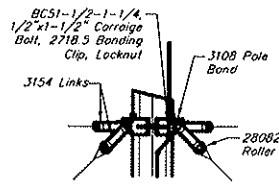
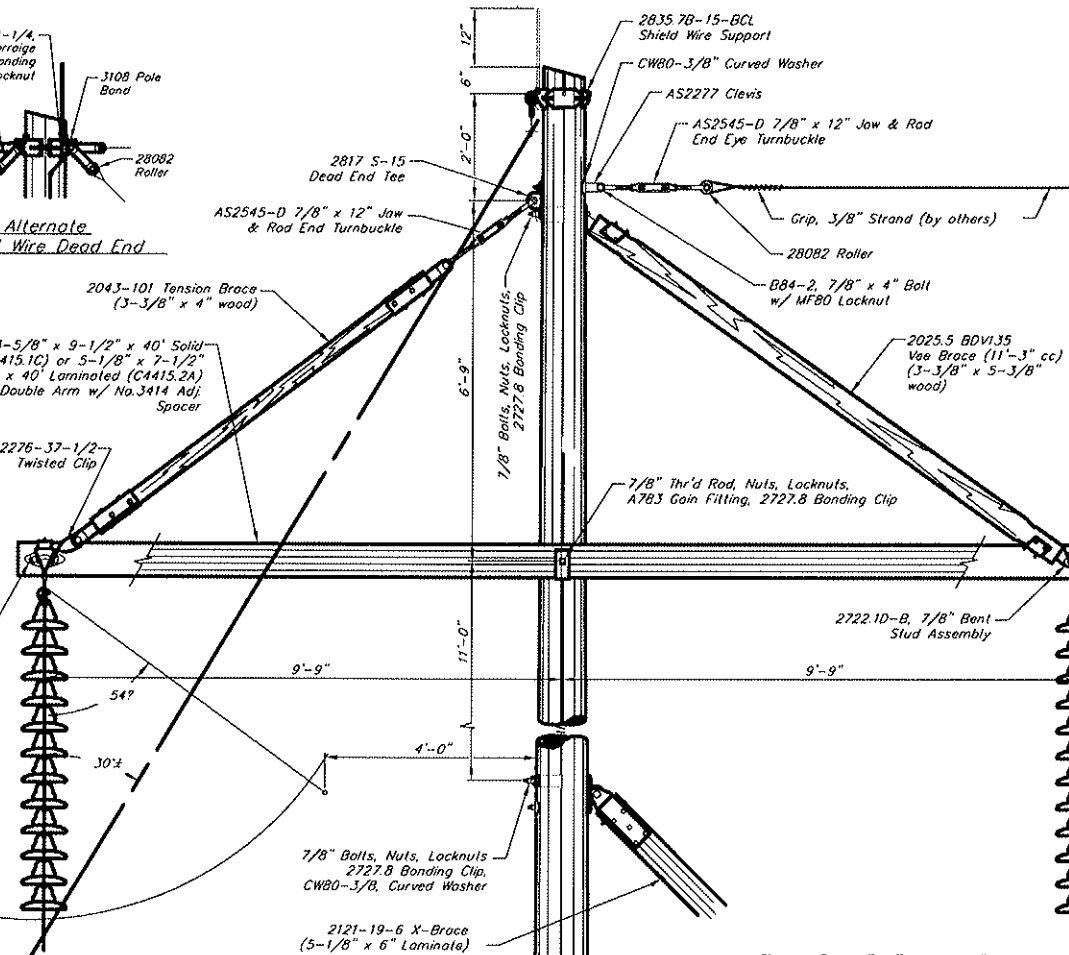


Install A-1895-2 Pole Anchors when indicated on Plan & Profile



Alternate Shield Wire Dead End



Type C4415-B Long Span
Tangent Structure
230 KV Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

BILL OF MATERIAL	
ASSEMBLED ARM	
1	- C4415.2A Assembled Arm, consisting of:
2	- C4415.2A-1 Side Arm, 5-1/2" x 7-1/2" x 40'-0" Laminated
3	- 3414.2MF-100 Adj. Spacer Fitting
12	- W866-1-3/4, 5/8" x 6" WH Bolt
6	- W858-1-1/2-1-3/4, 1/2" x 8-1/2" WH Bolt
2	- AS2277-37-1/2 Clip
2	- 2722.10-B, 7/8" Bent Bolt, w/ N80 & MF80
1	- 2722.10-B, 7/8" Bent Stud, w/ 2-N80 & 2-MF80
ARM MOUNTING HARDWARE	
2	- W828-5, 7/8" x 28" Thr'd Rod w/ 3-N80 & 2-MF80
4	- A783.1W Gain Fitting
2	- 2727.8 Bonding Clip
X-BRACE ASSEMBLED & MOUNTING HARDWARE	
1	- Set 2121-19-6 X-Brace, 19'-6" Pole Spacing
2	- 2840.1H CC Rods
2	- 2086.8A CC Strap
2	- B818-6, 7/8" x 18" Bolt
2	- B816-6, 7/8" x 16" Bolt
2	- B814-6, 7/8" x 14" Bolt
4	- 2817-15 Dead End Tee
4	- B103-1-1/2EX, 1-3/8" Bolt, MF100
4	- 2727.8 Bonding Clip
4	- N80, 7/8" Nut
4	- MF80, 7/8" Locknut
4	- CW80-3/8 Curved Washer
BRACE ASSEMBLED	
2	- 2025.5 60V1.35 Vee Brace, (11'-3" CC Holes), 37-1/2" & 52-1/2" Flaps (3-3/8" x 5-3/8" x 10'10" Wood)
2	- 2043-101 Tension Brace, (8'-5" CC Holes), (3-3/8" x 4-3/8" x 7'-7" Wood)

BRACE MOUNTING HARDWARE & CROSS TIE MATERIAL	
3	- AS2545-D 7/8" x 12" Jaw & Rod End Eye Turnbuckle
2	- 2817-15 Dead End Tee (All Holes 15/16")
2	- AS2277 Clevis
2	- CW80, 7/8" Curved Washer
2	- 28082 Rollers
2	- B84-2, 7/8" x 4" Bolt, MF80
4	- B814-6, 7/8" x 14" Bolt, MF80
2	- 2727.8 Bonding Clip
2	- N80, 7/8" Nut
4	- MF80, 7/8" Locknut
SHIELD WIRE ATTACHMENT & GUYING HARDWARE	
2	- 2835 7/8-15-BCL Shield Wire Support (7-1/2" - 12" Pole Diam.)
2	- B51-1/2-1-1/4, 1/2" x 1-1/2" Bolt w/ MF50
2	- 2718.5 Bonding Clip

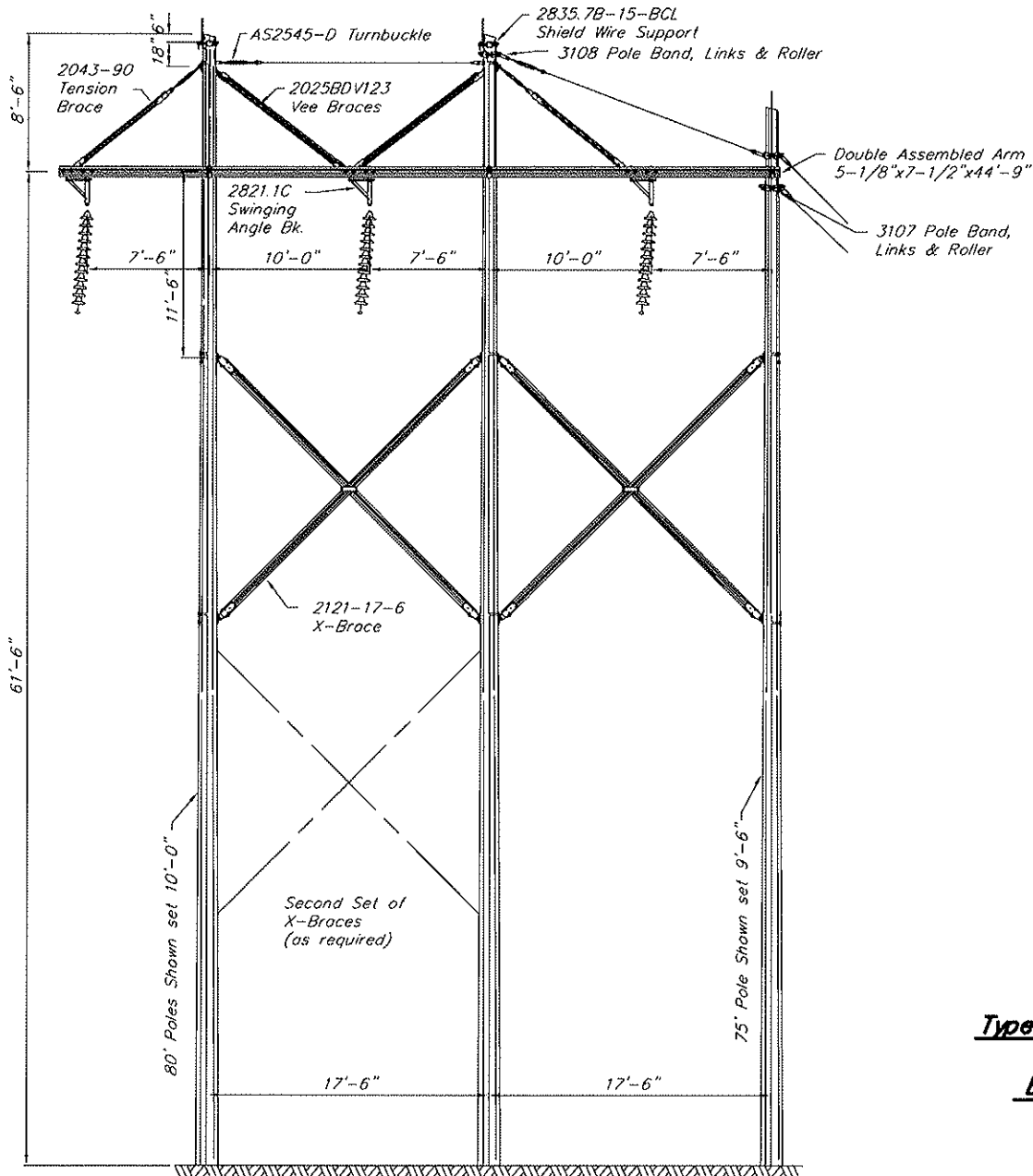


TRANSMISSION STANDARDS
TYPE C4415-B LONG SPAN TANGENT STRUCTURE
230KV
BLACK HILLS POWER

DESIGNED AND DRAWN BY:	
ROUGHIES BROTHERS Seward, Nebraska	
REV. DATE	REV. NO.
1/6/84	1
DRAWING NO.	SHEET
230-B	1

DSGH	XX
DR.	JLM
APPROVED BY	DATE

FIGURE 11



BILL OF MATERIAL	
ASSEMBLED ARM	
1	- C4415.3A Assembled Arm, consisting of:
1	- C4415.3A-1A Arm Assembly
2	- C4415.3A-1 Side Arm, 5-1/8"x7-1/2"x44"-9" Laminate
6	- 3414.2WF-100 Adj. Spacer Filling
24	- HB66-1-3/4, 5/8"x6" W.H. Bolt
12	- HB58-1/2-1-3/4, 1/2"x8-1/2" W.H. Bolt
2	- AS2276-37-1/2 Twisted Clip
2	- 2722.1B-B, 7/8" Bent Bolt, w/ N80 & MF80
1	- 2722.1D-B, 7/8" Bent Stud, w/ 2-N80 & 2-MF80
2	- HB58-1/2-1-3/4, 1/2"x8-1/2" W.H. Bolt w/ LW50T
ARM MOUNTING HARDWARE	
3	- 1R28-5, 1/8"x28" Thr'd Rod, w/ 3-N80 & 2-MF80
6	- A783.1W Con. Filling
3	- 2727.8 Bounding Clip
3	- 2821.1C Swinging Angle Brackets
X-BRACE ASSEMBLED & MOUNTING HARDWARE	
2	- Set 2121-17-6 X-Brace, 17'-6" Pole Spacing
2	- 2840.1H C.C. Rods
2	- 2086.8A C.C. Strap
3	- B818-6, 7/8"x18" Bolt
6	- B816-6, 7/8"x16" Bolt
3	- B814-6, 7/8"x14" Bolt
8	- 2817D-15 Dead End Tee
8	- B103-1-1/2EX, 1"x3" Bolt, MF100
12	- 2727.8 Bounding Clip
12	- N80, 7/8" Nut
12	- MF80, 7/8" Locknut
8	- CW80-3/8, Curved Washer
BRACES ASSEMBLED	
2	- 2025BDV123 Vee Brace, (10-3" CC Holes) 37-1/2" x 52-1/2" Flgs. (3-3/8"x4-3/8" v9-8" Wood)
2	- 2043-90 Tension Brace, (7'-6" CC Holes) (3-3/8"x4-3/8" v6-8" Wood)
BRACE MOUNTING HARDWARE & CROSS IN MATERIAL	
4	- AS2545-D, 7/8"x12" Jaw & Rod Eye Turnbuckle
2	- 2817S-15 Dead End Tee (All Holes 15/16")
2	- AS2277 Clevis
2	- CW80, 7/8" Curved Washer
2	- 28082 Rollers
2	- B84-2, 7/8"x4" Bolt, MF80
4	- B814-6, 7/8"x14" Bolt
2	- 2727.8 Bounding Clip
2	- N80, 7/8" Nut
4	- MF80, 7/8" Locknut
2	- 3108.5 Pole Band Assembly (7"-10" Pole Diam.)
6	- 3154 Links
3	- 28082 Rollers
3	- B83-2, 7/8"x3" Bolt, MF80
1	- 3107.5 Pole Band Assembly (7"-10" Pole Diam.)
3	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
3	- 2718.5 Bounding Clip
2	- 3155 Links
1	- 28083 Rollers
1	- B103-1/2-2-1/2, 1"x3-1/2" Bolt, MF80
SHIELD WIRE ATTACHMENT	
2	- 2835.7B-15-BCL Shield Wire Support, (7-1/2"-12" Pole Diam.)
2	- B51-1/2-1-1/4, 1/2"x1-1/2" Bolt, MF50
2	- 2718.5 Bounding Clip

Type C4415-C 1'-4' Angle Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

Install A-1895-2 Pole Anchors when Indicated on Plan & Profile



DSCR.	XX
DR.	J.M.
APPROVED BY	DATE

TRANSMISSION STANDARDS

TYPE C4415-C, 1' - 4' ANGLE STRUCTURE
230KV
 BLACK HILLS POWER

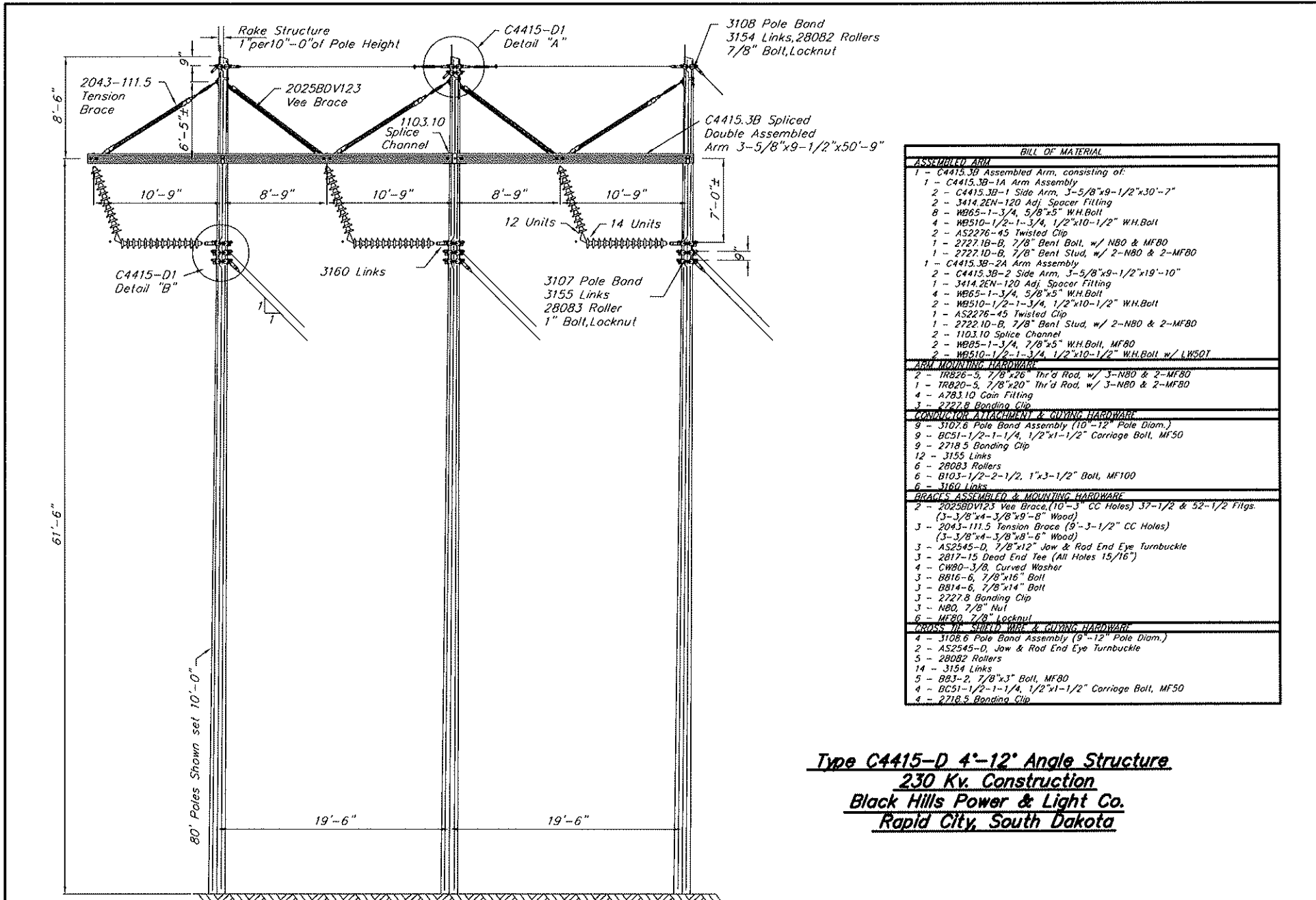
DESIGNED AND DRAWN BY:



REV. DATE	REV. NO.
1/8/94	1
DRAWING NO.	SHEET

230-C 1

FIGURE 11



BILL OF MATERIAL	
ASSEMBLED ARM	
1 - C4415.3B Assembled Arm, consisting of:	
1 - C4415.3B-1A Arm Assembly	
2 - C4415.3B-1 Side Arm, 3-5/8"x9-1/2"x30"-7"	
2 - 3414.2EN-120 Adj. Spacer Filling	
8 - WB65-1-3/4, 5/8"x5" W.H. Bolt	
4 - WB510-1/2-1-3/4, 1/2"x10-1/2" W.H. Bolt	
2 - AS2276-45 Twisted Clip	
1 - 2727.10-B, 7/8" Bent Bolt, w/ N80 & MF80	
1 - 2727.10-B, 7/8" Bent Stud, w/ 2-N80 & 2-MF80	
1 - C4415.3B-2A Arm Assembly	
2 - C4415.3B-2 Side Arm, 3-5/8"x9-1/2"x19"-10"	
1 - 3414.2EN-120 Adj. Spacer Filling	
4 - WB65-1-3/4, 5/8"x5" W.H. Bolt	
2 - WB510-1/2-1-3/4, 1/2"x10-1/2" W.H. Bolt	
1 - AS2276-45 Twisted Clip	
1 - 2727.10-B, 7/8" Bent Stud, w/ 2-N80 & 2-MF80	
2 - 1103.10 Splice Channel	
2 - WB65-1-3/4, 7/8"x5" W.H. Bolt, MF80	
2 - WB510-1/2-1-3/4, 1/2"x10-1/2" W.H. Bolt w/ LW50T	
ARM MOUNTING HARDWARE	
2 - 1R826-5, 7/8"x26" Thr'd Rod, w/ 3-N80 & 2-MF80	
1 - 1R826-5, 7/8"x20" Thr'd Rod, w/ 3-N80 & 2-MF80	
4 - A783.10 Cone Filling	
3 - 2727.8 Banding Clip	
CONDUCTOR ATTACHMENT & GUYING HARDWARE	
9 - 3107.6 Pole Band Assembly (10"-12" Pole Diam.)	
9 - BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50	
9 - 2718.5 Banding Clip	
12 - 3155 Links	
6 - 28083 Rollers	
6 - B103-1/2-2-1/2, 1"x3-1/2" Bolt, MF100	
6 - 3160 Links	
BRACES ASSEMBLED & MOUNTING HARDWARE	
2 - 2025BDV123 Vee Brace, (10-3 CC Holes) 57-1/2 & 52-1/2 Fills.	
(3-3/8"x4-3/8"x9-8" Wood)	
3 - 2043-111.5 Tension Brace (9-3-1/2" CC Holes)	
(3-3/8"x4-3/8"x8-6" Wood)	
3 - AS2545-D, 7/8"x12" Jaw & Rod End Eye Turnbuckle	
3 - 2817-15 Dead End Tee (All Holes 15/16")	
4 - CW80-3/8, Curved Washer	
3 - B816-6, 7/8"x16" Bolt	
3 - B814-6, 7/8"x14" Bolt	
3 - 2727.8 Banding Clip	
3 - N80, 7/8" Nut	
6 - MF80, 7/8" Locknut	
CROSS ILL. SHIELD WIRE & GUYING HARDWARE	
4 - 3108.6 Pole Band Assembly (9"-12" Pole Diam.)	
2 - AS2545-D, Jaw & Rod End Eye Turnbuckle	
5 - 28082 Rollers	
14 - 3154 Links	
5 - B83-2, 7/8"x3" Bolt, MF80	
4 - BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50	
4 - 2718.5 Banding Clip	

Type C4415-D 4'-12' Angle Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

Install A1895-2 Pole Anchors when Indicated on Plan & Profile

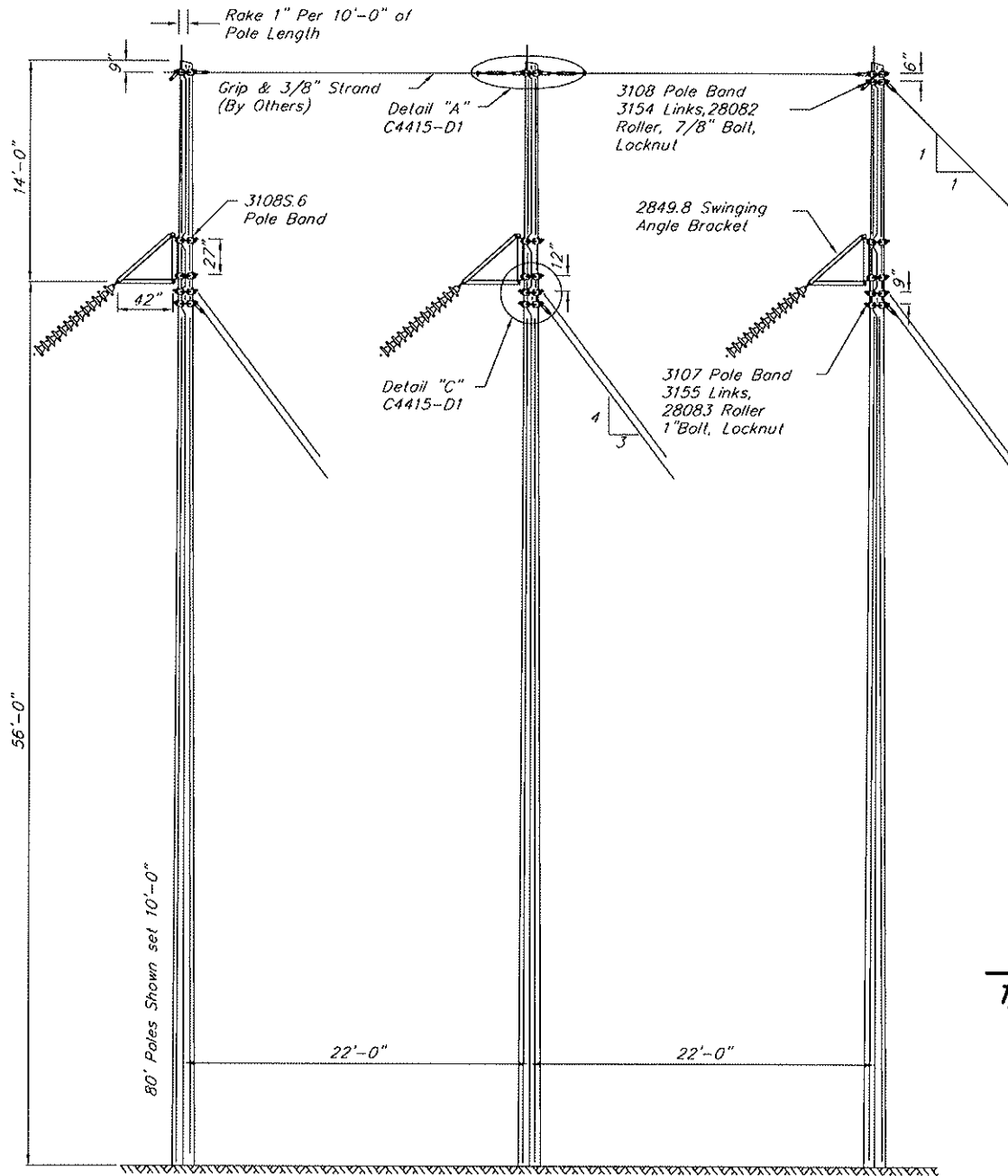


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DR	JAM
APPROVED BY	DATE

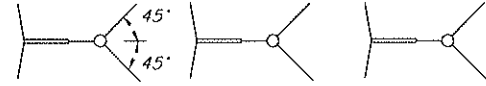
TRANSMISSION STANDARDS
TYPE C4415-D, 4' - 12' ANGLE STRUCTURE
230KV
 BLACK HILLS POWER

DESIGNED AND DRAWN BY:	
TOUGHNESS BROTHERS	
REV. DATE	REV. NO.
1/6/84	1
DRAWING NO.	SHEET
230-D	1

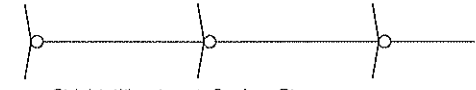
FIGURE 11



BILL OF MATERIAL	
CONDUCTOR ATTACHMENT & GUYING HARDWARE	
3	- 2849.8 Swinging Angle Bracket
6	- 3108S.6 Pole Band Assembly (9"-12" Pole Diam.)
3	- 2718.5 Banding Clip
3	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
6	- 3107.6 Pole Band Assembly (10"-12" Pole Diam.)
6	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
6	- 2718.5 Banding Clip
12	- 3155 Links
6	- 28083 Rollers
6	- B103-1/2-2-1/2, 1"x3-1/2" Bolt, MF100
CROSSING, SHIELD WIRE & GUYING HARDWARE	
2	- A52545-D, 7/8"x12" Jaw & Rod End Eye Turnbuckle
4	- 3108.6 Pole Band Assembly (9"-12" Pole Diam.)
5	- 28082 Rollers
5	- B83-2, 7/8"x3" Bolt, MF80
4	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
4	- 2718.5 Banding Clip



Conductor Level Guying Plan



Shield Wire Level Guying Plan

Type C4415-E 12'-20° Angle Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

Install A1895 Pole Anchors when Indicated on Plan & Profile

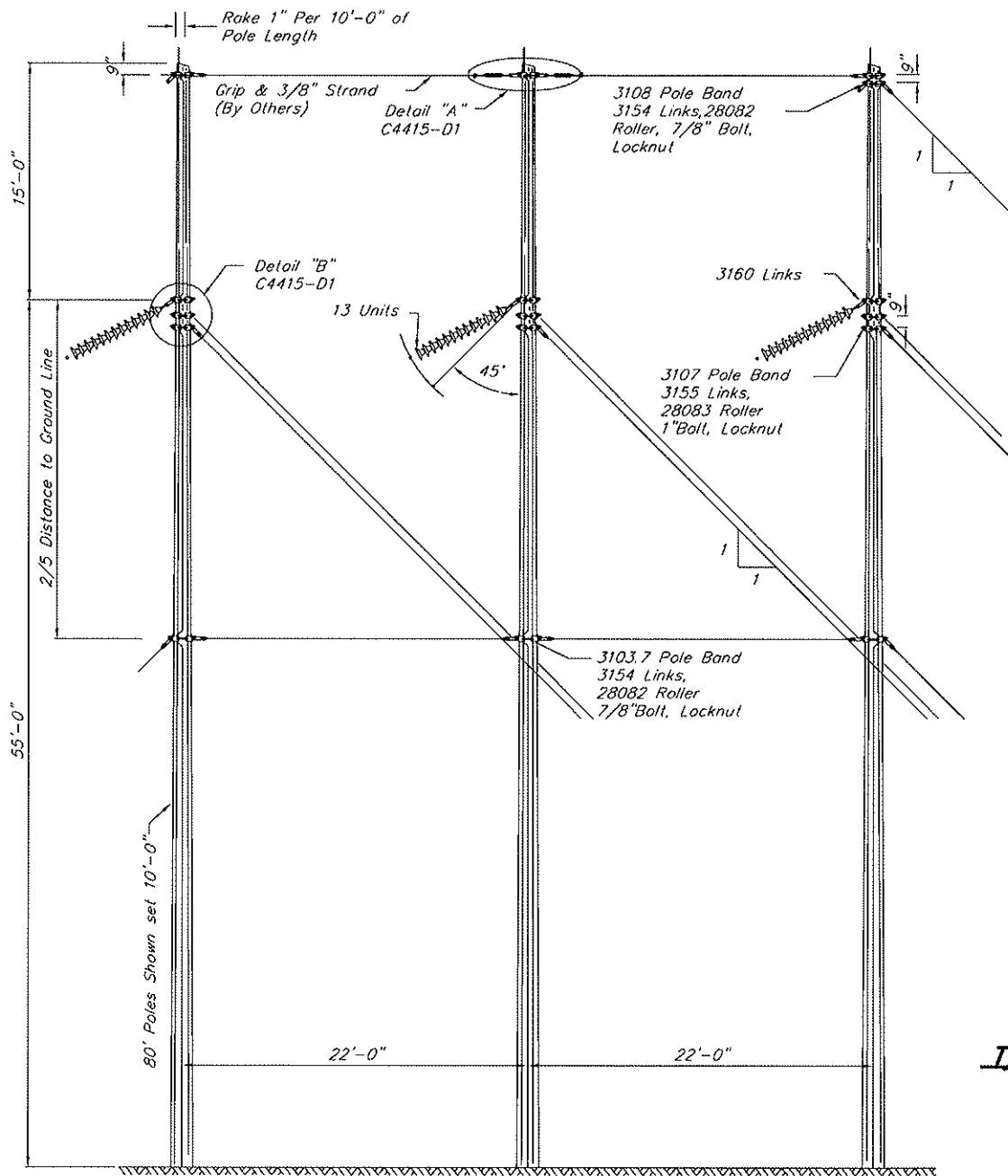


DSCH.	XX
DR.	J.M.
APPROVED BY	DATE

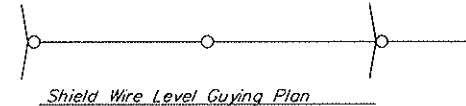
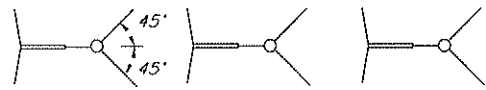
TRANSMISSION STANDARDS
TYPE C4415-E, 12' - 20° ANGLE STRUCTURE
230KV
 BLACK HILLS POWER

DESIGNED AND DRAWN BY:	
TOUGHIES BROTHERS General Contractors	
REV. DATE	REV. NO.
1/5/84	1
DRAWING NO.	SHEET
230-E	1

FIGURE 11



BILL OF MATERIAL	
CONDUCTOR ATTACHMENT & GUYING HARDWARE	
9	- 3107.6 Pole Band Assembly (10"-12" Pole Diam.)
9	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
9	- 2718.5 Bonding Clip
6	- 3160 Links
12	- 3155 Links
6	- 28083 Rollers
6	- B103-1/2-2-1/2, 1"x3-1/2" Bolt, MF100
CROSS TIE, SHIELD WIRE & GUYING HARDWARE	
2	- AS2545-D, 7/8"x12" Jaw & Rod End Eye Turnbuckle
4	- 3108.6 Pole Band Assembly (9"-12" Pole Diam.)
5	- 28082 Rollers
14	- 3154 Links
5	- BB3-2, 7/8"x3" Bolt, MF80
4	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
4	- 2718.5 Bonding Clip
STRUT GUY MATERIAL	
3	- 3103.7 Pole Band Assembly (11"-14" Pole Diam.)
12	- 3154 Links
6	- 28082 Rollers
6	- BB3-2, 7/8"x3" Bolt, MF80



Type C4415-F 20'-30' Angle Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

Install A1895 Pole Anchors when Indicated on Plan & Profile

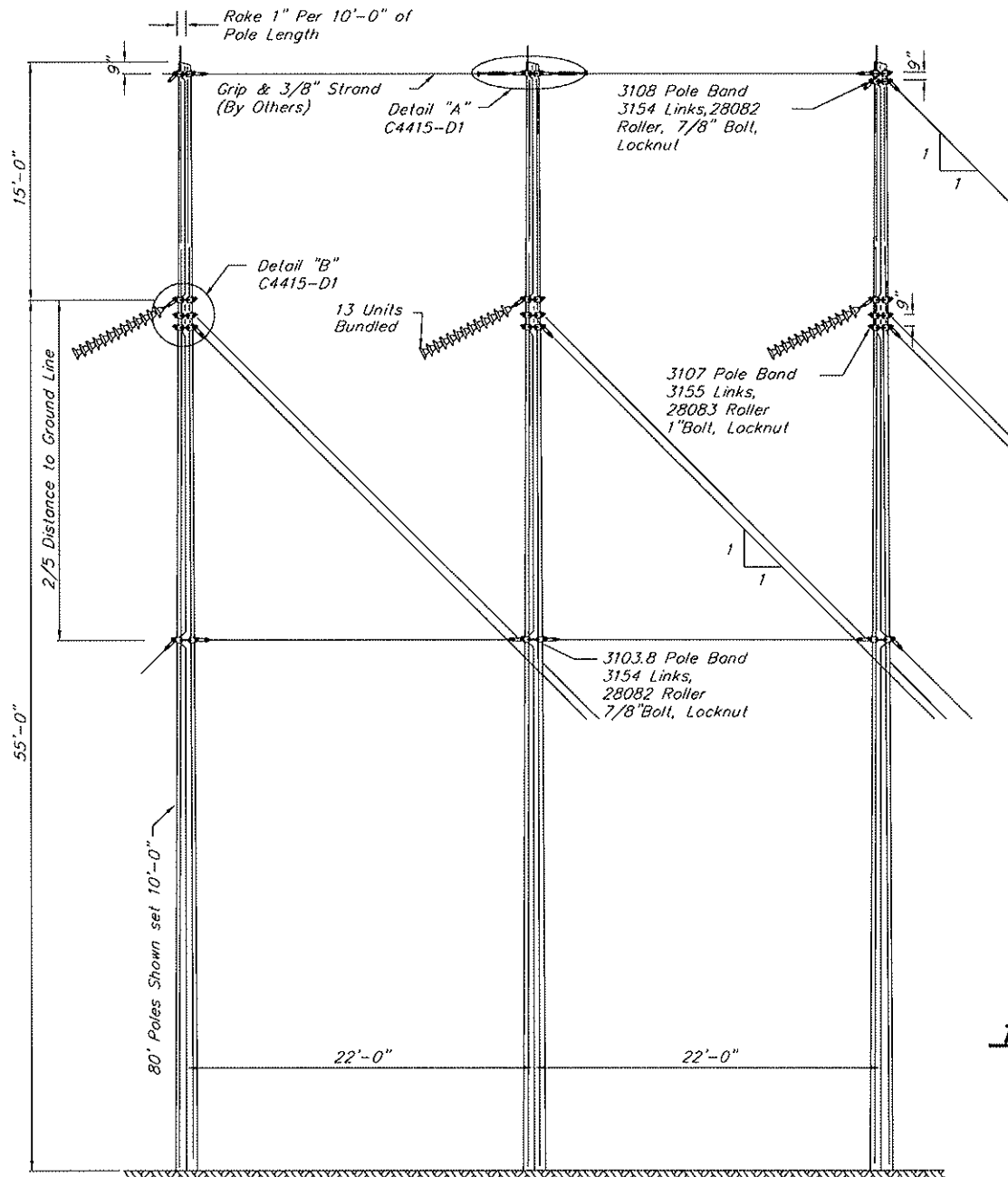


DSCM	XX
DR	JL
APPROVED BY	DATE

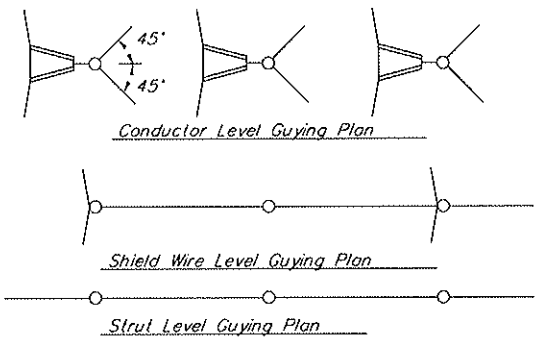
TRANSMISSION STANDARDS
TYPE C4415-F, 20' - 30' ANGLE STRUCTURE
230KV
 BLACK HILLS POWER

DESIGNED AND DRAWN BY:	
TOUGHERS BROTHERS	
REV. DATE	REV. NO.
1/8/94	1
DRAWING NO.	SHEET
230-F	1

FIGURE 11



BILL OF MATERIAL	
CONDUCTOR ATTACHMENT & GUYING HARDWARE	
9	- 3107.6 Pole Band Assembly (10"-12" Pole Diam.)
9	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
9	- 2718.5 Bonding Clip
18	- 3155 Links
6	- 28083 Rollers
6	- B103-1/2-2-1/2, 1"x3-1/2" Bolt, MF100
CROSSING SHIELD WIRE & GUYING HARDWARE	
2	- AS2545-D, 7/8"x12" Jaw & Rod End Eye Turnbuckle
4	- 3108.6 Pole Band Assembly (9"-12" Pole Diam.)
5	- 28082 Rollers
14	- 3154 Links
5	- BB3-2, 7/8"x3" Bolt, MF80
4	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
4	- 2718.5 Bonding Clip
STRUT GUY MATERIAL	
3	- 3103.8 Pole Band Assembly (13"-16" Pole Diam.)
3	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
3	- 2718.5 Bonding Clip
12	- 3154 Links
6	- 28082 Rollers
6	- BB3-2, 7/8"x3" Bolt, MF80



Type C4415-G 30°-45° Angle Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

Install A1895 Pole Anchors when indicated on Plan & Profile

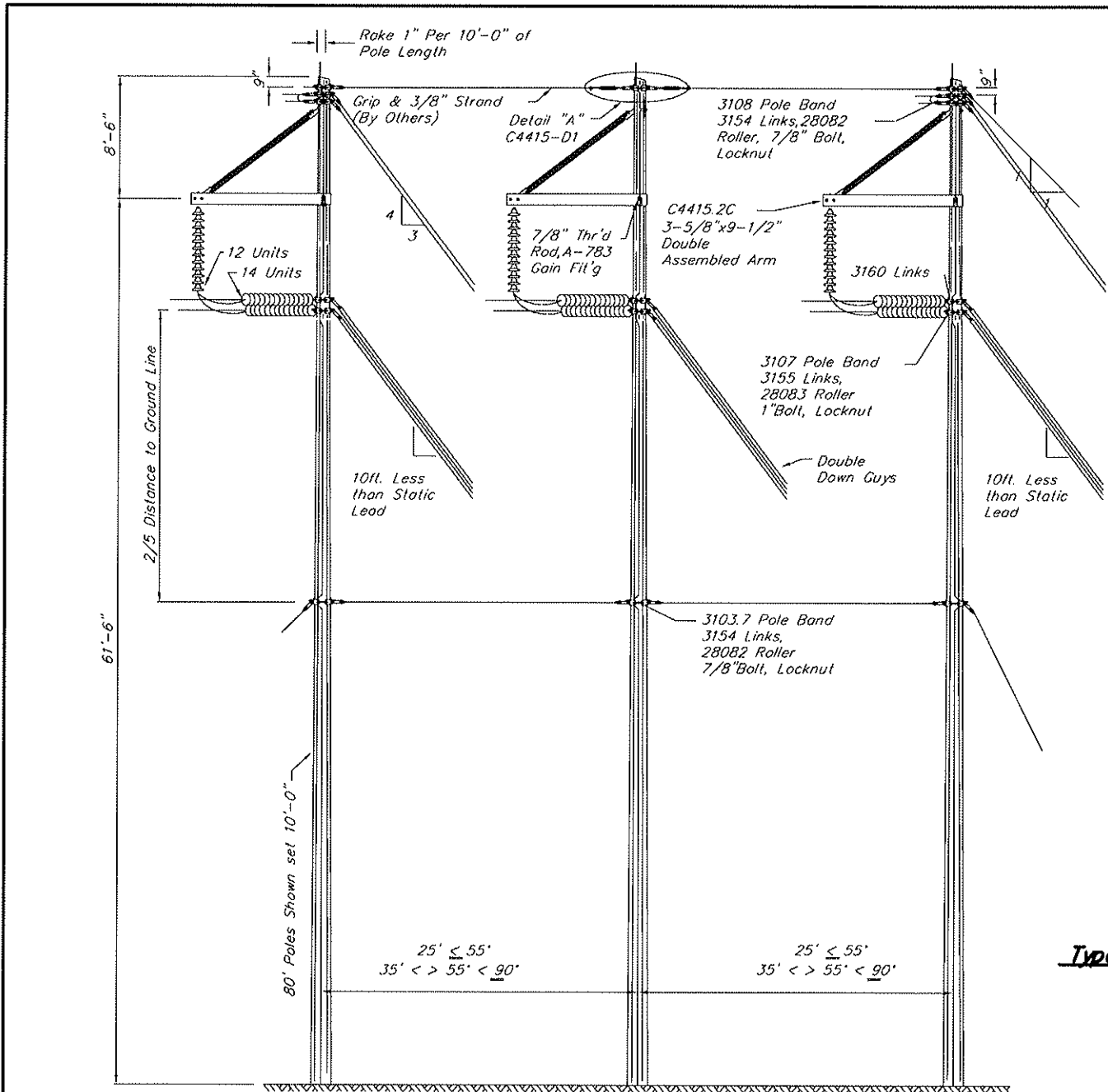


DSCH	XX
DR	JM
APPROVED BY	DATE

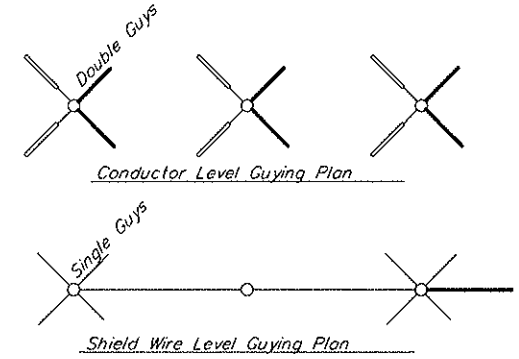
TRANSMISSION STANDARDS
TYPE C4415-G, 30° - 45° ANGLE STRUCTURE
230KV
 BLACK HILLS POWER

DESIGNED AND DRAWN BY:	
TOUGHNIPS BROTHERS Structural Hardware	
REV. DATE	REV. NO.
1/6/84	1
DRAWING NO.	SHEET
230-G	1

FIGURE 11



BILL OF MATERIAL	
ASSEMBLED ARM	
3	- C4415.2C Assembled Arm consisting of:
2	- C4415.2C-1 Arm, 3-5/8"x9-1/2"x9"-9"
1	- 3414.2EN-120 Adj. Spacer Fitting
4	- W865-1-3/4, 5/8"x5" W.H. Bolt
2	- W8510-1/2-1-3/4, 1/2"x10-1/2" W.H. Bolt
1	- 2722.1B-B, 7/8" Bent Bolt w/ N80 & MF80
2	- W8510-1/2-1-3/4, 1/2"x10-1/2" W.H. Bolt, LWSOT
ARM MOUNTING HARDWARE	
3	- YR826-5, 7/8 x 26 Thr'd Rod, 3 - N80, 2 - MF80
6	- A783.10 Gain Fitting
3	- 2727.B Bonding Clip
WET BRACE ASSEMBLY & MOUNTING HARDWARE	
3	- 2025BDV123 Veg Broce, 10-3" CC Holes, (3-3/8 x 4-3/8 x 9'-8" Wood), 37-1/2' & 52-1/2' Fit'gs.
3	- B814-6, 7/8 x 14" Bolt with MF80
3	- 2727.B Bonding Clip
3	- N80, 7/8" Nuts
3	- CW80-3/8 Curved Washer (4 x 4 x 3/8")
CONDUCTOR ATTACHMENT & GUYING HARDWARE	
6	- 3107.6 Pole Band Assembly (10"-12" Pole Diam.)
6	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
6	- 2718.5 Bonding Clip
12	- 3160 Links
12	- 3155 Links
6	- 28083 Rollers
6	- B103-1/2-2-1/2, 1"x3-1/2" Bolt, MF100
CROSS THE SHIELD WIRE & GUYING HARDWARE	
2	- AS2545-D, 7/8"x12" Jaw & Rod End Eye Turnbuckle
7	- 3108.6 Pole Band Assembly (9"-12" Pole Diam.)
9	- 28082 Rollers
18	- 3154 Links
9	- B83-2, 7/8"x3" Bolt, MF80
7	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
7	- 2718.5 Bonding Clip
SHIELD WIRE MATERIAL	
3	- 3103.7 Pole Band Assembly (11"-14" Pole Diam.)
12	- 3154 Links
6	- 28082 Rollers
6	- B83-2, 7/8"x3" Bolt, MF80
3	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
3	- 2718.5 Bonding Clip



Type C4415-H 30°-90° Angle Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

Install A1895 Pole Anchors when Indicated on Plan & Profile

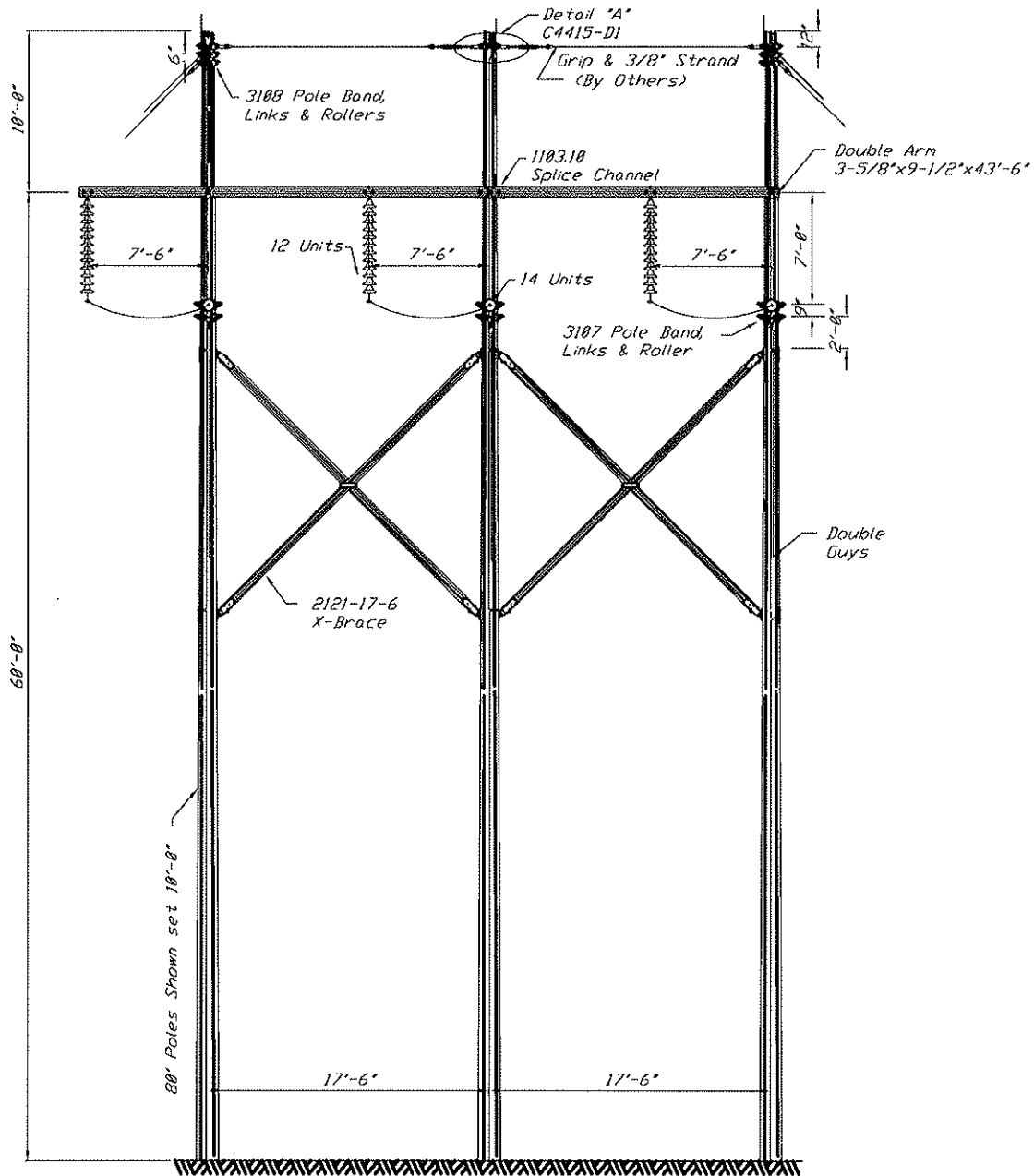


DSCR.	XX
DR.	JLM
APPROVED BY	DATE

TRANSMISSION STANDARDS
TYPE C4415-H, 30° - 90° ANGLE STRUCTURE
230KV
 BLACK HILLS POWER

DESIGNED AND DRAWN BY:	
DOUGHERS BROTHERS Specialty Fabricating	
REV. DATE	REV. NO.
1/6/94	1
DRAWING NO.	SHEET
230-H	1

FIGURE 11



BILL OF MATERIAL	
ASSEMBLED ARM	
1	C4415.SA Assembled Arm, consisting of:
1	C4415.SA-1A Arm Assembly
2	C4415.SA-1 Side Arm, 3-5/8"x9-1/2"x25'-4"
2	3414.2EN-100 Adj. Spacer Fitting
8	WB65-1-3/4, 5/8"x5" W.H.Bolt
4	WB510-1/2-1-3/4, 1/2"x10-1/2" W.H.Bolt
1	C4415.SA-2A Arm Assembly
2	C4415.SA-2 Side Arm, 3-5/8"x9-1/2"x17'-10"
1	3414.2EN-100 Adj. Spacer Fitting
4	WB65-1-3/4, 5/8"x5" W.H.Bolt
2	WB510-1/2-1-3/4, 1/2"x10-1/2" W.H.Bolt
2	1103.10 Splice Channel
4	WB65-1-3/4, 7/8"x5" W.H.Bolt
2	WB510-1/2-1-3/4, 1/2"x10-1/2" W.H.Bolt
ARM MOUNTING HARDWARE	
2	1R026-5, 7/8"x26" Thr'd Rod, w/ 3-N08 & 2-MF00
1	1R018-5, 7/8"x18" Thr'd Rod, w/ 3-N08 & 2-MF00
4	A703.10 Goin Fitting
2	2727.B Bonding Clip
X-BRACE ASSEMBLY & MOUNTING HARDWARE	
2	Set 2121-17-6 X-Brace, 17'-6" Pole Spacing
2	2006.0A CC Strap
6	B016-6, 7/8"x18" Bolt
6	B016-6, 7/8"x16" Bolt
3	B014-6, 7/8"x14" Bolt
8	2017D-15 Dead End Tee
8	B103-1-1/2EX, 1"x3" Bolt, MF100
6	2727.B Bonding Clip
6	N08, 7/8" Nut
12	MF00, 7/8" Locknut
12	CV00-3/8, Curved Washer
CONDUCTOR ATTACHMENT & GUYING HARDWARE	
2	AS045-D, 7/8"x16" Goin & Rod Eye Turnbuckle
6	3107.6 Pole Band Assembly (18"-12" Pole Diam.)
6	BCS1-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
6	2710.5 Bonding Clip
24	3155 Links
6	2000.3 Rollers
6	B103-1/2-2-1/2, 1"x3-1/2" Bolt, MF00
CROSS-TIL SHIELD WIRE & GUYING HARDWARE	
7	3100.5 Pole Band Assembly (7'-10" Pole Diam.)
7	BCS1-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
7	2710.5 Bonding Clip
16	3154 Links
8	2000.2 Rollers
8	B03-2, 7/8"x3" Bolt, MF00

Type C4415-J
In-Line Dead End Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

Install A-1895-2 Pole Anchors when Indicated on Plan & Profile



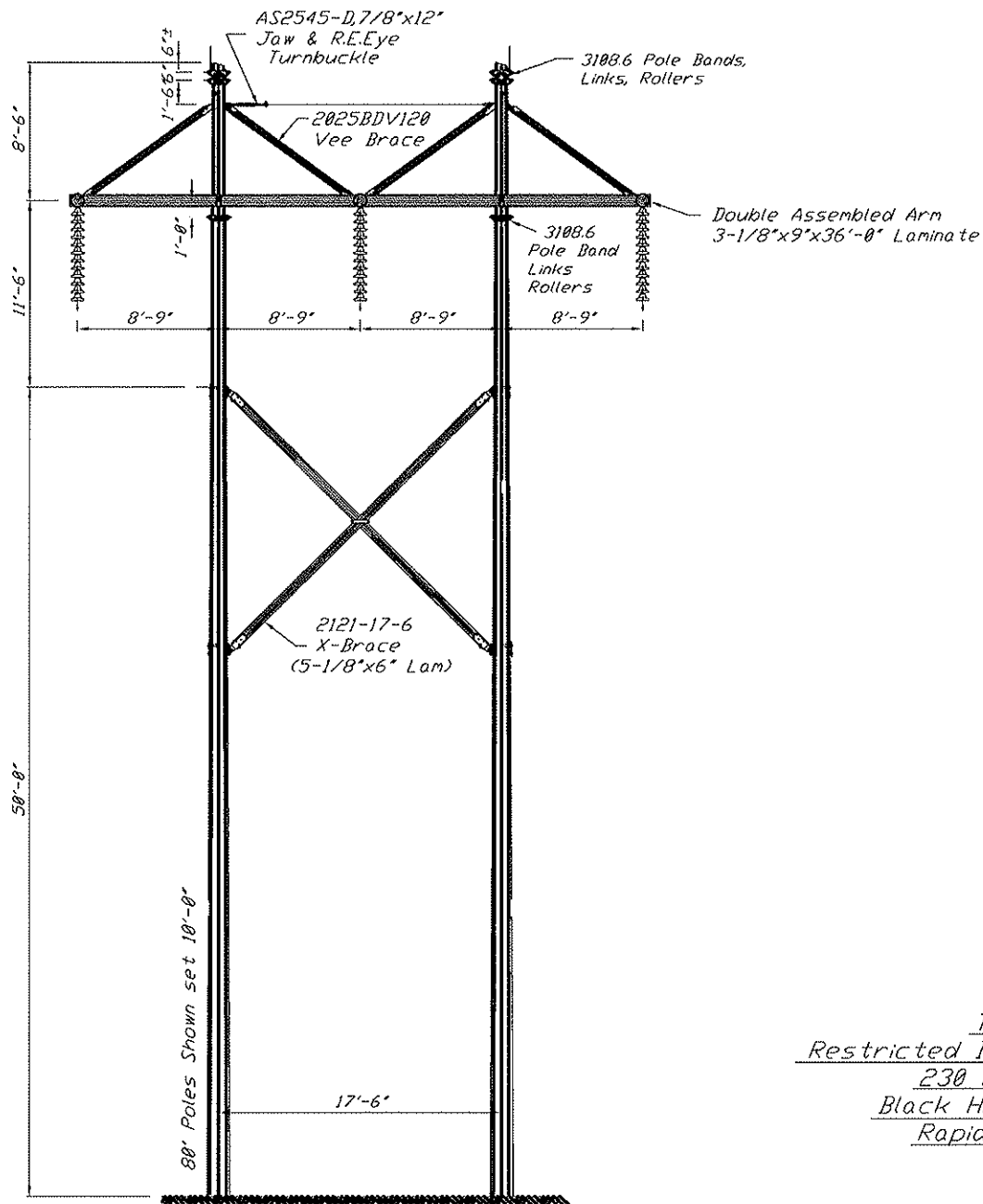
DSCN: XX
 DR: JLM
 APPROVED BY: DATE

TRANSMISSION STANDARDS
 TYPE C4415-J, IN-LINE DEAD END STRUCTURE
 230KV
 BLACK HILLS POWER

DESIGNED AND DRAWN BY:
HUGHES
 BROTHERS
 Seward, Nebraska

REV DATE 1/6/94	REV NO 1
DRAWING NO. 230-J	SHEET 1

FIGURE 11



BILL OF MATERIAL	
ASSEMBLED ARM	
1 - C4415.4A Assembled Arm, consisting of:	
2 - C4415.4A-1 Side Arm, 3-1/8" x 9" x 36'-0" Laminate	
3 - 2884.2UV-12 Spacer Fitting	
12 - B65-1-3/4, 5/8" x 5" Bolt	
6 - WB510-1-3/4, 1/2" x 18" W.H. Bolt	
6 - 2817-15 Dead End Tee	
2 - AS2275-37-1/2 Clip	
2 - 27221B-B, 7/8" Bent Bolt w/ N80 & MF80	
1 - 27221D-B, 7/8" Bent Stud w/ 2-N80 & 2-MF80	
ARM MOUNTING HARDWARE	
2 - 1803-5, 7/8" x 28" Thrd Rod with 3- N80 & 2-MF80	
4 - 1783.1U Gdn Fitting	
2 - 2727.8 Banding Clip	
X-BRACE ASSEMBLY & MOUNTING HARDWARE	
1 - Set 2121-17-6 X-Brace, 17'-6" Pole Spacing	
2 - 2848.1H CC Rods	
2 - 2886.8A CC Strap	
2 - BB16-6, 7/8" x 18" Bolt	
4 - BB16-6, 7/8" x 16" Bolt	
4 - BB14-6, 7/8" x 14" Bolt	
4 - 2817D-15 Dead End Tee	
4 - B103-1-1/2EX, 1" x 3" Bolt, MF100	
4 - 2727.8 Banding Clip	
4 - N80, 7/8" Nut	
8 - MF80, 7/8" Locknut	
8 - CW80-3/8, Curved Washer	
BRACES ASSEMBLY	
4 - 2025BDV120 Vee Brace (10'-8" CC Holes, 37-1/2" & 52-1/2" Fitts. (3-3/8" x 4-3/8" x 9'-5" Wood)	
BRACE MOUNTING HARDWARE & CROSS TIE MATERIAL	
1 - AS2545-D, 7/8" x 12" Jaw & Rnd End Eye Turnbuckle	
2 - AS2277 Clevis	
4 - CW80, 7/8" Curved Washer	
2 - 2888.2 Rollers	
2 - BB4-2, 7/8" x 4" Bolt, MF80	
4 - BB14-6, 7/8" x 14" Bolt	
2 - 2727.8 Banding Clip	
2 - N80, 7/8" Nut	
4 - MF80, 7/8" Locknut	
SHIELD WIRE ATTACHMENT & GUYING HARDWARE	
6 - 3108.6 Pole Band	
6 - B51-1/2-1-1/4, 1/2" x 1-1/2" Bolt with MF58	
6 - 2718.5 Banding Clip	
24 - 3154 Links	
8 - 2888.2 Roller	
8 - BB3-2, 7/8" x 3" Bolt, MF80	

Type C4415-K
Restricted Insulator Swing Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

Install A1B95-2 Pole Anchors when indicated on Plan & Profile

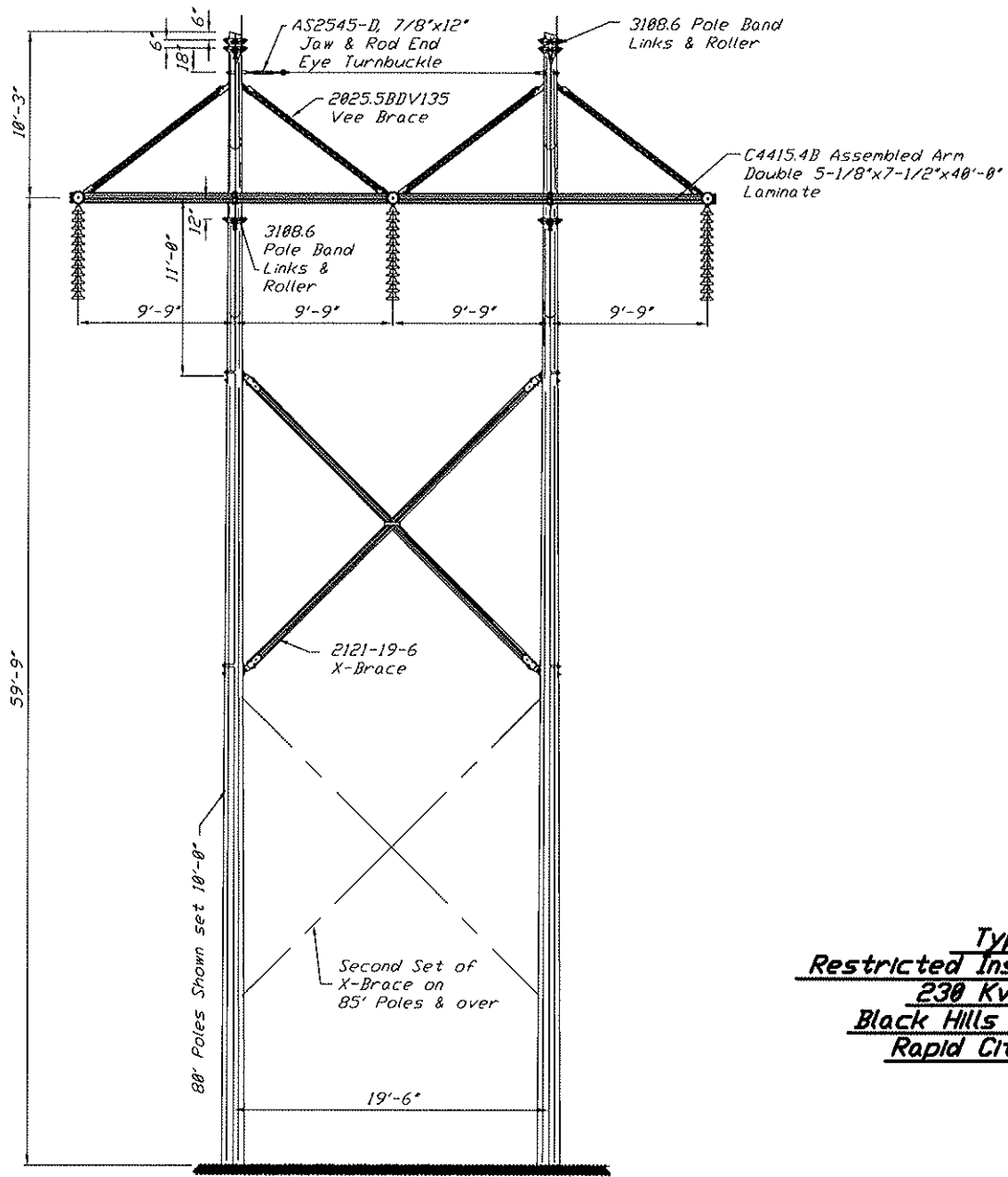


DESIGNED AND DRAWN BY:	
 ROUGH'S BROTHERS Seward, Nebraska	
REV DATE	REV NO
1/6/84	1
DRAWING NO	SHEET
230-K	1

DSCH	XX
DR	J.M.
APPROVED BY	DATE

TRANSMISSION STANDARDS
 TYPE C4415-K, RESTRICTED INSULATOR SWING STRUCTURE
 230KV
 BLACK HILLS POWER

FIGURE 11



BILL OF MATERIAL	
ASSEMBLED ARM	
1	C4415.4B Assembled Arm, consisting of:
2	C4415.4B-1 Side Arm, 5-1/8"x7-1/2"x48'-0" Laminate
2	2884.2W-12 Spacer Fitting
6	2017-15 Dead End Tee
2	AS2276-37-1/2 Clip
2	2722.1B, 7/8" Bent Bolt, N88, MF88
1	2722.1B, 7/8" Bent Stud, 2-N88, 2-MF88
ARM MOUNTING HARDWARE	
2	1828-5, 7/8"x28" Thr'd Rod, 3-N88, 2-MF88
4	A783.1W Gsm Fitting
2	2727.8 Bonding Clip
X-BRACE ASSEMBLED & MOUNTING HARDWARE	
1	Set 2121-19-6 X-Brace, 19'-6" Pole Spacing
2	2848.1H CC Rops
2	2886.8A CC Strap
2	B028-6, 7/8"x28" Bolt
4	B018-6, 7/8"x18" Bolt
2	B816-6, 7/8"x16" Bolt
4	2017D-15 Dead End Tee
4	B183-1-1/2EX, 1"x3" Bolt, MF188
4	2727.8 Bonding Clip
4	N88, 7/8" Nut
8	MF88, 7/8" Locknut
8	CV88-3/8 Curved Washer
BRACES ASSEMBLED	
4	2025.5BDV135 Vee Brace, (11'-3" LL Holes)
37	1/2"x52-1/2" Fittgs. (3-3/8"x5-3/8"x18'-8" Wood)
BRACE MOUNTING HARDWARE & CROSS TIE MATERIAL	
2	AS2245-D, 7/8"x12" Jaw & Rod End Eye Turnbuckle
2	AS2277 Clevis
4	CV88, 7/8" Curved Washer
2	2888.2 Rollers
2	B84-2, 7/8"x4" Bolt, MF88
4	B814-6, 7/8"x14" Bolt
2	2727.8 Bonding Clip
2	N88, 7/8" Nut
4	MF88, 7/8" Locknut
SHIELD WIRE ATTACHMENT	
2	3188.6 Pole Band Assemblies
2	BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF58
2	2718.5, Bonding Clip
8	3154 Links
GUYING HARDWARE	
4	3188.6 Pole Band Assemblies
4	BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF58
4	2718.5 Bonding Clip
16	3154 Links
8	2888.2 Rollers
8	B83-2, 7/8"x3" Bolt, MF88

Type C4415-L
Restricted Insulator Swing Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

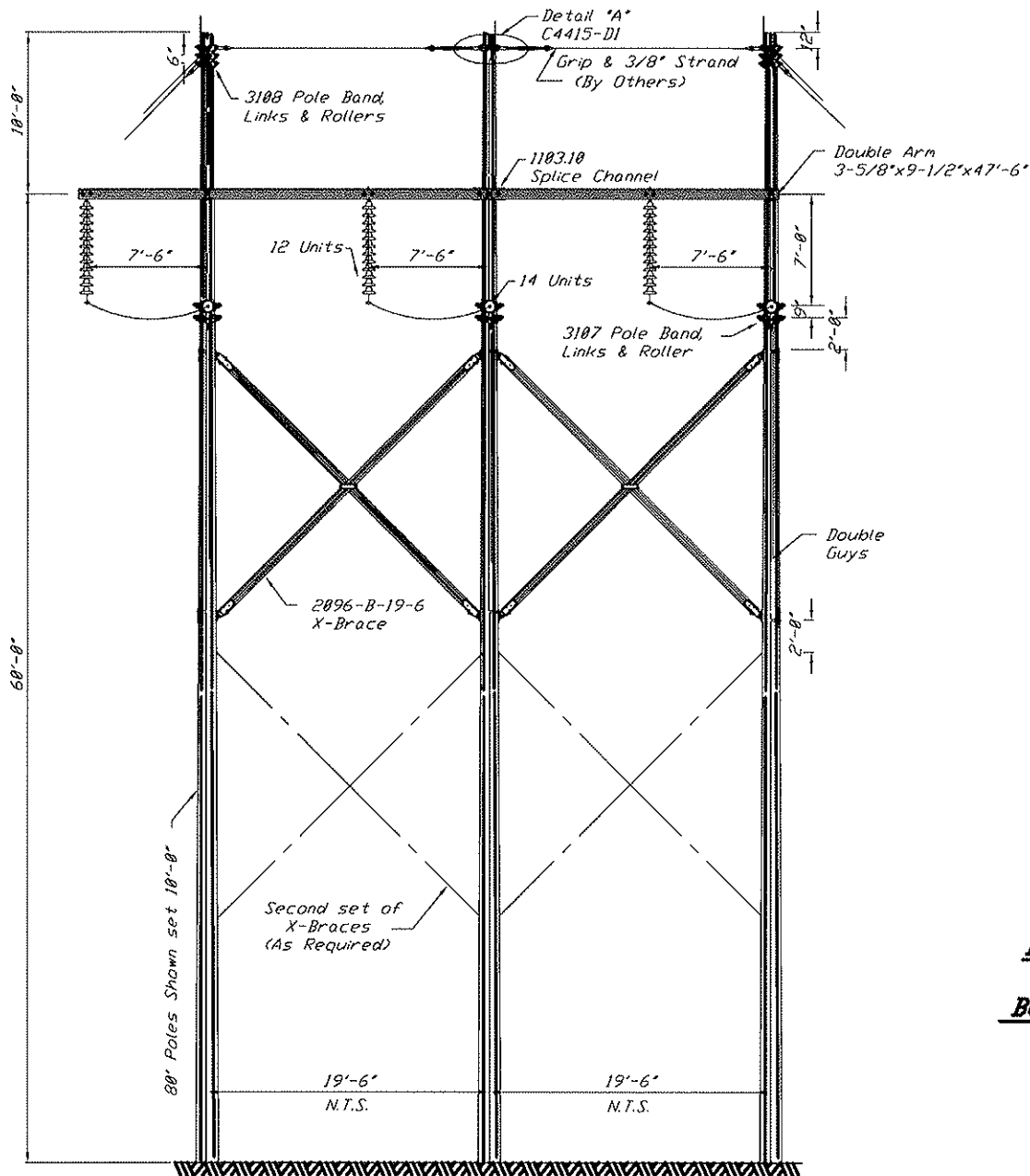
Install A-1895-2 Pole Anchors when Indicated on Plan & Profile



DESIGNED AND DRAWN BY:
TOUGHNESS BROTHERS
 Seward, Nebraska
 REV. DATE: 1/6/94
 REV. NO: 1
 DRAWING NO: 230-L
 SHEET: 1

TRANSMISSION STANDARDS
TYPE C4415-L, RESTRICTED INSULATOR SWING STRUCTURE
230KV
 BLACK HILLS POWER

DSCH. XX	
DR. JAM	
APPROVED BY	DATE



BILL OF MATERIAL	
ASSEMBLED ARM	
1	- C4415.5B Assembled Arm, consisting of:
1	- C4415.5B-1A Arm Assembly
2	- C4415.5B-1 Side Arm, 3-5/8"x9-1/2"x27'-4"
2	- 3414.2EN-120 Adj. Spacer Fitting
0	- W865-1-3/4, 5/8"x5" W.H. Bolt
4	- W8510-1/2-1-3/4, 1/2"x10-1/2" W.H. Bolt
1	- C4415.5B-2A Arm Assembly
2	- C4415.5B-2 Side Arm, 3-5/8"x9-1/2"x19'-10"
1	- 3414.2EN-120 Adj. Spacer Fitting
4	- W865-1-3/4, 5/8"x5" W.H. Bolt
2	- W8510-1/2-1-3/4, 1/2"x10-1/2" W.H. Bolt
2	- 1103.10 Splice Channel
4	- W805-1-3/4, 7/8"x5" W.H. Bolt
2	- W8510-1/2-1-3/4, 1/2"x10-1/2" W.H. Bolt, LWSBY
ARM MOUNTING HARDWARE	
2	- 1R826-5, 7/8"x26" Thr'd Rod w/ 3-N80 & 2-MF80
1	- 1R828-5, 7/8"x28" Thr'd Rod w/ 3-N80 & 2-MF80
4	- A783.10 Gain Fitting
2	- 2727.0 Bonding Clip
X-BRACE ASSEMBLED & MOUNTING HARDWARE	
2	- Set 2896-B-19-6 X-Brace, 19'-6" Pole Spacing
4	- 2040.1E CC Rods
4	- 2007.4A CC Strap
6	- B010-6, 7/8"x10" Bolt
6	- B020-6, 7/8"x20" Bolt
3	- B014-6, 7/8"x14" Bolt
0	- 20170-15 Dead End Tee
0	- B103-1-1/2EX, 1"x3" Bolt, MF100
6	- 2727.0 Bonding Clip
6	- N08, 7/8" Nut
12	- MF08, 7/8" Locknut
0	- CW88-3/8, Curved Washer
CONDUCTOR ATTACHMENT & GUYING HARDWARE	
6	- 3107.6 Pole Band Assembly (10'-12" Pole Diam.)
6	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
6	- 2718.5 Bonding Clip
24	- 3155 Links
6	- 20003 Rollers
6	- B103-1/2-2-1/2, 1"x3-1/2" Bolt, MF00
CROSS TIE, SHIELD WIRE & GUYING HARDWARE	
2	- AS2545-D, 7/8"x12" Jaw & Rod Eye Turnbuckle
7	- 3100.5 Pole Band Assembly (7'-10" Pole Diam.)
7	- BC51-1/2-1-1/4, 1/2"x1-1/2" Carriage Bolt, MF50
7	- 2718.5 Bonding Clip
16	- 3154 Links
0	- 20002 Rollers
0	- B03-0, 7/8"x3" Bolt, MF00

Type C4415-M
In-Line Dead End Structure
230 Kv. Construction
Black Hills Power & Light Co.
Rapid City, South Dakota

Install A-1895-2 Pole Anchors when Indicated on Plan & Profile

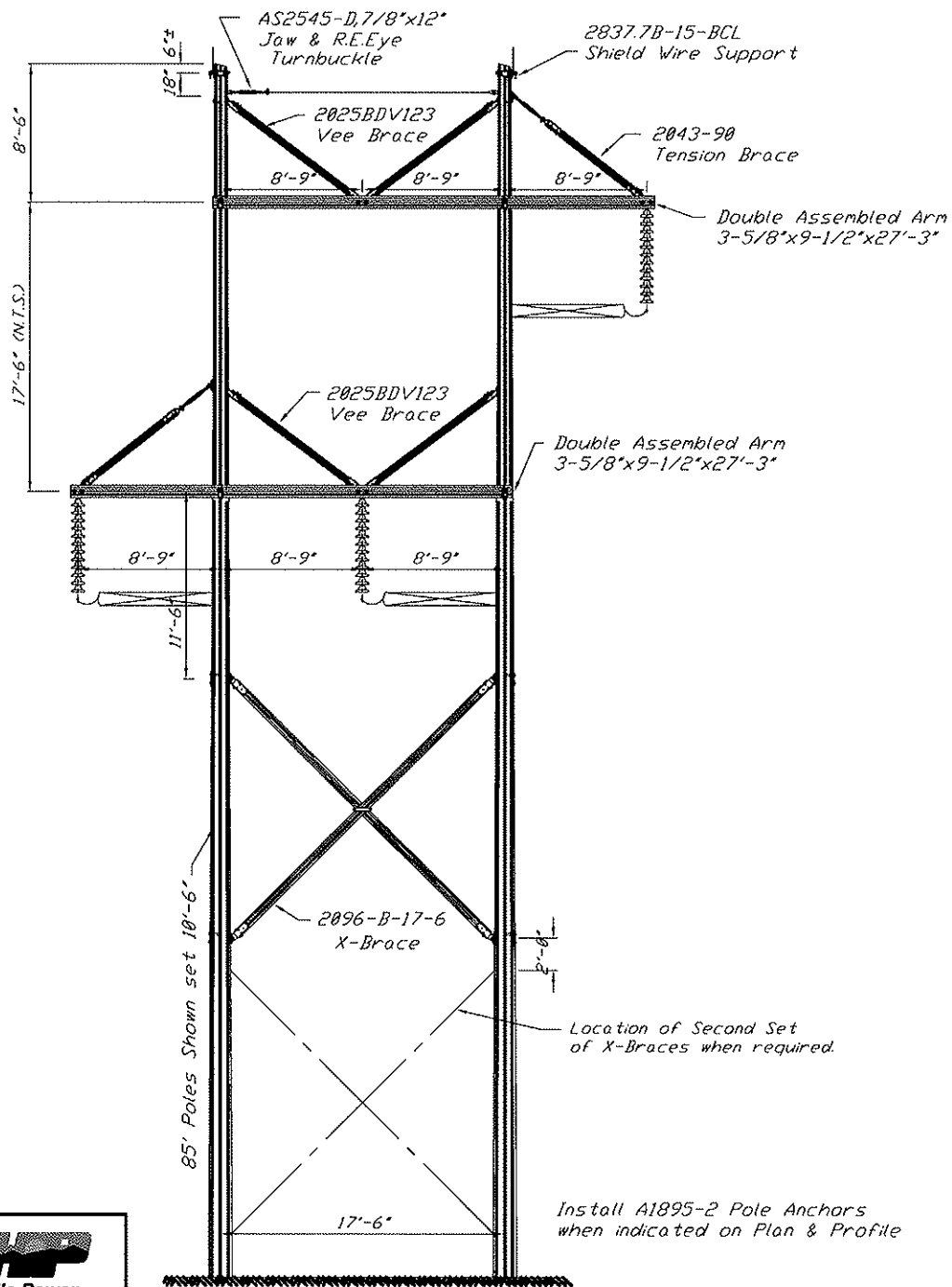


DSCN	XX
DR.	JM
APPROVED BY	DATE

TRANSMISSION STANDARDS
TYPE C4415-M, IN-LINE DEAD END STRUCTURE
230KV
 BLACK HILLS POWER

DESIGNED AND DRAWN BY:	
REV. DATE	REV. NO.
1/7/94	1
DRAWING NO.	SHEET
230-M	1

FIGURE 11



BILL OF MATERIAL	
ASSEMBLED ARM	
1 - C4415.7C Assembled Arm, consisting of:	
2 - C4415.7C-1 Side Arm, 3-5/8"x9-1/2"x27'-3"	
2 - 3414.2CN-128 Adj. Spacer Fitting	
8 - WB65-1-3/4, 5/8"x5" V.H. Bolt	
6 - WBS18-1/2-1-3/4, 1/2"x18-1/2" V.H. Bolt	
1 - AS2276-37-1/2 Clip	
1 - 2722.1B-B, 7/8" Bent Bolt w/ NBB & MF88	
1 - 2722.1D-B, 7/8" Bent Stud w/ 2-NBB & 2-MF88	
1 - C4415.7D Assembled Arm, consisting of:	
2 - C4415.7C-1 Side Arm, 3-5/8"x9-1/2"x27'-3"	
2 - 3414.2CN-148 Adj. Spacer Fitting	
8 - WB65-1-3/4, 5/8"x5" V.H. Bolt	
6 - WBS18-1/2-1-3/4, 1/2"x18-1/2" V.H. Bolt	
1 - AS2276-37-1/2 Clip	
1 - 2722.1B-B, 7/8" Bent Bolt, w/ NBB & MF88	
1 - 2722.1D-B, 7/8" Bent Stud, w/ 2-NBB & 2-MF88	
ARM MOUNTING HARDWARE	
2 - 1R028-5, 7/8"x28" Thr'd Rod w/ 3-NBB & 2-MF88	
2 - TRB26-5, 7/8"x26" Thr'd Rod, w/ 3-NBB & 2-MF88	
8 - A7B3.10 Gain Fitting	
4 - 2722.8 Bonding Clip	
BRACE ASSEMBLED & MOUNTING HARDWARE	
1 - Set 2096-B-17-6 X-Brace, 17'-6" Pole Spacing	
2 - 2040.1E CC Rods	
2 - 2007.4A CC Strop	
4 - B018-6, 7/8"x18" Bolt	
4 - B020-6, 7/8"x20" Bolt	
4 - 2017D-15 Dead End Tee	
4 - B103-1-1/2CX, 1"x3" Bolt, MF100	
4 - 2727.8 Bonding Clip	
4 - NBB, 7/8" Nut	
8 - MF88, 7/8" Locknut	
8 - CW88-3/8 Curved Washer	
BRACES ASSEMBLED	
4 - 2025BDV123 Vee Brace, (18'-3" CC Holes), 37-1/2" & 52-1/2" Fitts. (3-3/8"x4-3/8"x9'-8" Wood)	
2 - 2043-90 Tension Braces, (17'-6" CC Holes) (3-3/8"x4-3/8"x6'-8" Wood)	
BRACE MOUNTING HARDWARE & CROSS ILL MATERIAL	
3 - AS2545-D, 7/8"x12" Jaw & Rod End Eye Turnbuckle	
2 - 2017S-15, Dead End Tee (All Holes 15/16")	
2 - AS2277 Clevis	
2 - CW88-3/8, 7/8" Curved Washer	
2 - 2002 Rollers	
2 - B04-2, 7/8"x4" Bolt, MF88	
4 - B014-6, 7/8"x14" Bolt	
3 - B016-6, 7/8"x16" Bolt	
2 - 2727.8 Bonding Clip	
4 - NBB, 7/8" Nut	
7 - MF88, 7/8" Locknut	
SHIELD WIRE ATTACHMENT	
2 - 2837.7B-15-BCL Shield Wire Support (7-1/2"-12" Pole Dia)	
2 - B51-1/2-1-1/4, 1/2"x1-1/2" Bolt with MF58	
2 - 2718.5 Bonding Clip	

Type C4415-N
 Transposition Structure
 230 Kv. Construction
 Black Hills Power & Light Co.
 Rapid City, South Dakota

Install A1895-2 Pole Anchors when indicated on Plan & Profile



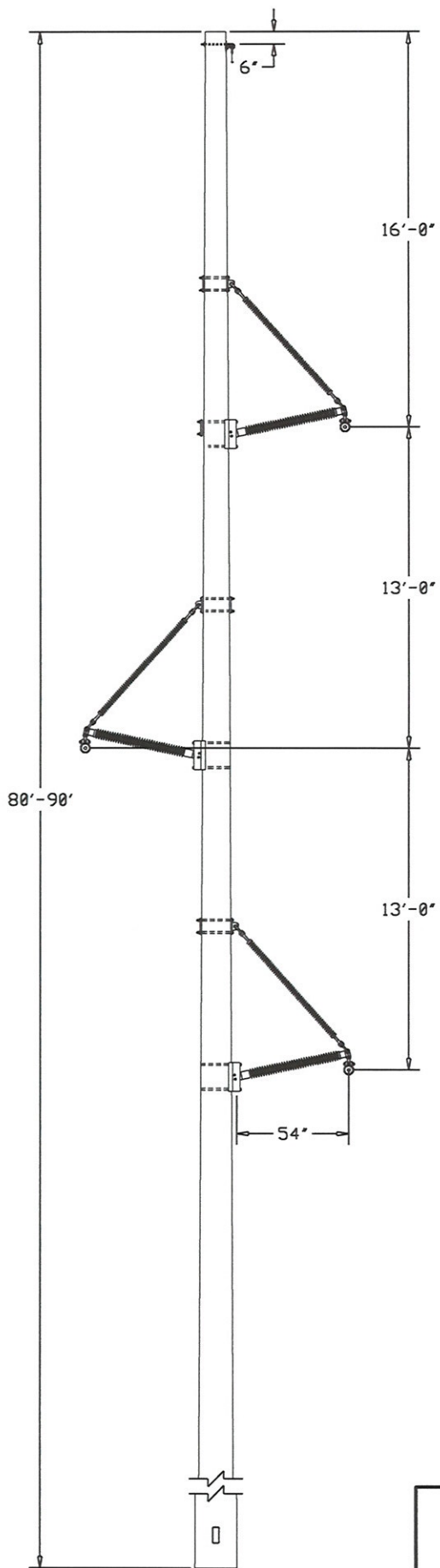
OSCN. XX
DR. XX
APPROVED BY DATE

TRANSMISSION STANDARDS
 TYPE C4415-N, TRANSPPOSITION STRUCTURE
 230KV
 BLACK HILLS POWER

DESIGNED AND DRAWN BY:	
MOUGHES BROTHERS Seward, Nebraska	
REV. DATE	REV. NO.
1/6/94	1
DRAWING NO.	SHEET
230-N	1

FIGURE 11

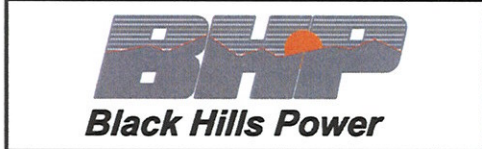
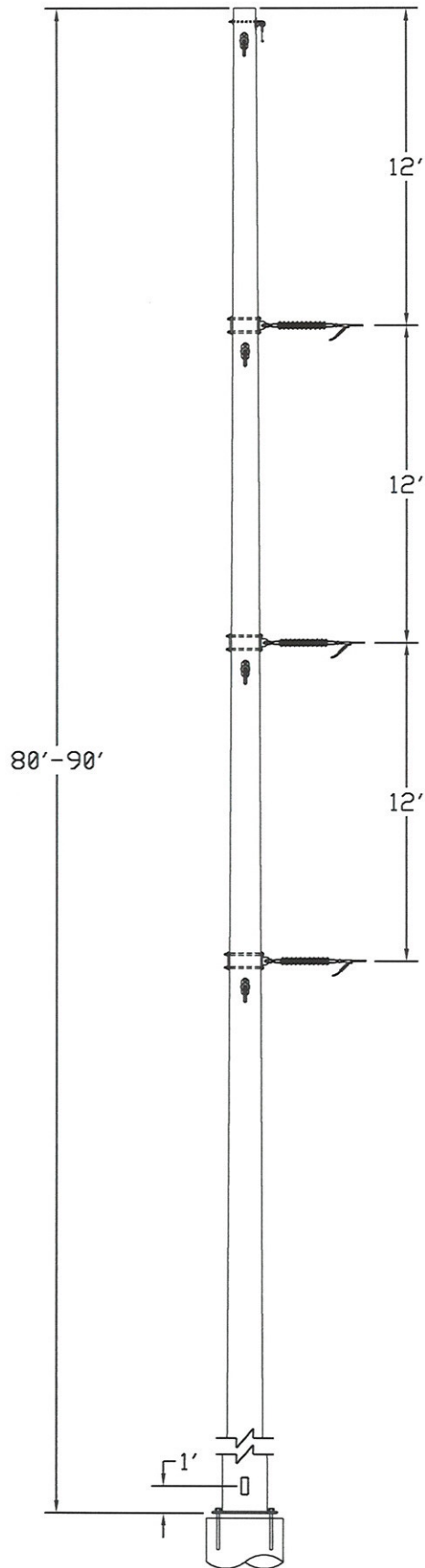
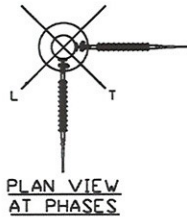
FIGURE 11



BHP
Black Hills Power

230kV TANGENT STRUCTURE

FIGURE 11



230kV DEADEND ANGLE