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California Public Utilities Commission
Consumer Protection and Safety Division

ROADWAY WORKER PROTECTION ON CALIFORNIA RAIL TRANSIT SYSTEMS

Consumer Protection and Safety Division Report for R.09-01-020

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EXECUTIVE SUMMARY

Forty rail roadway workers from around the nation died after being struck by trains from 1997 to 2008. This staff report examines twelve of those tragedies, including three that happened in California, makes recommendations, and proposes regulations that the staff believes will significantly improve rail transit roadway worker safety.

Rail roadway workers are the men and women who perform routine maintenance and repair work on or near rail tracks. Their work is, by its very nature, hazardous because it involves the ever-present possibility of being struck and killed by a moving train. An exceptionally high level of situational awareness is therefore required of train and roadway worker crews.

Federal regulations have been protecting the safety of rail roadway workers since 1997 when those workers are employed by any of the nation's freight railroads, inter-city passenger railroads, or commuter railroads. There are no federal or state regulations that work to improve the safety of rail transit roadway workers. Each rail transit agency in California has its own roadway worker protection program.

Staff's review of twelve rail transit roadway worker accidents demonstrates that the affected rail transit employees, both roadway workers and train operators, were not sufficiently aware of the immediate hazards when the roadway workers were working on or near the track. Staff has concluded that rules that enhance the situational awareness of wayside workers and train operators will save lives, and therefore recommends a General Order that provides the following requirements:

- A fundamental requirement that each roadway worker performing work on or near tracks be accompanied by a lookout —an employee whose sole function and commitment is to protect those on or near the track from approaching trains.
- A requirement that roadway work locations be demarked by warning flags that ensure that train operators slow trains and prepare to stop in advance of roadway work.
- A requirement that roadway worker crews designate a predetermined safe refuge area.
- A requirement that rail transit agencies adopt a program for reporting and recording near-hits.
- A requirement that rail transit agencies invest in electronic devices that provide roadway workers with an early warning of approaching trains and, eventually, with devices that warn train operators of the presence of track workers.
- A requirement that rail transit agencies adopt a separate roadway worker safety manual approved by Commission staff.
- Rules-compliance testing requirements.
- Training requirements linked to rules-compliance testing results.

Staff also recognizes that the implementation of collision-avoidance technologies, such as positive train control (PTC), will provide increased protection against train accidents of all kinds, including wayside worker accidents, and recommends that the rail transit agencies begin planning for the installation of this technology.

INTRODUCTION

Forty roadway workers were struck and fatally injured by trains and on-track vehicles in preventable accidents between 1997 and 2008 nationwide.[1] These fatalities to Roadway Workers continue to occur with alarming frequency even after promulgation of the Federal Railroad Administration's Roadway Worker Protection Regulations in 1997,[2] with 2008 being the worst year since those regulations were issued in 1997.[3]

The railroad transportation industry has a fatal injury rate more than twice the all-industry rate.[4] Roadway workers' jobs within the railroad transportation industry are especially hazardous.[5] Rail transit systems accounted for "about half of the fatalities involving passenger railroading, while standard passenger trains [Amtrak] and commuter trains each accounted for about a quarter."[6]

Three rail transit roadway workers have been fatally injured in California in the last nine years. A San Francisco Bay Area Rapid Transit (BART) employee was fatally injured on January 12, 2001, in an area of a BART tunnel that has insufficient clearances to allow a BART train to pass without striking a wayside employee working in the area. A Sacramento Regional Transit District (SRTD) maintenance employee was struck by an SRTD train and fatally injured on July 24, 2008, while lubricating tracks. A BART employee was struck by a BART train and fatally injured on October 14, 2008, while he was working in the right-of-way.

Staff's investigations into these three accidents, and its examination of nine similar accidents nationally, revealed common themes that pose unacceptable risk to rail transit roadway workers. The fundamental problem underlying these fatal accidents was work that necessarily took workers' attention away from impending danger, namely, approaching trains or on-track equipment. These workers were required to focus on specific tasks, such as track and structures

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[1] *BMWED Journal*, Vol. 118, No. 1, January/February 2009, p. 2; see also: President's Perspective, Freddie N. Simpson, *BMWED Journal*—January/February 2009.

[2] 49 C.F.R. Part 214 C.

[3] Ibid.

[4] *The Monthly Labor Review*, July/August 2007, http://www.bls.gov/opub/mlr/2007/07/art2full.pdf *The Monthly Labor Review* was established in 1915 as the principal journal of fact, analysis, and research of the Bureau of Labor Statistics, an agency within the U.S. Department of Labor.

[5] Id. at p. 17.

[6] Id. at pp. 17-25. See also: id., footnote 17 at p. 25, "Monorails such as those used at airports also were involved in a small number of cases."

inspections and maintenance, and were not able to pay sufficient attention to their personal safety.

Staff believes that the proposed General Order is necessary to reduce the level of risk in this industry segment by targeting one of the greatest and most unacceptable risks posed to workers within this high-risk industry, and by targeting the most dangerous practices when facing these risks. Staff proposes the General Order included as Appendix A to this report. The proposal is based on Staff's accident investigations, examination of similar accidents nationwide, accident statistics, roadway worker operations analyses, and the human factors involved in roadway worker duties and safety. In summary, the staff proposes several regulatory measures that will require work assignments to be accompanied by affirmative, alert, vigilant, and dedicated persons and procedures that are independent of the work tasks.

BACKGROUND

The Commission opened this rulemaking, OIR 09-01-020, following the roadway worker fatalities occurring on BART and SRTD in 2008. The purpose of the rulemaking is to determine (1) whether current protections for rail transit agency roadway workers are adequate, (2) whether the Commission should adopt a General Order implementing new rules for rail transit agency protection of maintenance-of-way, track, signal, operating employees, and others engaged in roadway work, and (3) if new protections are needed, a description of the protections to be required by rail transit agencies and included in the General Order.

The Commission issued the OIR on February 2, 2009, and solicited comments from the parties to the proceeding – the RTAs and their unions. Parties filed comments on March 31, 2009, primarily stating that no new rules are required and that current protections are adequate if they are followed. Parties responded to Staff's requests for information regarding the agencies' current roadway worker safety policies, practices, rules, training, and procedures. Also, Staff discussed OIR issues with rail transit and transit worker representatives in workshops on September 29 and 30, 2009.

This report will be served on the parties and the service list. Comments will be due on March 1, 2010, and reply comments will be due March 16, 2010, according to the current schedule in the Administrative Law Judge's November 12, 2009, ruling.

This section describes the issues critical to the OIR, including the Commission's jurisdiction to regulate rail transit safety appliances and procedures in California, the accidents that inform the discussion and analysis, accident causes, roadway worker duties and procedures, and the issues the parties identified in their comments.

JURISDICTION

The Commission has safety and security oversight jurisdiction over rail fixed guideway systems[7] in the state under 49 C.F.R. Parts 659 et seq. Further, the Commission has safety oversight jurisdiction over California's transit systems under California Public Utilities (Cal. Pub. Util.) Code Section 99152, as well as under the Cal. Pub. Util. Code sections establishing each individual transit agency within California.

[7] 49 C.F.R. Part 633.5 defines fixed guideway system as "any public transportation facility which utilizes and occupies a separate right-of-way or rails. This includes, but is not limited to, rapid rail, light rail, commuter rail, automated guideway transit, people movers, and exclusive facilities for buses and other high occupancy vehicles."

> Any public transit guideway planned, acquired, or constructed, on or after January 1, 1979,[8] is subject to regulations of the Public Utilities Commission relating to safety appliances and procedures.
>
> The commission shall inspect all work done on those guideways and may make further additions or changes necessary for the purpose of safety to employees and the general public.
>
> The commission shall develop an oversight program employing safety planning criteria, guidelines, safety standards, and safety procedures to be met by operators in the design, construction, and operation of those guideways. Existing industry standards shall be used where applicable.
>
> The commission shall enforce the provisions of this section.
>
> Cal. Pub. Util. Code § 99152.

ROADWAY WORKER ACCIDENTS

CALIFORNIA

Three roadway workers have been fatally injured on California rail transit agency properties since 2001. The accidents are:

- Bay Area Rapid Transit District fatality on October 14, 2008.
- Sacramento Regional Transit District fatality on July 24, 2008.
- Bay Area Rapid Transit District fatality on January 12, 2001.

In each of these fatal accidents staff identified inadequate roadway worker protections as a contributory factor.

[8] Although much of the San Francisco Municipal Railway was constructed before January 1, 1979, the San Francisco Bay Area Rapid Transit District over which the Commission has safety jurisdiction under Cal. Pub. Util. Code § 29047, includes the City and County of San Francisco under Cal. Pub. Util. Code § 28600. *See also: Order Instituting Rulemaking to Incorporate Safety Standards for Rail Fixed Guideway Systems in a General Order*, D.96-09-081, in R.96-04-021, 1996 Cal. PUC LEXIS 954; 68 CPUC2d 156 (Sept. 20, 1996).

BAY AREA RAPID TRANSIT DISTRICT

BART'S OCTOBER 14, 2008 FATAL ROADWAY WORKER ACCIDENT

A BART train struck and fatally injured a BART structures inspector[9] while he was inspecting the fence along the BART right-of-way on October 14, 2008, as part of a two-man crew. The inspectors had requested and received a "Simple Approval" authorization from the control center to enter a restricted area consistent with existing BART rules and procedures.[10] Simple Approval allows inspectors to access trackways with their own vigilance for approaching trains as their only protection. (Discussed further in the Discussion section later in this report.)

Probable Cause

Staff has determined that the reliance on Simple Approval procedures and failure to comply with BART rules are the most probable causes of this accident.

Contributing Cause Factors

Additional contributing factors to this fatal accident were:

- No lookout or flagperson[11] was watching for approaching trains.
- Additional roadway workers were performing work on the adjacent track without knowledge and/or coordination with the structures inspectors.
- Trains were operating in single-track mode, taking turns operating on one track in opposing directions rather than in the usual and customary method of opposing trains operating on separate tracks. The Structures Inspectors were unaware of single-track operations.
- The toe path (walkway) adjacent to the right-of-way was partially obscured by overgrown vegetation which may have caused the victim to walk into the trackway and may have diminished the train operator's field of vision.
- No other technology was in use to warn roadway workers at the time of the accident.
- The structures inspector failed to comply with BART's rule which requires that inspector set his/her portable radio to "scan" mode[12] to monitor communications between trains, control operators, and/or other roadway workers.

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[9] Wayside workers responsible for inspecting fences, vegetation, and structural buildings along the right-of-way.

[10] Section 6200 of the BART's Operations Rules and Procedures Manual. The request was made of the Power and Support Controller, a personnel position in the control center not responsible for train movement.

[11] Flagperson means personnel assigned to assist in the control of train movements by the display of hand signals, flags, or lights. BART Operations Rules and Procedures, revised January, 2008.

- BART's policy of allowing roadway workers to use personal cell phones as a means of communication between themselves, permits these workers to become distracted from the job being performed, a policy which may also effectively circumvent the BART rule to set portable radios to scan mode.
- The structures inspector was wearing a safety vest at the time of the accident, but it was not the required safety vest mandated in BART rules and procedures.[13] Reenactment of the accident findings revealed that the BART-approved safety vest provides a slight improvement with regard to the visibility of the wayside workers.
- BART did not have a compliance testing or safety rules testing program to insure workers' compliance with roadway safety rules and procedures.

Staff further determined that BART does not have a program to collect, review, or develop corrective action plans for near-collision and/or near-hit reports from roadway workers. Although BART does have an existing requirement that each "unusual occurrence" — such as an accident, disturbance, irregularity, or rule/procedure violation which might affect service or involve or threaten injury to persons or damage to equipment on BART Property — be documented on an *Unusual Occurrence Report,*[14] this requirement does not specifically require roadway worker near-hit reporting.

BART'S JANUARY 12, 2001 FATAL ROADWAY WORKER ACCIDENT

A BART electrician was struck and fatally injured by a BART train on January 12, 2001. The electrician was on the fourth day of his assignment in this capacity and was part of a two-man crew. The crew was walking between the rails and the wall inside a tunnel to investigate a report of a small fire on the track. The electrician was struck while facing the track with his back against the tunnel wall. The workers were authorized to be working on the trackway with Simple Approval authority.[15] The surviving crewmember stated he only had a few seconds to position himself safely against the tunnel wall and yell to the other crewmember to get out of the way before the train arrived.[16] The tunnel has insufficient clearance for a person to stand

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[12] BART Structures Inspection Procedure Section 6.1.11, Procedure #11: M-RK II Portable Radio Use revised 03/01/01.

[13] BART Maintenance and Engineering Safety Manual, Section III, 303.06: BART approved high-visibility safety vest is required to protect employees from hazards resulting from not being visible to equipment or vehicle operators. An approved light weight vest may be used during warm weather. Vest must meet ANSI 107-1999 Standard and BART System Safety Requirements. A high-visibility vest is required when:

- Working on or about the right-of-way, main line tracks and/or in yards.
- Working near highway vehicle traffic, station parking lots.

[14] BART System Safety Program Plan, February 1, 2008.

[15] BART Operations Rule Manual, Section 6200.

[16] BART Accident Investigation Final Report (Sept. 5, 2001), at p. 7.

along the wall while a train passes at the location where the roadway worker was struck by the train.[17]

Probable Cause

The accident investigation report[18] identified the most probable cause of this accident as the failure of the wayside maintenance crew to detect the approaching train and move to a safe location prior to its arrival.

Contributing Cause Factors

Contributing factors include the ambient noise from the approaching train and the sound from the ventilation fans, inattentiveness to surrounding conditions, reliance on Simple Approval rules, and the victim's inexperience with the work environment.

SACRAMENTO REGIONAL TRANSIT DISTRICT

SRTD'S JULY 24, 2008 FATAL ROADWAY WORKER ACCIDENT

A Sacramento Regional Transit District (SRTD) train struck and fatally injured a wayside maintenance worker just east of the Watt/I-80 West Station in Sacramento, California, on July 24, 2008. The train was operating normally in manual mode with no reported defects. The weather was sunny and clear and the view ahead was unobstructed. The wayside worker had walked to a point on the track between the rails with his back to the train when it was stopped approximately 260 feet away at the station platform, and was struck by the train as it left the station. Staff concluded from the operator's interview and the train's video recordings, that neither the wayside worker nor the train operator saw each other. The wayside worker was focused on lubricating the track[19] and the train operator had just received two text messages as the train departed the station and had been frequently using her cell phone during the trip.

Probable Cause

Staff has determined the most probable causes of this accident were:

- The requirement for the wayside worker to simultaneously attend to work tasks and approaching trains.
- SRTD's inadequate safety protection procedures, choices, and rules applicable and available to wayside workers.
- The wayside worker's choice of an inadequate level of protection, and his failure to detect approaching trains and move away from the track.

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[17] Id. at p. 14.

[18] BART System Safety Report, dated September 5, 2001

[19] "Lubricating the track" refers to the regular maintenance activity of placing grease on the curves of a track using a grease gun to reduce derailment potential and lateral forces, enhance wheel and rail life, increase fuel economy, and reduce noise and ground-borne vibration.

- The train operator's inattention to duties from use of her personal cell phone while operating the train.

Contributing Cause Factors

Additional contributing factors to this accident included:

- Absence of a program to collect, review, and develop corrective action plans for near-collisions and/or near-hit reports.
- Inadequate rules compliance testing of train operators.
- Lack of a rules compliance testing program for wayside workers.
- Setting working distance limits of approximately 6.5 miles in length for wayside workers. These long distances do not focus train operators' attention on the specific areas where workers are working at any one time, and likely decrease operator's ability to be sufficiently vigilant.
- Possible conflicting workload and scheduling incentives that may interfere with the choice of safe protection by wayside workers. Workers may be incented to choose protections that minimize schedule impacts but which do not maximize personal safety.
- Possible train operator inattention to duties from personal conversation with another SRTD employee on-board the train.

GEORGIA

The Metropolitan Atlanta Rapid Transit Authority (MARTA) fatal roadway worker accidents:

- MARTA'S fatalities on April 10, 2000.
- MARTA'S fatality on February 25, 2000.

MARTA'S APRIL 10, 2000 FATAL ROADWAY WORKER ACCIDENT

An unscheduled MARTA train struck the bucket of a self-propelled lift that was fouling the southbound main track at MARTA's Lenox Station, in Atlanta, Georgia, on April 10, 2000. Two MARTA contract workers who were repairing the station ceiling from the lift bucket were fatally injured when they were thrown from the bucket to the station platform.[20]

Probable Cause

The NTSB determined that the probable cause of the accident was MARTA's failure to require use of single-tracking safety procedures to protect the work site and the failure of the rail system control center assistant superintendent and the flagman to follow all MARTA safe clearance procedures for protecting workers fouling the track.

[20] NTSB Report Number RAB-03-02 (Aug. 18, 2003), http://www.ntsb.gov/publictn/2003/RAB0302.pdf.

Contributing Cause Factors

The NTSB also determined that MARTA's lack of an effective program to ensure that employees were complying with its safety rules contributed to the accident.

MARTA'S FEBRUARY 25, 2000 FATAL ROADWAY WORKER ACCIDENT

An eastbound MARTA train struck two automatic train control technicians who were inspecting signal equipment on the main track in Decatur, Georgia on February 25, 2000. One of the technicians was killed and the other sustained serious injuries.[21] The technicians had not placed flagging devices to warn train operators of their presence and had not placed shunts on the rail to activate the signal system warning approaching trains.[22] The technicians also failed to request a safe clearance restriction from the operation control center for the inspection.[23]

Probable Cause

The NTSB determined the probable cause to be the failure of MARTA to ensure that written safe clearance procedures were followed for employees doing inspections on the right-of-way.[24]

Contributing Cause Factors

Although not mentioned in the NTSB's Accident Report, the roadway workers' failure to place flagging devices and/or shunts and their failure to request a safe clearance restriction contributed to the accident.

ILLINOIS

CHICAGO TRANSIT AUTHORITY'S FEBRUARY 26, 2002 WORKER ACCIDENT

A Chicago Transit Authority (CTA) Green Line train struck two signal maintainers in the Chicago Loop on the night of February 26, 2002. One maintainer fell from the elevated loop structure onto a parked automobile and was seriously injured. The signal maintainers failed to place flashing yellow lights to warn train operators of the track work as required by CTA rules.[25] CTA did not have any written procedures requiring that a safety lookout be designated.[26]

Probable Cause

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[21] NTSB Report Number RAB-03-03 (Aug. 8, 2003), http://www.ntsb.gov/publictn/2003/RAB0303.pdf .

[22] Id. at p. 3.

[23] Id. at p. 1.

[24] Id. at p. 8.

[25] NTSB Report Number**:** RAB-03-04 (Feb. 6, 2004), http://www.ntsb.gov/publictn/2003/RAB0304.pdf .

[26] Id. at p. 3.

The NTSB determined that the probable cause of the accident was the failure of the signal maintainers to watch for approaching trains and their failure to obey the CTA's rule that they increase their visibility by displaying a flashing yellow warning light.[27]

Contributing Cause Factors

The NTSB further found that contributing to the maintainers' reduced awareness of oncoming trains was the absence of clear requirements regarding the designation of safety lookouts and the use of interlocking signals to protect work areas.[28]

MASSACHUSETTS

THE MASSACHUSETTS BAY TRANSPORTATION AUTHORITY'S (MBTA'S) FATAL ROADWAY WORKER ACCIDENT OF JANUARY 9, 2007.

A southbound Massachusetts Bay Transportation Authority passenger train operated by the Massachusetts Bay Commuter Railroad struck a track maintenance vehicle performing track work on January 9, 2007. Six maintenance-of-way employees were working on or near the track maintenance vehicle. Two employees were killed and two were seriously injured.[29] The accident caused significant service interruption. Property damage was also substantial, with the estimated damages to track and equipment totaling over $500,000.

Probable Cause

The NTSB determined that the probable cause of this accident was the failure of the train dispatcher to maintain blocking that provided signal protection for the track segment occupied by the maintenance of way crew, and the failure of the work crew to apply a shunting device that would have provided redundant signal protection for their track segment.

Contributing Cause Factors

The NTSB found the Massachusetts Bay Commuter Railroad's failure to ensure that maintenance-of-way work crews applied shunting devices as required was a contributing factor to the accident.[30] Finally, the NTSB found that maintenance-of-way crews on all railroads who depend on the train dispatcher for signal protection need redundant protection (e.g., shunting devices) to restrict train movements into work areas.[31]

NEW YORK

New York City Transit's (NYCT's) fatal roadway worker accidents:

- NYCT's fatality on April 24, 2007

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[27] Id. at p. 4.

[28] Ibid.

[29] NTSB RAR-08/01 (March 18, 2008), http://www.ntsb.gov/publictn/2008/RAR0801.pdf .

[30] Id. at p. vi.

[31] Id., Finding #6 at p. 22.

- NYCT's fatality on April 29, 2007

NYCT'S APRIL 24, 2007 FATAL ROADWAY WORKER ACCIDENT

A veteran NYCT track worker was struck by a train and killed while setting up lanterns to warn trains to slow down in advance of a trackside work area on April 24, 2007. A local train had stalled due to brake problems and a train behind it was diverted to the express track. Central control personnel did not know the trackside workers had begun work, and the diverted train could not stop in time to avoid hitting the worker.[32]

Probable Cause

A Board of Inquiry into the accident determined that the probable cause of the accident was the roadway worker's belief that southbound revenue service had ended.

Contributing Cause Factors

The Board of Inquiry found as a contributing factor that the job supervisor failed to properly follow flagging procedures. Further, not all roadway workers—supervisory or nonsupervisory—were supplied with radios.[33]

NYCT'S APRIL 29, 2007 FATAL ROADWAY WORKER ACCIDENT

Another veteran NYCT worker, a painter, was killed instantly on April 29, 2007, when struck by a train that had just come around a sharp curve. The view of the train operator was obscured by the station platform, and no warning signals or devices had been set to warn the train operator of the work being performed. The train also struck and seriously injured a second roadway crewmember. [34]

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[32] "Fatal Injury Track Worker Daniel Boggs, Pass # 080662, April 24, 2007, Board of Inquiry Final Report (July 31, 2007)", http://www.nytimes.com/packages/pdf/nyregion/city_room/20070802_boggsreport.pdf ; see also: *The New York Times*, Stalled Train May Have Played Part in Track Worker's Death (April 26, 2007), http://www.nytimes.com/2007/04/26/nyregion/26worker.html?scp=1&sq=NYCT%20accidents%20April%202007&st=cse .

[33] "Fatal Injury Track Worker Daniel Boggs, Pass # 080662, April 24, 2007, Board of Inquiry Final Report (July 31, 2007)", *supra*, p. 2 of 24.

[34] "Fatal Injury Track Worker Marvin Franklin, Pass # 291103, April 29, 2007, Board of Inquiry Final Report (July 31, 2007)", http://www.nytimes.com/packages/pdf/nyregion/city_room/20070802_frankllinreport.pdf ; see also: *The New York Times*, Worker Is Killed by a G Train in Brooklyn (April 30, 2007), http://www.nytimes.com/2007/04/30/nyregion/30train.html?scp=3&sq=NYCT%20accidents%20April%202007&st=cse ; and *The New York Times*, After a Four-Day Safety Review, Subway Work Is Resuming (May 4, 2007), http://www.nytimes.com/2007/05/04/nyregion/04transit.html .

Probable Cause

The Board of Inquiry found that the probable cause of the accident was the supervisor's abandoning of his flagging responsibilities.[35]

Contributing Cause Factors

NYCT's investigation found "clear deficiencies in flagging activities, including adjacent track flagging, caution lights and portable train trip positioning relative to the work area, and poor compliance with flagging requirements identified during the pre-job inspection."[36] An NYCT employee survey also revealed a perception among employees that employees who only perform flagging jobs are much better flaggers and, as a result, flagging for contractors is stronger than flagging by NYCT employees. The employee survey also noted that near-hit incidents are frequent and most go unreported due to a fear of reprisal, a feeling that "nothing will get done," or a desire not to get a coworker in trouble.[37]

WASHINGTON D.C.

The Washington Metropolitan Area Transportation Authority's (WMATA's) fatal roadway worker accidents:

- WMATA's fatality on August 9, 2009
- WMATA's fatalities on November 30, 2006
- WMATA's fatality on May 14, 2006

WMATA's AUGUST 9, 2009 FATAL ROADWAY WORKER ACCIDENT

A Washington Metropolitan Area Transit Authority (Metro) roadway worker was struck and killed by ballast regulator vehicle on August 9, 2009, while he was replacing cross ties on the Metro system's roadway.

Neither the probable cause nor the contributing causes have yet been determined in this accident, although it is apparent that the worker was working on the track did not do what was necessary to avoid being struck by the approaching ballast regulator.

WMATA's NOVEMBER 30, 2006 FATAL ROADWAY WORKER ACCIDENT

A northbound Metro Yellow Line subway train struck and killed two Metro employees performing a walking inspection of the track on November 30, 2006. The northbound train was traveling along track normally used for southbound trains.

Probable Cause

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[35] "Fatal Injury Track Worker Marvin Franklin, Pass # 291103, April 29, 2007, Board of Inquiry Final Report (July 31, 2007)", *supra*, p. 2 of 33.

[36] FTA's Rail Transit Safety Quarterly Newsletter (Fall 2008), *supra*, p. 11.

[37] Ibid.

The NTSB determined that the probable cause of this accident was the failure of the walking track inspectors to maintain an effective lookout for trains and the failure of the train operator to slow or stop the train until she could be certain that the track workers were aware of the train's approach and had moved safely aside.[38] Both track workers had previously called the Metro Control Center to receive permission to walk on the track. The Control Center made blanket radio announcements to train operators notifying them of the work and the approximate location of the track workers. The operator of the northbound train which struck the track workers stated that she did not recall having heard the radio announcements.

Contributing Cause Factors

The NTSB also determined that Metro's announcement system for on-track work was insufficient to protect wayside workers.[39] Among other things, the NTSB determined that Metro's wayside worker rules did not consider the fact that "trains being operated at normal speeds may not be able to stop short of wayside workers who are unaware of the train's approach and have failed to move to a safe area."[40] More importantly, the NTSB criticized Metro's wayside worker rules and procedures because they did not require that a lookout be assigned to help protect the track inspectors who were performing their inspection while simultaneously watching for the approach of trains in both directions.[41]

WMATA's MAY 14, 2006 FATAL ROADWAY WORKER ACCIDENT

WMATA's southbound Metro Red Line subway train struck and killed an automatic train control mechanic at the interlocking north of the Dupont Circle station on May 14, 2006. Two other mechanics remained clear of this southbound Metro train traveling at 40 mph. The mechanic struck by the Red Line train did not clear the track.

Probable Cause

The NTSB determined that the probable cause of the accident was the mechanic's failure to stay clear of the approaching southbound train either because he was not aware of the presence of the train or because he lacked a physical reference by which to identify a safe area outside the train's dynamic envelope.[42]

Contributing Cause Factors

The NTSB determined that the contributing causes to this accident were the same as those referred to in the November 30, 2006 accident, *supra*.

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[38] Ibid.

[39] Ibid.

[40] Id. at p. 4.

[41] Ibid.

[42] NTSB R-08-01 through -04 (January 30, 2008), http://www.ntsb.gov/recs/letters/2008/r08_1_4.pdf .

COMMENTS TO THE RULEMAKING

The Rail Transit Agencies (RTAs) and BART's Service Employees International Union (SEIU) Local 1021 labor union submitted comments to the Rulemaking. Those comments are summarized below.

BART & SEIU 1021

SEIU Local 1021 submitted comments in this proceeding in which it noted that BART had received over 32 safety violation citations since 2003. SEIU 1021 recommended that the CPUC and California Department of Occupational Safety and Health (DOSH) join together to improve BART's safety record through more stringent enforcement of existing safety rules. SEIU 1021 emphasized that on January 30, 2008, in an incident that took place in the trackway near Daly City Station, eight DOSH citations were issued to BART because a roadway worker crew had been found working without any roadway work training.[43]

BART, on the other hand, stated that no new rules or protections are needed and that any rules other than those of the Federal Railroad Administration (FRA) or American Public Transportation Association (APTA) could result in duplication or conflict.[44] BART also opposes application of FRA roadway worker protection rules to its system and recommends the APTA draft rules apply instead with allowances for variances in RTA operations.[45]

LACMTA

The Los Angeles County Metropolitan Transportation Authority (LACMTA) states that new rules are not necessary, and further states that because the RTAs "have established the necessary protections for roadway workers . . . the adequacy of existing rules greatly depends" on the extent roadway workers obey the existing rules. (LACMTA Comments, March 30, 2009, at pp. 2-3.) Further, LACMTA questions the implementation of new technological roadway worker protections because it is a "one-size-fits-all" approach which fails to address each RTA's varying operating environments. Finally, LACMTA notes that two separate efforts are underway to develop roadway worker protection standards, the APTA draft rules and new proposals by the FTA.

SCVTA

The Santa Clara Valley Transportation Authority (SCVTA) states that no new roadway worker protections are necessary. SCVTA calls for strict compliance with existing protections.[46] However, SCVTA does note that ongoing reviews of RTA roadway worker protections are important and that "the adoption of new technologies is necessary to maintain high safety

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[43] SEIU Comments (April 17, 2009) at pp. 2-3.

[44] BART Response to CPUC Data Request (Sept. 14, 2009) at p. 3.

[45] BART Response to Rulemaking (April 2, 2009) at p. 8.

[46] SCVTA Comments (March 31, 2009) at p. 3.

standards."[47] Finally, SCVTA states that if new rules are required by the Commission, that they should be consistent with both FRA and (the draft) APTA roadway worker rules and provide for a lead time before implementation of at least six months.[48]

SDTI

The San Diego Trolley's (San Diego Trolley Inc., or SDTI) position is that its current protections have "proven to be effective in providing [protection to] workers on or near the right-of-way... provided all the established rules/procedures are followed."[49] SDTI also notes that its Roadway Worker On-Track Safety Plan (Plan) was approved by the FRA.[50] SDTI is confident that if its Plan is followed every time, roadway worker incidents will be eliminated.[51] Staff notes that SDTI's Plan allows for Lone Workers but requires such single workers to be trained, qualified, and specially permitted to use self-protection. SDTI supervisors regularly observe flag personnel and meet with flaggers on a weekly basis to discuss roadway worker protections and procedures.[52]

SRTD

The Sacramento Rapid Transit District (SRTD) states that existing roadway worker protections are adequate.[53] If additional protections are required, SRTD recommends random periodic operational evaluations of roadway workers as a means of determining worker rules compliance, and states that such a program could be implemented within 60-90 days.[54] SRTD also contends that there are special circumstances and procedures specific to each RTA that "should be considered during any review and approval process" for new regulations.[55] SRTD has looked at technologies for early warning of approaching trains but concluded that this technology did not provide consistent and adequate warning of approaching trains.[56] Finally, SRTD recommends that "the Commission not adopt a specific roadway worker protection program which would be imposed on all RTA's . . . but, rather, "review and accept each RTA's roadway worker protection program" as it presently exists.[57]

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47 Ibid.

48 Id. at p. 4.

49 SDTI Comments (March 27, 2009) at p. 1.

50 Id. at p. 2.

51 Ibid.

52 Ibid.

53 SRTD Comments (March 31, 2009) at p. 2.

54 Ibid.

55 SRTD Comments to CPUC Data Requests (Aug. 13, 2009) at p. 3.

56 Id. at p. 4.

57 Id. at p. 6.

DISCUSSION

ACCIDENT ANALYSIS SUMMARY

The twelve accidents described in the Roadway Worker Accident section of this report demonstrate the futility of requiring roadway workers to attend to their personal safety at the same time that they are required to attend to a work task. These cases demonstrate that workers cannot dedicate sufficient attention to both tasks, and need protection that will allow them to perform the work itself without being responsible for two incompatible tasks.

Each accident would likely have been prevented if independent dedicated lookouts and proper flagging procedure protections were employed. Staff has tailored its recommendations to prevent recurrences of these types of accidents as described in the following sections.

SYSTEMS APPROACH

A systems approach to safety analysis requires that all possible aspects of an operation and organization be examined and assessed for accident prevention potential.[58] Unfortunately, organizations sometimes close accident investigations after finding that an existing rule had been violated. Examples of this short-sighted approach were expressed in more than one RTA's comments, where they assert that for accident prevention, workers just need to obey the existing rules. In contrast, a systems approach examines many different aspects of the situation, including not only the worker, but the work situation, task demands, the environment, human limitations and capabilities, and the certainty of human error. A systems approach would examine the task demands and ensure that they do not impede a worker's ability to follow the rules. Such an approach would examine incentives and disincentives for rule compliance, the existing safety culture, supervisor and peer behavior modeling, and all possible procedures and devices that might preclude the opportunity for human error, minimize any impact, or both.

FUNDAMENTAL ATTRIBUTION ERROR

Psychologists have long recognized that individuals tend to "blame the victim," or in their words, attribute too much outcome responsibility to the person. The "fundamental attribution error" is defined as the "pervasive tendency to 'overattribute' behavior to the personal dispositions" of those whose actions are being considered or observed.[59] Observers tend to focus on the individual's actions and not on the whole system. Accident investigators are likely to have the tendency to overlook human capabilities and limitations, conflicting demands, situation complexity, training effectiveness, and other factors that affect behavior. Investigators

[58] See, for example, *Basic Guide to System Safety*, by J. Vincoli, CSP, 2nd edition, March 2006, Wiley.

[59] Ross, L. The intuitive psychologist and his shortcomings. In L. Berkowitz (ed.), *Cognitive theories in social psychology*. New York: Prentice-Hall, 1978.

may tend to overlook the possibility that when all factors are considered, those factors may explain the accident cause better than the individual's actions.

Investigators may also focus on what is obvious after the accident has occurred and not on the victim's reasonably expected state and the entire situation leading up to the accident. The lay expression "hindsight is 20/20" has been researched and confirmed by psychologists as the "hindsight bias."[60] Investigators and policy makers must avoid this bias not only because it depends on an inadequate model of human behavior, but also because it discourages exploration of all the possibilities for prevention, and instead focuses on more simplistic singular after-the-fact attributions. Claims that workers "just need to follow the rules" reveal wishful thinking, not sound analysis on which policy should be based.

CONCLUSION

Roadway workers must be protected by the best procedures and devices, not by wishful thinking about perfect rules compliance, especially when the work assignment itself is a safety distraction.

UNOBSERVED APPROACHING TRAINS

In the accident descriptions presented in this report, a consistent reason that rail transit workers were hit by transit trains was workers' lack of awareness of approaching trains. Contributing to this cause in most cases was train operators' lack of awareness of workers' presence and insufficient time to slow and stop the train before striking those workers. Directing roadway workers or contractor employees to perform jobs on or near active track, while at the same time directing them to be conscious of possible approaching trains, has not worked to adequately protect roadway workers from being struck by trains. When job tasks divert attention away from safety vigilance, safety suffers. Self-protection is inadequate, dangerous, and has proven to have fatal consequences. Therefore, staff has determined that alternative protections are required.

Most of the RTAs' roadway worker protections were appropriated from the railroad industry. However, although similar, the railroad and rail transit industries are not identical. Rail transit systems are generally constructed in complex densely-populated urban environments. The construction and equipment of RTA trains are very different from railroad passenger and freight trains. They operate more frequently and commonly in areas congested with motor vehicles, pedestrians and/or bicycles such as Sacramento's "K" Street Mall. While they can stop in shorter distances than railroad trains, they also accelerate faster and sometimes operate in lanes adjacent to or shared with motor vehicle traffic. Few RTAs have automatic train control systems that provide central or dispatching offices with the location of the trains. RTAs often operate on aerial or in underground structures which have limited clearances for employees

[60] Fischhoff, B. (1975). Hindsight ≠ foresight: The effect of outcome knowledge on judgment under uncertainty. *Journal of Experimental Psychology: Human Perception and Performance*, Vol. 1, pp. 288 - 299. See also, Kahneman, D., Slovic, P., & Tversky, A. (Eds.), *Judgment under Uncertainty: Heuristics and biases*. Cambridge: Cambridge University Press, 1982.

working on or near track. The railroad industry has superior train control, better communications,[61] greater resources, and in many cases, superior roadway worker protection training.

Railroad rules for roadway workers, termed "Lone Worker,"[62] "Train Line-ups,[63] and "Definite Train Location,[64] rely on employees to protect themselves from being struck by approaching trains. RTAs utilize similar procedures requiring rail transit workers to protect themselves from being struck by trains. These self-protection procedures have not provided sufficient protection[65] for rail transit roadway workers and contractor employees and should be replaced by rules and procedures requiring the presence of lookouts, proper placement of flags, and the pre-establishment of safe refuge areas.

SELF-PROTECTION PROCEDURES

BART's Simple Approval Protection

BART's Simple Approval permits its roadway workers to access trackways[66] or restricted areas containing remotely controlled or monitored trains. The individual roadway worker requesting Simple Approval has the sole responsibility to perform the job function and simultaneously watch for approaching trains. No other protection is provided. The roadway worker depends exclusively on his/her own ears and eyes to avoid a collision with an approaching train. BART's

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[61] "Roadway workers communicate with dispatchers to obtain and release track occupancy authority, as well as to communicate track problems that may require speed restrictions to be put in place or track to be taken out of service." *Communication and Coordination Demands of Railroad Roadway Worker Activities and Implications for New Technology*, USDOT, FRA, Office of Research & Development (Nov. 2007), p. 2.

[62] "An individual roadway worker who is not being afforded on-track safety by another roadway worker, who is not a member of a roadway work group, and who is not engaged in a common task with another roadway worker." American Public Transportation Association's (APTA's) *Standard for Roadway Worker Protection Requirements* (May 2009 Draft), Rule 3.1.10. See also: APTA Draft Rule 4.5.7. *On-Track Safety for Lone Workers*; and 49 C.F.R. Parts 214.337(a) through 214.339.

[63] See 49 C.F.R. Parts 214.333 through 214.335. Informational train line-ups are to be discontinued by a date certain and a $5,000 penalty may be assessed for failure to discontinue its use. 49 C.F.R. Part 214, App. A.

[64] See 49 C.F.R. Part 214.331. The FRA's criteria for using "definite train location" precludes its use by transit agencies, i.e., definite train location may not be used if the number of trains exceeds three in any none-hour period.

[65] For example, the three California fatalities discussed *supra* were the result of the transit agency's reliance on employee self-protection.

[66] Trackway means the mainline portion of the BART system within protective fencing, tunnels, tubes, subways, stations or aerial structures where trains operate. BART Operations Rules and Procedures, Revised January, 2008.

Simple Approval rule prohibits the roadway worker from "fouling"[67] the track unless the worker is able to detect an approaching train or on-rail equipment with sufficient time to move to a predetermined location clear of the track[68] fifteen seconds before a train or on-rail equipment operating at the maximum authorized speed on that track could arrive. BART effectively relies on the rule to prevent trains from striking roadway workers. Thus, Simple Approval places the entire burden of safety on the roadway worker. There is no automatic train stop system or warning system to slow or stop trains for wayside workers nor any other automatic safety procedure to prevent injury to wayside workers. More importantly, neither human error nor worker distraction is taken into consideration. In short, there is no margin of error in BART's application of Simple Approval.

BART's Recent Changes to Simple Approval

Subsequent to their accidents, BART has included additional requirements for Simple Approval authority to limit its use by roadway workers. Roadway work that requires fouling the track may only be performed using Simple Approval when roadway workers are in a group of at least two persons with at least one person acting as a watchperson. After the 2001 accident, BART designated some areas as No Simple Approval areas, including tunnel areas similar to the 2001 accident site.

Additionally, roadway workers must be informed when working on the main line whenever trains are reverse-running[69] through the authorized work location with no more than two parallel tracks. However, Simple Approval for individual roadway workers continues to be permitted for work in areas with fewer than two parallel tracks, work on a designated walkway, or work that does not "require" fouling the track.

SRTD'S Wayside Procedure Advisory

The roadway worker involved in the July 24, 2008, accident described earlier in this report had requested and was granted Wayside Procedure 8.00 Advisory[70] in compliance with SRTD rules and procedures.[71] The use of this rule was the sole protection for the two workers during this

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[67] Fouling a track means placing an individual or an item of equipment in such proximity to a track that the individual or equipment could be struck by a moving train or on-rail equipment. BART Operations Rules and Procedures, Revised January 2008.

[68] BART rules defines *clear of track* as "a location with at least 44 inches between you and the nearest running rail when a walkway with a handrail or other means of support/reference is present (wall, fences or in the case of yards and local control areas, a stationary train appropriately protected from movement). For all other conditions, Clear of Track is defined as a location with at least 60 inches between you and the nearest running rail. These dimensions are for straight track; on curved track, additional clearance needs to be added for carbody overhang." BART Operations Rules and Procedures, Revised January 2008.

[69] The operation of a train in other than the normal direction of travel.

[70] SRTD Rail Operations Rules, Section 8, Wayside Procedure 8.00 Advisory.

[71] SRTD Rail Operation Rules, revised 10/1/08.

incident. Wayside Procedure 8.00 Advisory provided the wayside maintenance employees the least amount of protection of any SRTD Wayside Procedure. As with BART's Simple Approval, the responsibility for protection against approaching trains under this rule rested solely with the wayside maintenance employee.

The Wayside Procedure 8.00 Advisory also requires the control center operator to radio notification to all trains in the area. However, train operators are not required to respond affirmatively or to record the Advisory in their logs. Thus the burden of safety lies with the wayside maintenance worker when the Advisory is used. The train operator in the 2008 accident later stated that she did not hear the Advisory. The controller announced the Wayside Procedure 8.00 Advisory at 12:11 pm. During that time, the train operator was operating the train on the Watt/I-80 to Meadowview route, having departed the Watt/I-80 Station at 11:29 a.m. The Wayside Procedure 8.00 Advisory notification to the trains in the area was only eight seconds in duration and covered any work occurring in 6.5 mile long stretch of track without any more detail regarding where the workers were located.

SRTD'S Changes to Wayside Worker Procedures

SRTD suspended the use of the Wayside Advisory 8.00 following this accident. Additionally, SRTD has made substantial changes to its wayside worker protection rules by eliminating advisory-only protection rules. All wayside work is currently announced in a bulletin which is recorded on the control log and acknowledged by all train operators. SRTD now requires a lookout or flagperson for all wayside work performed with the exception of tool-free inspections. All bulletins are now limited to one hour in duration, are re-issued if the work goes longer than one hour, and are specific to the work zone.

LOOKOUTS/WATCHPERSONS RULES

Many, if not all, of California's rail transit agencies use lookouts and watchpersons to protect roadway workers and contractor employees performing work on or near tracks. Procedures for the use of lookouts and watchpersons are described in both the C.F.R. for railroad workers (49 C.F.R. Parts 214.329, 214.349, and 214.353) and the American Public Transportation Association's (APTA's) Draft roadway worker protection procedures (watchperson/lookout rule sections 3.1.20, 3.1.21, and 4.4).[72] Most California rail transit agencies have written procedures for lookouts and watchpersons. However, the use of lookouts and watchpersons is not required by regulation as it is in the C.F.R. for railroads, and thus are not always used when they could provide safety benefit. Staff does not intend to modify these well-established rules and procedures except to require that lookouts and watchpersons be required whenever rail transit employees come within ten feet of track and within five feet of street-running track.

Further, the lookout/watchperson should be on duty to warn of approaching train at all times. If there is only one lookout/watchperson and he or she must leave this duty for any length of time, the roadway workers must move to the safe refuge area during the absence of the lookout/watchperson. No roadway work may be performed, and all roadway workers must move to a safe refuge area in the absence of an on-duty and observant lookout/watchperson. Finally, the lookout/watchperson requirement should apply at all times without regard to revenue or non-revenue service.

FLAGGING RULES

The RTAs' existing flagging rules, adopted from railroad flagging rules, are complex and cumbersome for rail transit purposes. Appendix B, *infra*, discusses these existing rules in comparison to those proposed here.

FLAGS

The different colored flags used in railroad roadway work: green, white, yellow, red,[73] and blue,[74] are confusing and not all of these color signals are necessary for rail transit operations.

Railways use a number of colored flags. When used as wayside signals they usually use the following meanings (exact meanings are set by the individual railroad company):

- Red = stop.
- Yellow = proceed with care.
- Green or white = proceed.

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[72] Standard for Roadway Worker Protection Program Requirements, prepared by the American Public Transportation Association's Rail Transit Standards Operating Practices Committee, dated May 4, 2009.

[73] "Flagman's signals means a red flag by day and a white light at night, and fusees as prescribed in the railroad's operating rules." 49 C.F.R. Part 218.5.

[74] See 49 C.F.R. Parts 218.21 et seq. and Appendix B, *infra*.

- A flag of any color waved vigorously means stop.
- A blue flag on the side of a locomotive means that it should not be moved because someone is working on it (or on the train attached to it). A blue flag on a track means that nothing on that track should be moved. The flag can only be removed by the person or group that placed it.
- At night, the flags are replaced with lanterns showing the same colors.

See: Wikipedia, *Railway Flags*.

The railroads, Union Pacific Railroad, BNSF, Amtrak, SRTD, and SCVTA, use these flags. However, not all of these color signals are necessary for rail transit operations. Likewise, there is no need to distinguish between track maintenance workers[75] and vehicle maintenance workers (those performing work on rail transit vehicles while on the road and away from the yard) for rail transit purposes. (See Appendix B, *infra*.) Staff proposes the use of the following colors for signal flags or cones in all rail transit operations.

- Yellow-Red: to warn the train operator to slow and be prepared to stop.
- Red: to signal the train operator to stop.
- Green: to signal the train operator to resume speed.

RTAs should use the following flags:

- A flag made of yellow and red material, a flag of red material, and a flag of green material—all of these flags must be clearly visible from a distance as a warning signal; and/or
- a plastic cone either yellow-red in color or topped with a yellow-red flag, a plastic cone either red in color or topped with a red flag, a plastic cone either green in color or topped with a green flag, and all of these cones and flags must be clearly visible from a distance as a warning signal; and/or
- a flashing light which is clearly observable from a sufficient distance to perceive, react, and stop movement.
- Roadway work performed after dark, in tunnels, or in locations with low ambient light levels shall consist only of flashing lights of the same color as required for flags, except yellow may be used to represent yellow-red, and shall be clearly visible from a distance as a warning signal.

[75] 49 C.F.R. Part 214.7 defines roadway worker as "any employee of a railroad, or of a contractor to a railroad, whose duties include inspection, construction, maintenance or repair of railroad track, bridges, roadway, signal and communication systems, electric traction systems, roadway facilities or roadway maintenance machinery on or near track or with the potential of fouling a track, and flagmen and watchmen/lookouts as defined in this section."

- These rules should apply at all times without regard to revenue or non-revenue service.

FLAG PLACEMENT

Yellow-Red Warning Flag Placement

The yellow-red warning flag should be placed in both directions on the track on which roadway work is being performed such that an approaching train will slow and be able to safely stop in advance of the workers on or near the track or adjacent track.

Red Warning Flag Placement

In situations where there is a machine on or fouling the track, or in circumstances in which roadway workers can not safely move to a safe refuge area before a train may arrive, or for any reason requiring trains to stop in advance of the roadway work being performed, a red warning flag shall be placed in both directions on the track such that an approaching train will be able to safely stop in advance of the work being performed.

Green Warning Flag Placement

A green flag may be placed outside the work area designated by the placement of yellow-red warning flags to signal to the train operator that normal speed may be resumed.

Adjacent Tracks Requiring Flag Placement

All adjacent tracks within ten (10) feet of either rail of a track where work is being performed shall also be flagged with yellow-red and green signal flags.

OTHER REGULATORY DEVELOPMENT

More than one RTA raised the prospect of Federal Transit Administration (FTA) roadway worker protection regulations as obviating the need for Commission regulation. However, the FTA currently does not have authority to directly regulate rail transit safety, and that legislation to give the FTA such authority is in the early stages, just having been introduced December 2008.[76] Additionally, proposed legislation that would require federal safety oversight of RTAs provides that the States may establish more stringent safety standards.[77] Finally, in the FTA's discussion of the direction of rail transit regulation, the agency states that California's rail transit regulatory program, which includes its rulemaking authority, is a model for regulation, the "gold standard" for state rail transit safety oversight.[78]

More than one RTA also suggested that APTA's roadway worker protection efforts should suffice. Staff maintains that independently developed and mandated minimum safety

[76] http://www.fta.dot.gov/regional_offices_10891.html

[77] See: http://testimony.ost.dot.gov/final/PelosiTransit.PDF

[78] See the statements of FTA Administrator Peter Rogoff in the video of the hearing on the new proposed FTA legislation at: http://transportation.house.gov/hearings/hearingDetail.aspx?NewsID=1060 .

requirements are essential for roadway worker safety. Voluntary guidelines, especially when modifiable by each agency, do not provide enough assurance that safety will be preeminent.[79]

ROADWAY WORKER PROTECTION RECOMMENDATIONS

RECOMMENDED PROTECTIONS

Staff recommends that RTAs adopt and include in their roadway worker protection rules and procedures the following:

1) LOOKOUTS/WATCHPERSONS: Adopt and enforce a rule or rules requiring the presence of "lookouts/watchpersons" to protect all employees performing work within ten feet of track (five feet for street-running track).

2) FLAGGING: Adopt and enforce a rule or rules requiring the "placement of flags or other easily observable warning devices" in advance of the roadway work being performed such that an approaching train operator can observe, react, slow, and be able to safely stop in advance of the workers on or near the track or adjacent track. Existing rules for flagging should be simplified and modified pursuant the discussion in FLAGGING RULES, supra.

3) SAFE PLACE OF REFUGE: Strictly enforce existing rail transit rules and procedures requiring the workers to predetermine a "safe place of refuge" the worker may move to at least 15 seconds before an approaching train would arrive.

4) SEPARATE ROADWAY WORKER MANUAL: Adopt and maintain a separate manual containing all necessary roadway worker safety procedures and rules, make them freely available to roadway workers, and ensure that roadway workers have easy access to the manual when performing job functions.

5) RIGHT TO CHALLENGE:[80] Provide and ensure that rail transit roadway workers have a right to challenge in good faith whether

[79] The importance of independent safety oversight is described in *Analysis of Senate Bill SB-53: Submission to the California Research Bureau*, California Public Utilities Commission, Consumer Protection and Safety Division, Richard W. Clark, Director, March 20, 2009.

[80] The "Right to Challenge" is separate and distinct from the "Whistleblower" protections under Federal and California law (see *Burlington Northern & Santa Fe Ry. v. White*, 548 U.S. 53, 57 (2006)). Under whistleblower protections, every employee in California (with certain limited privilege exceptions) is entitled to disclose to government agencies any information that the employee has a reasonable cause to believe may disclose a violation of state or federal law, rule, or regulation. The employer may not retaliate against the employee for exercising disclosure under the law. If the

the on-track safety procedures to be applied provide adequate safety and comply with RTA safety procedures and rules.

6) TRAINING IMPROVEMENT: Improve the training of roadway worker supervisors and job foremen as described below. Improve the training of roadway workers as described below.

7) NEAR-HIT REPORTING PROGRAM: Establish a Near-hit Reporting Program as provided below.

8) TECHNOLOGICAL/ELECTRONIC WARNING DEVICES: Test, implement, and install "technological/electronic devices that warn roadway work crews of the imminent arrival of an approaching train."

Existing RTA rules and procedures that are inconsistent with these recommendations should be removed.

IMPROVED TRAINING REQUIREMENTS

Staff recommends that each RTA ensure that its on-track safety training program for roadway workers enables each worker to understand the hazards of the required job duties and the methods to safely carryout those duties.

Staff recommends that each RTA ensure that roadway worker safety trainers have adequate experience, understanding, and knowledge of safe roadway working rules and procedures to properly train and test less experienced roadway workers.

Staff recommends that each RTA adopt a "worker safety training program" to provide feedback from both the trainers and roadway workers to gauge the success of an on-track safety training program. Each RTA at a minimum shall perform safety training on a yearly basis.

Finally, staff recommends that each RTA adopt a "compliance testing program" to determine whether roadway workers fully comply with applicable roadway worker safety rules and procedures and to determine the adequacy and success of the on-track safety training program. Each RTA at a minimum should perform compliance testing monthly, quarterly and yearly at varying levels to determine worker compliance with the rules and procedures.

NEAR-HIT REPORTING PROGRAM

Current CPUC General Orders and the FTA's State Safety Oversight regulations, 49 CFR Part 659 et seq, require RTAs to implement hazard management programs, but the existing programs have not captured, analyzed and provided corrective actions for near-hits. Only two of the eleven RTAs in California stated they have near-hit programs. Other RTAs claim that they utilize internal programs but there is no evidence supporting the claim that those programs encourage reporting, result in an appropriate record of employee reports, or record the reports with the resultant corrective actions.

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employer retaliates, the employee may be entitled to reinstatement and back wages and the employer may be fined up to $10,000 in civil penalties and prosecuted criminally. (Cal. Lab. Code §§ 1102-1105.)

The FRA began implementing a close-call reporting program in December, 2008. The FRA's Confidential Close-Call Reporting System (C^3RS) is a trial program with the Union Pacific and the Canadian Pacific Railroads. C^3RS attempts to implement a collaborative problem-solving approach to improving safety.[81] It is a safety pilot program designed to give rail employees the ability to voluntarily and anonymously report "close call" incidents that could have resulted in an accident but did not. The FRA states that early indications are that it can be implemented successfully and that it does lead to root-cause analysis and corrective actions with respect to close-calls. The FRA further states that the program has had a positive effect on labor and management collaboration in safety improvement efforts and how organizations embrace a safety culture.[82] The FRA concludes that the program can be implemented successfully.[83]

U.S. Transportation Secretary Ray LaHood testified to the program's success, citing New Jersey Transit's participation in the C^3RS Project, and saying, "We are excited that New Jersey Transit is taking part in this voluntary program that has already proven to reduce injuries and save lives. We hope that others will follow suit and strengthen our efforts."[84]

Staff recommends that each RTA establish a Near-hit Reporting Program for reporting and recording near-hit incidents that could have caused significant injury to rail transit employees including, but not limited to, close-call collisions between trains and motor vehicles, pedestrians, and bicycles, close-call collisions between trains, close-call collisions with rail transit workers, and close-calls in the use of roadway/railway maintenance equipment. This program should encourage rail transit employees to report such close-calls and should be free of disciplinary repercussions to the extent reasonable under the relevant factual circumstances.

ELECTRONIC WAYSIDE WARNING DEVICES

NTSB'S RECOMMENDATION

Following WMATA's Metro Red Line accident of May 14, 2006, in which a subway train struck and killed an automatic train control mechanic near the Dupont Circle station, the NTSB issued corrective measures; among them was the recommendation to promptly implement new technologies to warn roadway workers of approaching trains.

> Promptly implement appropriate technology that will automatically alert wayside workers of approaching trains and will automatically alert train operators when approaching areas with workers on or near the tracks. (R-08-04)
>
> (NTSB R-08-01 through -04, January 30, 2008, *supra*, at p. 8.)

The NTSB further stated:

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[81] U.S.D.O.T., FRA, Research Results, RR08-33 (Dec. 2008), http://www.fra.dot.gov/downloads/Research/rr0833.pdf .

[82] The Report states that safety culture is the accepted beliefs about how safety should be improved. Id. at p. 4.

[83] Ibid.

[84] FRA Press Release, Nov. 19, 2009, http://www.fra.dot.gov/us/press-releases/333 .

> Technology can provide additional protection for wayside workers, especially in a work environment in which a lapse of attention can quickly result in serious injury or death. In June 2006, the Federal Transit Administration provided funding to a manufacturer for early alarm system technology to automatically alert wayside workers of approaching trains, to alert train operators when they are approaching wayside work areas, and to detect train overspeed if the train operator does not respond appropriately to the work zone notification. There are two versions of early alarm technology presently available from this manufacturer.
>
> One version utilizes a portable track-mounted unit that can alert wayside crews of approaching trains, but it does not alert the train operator. This system uses a portable train detector that is attached to the running rail near the track work area. The train detector communicates with a portable warning light/horn unit located near the work crew of flagman/lookout. The train detector also communicates with a personal pocket device that can be carried by each wayside worker. When the portable track-mounted unit detects a train on the track, the warning light/horn unit and the personal pocket devices are activated to alert the wayside workers of the approaching train.
>
> The other version, mounted in the cab of the train, provides alerts to the train operator and the wayside workers. The system provides train operators with an audible and visual alarm when they are approaching wayside workers who are near the tracks and are wearing a personal pocket device. The system provides overspeed detection and alerts the wayside workers wearing a personal pocket device that the train is approaching. Pilot projects have been tested on several transit properties. The Massachusetts Bay Transportation Authority and the Maryland Transit Administration are installing this early alarm equipment system-wide.
>
> (NTSB R-08-01 through -04 (January 30, 2008), *supra*, at p. 7.)

"On-size-fits-all" Early Warning Technology

LACMTA's voiced opposition to a "one-size-fits-all" technology requirement in their comments described earlier in this report. Staff does not intend to impose any one technology on all RTAs; the proposed General Order provides individual agency flexibility.[85]

Technology Efficacy

SRTD commented that its review of early warning technology indicated the technology was unsatisfactory. Staff contends that SRTD's testing was insufficient to thoroughly test the technology, which is identical to that employed by RTAs nationwide including SCVTA. This issue is addressed in the General Order, since it explicitly provides for a testing process and review, as well as a four year period for implementation.

The RTAs voiced resistance in the workshop to using this technological improvement on the grounds that the system was not fail-safe and could result in roadway workers becoming complacent in protecting themselves from approaching trains. RTAs also raised financial constraints as an obstacle to funding the investment.

Staff disagrees with the RTAs' resistance to implementation of this new wayside warning technology. To the contrary, staff agrees with the analysis of the NTSB that this early warning alarm technology could help prevent accidents caused by roadway worker and train operator lapses in attention. The fact that the system is not fail-safe is not a reasonable basis for rejecting the technology. Safety systems that are not perfect may nevertheless provide additional levels of safety that may be useful in accident prevention.

This technology will provide a significant improvement in roadway worker protection, even though it may not alone entirely solve the problem of roadway workers being struck by trains. Notably, it will be one element in a program including strict enforcement of flagperson/watchperson, flagging, rules compliance testing, and safe place of refuge requirements,. Staff strongly recommends that the RTAs develop a testing and implementation process for installation of wayside early warning alarm technology within a reasonable time not to exceed four (4) years.

POSITIVE TRAIN CONTROL RECOMMENDATIONS

NTSB'RECOMMENDATIONS

The NTSB determined that the MBTA's lack of Positive Train Control[86] was a major contributory factor to the accident which killed the operator of a train that ran into the back of a standing

[85] See Section 20 of the proposed General Order in Appendix A to this report.

[86] "Positive Train Control" (PTC) provides the train operator and the Operations or Control Center with the location of the train at all times through satellite relayed radio signals using a Global Positioning System. This constant stream of information permits an on-board computer to systematically/automatically stop a train before it runs into another train, a closed switch, or other

light rail train.[87] The NTSB notes that PTC "would have intervened to stop the train and prevent the collision."[88] In its discussion concerning PTC the NTSB writes:

> Four decades of NTSB investigations of railroad accidents have shown that the most effective means of avoiding train-to-train collisions is through use of a positive train control system that will automatically stop a train if the crew fails to comply with a signal indication. Previous investigations have identified a wide range of factors that can affect a train crew's response to signal indications, such as multiple simultaneous distractions, cell phone usage, dense fog, crew inattention, use of prescription medications, and fatigue.
>
> . . .
>
> The NTSB therefore concludes that this accident could have been prevented had the MBTA Green Line been equipped with a positive train control system that could have intervened to stop train 3667 before it could strike the rear of train 3681.
>
> The Rail Safety Improvement Act of 2008 requires each class I, intercity, and commuter rail carrier (carriers regulated by the Federal Railroad Administration) to develop and submit to the U.S. Secretary of Transportation, within 18 months, its plan for the implementation of a positive train control system by December 31, 2015. Transit agencies that operate trolley, light rail, and heavy rail systems are not included in the requirements of the Rail Safety Improvement Act of 2008. The NTSB therefore recommends that the FTA facilitate the development and implementation of positive train control systems for rail transit systems nationwide**.** [R-09-08] The NTSB further recommends the MBTA develop and implement a positive train control system for all its rail lines [emphasis added].
>
> *Collision Between Two Massachusetts Bay Transportation Authority Green Line Trains, Newton, Massachusetts, supra,* at pp. 30 and 34.

The need for PTC in the rail transit industry nationwide is most apparent in train collisions in which scores of passengers may be injured or killed along with train operators. However, the

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known hazard. PTC supplants the present block signal system used to protect trains from entering hazardous track space.

[87] *Collision Between Two Massachusetts Bay Transportation Authority Green Line Trains, Newton, Massachusetts, May 28, 2008*, *supra*, at p. vii. See also http://www.ntsb.gov/publictn/2009/RAR0902.pdf

[88] Ibid .

hazard to roadway workers posed by moving trains is just as real and just as deadly. PTC may allow the train operator and the control center to know the location of roadway workers and automatically slow or stop the train when it approaches the vicinity. Likewise, PTC may allow roadway workers to know of the approach of all trains so that they can move to a safe place of refuge before the train arrives.

STAFF'S RECOMMENDATION FOR IMPLEMENTATION OF POSITIVE TRAIN CONTROL

Staff strongly supports the NTSB's recommendation to the FTA to begin the implementation of PTC on all rail transit systems in the nation. Staff recommends that the Commission order California rail transit systems to begin the process of examining and planning for PTC implementation. Staff recommends the following provisions in a Commission order requiring each RTA:

- To identify and assess technologically available collision-avoidance technologies for train collision avoidance as they might be applied for roadway worker safety as well as train collision avoidance.
- To assess their systems and their different operations, for example, underground and street-running, for collision-avoidance technology applications, and determine different levels of feasibility, implementation timelines, benefit, and cost, including roadway worker protections.
- To cooperate with, and learn from, Class I railroads in the Los Angeles Basin when implementation of PTC begins there in January 2013.
- To seek economies of scale with other RTAs with the purpose of identifying technology that could apply to other RTAs and realize cost savings.
- To report within 12 months of the effective date of a Commission order in this proceeding the results of the above elements of study, and annually thereafter.

CONCLUSION

Work in the rail transportation industry is hazardous.[89] The hazards to employees working on or near tracks posed by moving trains or maintenance machinery are significant and should be reduced to the greatest extent that rules, procedures, supervision, enforcement, and modern technology permit. Staff has recommended new, simplified rules that apply to all employees who come within ten feet of rail transit track and within five feet for street-running track.

First, employees who come within ten feet of rail transit track and five feet for street-running track to perform any job function for the rail transit agency must be accompanied at all times by a lookout or watchperson whose sole purpose and responsibility is to warn of approaching trains.

Second, clearly visible flags should be placed in both directions on the track being worked on sufficiently far from the work being performed to permit an approaching train to slow and stop in advance of the roadway work crew.

Third, RTAs should strictly enforce existing rail transit rules and procedures that:

- Require their employees to predetermine a "safe place of refuge" they may move to at least 15 seconds before an approaching train would arrive.
- Ensure roadway workers have the right to challenge in good faith a work assignment.

Fourth, RTAs should develop and implement a Near-hit (or Close-Call) Reporting and Recording Program.

Fifth, RTAs should improve their training programs for supervisors and job foremen and roadway workers generally.

Sixth, RTAs should adopt a "compliance testing program" to determine whether roadway workers fully comply with applicable roadway worker safety rules and procedures and to determine the adequacy and success of the on-track safety training program. At a minimum, each RTA should perform compliance testing monthly, quarterly, and yearly at varying levels to determine worker compliance with the rules and procedures.

Seventh, RTAs should test, implement, and install within four years "technological/electronic devices that warn roadway work crews of the imminent arrival of an approaching train and warn train operators of approaching roadway work sites and employees.

Finally, RTAs should begin planning for PTC so that installation of PTC will be completed no later than six (6) years from the date of the Commission's order in this proceeding.

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[89] See *The Monthly Labor Review*, July/August 2007, *supra*, at p. 17, referenced earlier in the *Introduction* to this Report.

SUMMARY OF STAFF RECOMMENDATIONS

1. Staff recommends that any rail transit employee who comes within ten feet of tracks (five feet of street-running track) should be accompanied by a lookout/watchperson.

2. Staff recommends that any work performed within ten feet of tracks (five feet of street-running track) shall be flagged to warn train operators of the presence of rail transit workers.

3. Staff recommends the use of the following colors for signal flags or cones in all rail transit operations: yellow-red to warn the train operator to slow and be prepared to stop, red to signal the train operator to stop, and green to signal the train operator to resume speed.

4. Staff recommends that warning flags used to warn train operators of approaching work on or near tracks should be made of yellow and red material, a flag of red material, and a flag of green material which is clearly visible from a distance as a warning signal; and/or should be a plastic cone either yellow-red in color or topped with a yellow-red flag, a plastic cone either red in color or topped with a red flag, a plastic cone either green in color or topped with a green flag, and all such cones and flags shall be clearly visible from a distance as a warning signal; and/or a flashing light which is clearly visible from a distance as a warning signal.

5. Staff recommends that roadway work performed after dark, in tunnels, or in locations with low ambient light levels shall consist only of flashing lights as the same color as the flags described above, except that a yellow flashing light(s) may be used in place of a yellow-red cone or flag, and these flashing light(s) shall be clearly visible from a distance as a warning signal.

6. Staff recommends that a yellow-red warning flags shall be placed in both directions on the track on which roadway work is being performed such that an approaching train will slow and be able to safely stop in advance of the workers on or near the track or adjacent track.

7. Staff recommends that in situations where there is a machine on or fouling the track, or in circumstances in which roadway workers can not safely move to a safe refuge area before a train may arrive, or for any reason requiring trains to stop in advance of the roadway work being performed, a red warning flag shall be placed in both directions on the track such that an approaching train will be able to safely stop in advance of the roadway workers.

8. Staff recommends that a green flag may be placed outside the work area designated by the placement of yellow-red warning flags to signal to the train operator that normal speed may be resumed.

9. Staff recommends that all tracks within ten feet of the work being performed shall also be flagged.

10. Staff recommends that RTAs should strictly enforce their existing rules and procedures requiring workers performing jobs within ten feet of tracks and within five feet of street-running tracks to predetermine a "safe place of refuge" to move to at least 15 seconds before an approaching train would arrive.

11. Staff recommends that RTAs maintain a separate Manual containing all necessary roadway worker safety procedures and rules, that RTAs make them freely available to roadway workers, and that RTAs ensure that roadway workers have easy access to the Manual when performing job functions.

12. Staff recommends that every rail transit roadway worker should be provided with the right to challenge in good faith whether the on-track safety procedures to be applied provide adequate safety and comply with RTA safety procedures and rules.

13. Staff recommends that RTAs should test, implement, and install "technological/electronic devices that warn roadway work crews of the imminent arrival of an approaching train."

14. Staff recommends that each RTA ensure that its on-track safety training program for roadway workers enables each worker to understand the hazards of the required job duties and the methods to safely carryout those duties.

15. Staff recommends that each RTA ensure that roadway worker safety trainers shall have adequate experience, understanding, and knowledge of safe roadway working rules and procedures to properly train and test less experienced roadway workers.

16. Staff recommends that each RTA adopt a "worker safety training program" to provide feedback from both the trainers and roadway workers to gauge the success of an on-track safety training program. At a minimum each RTA shall perform safety training on a yearly basis.

17. Staff recommends that each RTA adopt a "compliance testing program" to determine whether roadway workers fully comply with applicable roadway worker safety rules and procedures and to determine the adequacy and success of the on-track safety training program. At a minimum each RTA shall perform compliance testing monthly, quarterly and yearly at varying levels to determine worker compliance with the rules and procedures.

18. Staff recommends that each RTA establish a Near-hit Reporting Program for reporting and recording near-hit incidents that could have caused significant injury to rail transit employees including, but not limited to, close-call collisions between trains and motor vehicles, pedestrians, and bicycles, close-call collisions between trains, close-call collisions with rail transit workers, and close-calls in the use of roadway/railway maintenance equipment. This program should

encourage rail transit employees to report such close-calls and should be free of disciplinary repercussions to the extent reasonable under the relevant factual circumstances.

19. Staff strongly recommends that the RTAs develop a testing and implementation process for installation of wayside early alarm technology within a reasonable time not to exceed four (4) years.

20. Staff recommends that the Commission order California rail transit systems to begin the process of examining and planning for implementation of collision-avoidance technology implementation, and report annually to the Commission regarding their progress. The annual reports should include descriptions of progress indentifying roadway worker applications; different applications in different operating environments; feasibility, costs and benefits, and applications for roadway worker safety; economies of scale; and collaboration with railroads regarding PTC implementation experience.

APPENDIX A

Staff's Proposed General Order For Roadway Worker Protection On California's Rail Transit Systems

GENERAL ORDER NO. _____

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

RULES AND REGULATIONS GOVERNING ROADWAY WORKER PROTECTION PROVIDED BY RAIL TRANSIT AGENCIES AND RAIL FIXED GUIDEWAY SYSTEMS

TABLE OF CONTENTS

Rail Transit Agencies (RTA) and Rail Fixed Guideway Systems (RFGS) operating in California must comply with the following rules governing roadway worker protection.

1 GENERAL PROVISIONS

1.1 *Authority.* These rules and regulations are authorized by and implement the provisions of 49 U.S.C. § 5330; 49 C.F.R. § 659; and California Public Utilities Code Section 99152, as well as the California Public Utilities Code sections establishing each individual transit agency within California.

1.2 *Purpose.* The purpose of these rules and regulations is to ensure that each RTA is responsible for the safety, training, and briefing of its roadway workers so that each roadway worker understands and complies with the RTA's roadway worker safety rules and procedures. These rules and regulations are intended to ensure that each RTA adopts a program for roadway workers containing specific rules for protecting roadway workers.

1.3 *Applicability.* These rules and regulations are applicable to all RTAs in California. These rules do not prohibit RTAs from implementing rules that provide greater safety.

1.4 *Additional Rules.* The Commission may make such additional rules and regulations or changes to these rules and regulations as necessary for the purpose of safety.

1.5 *Exemptions or Modifications.* Requests for exemptions or modifications from these rules and regulations shall contain a full statement of the reasons justifying the request. A request must demonstrate that safety would not be reduced by the proposed exemption or modification. Any exemption or modification so granted shall be limited to the particular matter covered by the request and shall require Commission approval.

2 DEFINITIONS

2.1 *Contractor* means an entity that performs tasks on behalf of the RTA.

2.2 *Employee* means a person employed by an RTA in California, or a contractor working on behalf of such RTA.

2.3 *Lock-out* means a section of track made inaccessible by derail, disconnected track, or spiked or "plugged" switch, on both sides of the worksite, to prevent train or on-track roadway work vehicle movement into the worksite.

2.4 *Lookout/ Watchperson* means an employee who has been trained and qualified, and whose sole duty is to provide warning to roadway workers of approaching trains or on-track equipment. A Lookout/Watchperson must be on duty at all times and is required without regard to revenue or non-revenue service.

2.5 *Near-hit* means an incident infringing on the safety of the roadway worker on or near the tracks, but without contact or injury. A near-hit may include factors such as train speed and/or the proximity of trains to employees.

2.6 *Rail Fixed Guideway System (RFGS)* means any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit and not regulated by the Federal Railroad Administration or not specifically exempted by statute from Commission oversight.

2.7 *Rail Transit Agency (RTA)* means the entity that plans, designs, constructs, and/or operates a RFGS.

2.8 *Rail Transit Vehicle* means an RTA's rolling stock, including but not limited to passenger and maintenance vehicles.

2.9 *Right of way* means a strip of land that is granted, through an easement or other mechanism, for transportation purposes which includes the RTA's rails, track, crossties, ballast, bridges, underpasses, tunnels, wayside signals, near-track communication facilities, and stations.

2.10 *Roadway work* means any work performed by transit employees within ten (10) feet of the track or within five (5) feet of street-running track.

2.11 *Roadway worker* means any RTA employee performing any work within ten (10) feet of the track or within five (5) feet of street-running track.

2.12 *Roadway work vehicle* means the RTA's on-track maintenance and hi-rail vehicles.

2.13 *Self-protection alone shall not be sufficient protection* means no employee shall be permitted within ten (10) feet of the track, or within five (5) feet of street-running track, without the accompaniment of another employee who will act as a Lookout/Watchperson and whose sole duty is to provide warning to roadway workers of approaching trains or on-track equipment.

2.14 *System Safety Program Plan (SSPP)* means a document adopted by an RTA detailing its safety policies, objectives, responsibilities, and procedures.

2.15 *Wayside early warning alarm technology* means technological/electronic devices that warn roadway work crews of the imminent arrival of an approaching train and/or warn train operators approaching roadway work sites and employees.

3 RTA RESPONSIBILITY

3.1 Each RTA shall adopt and implement a program that will afford on-track safety to all its roadway workers.

3.2 Each RTA shall adopt a training program to train roadway workers so that each worker understands the hazards of the required job duties and

the methods to safely carryout those duties by following the RTA's roadside worker safety program and rules.

3.3 The RTA's training program shall be sufficient to ensure competency in each job duty to be performed by the roadway worker and in the duties to be performed by those training roadway workers, with emphasis on roadway worker protection duties and responsibilities.

3.4 Each RTA shall adjust its training program to address compliance problems, based on the results of compliance testing.

3.5 Each RTA shall maintain a record-keeping system to retain training records. These records shall be maintained and made available to Commission Staff for a period no less than three (3) years.

3.6 Each RTA shall ensure that each roadway worker is competently trained in every job duty prior being given those duties, with emphasis given to roadway worker protection duties and responsibilities.

3.7 Each RTA shall maintain records of employee-reported unsafe acts or conditions that could result in an accident or incident.

3.8 Each RTA shall adopt and maintain a separate manual containing all necessary roadway worker safety procedures and rules, make them freely available to roadway workers, and ensure that roadway workers have easy access to the manual when performing job functions.

3.9 Each RTA shall ensure that the manuals for other crafts shall be reviewed and made consistent with the rules of this general order.

3.10 Each RTA shall submit their on-track safety manual to Commission Staff for approval and any subsequent modifications shall be approved by Commission Staff prior to RTA implementation.

3.11 Each RTA shall modify their SSPP in accordance with these rules and submit to Commission Staff for approval.

4 ROADWAY WORKER RESPONSIBILITY

4.1 Each roadway worker shall have participated in a job briefing and competent job training prior to the performance of, or change in, any job duty.

4.2 Each roadway worker shall be free to challenge, and/or refuse, any job duty he or she has reason to suspect is unsafe or dangerous.

4.3 Each roadway worker shall be free to challenge, and/or refuse, any job duty that would violate any RTA safety rule or procedure.

4.4 Each roadway worker shall have the responsibility of reporting unsafe acts or conditions to the RTA that could result in an accident or incident, and each RTA shall communicate and encourage this responsibility.

5 JOB BRIEFING

5.1 Any roadway work within ten (10) feet of the nearest rail of transit track, or within five (5) feet of street-running track, shall only be performed after a job briefing in which each roadway worker shall have the job function, rules, and procedures for carrying out job duties discussed and explained. The job briefing shall emphasize the following aspects:

- **a.** The general work plan.
- **b.** The means by which safety is to be provided to the roadway workers through compliance with these roadway worker safety rules and procedures.
- **c.** Proper Protective Equipment.
- **d.** Identification and location of key personnel such as Lookout/Watchperson, and employee-in-charge.
- **e.** Appropriate flags and proper flag placement.
- **f.** The existing or potential hazards involved in the job to be performed and the means to eliminate or protect against such hazards.

g. The predetermined "safe place of refuge" the worker may move to at least 15 seconds before an approaching train would arrive.

h. The means of communication among the roadway workers to be used in the job performance.

i. Acknowledgement and understanding by each roadway worker of the work to be performed and the safety procedures and protections to be used.

j. Any change in the work roadway worker shall have participated in a job briefing and competent job training prior to the performance of, or change in, any job duty.

6 RIGHT TO CHALLENGE

RTAs shall provide and ensure that transit roadway workers have the right and opportunity to challenge in good faith whether the on-track safety procedures to be applied provide adequate safety and comply with RTA safety procedures and rules.

7 WHISTLEBLOWER PROTECTION

Each RTA shall promote and adopt a whistleblower protection program consistent with State and Federal guidelines and regulations.

8 SELF-PROTECTION NOT ALLOWED

No transit employee shall be permitted to come within ten (10) feet of the nearest rail of transit track without the accompaniment of a Lookout/Watchperson whose sole duty is to provide warning to roadway workers of approaching trains or on-track equipment. (EXCEPTIONS: Transit employees shall not be permitted to come closer than five (5) feet of the nearest rail of transit track without the accompaniment of a Lookout/Watchperson when performing work on street-running transit track unless the track is

Locked-Out, or when crossing tracks, or when performing work performed on platforms in stations)

9 LOOKOUT/WATCHPERSON

9.1 Any work to be performed within ten (10) feet of the nearest rail of transit track which has not been Locked-Out shall require a minimum of two roadway workers one of whom shall be a Lookout/Watchperson whose sole duty is to provide warning to roadway workers of approaching trains or on-track equipment. (EXCEPTIONS: A Lookout/Watchperson shall not be required for roadway work on street-running transit trains unless the roadway worker is permitted to come within five (5) feet of the nearest rail of transit track when performing work and the track is not Locked-Out. Further, crossing the transit tracks shall not be considered work requiring a Lookout/Watchperson.)

9.2 The Lookout/Watchperson must be on duty to warn of approaching trains at all times. If there is only one Lookout/Watchperson and he or she must leave this duty for any length of time, the roadway workers must move to the safe refuge area during the absence of the Lookout/Watchperson. No roadway work may be performed, and all roadway workers must move to a safe refuge area, in the absence of an on-duty and observant Lookout/Watchperson.

9.3 The Lookout/Watchperson requirement shall apply at all times without regard to revenue or non-revenue service.

10 SIGNAL FLAGS

10.1 Any work to be performed within ten (10) feet of the nearest rail of transit track which has not been Locked-Out shall be performed only after signal flags or cones are placed to caution trains operating in both directions to slow and be prepared to stop. Crossing the transit tracks shall not require the placement of signal flags or cones. (EXCEPTIONS:

Signal flags or cones shall not be required for roadway work on street-running transit track unless the roadway worker is permitted to come within five (5) feet of the nearest rail of transit track when performing work and the track is not Locked-Out. Work performed on station platforms is also exempted.)

10.2 The following colors of signal flags or cones shall be used in all transit operations.

- **a.** Yellow-Red: to signal the train operator to slow and be prepared to stop.
- **b.** Red: to signal the train operator to stop and not proceed except under agency rules approved by Commission Staff.
- **c.** Green: to signal the train operator to resume speed.

10.3 RTAs shall use the following signal flags:

- **a.** A flag made of yellow and red material, a flag of red material, and a flag of green material—all of these flags must be clearly visible from a distance as a warning signal; and/or
- **b.** a plastic cone either yellow-red in color or topped with a yellow-red flag, a plastic cone either red in color or topped with a red flag, a plastic cone either green in color or topped with a green flag, and all of these cones and flags must be clearly visible from a distance as a warning signal; and/or
- **c.** flashing lights of same color as required for signal flags, except yellow may be used to represent yellow-red, and shall be clearly visible from a distance as a warning signal.

10.4 Roadway work performed after dark, in tunnels, or in locations with low ambient light levels shall consist only of flashing lights of same color as required for signal flags, except yellow may be used to represent yellow-red, and shall be clearly visible from a distance as a warning signal; and

10.5 These rules shall apply at all times without regard to revenue or non-revenue service.

11 SIGNAL FLAG PLACEMENT

11.1 Signal flags shall be placed a sufficient distance from the location of the work to be performed to allow the trains operating on the track to reduce speed and be prepared to stop in advance of the roadway work being performed, and shall be placed in the following manner:

- **a.** The yellow-red flag shall be placed in both directions on the track on which roadway work is being performed such that an approaching train will slow and be able to safely stop in advance of the workers on or near the track or adjacent track.
- **b.** In situations where there is a machine on or fouling the track, or in circumstances in which roadway workers can not safely move to a safe refuge area before a train may arrive, or for any reason requiring trains to stop in advance of the roadway work being performed, a red flag shall be placed in both directions on the track such that an approaching train will be able to safely stop short of the red flag, and proceed only according to RTA rules approved by Commission staff.
- **c.** A green flag may be placed outside the work area designated by the placement of yellow-red flags to signal to the train operator that normal speed may be resumed.
- **d.** All adjacent tracks within ten (10) feet of either rail of a track where work is being performed shall also be flagged with yellow-red and green flags.

12 SAFE TRAIN OPERATIONS IN FLAGGED TERRITORY

The Train Operator shall slow the train sufficiently upon entering a flagged area to be able to stop in advance of the roadway workers on or near the track. Further, the Train Operator shall sound the FRA horn when a wayside worker is observed.

13 SAFE PLACE OF REFUGE

Employees coming within ten (10) feet of transit track, or within five (5) feet of street-running track, shall at all times have a predetermined safe place of refuge that they may move to not less than 15 seconds before an approaching train would arrive.

14 LOCKED-OUT TRACK

If all track within (150) feet of the work performed by roadway workers is made physically inaccessible through portable derails, disconnected track, a spiked or “plugged” switch, on both ends of the worksite, or not connected by rail to the system track over which trains may operate, the Lookout/Watchperson and Signal Flag rules shall not be required.

15 TRAINING

15.1 Each RTA shall adopt an on-track safety training program for roadway workers providing each worker with an understanding of the hazards of the required job duties and the methods to safely carryout those duties. Employees providing safety training shall have sufficient training and experience to be capable of fully explaining and testing the safety hazards involved, the proper safety procedures to be used to adequately address those hazards, and the importance of complying with all relevant safety rules. This on-track safety training program shall be included in the RTA’s SSPP and made available to CPUC staff upon demand.

a. RTA Roadway Worker Requirements

i. No RTA shall assign an employee to perform the duties of a roadway worker, and no employee shall accept such assignment, unless that employee has received training in the on-track safety procedures associated with the assignment to be performed, and further, that employee must have demonstrated the ability to fulfill the responsibilities for performing that on-track job assignment.

ii. Each RTA shall train new roadway workers employees on the on-track safety rules and procedures that they are required to follow, before these employees assume any roadway job duties.

iii. Each RTA at least once every calendar year shall train all roadway workers on the on-track safety rules and procedures that they are required to follow.

iv. Each RTA shall maintain written or electronic records of each roadway worker's training and qualifications. Each record shall include the name of the employee, the type of qualification made, and the most recent date of qualification.

v. Each RTA shall adopt a worker safety training program for roadway workers to provide feedback and gauge the success of an on-track safety training program. At a minimum each RTA shall perform safety training on a yearly basis.

vi. Each RTA shall adopt a compliance testing program to determine roadway workers safety compliance and to ensure success of the on-track safety training program. At a minimum each RTA shall perform compliance testing monthly, quarterly and yearly at varying levels to determine compliance with rules and procedures.

vii. Each RTA shall align its training program based on compliance testing

b. Roadway Worker Training Requirements

i. The training of all roadway workers shall include, as a minimum, the following:
   1. Recognition of railroad tracks and understanding of the space around them within which on-track safety is required.
   2. The functions and responsibilities of various persons involved with on-track safety procedures.
   3. Proper compliance with on-track safety instructions given by persons performing, or responsible for, on-track safety functions.
   4. Signals given by a Lookout/Watchperson, and the proper procedures upon receiving a train approach warning from a Lookout/Watchperson.
   5. The hazards associated with working on or near railroad tracks, including review of on-track safety rules and procedures.
   6. Discussion of the efficiency testing and compliance program requirements.

c. RTA Roadway Worker Training-Personnel Requirements

i. Each Transit agency shall insure that their wayside training personnel have a minimum of four years experience with wayside protection.

ii. All training personnel will have a minimum of two years experience in the field using some form of wayside protection and must have working knowledge of the FRA requirements for track maintenance and inspections.

iii. All training personnel will be required to pass, with a score of 90% or better, a wayside protection exam consisting of the same material that wayside employees are required to know. Each agency will require the training personnel to take this

exam every calendar year while working in the wayside protection program. The exam scores will be documented and made available for regulatory review.

iv. Each RTA shall adopt a safety training program for training personnel to provide feedback and gauge the success of an on-track safety training program. At a minimum each RTA shall perform safety training on a yearly basis.

v. Each RTA shall adopt a compliance testing program to determine whether training personnel fully comply with applicable roadway worker safety rules and procedures and to determine the adequacy and success of the on-track safety training program. At a minimum each RTA shall perform compliance testing monthly, quarterly and yearly at varying levels to determine compliance with the rules and procedures.

vi. Each RTA shall align its training program based on compliance testing.

16 NEAR-HIT PROGRAMS AND RECORDS

16.1 Each RTA shall establish a program for reporting and recording near-hit incidents that could have caused significant injury to transit employees including, but not limited to, close-call collisions between trains and motor vehicles, pedestrians, and bicycles, close-call collisions between trains, close-call collisions with transit workers, and close calls in the use of maintenance equipment. Those records shall be retained by the RTA for a period of three (3) years and shall be made available to CPUC staff on demand.

a. The near-hit program shall include:

i. A policy statement supporting the near-hit program signed by the CEO.

ii. A training program.

iii. A process to convey responsibility to employees to report near-hits.

iv. A document, made readily available to all employees, to record details of the near-hit reporting.

v. A process for employees to submit near-hit reports.

vi. Method to store, easily access, and track near-hits and corrective actions.

vii. Detailed processes and timeframes to perform root cause analysis and identify and implement corrective actions.

b. RTAs shall submit a copy of their near-hit program to staff within thirty (30) days of the effective date of this order and within thirty (30) days of any subsequent modifications.

c. Each RTA shall incorporate their near-hit program into their SSPP and submit the SSPP to Commission Staff for approval within sixty (60) days of the effective date of this order.

d. RTAs shall report near-hits on a monthly basis to Commission Staff in the [an existing monthly report maybe]

e. Each RTA shall post a notice of its near-hit program at all locations where RTA employees report for duty.

17 SYSTEM SAFETY PROGRAM PLAN

Each RTA shall modify their SSPP to include a roadway worker safety plan compliant with these rules. The SSPP shall be modified and submitted to Commission Staff within 60 day's of the effective date of the rules.

18 PROPER PROTECTIVE EQUIPMENT

Any roadway worker within ten (10) feet of the track (five (5) feet for street running track) is required to wear proper head, eye, foot and high-visibility safety apparel, in compliance with the American National Standards Institute and International Safety Equipment Association requirements.

19 ON-TRACK ROADWAY WORKER SAFETY MANUAL

19.1 Each RTA shall adopt and maintain a separate On-Track Roadway Worker Safety Manual containing all necessary roadway worker safety procedures and rules so that each worker understands the hazards of the required job duties and the methods to safely carryout those duties by following the RTA's roadside worker safety program and rules.

19.2 Each RTA shall make them freely available to all employees including roadway workers, and ensure that all employees including roadway workers have easy access to the Manual when performing job functions.

19.3 Each RTA shall incorporate these On-Track Roadway Worker Safety Manual requirements into their SSPP and submit the SSPP to Commission Staff for approval within sixty (60) days of the effective date of this order.

19.4 Each RTA shall provide Commission Staff with copies of the RTA's Commission Staff approved On-Track Roadway Worker Safety Manual, and any subsequent modifications shall be approved by Commission Staff prior to RTA implementation. Additional copies shall be provided to Commission Staff upon request.

20 TECHNOLOGICAL/ELECTRONIC WARNING DEVICES

Each RTA shall develop a testing and implementation process and timeline for installation of wayside early warning alarm technology, such as a track-mounted portable train detector communicating with the portable light/horn, that warns roadway crews of approaching trains and, such as a cab-mounted audible and visual alarm to warn train operators of work sites and employees ahead. Each RTA shall install the technology no later than four (4) years from the effective date of this G.O. Each RTA shall submit a written report of their testing and implementation process and timeline to Commission Staff for review.

Appendix B

Flag Protection

Flag protection is used by Railroads for both track maintenance and vehicle maintenance crews.

TRACK MAINTENANCE FLAGS

Track maintenance crews use three different flags, a green flag, yellow flag, yellow-red flag, and a red flag. The green flag is used to inform the operator they can precede, usually at track maximum or authorized speed. The yellow flag is used to inform the operator that there is a restriction of some kind. The yellow-red flag informs the operator that a stop is required ahead. The red flag serves to inform the operator to stop. Any of these three flags can be use with each other. You could have a red flag followed by a yellow flag or a yellow flag followed by a green flag. The distance for track maintenance flag placement varies from one RTA to another and the yellow flags restrictions vary from one RTA to another.

VEHICLE MAINTENANCE FLAGS

Vehicle maintenance crews use a blue flag.[90] This is used by only two RTAs. The blue flag is used to flag equipment when vehicle maintenance crews are working on, under, or between Light Rail Vehicles (LRVs). Blue flags would be placed ahead and behind the LRV, there would also be a blue flag or blue tag put on the control stand that would be visible to the operator. Blue lights would be used at night in each location for visibility. The FRA rule, 49 C.F.R. Part 218.25, provides:

> When workers are on, under, or between rolling equipment on a main track:
>
> (a) A blue signal must be displayed at each end of the rolling equipment; and
>
> (b) If the rolling equipment to be protected includes one or more locomotives, a blue signal must be attached to the controlling locomotive at a location where it is readily visible to the engineman or operator at the controls of that locomotive.
>
> (c) When emergency repair work is to be done on, under, or between a locomotive or one or more cars coupled to a locomotive, and blue signals are not available, the engineman

[90] "This subpart prescribes minimum requirements for the protection of railroad employees engaged in the inspection, testing, repair, and servicing of rolling equipment whose activities require them to work on, under, or between such equipment and subjects them to the danger of personal injury posed by any movement of such equipment." 49 C.F.R. Parts 218.21 et seq.

> or operator must be notified and effective measures must be taken to protect the workers making the repairs.
>
> (49 C.F.R. Part 218.25)

The FRA regulations define a blue signal:

> Blue signal means a clearly distinguishable blue flag or blue light by day and a blue light at night. When attached to the operating controls of a locomotive, it need not be lighted if the inside of the cab area of the locomotive is sufficiently lighted so as to make the blue signal clearly distinguishable.
>
> (49 C.F.R. Part 218.5)

(END OF ATTACHMENT 1)