Improving Safety at Level Crossings

5 October 2007

Sinclair Knight Merz Pty Ltd

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Document history and status

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type

Distribution of copies

Revision	Copy no	Quantity	Issued to

Printed:	5 October 2007
Last saved:	4 October 2007 02:00 PM
File name:	I:\SFRA\Proposals\SFP7380\Deliverables\Draft Proposal\SFP7380 (Level Crossings - VT0288) Proposal Rev draft 13.doc
Author:	Brent Graham
Project Manager:	**Brent Graham**
Name of organisation:	
Name of project:	
Name of document:	
Document version:	
Project number:	SFP7380

1. Wayside Train Horn

1.1 History of Use

The wayside train horn has been approved for use in North America. Most installations have been in urban "quiet zones".

1.2 Description

An electronic train horn is mounted at the level crossing and oriented towards the oncoming road traffic. The train horn sounds when activated by an approaching train and an indication is given to notify the train driver that the wayside horn is operating correctly and it not necessary to sound the train horn.

1.3 Potential Benefit

The primary objective of this technology is to reduce noise pollution. It could however be adapted to increase safety by increasing the volume of the wayside train horn.

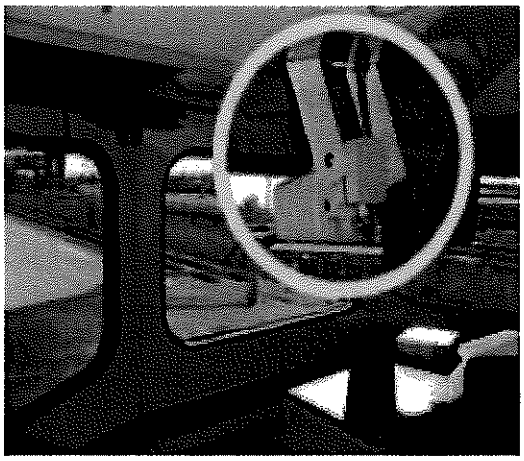
2. Trainborne Video Cameras

2.1 History of Use

Known installations are GO Transit, Toronto and Burlington Northern Santa Fe Railroad (BNSF).

2.2 Description

Video cameras are installed on the lead car/locomotive to record activity ahead of the train. BNSF employs conventional video tape. Go Transit has recently switched to a digital camera and records in MPEG format. Responding to driver concerns GO Transit does not record audio while BNSF selected to mount the camera unit on top of the locomotive cab. GOTransit quoted a cost of $3,200 per unit. Both organisations indicated they are very pleased with the results.



2.3 Potential Benefit

While this technology may not improve level crossing safety directly, analysis of the recordings following an incident significantly improved the reliability and timeliness of incident investigations, corroborated railway staff statements and reduced lawsuits.

Recording near misses as well as actual collisions has allowed GO-Transit to work with trucking companies identified in the videos.

2.4 Risks

A procedure must be in place for handling of the recordings following an incident to maintain continuity of evidence in the event of civil or criminal proceedings.

As with all new equipment there are maintenance issues which need to be addressed.

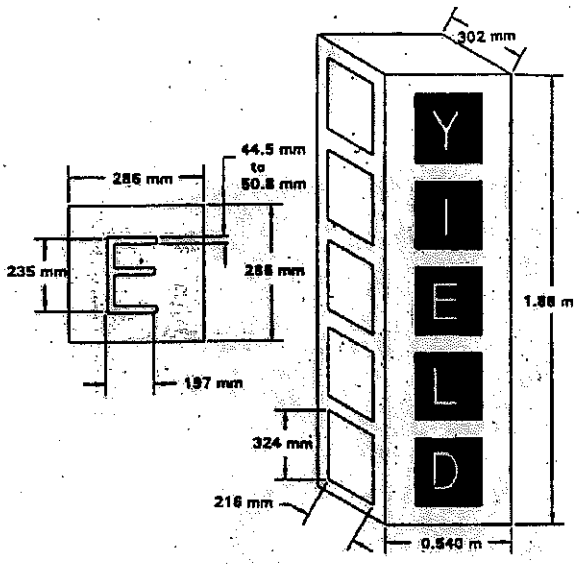
3. Train Illuminated Passive Sign

3.1 History of Use

BNSF has tested a passive warning sign developed by 3M which is illuminated by the train's headlamps.

3.2 Description

The sign is a rectangular box with clear side panels and a translucent front panel which contains a message or symbol. Light from the locomotive strikes the side panel of the sign and is redirected and spread through the front panel and the sign appears to have internal lighting. It is reported to be illuminated by a train in excess of 650 meters away and would provide a warning time of 23 seconds for a 105 km/h train.



3.3 Potential Benefit

The low cost of this system may allow it to be implemented in locations which are not economical to upgrade by conventional technologies.

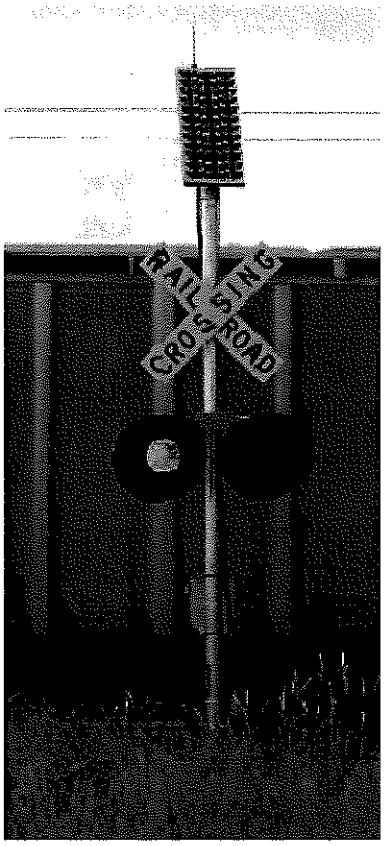
4. C3HRI Low Cost Level Crossing

4.1 History of Use

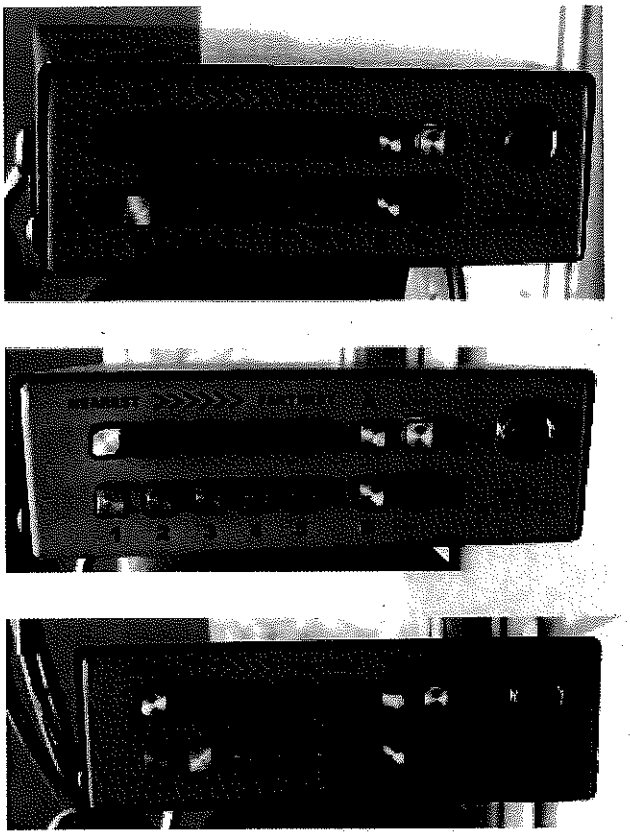
The Minnesota Department of Transportation, in conjunction with the Twin Cities and Western Railroad has tested (2005) a low cost level crossing protection system.

4.2 Description

The system locates locomotives and level crossings using GPS satellites, maintains wireless communications between the components and is powered through solar panels and batteries. The GPS coordinates of each level crossing is recorded in a digital map on board the locomotive. As the train approaches the crossing, it polls the crossing to determine it's health and the crossing equipment is activated.



If the crossing equipment does not respond to a poll from the locomotive, or failure is detected an alarm is generated in the cab.



4.3 Potential Benefit

The low cost of this system may allow it to be implemented in locations which are not economical to upgrade by conventional technologies. Costs are $20,000 per crossing plus $8,000 per locomotive.

4.4 Risks

All locomotives need to be equipped with a dual GPS system.

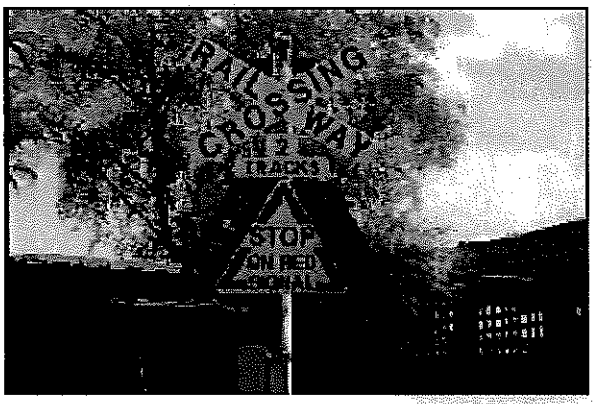
5. Elsie Low Cost Level Crossing

5.1 History of Use

None known

5.2 Description

Developed locally in Victoria, this system utilises axle counter technology to provide train detection and speed sensing. Central monitoring is possible via SMS and the system can be solar powered.



5.3 Potential Benefit

The low cost of this system may allow it to be implemented in locations which are not economical.

5.4 Risks

The signal and signage as designed is non-standard.

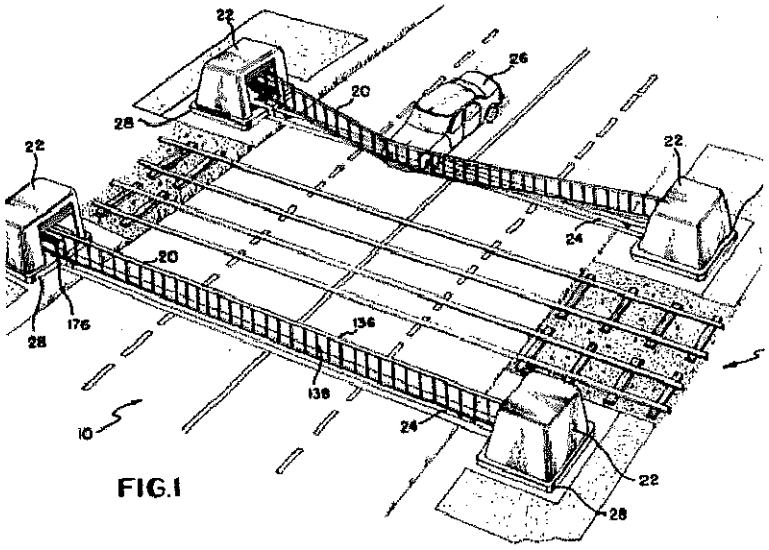
6. Retractable Barriers

6.1 History of Use

Long Island RailRoad (New York) is one agency that is currently testing an alternate to boom barriers.

6.2 Description

These are attenuating devices designed to span the roadway to prevent vehicle passage by bringing the encroaching vehicle to a "controlled" stop. The only test results we have been able to locate were for a 820 kg car and 2000kg truck travelling at 70 km/h



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6.3 Potential Benefit

Increased compliance

6.4 Risks

On top of everything else, this is likely to be expensive to implement and maintain. May not stop heavy vehicles at high speed.

7. In-Pavement Lights

7.1 History of Use

In-Pavement lights are becoming common at crosswalks in North America and to a lesser extent in Australia. BNSF is piloting their use at some level crossings in the Pacific Northwest.

7.2 Description

LED lights are installed into the roadway pavement parallel and near to the stop line. Five units would cover a single lane. Upon the approach of a train, the lights would alternately flash (3,2,3,2 etc)

7.3 Potential Benefit

This could be installed for relatively low cost (~$18,000 per roadway lane) at passive crossings where track circuits are installed or where some other means of train detection could be implemented. They could also be connected to the FCR relay at flashing light locations.

In pavement lights have the potential to stimulate otherwise unaware road users of an approaching train to enable them to react appropriately.

In pavement lights may be particularly useful for East-West crossing orientations where the sun angle might be considered to increase the risk of the road user not seeing the passive or active controls.

7.4 Risks

The addition of non-vital warning equipment may increase the apparent liability of the railway operator in the event of an accident.

Road users may, over time, become complacent about the new warning once the novelty effect has worn off and revert to old behaviours.

8. Adaptive Lighting

8.1 History of Use

None known

8.2 Description

Lighting at level and pedestrian crossings could be reduced to a minimal level while no trains are approaching by either reducing the voltage to the lamps or reducing the number of lamps in operation. When a train approaches, additional lights are turned on (or the voltage increased to normal level) which would alert the pedestrian that the status of the crossing is about to change.

8.3 Potential Benefit

Relatively low cost. May result in energy savings

This approach would be unlikely to provide a benefit to motor vehicle operators.