3M™ Composite Conductor
ACA Conductor Accessories Repair Sleeves for 1272 ACCR
Tensile Tests
3M Company

NEETRAC Project Number: 06-082

June, 2006

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 1272 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) per ANSI C119.4. Three conductor samples were damaged by cutting one-third of the aluminum strands. Following the repair, all three samples exceeded the nominal RBS rating for this conductor.

Samples:

1) Three (3) Conductor Accessories repair sleeves for 1272 conductor
2) Conductor removed from the Oak Ridge National Laboratory (ORNL) test line

References:

1) NEETRAC – 3M Proprietary Information Agreement Dated 3/27/01 (copy located in 01-121 project folder and at GTRC legal department)
2) PRJ 06-082, NEETRAC Project Plan
3) 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 conducted in accordance with a NEETRAC procedure entitled "PRJ06-082, CONFIDENTIAL – 1272 ACCR Repair Sleeve Tensile Tests". The procedure controls all technical and quality management details for the project.

New conductor was not available, but sufficient conductor remained from the evaluation of 1272 ACCR from the Oak Ridge Test Line. The available conductor was cut into three 17'11" long sections. ACA Conductor Accessories provided three repair sleeves. The conductor was held with basket grips and pulled to 3,500 lbs in the MTS tensile machine. Tension is intended to simulate

conductor in-service. Thirteen (13) strands of the outer layer and five (5) strands from the second later of the conductor were cut (18 strands total). A repair sleeve was installed in accordance with ACA Conductor Accessories instructions. Following the compression of the sleeve, the tension was reduced, and 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 21,500 lbs/min. Figure 1 shows a typical sample prior to the tensile test. Figure 2 shows the sleeve painted to document the location of the conductor relative to the sleeve. Figures 3 and 4 show the failures for the samples that failed at the repair sleeve. Figure 5 shows the load and actuator position data recorded during each test.

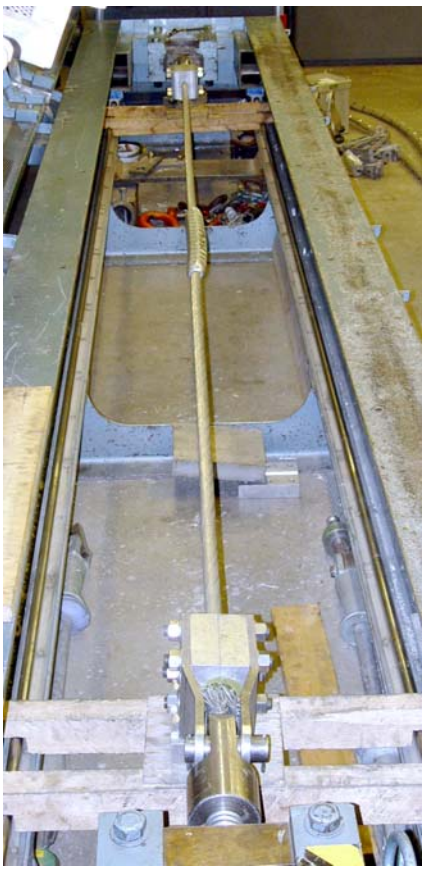

Figure 1, sample with repair sleeve in tensile machine

Ultimate load and failure description are as follows:

Sample #	Breaking Load	% RBS	Failure Description
RS1	46,290	106	Break 3 ¾" inside repair sleeve
RS2	46,250	106	Break at mouth of east resin socket
RS3	48,030	110	Break 4 ¼" inside repair sleeve

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

Figure 3 sample RS1 failure

Figure 4 sample RS3 failure

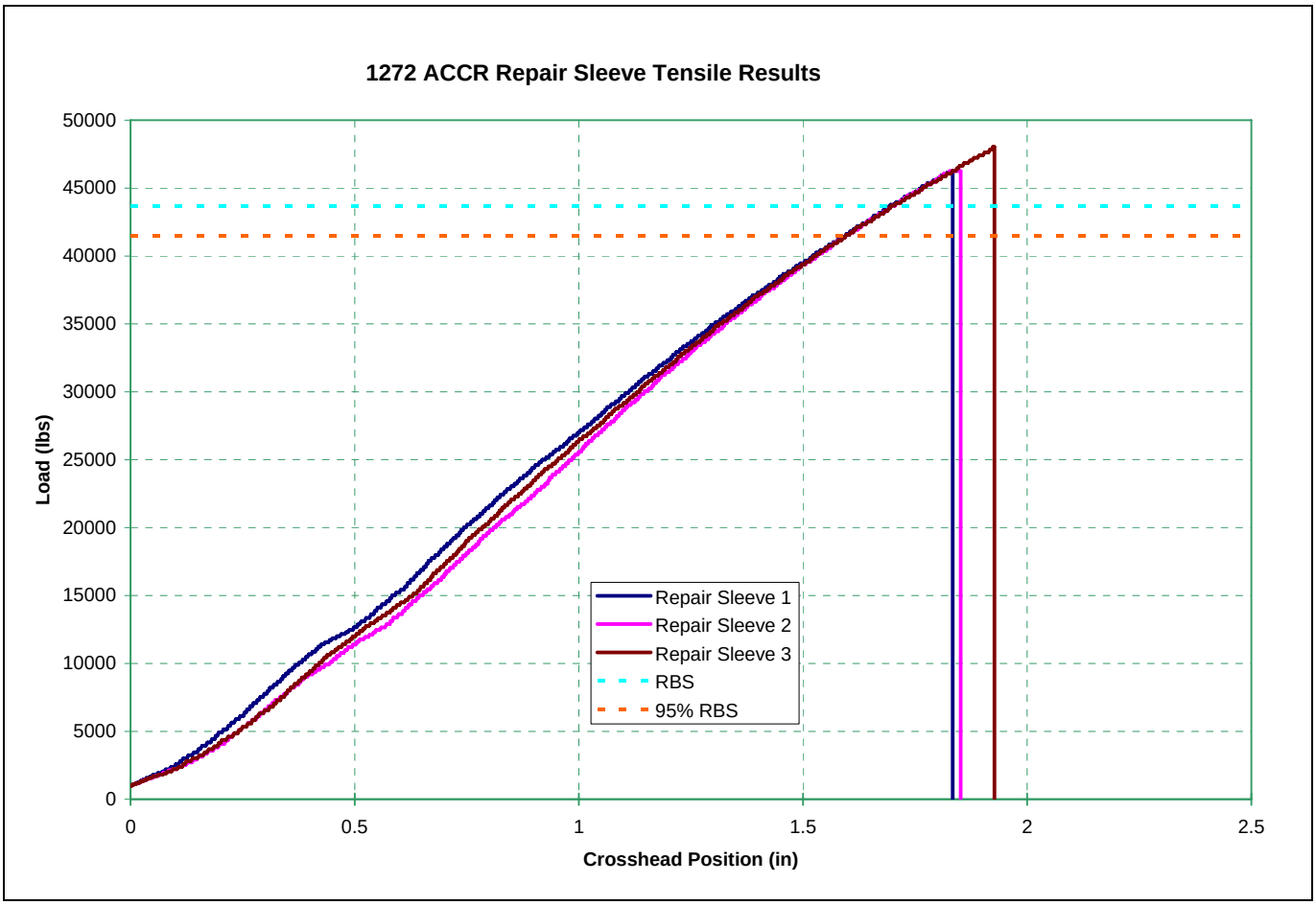

Figure 5, load and actuator position data

Conclusions:

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

Acknowledgement

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