the dead-end connectors was noticed during the five hundred (500) thermo-mechanical cycles and five (5) 70% RBS holds. Furthermore, the dead-end connectors showed good electrical performance and minimal changes in DC resistance. The tension and dummy assemblies reached 93.8% RBS and 96.5% RBS before failure occurred.

The results of the Endurance Test suggest that the combination of thermal and mechanical stresses may cause a slight reduction in the mechanical strength of the T13 ACCS/TW/C^7 conductor and AFL B11171-ANT 995-T13 ACCS/TW/C^7 connector assemblies.

ACCS Tokyo Rope (2020)

This section describes testing performed in 2020 on 973.1 kcmil T14 aluminum conductor, composite supported trapezoidal wire conductor with a carbon fiber thermoplastic composite core (ACCS/TW/TR C^7).

Tokyo Rope ACCS C^7-TW conductor consists of a core of seven carbon composite (CFCC) strands covered by twenty trapezoidal-shaped 1350-O aluminum wires stranded in two layers. The composite core was manufactured by Tokyo Rope, and the conductor was stranded by Southwire.

The outside diameter of the conductor is 1.108 inches. The diameter of the individual core strands is 0.1417 inches, and the overall core diameter is 0.4252 inches. The continuous rating temperature of conductor is defined as 180 °C under specified weather conditions. Its rated breaking strength (RBS) is 37,200 lb., which is higher than the RBS of the Celanese core conductors evaluated.

Results

The Tokyo Rope ACCS C^7-TW test conductor passed 500 thermo-mechanical cycles and underwent the breaking load test afterwards.

The following observations were made with regards to the Maximum Load Tests on the Endurance Test assemblies:

1. The tension assembly reached 39,667 lb., corresponding to 106.6% of the conductor's RBS, before failure.
2. The dummy assembly reached 38,624 lb., corresponding to 103.8% of the conductor's RBS, before failure.
3. Both failures occurred in the effective length of the conductor, outside the dead-end connectors.
4. The typical failure appearance of the test conductor is shown in Figure 3-19.

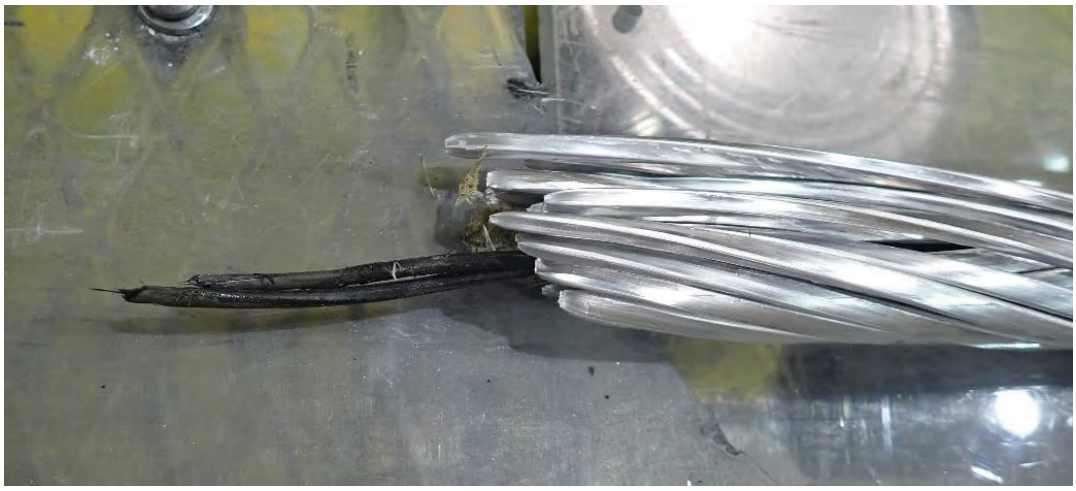

Figure 3-17. Typical Failure Appearance after Endurance Test (Tension Sample) for Tokyo Rope ACCS C^7-TW

All compression dead-ends were installed as per AFL's instructions, including the use of high temperature inhibiting compound. All four (4) connectors showed good thermal stability throughout the five hundred (500) cycles with slight temperature increases overall (~2°C to 6°C).

The mouths of all dead-end connectors were marked to detect any slippage or conductor movement during the Endurance Test. No movement was observed on any connectors during the five hundred (500) thermo-mechanical cycles and five (5) 70% RBS holds.

The Endurance Test was performed to demonstrate the performance of the 973.1 kcmil T14 ACCS/TW/TR C^7 conductor with Tokyo Rope International CFCC® core when exposed to combined thermal and mechanical stresses. All steady-state temperature measurements taken along the Tokyo Rope ACCS C^7-TW conductor and connectors of the tension and dummy assemblies showed good overall thermal stability during the five hundred (500) thermo-mechanical cycles. No slippage or movement at the dead-end connectors was noticed during the five hundred (500) thermo-mechanical cycles and five (5) 70% RBS holds. Furthermore, the dead-end connectors showed good electrical performance and minimal changes in DC resistance. The Tokyo Rope ACCS C^7-TW tension and dummy assemblies reached 106.6% RBS and 103.8% RBS before failure occurred.

The results of the Endurance Test suggest that the combination of thermal and mechanical stresses do not cause a reduction in the mechanical strength of the 973.1 kcmil T14 ACCS/TW/TR C^7 and AFL B12993-B-C^7T connector assemblies as evaluated.

Summary

The 2015 endurance tests investigated the performance of the ACCR C^7 conductor with Celanese core when exposed to combined thermal and mechanical stresses. The Celanese ACCR C^7-TW dummy conductor, which was not tensioned during the test and only exposed to thermal cycling, had almost the same remaining mechanical strength (122.4% RTS) than the Celanese ACCR C^7-TW tensioned test conductor (which broke at 124.1% RTS). With only two data points,