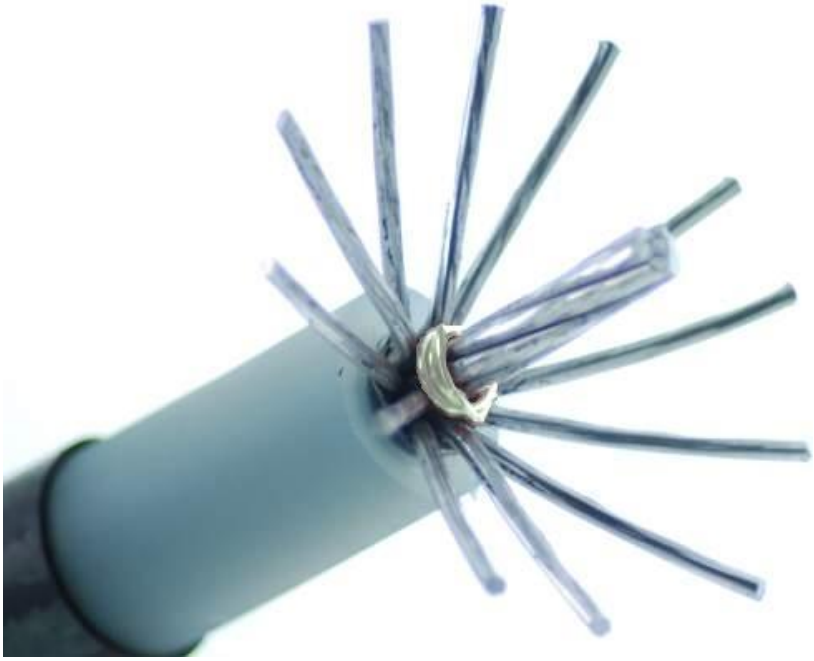
Rejuvenation Instructions

#512 – Cable Preparation – iUPR & SPR



This NRI covers the following:

- How to remove the connector.
- How to prepare the cable using the semi-con scorer, tool stop, and insulation stripper.
- How to remove corrosion.
- How to add wrap wire.

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WARNING: It is dangerous working around energized high-voltage systems, pressurized systems, and chemicals. Always work in accordance to the Novinium Field Operations Safety Handbook (FOSH) or other local governing safety standards.

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Revised: September 28, 2015

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Removing the Connector

- In SPR installations, the connector must be replaced to ensure maximum reliability with the IA.
- For iUPR installations, if the existing connector and cable preparation quality are satisfactory and meet IEEE® P1816™ requirements, the existing connector may be kept with the cutbacks modified per the non-extension, or standard templates.
- Under some additional circumstances, Engineering approval can be given to keep the existing connector. Contact Engineering to discuss.
- The removal process depends on if there is sufficient slack in the cable.

1. Cable has sufficient slack.

a. Position cable cutters next to the last crimp in the old connector, over the un-crimped portion of the connector. This will preserve conductor length.

b. Remove the old connector with a square cut.

Figure 1: Cut next to the bottom crimp.

2. Cable has insufficient slack.

a. Retrieve the connector cut-off tool, also known as the lug splitter.
   - There are two varieties of lug splitters: a URD size and a feeder size.
   - Select the correct one for the application.

Figure 2: Lug splitter kit.

Figure 3: Lug splitter head.

b. Position the cable cutters where the conductor strands end.
   - This is usually just after the “no-crimp” line on the connector.
   - This will preserve the maximum conductor length possible.

Figure 4: Cut the connector after the top crimp.

c. Cut the old connector with a square cut.

Figure 5: Square cut on the connector.

d. Insert the appropriately spaced blade block into the DMC tool head. There are three differently spaced blade blocks in each Lug Splitter kit.

Figure 6: Three stock lug splitter blade blocks.

e. If a larger spacing is required, remove the blades and add the available shims between the blades and block.
   - The distance between the blades should be slightly larger than the strand bundle diameter.

Figure 7: Lug splitter tool kit.

f. Taking care not to damage the conductor strands, press the blades into the connector.

g. Once the blades have pierced through the connector body, retract the blades.
   - Longer connectors may need to be cut more than once.

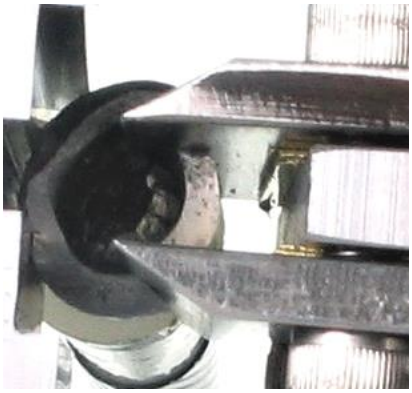

Figure 8: Blades piercing connector.

h. Use two channel locks to split open the cuts and remove the connector.

Figure 9: Pull the cut connector apart.

Figure 10: Remove the connector pieces.

Preparing the Cable

1. Square the connector.

Use a square to check the quality of the conductor cut.

- The longest strand may not be more than:
  - 1/16” longer than the shortest strand for 7 to 19 strand conductors.
  - 1/8” longer than the shortest strand for conductors with more than 19 strands.
- Making the strands have a uniform length ensures full insertion of the conductor into the connector and a good electrical connection.
- Shorten the longer strands with a file or hacksaw to meet the specification.

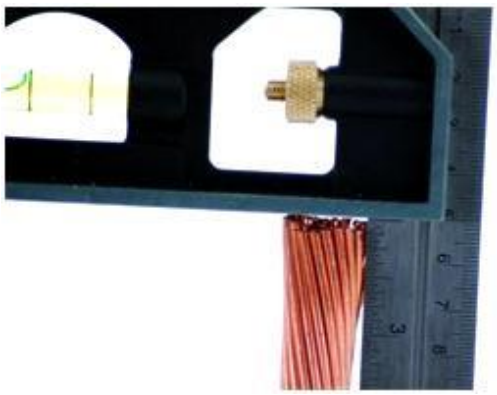

Figure 11: Square the conductor strands.

2. Use the template to adjust cutbacks.

a. Remove the cable jacket, if present, as necessary for cable preparation.

b. Use the designated template to mark the new location of insulation and semi-con cutbacks per **NRI 500**.

c. Adjust the semi-con cutback by using IEEE® P1816™ approved methods.

d. Place the tool stop on the position called out on the template.

e. Face the rounded shoulder of the tool stop away from the cable end.

Figure 12: Adjust the semi-con layer per the template.

f. Tighten the tool stop to hand tight; then with a wrench, tighten a quarter to half turn more.

- Do not overtighten as the tool stop can deform the insulation.

g. Use only the Novinium mod 2 of the Speed Systems® Mark 1 insulation stripper to remove the insulation.

h. Spiral cut the insulation until the stripper contacts the tool stop.

i. Hold the tool stop from below to give the tool stop extra support.

j. Take care not to cut or nick the strands. If the strands are damaged, cut the portion off and start over.

Figure 13: Remove the insulation per the template.

k. Remove the tool stop when finished.

l. Check for and smooth out any scratches or gouges made to the cable during this process. Otherwise, remove the damaged section and start preparation over.

m. Check the cutbacks against the template and make any adjustments necessary.

n. Clean the cable according to manufacturer's instructions.

3. Marking tape position.

Marking tape is placed on the cable to help with component alignment.

a. Use a silver marker to mark the positions of the marking tape noted on the template.

b. Place marking tape at the marks. If using molded components, tape can be placed after components are in their final positions, and the silver marks can be used until then.
   - This is done to avoid the tapes from sliding during positioning of the component body.

c. For molded splices, mark a third marking tape position one splice body length from the insulation cutback on the cable that will hold the splice body during swaging and crimping.

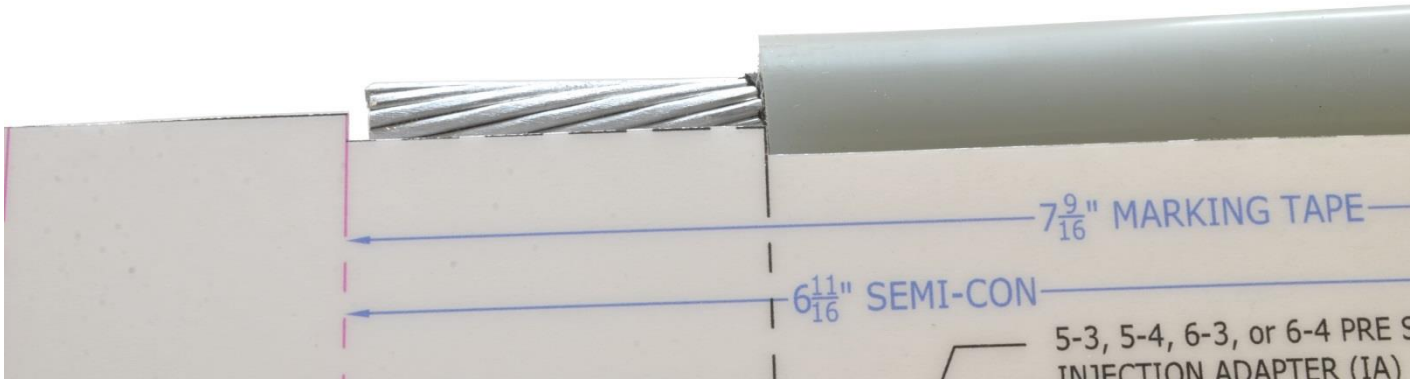

Figure 14: Place cable against the template to physically compare.

4. Remove corrosion.

Removing corrosion from the conductor will increase conductivity, lower operating temperature, and help increase the lifespan of the connection.

a. Using your fingers or a dental pick, separate a single strand from the outer bundle layer.

b. Inspect the conductor for corrosion. The color can range from blue-green to white.

Copper conductors with no corrosion:

- Clean the outer strand layer with solvent and a wire brush.

Aluminum and copper conductors with corrosion:

- Gently fan the outer strand layer.
- Clean the strands with solvent and a rag.
- Use a dental pick or wire brush to remove any grease or oxides not removed by the solvent.

Figure 15: Fan the outer strands and remove grease or oxides.

Heavily corroded conductors:

- The most effective corrosion removal method is to individually abrade each corroded strand with 120 grit aluminum oxide sandpaper.
- Sanding the outer two strand layers and the outer surface of the remaining bundle drastically increases conductivity.
- In situations with extreme corrosion, every strand may need sanding.

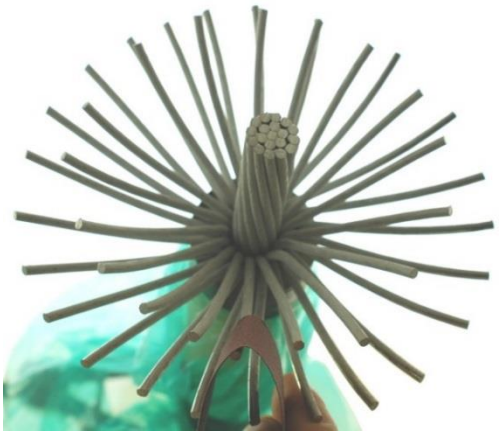

Figure 16: Sand heavily corroded conductors.

- Protect the insulation from conductive particles. Do not damage the conductor.

Figure 17: Protect insulation from debris.

5. Blockages.

- If there is strand blocking compound, **STOP**. The cable cannot be injected.
- If there is a large amount of debris in the strands appearing to extend past the insulation cutback, call Engineering for troubleshooting options.

Figure 18: Strand blocked cable cannot be injected.

6. Prepare non-tinned aluminum connectors.

a. Insert a wire brush into the connector's barrel to coat it with anti-oxidant grease.

b. Scrape the inside of the barrel to remove the oxide layer and to spread the grease.

Figure 19: Scrape non-tinned aluminum connectors before use.

7. Prepare the conductor.

a. With the same grease covered wire brush, scrape the thin oxide layer (or patina) from all exposed strands.
   - This will apply a coating of anti-oxidant grease to the strands making the electrical connection.

b. Keep the half inch of strand length next to the insulation cutback free of grease.

Figure 20: Coat the conductor with grease from the connector.

8. Add the wrap wire.

There is a high flow resistance when injecting conductors with fewer than 34 strands. Adding a wrap wire to the conductor will help improve flow in and out of the space between strands (conductor interstices).

a. Use some 20 ga. (0.032” diameter) wire of the same metal as the conductor.

Figure 21: Wrap wires.

b. Wrap two to three revolutions of wire around the inner strand bundle (all except the outermost layer).

Figure 22: 2-3 wraps of wire around inner bundle.

c. Slide the wire as close as possible to the insulation cutback.

d. Return the strands to their original position, but they do not need to be coiled around as they originally were.
   - Using fingers is usually sufficient.

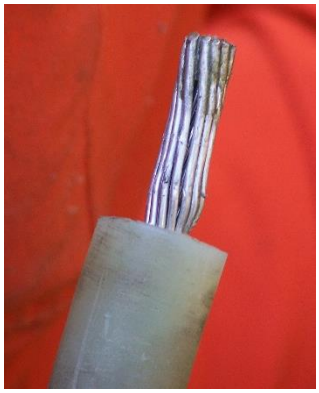

Figure 23: Return strands to original position.

e. Apply a tight cinch or insert the strand bundle into the connector to "train" the strands into position.

f. Remove the connector – it will be installed later.

g. Remove the cinch, if used.

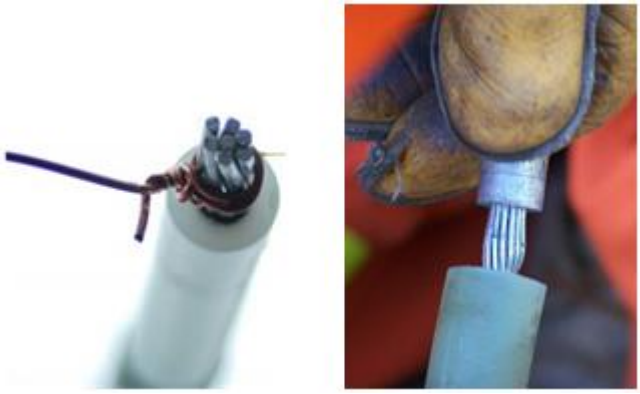

Figure 24: Train the strands with a cinch or connector.

Installing the Connector

To complete the connector installation for iUPR and SPR injections, follow procedures for the application:

- **NRI 522: 200A Elbows – iUPR**
- **NRI 523: 200A Elbows – SPR**
- **NRI 532: 200A Splices – iUPR**
- **NRI 533: 200A Splices – SPR**
- **NRI 542: 200A Live-Front Terminations – iUPR**
- **NRI 543: 200A Live-Front Terminations – SPR**
- **NRI 553: 600A Dead-Break Terminations – SPR**
- **NRI 563: 600A Live-Front Terminations – SPR**
- **NRI 573: 600A Splices – SPR**