

Figure 1

PROPOSED Segment: A
161 kV

Calculated Electric Fields Table

Circuit Name: Q1 La Crosse Tap to Briggs Road Substation

Facility Description: Proposed Davit Arm Single Circuit 161 kV

Distance from Centerline (feet)	Electric Field (kV/m)
Centerline	1.258
25	1.393
50	0.542
100	0.123
150	0.047
200	0.024
300	0.010

Assumptions:

Typical Midspan Height = 26 feet
 5% Overvoltage Condition (169.05 kV)
 Conductor = 795 DRAKE ACSS (1.107")
 Shield Wire = OPGW (0.571")
 ROW Width = 80 Feet
 Field is Assymetrical so Highest Values Shown per Distance

Calculated Magnetic Fields Table

Circuit Name: Q1 La Crosse Tap to Briggs Road Substation

Facility Description: Proposed Davit Arm Single Circuit 161 kV

Normal Load		Contingency Load	
Distance from Centerline (feet)	Magnetic Field (mG)	Distance from Centerline (feet)	Magnetic Field (mG)
Centerline	15.5	Centerline	79.1
25	10.6	25	54.1
50	4.6	50	23.5
100	1.4	100	7.1
150	0.6	150	3.3
200	0.4	200	1.9
300	0.2	300	0.9

Assumptions:

Typical Midspan Height = 26 feet
 Normal Load = 27 MVA (96.8A)
 Contingency Load = 138 MVA (494.9A)
 Conductor = 795 DRAKE ACSS (1.107")
 Shield Wire = OPGW (0.571")
 ROW Width = 80 Feet
 Field is Assymetrical so Highest Values Shown per Distance

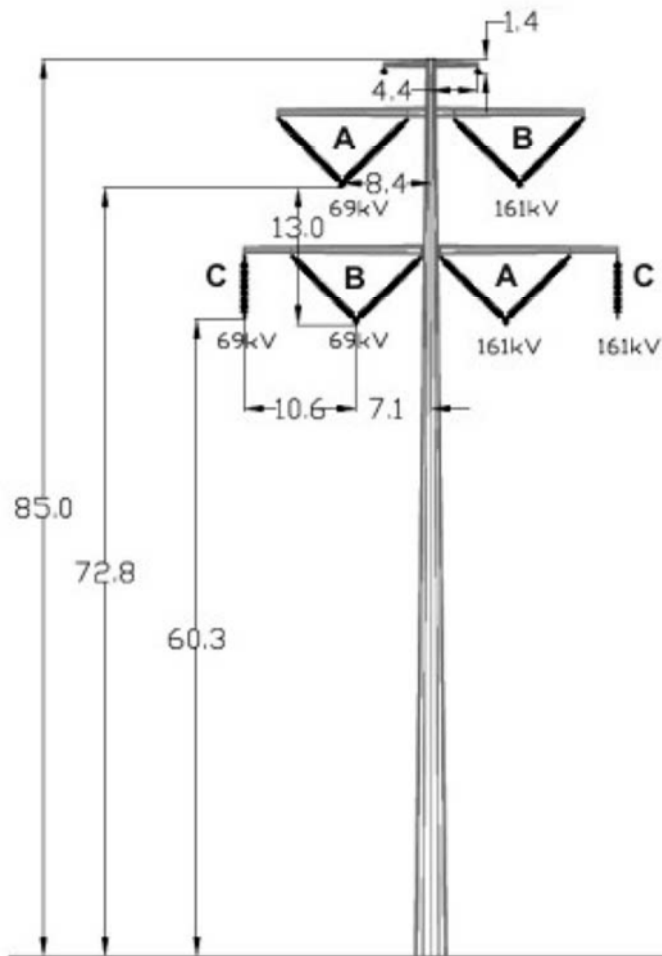


Figure 2

PROPOSED Segment: B
161 kV and 69 kV - BEST PHASING ARRANGEMENT

Calculated Electric Fields Table

Circuit Name: Q1 La Crosse Tap to Briggs Road Substation

Facility Description: Proposed Davit Arm Double Circuit 161 kV and 69 kV

Distance from Centerline (feet)	Electric Field (kV/m)
Centerline	0.776
25	1.555
50	0.547
100	0.080
150	0.028
200	0.014
300	0.006

Assumptions:

Typical Midspan Height = 26 feet
 5% Overvoltage Condition (169.05 kV and 72.45 kV)
 161 kV Conductor = 3M 636 GROSBEAK ACCR (1.004")
 69 kV Conductor = 477 FLICKER ACSR (0.846")
 Shield Wire = OPGW (0.571")
 Shield Wire = 7/16" EHS (0.4375")
 ROW Width = 80 Feet
 Field is Assymetrical so Highest Values Shown per Distance

Calculated Magnetic Fields Table

Circuit Name: Q1 La Crosse Tap to Briggs Road Substation

Facility Description: Proposed Davit Arm Double Circuit 161 kV and 69 kV

Normal Load		Contingency Load	
Distance from Centerline (feet)	Magnetic Field (mG)	Distance from Centerline (feet)	Magnetic Field (mG)
Centerline	10.7	Centerline	52.3
25	10.7	25	52.7
50	4.3	50	21.4
100	1.1	100	5.4
150	0.5	150	2.3
200	0.3	200	1.3
300	0.1	300	0.6

Assumptions:

Typical Midspan Height = 26 feet
 161 kV Normal Load = 27 MVA (96.8A)
 69 kV Normal Load = 2.4 MVA (20.1A)
 161 kV Contingency Load = 138 MVA (494.9A)
 69 kV Contingency Load = 17 MVA (142.2A)
 Load Flow in Same Direction for Both Circuits
 161 kV Conductor = 3M 636 GROSBEAK ACCR (1.004")
 69 kV Conductor = 477 FLICKER ACSR (0.846")
 Shield Wire = OPGW (0.571")
 Shield Wire = 7/16" EHS (0.4375")
 ROW Width = 80 Feet
 Field is Assymetrical so Highest Values Shown per Distance

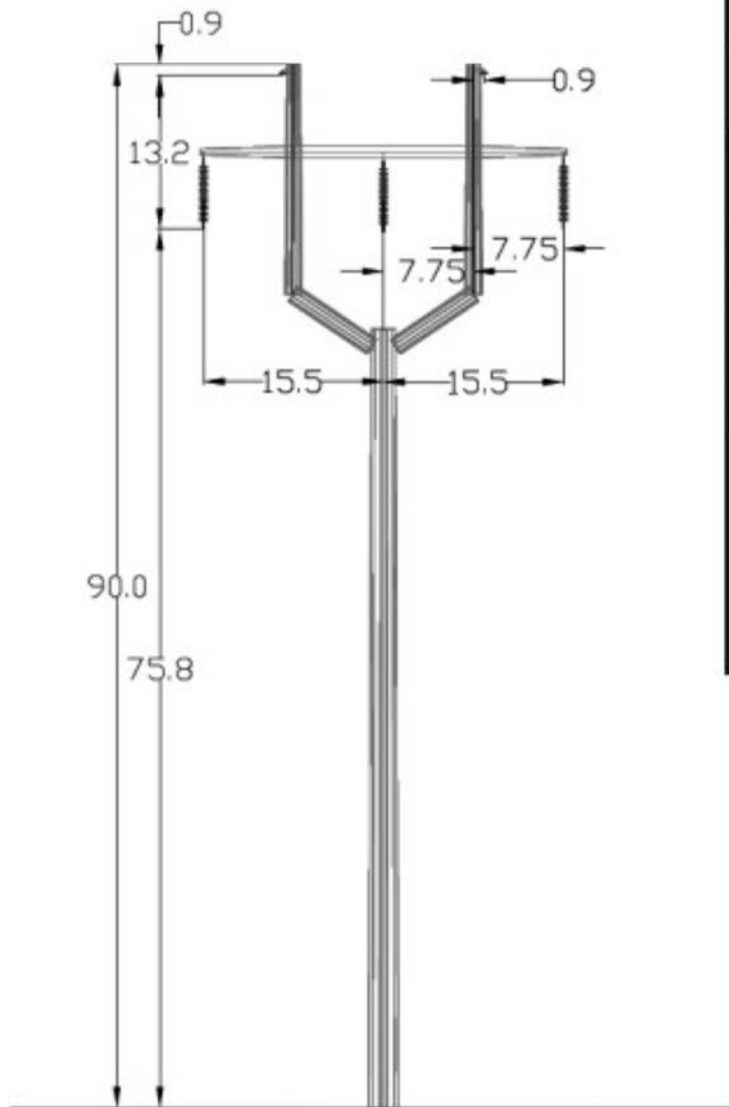


Figure 3

PROPOSED
161 kV

Segment: C

Calculated Electric Fields Table

Circuit Name: Q1 La Crosse Tap to Briggs Road Substation

Facility Description: Proposed Y-Frame Single Circuit 161 kV

Distance from Centerline (feet)	Electric Field (kV/m)
Centerline	1.103
25	2.047
50	0.776
100	0.130
150	0.041
200	0.018
300	0.006

Assumptions:

Typical Midspan Height = 26 feet
 5% Overvoltage Condition (169.05 kV)
 Conductor = 795 DRAKE ACSS (1.107")
 Shield Wire = OPGW (0.571")
 Shield Wire = 7/16" EHS (0.4375")
 ROW Width = 80 Feet

Calculated Magnetic Fields Table

Circuit Name: Q1 La Crosse Tap to Briggs Road Substation

Facility Description: Proposed Y-Frame Single Circuit 161 kV

Normal Load		Contingency Load	
Distance from Centerline (feet)	Magnetic Field (mG)	Distance from Centerline (feet)	Magnetic Field (mG)
Centerline	24.2	Centerline	123.7
25	15.5	25	79.3
50	6.1	50	31.2
100	1.7	100	8.7
150	0.8	150	4.0
200	0.5	200	2.3
300	0.2	300	1.1

Assumptions:

Typical Midspan Height = 26 feet
 Normal Load = 27 MVA (96.8A)
 Contingency Load = 138 MVA (494.9A)
 Conductor = 795 DRAKE ACSS (1.107")
 Shield Wire = OPGW (0.571")
 Shield Wire = 7/16" EHS (0.4375")
 ROW Width = 80 Feet

Table 19 - Calculated Electric Fields Table

Calculated Electric Field Data³

Transmission Line Segments: NR

Facility Description: ⁴ Existing Single Pole, H-Frame

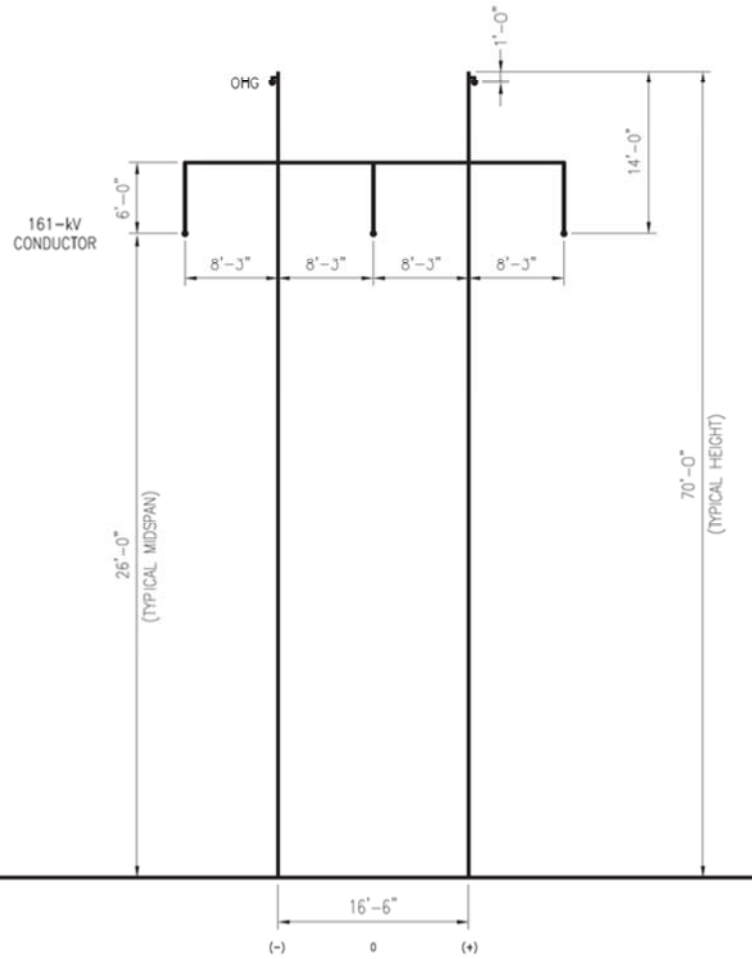
Single Circuit 161kV

Applies to all existing 161 kV H-

Distance from Centerline (feet)	Electric Field (kV/m)
Centerline	0.68
25	1.72
50	0.82
100	0.15
150	0.05
200	0.02
300	0.01

Assumptions:
 Typical Midspan Sag = 26 to 30 feet
 Amperage = 427 A

³ Provide a measured diagram of structures showing the height of conductors from the ground at the structure.
⁴ Describe facility - Structure type, configuration, location
⁵ Figure 8



LOOKING TOWARDS NORTH La CROSSE

FIGURE 8

Table 22a - Calculated Magnetic Fields Table

Calculated Magnetic Field Data³

Transmission Line Segments: NR

Facility Description: ⁴ Existing H-Frame⁵

Single Circuit 161kV

Circuit 1: Alma - Marshland 161 kV or Alma - Tremul 161 kV⁶

Distance from Centerline (feet)	Existing Normal Load		Existing Normal Peak	
	Magnetic Field (mG)	Distance from Centerline (feet)	Magnetic Field (mG)	Distance from Centerline (feet)
Centerline	68.74	Centerline	86.07	
25	48	25	60.11	
50	21.39	50	26.78	
100	6.3	100	7.89	
150	2.91	150	3.64	
200	1.67	200	2.09	
300	0.77	300	0.96	

Assumptions:
 Typical Midspan Sag = 26 to 30 feet
 Amperage = 427 A
 161 kV Circuit Phase Angle: A phase = 240 Deg, B Phase = 120 Deg, C phase = 0 Deg

³ Provide a measured diagram of structures showing the height of conductors from the ground at the structure.
⁴ Describe facility - Structure type, configuration, location
⁵ Figure 8
⁶ Lines on Alma - Marshland and Alma - Tremul are essentially identical

EXISTING
SEGMENTS: N

	DSGN	PEI	9/27/10	EMF FIGURES GENERAL DRAWING	JOB NUMBER	REV
	DRN	PEI	9/27/10		DRAWING NUMBER 8	B
	CKD	PEI	9/27/10			
	SCALE:	NTS				
REFERENCE DRAWINGS	FOR 11x17 DWG ONLY			161-kV H-FRAME		

