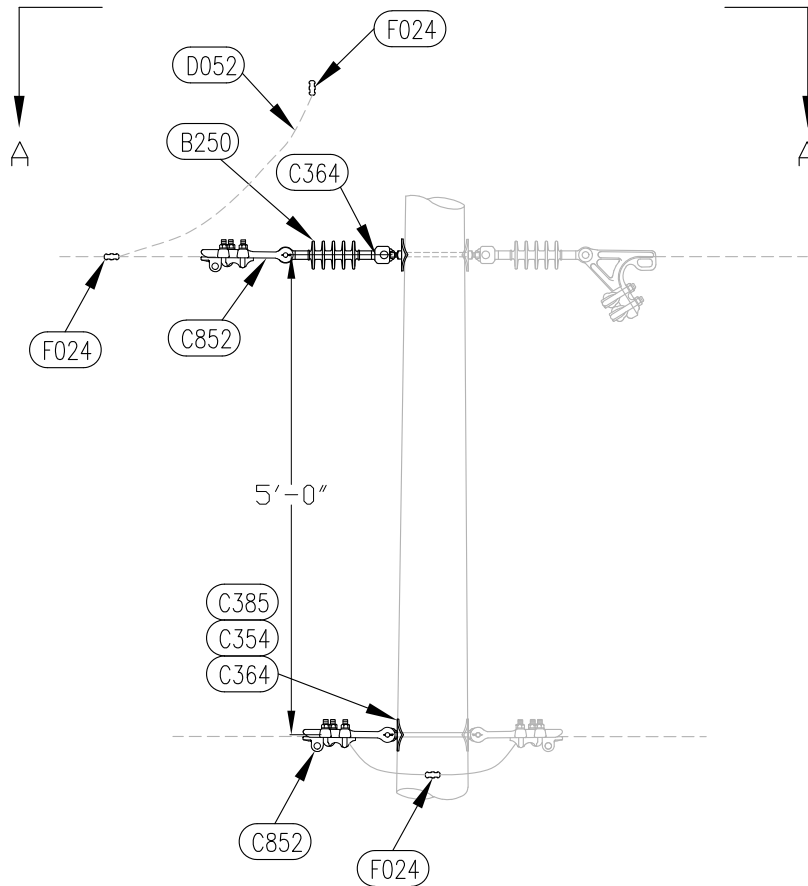
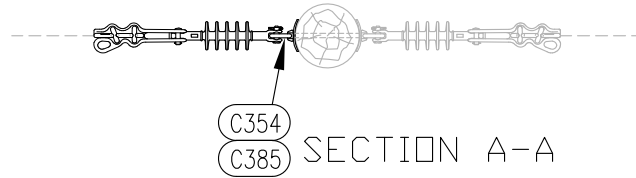


BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B250	1	Suspension, Polymer, 15kV, 15,000#, Clevis-Eye	C852	2	Clamp, St. Line DE, Side Opening, #2-#336.4 ACSR
C354	2	Nut, Locknut, 5/8"	D001	5'	Wire, #6 CU Solid, Bare, Annealed
C364	2	Nut, Eye, 5/8"	D052	10'	Cable, #6 CU, Covered Line Wire
C385	2	Washer, Curved, 3"X3"X1/4", 11/16" Hole	F024	6	Connector, Compression, #4 ACSR - #4 ACSR



GRP
Engineering, Inc.

TITLE
A5-3 #4 ACSR ASSEMBLY DETAIL

GRAND RAPIDS, MICHIGAN, 616-942-7183
PETOSKEY, MICHIGAN, 231-439-9683

DATE
03-13-2018

DR.
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MPM

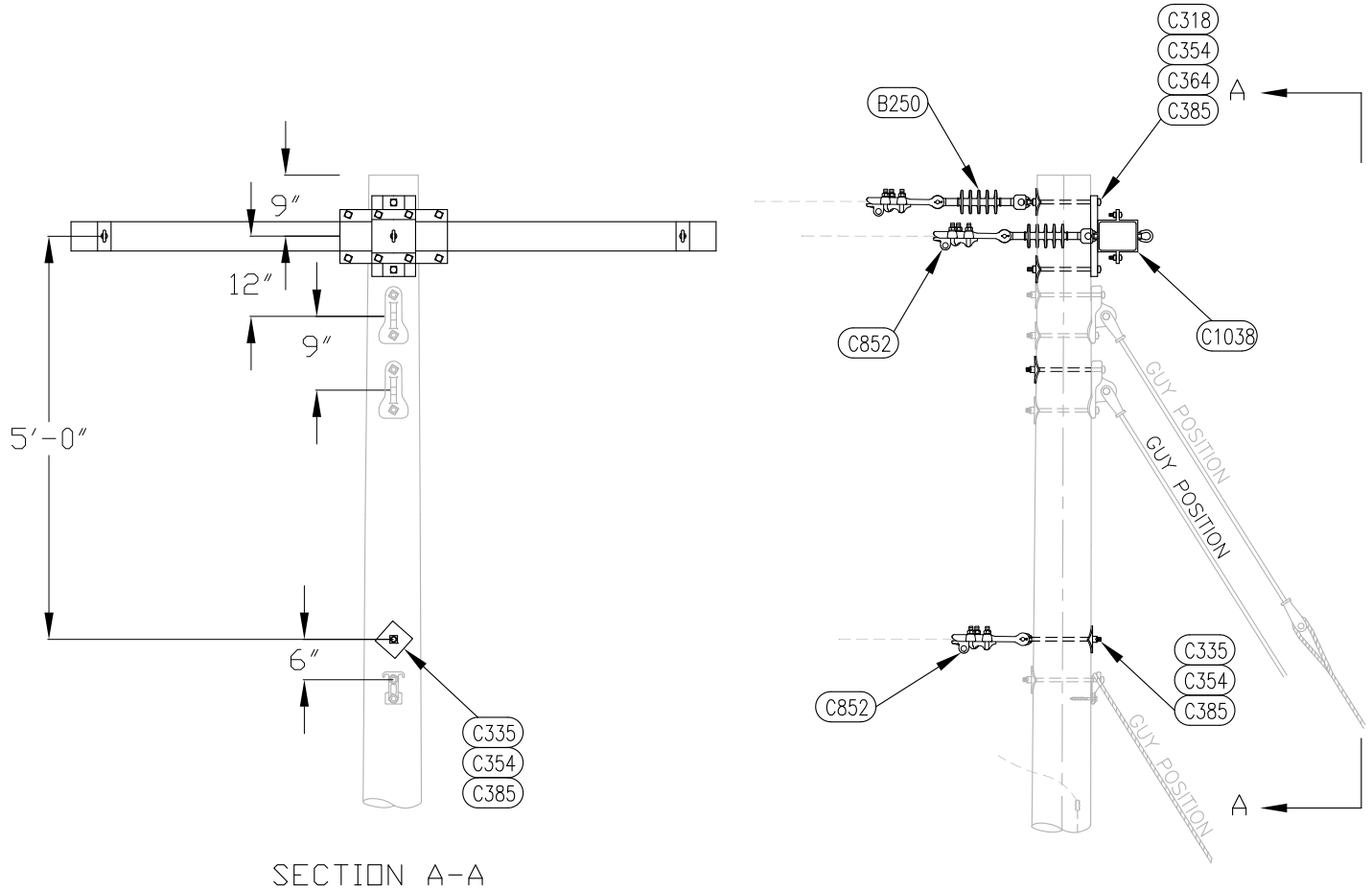
PROJECT NO.
18-0920.01

DRAWING

A5-3

BILL OF MATERIALS

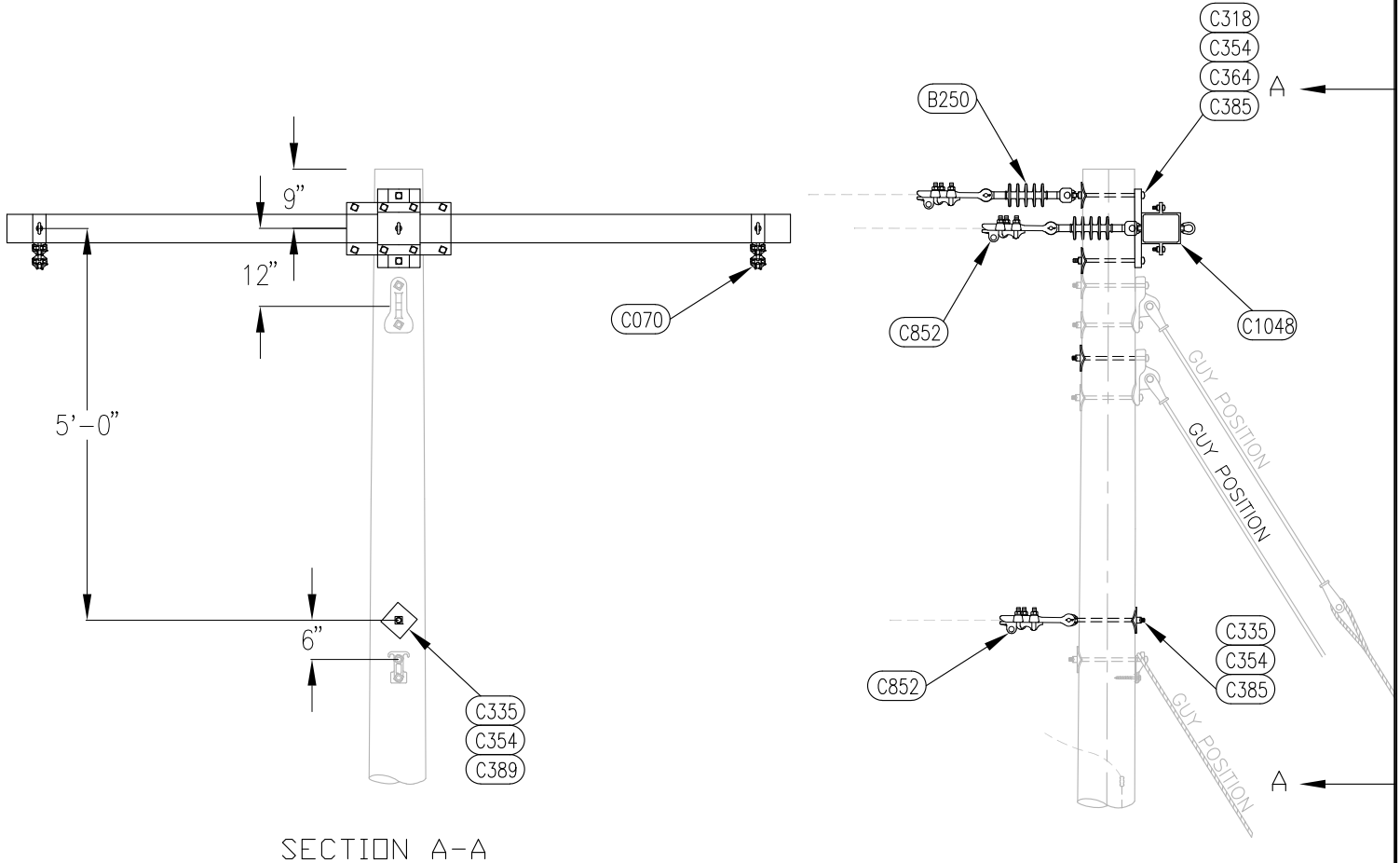
DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B250	3	Insulator, Susp, Poly, 15kV, 15k, Clevis-eye	C364	1	Nut, Eye, 5/8"
C318	2	Bolt, Machine, 5/8" x Req'd Length w/ Nut	C385	3	Washer, 3" x 3" x 1/4" Square Curved Washer, 11/16" Hole
C335	1	Bolt, Eye, 5/8" X Req'd Length w/ Nut	C852	4	Clamp, Straight Line DE, Side Opening, 9,000#
C354	3	Nut, Locknut, 5/8"	C1038	1	Crossarm, DE, Braceless Assy, 10k#, 8' Composite



	TITLE	DATE	PROJECT NO.
	C7A #336.4 ACSR ASSEMBLY DETAIL	03-13-2018	18-0920.01
	GRAND RAPIDS, MICHIGAN, 616-942-7183 PETOSKEY, MICHIGAN, 231-439-9683	DR. KMW ENG. MPM	DRAWING C7A

BILL OF MATERIALS

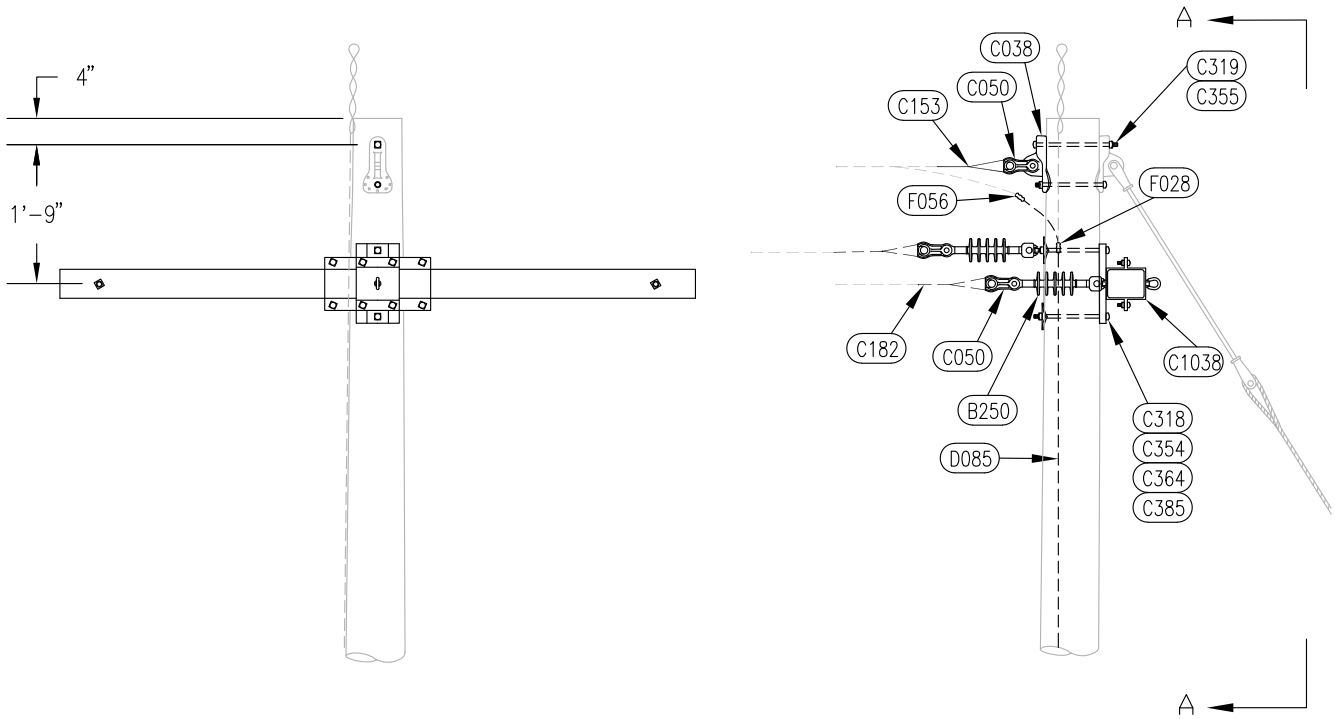
DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B250	3	Insulator, Susp, Poly, 15kV, 15k, Clevis-eye	C354	1	Nut, Locknut, 5/8"
C070	4	Clamp, Dead-end, Pistol Grip, #336.4 ACSR, 15k#	C355	2	Nut, Locknut, 3/4"
C1048	1	Crossarm, DE, Braceless, 10,000#, 10' Composite	C364	1	Nut, Eye, 5/8"
C319	2	Bolt, Machine, 3/4" x Req'd Length w/ Nut	C385	3	Washer, 3"x3"x1/4" Sq. Curved Washer, 11/16" Hole
C335	1	Bolt, Eye, 5/8" X Req'd Length w/ Nut	C390	3	Washer, Cast, 4"x4"x1/4" Sq. Crvd Washer, 13/16" Hole



	TITLE	DATE	PROJECT NO.
	C7A-10 #336.4 ACSR ASSEMBLY DETAIL	03-13-2018	18-0920.01
	GRAND RAPIDS, MICHIGAN, 616-942-7183 PETOSKEY, MICHIGAN, 231-439-9683	DR. KMW ENG. MPM	DRAWING C7A-10

BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B250	3	Insulator, Susp, Poly, 15kV, 15k#, Clevis-eye	C354	2	Nut, Locknut, 5/8"
C038	1	Pole Eye Plate, 4-5", 21,000#	C355	2	Nut, Locknut, 3/4"
C050	4	Clevis, Thimble, Dead-End, 20,000#	C364	1	Nut, Eye, 5/8"
C153	1	Grips, Dead-End, Preformed, 052 AWA	C385	2	Washer, 3" X 3" X 1/4" Square Curved, 11/16" Hole
C182	3	Grips, Hendrix Spacer Cable Dead-End	D085	20'	Cable, #4/0 CU Strand, RHW/USE 600V
C1038	1	Crossarm, DE, Braceless Assy, 10k#, 8' Composite	E104	40	Copper Staples, Down Lead, #4/0 CU Stranded
C318	2	Bolt, Machine, 5/8" X Req'd Length w/Nut	F028	2	Connector, Compression, #4/0 CU to #6 CU
C319	2	Bolt, Machine, 3/4" X Req'd Length w/Nut	F056	1	Connector, Compression, 052AWA to #4/0 CU



SECTION A-A

GRP
Engineering, Inc.

TITLE
**C7A-H #336.4 HDX & #052 AWA
ASSEMBLY DETAIL**

GRAND RAPIDS, MICHIGAN, 616-942-7183
PETOSKEY, MICHIGAN, 231-439-9683

DATE
03-21-2018

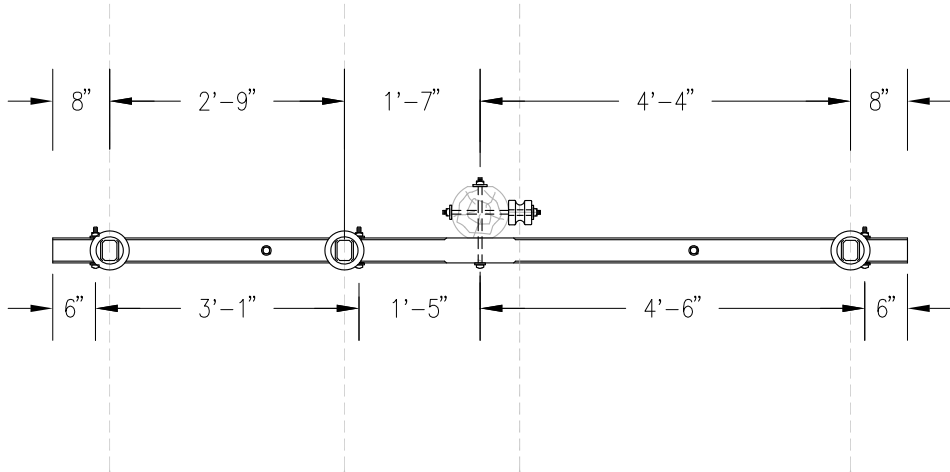
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PROJECT NO.
18-0920.01

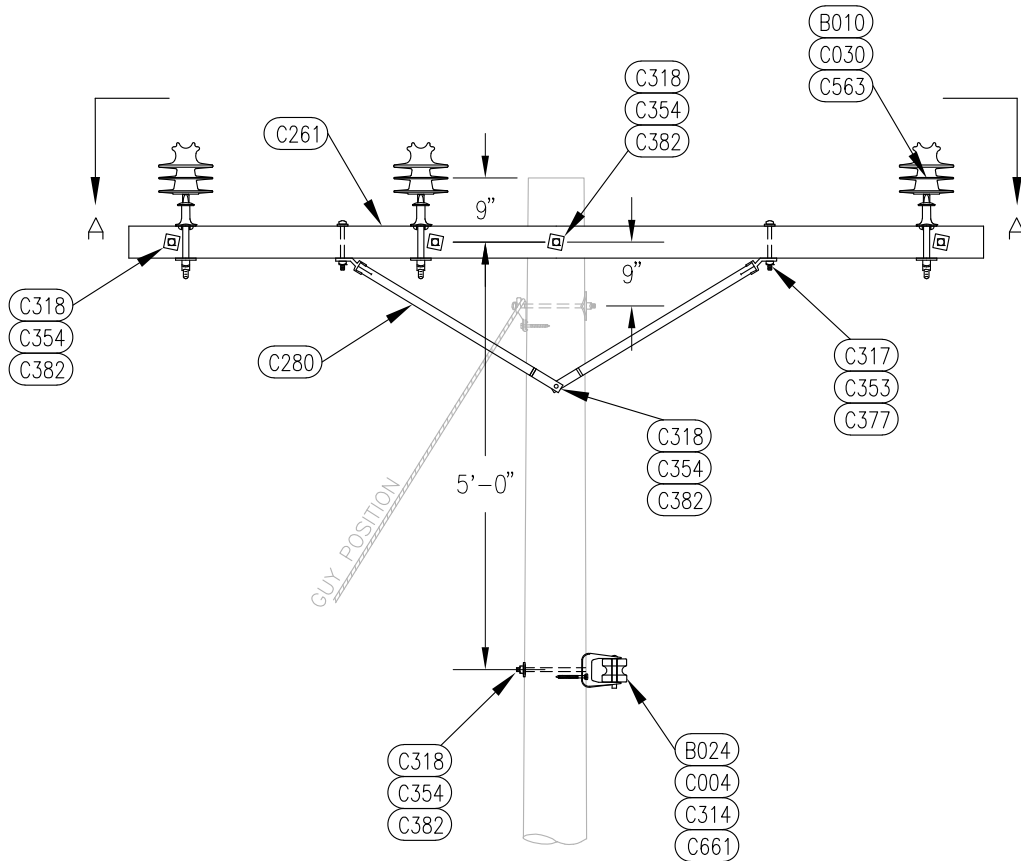
DRAWING
C7A-H

BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B010	3	Insulator, Pin, Polymer, 15kV, F-Neck, ANSI 55-4	C318	3	Bolt, Machine, 5/8" x 5" w/ Nut
B024	1	Insulator, Spool, Poly., 3" X 3 1/8", 5/8" 3k#	C318	3	Bolt, Machine, 5/8" x Req'd Length w/ Nut
C004	1	Bracket, Spool, 3" Spool, 5/8" Pin	C353	2	Nut, Locknut, 1/2"
C030	3	Pin, Crossarm, Saddle-Type	C354	6	Nut, Locknut, 5/8"
C261	1	Crossarm, Wood, 3-3/4" X 4-3/4" X 10', Penta	C377	2	Washer, Round 1-3/8" Dia., 9/16" Hole
C280	1 pr	Brace, Wood Crossarm, 60" Span, 18" Drop	C382	10	Washer, 2-1/4" X 2-1/4" X 3/16" Square, 11/16" Hole
C314	1	Screw, Lag 1/2" X 4"	C563	3	Pre-Formed Ties, #336 ACSR, C/F-Neck
C317	2	Bolt, Machine, 1/2" x 6" w/Nut	C661	1	Spool Tie, #336 ACSR, ANSI 53-2



SECTION A-A



GRP
Engineering, Inc.

TITLE
C9-3N #336.4 ACSR ASSEMBLY DETAIL

GRAND RAPIDS, MICHIGAN, 616-942-7183
PETOSKEY, MICHIGAN, 231-439-9683

DATE
03-13-2018

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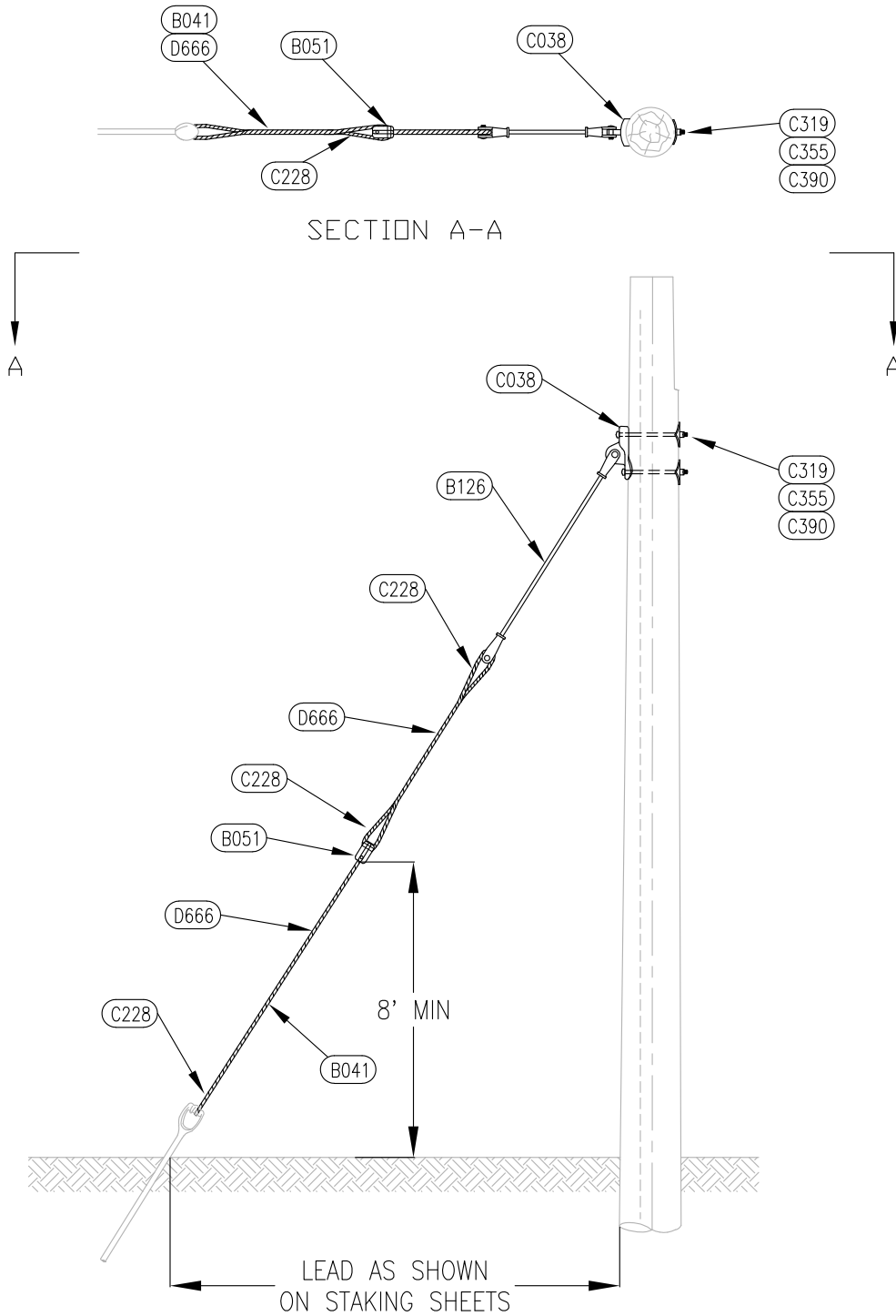
PROJECT NO.
18-0920.01

DRAWING

C9-3N

BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B041	1	Guard, Guy Guard, 8' Yellow, PVC	C319	2	Bolt, Machine, 3/4" X Req'd Length w/Nut
B051	1	Insulator, Guy Strain, Porcelain, 1/2", 12,000#	C355	2	Nut, Locknut, 3/4"
B126	1	Insulator, Guy Strain, FG, Clevis-Clevis Roller, 54"	C390	2	Washer, 4" X 4" X 1/4" Sq. Curved Washer, 13/16" Hole
C038	1	Pole Eye Plate, 4-5", 21,000#	D666	38'	Cable, Guy Strand, 10M Alumoweld
C228	4	Grip, Guy Dead-End, 10M Alumoweld			



GRP
Engineering, Inc.

TITLE
E1-3Fi 10 AW ASSEMBLY DETAIL

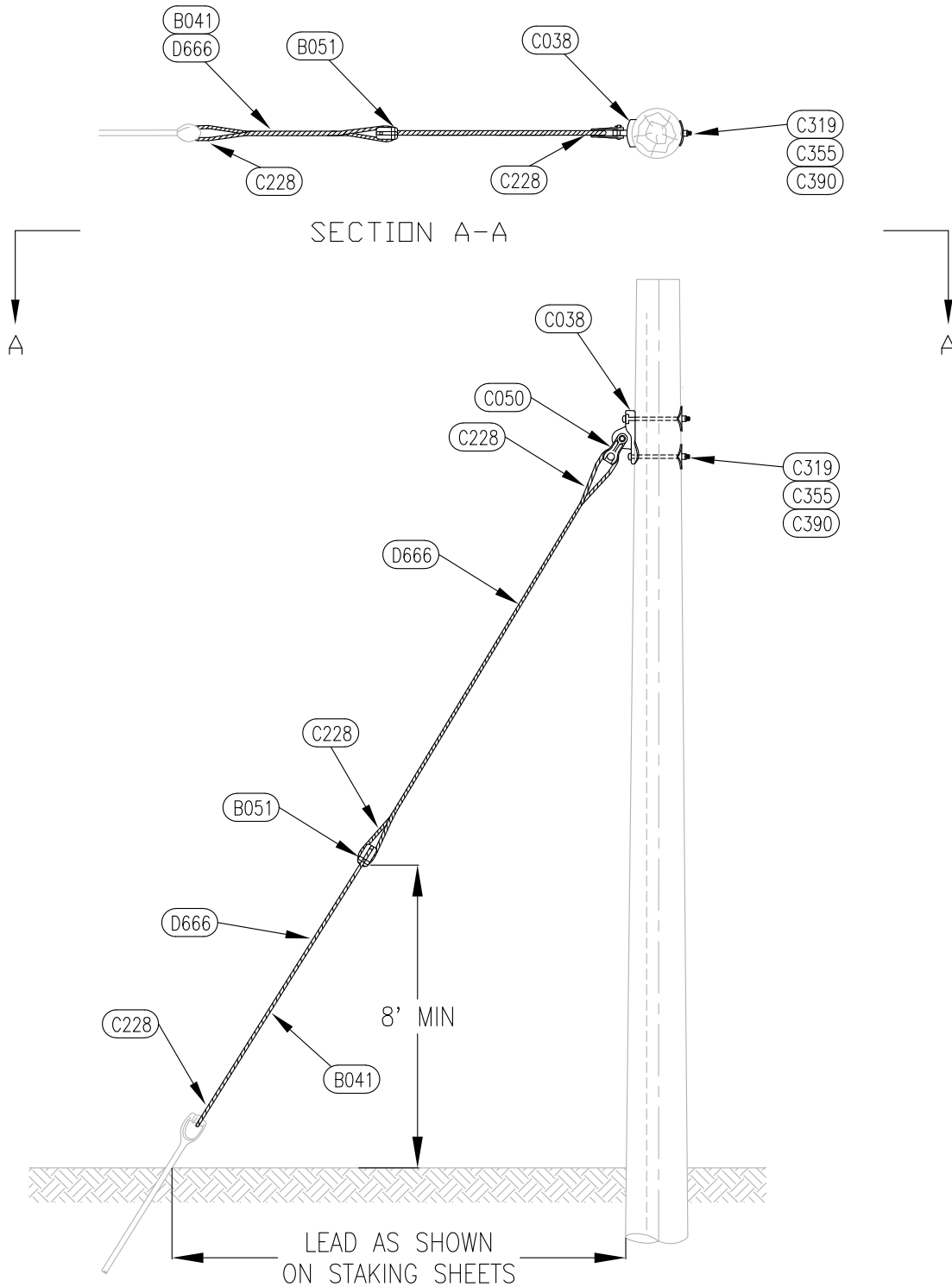
GRAND RAPIDS, MICHIGAN, 616-942-7183
PETOSKEY, MICHIGAN, 231-439-9683

DATE
03-13-2018
DR.
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ENG.
MPM

PROJECT NO.
18-0920.01
DRAWING
E1-3Fi

BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B041	1	Guy Guard, 8' Yellow, PVC, Helical Pigtail Wrap	C319	2	Bolt, Machine, 3/4" x Req'd Length w/Nut
B051	1	Insulator, Guy Strain, Porcelain, 1/2", 12,000#	C355	2	Nut, Locknut, 3/4"
C038	1	Pole Eye Plate, 4-5", 21,000#	C390	2	Washer, 4" X 4" X 1/4" Sq. Curved Washer, 13/16" Hole
C050	1	Clevis, Thimble, Dead-End, 20,000#	D666	38'	Cable, Guy Strand, 10M Alumoweld
C228	4	Grip, Guy Dead-End, 10M Alumoweld			



GRP
Engineering, Inc.

TITLE
E1-3i ASSEMBLY DETAIL (#10 AW UGS)

GRAND RAPIDS, MICHIGAN, 616-942-7183
PETOSKEY, MICHIGAN, 231-439-9683

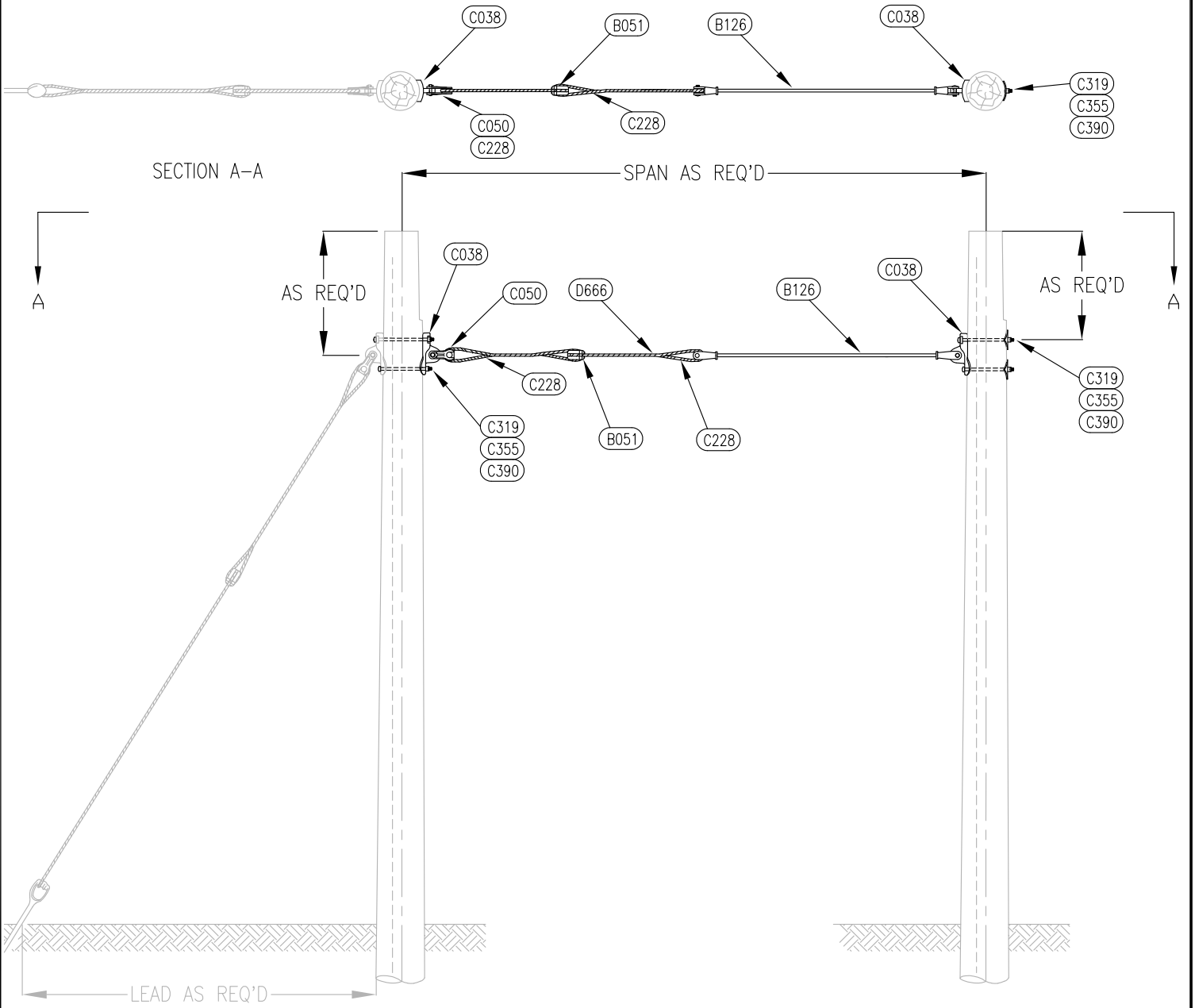
DATE
03-13-2018
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ENG.
MPM

PROJECT NO.
18-0920.01

DRAWING
E1-3i

BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B051	1	Insulator, Guy Strain, Porc, 12,000#, ANSI 54-2	C319	4	Bolt, Machine, 3/4" x Req'd Length w/ Nut
B126	1	Insulator, Fiberglass, Clevis-Roller, 54", 21,000#	C355	4	Nut, Locknut, 3/4"
C038	2	Pole Eye Plate, 4-5", 21,000#	C390	4	Washer, 4"x4"x1/4" Square Curved, 13/16" Hole
C050	1	Clevis, Thimble, Dead-end, 20,000#	D666	100'	Cable, Guy Strand, 10M Alumoweld
C228	4	Grip, Guy Dead-End, 10M Alumoweld			



GRP
Engineering, Inc.

TITLE
E2-3Fi 10 AW ASSEMBLY DETAIL

GRAND RAPIDS, MICHIGAN, 616-942-7183
PETOSKEY, MICHIGAN, 231-439-9683

DATE
03-13-2018

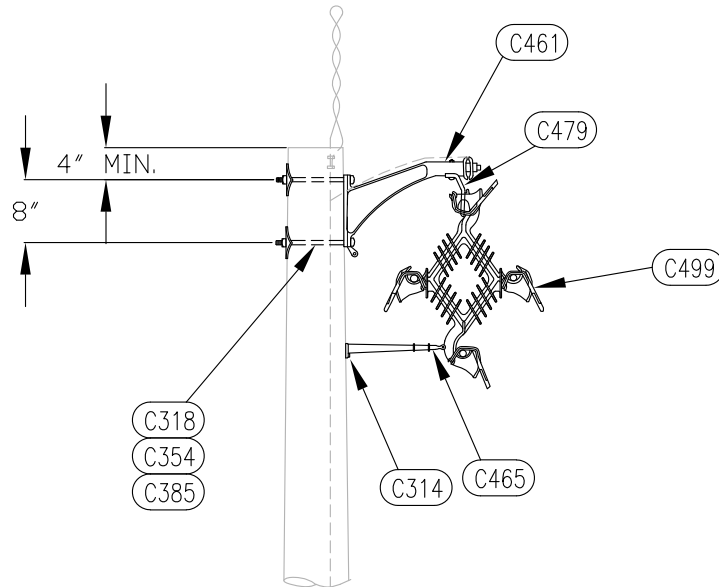
DR.
KMW
ENG.
MPM

PROJECT NO.
18-0920.01

DRAWING
E2-3Fi

BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
C314	1	Screw, Lag 1/2" X 4"	C461	1	Bracket, Tangent, 14" Offset
C318	2	Bolt, Machine, 5/8" x Req'd Length w/ Nut	C465	1	Bracket, Hendrix Antisway, 14"
C354	4	Nut, Locknut, 5/8"	C479	1	Bracket, Hendrix Tangent Stirrup
C385	2	Washer, 3" X 3" X 1/4" Sq. Curved, 11/16" Hole	C499	1	Spacer, Hendrix Cable W/Integral Clamps, 15kV, RTL-15

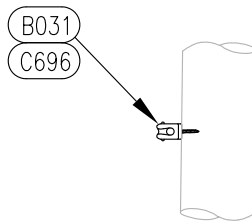


NOTES:
 EMBED LOCKNUT UNDER TANGENT BRACKET ON
 THREADED SIDE OF BOLT WHEN INSTALLING
 BRACKETS BACK TO BACK.

	TITLE	DATE	PROJECT NO.
	HD-T-14 ASSEMBLY DETAIL	03-13-2018	18-0920.01
	GRAND RAPIDS, MICHIGAN, 616-942-7183 PETOSKEY, MICHIGAN, 231-439-9683	DR. KMW ENG. MPM	DRAWING HD-T-14

BILL OF MATERIALS

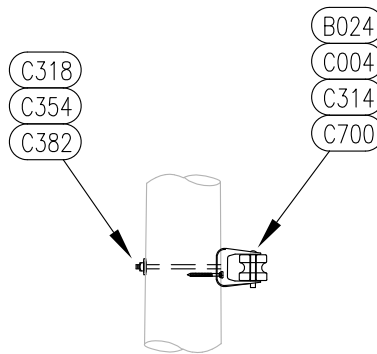
DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B031	1	Wire Holder, #22 X 2 1/4" Wood Screw	C696	1	Grip, Service, Dead End, #6 TX Neutral



	TITLE	DATE	PROJECT NO.
	K10 ASSEMBLY DETAIL	03-13-2018	18-0920.01
	GRAND RAPIDS, MICHIGAN, 616-942-7183 PETOSKEY, MICHIGAN, 231-439-9683	DR. KMW	DRAWING K10
	ENG. MPM		

BILL OF MATERIALS

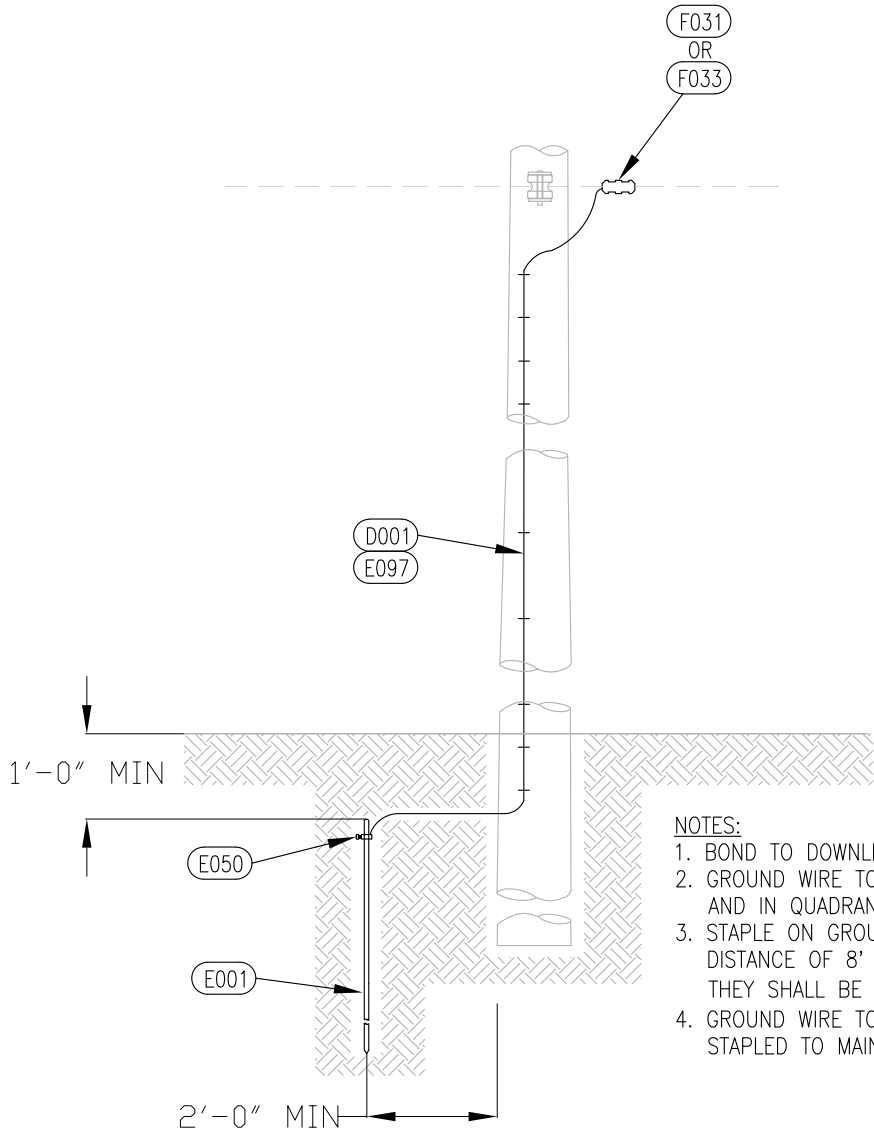
DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B024	1	Insulator, Spool, Polymer, 3" X 3 1/8", 5/8" Pin	C318	1	Bolt, Machine, 5/8" x Req'd Length w/ Nut
C004	1	Bracket, Spool, 3" Spool, 5/8" Pin	C354	1	Nut, Locknut, 5/8"
C314	1	Screw, Lag 1/2" X 4"	C382	1	Washer, 2 1/4"x2 1/4"x3/16" Square, 11/16" Hole



	TITLE	DATE	PROJECT NO.
	K14 ASSEMBLY DETAIL	03-13-2018	18-0920.01
	GRAND RAPIDS, MICHIGAN, 616-942-7183 PETOSKEY, MICHIGAN, 231-439-9683	DR. KMW ENG. MPM	DRAWING K14

BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
D001	40'	Wire, #6 CU Solid, Bare, Annealed	E097	35	Staples, Zinc Plated, Diamond Point, Down Lead
E001	1	Ground Rod, 5/8" X 8' Copper Clad	F031	1	Connector, Compression, Side by Side #336 ACSR-#6CU
E050	1	Clamp, Ground Rod, Bronze, 5/8"	F033	1	Connector, Compression, Side by Side #336 ACSR-#6CU



NOTES:

1. BOND TO DOWNLEAD AT ALL DISTRIBUTION NEUTRALS & MESSENGERS.
2. GROUND WIRE TO BE LOCATED ON SAME SIDE AS NEUTRAL CONDUCTOR AND IN QUADRANT OPPOSITE CLIMBING SPACE OR POLE TOP PIN.
3. STAPLE ON GROUND WIRE SHALL BE 2' APART, EXCEPT FOR A DISTANCE OF 8' ABOVE GROUND AND 8' FROM TOP OF POLE WHERE THEY SHALL BE 6" APART.
4. GROUND WIRE TO CLEAR ALL HARDWARE BY 2" MIN. AND SHALL BE STAPLED TO MAINTAIN THIS POSITION.

GRP
Engineering, Inc.

TITLE
M2-11 #336 ACSR ASSEMBLY DETAIL

GRAND RAPIDS, MICHIGAN, 616-942-7183
PETOSKEY, MICHIGAN, 231-439-9683

DATE
03-13-2018

DR.
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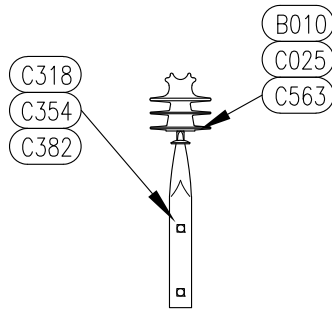
PROJECT NO.
18-0920.01

DRAWING

M2-11

BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B010	1	Insulator, Pin, Polymer, 15kV, F-Neck, ANSI 55-4	C354	2	Nut, Locknut, 5/8"
C025	1	Pin, Pole Top, 20"	C382	2	Washer, 2-1/4" X 2-1/4" X 3/16" Square, 11/16" Hole
C318	2	Bolt, Machine, 5/8" x Req'd Length w/ Nut	C563	1	Pre-Formed Ties, Wraplock, #336.4 ACSR 18/1, F-Neck



GRP
Engineering, Inc.

TITLE
M5-2 #336 ACSR ASSEMBLY DETAIL

GRAND RAPIDS, MICHIGAN, 616-942-7183
PETOSKEY, MICHIGAN, 231-439-9683

DATE
03-13-2018

DR.
KMW

ENG.
MPM

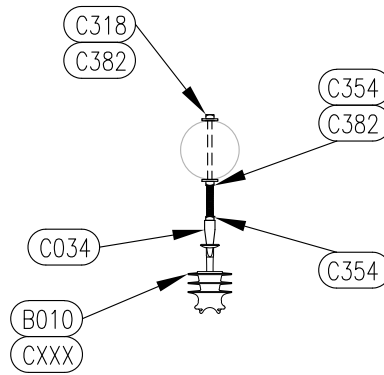
PROJECT NO.
18-0920.01

DRAWING

M5-2

BILL OF MATERIALS

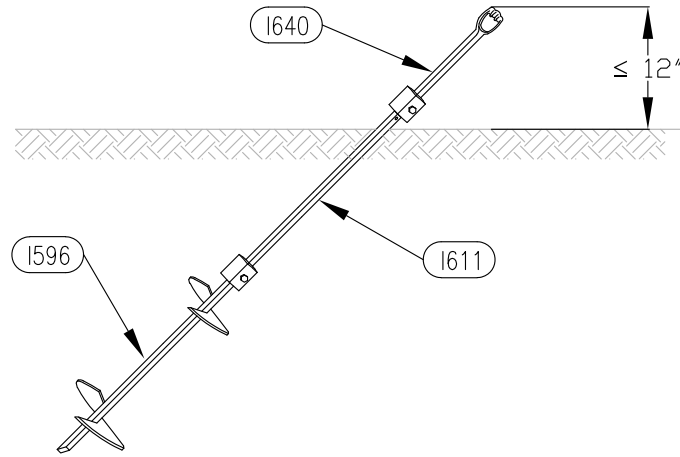
DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
B010	1	Insulator, Pin, Polymer, 15kV, F-Neck, ANSI 55-4	C354	2	Locknuts, 5/8"
C034	1	Adpater, Insulator	C382	2	Washer, 2-1/4" X 2-1/4" X 3/16" Square, 11/16" Hole
C318	1	Bolt, Machine, 5/8" x Req'd Length w/Nut	C563	1	Pre-Formed Ties, Wraplock, #336.4 ACSR 18/1, F-Neck



	TITLE	DATE	PROJECT NO.
	M5-4 ASSEMBLY DETAIL	03-13-2018	18-0920.01
	GRAND RAPIDS, MICHIGAN, 616-942-7183 PETOSKEY, MICHIGAN, 231-439-9683	DR. KMW ENG. MPM	DRAWING M5-4

BILL OF MATERIALS

DWG REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
I596	1	Anchor, Multi Helix, 1 1/2" Square, 8"-10" Helix	I640	1	Anchor, Adapter, Square Shaft 1 1/2", Triple-eye
I611	1	Anchor, Extension, Square Shaft 1-1/2" x 5'			

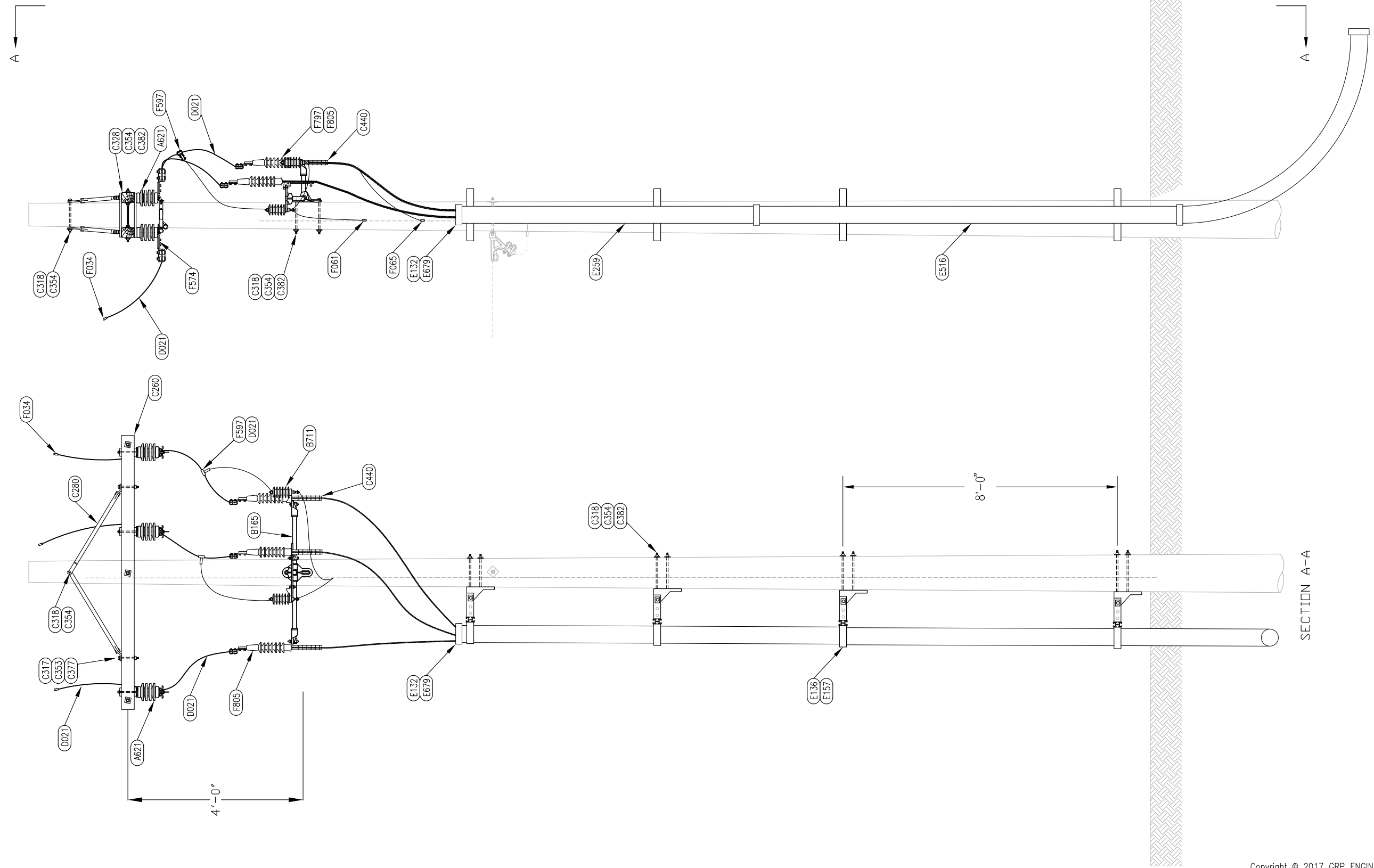


NOTE:
EXTRA ANCHOR EXTENSIONS MAY BE
REQUIRED TO ACHIEVE PROPER HOLDING
STRENGTH.

	TITLE	DATE	PROJECT NO.
	TA-2H ASSEMBLY DETAIL	03-13-2018	18-0920.01
	GRAND RAPIDS, MICHIGAN, 616-942-7183 PETOSKEY, MICHIGAN, 231-439-9683	DR. KMW ENG. MPM	DRAWING TA-2H

BILL OF MATERIALS

REF	QTY.	DESCRIPTION	DWG REF	QTY.	DESCRIPTION
A621	3	Switch, Distl., 12" Blade, 600A, 14.4kV w/ Back Pl.	D016	15'	Cable, #2 CU 7-Strand, Bare, Soft Drawn
B165	1	Bracket, 0" Extension, 3 Phase, 3-Holes, 48" x 13"	D021	45'	Cable, #350 MCM CU 19-Strand, Bare, Soft Drawn
B711	3	Arrester, Riser Pole Class, 8.4kV MCOV, Polymer	E136	8	Bracket, Conduit 6" Stand-off w/ 24" 4-way T-Slot Rail
C260	2	Crossarm, Wood, 3-3/4" X 4-3/4" X 8'	E157	8	Conduit Support Strap Kit, 6"
C280	2 pr	Brace, Wood Crossarm, 60" Span, 18" Drop (pair)	E259	2	Conduit, 6" PVC SCH 40, 10' Length
C317	4	Bolt, Machine, 1/2" x 6" w/ Nut	E516	1	Conduit, 6" Rigid Galvanized Steel, 10' Length
C318	21	Bolt, Machine, 5/8" x Req'd Length w/ Nut	E679	1	End Bell, 6" PVC
C328	3	Bolt, Double Arming 5/8" x Req'd Length w/ Nut	F034	3	Connector, Compression, #336.4 ACSR - #4/0 CU
C353	4	Nut, Locknut, 1/2"	F061	3	Connector, Compression, #2 CU - #6 CU
C354	25	Nut, Locknut, 5/8"	F065	3	Connector, Compression, #4/0 CU - #2 CU
C377	4	Washer, Round 1-3/8" Dia, 9/16" Hole	F574	9	Connector, Bolted, #1/0 Sol - #500 Cable to Flat, Double, Bronze
C382	28	Washer, 2 1/4" x 2 1/4" x 3/16" Sq., 11/16" Hole	F597	3	Connector, Bolted, Cable T-Tap, Bronze
C440	3	Bracket, Cable Positioner	F797	3	Connector, Compression, Terminal, CU/AL, #750 to 2 Hole NEMA PAD
D001	20'	Wire, #6 CU Solid, Bare, Annealed	F805	3	Terminator, 15kV QT-III Silicone Rubber, #500-#1000 JCN/CN



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PROJECT
SUBSTATION UG EXIT REPLACEMENT

CLIENT
TRAVERSE CITY LIGHT & POWER

3 PH. RISER - UNDERSLUNG DISC. #750 MCM

GRP Engineering, Inc. GRAND RAPIDS, MI, 616-942-7183 / PETOSKEY, MI, 231-439-9683

DATE: 03-21-2018
 ISSUE:
 BY: KMW APP: MPM
 WORK ORDER:

PROJECT NO. 18-0920.01
 DRAWING: **UC5-1U**