3M™ Composite Conductor
795-kcmil ACCR Conductor Repair Sleeve Tensile Tests

3M Company

NEETRAC Project Number: 04-180, Release 3

June, 2006

National Electric Energy Testing, Research & Applications Center

NEETRAC

A Research Center of the
Georgia Institute of Technology

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Summary:

3M contracted with NEETRAC to determine the residual strength of 3M's 795 kcmil ACCR conductor following damage repair using ACA Conductor Accessories (formerly Alcoa-Fujikura Ltd.) compression repair sleeves. Repaired conductor is required to retain 95% of the nominal Rated Breaking Strength (RBS). Three conductor samples were damaged by cutting one-third of the aluminum strands. Following the repair, all three samples exceeded the strength requirements.

Samples:

1) Three (3) ACA repair sleeves (part # C9121-B) for 795 ACCR conductor
2) Conductor samples provided by 3M

References:

1) ANSI C119.4-1998 (strength requirements for conductor fittings)

Equipment Used:

1) MTS servo-hydraulic long-bed tensile machine, Calibration Control # CQ-0195.

Procedure and Results:

Testing was directed by Wayne Quesnel of ACA. New conductor samples were cut from a reel. The AFL repair sleeve is intended for repair of conductor with up to 1/3 of the strands broken. Accordingly, 8 strands (31% of the 26 aluminum strands) were cut to simulate the maximum repairable damage. To simulate in-service line tension, the sample was held with basket grips and pulled to 1,000 lbs during the damage and repair procedures. After cutting the 8 strands, a repair sleeve was installed in accordance with instructions available from the ACA web site. Following the compression of the sleeve, birdcaging in the aluminum layer was worked to the free end of the sample. The basket grips were removed, and cast-resin lab fittings were installed in accordance with a procedure designed to ensure that all conductor components are loaded in a manner similar to loading in-service on a long span.

After the resin cured, the samples were loaded in the tensile machine and pulled to destruction at a rate of 15,000 lbs/min. Figure 1 shows a typical sample during installation of the repair sleeve. Figure 2 shows the sample immediately prior to test. Figure 3 shows the typical failure pattern. Figure 4 shows the load and actuator position data.

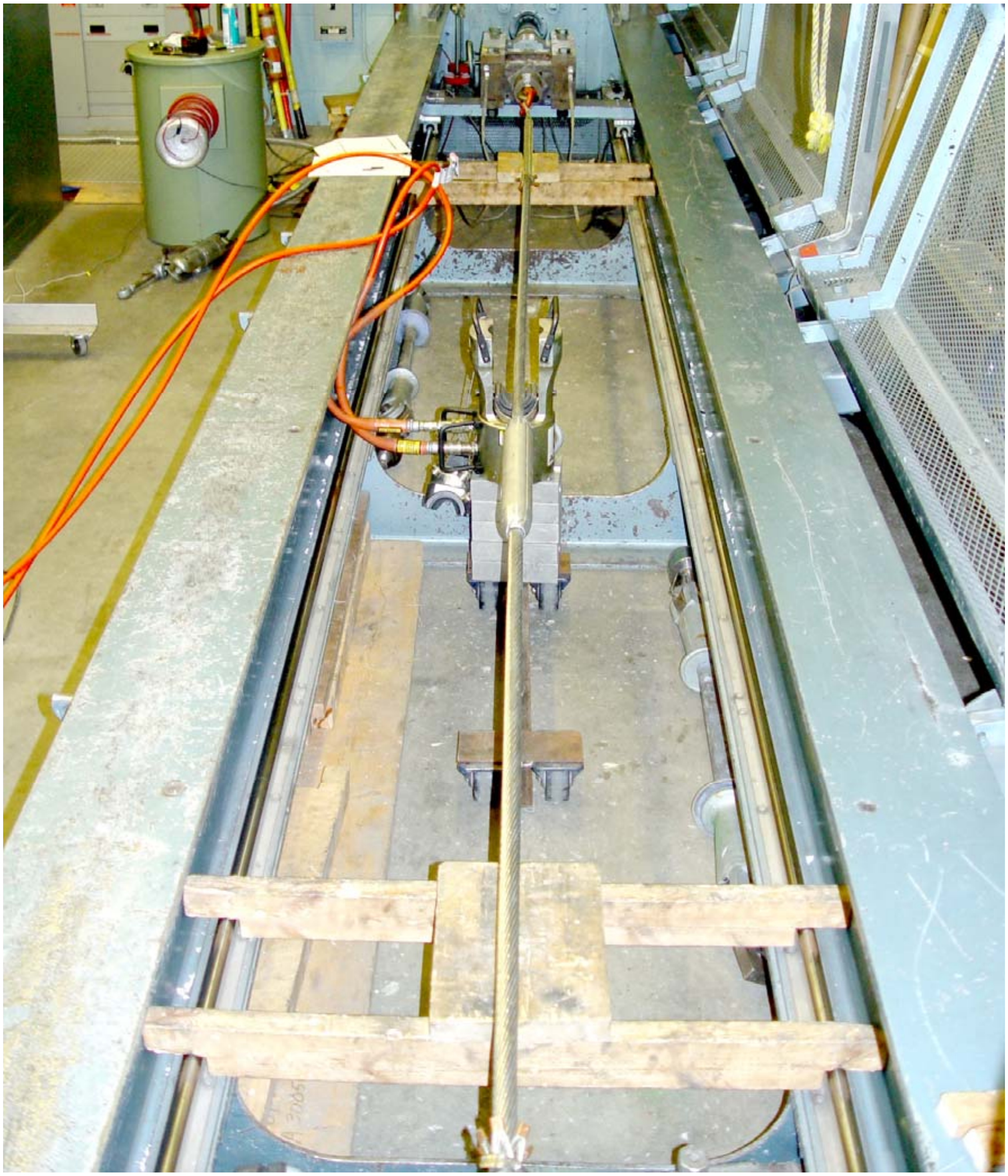

Figure 1: sample with repair sleeve in tensile machine

Ultimate load and failure description are as follows:

Sample #	Breaking Load	% RBS	Failure Description
RS1	31,820	102	Break 3 1/2" inside repair sleeve
RS2	30,850	99	Break 5" inside repair sleeve
RS3	31,080	100	Break 5" inside repair sleeve

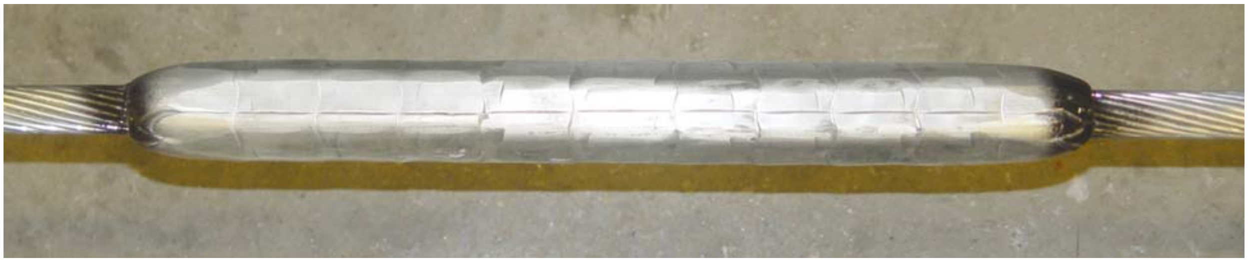

Figure 2: paint is sprayed to identify the interface between the conductor and the repair sleeve

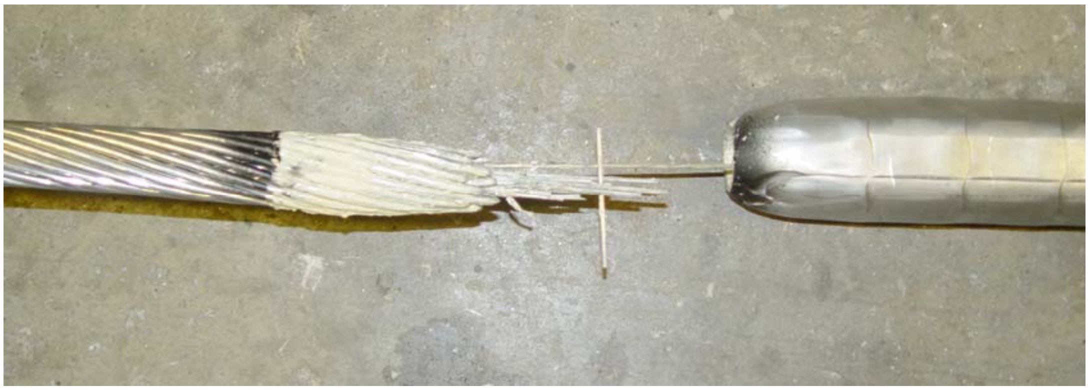

Figure 3: typical tensile overload failure

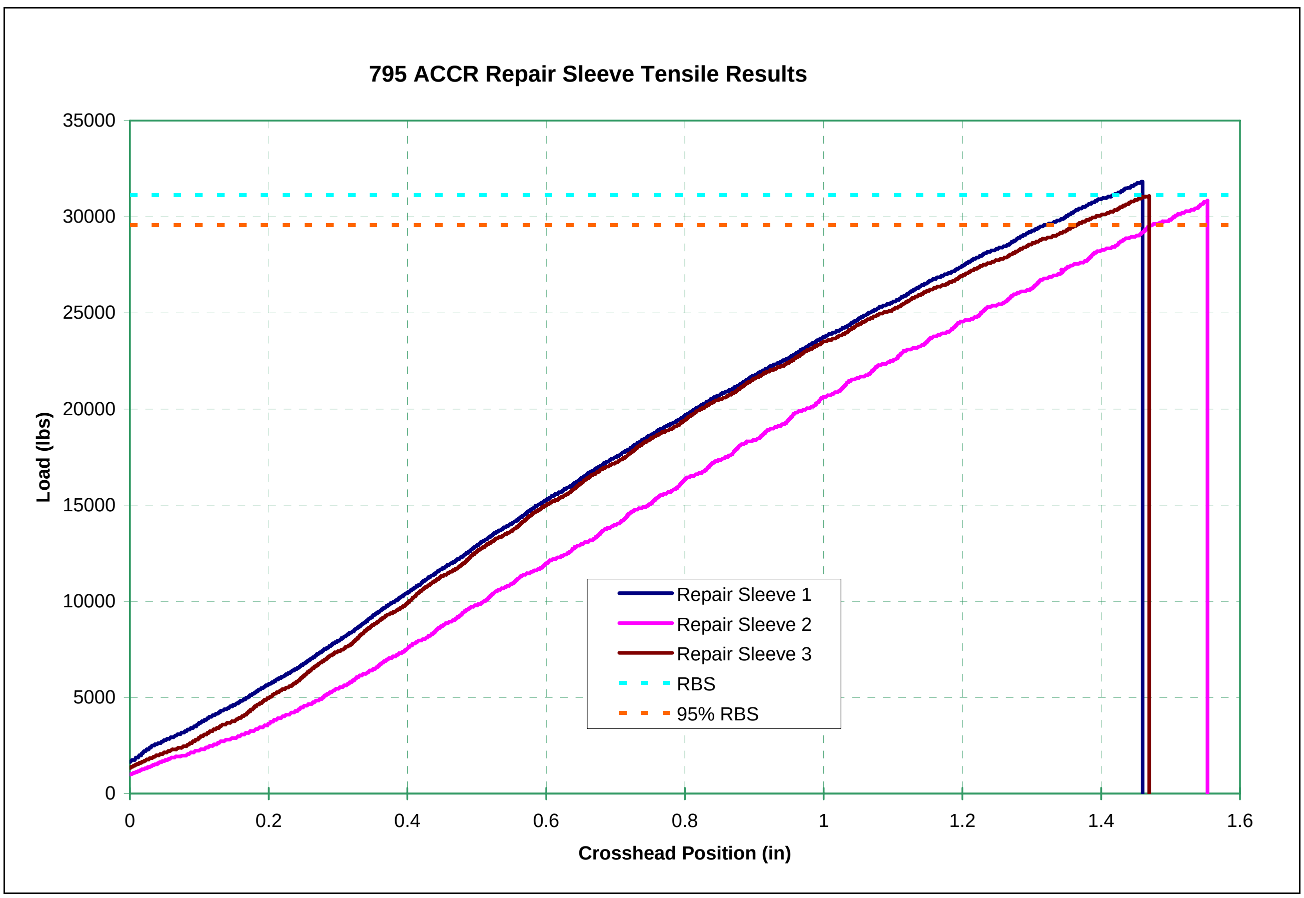

Figure 4: load and actuator position data

Conclusions:

ANSI C119.4 – 1998 requires "full tension" connectors to hold at least 95% of the conductor RBS. The three samples tested exceeded 95% RBS, and therefore exceed the tension criterion of the ANSI standard for a full-tension fitting.

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