Railway Technical Society of Australasia Submission to the Road Safety Committee on “existing, new and developing technologies for implementation to improve safety at level crossings”.

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1. Introduction and Acknowledgements

The Railway Technical Society of Australasia (RTSA) is a technical society of Engineers Australia[5], and promotes the science and practice of railway engineering and related technology. The RTSA seeks the advancement of the rail industry through excellence in railway engineering and technology, and through its industry and community education programs.

Firstly, we would like to acknowledge the work of the ATSB and the recommendations made in the past relating to the specific aims of this inquiry particularly recommendation "RR20020031 Pursue a more cost effective method of upgrading railway level crossings to provide active protection with no negative impact on safety" made in September 2004[6]. In the same inquiry it was noted:

> *Notwithstanding the limited options that exist for varying level crossing protection (being limited to active, passive and grade separation treatments), VicRoads is actively involved in considering alternative means of assessment. For example, it (is) currently trialling aspects of a Queensland model for rail level crossing assessment, known as the Australian Level Crossing Assessment Model 'Alcam'…*

Hence our acknowledgement that level crossing protection solutions appear to have been somewhat constrained and that this inquiry is an attempt to "look outside of the box" to achieve a more rapid response to the risks posed by level crossings.

We also acknowledge the work of the Australasian Railway Association in its program "National Railway Level Crossing Behavioural Plan" in which the focus is behavioural aspects and not technology but where we recognise how both elements of an overall program are necessary.

Without limiting all of the efforts made in the quest for safer level crossings by all parties we would particularly like to mention the work at Monash University and the definitive Seventh International Symposium on Railroad – Highway Grade Crossing Research and Safety where the focus was on passive crossings. The Proceedings are mandatory reading for any person serious about safety at passive crossings.

[5] Engineers Australia is the national peak body for all engineering disciplines.

[6] Level Crossing Collision Between Steam Passenger Train 8382 and Loaded B-double Truck Benalla,Victoria, 13 October 2002, RAIL SAFETY INVESTIGATION 2002/0003, Australian Transport Safety Bureau

Wigglesworth[7] and others made many suggestions for improved safety at that Symposium and the subsequent Symposium[8] have continued to advance the knowledge.

We should also make it clear that many inquiries and studies have been undertaken into safety at level crossings and have included sections addressing emerging technologies. We mention specifically the REPORT ON THE SAFETY OF RAILWAY LEVEL CROSSINGS — WHERE ROADS AND RAILWAY LINES MEET AT SUBSTANTIALLY THE SAME LEVEL by the STAYSAFE Committee of the Parliament of NSW where many significant references were cited.

Finally, we would like to acknowledge the input received by the members of the RTSA and of consultancies who have chosen to voice their suggestions through this submission.

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[7] PASSIVE RAILROAD-HIGHWAY GRADE CROSSINGS : WHAT ARE THE RESEARCH PRIORITIES? Eric C Wigglesworth AM

[8] Eighth International Symposium on Railroad-Highway Grade Crossing Research and Safety, Sheffield, England - April 2004

2. Process

While it would be convenient to have at one's disposal a kit-bag of technologies that could simply be applied in a standardised form, the reality is that a number of factors influence the choice of an appropriate technology, not only the mere fact of its existence.

The factors that may need to be taken into account include:

- Crossing priority risk prevention across all crossings (State Prioritisation)
- Benefit and costs associated with technologies at a single crossing (Individual Crossing Assessments)
- Funding, programming and skills in the Industry (Upgrade Programming)
- Due Process of Evaluation

We will speak to each of these factors in turn.

2.1 State Prioritisation

In order to determine which crossings are the most "needy" Victoria like all other states has implemented the use of evaluation methodology[9] known as the Australian Level Crossing Assessment Model (ALCAM).

This has been a national breakthrough and we are proud that members of the RTSA have been involved in its creation and implementation. The fact that ALCAM is not more widely available to the industry for assessments is regrettable. Unfortunately, the wider industry, and in particular design consultants are being denied access to the software. There are a vast number of level crossing treatments being designed by competent railway consultants and many of these are for railways that are not managed by the mainstream railway owners and who do not have the technical competence to design level crossings.

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[9] Risk Scoring Matrix

The implication of not having access to ALCAM could be compared to a designer who is expected to design a bridge, but is prevented from having access to the Australian Bridge Design Standard.

If the rail industry and government are serious about improving level crossing safety then ALCAM should be made available to experienced railway design consultants. There are obviously important aspects to the proper control of ALCAM use, such as training, version control and verification. However, these can all be managed using similar techniques to those applicable to other design standards and tools.

We also recognise ALCAM's limitations in that it was devised to rank crossings so that programs could be developed for the implementation of active level crossing protection as we currently know it.

In Victoria, the last 12 months has seen instances where serious accidents have occurred on either crossings that are not eligible for active treatment or on crossings where active treatment has already been provided. Hence, ALCAM has not been able to provide any useful input except as to indicate whether the risks associated with a crossing warrant active protection or not.

The weakness with ALCAM is that it does not consider other forms of protection. That is protection that lies between the mitigations of the standard non-active and active categories or mitigations that go beyond the standard forms of active protection and full grade separation. Some suggestions for consideration are provided later.

2.2 Individual Crossing Assessments

ALCAM's strength is that it collects data on all aspects of the crossing's risk profile. Despite the fact that it provides guidance as to whether the crossing is a candidate for active protection or not, it could also be used for intermediate protection categories.

For example if the risk profile indicated a risk half way between "flashing lights" and "stop signs" the quantum of risk could be used for a mitigation half way between those two mitigations.

Like most industry bodies the RTSA's concentration is focussed on matters pertaining to its industry. But also like most bodies this concentration has lead to a focus that skips over other industries and a basic psychology of self-preservation.

This is quite a self-effacing perspective because there is obvious good will between industries and that if one can assist another it will do so, we are after all for the most part, professional bodies. Nevertheless, the members of the respective industries are unaware of many of the intricacies associated with the operation of the other industries and therefore have difficulty contributing intelligently about the other's operation.

Take for example a suggestion by one of our members that a simple cost effective solution to ensure road vehicle drivers are alert on the approach to a level crossing, is to install a dip in the road on the approach. This would "wake up" the driver.

Without going in to too much detail the solution has its merits but also has some negative aspects. Would the dip be dangerous by introducing a discontinuity to the road surface? When it rains would the dip fill up with water and create a hazard? What classification of roads could this "technology" be applied to?

There is a clear trade-off between the benefits the "device" would bring and the "cost" associated with its implementation. While ever the road authority has the only say in the matter, the negative aspects imposed on road users would render the suggestion "impractical". So inevitably, while constructive suggestions are offered in good faith these are dismissed on the basis of detrimental effects on one of the parties.

Similarly, with suggestions from the road "experts" the matters are cast aside because of the negative effects on rail users. A notable suggestion in WA during the 1980's suggested that because trains were creating such road congestion at a prominent city road crossing, the crossing should operate like a normal traffic light intersection. In fact, while not sensible in its own right it lead the railway to schedule trains operating in opposite directions across the crossing at the same time so as to reduce the time of road blockage.

So how can the plethora of suggestions be adequately evaluated? By using the combined talents of the respective industries in an open transparent forum, which is subject to open scrutiny by its peers.

We are aware of the presence of a "Railway Crossing Protection Committee" in Victoria. After years of subdued operation[10] following the privatisation of the railways, this group came into operation once again recently[11]. It is our view that the Committee should include expertise from train operators and other industry experts. This is not the group we are suggesting should be the open forum for consideration. This current body may be appropriate for "peak" decision making. Rather we are suggesting a wider advisory group but to which the "peak" body should report the results of evaluations

[10] We note no representation from a train operator, police or emergency services or recognised "independent expert"

[11] Victoria Government Gazette, No. G 37 Thursday 15 September 2005

and reasons for decision. The industry advisory group would be able to assemble to consider new technologies and improvements to approval processes, and where particular crossings require innovative approaches, the group could be used to "workshop" those solutions. They would also be able to monitor implementation, further adding to the knowledge base. The group would be honorary and would be designed to ensure full industry knowledge is applied in those circumstances. With due respect to individuals and consultancies, many of whom are our members, no single person or consultancy has the knowledge to bare on this problem.

We understand that an open forum will see the first few evaluations being a tedious, long drawn out affair as everybody wishes to make their views known, but the process will settle down to one involving constructive criticism. In any event, the industries concerned should not shy from facing their proper accountability.

There is also a question of education, one industry to another. How can one industry gain an appreciation of the other's operation? Amongst other things, the Charter of the Advisory Group would be to arrange regular industry briefings and other educational events.

In support of this industry active involvement Recommendations "*RR20020020/RR20020024 Actively involve the railway industry with level crossing safety issues*" of a recent investigation into a fatal railway level crossing incident[12] sums up the spirit of our recommendation. This recommendation was made to VicRoads and the Benalla Rural City Council.

2.3 Upgrade Programming

We liken the issue of upgrading level crossing safety to the painting of the Sydney Harbour Bridge. Once one thinks its finished its time to start again.

But more than that, one has to achieve a certain sustainability first and where there is a deficit in upgrading to match the current road and rail traffic levels, that deficit has to be bridged with a once off catch-up program. Victoria is in that position now, with a huge backlog of crossing improvements. To the credit of this inquiry, we recognise that innovation in technology could assist in fast tracking this backlog.

The main issue relating to a stop start program that has been symptomatic of the process right across Australia is the impact it has on the ability of the industry to

[12] Level Crossing Collision Between Steam Passenger Train 8382 and Loaded B-double Truck Benalla,Victoria, 13 October 2002, RAIL SAFETY INVESTIGATION 2002/0003, Australian Transport Safety Bureau

respond. Engineers Australia[13] and the Australasian Railway Association have well documented and publicised evidence of drastic skills shortages in some railway disciplines, notably signalling engineering. This is a key resource is implementing an upgrade program (using the existing technology or practices).

Therefore, a meaningful approach to this issue is the development of long term strategies. There are a handful of immutable facts about level crossings:

- Road and rail traffic over existing crossings, will, for the most part[14], continue to increase with the increase in our population and industry.
- Trains and road vehicles will be required to travel faster with the pressure of time on our lifestyle.
- There will be an increasing number of road and rail crossings required for our increasing population

Why then, could there ever be any thought that there will not be an on-going need for the application of level crossing treatments. But this is exactly the image portrayed by the road and rail authorities. Recent announcements[15] about by the Department of Infrastructure give the impression that the program of level crossing improvements is one off despite the publicity showing the program is "on going" with 90 crossings earmarked over 10 years. This rate is perhaps the rate that is needed every year in a sustainable program and certainly not enough to overcome the backlog.

The most far sighted Victorian Government policy of recent times[16] is the proclamation that no new level crossings will be installed anywhere. While well intentioned it is naïve or badly worded. While there may be adequate justification for the policy in metropolitan areas where the degree of conflict between road and rail movements is high, the application of the policy in rural areas is naïve and smacks of a typical knee jerk reaction after a particularly high profile incident. The policy essentially adds to the cost of providing safety at level crossings by imposing a particular technological solution, that of grade separation. A large proportion of the total current funding[17] available for

[13] Formerly known as the Institution of Engineers Australia

[14] With the exception of railway lines that are closed or road discontinuances

[15] http://www.doi.vic.gov.au/doi/internet/transport.nsf/AllDocs/331363D32B5953BECA256F5400010314?OpenDocument

[16] http://www.dpc.vic.gov.au/domino/Web_Notes/MediaRelArc02.nsf/4d9fa39283ff510d4a256b36001bd4e0/bf66f0cf21fe184aca256c37007ecb88?OpenDocument

[17] Federal government, State government, local government and private sector

level crossing safety has essentially been narrowed to a small number of mandated crossings.

Technology should be able to give us a better outcome than a few grade separated crossings and thousands of poorly treated crossings.

2.4 Process of Evaluation

There are a number of issues that need evaluating in the course of suggesting that new processes or procedures are applicable to facilities that are in the public domain.

In section 3 of this submission we will concentrate on devices used in the (level crossing) industry outside Victoria, or devices used in other industries and not those in common use already. Clearly there appears to be other matters that override the use of these technologies in Victoria and the apparent reluctance to use them probably has more to do with the institutional context than with the technologies themselves.

The next sections outline issues associated with the evaluation of new technologies and their applicability.

2.4.1 Failsafe Railway Solutions and Road Solutions

As railway practitioners we have always tried to address railway safety in the context of providing failsafe[18] solutions. This approach leads to very large costs for signalling works and the use of specially designed proprietary equipment.

All railway signalling associated with active level crossings is failsafe and therefore is very expensive. Alternatives to the current system have often been dismissed because they are not failsafe, such as radio activated systems.

Railway safety systems have been installed on the basis of the risks associated with conflicting movements, up until the advent of ALCAM almost entirely solely on the basis of the number of road movements multiplied by the number of train movements. That is, they address the risks to road users and the risks to rail users. As we have seen with the Kerang and Benalla incidents, the risks to the rail users are increasing as the size and weight of road vehicles increases. Stopping and acceleration times and distances for these larger road vehicles are increasing the risk to both road and rail users.

Therefore, perhaps it is incumbent on the road users to treat the road traffic with equal weight as the rail users have attempted to prevent rail fatalities; that is, with failsafe

[18] Designed to fail in the safe position, such as lowering boom gates or displaying a red light.

road solutions. To date these have only been by way of grade separation. In the meantime rail authorities will continue to protect its users with failsafe solutions.

What systems then are failsafe for the road user other than grade separation? Only one device is known to us, that shown in Figure 1, a level crossing somewhere on the line Moskva to Briansk in Russia. Note the raised section of road to prevent vehicle ingress onto the tracks. This is a common method in Russia.

Figure 1 “Failsafe” Road Treatment at Level Crossing

Photo: Helmut Uttenthaler, helmut.uttenthaler@gmx.at

No doubt there may be some road safety issues associated with this type of device but surprisingly this is the same type of device railway engineers use to avoid catastrophic collisions. We purposely derail a train and run the risk of injuries to passengers caused by the derailment in order to avoid the risk of a more catastrophic incident such as a collision with another train.

Do road solutions consider similar concepts? Would road solutions consider “derailing” a vehicle in order to avoid the more catastrophic consequences of a collision with a train?

Surprisingly, such “derailment” mechanisms are common in road situations such as runaway exits on steep grades and heavy vehicle 'arrestor bed' to stop a vehicle safely such as used on the Great Eastern Highway at Greenmount in Perth[19] and in Adelaide[20]. Road authority design manuals[21] incorporate the provision.

2.4.2 Evaluating New Ideas

So what is the process for evaluating a new idea and implementing it?

In the case of the Kerang incident the Victorian authorities were able to approve and implement[22] ideas that had been in the public forum for years, overnight. Advanced flashing lights have been in use in other states for years. In fact advanced warning lights have been in use on slow speed[23] traffic intersections such as at Melbourne Airport, so what criteria would limit their use at high volume level crossings?

A longer procedure would be usual, including a risk assessment, cost benefit analysis, incorporation into an Australian Standard, trialling and incorporation into the current program. We certainly do not protest at the leadership taken by the government but simply ask if the solution was so apparent why it had not been implemented before despite the fact that the treatment had not previously been identified in the Australian Standard?

This process of evaluating existing successful devices used elsewhere needs to be streamlined. Hence, to reinforce our earlier suggestion that wider industry participation is required to on the one hand provide the application of the total industry talent and also to "push" ideas to the relevant authorities for their serious consideration.

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[19] www2.mainroads.wa.gov.au/NR/rdonlyres/B0E16980-9257-4BAD-9C4A-E030E5F11327/0/E5964_20070625095802379.PDF

[20] http://www.transport.sa.gov.au/news_media/media_releases_content_2004/may/safety_improvements_expressway.asp

[21] For example MainRoads Queensland Road Planning and Design Manual Chapters 12 & 15.

[22] Appendix 3 is a report by the Herald Sun

[23] 40 kmph

3. Technology

In this section we highlight technology applicable at a number of levels, some directly providing solutions "on the ground" at crossings and others using technology to improve safety at level crossings, both methods of which should be developed hand in hand.

We make no comment as to the applicability of this technology in individual crossing circumstances.

3.1 Technology to Facilitate Safety

In this section we refer to technology that is helping to improve safety at level crossings which is implemented in the wider context of safety.

3.1.1 Targeted media and research services

With this technology new trends, safety alerts and information relating to level crossings is published widely. An example of the type of service currently operating in Australia is shown in Appendix 1. This particular example provides insight into a European hardware system currently being developed.

3.1.2 Internet Based Web Pages

The internet technology and the use of home pages brings attention to employees and also the general public when used appropriately. An example of the use of this technology is shown in Appendix 2.

3.1.3 Red Light Cameras and Web Cam

Continuous camera monitoring and "red light" cameras at level crossings are now being introduced around Australia[24] and have been in place for many years in Europe. The latest Victorian government announcement includes trials of this technology.

Apart from capturing evidence to prosecute offenders the biggest advantage is that the operation of the crossing can be monitored and design changes to the crossing can be made after an analysis of the actual driver behaviour. It is also invaluable for designers to be able to watch driver behaviour and design new crossings appropriately.

A web cam service currently exists at http://home.iprimus.com.au/bexleyboy/webcams/text.html where a number of level crossings are shown on continuous monitoring.

[24] Perth WA, after being on trial for 3 years

3.1.4 ALCAM Risk Matrix

In section 2.2 we made reference to the fact that the ALCAM software is not available to consulting and non-mainstream rail infrastructure owners. In risk assessments required by state regulators those bodies use other forms of assessment, to assert their level crossing treatment. This is regrettable for two reasons. Firstly, non-standardised methods of assessment are being applied and secondly, the skill set in the profession is diluted.

3.2 Hardware Technology

We have confined our comments so as to exclude those technologies used on a routine basis in Victoria but have highlighted technologies that we know are of use elsewhere in Australia and overseas as well as other technologies not in use anywhere.

3.2.1 Hardware on Trains

3.1.1.1 Locomotive Visibility

This area of technology has been under debate for many years and was summed up in a speech provided by the Victorian State Coroner at the symposium held at Monash University in February 2002 entitled 'Get Active at Passive Crossings' in which he stated:

> *Eleven years ago, inquests into seven fatal accidents that occurred at railway crossings in 1989 were held to try and identify any common features. The important issue that arose from this was the need for a motorist negotiating a crossing to be told if a train is approaching. It also must be noted that speed, alcohol and drugs did not appear to be an issue. It is noted that the Railway Level Crossing Road Safety Co-ordination Committee (Vic) was then (1989) considering strobe lights on locomotives. I consider that installation of strobe lights on trains would not only benefit passive crossings but would also assist increasing awareness of an approaching train at crossings where lights and boom barriers are installed. Many of the deaths examined during the inquest may well have been avoided by the installation and operation of strobe lights on locomotives.*
>
> *Some 13 years after the inquests, although development work has been undertaken by government agencies on inexpensive and effective means of warning motorists of an approaching train, we are yet to see the widespread introduction of new and innovative technology to save lives in the area of railway level crossings.*

Lighting that has been suggested includes strobe lighting, activated on approach to the crossing as well as “ditch lights”. Both these solutions give the locomotive better visibility especially at night but also in the day.

3.1.1.2 Locomotive Shape

The “cow catcher” on locomotives did use to perform a valuable function, that of “sweeping aside” debris from the tracks. Certain cow catcher designs detracted from a safe environment for those who needed to work in and around the locomotive and coupling locomotives was also made more difficult. We note that modern locomotives and railcars are invariably bull nose and this frontal shape results in a road vehicle being crushed and the train being derailed.

It is suggested an improved rail vehicle shape incorporating the function of “sweeping aside” road vehicles would reduce the consequences of a collision but that the design would also need to take into account the other issues of safety and coupler function.

3.1.1.3 Rail Vehicle Visibility

A common form of improving the visibility of wagons both in Australia and overseas is the provision of reflectorised strips on the side of vehicles and a number of standards are explicit about the need to enhance visibility on both the front and side of the train.

For example, Queensland Rail Standard STD/0049/TEC, section 5.1.2 Livery and Signage mandates the use of yellow (as defined in AS 1318) on the front of trains. In addition “*Reflective decal(s) of minimum total area 0.05m^2 shall be fitted to each side of all rollingstock*.” There is no such standard applicable in Victoria with operators merely having to satisfy a risk mitigation procedure in their Safety Management System and therefore the perception of risk is a variable parameter between operators.

To the embarrassment of the rail industry there is not yet a complete Australian Standard covering the design and maintenance of rollingstock although the Australasian Railway Association through its Code Management Company is well underway in the creation of Australian Standards covering these aspects. Therefore the initiatives shown by Queensland in these matters cannot yet be mandated in Victoria and this is symptomatic of the fragmented nature of the railway industry in this state.

3.1.1.4 Locomotive Radio Activation

This technology has been previously referred to in section 3.1.1 and consists of activation of the level crossing protection by train positioning technology. This is emerging technology, which is also applicable to train signalling for safeworking[25] purposes.

3.1.1.5 Remotely Activated Proximity Warning Systems

These systems were referred to in the Office of Transport Safety Investigation of NSW report on the fatal Baan Baa level crossing accident at section 5.4 as follows:

> *What is apparent is that there are new, relatively low cost technologies that could be utilised on the approaches to level crossings that would provide increased warning of both the presence of a level crossing and of approaching trains. Remotely activated proximity warning systems such as those employed in the aviation industry are good examples of such contemporary safety technologies. Such technology might allow a train driver to not only sound the train's alarms on approaching a level crossing and activate alarms at the level crossing, but also to be given a positive indication that there is no obstruction at the crossing.*

3.2.2 Hardware on the Railway Track

The active level crossing protection used in Victoria is activated through the use of track circuits similar to those used in the signalling system. Alternative means of activation are also in use in Australia including the use of wheel detectors/axle counters, which are used widely in NSW. These can use either magnetic field devices or mechanical displacement devices.

Axle counters have recently been introduced[26] for signalling purposes in Victoria but not for active level crossing purposes. This may represent a step toward more cost efficient active level crossing protection. We note that axle counters do not provide broken rail detection like conventional signalling circuits but on a line that is otherwise unsignalled the additional safety of broken rail detection over the short length associated with the crossing would need to be evaluated.

3.2.3 Road Pavement Initiatives and the Australian Standard

The initiatives provided by members of RTSA are necessarily "out of the box" and RTSA does not endorse the technology suggested as being suitable but are provided in

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[25] The terminology used to describe the system of train authorisation to occupy a section of track and to avoid collision with other trains or rail devices

[26] On some Regional Fast Rail corridors and the Stony Point Line

the spirit of offering any alternative that could sensibly be used in the fight against the tragic loss of life.

In addition the existing Australian Standard AS 1742.7 - 2007[27] already provides a range of treatments aimed at improving safety at level crossings. We offer some alternatives to those provided for in the Standard and which may be considered in the context of review of the Standard but fit within your Committee's terms of reference as "technology". Suffice to say the Standard is not prescriptive about the level of protection to be applied to each crossing (except in as much as sight distance on passive crossings) and that ALCAM or similar risk evaluation software must be used in conjunction. To that end, this disjointed process is an impediment to appropriate use of the technology to hand.

We note that some of the Standard's devices are dependent on the construction characteristics of the road[28]. The RTSA suggests that the road characteristics should be at a standard that reflects the risks of the interface, road and rail.

Speed Bumps – as used to calm traffic in suburban areas and suggested as a way of slowing vehicle speed down on minor roads particularly where "give way" signs on a crossing do not require the vehicle to stop or with "stop" signs where the device would alert the driver to the hazard ahead.

Rumble strips –these devices have been recently been implemented as a major safety improvement program for level crossings in Victoria. We are aware of variations in this technology including activated lighting in association with train detection.

Speed dips – similar to speed bumps but perhaps less severe on vehicle suspensions and therefore applicable to higher speed roads

Raised Pavement Markers – These coloured devices sit slightly raised of the road surface and are frequently used as road markings for traffic separation and identification of fire hydrants for example. This suggestion is to use these devices in an arrangement in advance of the road crossing to warn drivers and then at the crossing provide for alignment guidance. They could be for example on the road shoulders in the same way rumble strips are placed to alert drivers to the edge of the road. Being coloured they would assist in the daylight hours and be especially helpful at night.

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[27] Australian Standard Manual of uniform traffic control devices (AS1742), Part 7, Railway crossings

[28] For example the use of white solid lines is dependent on road width

Zig-zag Line Markings – these markings are commonly used for pedestrian crossings and other areas of hazard in most states but appear to be overlooked for the use in level crossings.

Cross Hatched Crossing Marking– this technology is mentioned only because the current Standard is not prescriptive about its use. The RTSA believes that this technology should be mandatory on every surfaced level crossing so as to avoid confusion[29] for drivers and to provide a clear signal that every level crossing is a dangerous place even when moving.

3.2.4 Road Signage

Australian Standard AS 1742.7 provides a comprehensive range of signage and no doubt in its compilation sought advice from a wide range of inputs. We assume that it is under constant review to learn as much from other countries as possible but if it is not perhaps this inquiry can ensure that it is.

3.2.5 Vehicle Alerts

A wide range of GPS devices and radio technology devices are fully functional or in the advanced testing stages and are a potential source of a system where broadcast alerts are made to drivers as they approach level crossings.

In one device, made by Speed Mate Pty Ltd[30], a Melbourne firm, a mobile device in the vehicle receives broadcast signals from a stationary transmitter to warn motorists of impending hazards. The transmitter can be programmed to give continuous broadcasts or at specific times or on specific instruction.

GPS devices now on sale have detail that would enable a verbal message on the approach to a level crossing, which could assist in alerting the driver to the hazard.

In 2000 the United Nations[31] identified the growing technology and applicability of radio based solutions for level crossings. At the time trials were occurring on the San Francisco system BART and a while full scan of all available trails since that time has not been done in this review, there should be sufficient data now for a comprehensive evaluation. In any event, given the rapid advances in this technology frequent reviews should be made.

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[29] Why some and not others?

[30] RTSA does not endorse this product in any way, it is mentioned simply as an example

[31] EVALUATION OF COST-EFFECTIVE SYSTEMS FOR RAILWAY LEVEL-CROSSING PROTECTION, ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC, United Nations, ST/ESCAP/2088, Section 4.5.2

3.2.6 Obstruction Warning Devices for Level Crossings

These devices were identified in the United Nations 2000 report and have also received some attention in Perth where, similarly to Melbourne the metropolitan area has many level crossings in an urban system. It is understood the Level Crossing Protection Committee is aware of this technology and evaluating it.

4. Summary

The Railway Technical Society of Australasia makes the following suggestions in Table 1 in regard to improving safety at level crossings by way of technology, technology facilitated and process solutions.

Table 1Suggestions to Improve Level Crossing Safety Using Technology

1	Provide the opportunity for full industry participation and application of its combined knowledge by way of an “Advisory Group” that would investigate, research, workshop and educate as well as be involved in active monitoring upon implementation.
2	Make the software known as ALCAM more widely available to competent persons for their use in crossing design and assessment
3	Streamline approvals processes for “new” technologies specifically by recognising prior success in other jurisdictions and by performing rapid assessments for hitherto unknown technologies
4	Rapidly assess emerging technology associated with vehicle alerts and other forms of radio based transmissions
5	Assess the use of a wider array of internet and web based facilities including those associated with education as well as level crossing monitoring
6	Continue to review the Australian Standard AS 1742.7 on a regular basis

We wish the Committee well in their endeavours.

ENGINEERS AUSTRALIA RTSA

Appendix 1

(http://www.transscan.com/highlights/2006/2006-02_rail-crossings.asp)

Volume 8, Number 2, June 2007

Main Content

Highlights

Europe finds a new way to run rail crossings

The idea is to enable trains themselves to activate the automatic barriers so that no matter at what speed the train is travelling, road traffic will get to use the crossing for as long as is safely possible. Initial tests on Austria's Linzer Localbaan (LiLo) rail service are said to have proved successful and the developer - the European Space Agency - is hoping the system can eventually be introduced to all EU rail systems.

Currently most European countries use ALX systems - automatic level crossings geared to closing barriers immediately sensors detect that an approaching train has passed a certain point along the track.

The drawback with ALX is that the sensors make no allowances for the speed at which the train is travelling. With ALX, barriers are closed on the assumption that the approaching train is a high-speed express - even though it may only be a slow, all-stations commuter train.

To answer the problem, the Space Agency is developing a new system that uses a computer control fitted aboard the train itself to close and open the barriers.

The computer system closes the barrier after calculating the train's precise speed, its precise position on the track, and the precise moment it is going to pass over the crossing.

To work out the train's position so accurately the computer draws on signals from a combination of navigation satellites including American GPS, Russia's GLONASS, and Europe's EGNOS.

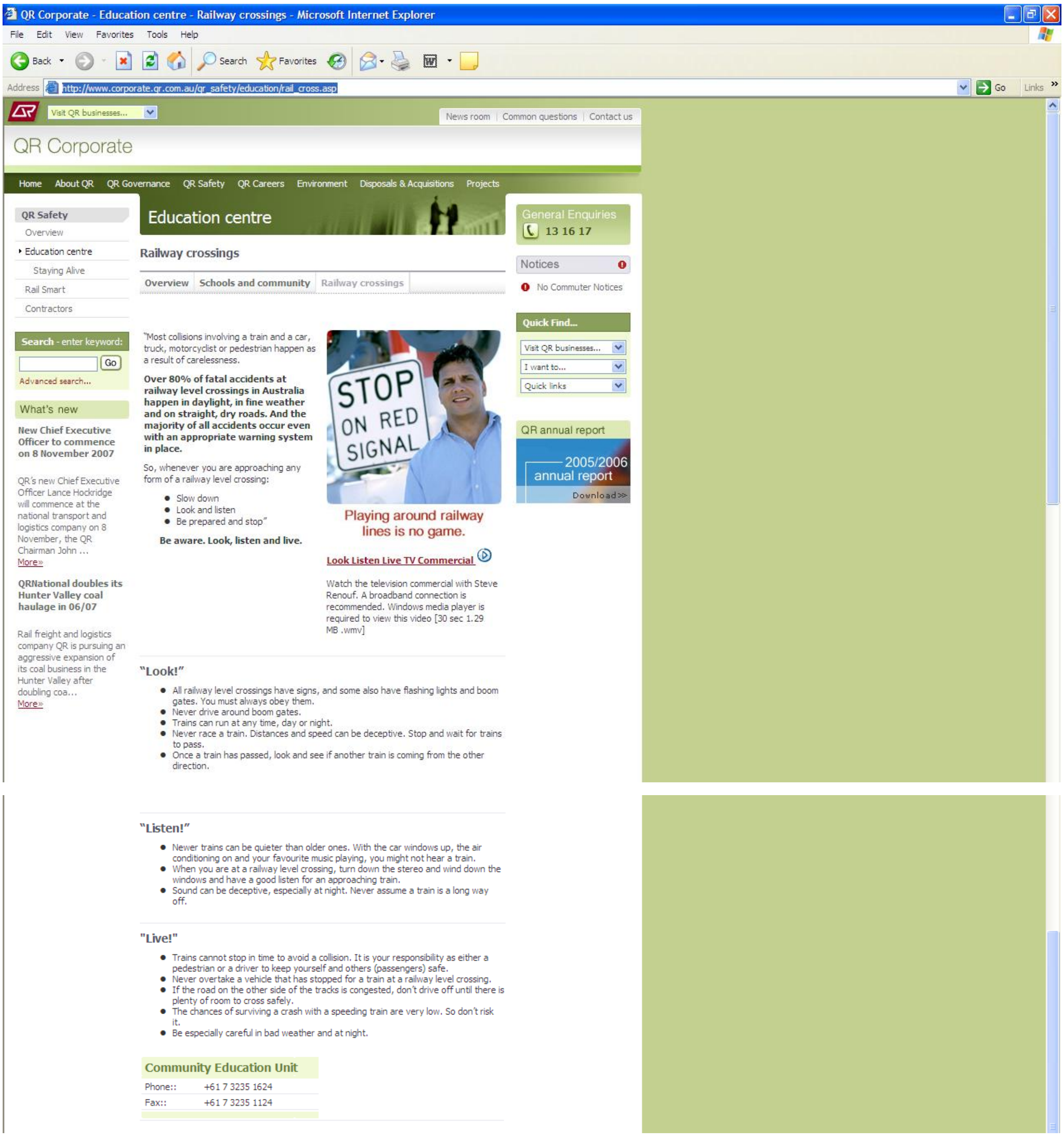
The agency says the advantages of a satellite control system is that it reduces the cost of track-side equipment and cabling, increases road traffic flow and reduces vehicle emission by virtue of the fact that cars and trucks will spend less time waiting.

But there is still some way to go before the new system becomes operational. Ultimately any production version is expected to await Europe's Galileo navigational satellite network due to become operational at the end of the decade.

Footnote Information: Published by the Western Australian Department for Planning and Infrastructure and Main Roads WA

Appendix 2

(http://www.corporate.qr.com.au/qr_safety/education/rail_cross.asp)



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Education centre

Railway crossings

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"Most collisions involving a train and a car, truck, motorcyclist or pedestrian happen as a result of carelessness.

Over 80% of fatal accidents at railway level crossings in Australia happen in daylight, in fine weather and on straight, dry roads. And the majority of all accidents occur even with an appropriate warning system in place.

So, whenever you are approaching any form of a railway level crossing:

- Slow down
- Look and listen
- Be prepared and stop"

Be aware. Look, listen and live.

STOP ON RED SIGNAL

Playing around railway lines is no game.

Look Listen Live TV Commercial

Watch the television commercial with Steve Renouf. A broadband connection is recommended. Windows media player is required to view this video [30 sec 1.29 MB .wmv]

"Look!"

- All railway level crossings have signs, and some also have flashing lights and boom gates. You must always obey them.
- Never drive around boom gates.
- Trains can run at any time, day or night.
- Never race a train. Distances and speed can be deceptive. Stop and wait for trains to pass.
- Once a train has passed, look and see if another train is coming from the other direction.

"Listen!"

- Newer trains can be quieter than older ones. With the car windows up, the air conditioning on and your favourite music playing, you might not hear a train.
- When you are at a railway level crossing, turn down the stereo and wind down the windows and have a good listen for an approaching train.
- Sound can be deceptive, especially at night. Never assume a train is a long way off.

"Live!"

- Trains cannot stop in time to avoid a collision. It is your responsibility as either a pedestrian or a driver to keep yourself and others (passengers) safe.
- Never overtake a vehicle that has stopped for a train at a railway level crossing.
- If the road on the other side of the tracks is congested, don't drive off until there is plenty of room to cross safely.
- The chances of surviving a crash with a speeding train are very low. So don't risk it.
- Be especially careful in bad weather and at night.

Community Education Unit	
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Appendix 3

Herald Sun June 25, 2007

Premier Steve Bracks today said safety upgrades included:

ADVANCE warning signs at 26 regional highway level crossings and 27 busy sites statewide. The flashing signs will be built on roadsides about 250 metres before level crossings and will be activated automatically when a train is approaching.

RAISED rumble strips at 200 regional crossings.

NEW penalties for reckless drivers racing trains, plus lifting fines for other offences such as ignoring stop and give way signs from $177 to $430.

TESTING red light cameras at two major level crossings, one metropolitan and one regional.

FAST-TRACKING works to remove distractions such as overgrown vegetation.

RESEARCHING new technologies such as GPS devices and radio signalling to warn drivers of crossings.

AN updated advertising campaign to educate motorists.

The move follows Victoria's worst rail crash in 66 years and revelations five V/Line train drivers warned almost a year ago of near-misses at the site.

The drivers complained last July to the police, the council and the State Government that motorists were failing to obey signals at the Murray Valley Highway level crossing, near Kerang.

The Kerang crossing is earmarked for both new flashing warning signs and rumble strips that will be installed in the next six months.

In Victoria, more than 90 near-misses between trains and road vehicles have been reported in the past year.

"This package contains extra safety measures in addition to the annual program that will further enhance safety at our level crossings and it doubles our financial commitment to level crossing safety over the next two years," Mr Bracks said.

Opposition public transport spokesman Terry Mulder said dangerous crossing upgrades were taking far too long despite deaths and scores of near-misses.

Mr Mulder said the State Government had failed to properly upgrade deadly crossings in Benalla, Nagambie, Trawalla, Cressy and Mininera.

"A collision like Kerang was always going to happen," Mr Mulder said.

"More frequent trains, higher speed trains, more trucks and more private motorists, without level crossing safety upgrades, is a recipe for incidents like Kerang."

At least 19 Victorians had died in truck-train crashes in the past five years, he said.

Mr Mulder said 1446 Victorian level crossings had warning signs and markings - but no lights or bells.

Public Transport Minister Lynne Kosky said the Government would ask The Victorian Rail Crossing Safety Steering Committee, which includes experts from the Department of Infrastructure, VicRoads, VicTrack and rail operators, to research improved safety.

The committee will examine whether GPS devices in trucks can be programmed to recognise and alert drivers that they are approaching a level crossing.

The committee will also investigate if a radio transmitter at a level crossing could override a vehicle radio to warn the driver that they are approaching a crossing.

Ms Kosky said the Kerang tragedy was a reminder of how dangerous level crossings could be.

"Unfortunately, we have witnessed the fatal consequences of collisions between a train and a motor vehicle a number of times in Victoria over the last few years," Ms Kosky said.

"While infrastructure improvements play a role in bringing level crossings to motorists' attention, there is still a vital need to educate and remind drivers about level crossing safety."

A state memorial service for those touched by the Kerang disaster will be held on Friday at St Patrick's Cathedral from 2.30pm.

Appendix 4

Executive Chairman
Mr Ravi Ravitharan

Reference: RTSA-NS-147

11th September 2007

Railway Technical Society of Australasia

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Mr. D E McCauley,
44 Robin Avenue,
Sorrento, WA 6020

Dear Mr McCauley

Railway Level Crossings

Your letter dated 31 July 2007 and addressed to Engineers Australia has been brought to my attention. Thank you for your interest.

Clearly, you are correct that the steam train symbol currently used on rail and road level crossing warning signs may be considered anachronistic. On the other hand, there is probably no symbol that would exemplify all types of trains, now and in the future. Probably it becomes a matter of opinion but it could be said that the antique symbol has the advantage of being timeless.

Be that as it may, we note your impressive experience and qualifications in the field of level crossing protection planning, design, installation and maintenance. We consider that it would be most beneficial if knowledge such as yours could be utilised.

As a result of recent serious level crossing incidents, The Parliament of Victoria Road Safety Committee, an all-party joint investigatory committee, is currently commencing an inquiry into improving safety at level crossing with the following terms of reference: - 'Inquire into and report on existing, new and developing technologies for implementation to improve safety at level crossing'.

The closing date for submissions to the inquiry is 05 October 2007. The RTSA Technical Sub committee and the RTSA Victoria Chapter wish to play a major role in preparing a submission to this inquiry on behalf of the RTSA.

The RTSA submission will at least cover the existing, new and emerging technologies in the following areas which may provide solutions for the issues facing at the railway crossing: Human factor, Crash Worthiness, Infrastructure (road and railway) design, Signage and Information technology etc.

The RTSA is calling (a copy of the press release attached for your information) on all Australian Governments, to commit additional funds to research cost-effective fail-safe level crossing technologies as part of a coordinated response to the scourge of level crossing accidents. RTSA favours a national body capable of conducting research into safety of level crossings and implementation of technological solutions to improve safety at level crossings. The national body should bring together scientific experts to review past level crossing accidents and identify the causes of these accidents as well as explore possible technological solutions which would mitigate risks of accidents at level crossings in the future.

If any of this is of particular interest to you and you would like to have input, please contact me on 0409 556 811 mobile or email ravi.ravitharan@eng,monash.edu.au

Comment in relation to your suggestion about signage could well be part of the RTSA submission.

Yours sincerely,

Ravi Ravitharan
Executive Chairman
RTSA.

Media Release

ENGINEERS
AUSTRALIA
RTSA

Technology provides solutions for Level Crossing Safety

No embargo - **10 September 2007**

The Railway Technical Society of Australasia (RTSA) is calling on the Australian Government to investigate new and emerging technologies for fail-safe protection at railway level crossings.

The RTSA welcomed the decision by the Victorian Government through its Road Safety Committee for the setting up an inquiry into Improving Safety at Level Crossings and to identify existing, new and developing technologies for implementation to improve safety at level crossings.

Along with greater enforcement, public awareness campaigns and a review of signage standards, Governments also needs to commit additional funding to implement new technologies for the active protection of life and property.

RTSA Executive Chairman, Ravi Ravitharan said 'The incidence and severity of accidents at level crossing in recent times is a national transport tragedy.'

"Clearly both the road and rail tasks are rapidly expanding, as Australia meets the challenge of a rapidly growing freight task.

"With the increasing use of larger, longer and heavier trucks, such as B-Doubles and B-Triple trucks, the risk profile of level crossings on our arterial and regional transport corridors appears to be deteriorating.

"The effectiveness of protection measures at level crossings needs to be re-assessed in light of these new freight challenges. The use of new technologies to protect drivers and pedestrians should play a more prominent role in reducing the risk profile," Mr Ravitharan said.

The RTSA is calling on all Australian Governments, to commit additional funds to research cost-effective fail-safe level crossing technologies as part of a coordinated response to the scourge of level crossing accidents.

The RTSA favours a national body responsible for overseeing research into safety of level crossings and the implementation of technological solutions to improve their safety. Such a national body should bring together scientific experts to review past level crossing accidents and identify the causes of these accidents as well as explore possible technological solutions which would mitigate risks of accidents at level crossings in the future..

www.RTSA.com.au

For further information contact:
Ravi Ravitharan on 0409 556 811 or John Bright on 0407 234 490