NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594

9/20/2015

MATERIALS LABORATORY FACTUAL REPORT Report No. 15-099

A. ACCIDENT INFORMATION

Place	:	Washington, DC
Date	:	January 12, 2015 3:15 p.m. EST
Vehicle	:	WMATA train #302 Yellow Line
NTSB No.	:	DCA15FR004
Investigator	:	Robert Gordon

B. COMPONENTS EXAMINED

A portion of traction power supply pig tail cable and a portion of its associated cable connector cover (also referred to as a "boot")(figure 1).

C. SUMMARY OF COURT HOUSE INCIDENT

WMATA provided the NTSB with the following incident description:

"On February 11, 2015, at approximately 1339 hrs., Train Operator (T/O), operating train 904 on inbound track, track 1, in approach to Rosslyn Station reported an arcing insulator about 150 ft ahead of train. ROCC instructed T/O to make announcements and reverse ends back to the platform at Court House for service back to Vienna. Upon further investigation at incident location, CM K1 194+00, RTRA supervisor reported an arching insulator and attempted to extinguish which was unsuccessful. Upon response, SMNT Power crew reported a cable boot emitting smoke. An insulator and cable boot were removed and in addition to the associated power cable. No injuries were reported as a result of this incident."

D. DETAILS OF THE EXAMINATION

The incident occurred at a location trackside near the Court House station where power supply was being provided to the 3rd rail. On the wayside of the tracks, power supply cables emerge from the ground through stub-up conduit pipes. The power cables extended from the stub-ups approximately 2 feet and terminate with lug ends. Bolted to these lugs are the lugs on the pigtail cables. The bolted connection between the lugs is enclosed within a cable connector cover. The other end of the pig tail cable is welded to the 3rd rail. WMATA delivered to the NTSB a portion of a pig tail cable and a portion of the cable connector cover used by this cable.

The portion of the pig tail cable was 37 inches feet long. One end had a clean cut which was made to facilitate removal of this cable after the incident. Brown rust colored debris was adhering to the cable's insulation on this end. The cut end would have been welded to the 3rd rail. The other end of the cable had a lug crimped onto the conductor (figure 2). Areas with yellow/white powder from the fire extinguisher are also visible on the cable's surface.

The examination of the pig tail cable found no evidence of substantial short circuit or electrical arcing damage on the conductor or cable lug. The cable insulation exhibited areas where it was thermally damaged and charred. This damaged portion of cable insulation was on the lug end of the cable and extended approximately 12 inches towards the other end. The damage to the cable insulation was continuous over the 12 inches but it did not cover the entire periphery of the insulation (figure 3). The thermal damage to the insulation was external exhibiting more damage to the exterior than the interior. Insulation resistance measurements[1] at 1000VDC across the damaged insulation surface indicated reduced dielectric properties (0.3 – 85 MΩ depending on the measurement points) when compared to similar measurements on the non-damaged insulation (>11 GΩ)

The cable connector cover which was installed with this pig tail was partially missing with the remaining portions exhibiting thermal damage (figure 4). The cable connector cover also had powder on its exterior from the use of the fire extinguisher.

At the site where the incident took place there were additional power supply cables providing power to the 3rd rail. These additional power cables were visually examined and found to have areas where debris was adhering to their insulation surface. In addition a rust colored liquid was observed to be weeping from some of the stub up conduits where these cables extended from (figure 5). Examination of the cable connector covers revealed large gaps between the cable insulation and the body of the cable connector covers (figure 6). The drawing for the cable connector assemblies (figure 7) indicated the use of sealing sleeves to make the assembly weather tight. No sealing sleeves were observed among the cable connector assemblies at the site of the incident. Additionally, no evidence of a sealing sleeve was identified on the incident pig tail cable.

[1] Using a Fluke model 1507 insulation tester

Figure 1: Portions of pig tail cable and cable connector cover as received.

Figure 2: Portion of the pig tail cable (3 views).

Figure 3: Close up of damage to the lug end (3 views).

Figure 4: Damaged cable connector cover ("boot").

Figure 5: Power supply cables in the vicinity of the incident cable.

Figure 6: Cable connector cover lacking sealing sleeve.

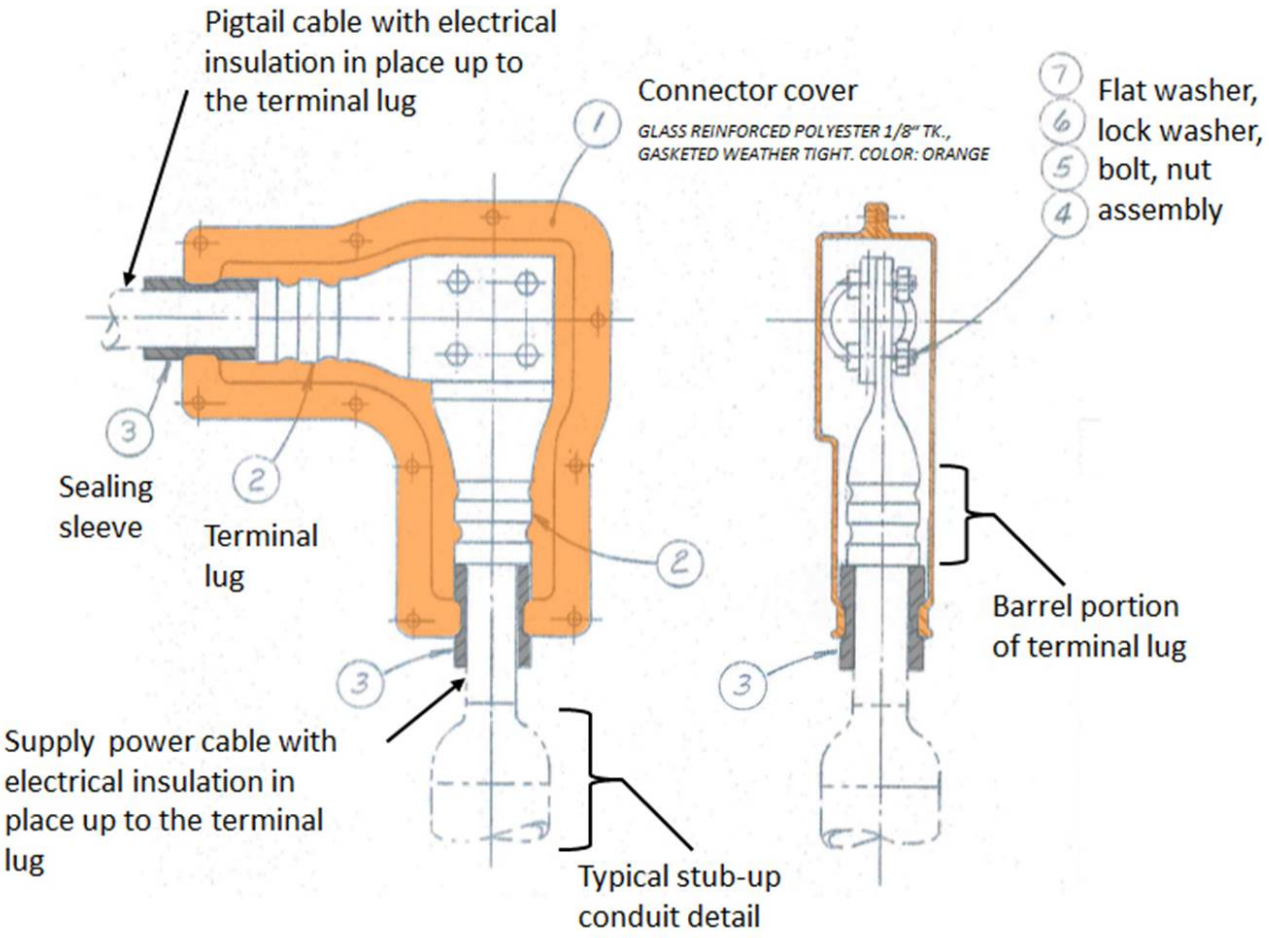

Figure 7: Cable connector assembly drawing.

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