 1.00 TENSION: 1.00 WIND: 1.00	1.8	0.9	0.0	0.8	0.4	0.0	12.5	SEE NOTES

STRUCTURE DESIGN CRITERIA		MAX INITIAL TENSION	ANGLE	WIND SPAN	WEIGHT SPAN
STR. TYPE: 161kV H-FRAME TANGENT 0-3°		NESC HEAVY (LBS)		(FT)	(FT)
CONDUCTOR: (3) 795 KCMIL ACSR "DRAKE"		11,000	0-3°	600	800
OPGW: (2) AFL DNO-12606		5,300	0-3°	600	800

DESIGN NOTES

- W = WIND ON PROJECTED AREA OF POLE, INCLUDING OVERLOAD FACTORS. WIND SHALL BE APPLIED IN DIRECTION OF MAXIMUM STRUCTURE LOADING.
- INCREASE W BY APPLICABLE SHAPE FACTOR FOR POLES.
1.1 = 12 SIDED
1.4 = 8 SIDED
1.6 = LATTICE AND FLAT SURFACES
- STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOAD COMBINATIONS.
A. ALL WIRES INSTALLED AS SHOWN.
B. FOR LOAD CASE 7 ONLY, ALL WIRES ATTACHED WITH A LONGITUDINAL LOAD (Lc) OF 11.3 KIPS ON ANY SINGLE CONDUCTOR ATTACHMENT POSITION WHICH MAY GOVERN.
C. FOR LOAD CASE 7 ONLY, ALL WIRES ATTACHED WITH A LONGITUDINAL LOAD (Ls) OF 3.6 KIPS ON ANY SINGLE SHIELD WIRE ATTACHMENT POSITION WHICH MAY GOVERN.
- V, T, AND L ARE, RESPECTIVELY: VERTICAL, TRANSVERSE, AND LONGITUDINAL WIRE LOADS IN KIPS.
- THE DEAD LOAD OF THE STRUCTURE SHALL BE MULTIPLIED BY THE VERTICAL OVERLOAD FACTOR.
- CONDUCTOR AND SHIELD WIRE LOADS ARE PER ATTACHMENT AND INCLUDE OVERLOAD FACTORS.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, POLE TOP DEFLECTION SHALL NOT EXCEED THE DISTANCE OF ONE POLE TOP DIAMETER UNDER NORMAL LOAD CASE 5, AND 5% OF POLE LENGTH UNDER ALL OTHER LOAD CASES.
- FOR ALL LOAD COMBINATIONS SHOWN IN NOTE 4, STRUCTURE ARM DEFLECTION SHALL NOT EXCEED THE DISTANCE OF 0.5% OF TOTAL ARM LENGTH UNDER NORMAL LOAD CASE 5, AND 6% OF ARM LENGTH UNDER ALL OTHER LOAD CASES.
- STRUCTURE AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF WIND ON THE STRUCTURE AND WIRE LOADS FOR EACH LOADING CASE.
- STRUCTURE SHALL BE DESIGNED WITH WEATHERING STEEL.
- GROUNDING PADS SHALL BE PLACED AT 2'-0" ABOVE THE GROUNDLINE ON OPPOSITE POLE FACES OF THE TRANSVERSE AXIS. GROUNDING PAD HOLES SHALL BE PLUGGED DURING GALVANIZING.
- PROTECTIVE COATING SHALL BE EVENLY APPLIED FROM THE TOP OF THE CORROSION COLLAR TO 4 FEET ABOVE THE BASE OF THE POLE. SURFACE PREPARATION AND THICKNESS ARE TO MANUFACTURER'S RECOMMENDATION.
- MID-ARM VANG SHALL BE PLACED DIRECTLY ABOVE V-STRING LOAD POINT. MID-ARM VANG SHALL BE DESIGNED FOR CONSTRUCTION LOADING (LOAD CASE 6). MID-ARM VANG LOADS SHALL NOT BE APPLIED CONCURRENTLY WITH LOADS APPLIED TO INSULATOR V-STRING ASSEMBLY.
- STRUCTURE CROSSARMS SHALL BE DESIGNED TO BE HORIZONTAL WITH NO RISE UNDER NORMAL CONDITIONS (LOAD CASE 5).
- STRUCTURE SEGMENTS SHALL BE JOINED USING FLANGED CONNECTIONS. MANUFACTURER SHALL PROVIDE ALL NECESSARY HARDWARE FOR SECURING CONNECTION JOINTS.

STRUCTURE ORDER TABLE: TP-14		
POLE LENGTH (FT)	STRUCTURE NUMBER	QTY
145	113, 114	2

REFERENCE DRAWINGS

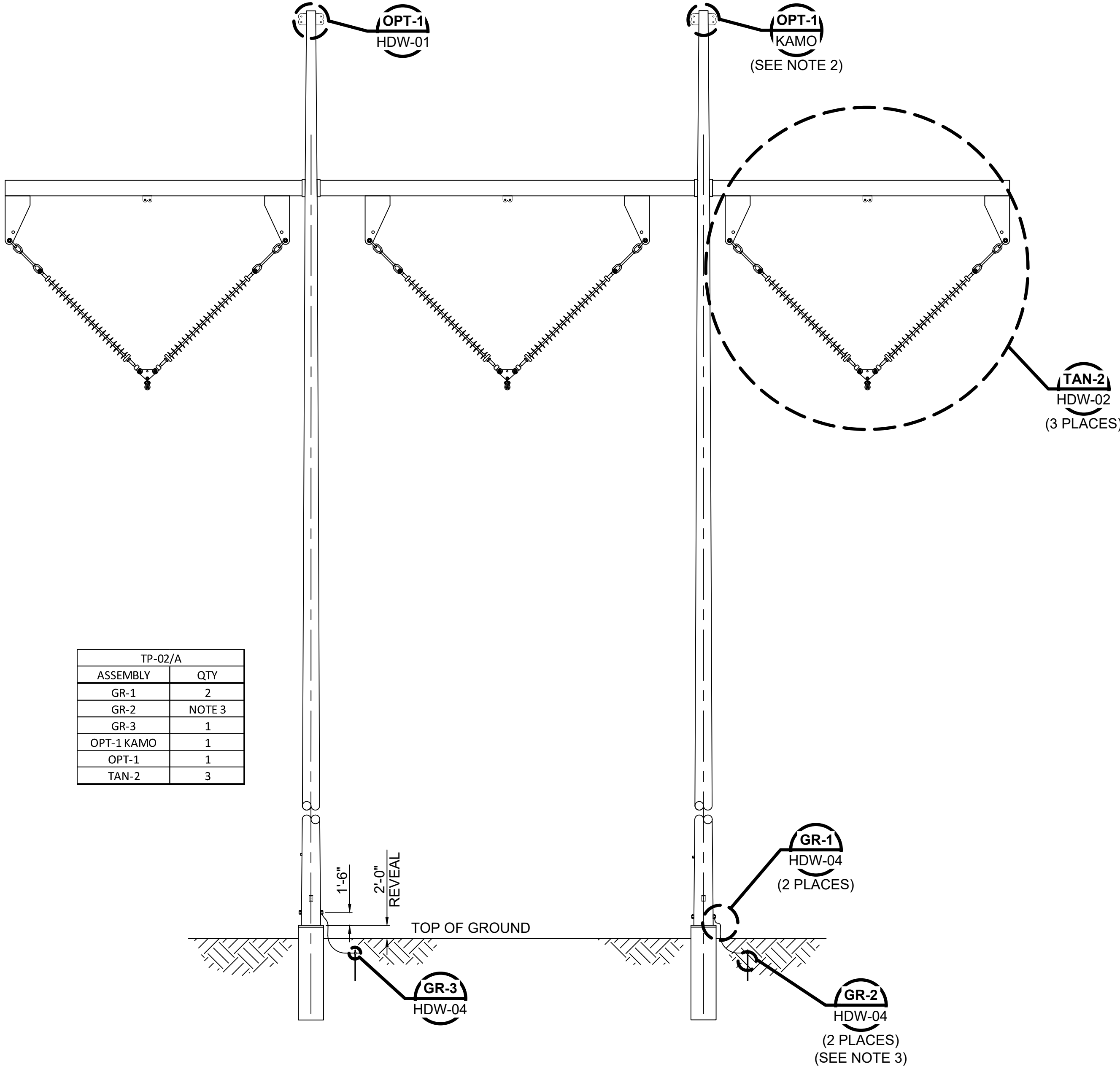
DRAWING #
DTL-01
BC-8454-4
MAT-01

DRAWING NAME:
STRUCTURE DETAILS
V-STRING HARDWARE DETAIL
STRUCTURE MATERIAL ASSEMBLY LIST

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

COPYRIGHT © 2026 BURNS & McDONNELL ENGINEERING COMPANY, INC.

TP-14
STR # 113, 114



TP-02/A	
ASSEMBLY	QTY
GR-1	2
GR-2	NOTE 3
GR-3	1
OPT-1 KAMO	1
OPT-1	1
TAN-2	3

ELEVATION

REFERENCE DRAWINGS

DRAWING #	DRAWING NAME:
DTL-01	STRUCTURE DETAILS
BC-8454-4	V-STRING HARDWARE DETAIL
MAT-01	STRUCTURE MATERIAL ASSEMBLY LIST

						GRAND RIVER DAM AUTHORITY FEEDER 9G REBUILD <MUSKOGEE COUNTY, OKLAHOMA> 161kV 161kV SINGLE CIRCUIT 0° – 3° TANGENT STEEL H-FRAME, DRILLED SHAFT SHEET 2			
						SCALE: NONE	DRAWN BY: W. BOLING	ENGR: E. BARBIN	APPD: H. DROLLETT
						CH: H. DROLLETT		DATE: 06/24/2026	
						DRAWING No.		REV.	
						TP – 14		0	
						GRDA GRAND RIVER DAM AUTHORITY P.O. BOX 409 VINITA, OK 74301			

0	06/24/2026	ISSUED FOR BID	WCB	HCD	HCD
NO.	DATE	DESCRIPTION	BY	CHK	APP

NOTES

- FRAMING DIAGRAMS SHOWN LOOKING AHEAD WHERE V-NOTCH FACES RIGHT. REFER TO PH-01 FOR ORIENTATION OF GRDA FIBER AND KAMO FIBER.
- ASSEMBLY TO BE PROVIDED BY KAMO.
- GR-2 ASSEMBLIES TO BE INSTALLED AS NEEDED TO MEET GROUNDING REQUIREMENTS. SEE MAT-01 FOR ESTIMATED QUANTITIES.

RELEASED FOR QUOTE ONLY
HAYDEN DROLLETT, P.E. # 34698
ON
06/24/2026
AND SHALL NOT BE USED FOR
PERMIT OR CONSTRUCTION
PURPOSES

