Live Line Tensioning Tools

TRAINING MANUAL
OBJECTIVE:
Given a distribution hotstick trailer, you will be able to identify the live line tensioning tools and explain their functions.

WHY?
Tensioning of conductors during live line work is critical to each job. In addition to calculating conductor tensions, the worker must be aware of the limits and capabilities of the tools.

LEARNING OBJECTIVES:

1. Identify and explain the function of the two-pole strain carrier and its accessories.

2. Identify and explain the function of the distribution insulator cradle.

3. Identify and explain the function of the hotstick tension puller.

4. Identify and explain the function of the nylon strap ratchet hoist.

5. Identify and explain the function of three types of link sticks.

6. Identify and explain the function of live line rope blocks and snubbing brackets.

7. Identify and explain the function of the transformer gin.
IN THIS MODULE:

1. Two-Pole Strain Carrier
2. Distribution Insulator Cradle
3. Hotstick Tension Puller
4. Nylon Strap Ratcheting Hoist
5. Link Sticks
6. Rope Blocks and Snubbing Brackets
7. Transformer Gin

RESOURCES:

• Distribution hotstick trailer

ESTIMATED TIME:

1 hour

PREREQUISITES:

• Weights and Forces module

LEARNING STEPS:

1. Watch the training video.
2. Cover the module.
4. Clarify any questions you may have.
5. Complete the Knowledge Check.
Introduction

Tensioning conductors during live line work is a critical part of the job. In addition to calculating conductor tensions, you must be aware of the limits and capabilities of the live line tensioning tools.

No matter what tool you are using, remember that your safety and that of your co-workers are prime considerations in all work activities.
Two-Pole Strain Carrier

The two-pole strain carrier relieves the mechanical strain on insulator strings, permitting their removal.

These strain carriers are normally used on single insulator strings.

However, when deadending hardware permits, they may also be used on multiple insulator strings allowing the removal of one insulator string at a time.

The working strength of the two-pole strain carrier is 15,000 pounds per insulator string.
Two-Pole Strain Carrier Accessories

There are seven accessories commonly used in conjunction with two-pole strain carriers.

**Yoke Plates**

The yoke plates are made from high strength aluminum plate and have a rated capacity of 15,000 pounds per insulator string. There are various yoke plates; however, in this module, we will deal with the two which are most common to a distribution hotstick trailer.
Conductor-End Yoke Assembly

The conductor-end yoke assembly attaches to a wire grip with a hook. There are also three machined deadend sockets which fit into a slot in the yoke assembly.

Structure-End Yoke Assembly

The structure-end yoke assembly includes a 6 foot steel chain or a pole bracket which is used for anchoring the yoke plate to the structure. Take-up trunnions, on the structure end of the adjustable strain poles, are attached on each end of the yoke plate.
Adjustable Strain Poles

Adjustable strain poles are used with various yoke plates and hook assemblies, serving as strain supports while insulators are removed and replaced.

These highly versatile poles measure 2 inches in diameter, and have stainless steel crosspins at 6 inch intervals. An adjustable heat treated aluminum pole clamp is required to engage different deadend and suspension hardware on the crosspins.
When minor adjustments are required, the pole clamps may be unlocked and repositioned with hotsticks.

The structure end of the pole provides a high strength steel screw, referred to as a strain jack.

When used in conjunction with a ratchet wrench and a take-up trunnion, this strain jack provides 12 inches of travel. The maximum loading for each pole is 7,500 pounds. The adjustable strain poles are available in lengths from 6 to 18 feet.
**Take-up Trunnions**

Take-up trunnions are designed for use with the strain jack on an adjustable strain pole. They are made of bronze alloy, and are of ball thrust bearing construction. The trunnions have a capacity of 7,500 pounds and accommodate a ratchet wrench for adjustment.

**Compression Sleeve Fitting**

The compression sleeve fitting is installed on the cast compression deadend body. When used with a deadend socket accessory, this fitting provides greater surface contact and a secure point of attachment for the conductor-end yoke plate.
Deadend Sockets

There are three deadend sockets which are interchangeable on the conductor-end yoke plate. These sockets are used to accommodate different sizes of wire utilized in a distribution system.

These machined sockets are designed to hold the tension of the conductor at the deadend body, rather than at the hook and wire grip.
Distribution Insulator Cradle

An insulator cradle is used to support a string of insulators during replacement.

The cradle is comprised of three epoxiglass poles attached together with two or more brass cradle brackets. Support ropes are attached to one end of the cradle, securing that end to the structure.
The conductor end has support lugs on each side of the cradle bracket which are used to attach wire tongs or strain link sticks. These sticks aid in raising and lowering the cradle.

The insulator cradle is available in three lengths — 6, 8 and 10 feet — all of which accommodate insulators up to 10 inches in diameter.
Hotstick Tension Puller

The hotstick tension puller includes handling rings to accommodate hotstick use.

At each end of the puller, there is a hook with a safety latch which secures the puller to other tensioning equipment.

The standard tension puller has a working capacity of 4,000 pounds and a maximum travel of 12 inches.
Nylon Strap Ratchét Hoist

The one ton nylon strap ratchét hoist has an epoxyglass handle with a butt ring, as well as handling rings on the hooks and latches which accommodate hotstick use.

A link stick must be used to secure the hoist to the structure because the nylon strap is not insulated.
There is a red mark on the strap which indicates the minimum number of wraps required to hold the strap in the hoist. The hook-to-hook distance is approximately 8 feet when the red mark is visible on the strap. The hoist should never be extended beyond this mark.
Link Sticks

There are three types of link sticks commonly used during live line work. Link sticks are available in different lengths and rated capacities. It is important that you know the limitations and capacities of each link stick before performing live line work procedures.

Strain Link Sticks

A strain link stick is used to provide insulation between the rigging on deadend structures, as well as running corners, and the energized conductor. The open end of the stick will tighten down on a grip or the conductor.
The butt end has a swivel ring which easily accommodates a hand line, rope blocks or a web hoist.

Strain link sticks range in length from 4 to 14 feet. The rated capacity of the 1-1/4 inch strain link stick is 3,500 pounds. The 1-1/2 inch stick has a rated capacity of 6,500 pounds.

Spiral Link Sticks

The spiral link stick can be used instead of the strain link stick when working space is confined.
The open end of the spiral link stick is very versatile, and is easily attached to a conductor grip or sling. This stick also has a butt ring which swivels.

The spiral link stick is made of 1-1/4 inch epoxiglass and comes in three lengths — 12, 30, and 42 inches. The spiral link stick has a rated capacity of 3,500 pounds.

Care must be taken when using this stick on deadend structures as not to shunt out the insulators when installing this live line tool.

Roller Link Sticks

The roller link stick is used to hold conductors securely away from the work area. The opening of the roller link stick will fit on conductors measuring up to 1-1/4 inches.
The roller link stick is applied to the conductor, and secured by rotating the pole to close down the opening.

The stick can then be pulled into position using a hand line attached to the butt ring on the stick. The rated capacity of the roller link stick is 1,000 pounds.

The snap (150 lbs.) or the hook (500 lbs.) should not be used. The rope should be tied with an approved knot.
Rope Blocks and Snubbing Brackets

Rope blocks provide a mechanical advantage for lifting or lowering apparatus and are frequently used in live line applications.

Rope blocks and related hoisting equipment must be checked daily before use.

Rope Snubbing Brackets and Extension Chain

The rope snubbing bracket is secured to the base of the pole with a chain and wheel tightener. Rope snarls or tangles can be prevented by tying the hand lines or light block lines to one of the six rings attached to the bracket.
An extension chain can be added to accommodate larger diameter poles. The rope snubbing bracket and extension chain have a maximum working load of 1,000 pounds.

**Insulated Rope Blocks**

Insulated rope blocks provide a mechanical advantage when lifting, lowering, splicing or deadending conductors.

Insulated rope blocks are equipped with hotstick handling rings on the hooks and latches.

Each block has a dielectric strength of 30,000 volts.

Rope blocks designed for live line work should be used only for that purpose.
Transformer Gin

The transformer gin is used while winching or hoisting distribution transformers and apparatus. The standard transformer gin is 26 inches long, and secured to the structure with a wheel tightener and a 36 inch chain.

The transformer gin has a maximum load rating of 2,000 pounds.
Summary

To summarize this module, you have learned:

• The identity and function of the two-pole strain carrier and its accessories.
• The identity and function of the distribution insulator cradle.
• The identity and function of the hotstick tension puller.
• The identity and function of the nylon strap ratchet hoist.
• The identity and function of three types of link sticks.
• The identity and function of live line rope blocks and snubbing brackets.
• The identity and function of the transformer gin.

Now...

• Complete the Review Questions.
• Clarify any questions or concerns you may have.
• Complete the Knowledge Check.
Identify and explain the function of the two-pole strain carriers and its accessories.

T / F 1. Two-pole strain carriers relieve the strain from a string of insulators, permitting their removal.

2. The working strength of a two-pole strain carrier per insulator string is:
   (a) 1,500 lbs.
   (b) 5,000 lbs.
   (c) 10,000 lbs.
   (d) 15,000 lbs.

T / F 3. An adjustable pole clamp is not required on a two-pole strain carrier.

4. The load rating of a two inch diameter adjustable strain pole is:
   (a) 1,500 lbs.
   (b) 3,500 lbs.
   (c) 5,500 lbs.
   (d) 7,500 lbs.

5. A (pole clamp / strain jack) is attached to the structure-end of an adjustable strain pole.

T / F 6. The conductor-end yoke assembly of a two-pole strain carrier includes a steel chain.
7. Match the graphics shown in the left column with the best description in the right column.

(a) ___ Deadend Socket

(b) ___ Structure-end Yoke Assembly

(c) ___ Take-up Trunnion

(d) ___ Compression Sleeve Fitting

8. The adjustable strain poles have stainless steel crosspins at __________ intervals.
Identify and explain the function of the distribution insulator cradle.

9. From the graphic below, identify the items shown by putting the correct letter from the graphic in the blanks provided.
   ___ Epoxiglas Poles
   ___ Support Lugs
   ___ Cradle Bracket
   ___ Support Ropes

10. The distribution insulator cradle is used to make insulator changes by supporting the insulator string.

11. The 8 foot long insulator cradle will support up to __________ inch diameter insulators.
Identify and explain the function of the hotstick tension puller.

12. The standard hotstick tension puller has a maximum working load of:
   (a) 1,000 lbs.
   (b) 2,000 lbs.
   (c) 3,000 lbs.
   (d) 4,000 lbs.

13. The maximum take-up distance of a standard hotstick tension puller is:
    (a) 12 inches.
    (b) 24 inches.
    (c) 36 inches.
    (d) 60 inches.

Identify and explain the function of the nylon strap ratchet hoist.

T / F 14. The nylon strap is the only insulated part of the nylon strap ratchet hoist.

15. A ________________ must be used when attaching the hoist to the structure.
16. From the graphic below, identify the items shown by putting the correct letter from the graphic in the blanks provided.

___ Nylon Strap
___ Hotstick Ring
___ Epoxiglas Handle
___ Butt Ring

17. The nylon strap should not be extended past the red mark on it.
Identify and explain the function of three types of link sticks.

18. Identify the type of stick shown in each of the graphics below:

(a) _______________

(b) _______________

(c) _______________
19. The maximum working load of a 1-1/4 inch roller link stick is:
   (a) 1,000 lbs.
   (b) 1,500 lbs.
   (c) 2,500 lbs.
   (d) 3,500 lbs.

20. The stick(s) used as insulation between the structure rigging and conductor grip is(are):
   (a) spiral and strain link sticks.
   (b) roller and strain link sticks.
   (c) roller link stick.
   (d) roller and spiral link sticks.

21. The maximum working load of a 1-1/2 inch, 14 foot strain link stick is:
   (a) 1,000 lbs.
   (b) 2,500 lbs.
   (c) 3,500 lbs.
   (d) 6,500 lbs.

22. The maximum working load of a 1-1/4 inch spiral link stick and a 1-1/4 inch strain link stick is:
   (a) 1,000 lbs.
   (b) 1,500 lbs.
   (c) 2,500 lbs.
   (d) 3,500 lbs.

23. The stick used to spread and hold conductors out securely from the work area is the:
   (a) spiral link.
   (b) roller link.
   (c) strain link.
   (d) grip-all.
Identify and explain the function of live line rope blocks and snubbing brackets.

24. The maximum total working load of a rope snubbing bracket is:
   (a) 500 lbs.
   (b) 1,000 lbs.
   (c) 1,500 lbs.
   (d) 2,000 lbs.

T / F 25. Rope blocks are used to provide a mechanical advantage when lifting, lowering, splicing or deadending conductors.

26. The dielectric strength of insulated rope blocks is:
   (a) 10,000 volts per block.
   (b) 20,000 volts per block.
   (c) 30,000 volts per block.
   (d) 40,000 volts per block.

Identify and explain the function of the transformer gin.

27. The maximum load rating of a standard transformer gin is:
   (a) 1,000 lbs.
   (b) 2,000 lbs.
   (c) 3,000 lbs.
   (d) 4,000 lbs.
Live Line Tensioning Tools

1. True
2. d
3. False
4. d
5. strain jack
6. False
7. b
c
d
a
8. 6 inch
9. c
d
a
b
10. True
11. 10
12. d
13. a
14. False
15. link stick
16. c
d
b
a
17. True
18. (a) spiral
(b) roller
(c) strain
19. a
20. a
21. d
22. d
23. b
24. b
25. True
26. c
27. b