Union Station – Train Separation Event October 9, 2020

Preliminary Investigation Briefing

October 22, 2020

Executive Summary

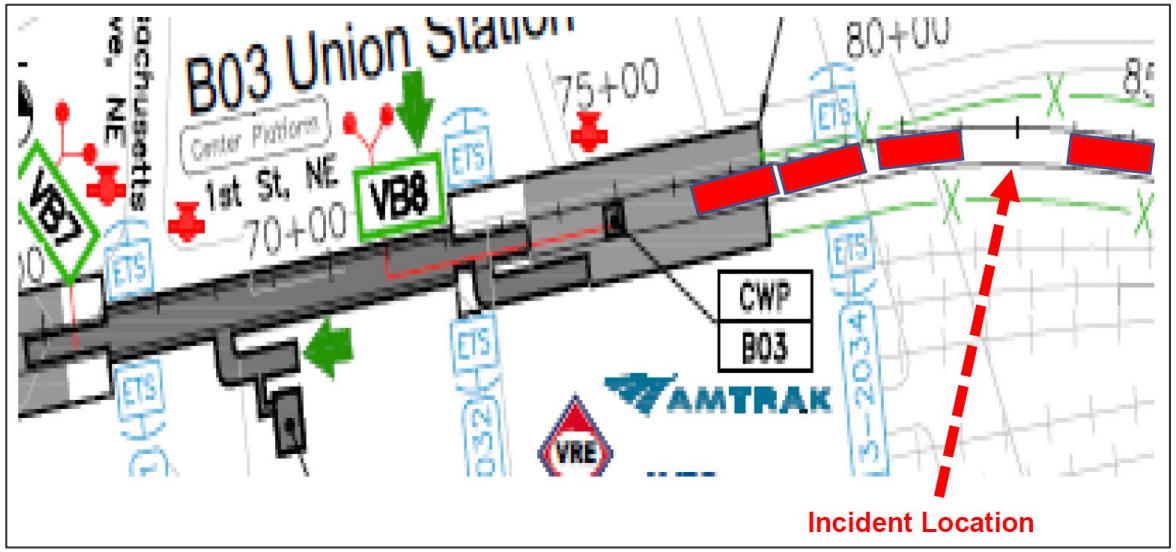
- Train 108 separated upon departure from Union Station on October 9, 2020
- No initial injuries reported
- Two passengers treated on scene for chest pains/ shortness of breath
- Human factors remain under review as part of ongoing investigation
- Information contained within this brief should be considered preliminary and subject to change as the investigation proceeds

Incident Summary

- Red Line Train 108 (6K Series) experienced a separation between cars 2 and 3 while in service upon departure from Union Station, on track #1, approximately 12:18 PM, on October 9, 2020
- Upon uncoupling, the emergency braking system activated (brake pipes dump followed by emergency brake relay de-energized), Train 108 stopped after traveling 172ft after train length changed from eight to two cars
- DCFD, MTPD, SAFE, RTRA responded; all external parties notified
- Investigation underway:
  - Vehicle inspections and testing
  - Employee and responder interviews
  - Data reviews
    - event recorders
    - maintenance records
    - training records
    - CCTV

General Overview

Railcar Placement Overview

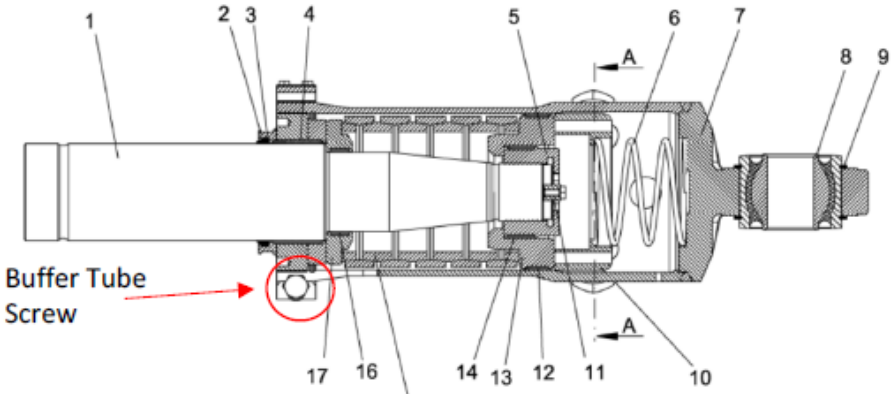


- Represents 1-married pair. Total of eight cars

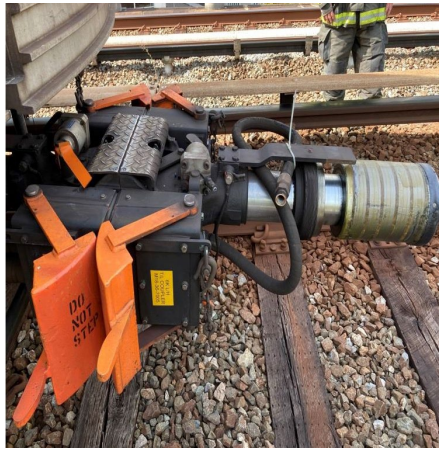
Involved Equipment Photographs

Car 6079 Front Coupler assembly coupled to half of car 6075 Front Coupler

Car 6075 Front Mechanical Coupler Draft Bar



Exploded view of F-End Draft Gear



Close up of Car 6079 Front Coupler assembly coupled to half of car 6075 Front Coupler

Car 6075 Front Mechanical Coupler Buffer Tube

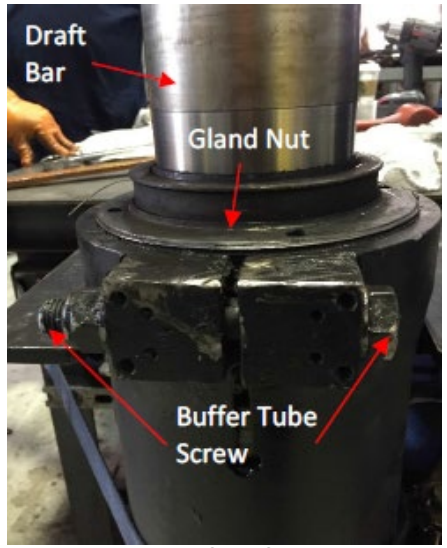


Photo of Draft Gear

Incident Chronology

***Note that times are approximate and subject to additional refinement as the investigation matures**

12:18:51 Train 108 Operator contacted the Radio RTC and reported that the train 'braked in emergency'

12:19:47 Non-revenue Train 805 contacted the ROCC and reported that Train 108 uncoupled between rail cars 6075 and 6079

12:22:37 ROCC Assistant Superintendent contacted DCFD to report the undesired uncoupling

12:23:00 - 12:26:00 ROCC dispatched operational and management support to facilitate the emergency response

12:26:33 Single track established between Judiciary Square and Union Station by way of track 2

12:29:11 ROCC instructed the Train Operator to report any hazards found and report the total amount of customers aboard

12:29:19 Train 108 Operator reported a smoldering crosstie where the rail cars are uncoupled

12:30:50 Third rail power de-energized track one

12:30:00 - 12:46:00 Management and ROCC personnel coordinate on scene command, confirm third rail power is down, and that smoldering crosstie is extinguished

12:47:06 ROCC de-energized third rail power track two Union station

12:57:06 - 13:02:35 RTRA Forward Liaison confirms customer counts (17 in lead cars, 86 in the trailing cars)

13:06:18 RTRA Forward Liaison reported that the Fire Department requested permission to enter the roadway thru an access gate B1 086+00

13:18:00 ROCC notified the RTRA Forward Liaison they received a report that personnel self-evacuated from the one of the rail cars

13:21:47 RTRA Forward Liaison reported that one customer exited from the 6-car consist and was escorted back on the train (MTPD reported other evac attempts and customers fighting due to panic)

13:34:00- 13:47:57 ROCC coordinates with CMNT to determine if the 6-car consist can be moved to Union Station or closer to the lead cars. Neither can occur. DCFD enter the roadway in preparation of the customer evacuation

13:50:28- 14:08:30 DCFD escorts all customers safely to the AMTRAK platform at CM B1-087+00

14:24:18 RTRA Forward Liaison reported to ROCC that DCFD and all personnel and equipment cleared the roadway

14:30:44 RTRA Forward Liaison reported to the ROCC that third rail power may be restored

15:53:00 ROCC restored third rail power between Brentwood Yard and Union Station tracks one and two

Initial Investigation Findings

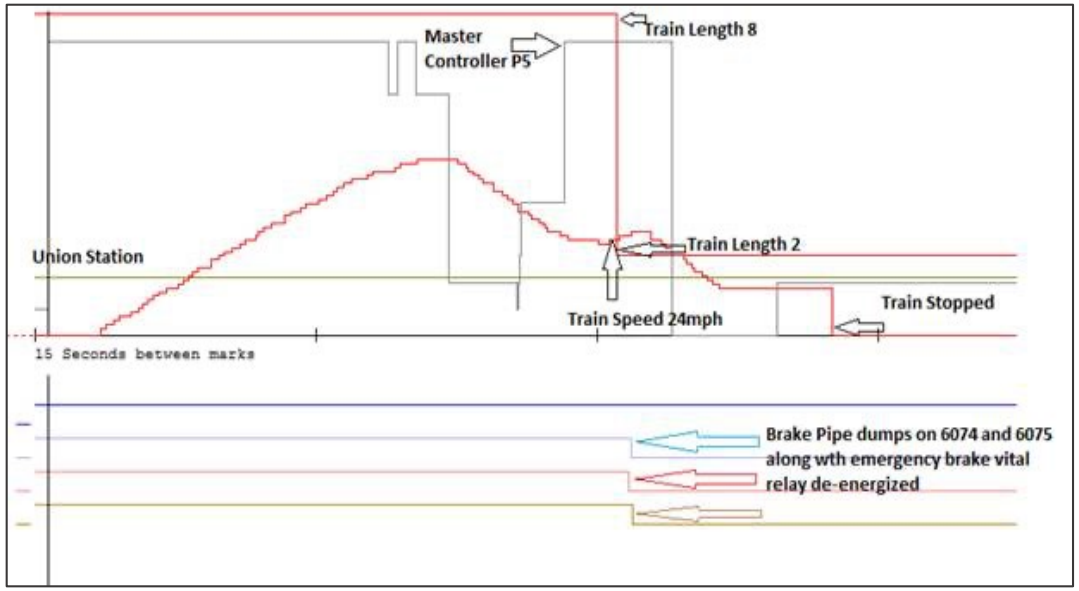
VMS Railcar Data Downloads

- Data does not show any abnormalities with train operations that could result in this incident

Office of Car Maintenance

- As a result of this event, CMNT conducted a rail car inspection of all couplers on the 6k series
  - Total railcars inspected: 166 (90% of the 6K fleet, remaining 18 removed from service until inspected)
  - Six railcars identified with potential discrepancies with three cars having incorrect hardware installed
  - The coupler was replaced on November 2019
  - Typical coupler overhaul is eight years
  - The railcar underwent several inspections (including coupler inspections, on January 16, April 22, June 16, August 21) leading up to the pull-apart event
  - Inspections did not identify any discrepancies with the coupler
- Based on mileage data, the impacted traveled 35,522 miles since the coupler replacement and before the subsequent separation

Event Recorder (ER) Data Graph/Sequence of Events



Historical Decoupling Event

- Similar event occur outside of McLean station on August 25, 2018
- An incorrect bolt was used which provided a false torque reading resulting in reduced clamping force on the buffer tube, which in-turn allowed the spanner nut to slowly back out over time
- Mitigation included development of Maintenance Service Inspection (MSI-150088) outlining rebuild procedures for 6K Semi-Permanent Drawbars and any other action deemed necessary to support prevention of repeated pull apart event
- A fleet wide inspection was conducted for immediate mitigation purposes

The investigation will determine the relationship between the current and prior events

Incident Investigation Chronology Reconstruction

Note that timeline is developed from eye witness accounts and employee interviews

Friday Night (Oct 9) – After on-scene documentation of the trainset, the affected consist was sent to Brentwood Yard for the purposes of further inspection and testing

Metro Safety Investigators, rail car engineering and maintenance management and technicians were present at Brentwood

Chief Mechanical Officer instructed staff to perform an inspection onsite, while in conversation with Deputy Chief of CENV, and instructed CMNT personnel to retrieve a torque wrench to perform the test

SAFE requested the coupler be removed from the train and transported to the MRO (Major Repair and Overhaul) shop at Greenbelt to conduct testing in a controlled environment with appropriate calibrated tools

SAFE and respective parties scheduled the removal efforts by Brentwood staff and transport to the Greenbelt shop

SAFE requested the unit be sealed with protective wrap which was determined to not be available at the time

A CMNT Technician asked Brentwood personnel if they were still conducting the test on the affected consist

SAFE personnel notified the CMNT Technician that the Front Coupler will be removed and sent over to Greenbelt MRO shop for bench testing. The team confirms the plan for calibrated bench testing, coupler tear down, and analysis to take place at Greenbelt the following day. SAFE departed the location and briefed the WMSC on the scheduled testing planned for 10/10

CMNT technicians perform a test to establish a torque reading on the coupler bolt. Emails containing the torque setting are transmitted

Saturday Morning (Oct 10) - The coupler is transported to Greenbelt Yard MRO

At Greenbelt, the front coupler inspection begins with CENV, CMNT, MRO personnel, CMNT superintendents, SAFE and WMSC

The buffer tube was placed on the MRO shop horizontal stand fixture for inspection and testing

The buffer tube clamp locking bolt torque stripe on the bolt and nut was observed as misaligned

SAFE investigators report the anomaly to management and an independent assessment of the chain of custody of the coupler is initiated

Torque Explained

What is torque?

- Application of a force acting at a radial distance and tending to cause rotation, and is used to create tension

Why?

- The tension in the bolt creates a "clamping" force between the two parts
- If the clamping force is too low, the fasteners can work loose due to vibration or movement between the component parts
- If a clamping force is too high, the fastener may permanently stretch and no longer apply the required clamping force

What is a torque stripe?

Torque stripe is used as a visual indicator to mark fasteners that have been torqued to make it obvious if it becomes loose

Torque stripe when the buffer tube was installed in car 6075

Torque stripe when the buffer tube was delivered to the MRO Shop

Investigation Process – Chain of Custody

- The investigation into the chain of custody and investigation process adherence revealed multiple gaps in understanding of roles, responsibilities and protocols surrounding incident investigations
- The current process details expectations for investigators and has general information about evidence preservation
  - 800-01: Incident and Accident Investigations of RAIL, BUS and MetroAccess

    "For all incidents … involving rail vehicles, CENV, CMNT and CTEM must obtain written release of the equipment via email or verbal notification from SAFE's Deputy Chief, Investigations or his/her designee before VMS/Event Recorder downloads, or any type of inspection activity, commences on or around the rail vehicle"
- Access controls for quarantined evidence and formal documentation of chain of custody are not part of the existing process

Investigation Process – Chain of Custody

- Existing incident investigation training for employees focuses on the investigator's role
- Employees who may be part of an investigation do not receive any training on their role in support of the investigation
- Metro is undertaking a comprehensive reevaluation of the investigation process to identify further opportunities to improve the structure of protocols
- This evaluation will apply lessons learned from prior investigations and will clarify expectations for involved parties and establish accountability for execution of the process

Next Steps

- Complete Fact-Finding
  - Additional interviews with involved staff
  - Complete records reviews and data fusion
  - Final damage assessments
  - Laboratory and engineering reports are pending
  - Investigating nonconforming materials (e.g., bolts)
  - Investigating the potential of improper preventative maintenance on a front coupler resulting in improper torque value

- Conduct further analysis
  - Identify any commonalities between prior decoupling events
  - Ensure mitigations/corrective actions from prior events are sustainable

- Initiate immediate actions and develop corrective action plans to address the incident causal factors
- Identify and implement investigation protocol improvements
- Complete draft report, submit to WMSC