
NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594



9/21/2015

MATERIALS LABORATORY FACTUAL REPORTReport No. 15-100

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

Portions of traction power supply pig tail cables and their associated cable connector covers (also referred to as a "boot")(figure 1).

C. SUMMARY OF FRIENDSHIP HEIGHTS INCIDENT

WMATA provided the NTSB with the following incident description:

"On May 19, 2015, at approximately 0634 hrs. Train Operator (T/O), operating train 206 on inbound track, track 2, in approach to Friendship Height station, reported a small fire on the wayside as well as smoke in the tunnel. ROCC instructed T/O to exit the train to attempt to extinguish the fire. The T/O was unable to extinguish the fire and found that it was a 3rd Rail feeder cable, which was the cause of the fire. Due to heavy smoke between Friendship Heights and Bethesda, service was suspended between Medical Center and Friendship Heights. POWR department replaced the 3rd rail feeder cable, service was restored. No injuries were reported as a result of this incident."

D. DETAILS OF THE EXAMINATION

The incident occurred at a location trackside near the Friendship Heights 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 emerge 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 each pig tail cable has a lug with a single bolt hole which

would be attached to the 3rd rail¹. WMATA delivered portions of 4 pig tail cables and their cable connector covers to the NTSB.

Portions of 4 pig tail cables were examined. Each of the pig tail cables had been cut to facilitate their removal from the incident site. Each pig tail cable consisted of one portion of cable with a single hole lug and a smaller portion of cable with a 4 hole lug. One of the portions of cable with a single hole lug attached had an area of thermal damage near the middle, in between the lug end and the cut end (figure 2). Adjacent to the damaged area of insulation were non-damaged sections of insulation. The thermally damaged area exhibited bare conductor in the middle with some severed strands and re solidified beads of copper (figure 3). Examination of photos provided by WMATA indicate that the damaged portion of insulation was adjacent to a 3rd rail insulator² (figure 4 & 5).

None of the portions of cable had sealing sleeves present. Sealing sleeves are used as part of the cable connector assembly (figure 6) . These cables all had heat shrink tubing bridging the gap between the cable's insulation and the barrels of the lugs. No anomalies were noted on the cable connector covers other than contaminants found on their interior surfaces.

Three out of four of the ends of the pig tail cables with the one hole lugs exhibited varying degrees thermal damage on the insulation near the lugs. This damage consisted of carbonized paths leading from the lug end towards the opposite end of the cable (figures 7,8,9) These carbonized paths are consistent with electrical arc tracking over the exterior surface of the insulation.

¹ When a composite 3rd rail is used, the pigtail cable is attached by lug and bolt instead of being welded.

² Insulators are used to support the 3rd rail.

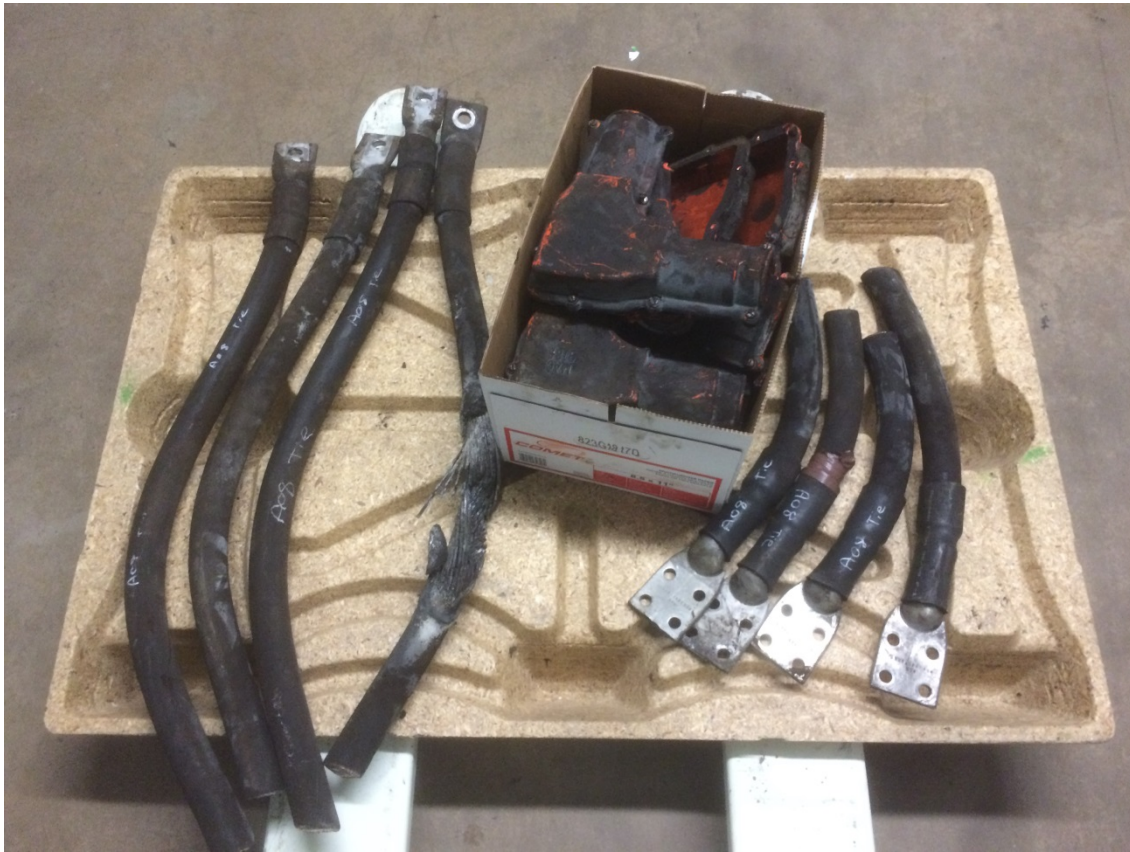


Figure 1: Portions of pig tail cables and cable connector covers as received from WMATA.

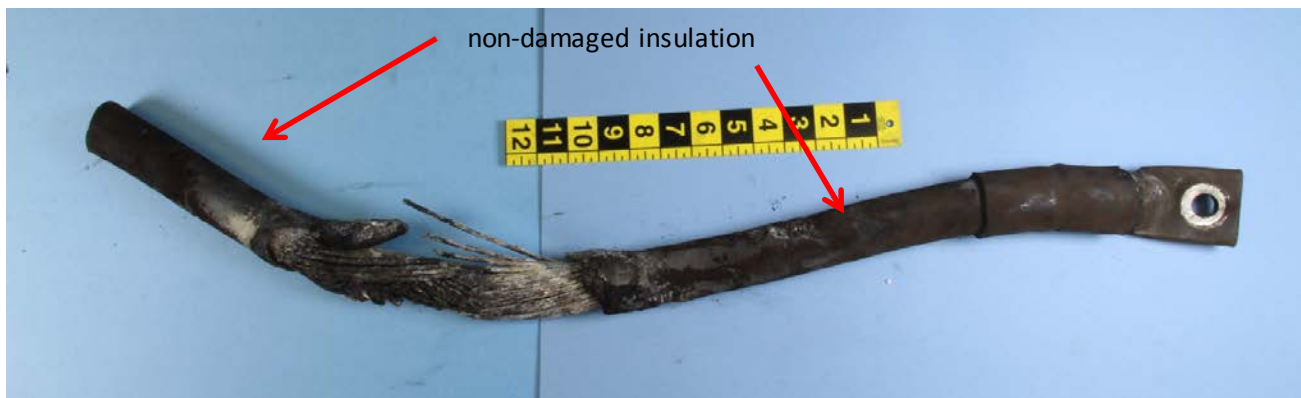


Figure 2: Portion of pig tail cable exhibiting thermal damage.



Figure 3: Close up of damaged section of pig tail cable.

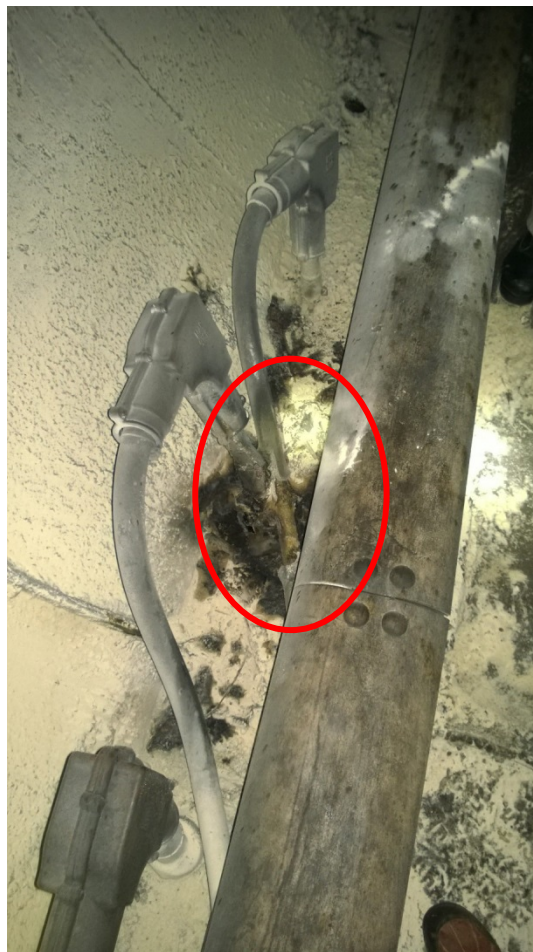


Figure 4: Photo provided by WMATA of the incident cable still in place. Red circle indicates location of thermal damage.

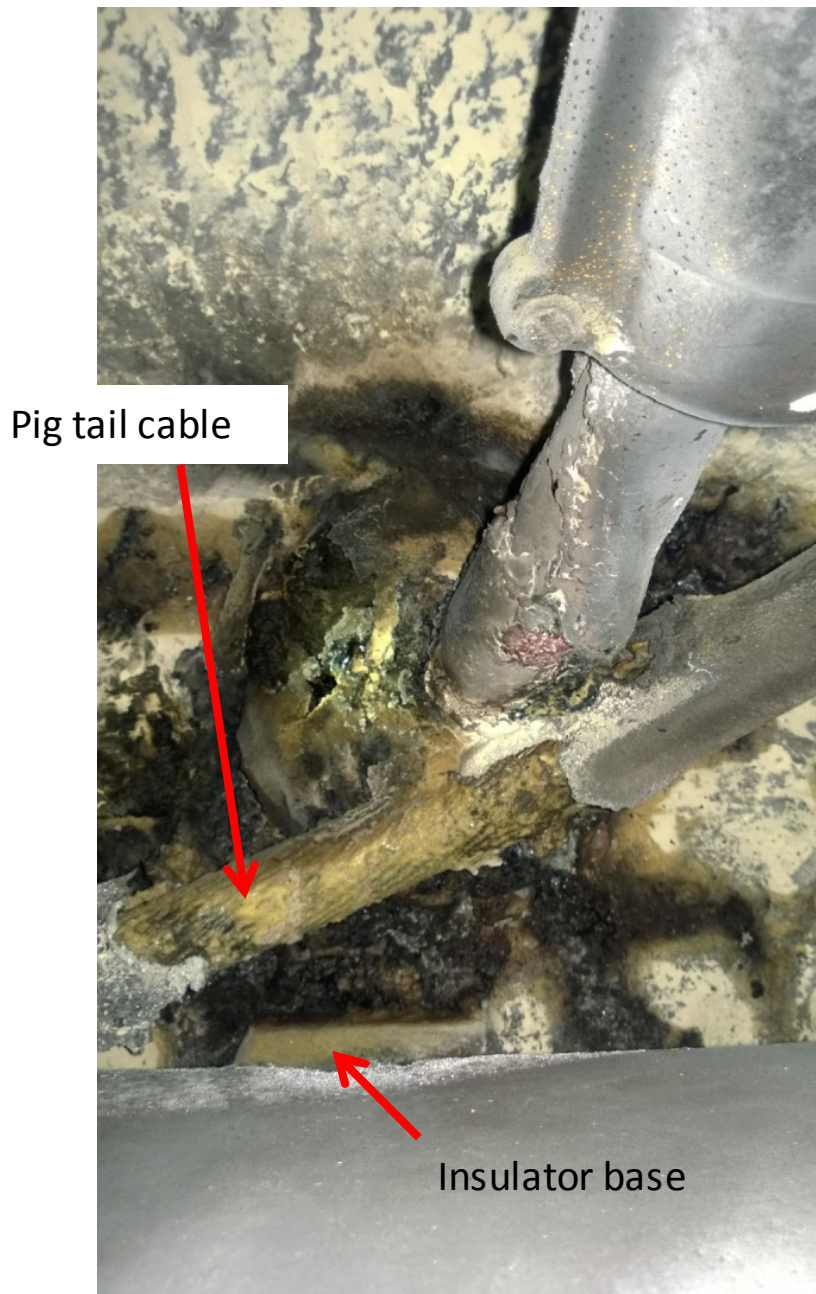


Figure 5: Close up of thermal damage to cable insulation and base of 3rd rail insulator. Photo taken by WMATA.

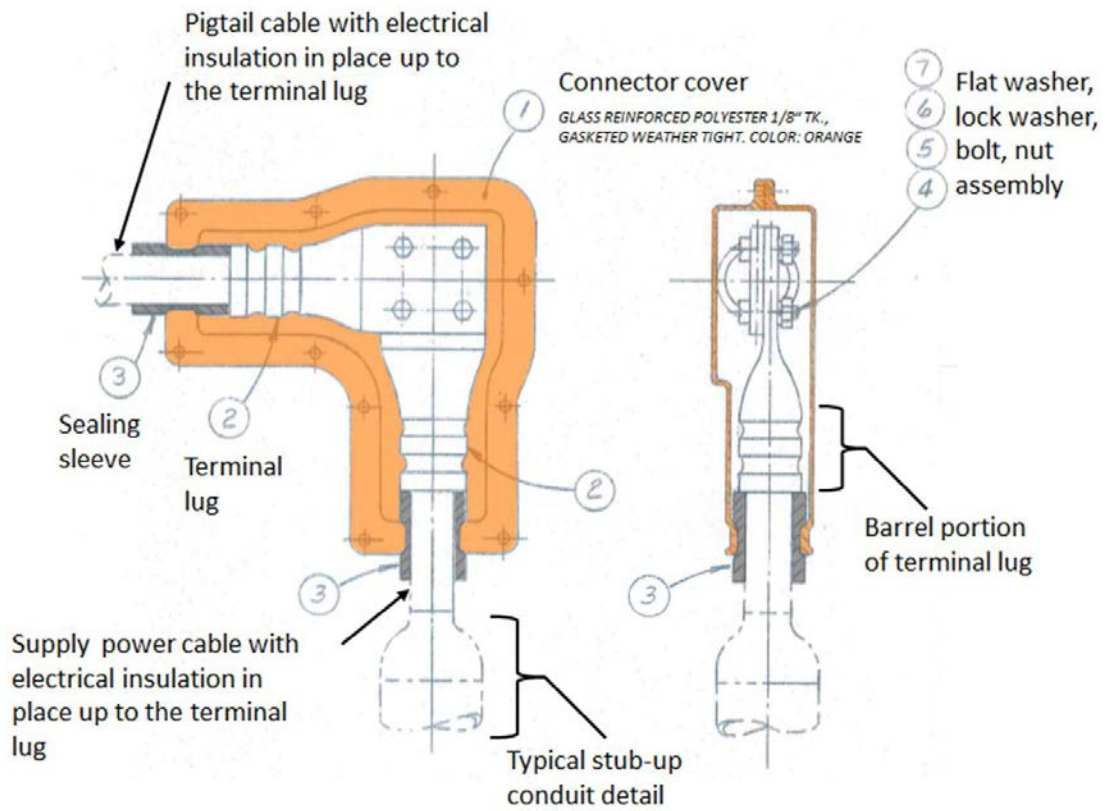


Figure 6: Drawing of cable connector assembly.



Figure 7: Carbonized arc tracks over insulation exterior.



Figure 8: Carbonized arc tracks over insulation exterior.



Figure 9: Carbonized arc tracks over insulation exterior.

Joseph Panagiotou
Fire and Explosion Investigator