REPORT

OF THE

AMERICAN PUBLIC TRANSPORTATION ASSOCIATION

PEER REVIEW PANEL

FOR

SAN FRANCISCO
BAY AREA RAPID TRANSIT DISTRICT

Oakland, California

November 2013

A Service of the Safety Management (Peer Review) Program of the American Public Transportation Association

REPORT

OF THE

AMERICAN PUBLIC TRANSPORTATION ASSOCIATION

PEER REVIEW PANEL

ON THE

BART WAYSIDE SAFETY PROGRAM

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I. INTRODUCTION

In November 2013, Ms. Grace Crunican, General Manager, Bay Area Rapid Transit (BART) contacted the American Public Transportation Association (APTA) to request a peer review of the agency's *Wayside Safety Program*.

Through discussions between APTA and BART staff, it was determined the review would be conducted November 18-21, 2013.

A panel of industry peers was assembled that provided expertise in wayside safety. The peer review panel consisted of the following transit individuals.

CLAY BUNTING
Assistant General Superintendent
Tracks and Structures
WMATA
Washington, DC

JAMES M. DOUGHERTY
Chief Safety Office
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Washington, DC

WYNTON HABERSHAM
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PATRICK LAVIN
Senior Director Operations
NYCT
New York, NY

JOSEPH WILSON
System Safety and Risk Management
SEPTA
Philadelphia, PA

WILLIAM P. GRIZARD
Director – Safety
APTA
Washington, DC

The panel convened in San Francisco on November 18, 2013. Mr. Jeffrey Lau, Chief Safety Officer at BART provided agency liaison and valuable onsite support to the Peer Review Panel selected to support the team as subject matter experts. Panel coordination and logistical support was provided by APTA Staff Advisor William Grizard. Mr. Grizard also coordinated panel member input in the drafting of this peer review report.

Methodology

The APTA peer review process is well established as a valuable resource to the industry for assessing all aspects of transit operations and functions. The process begins much like a structured formal audit activity, but unlike a formal audit, the peer review teams are comprised of highly experienced transit professionals who are selected on the basis of their subject matter knowledge. The purpose of using experienced subject matter professionals is to share methods, insight and experiences interactively with the requesting property. Through the utilization of on-site interviews of staff, review of relevant documents, and field inspections the review team engages the requesting property in an informal process of introspective examination and dialog on the areas of their concern. It is through this exchange of ideas and experiences that the synergic process of the peer review earns value as each of the participants, on the review team and at the property, gains a better understanding of the complexities of transit functions and opportunities for improvement. It is truly an industry self improvement process were all parties benefit. The peer review concludes with a caucus among the peer review team to draw out the opinions of the team members and define a consensus summation of observations taken and their professional judgment as to where areas of improvement could be attained. This information is then presented to the requesting property in an exit conference and followed by a report, if so desired by the requesting property. There are no expectations expressed or implied that the requesting property take any action to satisfy the opinions of the peer review team or to engage any members of the team in any follow up activities as the requesting property may want to undertake as a result of the review. The information provided by the peer review team is consensus based and transferred to the requesting property as a Pro Bono work product which the property holds all rights under the terms of the peer review agreement. The result of this peer review was determined to be of significant interest to BART, and a request was made by the GM to summarize the key issues in written form to be available for follow up briefings as may be determined at a later date by BART staff as they work through the number of issues brought forth from this review.

Scope of Report

The scope of this review, identified in the Request Letter from BART's GM (attachment A), focused on comparing the current and proposed standards and regulations concerning wayside safety of employees and contractors with BART's rules, procedures and training programs. The report is divided into the following sections:

- The proposed General Order 175 compliance
- APTA Roadway Work Protection Standards conformance
- BART Rules, Procedures & Training Program currently in effect and proposed changes
- Application of CPUC Standards Impact to Operational Performance (including ways to minimize impact to OTP)

The peer review team was given unrestricted access to the materials, procedures, and in interviews of management, supervision and line personnel in order to assess the BART Roadway Worker program which we were most appreciative. Without this cooperative and enabling frame

of reference it would have been more difficult and taken a greater amount of time to understand the methods used and decisions made by all personnel in conducting work at track level. Since the On Track Safety program is dependent upon each department and each work group to perform their work in a specific manner, using inter-related responsibilities to assure successful application, the peer review team decided to conduct sampling of the knowledge and understanding of each department's roles and responsibilities in the program using random employee interviews chosen cross-sectionally from management, line supervision and line workers along with coordination from support staff in safety, transportation, and training. This approach yielded a significant understanding of the history and current conditions of the On Track Safety program at BART and helped the peer review team identify issues that will be encountered by BART employees and management at all levels when moving forward with changes to the On Track Safety program.

II. OBSERVATIONS AND RECOMMENDATIONS

1. GENERAL ORDER 175 RULES AND REGULATIONS GOVERNING ROADWAY WORKER PROTECTION PROVIDED BY RAIL TRANSIT AGENCIES AND RAIL FIXED GUIDEWAY SYSTEMS EFFECTIVE OCTOBER 31, 2013 – INTERIM DECISION

The new General Order produced by the California Public Utilities Commission (CPUC) prescribes an entirely new model for BART in providing On Track Safety to employees not previously practiced. Due to the design limitations of the BART train control system, these new requirements effectively prevent BART from being able to conduct daytime twice a week track inspection without creating a major disruption of scheduled service. Comparing the proposed General Order 175 to current BART rules and procedures finds the following issues that need to be resolved:

- The General Order contains new definitions – EIC, Confirmed Hold, Good Faith Challenge, Near Miss Reporting, Track Zone, Roadway Worker. The BART rules, procedures and training do not address these concepts and work methods.
- Application of the General Order procedures involving – Flagging, Near Miss reporting, 3-way Communications, Radio Protocol, and Proper Signals will require BART departments to restructure and train personnel differently. Currently, BART departments provide for their own training and radio protocols. Interviews conducted by the Peer Review team found significant differences in how these tasks were performed. Employees on track can be on different radio channels and hand signals vary. BART does not flag under simple approval and no flagmen are assigned to work zones as this type of work is done during non revenue service periods. There is no direct contact between train operators and employees on track. GO 175 requires both initial and refresher RWP Training. BART does provide Initial training but the amount of time and content of the training varies between departments. Refresher training also varies by department.
- GO 175 establishes a specialization of roles and tasks to which employees must be trained and qualified. BART does not have this type of structure in place under the current Wayside Safety program and will require a major revision to the training program to provide for new qualification levels for those tasks.

Recommendations

BART Safety department has been proactively building a new Roadway Worker Protection program that addresses many of the gaps between the current On Track Safety program and the provisions identified in the new GO 175. These are significant departures from BART's current program and there are many challenges to overcome throughout the organization to be able to support the proposed changes. The review team suggests the following actions:

1. Establish an interdepartmental transition group to conduct a gap analysis and develop a framework on how to transition from the current program to the new program.

   a. Identify and remove the variances practiced by each department. (The team believes the first priority should be given to establishing common radio communication protocols.)
   b. Identify potential for new hazards to be introduced with each of the changes being considered and best ways to prevent occurrence.
2. BART should consider an overhaul of its Trackway Safety training effort. Training will be a key function and require restructuring to coordinate program requirements between departments, certification of instructors, adequate staffing to deliver to 3,200 employees along with new content and methods for achieving levels of qualification and of competence required. This will apply to both initial and refresher training.
3. Enhance controls over work zone safety with the application of flagging, 3-way communication and proper signaling methods for both train approach speeds, distances, and train approach warning for employee safety.
   a. Consideration should be given to flagging, signaling, and communication with trains and OCC being conducted by a separate class or department of employees, not engaged with the type of work for which protection needs to be provided.

2. APTA RWP STANDARDS COMPLIANCE

Primary APTA Standards that involve Wayside Safety:

- Work Zones – APTA RT OP S 004 03
- Contractor Safety – APTA RT OP S 010 03
- Roadway Worker – APTA RT OP S 016 11

In general the BART program conforms to the standards, with some significant variances in how the program is applied between revenue and non-revenue operations.

The design philosophy and long length of BART's signal blocks influences what types of On Track Safety can be applied for the work and the time when the work can be done most effectively. In addition, the design of the Automatic Train Operation software presents additional constraints. Most of the new signal systems have the ability to run ATO right up to a speed restriction, operate in restricted manual through the work area, and resume speed in manual operation to maximum authorized speed, with full train supervision in place, until ATO resumes resulting in only a mild and recoverable disruption to service. The BART ATO train control system is an early design and runs either in automatic at authorized speed or in road manual mode where it is restricted to 25 – 27 miles an hour. It does not have the flexibility to step down to ATP, ATS or other protective modes as most of the other ATO signal systems that were developed after the BART system can do. These design features are significant to BART because it will not allow trains to run above 25 mph in road manual and the length of distance that the reduced speed must be maintained is based on the limits of the block (which could be the distance between stations, literally miles) rather than just the location where the speed restriction exists (usually taking up only a few yards). In addition, operating in road manual is done "line of sight" and there is no protection for collisions between trains. The control center does not get an indication from a train in manual operations. With this signal design, the effect of slowing trains down past maintenance work zones is significant and represents the potential for an

extensive service recovery period and train to train collision. Therefore, most of the track maintenance is done nightly, in conformance to the APTA Standards. This is accomplished during non-revenue operations which is a three hour window (effective time is 2.5 hours) from 1am to 4am. To adjust to the limitations of the train control system, BART has transferred work to night time, which includes inspection and preventive maintenance work that was formerly done during daylight hours under simple approval, to improve employee safety and not adversely affect schedules. However, these tasks are being transferred into the 2.5 hour non-revenue maintenance window already congested with programmed, capital and periodic maintenance work. Saturating the maintenance window may require the "piggy-backing" of track access and work authority across multiple work zones to accomplish the same tasks previously spread out across the other 21 hours.

All three of the APTA Standards address the importance of visibility while on the wayside including specific colors, signs, lights and markers to be used for establishing work zones and recommending the types of high visibility criteria to be used as Personal Protective Equipment (PPE) for track workers, all of which the rail transit system is required to document in their On Track Safety program. Although these requirements are addressed in BART rules and procedures, the review team did not see emphasis placed on the visibility of the work zones or of the need for making the visibility of the persons on the wayside a high priority. The PPE requirements appeared to be administered differently by department and used at the discretion of the employee. The philosophy of having the employee conducting a personal risk assessment of their work task and applying the proper PPE for the task is an acceptable practice, however, it should not overlook the fact that the task is being performed in an active rail corridor. This is an environment where high visibility of track workers is important to the train operator, as well as necessitating protection from debris associated from trains passing a work location. In this respect, BART did not have a risk assessment for wayside work which identified the need to wear eye protecting, footwear, high visibility clothing (including hard hats) of railroad type 2 or type 3 retroreflectivity. This would be in addition to whatever the employee's individual task would require.

Recommendations

The review panel compared BART procedures with industry practices and standards and makes the following suggestions:

1. The BART program will need to be expanded from the current practices to provide a greater emphasis on work zone criteria, formalizing procedures for flagging, hand signaling, radio communications and controls over track allocation to allow for piggy-backing work zones which have not been a common practice.
2. BART has been looking at ways to extend the 2.5 hour maintenance window and recently explored the use of blanket style work authorizations during weekend outages which allows for several work groups to share the same authority. The review team believes this is an area where enhancements can be made to allow inspection groups to coordinate and pass through blanket style work authorizations.

3. BART does have single tracking capability but this has been rarely used because they believe that it can only be effective during weekends and they do not have a dedicated bus fleet to draw from for supplementing service with a bus bridge around the single tracking area. The review team believes that BART should develop more capability for single tracking and develop resources for operating a bus bridge.
4. BART should review the work procedures that are related to routine maintenance activities, especially in the areas of inspection, light repair and preventive maintenance to assure that adequate staffing to perform the task is provided and does not require (or allow) the watchperson, lookout or flagman performing safety critical work to become involved with maintenance tasks being performed. For example, the number of personnel needed to conduct a switch machine inspection should be in addition to the number of personnel needed to watch for trains or moving equipment.
5. BART should study the effect that temporary measures of moving inspections and preventive maintenance tasks to the night time maintenance window, as this may have compounding effects on the quality of inspections and/or create a backlog of deferred maintenance work. Loss of quality may act to accelerate the need for corrective maintenance or long term, downgrade the state of good repair.
6. BART should enhance the Personal Protective Equipment policy to evaluate the risks associated with working at track level and include in the Roadway Worker Protection program a prescribed list of PPE to be worn as identified in the APTA Standards. The key features in the industry being proper footwear for right of way conditions, eye protection, hardhat, and high visibility vests and/or additional clothing for a railroad type 2 or 3 environment.
7. The APTA standard for Roadway Worker Protection provides for the use of "protection provided by technological means". The review panel suggests that BART explore the use of technology to support all of the forms of Roadway Worker Protection in their program manual. This action would also be in conformance with the proposed CPUC GO 175.

3. BART RULES, PROCEDURES & TRAINING PROGRAM

The peer review team was provided copies of the current rules and procedures in effect at BART along with proposed new rules, procedures and manuals that had been developed to correspond with the proposed CPUC GO 175. It was also understood that the district had just recently suspended the use of a form of track access known as "simple approval". The team also had the opportunity to interview members of the departments responsible for conducting training for BART employees, utilities, and emergency services personnel that have a need for track access in performance of their duties. As correspondence with the CPUC GO 175 and APTA Standards has already been noted, this discussion on BART rules, procedures and training will necessarily cover some of the same issues but also serve to provide observations on the communication of the rules and procedures within the organization and some of the enhancements that could be made to close some gaps noted by the review team. Documentation reviewed included: Copies of internal safety audits verifying observations of rules compliance with On Track Safety related requirements, course descriptions of department wayside safety training programs, Wayside Safety Program manual, Track Safety Training Certification program, Operation Rules and

Procedures manual, M & E Safety manual, Operations Safety Compliance Plans, Operating Bulletins, and Accident Investigation reports, and Trackway Safety Training manual among others, to include a draft of the new RWP manual and associated operating bulletins to place it into effect.

The peer review team found the trackway safety program to consist of three methods of establishing work zones for On Track Safety by work order - work area, blanket, and equipment/facility. For On Track Safety outside of work zones there was only the Simple Approval process (no longer in effect) that had been modified over the years to provide for both Individual Train Detection and for Train Approach Warning using watchman / lookout. The program is decentralized within the individual departments and the level of controls used in work zone protection provide a minimal description of such areas as designating a person in charge of safety, communication of the protection requirements in job safety briefings and reliance upon the use of local prohibits without temporary restrictive warnings. Although blanket work areas with removal of traction power provide against train movement, there is still a need to protect against movement of hi-rail and self propelled track maintenance equipment. Job briefings currently do not provide for a formal Good Faith Challenge procedure. Although interviewees indicated that their informal process was considered appropriate and comfortable for expression of safety concerns, the review team did not find evidence that it was effectively applied. This was also the case with the Operations Safety Compliance Plan (OSCP) proficiency testing program designed to check the effectiveness of the On Track Safety rules and procedures. Although hundreds of OSCP performance checks were conducted, no failures were being identified on the various means of establishing On Track Safety. In the review team interviews with all levels of employees from all departments, each person could recall a near miss or close call train strike incident of either himself or someone he was working with. The OSCP testing did not surface these failures. Management was only aware of a very few of these incidents being reported and only 1 had received any type of investigation.

The new RWP manual does a very good job of enhancing and updating the BART program and resolves many of the peer review observations of the current plan and procedures in use.

Recommendations

1. As has been previously identified, Safety and Training need to play an even bigger role in ramping up for the GO175 changes, but there is more to it than that. The Wayside Safety program needs to transition to a greater detailed Roadway Worker Safety program which fundamentally changes the way work has been done at BART for 40 years. The changes needed cannot be accomplished by issuing new manuals and operating bulletins alone. BART must change habits, beliefs and safety culture to ensure success.
2. Qualification of trainers must also be part of the program upgrade, as well as establishing new qualifications levels for RWP duties.
3. If training for RWP does not become centralized, the coordination between department trainers on content and emphasis on specific course content must be improved.
4. Training program evaluations should be conducted to determine if there are any gaps between course content and what is encountered on the job.

5. Set the competence level for passing safety critical questions (concept of Cardinal Rules) at 100% for passing.
6. Include exercises in RWP training to demonstrate competency in radio communication, setting worksite flags, ability to use proper hand signals to stop trains, ability to use audible warning methods to warn workers, and methods on determining sight distance and train speeds to allow employees to clear to a place of safety 15 seconds before the arrival of a train.
7. Formalize OJT and mentoring being performed currently as part of the training effort.
8. The structure and methods within the organization used to communicate safety issues needs to be enhanced to be more visible, more timely, and more effective.
9. Effectiveness of the Joint Union Management Safety Committee (JUMSC) is limited, as is the number of ways that safety can be openly discussed and encouraged in the organization. The peer review team suggests re-chartering and re-purposing this committee to report directly to the Executive level and empowering the management representatives with decision making authority to enable actions arising out of the committee.
10. The safety department role has been upgraded to the executive level but the peer review team suggests that the role and purpose of the department would benefit from greater visibility and interface with the other departments.
11. Establish a strong On Track Safety Briefing program which includes a formal Good Faith Challenge provision and incorporate as a part of the track safety briefing.
12. Enhance the OSCP proficiency testing program to accommodate the changes in the program and identify specific tests to be conducted along with frequency of tests to promote the understanding and effective implementation of the new program.
13. The OSCP proficiency testing program focuses on procedural and rule adherence but has not been used effectively to detect low frequency/high consequence safety critical performance deficiencies which would allow them to be investigated as accident precursors. Consider developing a new layer of proficiency observations aimed at human factors and human error BART proposes to adopt a Roadway Worker Protection Near Miss, Non-Punitive- Reporting Program and the review team suggests this “near miss reporting” concept be applied in other areas where safety critical functions are performed.
14. BART management needs to take the lead on Safety Culture development, such as the expansion of the near miss program to develop a reporting culture, and in other areas such as informed culture, just culture, learning culture and resilient culture all of which are linked to promoting a positive safety culture identified in the APTA Urban Rail Safety Manual Element 3 section 3.3.2.
15. The peer review team recommends more emphasis be placed on proper job safety briefings for track access and in formalizing the concept of the Good Faith Challenge within the safety briefing. The current rule (2113) does not require a job safety briefing for track access and procedures covering job safety briefings do not make it clear that when tasks or situations change, a rebriefing is required. The APTA standard establishes the minimum requirements for track safety briefings. We had to look through multiple BART documents to find references to each of the 7 specific items and the 2 general conditions listed in the APTA standard. No one single BART document describes all the necessary elements of a proper job safety briefing for track access. Many agencies print

the job safety briefing criteria on the back of their track access authority form to minimize the chance of overlooking critical information. Even the new definition of Job Safety Briefing provided in the proposed Operating Bulletins does not detail what must be covered in a Track Safety Briefing and definition of a Good Faith Challenge is also missing from these documents.

16. The review team noted that BART has adopted the use of the CPUC GO 175 definition of "track zone" in the proposed RWP manual in place of the term "fouling" the track. There must be some purpose served in deviating from a traditional rail term that intuitively describes a place of danger, but we could find no discussion of why this term was chosen. The CPUC uses the term "work zone" in the GO 175 but does not define it. "Work Zone" is defined in APTA standards and in BART's program to denote a place where trains are restricted. "Track Zone" does not convey any sense of foreboding or risk. In the new RWP manual, BART should consider amending the term to add "Live Track Zone" which like "Live Electrical Wires" would be much more meaningful to track workers by imparting sense of danger if "fouling" is no longer an acceptable term under regulatory authority.

4. Application of CPUC Standards Impact to Operations (w/minimal impact to OTP)

The proposed CPUC GO 175 is significant in many ways. It is the first regulatory effort to define On Track Safety requirements in a transit environment. The FTA has no comparable regulation. The FRA did issue a comparable regulation (Part 214) in 1997 and the APTA Standards and many rail transit agency programs are patterned from that regulation. Although FRA and APTA are mentioned in the GO 175, in the end the CPUC has gone its own way with the regulatory effort and what started out as a consensus effort was abandoned in favor of a mandated directive. For the California transit agencies covered by the proposed rule the impacts will vary based primarily on the physical layout of the system, the design of the signal system and the sophistication of the technology to support train operations. For BART all three of these impact areas are major issues in bringing the agency into compliance with the GO 175. BART has already taken steps to transition over to a different maintenance scheme by shifting work that had been previously accomplished under a simple approval authority during daylight to a work zone authority at night within the 2.5 hour maintenance window, but much more will need to be considered in the mid and long term to satisfy both the regulatory requirement and the demands of an aging infrastructure that is being pressed to meet the expectations of today's societal demands with a system designed 40 years ago with a different set of expectations. The review panel does not believe that there is a set of solutions that can preserve OTP with minimal impact without significant time, cost and restructuring of the way business is conducted.

During interviews, someone said that the design of the BART system was essentially a rapid transit system operating as a commuter railroad. The four lines have been under almost continuous expansion over 40 years and stretch well out into regional communities then converging between the Oakland wye and South San Francisco. Ridership demand has resulted in narrowing the maintenance window to just 2.5 hours. There are long stretches of subway, at-grade and elevated guideway which were built before the minimum clearance distances were established. Track speeds replicate commuter rail and headways replicate transit. Braking

distances for train separation have to be supported by a signal system that was only envisioned to operate in one mode. The ATO system was not designed for a downgraded performance level that could still provide adequate service. The long length of signal blocks creates a problem in clearing them in a timely manner. 25 mph is not suitable to sustain service levels for any length of time, but also impacts work procedures.

One of the most immediate and long term impacts of the GO 175 requirements at BART is the effect it has on the number of daylight inspections and preventive maintenance activities that can be accomplished. BART would average 34 work orders per day but, without the ability to use a watchman / lookout under train approach warning procedures, all but the most critical have to be moved to nights. For those jobs that cannot be performed at night, Train Controllers are providing key out support (a form of local prohibits) for track and electrical workers to allow trains to operate in ATO at a downgraded speed of 27 mph. However, assigning personnel to this support activity takes them away from completing assigned Signal work (CM & PM). To support this function long term, signal department needs more radios (currently short on radios) and additional personnel.

Implementation of GO 175 will also have a staffing impact. In addition to Signal department, both Training and Safety departments will need additional staff resources to meet the demand for implementation of training 3,200 personnel. There will also be more use of a watchpersons / flaggers to perform the duties specified in GO 175.

Recommendations

1. Consider completely upgrading the train control signal system to correspond with the new car order.
2. Consider ways to compensate for loss of wayside access:
    - Switch to 20 minute headways after 8 pm to allow for limited maintenance activity
    - Conduct a state of good repair study to determine what the optimum maintenance window needs to be to support major rehabilitation on the one hand and maintainability of assets at prescribed preventive maintenance cycles on the other.
    - Extend the non-revenue maintenance window by at least 1 hour to accommodate the additional procedural requirements and work alignments created by GO 175
    - Engage in more aggressive weekend outages with the utilization of bus shuttles.
3. Consider creating a flagger / watchperson classification and roster to fulfill the prescribed duties of flagger and/or watchperson. The advantages to this separation of duties arrangement are that they might not become engrossed in the work being performed and less likely to be influenced by competing work objectives and therefore maintain a higher state of alertness.

5. <u>Risk Based Approach: Design and Technology</u>

Prior to the proposed GO 175 criteria for a 6 foot track zone clearance, transit agencies developed their own clearance distances based on the dynamic envelope measurement and a margin of safety. Most agencies adopted the FRA Part 214 criteria of 4 foot from the field side

of the nearest rail. BART uses a 5 foot clearance measurement due to the wider track gauge and wider body dimensions of the railcars and 8 feet for equipment. Although the new requirement of 6 feet has a greater safety margin from the dynamic envelope of the train for most of the other transit systems within CPUC's jurisdiction, it has a less of a safety effect on BART's wider profile, and may unintentionally affect the ability to gain access to walkways, equipment rooms, 3rd rail power switches and other trackway features. Areas particularly affected by this requirement exist on elevated viaduct, within close clearance areas, and subway structures with little opportunity for modification to the new requirement. Civil design considerations for future expansion and major rehabilitation should be considerate of On Track Safety clearance dimensions and sight distance requirements that have been proposed in GO 175 as they may not provide a safety margin appropriate to BART's profile and operational characteristics as would be considered adequate on other transit rail properties. Time and cost to retrofit or expand service under terms of GO 175 may be considerably higher for BART than for other California properties as a result.

Systems design and technologies may be the best solution to conform the new rule requirements to existing infrastructure without major modifications. Technologies that can enhance the safety of the track worker with additional detection and warning properties or to reduce the duration of exposure to be near the track are being introduced and tested but have not been proven in all transit rail applications and none have been certified as fail safety for the track worker. Smart camera technologies, software products that can overlay existing failsafe systems, such as GPS and GIS have potential uses in providing positive separation, detection, and warning. Although rail supply and manufacturing companies are working to develop technologies to support a safer track worker environment, these efforts still provide only limited solutions for employees at track level under specific conditions. Technology is currently being tested to perform virtual track inspections using high definition cameras linked to computer diagnostics which can very accurately capture the rail and trackbed conditions while moving at track speed. Track inspectors in the office review the footage taking note of where the computer has identified an anomaly and also comparing the detail to the previous video. This process reduces the amount of time that employees need to spend walking track for inspection.

Recommendations

1. Design of track access points should minimize the need to transverse trackway to gain access to fixed work locations such as tool houses, signal houses, substations.
2. The need to perform as many track inspections as currently conducted might be substantially reduced by high resolution cameras and detection equipment that can operate on a train or track machine capable of maximum operating speeds during revenue service. This could minimize the need for employees to be at track level regardless of the time of day. New Jersey Transit currently operates a test of this type of equipment under a waiver from the FRA and NYCTA is piloting this type of equipment on their system, while WMATA has an order placed. The review team thinks that this type of technology, if perfected, would be a good fit for the many track miles that BART must maintain and inspect.
3. The combination of scheduled 15 minute service throughout the revenue period along with a very short maintenance window of three hours is very constraining for providing

the necessary maintenance needed to keep the system in a state of good repair. As the system has aged over the years the demand for major rehabilitation is much higher and takes more time. The review team suggests that, at a minimum, an additional hour of nonrevenue operations be provided and that late night and weekend headways be adjusted to provide opportunity for inspections, light repair and preventive maintenance.

4. Explore the opportunity to enhance employee safety with redundant technologies that provide train approach warning.
    - Be cognizant of APTA guidance on selection and use of technologies that are not failsafe.

III. CONCLUDING REMARKS

The panel sincerely appreciates the support and assistance extended throughout the entire peer review process by all BART staff. We equally appreciate the open and frank communication provided by members of the staff. The panel stands available to assist with any clarification or subsequent support that may be needed

APPENDIX

APPENDIX A

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT
300 Lakeside Drive, P.O. Box 12688
Oakland, CA 94604-2688
(510) 464-6000

October 31, 2013

Mr. Michael Melaniphy
President
American Public Transportation Association
1666 K Street NW, Suite 1100
Washington, DC 20006

Dear Mr. Melaniphy:

The purpose of this letter is to request that APTA conduct an expedited peer review of BART's interim Wayside Safety Program and make recommendations regarding additional improvements to the program prior to its finalization. This review and any resulting recommendations should be made within the context of, and consistent with, the California Public Utilities Commission's (CPUC) newly adopted General Order #175 "Rules and Regulations Governing Roadway Worker Protection Provided By Rail Transit Agencies and Rail Fixed Guideway Systems".

As you know, the state safety oversight role in California lies with the CPUC. If you would like to include them in your examination, please contact Paul King, CPUC Deputy Director of Rail Safety a[redacted]

Please include in your assessment, BART's compliance with adopted APTA Standards on roadway worker protection. We also request that the scope of the peer review include a sampling of actual BART practices and performance related to wayside worker safety, including training, and whether actual field practices adhered to BART rules and procedures in effect at the time. Lastly, BART requests review and input from the peer review panel on strategies and options that minimize the impact on service reliability of the newly adopted wayside worker protection procedures.

This request is made at a time when the District has made a significant modification to its Wayside Safety Program and is considering other changes. These changes are a result of a double fatality accident that occurred on October 19, 2013 when a BART employee and a contractor were struck by an out of service train during a work stoppage. The cause and circumstances of this accident are currently under investigation by the National Transportation Safety Board.

We request that this peer review be expedited and that the panel assembled by APTA consist of industry experts in rail transit wayside worker safety. BART's Chief Safety Officer, Jeff Lau will be our contact person to help coordinate the

APPENDIX A

peer review. Mr. Lau can be reached at 510-874-7452 (office), 510-915-7944 (cell) and jlau@bart.gov.

Thank you very much for your willingness to assemble a panel.

Sincerely,

[redacted]

Grace Crunican
General Manager

cc: CPUC
Jeff Lau
Paul Oversier
Marcia deVaughn

APPENDIX B

AMERICAN PUBLIC TRANSPORTATION ASSOCIATION
PEER REVIEW OF
SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT
WAYSIDE SAFETY PROGRAM

November 18 – 20, 2013

AGENDA

BART headquarters: 300 Lakeside Drive, Oakland
BART EOC: Lake Merritt Station, Administration Facility

Monday (Nov 18th)

7:00 – 8:00 am	*300 Lakeside Dr, 18th Floor Conference Room* Available to Peer Review Panel
8:00 – 9:00 am	**Opening Conference**, *23rd Floor General Manager Conference Room* • Welcome by General Manager Grace Crunican • Introductions of Peer Review Panel and BART Senior Staff • Overview of the APTA Peer Review Program (B. Grizard) • Questions and Answers
9:00 – 9:30 am	Peer Review Panel proceeding to the BART Emergency Operations Center (EOC) at Lake Merritt Station (2 stops via BART)
10:00 – 12:00 pm	Technical Presentation of BART Wayside Safety/RWP Program *(at EOC)* • Operations Rules and Procedures Manual Section 6200/6300 (R. Crespo/R. Aguilera) • Operations Rules and Procedures Manual Section 7300 (C. D. Allen) • OCC Sign-for on Simple Approval (R. Aguilera) • CPUC General Order 175 – Roadway Worker Protection (J. Lau) • APTA Roadway Worker Safety Standards (J. Lau) • Operating Bulletins on New RWP Program (J. Lau/R. Crespo)
12:00 – 1:00 pm	Lunch

APPENDIX B

1:00 – 2:00 pm Tour of the Operations Control Center (R. Aguilera)

2:00 – 5:00 pm Review/Interview of Trackway Safety Training Programs *(at EOC)*
- Maintenance & Engineering Training (M. Smith/S. Almanza)
- Transportation Training (G. Leong)
- OCC Training (R. Aguilera/S. Camacho)

Tuesday (Nov 19th)

8:00 – 12:00 pm Review/Interviews at discretion of Peer Review Panel *(at EOC)*

Personnel from these M&E divisions will be available for interview:
- Power/Mechanical
- Track
- Signal / Train Control / Communications

12:00 – 1:00 pm Lunch

1:00 – 5 pm Peer Review Panel Caucus *(at EOC)*

Wednesday (Nov 20th)

7:00 – 8:00 am *300 Lakeside Dr, 18th Floor Conference Room*
Available to the Peer Review Panel

8:00 – 10:00 am **Exit Conference**, *23rd Floor General Manager Conference Room*
- Peer Review Panel – Discussion of Observations & Findings
- Closing Remarks by General Manager Grace Crunican

10:00 am Adjourn