

Regional Transportation District

Our mission:

To meet our constituents' present and future public transit needs by offering safe, clean, reliable, courteous, accessible and cost-effective service throughout the District.



Memorandum

To: RTD Board of Directors

From: Clarence W. Marsella, General Manager

Date: September 8, 2006

Subject: GMR 8961, Supplemental Information, West Corridor Fencing and Barriers

EXECUTIVE SUMMARY

It is common industry practice to utilize various types of fencing and barriers along light rail alignments. The use of fencing and barriers is for several reasons: to reduce and prevent pedestrian trespass and pedestrian accidents in the rail right-of-way; and to prevent vehicles from inadvertently entering the rail right-of-way resulting in auto/train accidents. Secondary to safety, incidents in the rail right-of-way cause significant service interruptions and delays in service (refer to photo on page 14).

Pedestrian trespass in the rail right-of-way is a common problem for all light rail operators, especially in residential areas and areas adjacent to schools and parks. The West Corridor runs through a residential area that includes schools and parks. Most light rail properties use various forms of fencing or other treatments in these areas to reduce the probability and severity of pedestrian accidents. RTD's light rail design criteria requires fencing and a ballast curb wall in residential areas where train speed is greater than 25 mph (the average West Corridor train speed is 35 mph). In addition to safety, the ballast curb wall provides for noise mitigation. If the curb wall is not used, the perceptive noise will increase requiring other noise mitigation. This design is recommended for the safety of residents and the light rail system.

Additionally, according to a preliminary hazard analysis performed by the West Corridor final design engineering consultants, leaving these areas unfenced and without barriers at the proposed design speed results in two unacceptable hazardous conditions: pedestrian on restricted alignment causing accident resulting in serious injury or death; and a motor vehicle on alignment causing an accident resulting in serious injury or death. Unacceptable hazardous conditions are not allowed by the FTA through the State Safety Oversight regulations enforced by the Colorado Public Utilities Commission. The design engineers recommend fencing and barrier protection as hazard mitigation to bring the hazards to a level acceptable by State Safety Oversight requirements.

There is also an industry trend in which light rail operators are revisiting older alignments and installing some type of fence or barrier protection because of pedestrian trespass and accident problems. Dallas and Portland are examples of properties that experienced pedestrian fatality accidents in unfenced ROW and then placed fencing or other barriers after the accidents occurred.

INTRODUCTION

This memo includes a summary of information received from other light rail properties regarding right-of-way (ROW) fencing, barriers and accident history. It also includes a summary of the draft preliminary hazard

analysis (PHA) conducted for the West Corridor by David Evans and Associates' safety and security sub-consultant Interactive Elements, Inc. Light rail properties around the country were surveyed via the APTA Safety and Security list server, e-mail request, and telephone interview. Ten properties provided information including: Dallas, Los Angeles, Minneapolis, Phoenix, Pittsburgh, Portland, Sacramento, Salt Lake City, San Diego and Seattle.

DEFINITIONS

Exclusive right-of-way – right-of-way in which light rail operates in its own envelope and has no interface with other modes except at stations. Typically, there are no at-grade grade crossings, the ROW is fenced, and train speed is typically at the higher end of capability (45-55 mph). Example: Southwest Corridor, Southeast Corridor, and West Corridor (along 6th Avenue).

Semi-exclusive right-of-way – right-of-way in which light rail operations has intermittent interface with at-grade vehicle and pedestrian crossings. Typically, there are at-grade crossings, the ROW is fenced, there may be adjacent streets, and train speed is in the mid-range of capability (25-45 mph). Example: Central Platte Valley Spur and West Corridor (Auraria to 6th Avenue).

Street running – right-of-way in which light rail operates mixed in with vehicle traffic in an urban environment with many interfaces between at-grade vehicle and pedestrian crossings. Typically, light rail usually operates at speeds less than 25 mph and in its own lane separated from vehicle traffic by a mountable curb or may at times share lanes with vehicles, and the ROW is usually not fenced except for areas where special circumstances require fencing. Example: Central Corridor (Auraria to Welton).

LIGHT RAIL PROPERTY SUMMARIES

Dallas Area Rapid Transit (DART)

The DART design criteria requires six feet high chain link fence where train speed is greater than 45 miles per hour. For ROW areas outside of this criteria, DART evaluates each area on a case by case basis and usually fences ROW adjacent to schools, parks and recreation areas, locations where people frequently cross and frequently trespass, special events areas, areas with security concerns, and parking areas associated with at grade stations.

DART also had the unfortunate experience of a pedestrian fatality involving a 9 year old boy. This was DART's first fatality accident and it occurred as the boy crossed the ROW in an area without ROW fencing. As a result of this accident, DART placed median fencing between the tracks where this accident occurred. This accident occurred in a median running environment in reduced speed territory adjacent to an apartment complex.

On the planned Southeast Dallas extension, the light rail alignment will go through or run adjacent to parkland for three miles. This section will be fenced for two reasons: train speed greater than 45 mph, but also because it is an area where people currently cross and trespass. DART stated they would fence this area even if train speed were below 45 mph.

Los Angeles County Metropolitan Transit Authority (LA MTA)

The LA MTA utilizes various fencing and barriers throughout their light rail system. Of particular note is their use of steel picket fencing, ornamental iron fencing, wire mesh fencing and vinyl-clad chain link fencing in slow speed operating environments (some with maximum train speeds of 20 mph). LA MTA uses some type of fence in every operating environment with the exception of street running. However, they are currently revisiting certain street running environments and proposing center median fencing to address pedestrian

crossing, jaywalking and trespassing. LA MTA's pedestrian crossing and trespass experience on the Blue Line led them to utilize ROW fencing on the newer Gold Line to address the types of problems encountered with pedestrians on the Blue Line. The fencing in slow speed areas of the Gold Line has been so effective in addressing pedestrian problems that the LA MTA has installed center median fencing on the Blue Line. LA MTA is also in the process of installing additional center or median fencing for street running sections of the Blue Line in Long Beach where train speeds do not exceed 35 mph.

Regarding LA MTA's pedestrian accident history, pedestrian accidents do occur at grade crossing areas, but their experience with pedestrian accidents along the ROW has been good which they attribute to ROW fencing in most environments.

Photographs showing LA MTA's various operating environments and fencing are included in the attachment (pages 7-9).

Minneapolis/St. Paul Metro Transit

Metro Transit utilizes various types of ROW fencing depending on the operating environment. The ROW fencing has been effective in preventing pedestrian accidents and has been effective in preventing pedestrian trespass in the ROW. Along the Hiawatha section, Metro Transit uses industrial type wooden privacy fencing where the alignment operates adjacent to back yards. Throughout the majority of their system, Metro Transit uses ROW fencing made from wooden posts with 4 horizontal cables. A photo of this fencing is included in the attachment (page 10). In the Downtown East section, Metro Transit experienced trouble with pedestrian movement across tracks in stations. Metro Transit installed 48 inch vinyl-coated chain link fence in the center of the tracks and it has been very effective in preventing pedestrian movements across the tracks. They are currently working on installing more fencing between the tracks to protect pedestrians from the second train scenario.

Phoenix Metro Valley Transit

The Metro Valley light rail project will be a street running light rail system with an average operating speed of 22 mph. The current design does not include ROW fencing; however, the design is considering some type of pedestrian barrier adjacent to a stadium.

Pittsburgh – Port Authority of Allegany County

The Port Authority has two main sections or stages of light rail, Stage I and Stage II. Right-of-way sections are reviewed on a case by case basis and ROW fencing may be installed along schools, playgrounds and other areas to address specific hazards and pedestrian issues. The Stage I section is a historical alignment that used to have streetcar service. It is a very tight and physically constrained corridor with an average train operating speed of less than 20 mph. It is not possible to install ROW fencing in the Stage I area. They do experience a high degree of trespass by pedestrians in the ROW. Stage II operates at higher speeds in largely secluded and isolated areas in deserted hillsides. Pedestrian issues are not a concern in Stage II due to the extremely low pedestrian density in the operating environment.

Portland – Tri-Met

Due to pedestrian migration and trespass issues on older alignments, Tri-Met has shifted their design to include center ROW treatments consisting of bollard and chain barriers and cable barriers. On the recently

opened Interstate Max (yellow line) for example, Tri-Met installed center bollard and chain barriers that have proven very effective at preventing and reducing pedestrian trespass and pedestrian accidents. The operating speed of this section is 35 mph. A photo of the barrier is included in the attachment (page 11). Tri-Met also revisited their existing alignment in the Skidmore area near downtown because of continuous problems with pedestrians. They placed historic-looking bollards and chains in this area which have proven effective at preventing and reducing pedestrian trespass and pedestrian accidents. Along Tri-Met's east side (Gresham) the operating speed is 35 mph and there are currently no ROW fencing or barriers, however, they recently had a pedestrian fatality in this section. Their experience with pedestrian migration and trespass in this area is very high and Tri-Met would like to place bollard and chain center barriers to reduce pedestrian trespass. Tri-Met stated that for all new light rail alignments, their preference is to use bollard and chain.

Tri-Met also experienced several serious pedestrian accidents including at least one fatality in the Beaverton area of the blue line (Hillsboro). In response to these accidents, Tri-Met installed railing, cabling and pedestrian swing gates to channel pedestrians to safe crossing areas instead of letting them cross the tracks in any area. Photos are included in the attachment (pages 12-13).

Sacramento Regional Transit

Sacramento Regional Transit uses ROW fencing along the ROW except for in the downtown street running environment. Their standard is 6 foot chain link along the ROW and around parking lots, and 4 foot chain link around station platforms. They also frequently use jersey barriers to separate the rail alignment from adjacent vehicle traffic.

Salt Lake City – Utah transit Authority

Salt Lake City UTA uses fencing where tracks are adjacent to school grounds or other high-risk facilities, and local access to the tracks may be controlled by fencing. Size, type and length of fencing or barrier are determined by site-specific requirements, or local jurisdictional requirements. A minimum of 4 foot chain link fence is required where trails, such as bike paths, are adjacent to the ROW.

San Diego Metropolitan Transit System

San Diego uses chain link fence in exclusive and semi-exclusive ROWs and primarily has some kind of fencing or barrier throughout most of their system. In addition to chain link, ornamental iron fencing is used in certain sections. San Diego states that ROW fencing has been effective in preventing pedestrian accidents and trespass. There have been a few pedestrian fatalities that were ruled suicides. San Diego stated they would use the same approach for new lines.

Seattle – Sound Transit

The Sound Transit light rail system will operate in a variety of ROW environments including: several miles of street running, a long tunnel section, and elevated sections. The street running portion will be in a median with curbs to delineate the rail ROW from adjacent auto lanes (similar to RTD street running). The tunnel section will not require fencing and there will be a parapet wall with a short section of fencing on top along the elevated section similar to RTD's aerial structures.

PRELIMINARY HAZARD ANALYSIS SUMMARY

The West Corridor final design contract specifications require the final design consultant to conduct a preliminary hazard analysis and resolution process. Hazard analysis is required by FTA for projects seeking a full funding grant agreement under the new Safety and Security Management Plan requirements. A draft

preliminary hazard analysis report was prepared by Interactive Elements, Inc., a subcontractor to David Evans and Associates. The report identifies various hazards associated with light rail operations and provides recommended mitigation measures to reduce the hazards. Regarding pedestrians and automobiles, two hazards of particular interest are: pedestrian on restricted alignment causing accident resulting in serious injury or death; and a motor vehicle on alignment causing an accident resulting in serious injury or death. The initial classification of these hazards without mitigation was determined to fall in the unacceptable category. The report author recommends fencing as a mitigation measure to reduce the hazards to an acceptable level. The Federal Transit Administration's State Safety Oversight regulations do not allow unacceptable hazards in operating systems. Therefore, these hazards must be mitigated or RTD would be subject to enforcement under the regulations. Enforcement would include the development of a corrective action plan and schedule to mitigate the hazard to an acceptable level that must be approved by the Colorado Public Utilities Commission (Colorado's State Safety Oversight Agency).

CONCLUSIONS

There are several conclusions stated below that can be made based on the information received from these properties.

- It is common industry practice to use various types of ROW fencing and barriers for light rail systems.
- Right-of-way fencing and barriers are very effective in reducing and preventing pedestrian accidents.
- Right-of-way fencing and barriers are very effective in reducing and preventing pedestrian trespass into the ROW.
- Right-of-way fencing and barriers are very effective in preventing automobiles from entering the light rail right-of-way.
- Light rail properties acknowledge that pedestrian trespass problems exist in residential areas, urban areas, areas adjacent to schools and special events areas. To address this concern, properties typically install some type of ROW fencing or barrier in these areas, and in some circumstances install fencing and barriers in street running areas where light rail speeds are 20 mph or less.
- Properties that built earlier systems without fencing and barriers are moving in the direction of using fencing and barriers in new extensions to reduce trespass and pedestrian accidents.
- Properties that built earlier systems without fencing and barriers have experienced significant pedestrian trespass problems resulting in serious pedestrian accidents including fatalities which have resulted in revisiting certain sections and installing some type of ROW fencing and barriers.
- The West Corridor preliminary hazard analysis performed by the RTD final design consultants recommends using fencing to reduce the pedestrian trespass and vehicle encroachment hazards to acceptable levels.

RECOMMENDATIONS

Based on the information obtained from other properties and the conclusions gathered, RTD's design criteria should be utilized for the safety of West Corridor residents and the RTD light rail system. While several properties use bollard and chain or cable style fence, RTD's design criteria recommends fencing to prevent children from ducking beneath chains or passing between cables. Since the West Corridor is largely

residential including schools and parks, the safety of children is a main concern. Therefore, ROW fencing is recommended in addition to comprehensive safety outreach programs to the public and schools.

Attachment: Appendix 1 – Photos

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ATTACHMENT: PHOTOS

LA MTA Gold Line, maximum operating speed is 20 mph, note center steel picket fence



LA MTA Blue Line, street running environment, maximum speed 35 mph, note center chain link fence



Other examples of LA MTA fencing, wire mesh



Other examples of LA MTA fencing, wire mesh and steel pickets



Minneapolis/St. Paul Metro Transit, 4-cable wooden post fence



Portland Tri-Met, bollard and chain barrier on Interstate Max



Portland Tri-Met, pedestrian railing, cables and swing gates



Portland Tri-Met, additional photos showing cable fencing, swing gates and railing



Denver RTD, automobile went through fencing and into Southeast Corridor rail alignment. The automobile came from the west side (not the highway side) from a parking lot road approximately 50 feet from the ROW. A concrete barrier was added after the accident.

