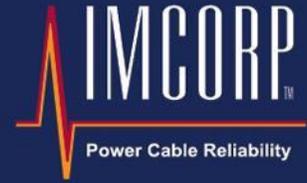


Identifying Workmanship Issues with Factory Grade® Technology



Contractor Workmanship Feedback with INCORP Factory Grade® Technology

HIGHLIGHTS

OVERVIEW

Workmanship issues are identified with the Factory Grade® technology.

CHALLENGE

Identifying other accessories with workmanship issues on failed cable system.

RESULTS

INCORP's Factory Grade® technology provides critical feedback to utility client trainers and installers.

A utility client requested INCORP to assist with a dissection and the identification of the root cause of an in-service joint failure on a critical 1000kcmil feeder. Based on the evidence received, the root cause was identified as insulation damage from an overheating connector as a result of improper crimping and little to no wire-brushing of the oxide on the outer aluminum conductor strands. In addition, the investigation revealed cable preparation issues such as jagged/non-radial cable semicon cutbacks. These findings raised concerns about the workmanship quality of recent repairs and the rest of the cable system. As a quality check the utility client had been using our Factory Grade® assessment extensively on their aging residential cable systems and decided to employ the technology as a quality control measure. The results of the assessment indicated multiple joints throughout the cable system were failing to meet the accessory manufacturer's minimum performance standards.

The utility client asked us to perform a dissection and root cause analysis on some of the substandard joints. The dissection showed systemic workmanship defects including knife cuts in the cable insulation and non-radial/jagged semicon cutbacks (see examples in Figure1).

By partnering with INCORP, the utility's engineers were able to provide immediate feedback to their trainers and the installation crews on precisely where to focus training and how to recognize and fix common errors during the installation process. The joints were re-assessed and our Factory Grade® technology verified that the entire cable system met the cable and accessory manufacturer's performance standards.



The Manufacturers' Standards



Component Standard	Testing Frequency	Thresholds* Sensitivity	Voltage
Terminations IEEE 48	50/60 Hz	5pC	≤1.5 Uo
Joints IEEE 404	50/60 Hz	5pC	≤1.5 Uo
Separable Connectors IEEE 386	50/60 Hz	5pC	≤1.3 Uo
MV Extruded Cable ICEA S-97/94-682/649	50/60 Hz	5pC	≤4.0 Uo [^]
HV / EHV Extruded Cable ICEA S-108-720	50/60 Hz	5pC	≤2.0 Uo

* No partial discharge should be observable above the sensitivity threshold up to the voltage threshold
[^]200 V/mil

Table I: Manufacturers' Standards

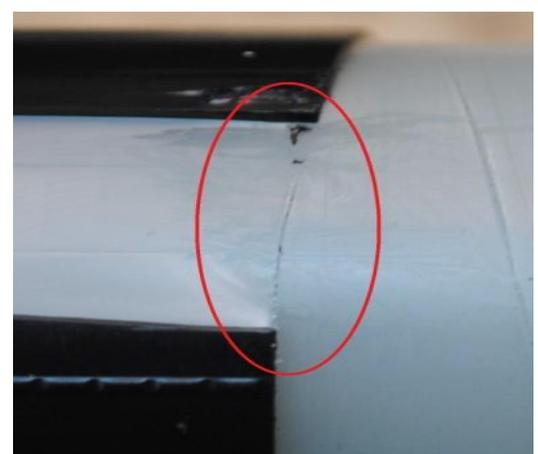


Figure 1: Dissection of the premolded joints shows non-radial and jagged cutbacks (left, red circle) creating stress-enhancements. Knife cuts into the cable insulation at the semicon cutbacks (right, red circle), creating voids and stress enhancements at some of the most critical points of the joint/cable interface

[1] IEEE standards are classified as:

- Standards: documents with mandatory requirements.
- Recommended practices: documents in which procedures and positions preferred by the IEEE are presented.
- Standard Guides: documents in which alternative approaches to good practice are suggested but no clear-cut recommendations are made.