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Decision No. 86013

ORIGINAL

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Investigation on the Commission's own motion into the safety appliances and procedures of the SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT.	Case No. 9867 (Filed February 4, 1975)

Malcolm Barrett and Sherwood G. Wakeman, Attorneys at Law, for Bay Area Rapid Transit District, respondent.
Charles R. Woodhouse, for Parsons Brinckerhoff-Tudor-Bechtel; Pettit, Evers & Martin, by Joseph Martin, Jr., Attorney at Law, for Rohr Corporation; Charles M. Carver and Willard Wattenberg, for themselves; and T. Richard Brown, Attorney at Law, for TRW, Incorporated; interested parties.
Walter H. Kessenick, Attorney at Law, for the Commission staff.

FOURTH INTERIM OPINION

Background

On January 19, 1975, a Bay Area Rapid Transit District (BART) train struck a "hi-rail" maintenance vehicle on the main line track, thereby killing the operator and causing extensive damage to the maintenance vehicle and the train equipment. This incident and others caused the Commission to commence this inquiry on February 4, 1975.

Pending hearing on the above matters, BART was ordered to institute and implement the following procedures in the conduct of its train operations to prevent future accidents pending the outcome of this investigation:

"1. Train movements in the vicinity of on-rail maintenance equipment shall be made in manual mode at a speed not exceeding that which will permit the train to stop before reaching such vehicle or vehicles but not exceeding 25 mph. Train operators shall advise Central Control that the maintenance vehicle involved is clear of the track on which the train is running before Central authorizes the train to proceed in automatic mode.

"2. The train controller at Central, wherever possible, shall align all routes for both revenue and nonrevenue vehicles during the movement of maintenance vehicles.

"3. All accidents or incidents that have caused or could cause accidents arising out of or involving operations in either main line or yard track areas shall be reported by telephone to the Commission within 24 hours.

"4. Upon completion of the normally required procedures and upon arrival at their maintenance area, maintenance vehicle operators shall make a final readback to Central Control of their nearest milepost location."

Finally, BART was required to present to the PUC staff, before February 19, 1975, "plans for adding a device or devices to maintenance vehicles used on-rail which will make such vehicles detectable to the train control system, the purpose of which would be to insure that no automatic train operations may be carried on within the immediate area in which maintenance equipment is operating."

Exhibits Nos. 5 and 5-A in this proceeding were timely responses to the foregoing requirement. Exhibits Nos. 16 and 21 set forth the details of the maintenance vehicle detection feasibility investigation by a special task force composed of personnel from BART, Lawrence Berkeley Laboratory (LBL), the PUC consultants, and the PUC staff.

In response to the requirement that BART submit a plan for providing detection of maintenance vehicles, a task force was formed to evaluate alternative methods for achieving maintenance vehicle detection, to select those methods which best satisfy the performance criteria and existing system constraints, to perform field experiments to determine the feasibility of the methods selected, to use field results to select and refine the most appropriate method, and to design and test a final prototype. This task force mission was limited to the completion of the prototype. Installation of the device on all of BART's maintenance vehicles capable of operating on the track was not undertaken by the task force. Exhibit No. 5-B indicates that the installation on all maintenance vehicles will be completed 40 weeks after February 10, 1975, or by November 17, 1975. Relying on BART's apparent agreement to expeditiously install the protection device on all maintenance vehicles, Decision No. 84582 ordered BART "to file monthly status reports on the progress of developing and installing a detection device on all maintenance vehicles".

During the hearing on February 9, 1976, BART advised the Commission that it was now considering alternate methods of protecting the maintenance vehicles and was now considering not installing the protection device on all maintenance vehicles. Whereupon the Commission set a hearing before Examiner Coffey on February 23, 1976 to determine how BART proposed to protect the maintenance vehicles.

BART Showing

On February 23, 1976, BART informed the Commission that it had changed its position from that stated on February 9 and now proposes to install the protection device on all maintenance vehicles. At page 1766 of the record begins a long explanation of why BART has changed from its tentative proposal on February 9 to its present position. We shall not summarize it here since we are concerned with BART's safety performance and not with excuses for BART not meeting its commitments.

By letter dated March 3, 1976, BART now estimates the following implementation schedule for the maintenance vehicle detection system:

1. Completion of design and testing of preproduction unit ..... 6 months
2. Award of production contract ..... 1 month
3. Receive first production units ..... 3 months
4. Complete installation of last unit ..... 5 months

By this schedule the first units will be in service in 10 months and the program will be completed in 15 months.

BART's assistant general manager testified that to protect the maintenance vehicles BART:

1. Intends to use the blanket work area concept wherever possible.
2. Vehicles within and outside the blanket work area will be equipped with the maintenance vehicle detection system.

Staff's Position on Maintenance of the Main Line

The following sets forth the staff's position on the requirements for safe maintenance of the main line:

"1. The basic position of the CPUC staff pertaining to maintenance operations on the main line is that the maintenance vehicles must always be detectable by the primary protection system and be displayed at BART Central on the 'big board'. This applies to revenue and non-revenue service hours.

"2. The maintenance vehicle detection will be accomplished by an on-board device such as the 'jammer' described in the 'Maintenance Vehicle Detection Engineering Task Force Final Report', dated August 12, 1975, or an equivalent. Because the design of this 'jammer' is double redundant (fail-tell-run) rather than the fail-safe design that is preferred, the staff will accept this device as just adequate to perform the designed function with the following provisions:

"A. No vehicle will be allowed to enter or to remain on the main line when either part or the total 'jammer' is inoperative.

"B. If 'jammer' becomes totally inoperative when on the main line, the vehicle operator will be in constant communications with BART Central and remain so until the vehicle is guided to an access point and is removed from the main line.

"C. When the maintenance vehicle is enroute from an access point to a work area it shall communicate its position to BART Central every mile and Central will verify its position, direction of travel and track number or identification.

"3. Routine maintenance on the main line shall be performed only during non-revenue service and shall commence following the departure of the last revenue vehicle from the terminal zones and shall not cause reverse running of the returning revenue vehicles (see letter to C. O. Kramer, November 26, 1975, subject: Extended Service, Track Maintenance).

"5. Prior to the entry on to the main line track of any maintenance vehicle, the following action shall be taken: Verification that no trains are in the vicinity, an announcement over the train radio warning that there is a maintenance vehicle that will be on the main line and its position, and verification of the position of the maintenance vehicle by use of 'occupancy activators' or shunts.

"6. The concept of a 'blanket work area' wherein the maintenance vehicles do not require the 'jammer' is acceptable providing:

"A. Both tracks will be included in the work area.

"B. All third rail power will be turned off in the work area.

"C. A maintenance of way access point shall be included in the work area.

"D. In addition to the prohibits set up at each end of the work area, flashing red lights in both directions shall be placed on each track at each end of the work area, and no derail mechanism shall be used.

"7. When the maintenance vehicle is on the main line enroute to a work area and either fails to report in for a period of 10 minutes or if occupancy is lost - attempts shall be made to establish radio communications to determine location and reason for loss of contact. If communications are not reestablished in 2 minutes, the following actions shall start immediately:

"A. Determine where the vehicle was at last contact and where it should be now.

"B. Turn off third rail power between the two points determined in A above and one mile on both sides of the zone - both tracks.

"C. Establish gate stops or station holds at both ends of the area established in B.

"D. Continue attempts to communicate by radio.

"E. If no communication is established after 5 minutes - a vehicle shall be sent into the area to determine what problems exist.

"8. All other rules and procedures that govern the maintenance vehicle will remain in force except when they conflict with those noted above."

A staff consultant made a number of specification recommendations for the design of the maintenance vehicle detection device to ensure reliable operation. These include the use of military grade integrated circuits, repackaging the device enclosure, uniform production of printed circuit boards, specification of transformer, specification of battery and battery location, the use of environmentally protected wiring and connectors, and the replacement of the present inadequate alarms. The consultant further

suggested that a failure mode analysis be made of the device by a person or institution other than the equipment designer, that the procedures to set maintenance vehicles on the tracks be reviewed, and that a representative of the Public Utilities Commission continue liaison with BART personnel developing the device. Since this device relies on redundancy to afford adequate safety protection, the components, manufacture, installation, and maintenance of these devices should be the highest quality available with current technology. We shall expect these recommendations of the staff consultant to be implemented by BART without further order of this Commission.

After extensive and wide-ranging cross-examination of BART witnesses, Dr. Wattenberg proposed that the Commission order BART to contract with LBL to complete the design of the detection device on the maintenance vehicle so that the device can be provided and installed by an outside contractor. BART's assistant general manager indicated that LBL would be requested to undertake the final engineering work. However, this record does not reflect LBL's position on this matter. It would not be appropriate for us to order BART to contract with LBL without further showing of present need.

Discussion

Two witnesses for the staff recommended that the detection devices be installed on all maintenance vehicles and BART management has reaffirmed its agreement to do so. It appears that such should be ordered. Until such time as BART has fully complied with the requirement to install the detection devices, the concept of a "blanket work area" should be applied as recommended by the staff, and other recommendations by the staff as set forth above should be implemented.

Findings

1. The prompt installation of detection devices on all BART maintenance vehicles is essential to the safety of BART employees and the general public.

2. The prompt implementation of the recommendations of staff witnesses set forth herein is essential to the safety of BART employees and the general public.

Conclusion

BART should be required to install detection devices on all maintenance vehicles and implement staff recommendations as herein ordered.

FOURTH INTERIM ORDER

IT IS ORDERED that:

1. On or before June 30, 1977, the San Francisco Bay Area Rapid Transit District (BART) shall complete the installation of detection devices on all maintenance vehicles operating on its mainline tracks. Monthly reports of progress shall be filed with the Commission on or before the 15th of each month.

2. Within sixty calendar days after the effective date of this order, BART shall file with this Commission such rules and procedures as may be necessary to implement the following interim safety requirements pending installation of detection devices on all maintenance vehicles:

   a. Routine maintenance on the main line shall be performed only during non-revenue service and shall commence following the departure of the last revenue vehicle from the terminal zones and shall not cause reverse running of the returning revenue vehicles.

b. Prior to the entry on to the main line track of any maintenance vehicle, the following action shall be taken: Verification that no trains are in the vicinity, an announcement over the train radio warning that there is a maintenance vehicle that will be on the main line and its position, and verification of the position of the maintenance vehicle by use of "occupancy activators" or shunts.

c. When the maintenance vehicle is on the main line enroute to a work area and either fails to report in for a period of 10 minutes or if occupancy is lost - attempts shall be made to establish radio communications to determine location and reason for loss of contact. If communications are not reestablished within 2 minutes, the following actions shall start immediately:

   (1) Determine where the vehicle was at last contact and where it should be now.

   (2) Turn off third rail power between the two points determined in (1) above and one mile on both sides of the zone - both tracks.

   (3) Establish gate stops or station holds at both ends of the area established in (2).

   (4) Continue attempts to communicate by radio.

   (5) If no communication is established after 5 minutes - a vehicle shall be sent into the area to determine what problems exist.

d. The concept of a "blanket work area" shall be utilized providing:

   (1) Both tracks will be included in the work area.

   (2) All third rail power will be turned off in the work area.

(3) A maintenance of way access point shall be included in the work area.

(4) In addition to the prohibits set up at each end of the work area, flashing red lights in both directions shall be placed on each track at each end of the work area, and no derail mechanism shall be used.

e. All other rules and procedures that govern the maintenance vehicle will remain in force except when they conflict with those prescribed herein.

The effective date of this order shall be twenty days after the date hereof.

Dated at San Francisco, California, this 29th day of JUNE, 1976.

President

Commissioners

Commissioner D. W. Holmes, being necessarily absent, did not participate in the disposition of this proceeding.