**Purpose:**
This procedure provides guidelines for managing emergency incidents involving the Metro Light Rail System, highlights specific life safety hazards inherent to the system, and also discusses considerations for shutting down power to the system when necessary. This procedure also provides light rail system information necessary for safe operation and focuses on the most likely light rail scenarios crews will encounter. However, these guidelines are not a universal remedy, and due to the limitless possible scenarios responding personnel could encounter, responding crews should always consider the risk management profile and exercise caution when operating near the light rail system.

**Light Rail terms:**
- LRV = light rail vehicle
- OCS = overhead contact system (overhead light rail electrical wires)
- TPSS = traction powered substation
- ETS = emergency trip switch (located at TPSS)
- OCC = operations control center (nerve center for communications and operations of light rail)
- Pantograph = big mechanical arm that connects the LRV to the overhead wires

**Background:**
The light rail system is an electrically powered public transportation system. A detailed map of the route, stops, and substations is provided in the appendix along with a list of important telephone numbers. The light rail uses a two track system that typically run parallel to each other. The LRVs operate on DC electric current supplied from the substations (TPSS) by two overhead wires (OCS). LRV’s connect with the OCS via a pantograph (big arm) that can be raised and lowered. The tracks operate as the negative return (not a significant electrical threat) for the current. The Operations Control Center (OCC) functions as the nerve center for the light rail and is able to communicate, coordinate, and remotely shut off power to the OCS. It will be located at 302 N. First Ave., 5th Floor (next to the Bus Control Center). The estimated train frequency is every 10 minutes during peak operations. The LRV’s have an operator located in the forward cab (each end has a cab) of the LRV. The (conductor/driver) must operate the train by utilizing a throttle equipped with a “dead man” switch. In the event the operator becomes incapacitated, the LRV will come to a stop. The system times traffic lights using predicative GPS technology and changes the signals much like the pedestrian button and car sensors do, but the only system that actively takes control of traffic signals is the Opticom system (when equipped) used by emergency responders. Train operators are required to stop for red lights and hazards.

**LRV**
- 90 feet long 12 feet high 8.5 feet wide Cab at each end
- 103,000 lbs empty with 200 person max capacity
- Normal max operating speed 35 mph, and up to 55 mph during high speed testing...
- Approximately 190 foot stopping distance at 35 mph
- Very Quiet
Track Switch Locations

- Tracks that move without warning
- Exert 1200 lbs of force
- Will crush your foot if standing in switch location
- Manually operable when de-energized (OCC can de-energize)

Traction Power Substations (TPSS)

- Approximately every mile
- Emergency Trip Switch (ETS) (located outside the door in Knox box)
- What’s inside: electrical gear and Ni-cad batteries
- Electricity AC 12000-21000 volts in, and 650-950 volts DC out

Overhead Contact System OCS (the overhead wires)

- 750-950 DC
- 2000-6000 AMPS (taser is .00021 amps 50k volts) AMPS KILL
- Wires are tensioned at 5,000 lbs top wire, and 3000 lbs bottom wire
- The normal height of the light rail overhead contact system wire is 18 feet, but at the underpass at Washington and the 143 the height is only 14.5 feet. BEWARE of lights, flags, or anything else sticking up when crossing the line.

Response:

Crews responding C-3 across the tracks shall adhere to our C-3 driving procedures. Additionally, any protrusion (extended utility lights, flags, etc) must be lowered to avoid contact with OCS. Furthermore, the tracks represent an additional lane of traffic that must be cleared when driving C-3. Left hand turns across the tracks account for the highest incidents of collisions with LRV’s.

Crossing the line

- Adds additional lane of traffic
- Normal height of OCS is 18 feet
- Lowest point is 14.8 feet located at Washington and the 143 overpass
- Have all lights and/or flags lowered.
Operating in Light Rail Intersections:
Never park apparatus on or between the light rail tracks. When operating in light rail intersections for incidents such as motor vehicle accidents company officers should consider the impact of LRV traffic on scene safety. When LRV traffic could compromise the safety of firefighters operating on or adjacent to the light rail tracks, the company officers will contact Fire Dispatch and request they contact the OCC to temporarily stop LRV traffic in the vicinity of the accident. However, LRV’s should be allowed to continue operating when it doesn’t compromise scene safety. Nonetheless, crews must remain watchful for LRV’s and company officers should consider assigning a crew member to watch for LRV’s. When in question, always error on the side of scene safety and stop LVR traffic as necessary.

Responding to EMS call on the LRV
- LVR operator will coordinate next stop location with OCC and alarm room
- The alarm room will provide the address and location during dispatch
- Have operator show you the key is out. This engages the brake and disables the throttle ensuring the LRV won’t move
- As long as LRV is functioning normally and on the track there is no need to shut down power. This will allow the AC and light to continue functioning
- Traffic safety as always

Responding to LVR versus another vehicle
Crews responding to LRV versus another vehicle calls need to be aware of the possibility of electrocution from derailed LRV’s. In most instances when LRV’s collide with other vehicles they do NOT derail. When LRV’s derail, the operator can usually lower the pantograph and therefore eliminate the electrocution risk from the OCS. However, on occasion when LRV’s derail the pantograph becomes entangled in the overhead wires and cannot be lowered. In this scenario, the entire LRV becomes energized and poses a significant electrocution risk to both emergency responders and any passenger who makes ground contact (completes the circuit). Company officers should complete the following size up upon arrival at any LRV derailment or LRV/vehicle accident:

Electrical hazard size up questions:
- Is the Pantograph raised/tangled?
- Is the LRV on the tracks?
- Is the OCS intact (no poles or wires down)
Electrical hazard size up: If the LRV is derailed and the pantograph is still in contact with the OCS, or if the OCS has been compromised and is damaged and lines are down then crews should not approach the LRV or track. The OCS needs to be de-energized and the company officer should assign another company (or do it themselves if in close proximity) to push the emergency trip switch (ETS) at the closest TPSS (requires Knox key). Pushing the ETS at the TPSS shuts down incoming AC power and outgoing DC power, and also sends a signal to the adjacent substations and shuts down their outgoing DC power, effectively isolating the section of line from power. However, there is no visible confirmation that power has actually been shut down. Crews should wait to approach the LRV, and also advise passengers to wait inside the LRV, until power has been confirmed to be dead by a Metro supervisor. The Metro supervisor should confirm that the appropriate breakers have been racked out and locked out in the TPSS. The supervisor should also attach meter to line to confirm power is off and attach grounding strap. At this point power is assumed safe.

Access and Extrication:
- Easiest access is through the LRV doors. Crew can manually open them by opening the exterior (emergency door releases). There is one location on each side of the vehicle, located on the left side when facing the LRV.
  - Windows are extremely hard to break
  - Cutting through the body of the LRV doesn’t provide adequate access
- The train has been engineered with a bumper and bar 3 inches off the track to reduce the chance of people or cars getting trapped underneath.
- LRV’s are extremely heavy and unstable when lifting and this should be a last resort.
  - Metro has a vehicle that can safely lift LVRs, but it has an estimated response time of 30-60 minutes

Traffic control:
- Protect scenes as necessary
- Beware of other LRV’s in opposite direction and shut down if necessary for scene safety
- Consider assigning a crewmember as lookout for LRV’s
- Consider PD for traffic control

Responding to LRV fires:
LRVs do not have a fire protection system (no sprinklers). Most of the working equipment (A/C, power supplies, and batteries) are located on the top of the LRV. Crews must ensure the LRV and OCS are de-energized prior to attempting extinguishing any significant LRV fires. Fires in the bottom undercarriage should only be extinguished after the pantograph has been lowered, but does not necessitate shutting down the OCS.
- Evacuate LRV (life safety first) to a safe location away from smoke
- Shut down power as necessary
- Stop other LRV traffic as necessary
- Protect the scene from traffic
Responding to Fire at TPSS:

- Treat it like electrical substation/vault.
- Do Not Enter or put water on it until absolutely confirmed de-energized by APS or SRP.
- Beware of OCS.
- Consider pushing the ETS if it is safe to do so
- Call for hazmat if smoke is coming from within TPSS
- Be aware of the risk of hazardous smoke inhalation.

Miscellaneous:

Natural Gas

- LRV’s produce significant sparks and represent an ignition source for natural gas leaks
- LRV’s traffic should be halted for any significant gas leak within close proximity

Switching Locations

It is possible that a foot could get stuck in a track switching locations. It is important to:

- Notify alarm to contact OCC and have them temporarily to shut LRV’s for your location
- Have the OCC also de-energize track switch
- Use manual lever (co-located on pole by switch) to open track
- Remain watchful for LRV’s

Impact of smoke plume on light rail system

- Treat the same way we treat other road closures for smoke plumes
  - They have the ability to shut off outside air if necessary, and this should be a minimum consideration if LRV’s are passing by smoke

Impact to Fire Operations:

Light rail impacts fire operations in several ways. First, the OCS represents an electrical as do other electrical lines. Crews should wait until they are de-energized before operating steams close to them. OSHA requires any apparatus, ladders, or other equipment to maintain a ten foot buffer from ungrounded electrical sources such as the OCS. Next, the alignment (the tracks and OCS) present new access obstacles and influence apparatus placement. Lastly, the alignment can impact water supply. Consider the following:

- OCS electrical hazards
  - Must stay 10 feet away (in every direction) per OSHA
  - Electrocution risk if straight stream contacts energized OCS
  - If operating hose streams might contact the OCS, then electricity must be shut down.
- Fire ground apparatus placement
  - Crews should preplan first due areas and plan apparatus placement around the light rail
- Laying lines across the tracks
  - Treat as a water supply of last resort and avoid whenever possible.
  - If necessary to lay across the track you need to communicate clearly to the alarm room that you are doing so, and advise them to shut down the light rail for that section