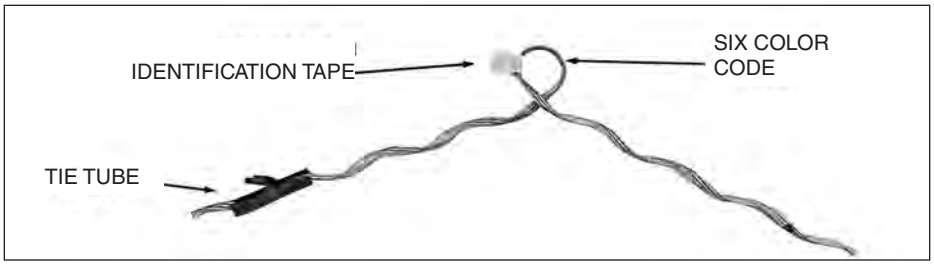
Spool Tie

NOMENCLATURE

RUS Accepted



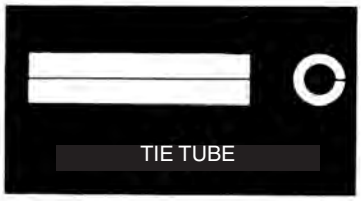
Tie Assembly: A Spool Tie Assembly consists of one metal tie component plus tie tube.

Tie Tube: Each Spool Tie is supplied with an elastomeric tie tube designed for abrasion protection with bare conductors.

Color Code: Identifies proper conductor size, corresponding to tabular information appearing in this section.

Identification Tape: Lists catalog numbers, proper insulator type, and nominal conductor sizes.

Applied Length: Describes length of tie after installation, plus assists in product identification.



GENERAL RECOMMENDATIONS

The Spool Tie is intended for use on aluminum based conductors with diameters from .190" to .968".

Interchangeable Neck-Style Insulators: Spool Ties listed in this section are designed to be applied to ANSI Class 53-1, 53-2, and 53-3 spool insulators which have 1-3/4" neck diameters. Consult PLP for specifics. "F" neck size Side Ties can be used for application on ANSI Class 53-4 and 53-5 which have 2-7/8" neck diameters.

To insure proper fit and service life of the Spool Tie, it is recommended only spool insulators with uniform dimensions, as described by the latest (C29.3) ANSI standards be used. A partial listing of acceptable insulators appears on the last page of this section. Consult PLP for applications on non-listed or non-standard insulators.

Each Spool Tie is supplied with an elastomeric tie tube designed to minimize abrasion to bare conductors and insulators. For application on jacketed conductors, the tube may be discarded. Spool Ties can also be applied to bare conductor without the tube where desired, although consideration of abrasion should be given.

Mechanical Strength: The Spool Tie is designed to provide superior mechanical strength and resiliency during conductor motion and cyclic loading conditions. Longitudinal holding strengths consistently exceed the requirements of the National Electric Safety Code. **TM-168E** covers the mechanical testing of the Spool Tie and is available upon request.

The RIV/TVI characteristics of Spool Ties are equivalent to those of a well made hand tie as originally installed. The precontoured loop and formed legs of the Spool Tie assure continued fit, which provide better RIV/TVI performance than a loosened tie wire.

Vibration Dampers: The Spool Tie is designed to outperform the hand tie during conductor motion activity, such as aeolian vibration and galloping. However, on some lines, the use of dampers may be necessary to prevent damage. Utilities that have experienced conductor motion or expect to, should consider adding dampers. Consult PLP® for general guidelines and advice concerning conductor motion and dampers. Also consult the Motion Control catalog section.

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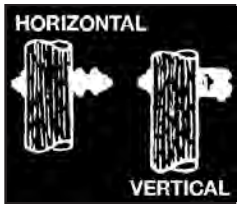
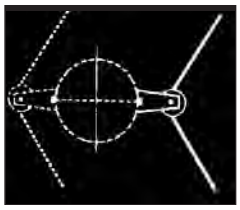
Spool Tie

INSTALLATION GUIDELINES





1. **Insulator Mounting**: When installing a Spool Tie, the spool insulator may be mounted either horizontally or vertically. Whatever the construction style, the conductor should be positioned so it will bear, as much as possible, into the insulator. During vertical mounted installations, the insulator should be removed from the rack or clevis so the conductor may be positioned inside the insulator. However, when running angles turn *into* the pole, the conductor should be placed on the *outside* of the insulator so the conductor bears against the spool.
2. **Line Angles - General Guidelines:** On horizontally-mounted insulators, Spool Ties can normally accommodate line angles up to **10**°. On vertically-mounted insulators, line angles up to **40**° can normally be achieved.

   In all cases the conductor should rest in the preferred insulator groove, independently of the tie, so the tie is not required to force the conductor to remain in that groove. The largest practical angle a tie can accommodate depends upon limiting factors such as conductor size, tension, span lengths, sag angles, insulator style and orientation, etc. Consult PLP® for further guidance on line angle issues.
3. **Tapping:** Taps should not be made directly over the legs or loop of the Spool Tie.
4. **Conductor Compatibility:** Spool Ties should be used only on the size, type, and lay direction for which they are designed. When using conductors not mentioned in this catalog section, consult PLP.
5. During installation and at all times, care should be taken to avoid gouging or damaging the protective coating of the Spool Tie or the conductor.
6. Spool Ties should not be used as tools; i.e., come-alongs, pulling-in grips, etc.
7. Consult the Spool Tie Application Procedure for additional installation information.
8. When in doubt about usage of Spool Ties, consult your PLP representative or Preformed Line Products.

SAFETY CONSIDERATIONS

1. This product is intended for a single (one-time) use and for the specified application. CAUTION: DO NOT REUSE OR MODIFY THIS PRODUCT UNDER ANY CIRCUMSTANCES.
2. This product is intended for use by trained craftspeople only. This product SHOULD NOT BE USED by anyone who is not familiar with and trained in the use of it.
3. When working in the area of energized lines with this product, EXTRA CARE should be taken to prevent accidental electrical contact.
4. For PROPER PERFORMANCE AND PERSONAL SAFETY be sure to select the proper size PREFORMED™ Spool Tie before application.
5. PREFORMED Spool Ties are precision devices. To insure proper performance, they should be stored in cartons under cover and handled carefully.

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Spool Tie

For use on:
ACAR, All-Aluminum
ACSR, Aluminum Alloy
AWAC, Compacted ACSR

Spool Insulator

ANSI 53-1
ANSI 53-2 **1-3/4" Neck Diam.**
ANSI 53-3

Catalog Number	Diameter Range (Inches)		Nominal Conductor Size		Units	Wt./Lbs.	Applied Length (Inches)	Color Code
	Min.	Max.	Bare Conductor	Plastic Jacketed Conductor	Per Carton			
SPL-1352-P	.245	.277	#4, 6/1, 7/1 #4, 7W Alum. Alloy	#6, 7W, 2/64s #6, Solid, 3/64s #6, 6/1, 2/64s	100	16	19	Orange
SPL-1353-P	.278	.315	#3, 7W Alum. Alloy #2, 7W All Alum.	#6, 6/1, 3/64s #4, Solid, 3/64s #4, 6/1, 2/64s	100	17	21	Purple
SPL-1354-P	.316	.357	#2, 6/1, 7/1 #2, 7W Alum. Alloy #1, 6/1	#2, 7W, 3/64s #4, 6/1, 7/1, 3/64s	100	23	24	Red
SPL-1355-P	.358	.405	1/0, 7W All Alum. 1/0, 6/1 1/0, 7W Alum. Alloy	#3, 7W, 4/64s #2, 7W, 3/64s #4, 7W, 5/65s	100	24	26	Yellow

Right-hand lay standard

EXPLANATORY NOTES:
(1) "Diameter Range" indicates the size of conductors that utilize the same tie.
(2) "Nominal Conductor Size" indicates only a few conductors that have outside diameters within the ranges listed.
(3) Since all spool insulators do not have neck dimensions suitable for application of the Spool Tie, consult the Insulator Manufacturer's List on the last page in this section.
(4) AWAC is a registered trademark of the Copperweld Co.

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Spool Tie

For use on:
ACSR, Compacted ACSR,
Aluminum Alloy , ACAR
All-Aluminum, AWAC®
Compacted All-Aluminum

Spool Insulator

ANSI 53-1
ANSI 53-2 **1-3/4" Diameter**
ANSI 53-3

Catalog Number	Diameter Range (Inches)		Nominal Conductor Size		Units	Wt./ Lbs.	Applied Length (Inches)	Color Code
	Min.	Max.	Bare Conductor	Plastic Jacketed Conductor	Per Carton			
SPL-1356-P	.406	.459	2/0, 7W All Alum. 2/0, 6/1 2/0, 7W Alum. Alloy	#2, 6/1, 3/64s #2, 7W, 4/64s #1, 7W, 4/64s	100	28	28	Blue
SPL-1357-P	.460	.520	3/0, 7W All Alum. 3/0, 6/1 3/0, 7W Alum. Alloy	#4, 7W, 8/64s #1, 6/1, 4/64s #1, 7W-19W, 5/64s 1/0, 7W, 4/64s	100	32	31	Orange
SPL-1358-P	.521	.588	4/0, 7W All Alum. 4/0, 6/1 4/0, 7W Alum. Alloy	1/0, 6/1, 4/64s 1/0, 7W, 5/64s 2/0, 7W, 4/64s 1/0, 6/1, 5/64s	50	18	32	Red
SPL-1359-P	.589	.665	266.8, 37W All Alum. 266.8, 18/1	3/0, 7W-19W, 4/64s 3/0, 6/1, 4/64s 4/0, 7W 19W, 4/64s 3/0, 6/1, 5/64s	50	19	23	Purple
SPL-1360-P	.666	.755	336.4, 18/1 336.4, 19W All Alum. 397.5, 19W All Alum. 400, 19W, 37W All Alum.	4/0, 7W, 5/64s 3/0, 6/1, 6/64s 4/0, 6/1, 5/64s 266.8, 19W, 5/64s	50	24	25	Brown
SPL-1361-P	.756	.858	477, 19W, 37W All Alum. 477, 18/1, 24/7, 26/7, 556.5, 19W All Alum.	266.8, 18/1, 5/64s 336.4, 19W, 4/64s 336.4, 37W, 6/64s	50	25	26	Red
SPL-1362-P	.859	.968	556.5, 26/7 636, 18/1 700, 37W, 61W All Alum.	350, 37W, 6/64s 336.4, 19W, 8/64s 450, 37W, 5/64s 477, 37W, 5/64s	50	26	28	Blue

Right-hand lay standard
EXPLANATORY NOTES:

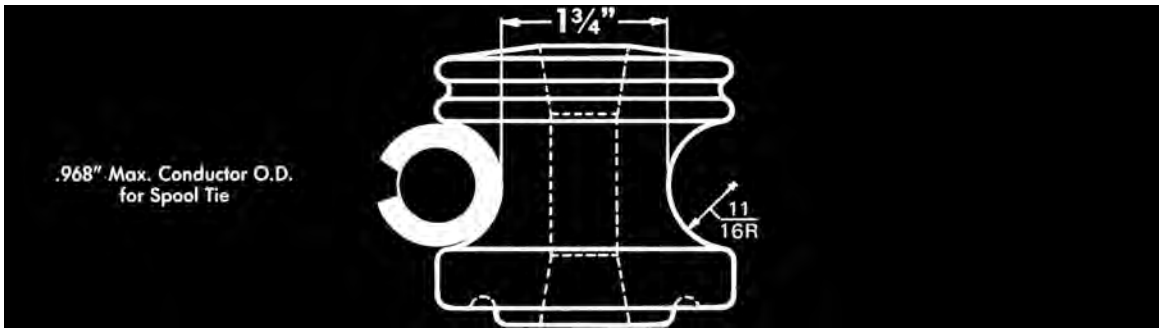
(1) "Diameter Range" indicates the size of conductors that utilize the same tie.
(2) "Nominal Conductor Size" indicates only a few conductors that have outside diameters within the ranges listed.
(3) Since all spool insulators do not have neck dimensions suitable for application of the Spool Tie, consult the Insulator Manufacturer's List on the last page in this section.
(4) AWAC is a registered trademark of the Copperweld Co.

Spool Tie

INSULATOR MANUFACTURER LIST:

Any given *Spool Tie* appearing in our catalog can be used interchangeably with any insulator of the same corresponding neck diameter appearing on this list. The diagramed neck dimensions, important to *Spool Ties*, are part of the ANSI Standard C-29.3 Specification.

ANSI 53-1
ANSI 53-2
ANSI 53-3
1-3/4" Neck Diameter



Chance	Joslyn	L.M.	Locke (G.E.)	Knox	Ohio Brass	Oliver	Utilities Serv.	ITE-Victor
C-909-0032	J-101 J-151	DE 453 DE 453 DE 453	#355	#310-W #310-D	#36361 #36368	#2000	#204 #204W #205 #205W	#2012

*Note: **ANSI 53-1 and 53-3 spool insulators** with 1-3/4" neck diameter will accept only a maximum conductor of .563" with a Spool Tie.*

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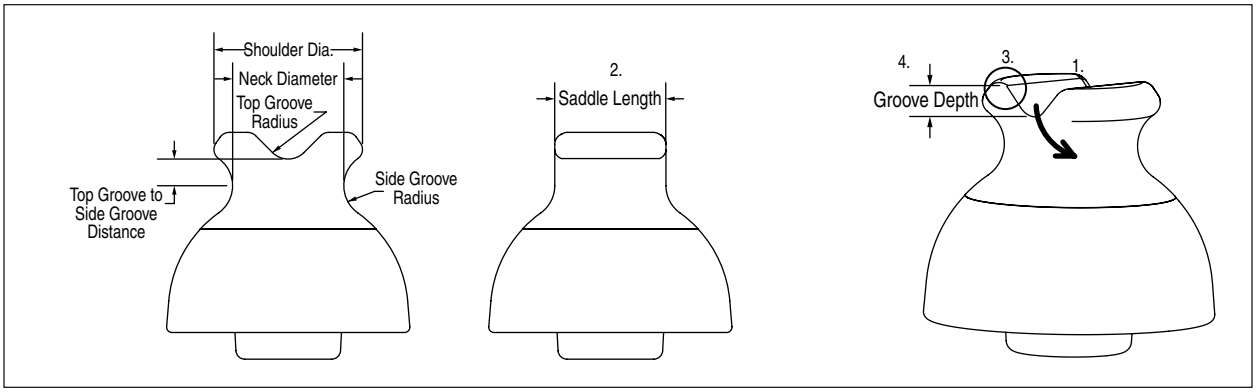
Insulator Fit

Interchangeable Insulators for use with PLP® Ties
Dimensional Factors that affect Tie Application and Performance



It is recommended that only insulators meeting the dimensional requirements of the most recent ANSI® C29.3, C29.5, C29.6, and C29.7 specifications be used with the appropriate PLP ties.

ANSI C29 Insulator Specifications and their Affects on PLP Ties

ANSI C29 specifies and defines dimensions for insulator heads that are crucial to the proper application and lifetime performance of PLP factory formed ties. These dimensions include:

- Neck Diameter - nominal
  - C-neck – 2-1/4"
  - F-neck – 2-7/8"
  - J-neck – 3-1/2"
  - K-neck – 4"
- Top groove radius (minimum)
- Side groove radius (minimum)
- Maximum shoulder diameter (maximum)
- Top groove to side groove vertical spacing

Some of the specified dimensions are simply maximum or minimum allowable values. The dimensions for the vertical distance from the bottom of the top groove to the middle of the side groove and the neck diameter have minimum and maximum values designated.

These dimensions and insulator designations determine the proper tie to be used and the maximum conductor size for the groove application. Review the individual tie sections for groove/conductor diameter limitations.

Insulator characteristics that are not part of the ANSI C29 Specifications

Some of the insulator characteristics that have an impact on the application and performance of PLP Ties are not included in the ANSI specification. These characteristics include:

1. **The transition contour of the top groove into side groove**
2. **Length of the saddle or top groove**
3. **Extension of shoulders past the edge of the top groove.**
4. **Depth of the top groove**

Each of these items has different results on a factory formed tie's performance. Combinations of several of these characteristics could result in initial tie damage and incorrect application.

1. The transition contour of the top groove into the side groove is important due to the tie's shape. If an edge is created instead of a smooth rounded transition, the tie's formed wire is forced to bend over a fulcrum point resulting in a high concentration of stress. This is detrimental for both the insulator and tie.

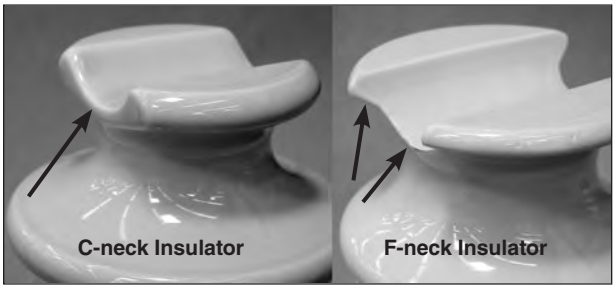


Figure 1a
Note the edge that exists between the top groove and the side groove above. Figure 1b shows a smooth transition.

Figure 1b

Insulator Fit

2. A top groove length longer than the insulator's neck diameter results in an edge. This edge creates a high stress contact point and results in an abnormal tie application. As an example, Figure 2 illustrates how a Distribution Tie reacts to this configuration (the tie tube was omitted to illustrate the gap beneath the conductor). Note the point contact at the insulator/tie interface.

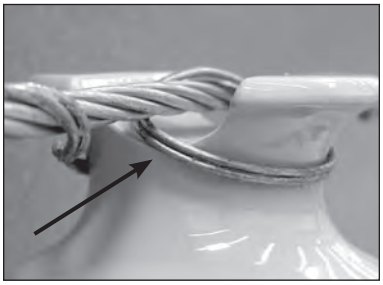


Figure 2

3. The shoulder extensions result in difficulty in application of top ties. As the tie is rotated, the added protrusions from the shoulders past the end of the top groove provide catch points for the tie (see F-neck Insulator in Figure 1a).

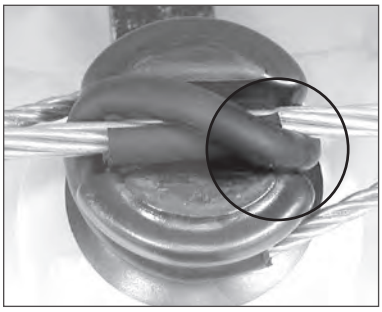


Figure 3

4. The top groove of the insulator can cause installation difficulties of top ties when its diameter is at the minimum ANSI designation. This is especially troublesome when installing the WRAPLOCK® Tie. Figure 3 illustrates the application on a C-neck insulator on 1/0 ACSR 6/1 conductor.

The circled area illustrates that the covered center section of the WRAPLOCK® Tie is wedged between the conductor and the inner surface of the insulator. This increases the installation difficulty of the tie.

In many instances the transition of the grooves can have a great impact on the form, fit, and function of a factory formed tie and hand tie wire. The sharp edge of a long top groove saddle (see Figure #1) can be especially hazardous to the soft hand tie wire as well as a factory formed tie.

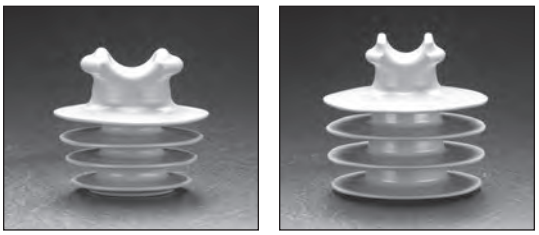
Insulator Review and Trial Applications

It is recommended the user conduct a thorough review of the insulator size, shape and geometry and conduct trial fits with the ties, prior to full scale field installations. Consult PLP for assistance, especially if there are any doubts concerning tie and insulator fit or performance.

Non-ANSI C29 Insulators

Some insulators that do not technically meet all the ANSI C29 Wet Process Porcelain Insulator standards may be suitable for use with PLP factory formed ties depending on their head and neck dimensions and geometry.

An example is the PLP polymer C & F-neck tie top insulators. These insulators have head and neck designs for use with PLP factory formed ties or PLP Ring Ties. The head and neck dimensions of the PLP Polymer C & F-neck insulators have been designed to match critical ANSI C29 dimensional specifications and meet or exceed most of the mechanical and electrical performance requirements specified in that standard.

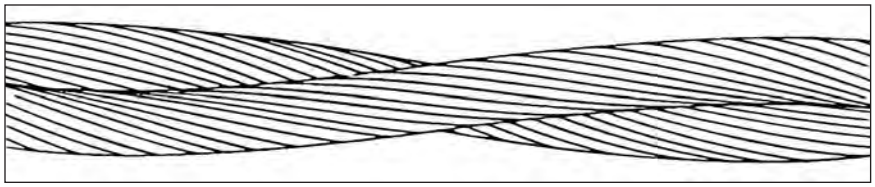


PLP Polymer 15kV and 35kV Insulators

Helical Ties for T2 Conductor

CONSTRUCTION

T2 conductor consists of two identical conductors twisted together in a left-hand lay direction at an approximate nine foot pitch length. Generally the conductors used are stanadrd ACSR, AAC or AAAC construction but can be conductors of any configuration.



THEORY

The spiral shape of the two conductors twisted together disrupts the forces created by the steady crosswinds that can cause cable motion. The forces are disrupted by the continuously changing profile exposed to the wind. This spiral shape, together with less torsional stiffness and varying bending stiffness also reduces or can minimize cable galloping due to ice and wind loads.

APPLICATION

T2 conductor can be used in regions that are subject to galloping due to wind and ice. T2 conductor is also designed to reduce the requirement for vibration protection when installed within accepted tension limits.

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Helical Ties for T2 Conductor

GENERAL RECOMMENDATIONS

T2 conductor is designed to prevent "typical" conductor motion activity like aeolian vibration and galloping, however, the non-circular configuration and unusual cable movement of T2 conductors requires special consideration of tie devices. When choosing products for T2 conductor, it is important not to mistake standard concentric conductor products listed in the catalog for similarly name T2 conductor. The T2 conductor equivalents require substantially larger sized products for similarly named conductor sizes. If a desired product is not listed in the product table in this section, contact Preformed Line Products to determine if the product has been reviewed. In many cases, Preformed Line Products can recommend products for a particular installation.

INTENDED USE. Manufactured formed wire ties secure conductors in the grooves of interchangeable headstyle insulators.

PREFORMED™ ties provide an improved method of securing conductor compared to clamp-top or hand-ties over Armor Rods.

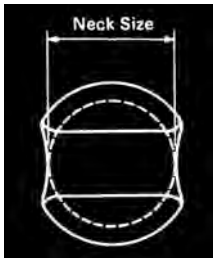
DEAD-ENDING. T2 conductor can be terminated in the same manner as a single conductor except both of the elements of the T2 conductor requires its own Dead-end device. The two Dead-end devices should be terminated on separate hardware on the structure.

CONDUCTOR REPAIR. When repairing T2 conductor, the individual elements of the span must be analyzed and repaired separately. To accomplish this, it is important to know the construction of the T2 conductor so the correct repair components can be chosen.

ARMOR RODS/ARMOR-GRIP® SUSPENSION/SUPPORT. When using Armor Rods or ARMOR-GRIP Suspensions or Supports, the introduction of a third piece of conductor is advisable. This short section of conductor is equal to one of the conductor elements of the T2 conductor. The additional piece of conductor is placed in the interstices of the two conductor elements of the T2 conductor assembly in order to create an assembly that is closer to the shape of the circle. The appropriately sized Armor Rod or ARMOR-GRIP Suspensions or Supports can then be easily installed over this new assembly. The additional piece of conductor should be held in place by a few pieces of tape prior to the installation of the Armor Rods. For specific information on this installation including the length of the additional piece of conductor and the appropriate Armor Rods or ARMOR-GRIP Suspension or Supports catalog number, contact Preformed Line Products.

INTERCHANGEABLE HEADSTYLE INSULATOR. To insure proper fit and service life, it is recommended that only insulators corresponding to C-Neck, F-Neck, J-Neck, K-Neck, or spool insulators be used. These neck diameter and groove height dimensions appear in ANSI standards.

Consult Preformed Line Products for engineering recommendations on non-interchangeable headstyle insulators. A sample of the insulator in question is desirable.



SAFETY CONSIDERATIONS

1. These products are intended for a single (one-time) use and for the specified application. CAUTION: DO NOT REUSE OR MODIFY THESE PRODUCTS UNDER ANY CIRCUMSTANCES.
2. This product is intended for use by trained craftspeople only. This product SHOULD NOT BE USED by anyone who is not familiar with and trained in the use of it.
3. When working in the area of energized lines with this product, EXTRA CARE should be taken to prevent accidental electrical contact.
4. For PROPER PERFORMANCE AND PERSONAL SAFETY be sure to select the proper size PREFORMED products before application.
5. PREFORMED products are precision devices. To insure proper performance, they should be stored in cartons under cover and handled carefully.

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Helical Ties for T2 Conductor

PREFORMED™ TIES FOR T2 CONDUCTOR

WRAPLOCK® Tie

Distribution Tie

EZ-WRAP® Spool Tie

Spool Tie

Double Support Tie

Side Tie

Double Side Tie

BENEFITS:

- Elastomeric tubes/pads cushion to protect T2 conductor.
- No special equipment or installation techniques required.
- Reduces time required to tie in T2 conductor
- Minimizes possibility of mistakes during tie installations.
- Complete line of ties readily available for popular T2 conductors and insulators.
- Over 15 years successful experience with support devices on T2 conductor
- Superior ability to hold T2 conductor to insulator
- Meets NESC longitudinal holding requirement
- Provides resiliency under all potential motion conditions
- Provides stability during twisting motion

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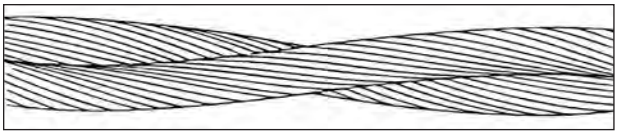
Helical Ties for T2 Conductor

For use on:
ACSR, Compacted ACSR, Aluminum Alloy, All-Aluminum, AWAC®, Compacted All-Aluminum



T2 Conductors	Distribution Tie	Wraplock Tie	Spool Tie	Ez Wrap Spool Tie	Double Support Tie	Double Side Tie	Side Tie
2 x #4 (6/1) ACSR (7/1) ACSR (7/W) AAAC	UTC-1106 UTF-1206 UTJ-1306 UTK-1606	WTC-0112 WTF-0212 WTJ-0412	SPL-1356-P	EZSP-4376	DST-0154 (C&F) DST-0354 (J)	DBST-1104 (C&F) DBST-1304 (J)	STC-1256-P STF-1156-P STJ-1506-P
2 x #3 (6/1) ACSR	UTC-1107 UTF-1207 UTJ-1307 UTK-1607	WTC-0114 WTF-0214 WTJ-0414	SPL-1357-P	EZSP-4376	DST-0155 (C&F) DST-0355 (J)	DBST-1105 (C&F) DBST-1305 (J)	STC-1257-P STF-1157-P STJ-1507-P
2 x #2 (6/1) ACSR (7/1) ACSR (7/W) AAAC	UTC-1108 UTF-1208 UTJ-1308 UTK-1608	WTC-0116 WTF-0216 WTJ-0416	SPL-1358-P	EZSP-4377	DST-0156 (C&F) DST-0356 (J)	DBST-1106 (C&F) DBST-1306 (J)	STC-1258-P STF-1158-P STJ-1508-P
2 x #1 (7/W) AAAC	UTC-1109 UTF-1209 UTJ-1309 UTK-1609	WTC-0118 WTF-0218 WTJ-0418	SPL-1359-P	EZSP-4378	DST-0157 (C&F) DST-0357 (J)	DBST-1107 (C&F) DBST-1307 (J)	STC-1259-P STF-1159-P STJ-1509-P
2 x 1/0 (6/1) ACSR (7/W) AAAC	UTC-1110 UTF-1210 UTJ-1310 UTK-1610	WTC-0119 WTF-0219 WTJ-0419	SPL-1360-P	EZSP-4379	DST-0158 (C&F) DST-0358 (J)	DBST-1108 (C&F) DBST-1308 (J)	STC-1260-P STF-1160-P STJ-1510-P
2 x 2/0 (6/1) ACSR (7/W) AAAC	UTC-1111 UTF-1211 UTJ-1311 UTK-1611	WTC-0122 WTF-0222 WTJ-0422	SPL-1361-P	EZSP-4380	DST-0159 (C&F) DST-0359 (J)	DBST-1109 (C&F) DBST-1309 (J)	STC-1261-P STF-1161-P STJ-1511-P
2 x 3/0 (6/1) ACSR (7/W) AAAC	UTC-1112 UTF-1212 UTJ-1312 UTK-1612	WTC-0124 WTF-0224 WTJ-0424	SPL-1362-P	EZSP-4381	DST-0160 (C&F) DST-0360 (J)	DBST-1110 (C&F) DBST-1310 (J)	STC-1262-P STF-1162-P STJ-1512-P
2 x 4/0 (6/1) ACSR	UTC-1112 UTF-1212 UTJ-1312 UTK-1612	WTC-0125 WTF-0225 WTJ-0425	SPL-1362-P	EZSP-4382	DST-0160 (C&F) DST-0360 (J)	DBST-1110 (C&F) DBST-1310 (J)	STC-1263-P STF-1163-P STJ-1513-P
2 x 266.8 (18/1) ACSR (26/7) ACSR	UTC-1113 UTF-1213 UTJ-1313 UTK-1613	WTC-0126 WTF-0226 WTJ-0426	*	*	DST-0161 (C&F) DST-0361 (J)	DBST-1111 (C&F) DBST-1311 (J)	STC-1263-P STF-1163-P STJ-1513-P
2 x 336.4 (18/1) ACSR	UTC-1113 UTF-1213 UTJ-1313 UTK-1613	WTC-0127 WTF-0227 WTJ-0427	*	*	DST-0161 (C&F) DST-0361 (J)	DBST-1111 (C&F) DBST-1311 (J)	STC-1264-P STF-1164-P STJ-1514-P
2 x 336.4 (26/7) ACSR 2 x 397.5 (19W) AAC	UTC-1114 UTF-1214 UTJ-1314 UTK-1614	WTC-0128 WTF-0228 WTJ-0428	*	*	DST-0161 (C&F) DST-0361 (J)	DBST-1112 (C&F) DBST-1312 (J)	STC-1264-P STF-1164-P STJ-1514-P

*Insulator groove not large enough for these T2 sizes.

EXPLANATORY NOTES:

(1) User should make sure insulator groove radius is large enough for T2 conductor and PLP tie with pad.
(2) This table represents application of the PLP ties on T2 conductor only.
(3) Consideration should be made of the physical fit of the actual T2 conductor plus PLP tie on a specific insulator because variances in individual insulators can affect application.
  a. Only insulators with ANSI accepted dimensions should be used with PLP ties.
  b. PLP suggests application trails be conducted on actual T2 conductor, PLP ties and insulators prior to installation.
(4) Consult PLP for application with Armor Rod, ARMOR-GRIP® Suspensions or Supports, or T2 conductor not shown.