STORM STRONG™

COMPOSITE CROSSARMS

PRODUCT BROCHURE

FRP UTILITY CROSSARM

DEADEND AND TANGENT CROSSARMS

"When the storm hits, is your grid **STORM STRONG**?™"

Top Reasons To Choose Transmission Innovations Cross Arms.

Transmission Innovations is the world leader in pultrusion manufacturing. Our commitment to continuous process and product improvement has transformed TI into a world-renowned pultruder specializing in custom profiles while utilizing high-performance resins and our proprietary high-pressure injection process.

As one of the world's most innovative leaders in the fiber reinforced polymer composites industry, we've partnered with Creative Pultrusions, Inc. to provide pultruded utility crossarms that are prefabricated and designed to provide lasting performance in harsh environments.

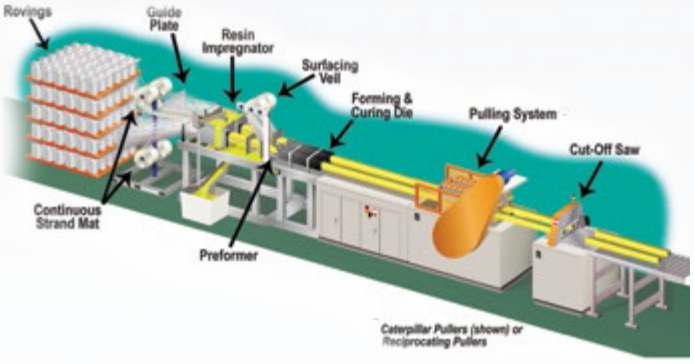
STORM STRONG™ CROSSARMS

At TI, our fiberglass utility deadend and heavy tangent crossarms are at the forefront of pultrusion technology, offering:

- Superior toughness and impact strength
- Lightweight as compared to wood and steel arms
- Unaffected by ants, woodpeckers and termites
- Environmentally friendly, no dangerous pesticides or preservatives
- Ultraviolet light stabilized
- Superior dielectric strength
- Will not rot, rust or corrode

WHAT IS PULTRUSION?

Pultrusion is a continuous manufacturing process utilized to make composite profiles with constant cross-sections whereby fiberglass reinforcements, in the form of roving and mats, are saturated with resin and channelled into a heated die. The profile exits the die in a solid state and in the form of the desired cross-section.

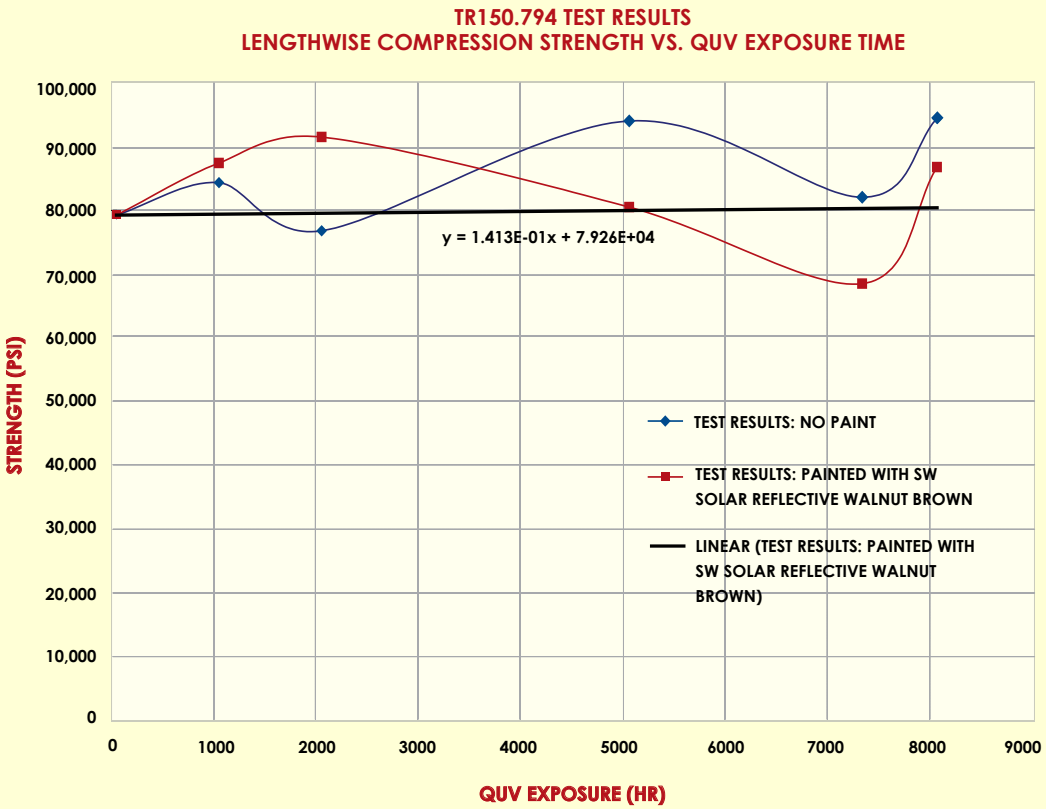


1. ENGINEERED ARMS MANUFACTURED TO HIGH QUALITY STANDARDS

The pultrusion arms have been designed for the rigors of electrical distribution with considerations for storms, wind, ice and UV. The deadend and tangent arms are manufactured by the pultrusion manufacturing method and exhibit a typical strength coefficient of variation (COV) of less than 5%.

2. ENGINEERED FOR AN EXTENDED SERVICE LIFE

The engineered arms have been designed to withstand the effects of UV. Extensive UV and moisture testing confirm that statistically no decrease in compression strength occurs when tested to ASTM G154-06.



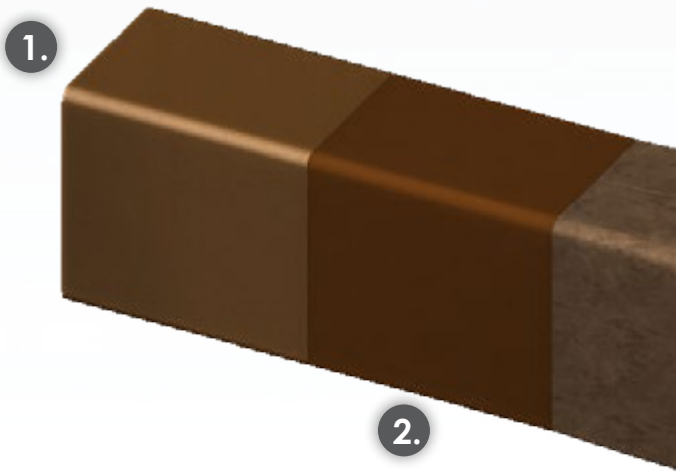
NOTE: Chart depicts the 8,000 hour QUV results of the compression strength, both painted and unpainted. Statistically, no decrease in compression strength was detected after the QUV testing.

CROSSARM CONSTRUCTION

The TI tangent and deadend crossarms are made with proprietary pultrusion technology. This technology is the catalyst that allows TI to manufacture the lightest and stiffest crossarm in the business. The lightweight crossarms reduce injury potential, while saving money in shipping and handling costs.

Many utilities prefer the Fiberglass Reinforced Polymer (FRP) crossarms over wood to increase their grid reliability. The engineered crossarm is recognized in the National Electric Safety Code (NESC) as having the same strength factor as steel. The FRP crossarm performs structurally like steel, without the negative effects of rusting and conductivity.

The TI crossarms can be supplied as blanks, whereas the utility drills and fabricates the crossarm to their requirements, or with the hardware attached, as specified. It's most common for utilities to specify that the crossarms be delivered drilled with hardware ready for the lineman to bolt them to the pole and clip in the wire. If your utility is looking to decrease labor and increase efficiency, let TI provide the finished product, fabricated to your unique specifications.



1. ADVANCED UV PROTECTION

Our fiberglass tangent and deadend crossarms contain several layers of UV protection. First, the fiberglass crossarms are encompassed with a 10 mil polyester surfacing veil. The 10 mil veil creates a resin rich surface and protects the glass reinforcements from fiber blooming. Finally, the tangent and deadend crossarms are coated with a 3 mil (wet) high-performance polyurethane paint or polyester powder coat providing the final layer of UV protection.

QUV testing, consisting of both light and moisture, cycled every four hours until 8,000 hours was achieved demonstrated no decrease in compression strength. Both painted and unpainted arms were tested. The paint protected the crossarm from chalking and fading, but did not affect the structural behavior of the arm. Paint or powder coated surfaces protect the fiberglass crossarms from fiber blooming long term.

2. RESIN/MATRIX

The FRP crossarms are manufactured with a thermoset resin system exhibiting superior toughness and strength. Thermoset resins, once cured, are very structural and resistant to moisture and harsh environments.

3. FIBERGLASS REINFORCEMENTS

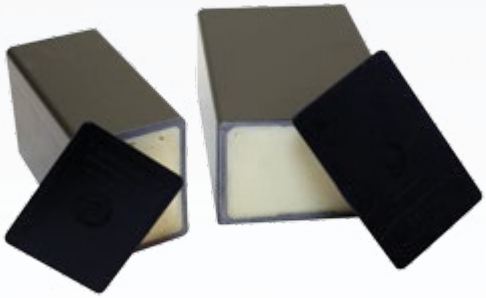
All TI crossarms are manufactured with electrical grade E-glass reinforcements in the form of roving, Continuous Filament Mat (CFM) or stitched mats. All E-glass reinforcements meet a minimum tensile strength of 290 ksi per ASTM D2343.

4. POLYURETHANE FOAM FILL

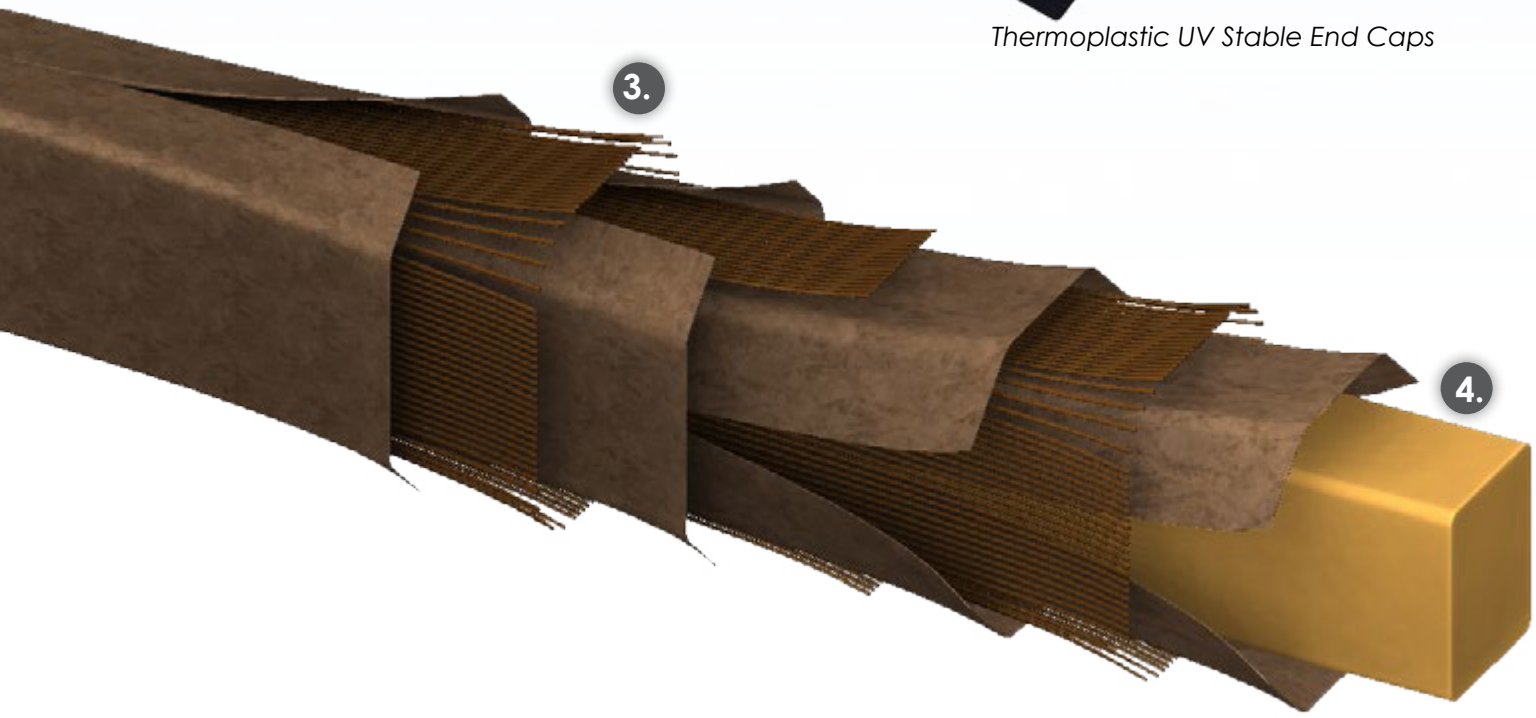
Our fiberglass crossarms are filled with a two-component, two-pound density closed-cell polyurethane foam. The foam core restricts moisture and insects from entering the interior of the arm.

END CAPS

Our deadend and tangent crossarms are capped with thermoplastic polymer UV resistant injection molded high-impact strength caps.



Thermoplastic UV Stable End Caps



3. UNAFFECTED BY TERMITES AND WOODPECKERS

Utilities in areas prone to woodpeckers and termites are replacing wood arms with TI crossarms. Utilities are reporting less than a ten year life with wood arms. The FRP arms negate woodpecker and termite damage and save the utilities money and outages.

DEADEND CROSSARMS

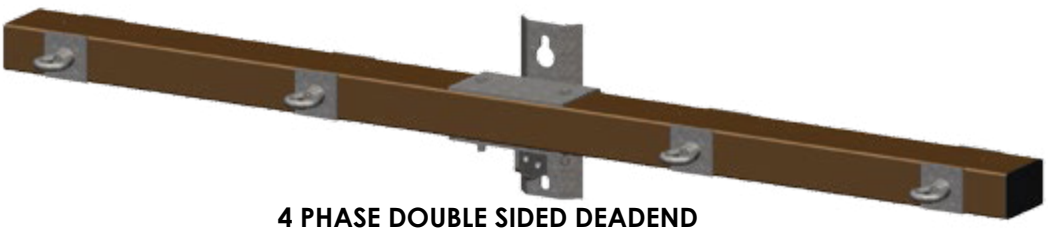
Transmission Innovations Crossarms are available in 3-5/8"x4-5/8" (92 mm x 117.5 mm) and 4"x6" (101.6 mm x 152.4 mm) rectangular cross sections. Selecting the correct crossarm, for your application, will depend on your phase loading and deflection or serviceability limitations.

In most cases, a single FRP deadend arm will replace two or three wood deadend arms resulting in significant labor and material cost savings, while still increasing the grid reliability. Lineman prefer the single deadend arm due to the significant weight reduction and safety enhancements, as compared to wood and steel arms.

TI publishes values that have been developed per the ASTM D8019-15 protocol, both in terms of average and the 5% Lower Exclusion Limit (LEL). The National Electric Safety Code (NESC) C2-2012 mandates that pole and arm suppliers report their design values based on a 95% confidence or 5% LEL value.

TI's deadend crossarms are available with or without hardware. It is common for utilities to specify the crossarms predrilled with deadend phase hardware including washers, double-arm (DA) bolts, eye nuts and a prefabricated center mount. All material hardware and steel fabrications are hot dip galvanized per ASTM D153.

The following charts describe the arm model, arm length, phases per arm, ultimate 5% LEL and average phase loads, deflection per 1,000 lbf phase load and the assembly weight. The utility engineer can utilize the charts to select the arm that best fits their phase loading conditions. In the event that the load scenario, for your application, is not described, the mechanical and physical properties charts can be utilized for the proper selection of the material properties necessary to conduct mechanics of materials calculations representing your particular load conditions.



4 PHASE DOUBLE SIDED DEADEND

DEADEND CROSSARM LOAD CHART

STANDARD DEADEND 4" X 6"

			LONGITUDINAL LOADING		
PART NUMBER	LENGTH (ft)	PHASES PER ARM	5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)
SD2060124KXXXX	5	2	17,000	18,300	0.07
SD2096124KXXXX	8	2	10,900	13,300	0.22
SD2096148KXXXX	8	4	8,500	9,100	0.26
SD2120124KXXXX	10	2	9,100	11,500	0.40
SD2120148KXXXX	10	4	7,000	8,900	0.47
SD2144124KXXXX	12	2	7,300	9,300	0.70
SD2144148KXXXX	12	4	4,900	6,200	0.93

CP2500 STANDARD DEADEND 3-5/8" X 4-5/8"

			LONGITUDINAL LOADING		
PART NUMBER	LENGTH (ft)	PHASES PER ARM	5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)
SD5060124LXXXX	5	2	9,400	10,400	0.10
SD5096124LXXXX	8	2	9,400	10,400	0.37
SD5096148LXXXX	8	4	4,700	5,200	0.42
SD5120124LXXXX	10	2	8,300	8,700	0.71
SD5120148LXXXX	10	4	4,700	5,200	0.82
SD5144124LXXXX	12	2	6,600	7,000	1.26
SD5144148LXXXX	12	4	4,500	4,700	1.67

CP3000 STANDARD DEADEND 3-5/8" X 4-5/8"

			LONGITUDINAL LOADING		
PART NUMBER	LENGTH (ft)	PHASES PER ARM	5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)
SD7060124LXXXX	5	2	14,200	17,300	0.08
SD7096124LXXXX	8	2	14,200	17,300	0.29
SD7096148LXXXX	8	4	7,100	8,600	0.33
SD7120124LXXXX	10	2	12,400	14,800	0.55
SD7120148LXXXX	10	4	7,100	8,600	0.64
SD7144124LXXXX	12	2	10,000	11,900	0.92
SD7144148LXXXX	12	4	6,700	8,000	1.22

Notes:
Strength and deflection calculations are based on phase locations shown in the drawings located at www.creativepultrusions.com.
The 5% LEL value is used for strength as dictated by NESC C2-2012.
Weights include centermount, hardware, and 3/4" double sided phase hardware.
Tested per ASTM D8019-15.
Longitudinal Loading acts in the major axis of the arm parallel to the conductor.
Vertical Loading acts in the minor axis of the arm.

STANDARD DEADEND 4" X 6"

VERTICAL LOADING			
5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)	WEIGHT w/ HARDWARE (lb)
9,700	10,100	0.12	58
5,600	6,100	0.47	71
4,400	4,800	0.54	86
4,200	4,600	0.92	81
3,300	3,600	1.06	95
3,400	3,700	1.61	90
2,300	2,500	2.13	104

CP2500 STANDARD DEADEND 3-5/8" X 4-5/8"

VERTICAL LOADING			
5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)	WEIGHT w/ HARDWARE (lb)
2,900	3,300	0.21	47
2,900	3,300	0.63	58
1,400	1,600	0.71	67
2,900	3,300	1.22	65
1,400	1,600	1.40	75
2,500	2,800	2.20	73
1,400	1,600	2.90	82

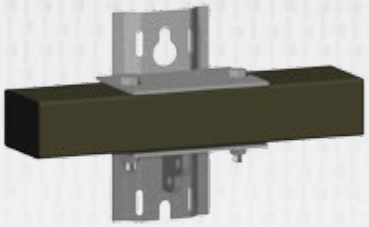
CP3000 STANDARD DEADEND 3-5/8" X 4-5/8"

VERTICAL LOADING			
5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)	WEIGHT w/ HARDWARE (lb)
6,300	7,200	0.16	55
5,800	7,200	0.48	69
3,100	3,600	0.55	82
4,300	5,900	0.94	79
3,100	3,600	1.08	91
3,400	4,700	1.69	88
2,300	3,200	2.23	101

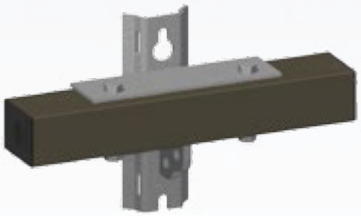
HARDWARE OPTIONS

TI offers the deadend crossarms with two, three or four phase/position hardware, in single or double deadend configurations. The mounting bracket is supplied with an integrated two-position guy attachment and is secured to the crossarm with 3/4" galvanized grade bolts.

Kit Part Number	Deadend Arm to Pole Mounting Bracket Kits	Weight
PTK012 (K)	TR150 4" x 6" Deadend Bracket Kit with Guy Attachments **Description:** Grade 50 steel deadend center mount featuring 3/4" dia. holes for double guy attachment. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a deadend configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK012 Kit Includes:** (1) STL082 Bracket (2) FAB185 - 6" x 3/4" Bolts A325 or 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 12" spacing of 3/4" pole mount hardware and includes 1-1/4" steel banding slots.	21 lbs.
PTK017 (L)	CP2500 Or CP3000 3-5/8" x 4-5/8" Deadend Bracket Kit with Guy Attachments **Description:** Grade 50 steel deadend center mount featuring 3/4" dia. holes for double guy attachment. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a deadend configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK017 Kit Includes:** (1) STL083 Bracket (2) FAB551 - 5-1/2" x 3/4" Bolts 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 12" spacing of 3/4" pole mount hardware and includes 1-1/4" steel banding slots.	19 lbs.



STL082



STL083

Double Deadend Hardware

The deadend hardware for a typical double deadend configuration includes a Double-Arm (DA) bolt, two 4" x 4" x 3/8" square washers or 3.5" x 3.5" x 3/8" square washers dependent upon the crossarm model, two eye nuts and a lock washer. DA bolts meet requirements of IEEE C135.1.

Galvanized Deadend Hardware

Position/phase deadend hardware is available in single and double deadend configurations in 5/8" or 3/4" hardware. All hardware is galvanized per ASTM A123 and or A153 standards.

ORDERING SPECIFICATIONS

SD 2 096 1 00 A XXXX

CROSSARM TYPE
SD - Standard Deadend

ARM LENGTH
In Inches
096 = 8 ft

COLOR
1 =Light Gray
2 = RAL 7013 (Brown Gray)
3 = RAL 8014 (Brown)

UNIQUE NUMBER ID
Created Upon Order Placement

CROSSARM PROFILE
2 = 4" x 6" TR150
4 = 4" x 6" TR150 with Torque Protection
5 = 3-5/8" x 4-5/8" CP2500
6 = 3-5/8" x 4-5/8" CP2500 with Torque Protection
7 = 3-5/8" x 4-5/8" CP3000
8 = 3-5/8" x 4-5/8" CP3000 with Torque Protection

DEADEND PHASE HARDWARE

Line Positions:	Wire Attachments
0 = N/A	0 = N/A
2 = 2 POS	1 = 1 Location
3 = 3 POS	2 = 2 Locations
4 = 4 POS	3 = 3 Locations
	ETC.

CENTERMOUNT CONFIGURATION
C = Customer Specific Deadend Bracket
K= STL082 - 4" x 6" TR150 Arm Deadend Bracket
L= STL083 - 3-5/8" x 4-5/8" CP2500 or CP3000 Arm Deadend Bracket
N= No Bracket

RUS APPROVED

4. LOWER INSTALLED COST

Once a utility decides to try a TI crossarm, they soon discover that the material and labor savings are above and beyond that of wood and steel arms.

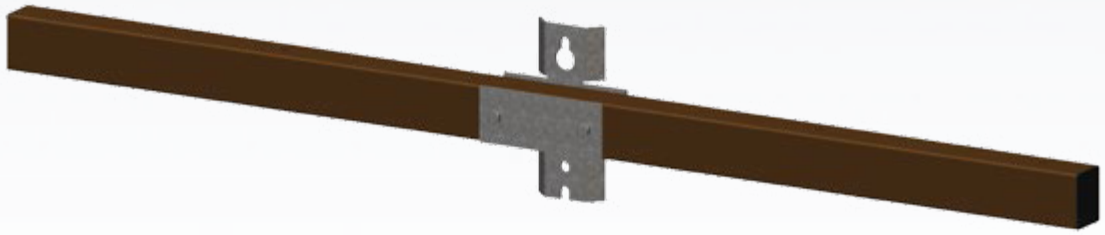
TANGENT CROSSARMS

Transmission Innovations Crossarms are available in 3.5" x 4.5" (89 mm x 114.3 mm) 3-5/8"x4-5/8" (92 mm x 117.5 mm) and 4"x6" (101.6 mm x 152.4 mm) rectangular cross sections. Selecting the correct tangent crossarm, for your application, will depend on your phase loading and deflection or serviceability limitations.

TI publishes values that have been developed per the ASTM D8019-15 protocol, both in terms of average and the 5% Lower Exclusion Limit (LEL). The National Electric Safety Code (NESC) C2-2012 mandates that pole and arm suppliers report their design values based on a 95% confidence or 5% LEL value.

Our tangent crossarms are available with or without hardware. It is common for utilities to specify the crossarms predrilled with prefabricated tangent center mounts. All mounting hardware and steel fabrications are hot dip galvanized per ASTM D153 and A123.

The following charts describe the arm model, arm length, phases per arm, ultimate 5% LEL and average phase loads, deflection per 1,000 lbf phase load and the assembly weight. The utility engineer can utilize the charts to select the arm that best fits their phase loading conditions. In the event that the load scenario, for your application, is not described in the charts, the mechanical and physical properties charts can be utilized for the proper selection of the material properties necessary to conduct mechanics of materials calculations representing your particular load conditions.



TYPICAL TANGENT CROSSARM

TECHNICAL DATA

MEDIUM TANGENT 3.5" X 4.5"						
PART NUMBER	LENGTH (ft)	PHASES PER ARM	5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)	WEIGHT w/ HARDWARE (lb)
MT1060100WXXXX	5	2	5,700	5,900	0.32	29
MT1096100WXXXX	8	2	4,000	4,300	0.78	38
MT1096100WXXXX	8	4	2,800	2,900	0.90	38
MT1120100WXXXX	10	2	3,100	3,300	1.40	44
MT1120100WXXXX	10	4	2,400	2,600	1.61	44
MT1144100WXXXX	12	2	2,600	2,800	2.21	50
MT1144100WXXXX	12	4	1,600	1,800	3.10	50

TECHNICAL DATA

CP2200 MEDIUM TANGENT 3-5/8" X 4-5/8"

PART NUMBER	LENGTH (ft)	PHASES PER ARM	5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)	WEIGHT w/ HARDWARE (lb)
MT9060100WXXXX	5	2	5,500	5,700	0.31	30
MT9096100WXXXX	8	2	3,900	4,600	0.99	39
MT9096100WXXXX	8	4	2,700	2,800	1.13	39
MT9120100WXXXX	10	2	3,000	3,500	1.18	45
MT9120100WXXXX	10	4	2,300	2,800	1.35	45

CP2500 HEAVY TANGENT 3-5/8" X 4-5/8"

PART NUMBER	LENGTH (ft)	PHASES PER ARM	5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)	WEIGHT w/ HARDWARE (lb)
HT5060100MXXXX	5	2	5,400	6,300	0.24	37
HT5096100MXXXX	8	2	5,400	6,300	0.53	48
HT5096100MXXXX	8	4	2,700	3,100	0.60	48
HT5120100MXXXX	10	2	5,400	6,300	0.93	55
HT5120100MXXXX	10	4	2,700	3,100	1.06	55
HT5144100MXXXX	12	2	5,200	5,400	1.41	63
HT5144100MXXXX	12	4	2,700	3,100	1.97	63

CP3000 HEAVY TANGENT 3-5/8" X 4-5/8"

PART NUMBER	LENGTH (ft)	PHASES PER ARM	5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)	WEIGHT w/ HARDWARE (lb)
HT7060100PXXXX	5	2	11,400	12,200	0.19	46
HT7096100PXXXX	8	2	11,400	12,200	0.41	61
HT7096100PXXXX	8	4	5,700	6,100	0.47	61
HT7120100PXXXX	10	2	11,400	12,200	0.72	70
HT7120100PXXXX	10	4	5,700	6,100	0.82	70
HT7144100PXXXX	12	2	9,600	10,400	1.04	80
HT7144100PXXXX	12	4	5,700	6,100	1.45	80

HEAVY TANGENT 4" X 6"

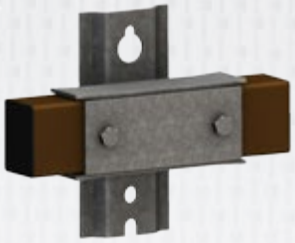
PART NUMBER	LENGTH (ft)	PHASES PER ARM	5% LEL ULTIMATE LOAD PER PHASE (lb)	AVERAGE ULTIMATE LOAD PER PHASE (lb)	DEFLECTION PER 1000LB PHASE LOAD (in)	WEIGHT w/ HARDWARE (lb)
HT2060100DXXXX	5	2	14,200	15,200	0.10	42
HT2096100DXXXX	8	2	11,200	12,000	0.30	56
HT2096100DXXXX	8	4	7,100	7,600	0.35	56
HT2120100DXXXX	10	2	8,600	9,200	0.53	65
HT2120100DXXXX	10	4	6,700	7,100	0.61	65
HT2144100DXXXX	12	2	7,200	7,700	0.78	74
HT2144100DXXXX	12	4	4,600	5,000	1.09	74

Notes:
Strength and deflection calculations are based on phase locations shown in the drawings located at www.creativepultrusions.com.
The 5% LEL value is used for strength as dictated by NESC C2-2012.
Weights include centermount and hardware.
Tested per ASTM D8019-15.

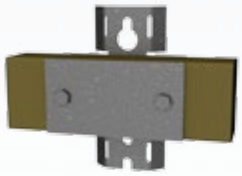
HARDWARE OPTIONS

Tangent arm-to-pole mounts are available in six configurations. Specifically, STL075, STL078, STL084, STL081, STL085, STL087 and STL089. The tangent arms do not require braces if used with the tangent pole mount and hardware.

Kit Part Number	Tangent Arm to Pole Mount Kits	Weight
PTK010 (T)	TR100 3-1/2" x 4-1/2"Heavy Duty Channel Tangent Bracket Kit **Description:** Grade 50 steel tangent mount. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a tangent configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK010 Kit Includes:** (1) STL075 Bracket (1) FAB437 - 11"x 4.5"x 1/4" Steel Plate (2) FAB551 - 5-1/2" x 3/4" Bolts 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 10" or 12" spacing of 3/4" pole mount hardware and includes 1-1/4" steel banding slots.	22 lbs.
PTK015 (D)	TR150 4" x 6" Tangent Bracket Kit **Description:** Grade 50 steel tangent mount. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a tangent configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK015 Kit Includes:** (1) STL078 Bracket (1) FAB438 - 11"x 6"x 3/8" Steel Plate (2) FAB185 - 6" x 3/4" Bolts A325 or 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 10" or 12" spacing of 3/4" pole mount hardware and includes 1-1/4" steel banding slots.	19 lbs.
PTK011(I)	TR100 3-1/2"x 4-1/2" Tangent Bracket Kit **Description:** Grade 50 steel tangent mount. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a tangent configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK011 Kit Includes:** (1) STL078 Bracket (1) FAB437 - 11" x 4.5"x 1/4" Steel Plate (2) FAB551 - 5-1/2" x 3/4" Bolts 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 10" or 12" spacing of 3/4" pole mount hardware and includes 1-1/4" steel banding slots.	15 lbs.



STL075

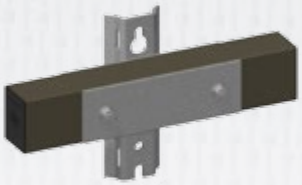


STL078

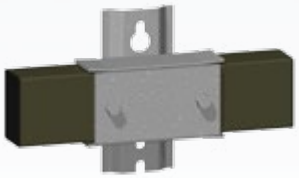
STL078

HARDWARE OPTIONS

Kit Part Number	Tangent Arm to Pole Mount Kits	Weight
PTK018 (M)	CP2500 3-5/8" x 4-5/8" Tangent Bracket Kit **Description:** Grade 50 steel tangent mount. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a tangent configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK018 Kit Includes:** (1) STL084 Bracket (1) FAB496 - 14"x4.5"x1/4" Steel Plate (2) FAB551 - 5-1/2" x 3/4" Bolts 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 8", 10" or 12" spacing of 3/4" pole mount hardware and includes 1-1/4" steel banding slots.	18 lbs.
PTK019 (J)	TR150 4" x 6" Heavy Duty Channel Tangent Bracket Kit **Description:** Grade 50 steel tangent mount. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a tangent configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK019 Kit Includes:** (1) STL081 bracket (1) FAB438 - 11"x6"x3/8" Steel Plate (2) FAB185 - 6" x 3/4" Bolts A325 or 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 10" or 12" spacing of 3/4" pole mount hardware and includes 1-1/4" steel banding slots.	28 lbs.
PTK021(P)	CP3000 3-5/8" x 4-5/8" Tangent Bracket Kit **Description:** Grade 50 steel tangent mount. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a tangent configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK021 Kit Includes:** (1) STL085 Bracket (1) FAB496 - 14"x4.5"x1/4" Steel Plate (2) FAB551 - 5-1/2" x 3/4" Bolts 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 8", 10" or 12" spacing of 3/4" pole mount hardware and includes 1-1/4" steel banding slots.	23 lbs.



STL084

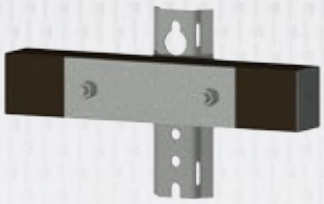


STL081

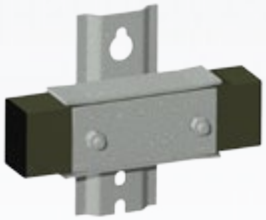
STL085

HARDWARE OPTIONS

Kit Part Number	Tangent Arm to Pole Mount Kits	Weight
PTK022 (W)	CP2200 3-5/8" x 4-5/8" or TR100 3-1/2" x 4-1/2" Tangent Bracket Kit **Description:** Grade 50 steel tangent mount. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a tangent configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK022 Kit Includes:** (1) STL089 Bracket (1) FAB496 - 14"x4.5"x1/4" Steel Plate (2) FAB551 - 5-1/2" x 3/4" Bolts 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 8", 10" or 12" spacing of 5/8" pole mount hardware and includes 1-1/4" steel banding slots.	15 lbs.
PTK023 (Q)	CP2200, CP2500 or CP3000 3-5/8" x 4-5/8" Tangent Bracket Kit **Description:** Grade 50 steel tangent mount. Bracket is intended for mounting FRP arms to steel, wood, concrete or FRP poles in a tangent configuration. Steel fabrication and hardware galvanized per ASTM A123 and A153, welded per AWSD1.1. **PTK023 Kit Includes:** (1) STL087 Bracket (1) FAB437 - 11"x 4.5"x 1/4" Steel Plate (2) FAB551 - 5-1/2" x 3/4" Bolts 5 SAE Grade (2) FAB186 - 3/4" Nuts A325 or 5 SAE Grade (2) FAB187 - 3/4" Lock/Spring Washers Note: Bracket drilled for 10" or 12" spacing of 3/4" pole mount hardware and includes 1-1/4" steel banding slots.	22 lbs.



STL089



STL087

ORDERING SPECIFICATIONS

MT 1 096 1 00 A XXXX

CROSSARM TYPE
MT - Medium Tangent
HT - Heavy Tangent

CROSSARM PROFILE
1 = 3-1/2" x 4-1/2" TR100
2 = 4" x 6" TR150
3 = 3-1/2" x 4-1/2" TR100 with Torque Protection
4 = 4" x 6" TR150 with Torque Protection
5 = 3-5/8" x 4-5/8" CP2500
6 = 3-5/8" x 4-5/8" CP2500 with Torque Protection
7 = 3-5/8" x 4-5/8" CP3000
8 = 3-5/8" x 4-5/8" CP3000 with Torque Protection
9 = 3-5/8" x 4-5/8" CP2200
A = 3-5/8" x 4-5/8" CP2200 with Torque Protection

Arm Length
In Inches
096 = 8 ft

Color
Color
1 =Light Gray
2 = RAL 7013 (Brown Gray)
3 = RAL 8014 (Brown)

DEADEND PHASE HARDWARE
Not used for tangent arms

Unique Number ID
Created Upon Order Placement

Centermount Configuration
C = Customer Specific Tangent Bracket
D = STL078 4"x 6" TR150 or TR100 Arm Tangent Bracket
J = STL081 4" x 6" TR150 Arm Channel Tangent Bracket
M = STL084 3-5/8" x 4-5/8" CP2500 Arm Tangent Bracket
N = No Bracket
P = STL085 3-5/8" x 4-5/8" CP3000 Arm Tangent Bracket
Q = STL087 3-5/8" x 4-5/8" CP2200, CP2500 or CP3000 Arm Tangent Bracket
T = STL075 3-1/2" x 4-1/2" TR100 Arm Channel Tangent Bracket
W = STL089 3-5/8" x 4-5/8" CP2200 or TR100 Arm Tangent Bracket

RUS APPROVED

5. CAN BE FIELD FABRICATED

Unlike steel and concrete arms, the CPI crossarms can be easily field drilled with carbide bits. In less than a minute, a new hole can be drilled in the crossarm.

BOLT TORQUE PROTECTION

Over-torque protection is available to protect the FRP crossarms from damage due to over-tightening of the hardware. The over-torque protection system protects the arm against torque loads up to 250 lbf-ft. TI recommends a maximum torque of 25 lbf-ft.

In general, the nut should be hand tightened and then snugged with a ½ turn of the wrench. A good visual detection involves snugging the nut until the spring washer is compressed. It takes between 20 and 25 lbf-ft of torque to compress a 5/8" or 3/4" pole line hardware spring washer.

Crossarms that are shipped with center mount brackets and phase hardware require no field tightening or loosening. The proper torque has been set at the factory.

STORM STRONG™
Torque Protection Bushings
Factory or Field Applied

6. ENHANCED LINEMAN SAFETY

The dielectric strength of the FRP arm is above 100kV/in, which increases worker safety while adding additional protection against potential electrical short circuiting.

CROSSARM SPECIFICATIONS

GENERAL

The tangent and deadend crossarms shall be manufactured by TI, in Alum Bank, PA 15521. The arm shall be pultruded and strength rated per the 5% LEL requirements as set forth in NESC C2-2012.

VISUAL REQUIREMENTS

The arms shall be manufactured per the visual standard ASTM D4385.

UV PROTECTION

The arms shall be encompassed with a 10 mil polyester surface veil to protect the glass reinforcements from fiber blooming. The arms shall be painted with a 3 mil (wet) film thickness polyurethane paint or polyester powder or equivalent UV protective coating.

HARDWARE AND FABRICATED STEEL

All brackets and hardware shall be manufactured in accordance with ASTM A123 and ASTM A153 and welded per AWSD1.1.

DIMENSIONAL REQUIREMENTS

The arms shall be manufactured to the dimensional requirements as set forth in ASTM D3917. In addition, the fabrication tolerances shall conform to the following dimensional requirements:

Arm Length: +1/2", -0" (+13mm, -0mm)
Squareness of End Cut: 1/8" (3mm)
Hole Diameter: ± .020" (.5mm)
Hole Location: ±1/4" (6mm)

Dimensional Requirements Notes:
1.0 Arm includes the end cap.
2.0 All bolted connections require a minimum nut to thread engagement of one full nut.

FOAM

The foam shall be a two component polyurethane foam with a density of 2 pcf.

COLOR OPTIONS

The arms shall be light gray, RAL 7013 brown gray or RAL 8014 brown in color.

PROPERTIES

Mechanical Properties	4" x 6" Heavy Deadend and Heavy Tangent (TR150)	3-5/8"x4-5/8" Heavy Deadend and Heavy Tangent (CP3000)	3-5/8"x4-5/8" Heavy Deadend and Heavy Tangent (CP2500)	3-5/8"x4-5/8" Medium Tangent (CP2200)	4.5" x 3.5" Medium Tangent (TR100)
Full Section Flexural Strength, 5% LEL Value (psi) ASTM D8019-15	55,135	94,510	76,688	37,291	37,204
Full Section Compression Strength, 5% LEL Value (psi) ASTM D8019-15	55,135	94,510	76,688	37,291	37,204
Full Section Modulus of Elasticity (psi) ASTM D8019-15	5,463,000	6,245,000	5,959,000	5,090,000	4,207,000
In-Plane Shear Strength, 5% LEL Value (psi) ASTM D8019-15	7,197	5,847	4,861	3,728	3,487
Ultimate Shear Capacity, 5% LEL Value, Major Axis (lbf) ASTM D8019-15	17,092	14,231	9,418	5,518	5,774
Pin Bearing Strength, Crosswise[1], 5% LEL Value (psi)	.25" wall/24,909 .30" wall/22,690"	.32" wall/16,075 .35" wall/11,027	.25" wall/15,624 .27" wall/8,612	.19" wall/6,453 .20" wall/7,148	.19" wall/27,189 .25" wall/13,344
Pin Bearing Strength, Lengthwise[2], 5% LEL Value (psi)	.25" wall/30,417 .30" wall/34,665"	".32" wall/30,609 .35" wall/26,446"	".25" wall/26,239 .27" wall/28,676	.19" wall/20,624 .20" wall/21,344	.19" wall/13,148 .25" wall/21,111
Physical Properties					
Water Absorption ASTM D570	% Max. 0.6	% Max. 0.6	% Max. 0.6	% Max. 0.6	% Max. 0.6
Moment of Inertia about the major axis (in^4)	24.9	15.0	12.3	9.6	9.9
Section Modulus about the major axis (in^3)	8.3	6.5	5.3	4.2	4.4
Moment of Inertia about the minor axis (in^4)	11.5	9.7	8.0	6.4	5.9
Section Modulus about the minor axis (in^3)	5.7	5.4	4.4	4.4	3.4
Flange thickness (in)	0.30	0.35	0.27	0.20	0.25
Web thickness (in)	0.25	0.32	0.25	0.19	0.19
Electrical Properties					
Dielectric Strength per ASTM D149-09 Method A, Short-Time Test(kV/in)	150	150	150	150	150
ASTM F711 (100 kVAC per foot - minutes dry)	passed	passed	passed	passed	passed
IEEE978 (75 kVAC per foot - 1 minute wet)	passed	passed	passed	passed	passed

Notes:
1. Crosswise direction is perpendicular to the length of the arm.
2. Lengthwise is the direction parallel to the arm length.

7. DESIGN VALUES ARE PUBLISHED PER THE NESC CODE REQUIREMENTS OF 5% LOWER EXCLUSION LIMIT (LEL)

TESTING

The crossarms, that were tested to determine the design strength and serviceability characteristics published in this document, were tested per ASTM D8019-15.

The design values are based on full section testing of numerous FRP crossarms to failure. The test results were used to establish the ultimate phase loading capacity dependent upon the length of the arm. In addition, pin bearing strength tests have been performed to establish the 5% LEL pin bearing strength of the crossarms. Note: the pin bearing tests were conducted with 3/4" bolts. The 5% LEL value represents a statistical method for characterizing the nominal strength.

The nominal 5% LEL strength is a value that suggests 95 out of 100 samples tested will meet or exceed the published nominal strength. Defined as 5% LEL (lbs.) = Mean Strength (lbs.) x (1 – 1.645 COV).

For additional information pertaining to reliability based designs please refer to:

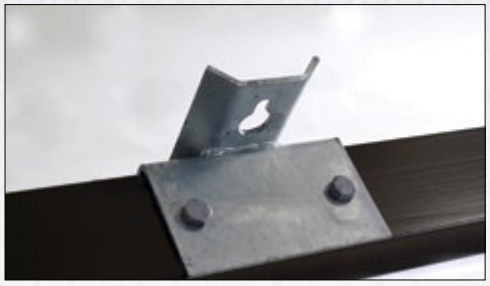
ASCE: Manuals and reports on Engineering Practice No. 111, the Reliability-Based Design of Utility Pole Structures.

Note, a 5% LEL value is required based on the NESC Code.

STANDARD INSTALLATION PROCEDURES

1.

Our TI deadend and tangent crossarms can be delivered ready to mount to the pole. All hardware and mounting brackets are installed in the manufacturing plant to the highest quality standards, so no assembly is required. The arm can be mounted to a wood or FRP pole by simply measuring the distance between the mounting holes and drilling the pole accordingly.



2.

The mounting bracket features a keyhole fabrication so that the arm can be placed over the mounting bolt during the mounting process. This feature saves time and reduces strain on the lineman. Once the holes have been drilled, simply position the arm/ bracket assembly on the pole and tighten the bolts.

3.

When attaching insulators or hardware to the crossarm, always use oversized washers such as 4" x 4" x 1/4" or 3.5"x 3.5"x 3/8" washers to back the bolts. FRP crossarms are not solid and can be damaged due to localized compression stresses. Never torque a bolt more than 25 ft. lb. As a general rule, only tighten the bolt until the compression lock washer has been compressed, or if no compression lock washer is utilized, hand tighten the nut and apply a 1/2 to one full turn of the nut with a wrench.

4.

In the event you need to field drill the arm, simply drill the hole with a carbide bit. Do not use a wood bit. The dust and drill filings are considered a nuisance dust; therefore, gloves, long sleeved shirts and safety glasses should be worn during field fabrication. The dust is non-toxic and will not cause any harm to your skin or lungs as determined by OSHA.

ATTACHING HARDWARE TO FIBERGLASS POLES:

The fiberglass poles will not change dimensionally with temperature or moisture as with a wood pole. Therefore, single tighten the bolt so that the compression lock washer has been compressed or hand tighten 1/2 turn. There is no need to over tighten the mounting bolts when attaching to an FRP pole. In fact, over tightening of the bolts could result in crush failing the FRP pole.

DESIGN NOTES

DESIGN NOTES

Manufacturing: Toll Free +1 888-551-4079 • www.transmissioninnovations.com
Sales: Toll Free: +1 866-887-8617 • www.dominohighvoltage.com

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Renewing the way the world carries its energy.
www.transmissioninnovations.com

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