



Rejuvenation
Instructions
Power Cables
Failure Sample
Handling

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- Ultrinium™ sustained pressure injection method (U.S. Patent 7,615,247)
- Ultrinium™ formulation optimization injection method (U.S. Patent 7,611,748)
- Injection Adaptor (U.S. Patents 7,195,504, 7,538,274 and 7,683,260)
- Perfectium™ single visit, single switch injection (U.S. Patent 7,353,601)
- Formulation of Ultrinium™ & Perficio™ components (U.S. Patent 7,658,808, 7,700,871 and other patents pending)
- Predicting performance of Electrical Power cables (U.S. Patent 7,643,977 and 7,848,912)
- N-Rex™ submarine cable injection process (U.S. Patent 7,976,747)
- N-Ter™ injection or Novinium thermally enhanced rejuvenation (patent pending)
- Reticular Flash Preventer (RFP) provides safer operation of conventional injection elbows
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Version 20120127

Failure Sample Handling

Novinium’s Perficio™ and Ultrinium™ fluids meet or exceed the reliability of older injection approaches. Ultrinium™ fluids in particular provide at least twice the dependability of competing products. Occasionally, even these treated cables or their attached components fail. Novinium learns from each failure and adjusts procedures, improves the equipment design, or reformulates the chemistry to provide a continuously improving post-injection reliability experience. These instructions help the circuit owner to provide the failure evidence in a way that preserves the failure story so that the most complete analysis can be performed. The principles of failure sample handling can be summarized into a handful of “do’s” and “don’ts”.

Do	Don’t
<ul style="list-style-type: none"> •Photograph the failure site in its “as found” condition, the affected sample and components removed, and the package prepared for shipment. •Remove all damaged cable and/or components, preferably as a single assembled unit •Use electrical tape to secure bare neutrals •Seal all ends and fault hole to minimize fluid loss or contamination from outside sources •Collect a warranty tag •Send the sample to the Reliability Lab right away •Complete Novinium Warrant Claim form available at www.novinium.org. 	<ul style="list-style-type: none"> •Throw anything away •Cut right at the failure •Clean anything •Bend or cut the sample to fit it in a package •Straighten a bent sample

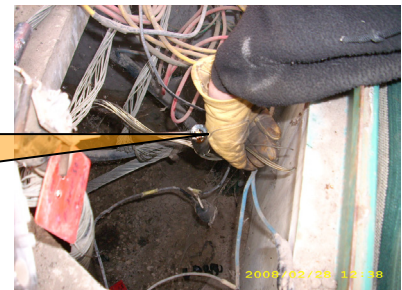
All cables must be deenergized, tested dead, and grounded before any of these Failure Sample Handling instructions may be executed. All switching operations must cease. 100% of the personnel on the site must verbally concur that it is safe to handle the cable. The ground must be connected to the termination to be handled, or in the case of a spiking operation at a cable midpoint (e.g. a splice or fault), the ground must be immediately adjacent (i.e. the connection can be confirmed by an unobstructed view of the cable between the spike and the work area) to the portion of the cable to be worked. The individual who executes these Failure Sample Handling instructions must be present when the ground is put in place.



Caution: Working around energized high-voltage systems may cause serious injury or death. The procedures in these instructions should be performed by personnel familiar with good safety practice in handling high-voltage electrical equipment. De-energize and ground all electrical systems before proceeding.

1. Take photographs of the fault location in an as-discovered condition to document the cable environment and cable lay. If the cable or component is bent significantly take a photograph at a right angle to the bend to document the bending radius. More photos are better.

after the cut is helpful; before the cut is better!



2. Execute the instructions of [NRI-99, "Cutting a Treated Cable"](#) before proceeding with this NRI 93.

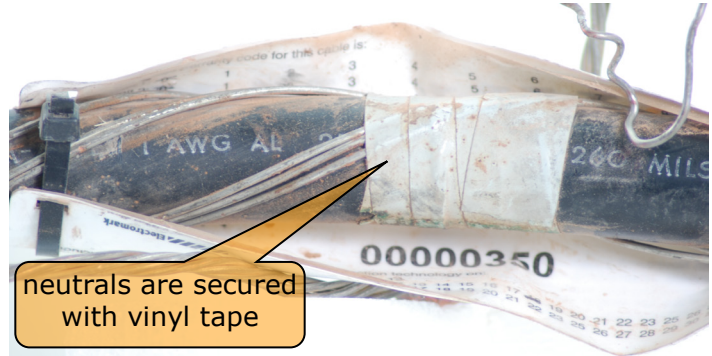


3. Preserve recovered fluid.
 - a. Place any fluid-stained paper towels or rags in zip-to-close plastic bags.
 - b. Pour any fluid into clean bottles which can be tightly sealed. Wrap vinyl electrical tape around bottle-cap joints to help keep the cap in place.



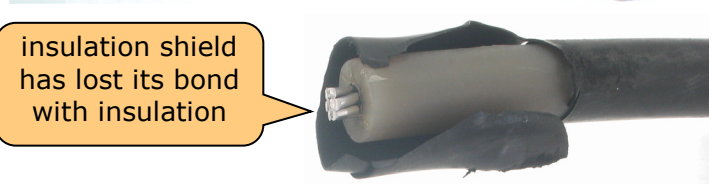
apply vinyl tape here to prevent the cap from unscrewing

4. Apply vinyl tape to bare neutrals to keep them in place.



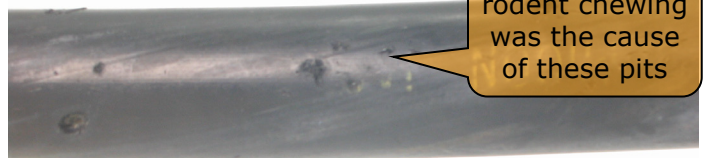
neutrals are secured with vinyl tape

5. Visually examine the cable near the fault site for any defects including a-c listed below.
 - a. The insulation shield is separated from the insulation.



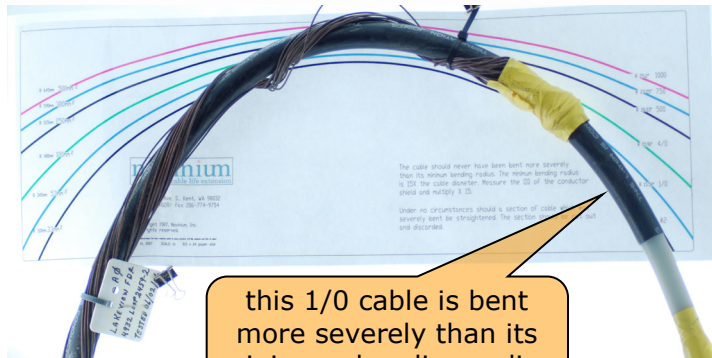
insulation shield has lost its bond with insulation

- b. The insulation shield has discharge marks, mechanical damage, or thermal damage.



rodent chewing was the cause of these pits

- c. The cable is bent more severely than its minimum bending radius. The minimum bending radius is 15X the cable diameter. Measure the OD of the insulation shield and multiply by 15 or use the bending radius template, [NRI 11](#).



this 1/0 cable is bent more severely than its minimum bending radius

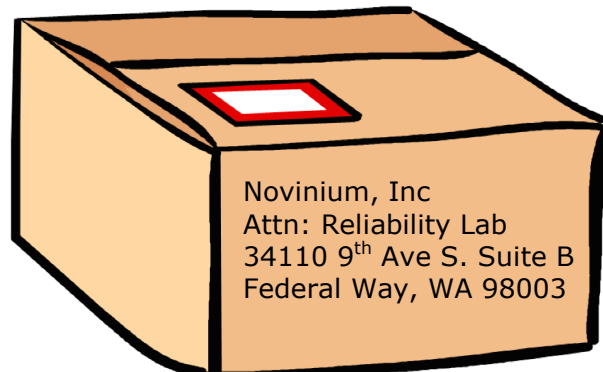
6. Cut the entirety of the portion of the cable and, where appropriate, the cable components that includes all damage from the step 5 survey. Record all known information about the failure conditions such as cable loading, mechanical disturbances, large amounts of ground water, etc.



7. Seal all cable ends and the fault hole to minimize any fluid loss. Shrink-to-fit end caps are ideal for cable ends, but a tight fitting plastic bag secured with vinyl tape is okay. Plastic sheeting over the fault hole cinched at either end with vinyl tape is the best way to seal the fault hole. Avoid allowing fluid to pool in the package if possible. Photograph the sealed cable sample at this stage.



8. Without bending the sample, package it for shipment. All fluids should be in sealed bottles. Secure bottle lids with vinyl tape. Place the bottles into zip-to-seal plastic bags. Use packaging filler to prevent damage during shipment. In the box include a warranty tag and a copy of the completed Novinium Warranty Claim Form available at www.novinium.org. Send photos to Novinium.



9. If any portions of a cable or component must be removed in the field ...
 - a. Apply marking tape to identify where the component ended.
 - b. Remove the component with minimum damage to the underlying portions. Note any inadvertent damage.
 - c. Photograph the failure site again after the component has been removed with the marking tape in the field of view.

