IRSE

INSTITUTION OF RAILWAY SIGNAL ENGINEERS

IRSE NEWS

ISSUE 153 FEBRUARY 2010

Ansaldo STS Now Offering Signet Solutions Courses in the Asia Pacific region

An agreement between Signet Solutions and Ansaldo STS to run commercial signalling courses within the Asia Pacific Region (including Australia, Hong Kong, Singapore and India) will help reduce the current skills shortage in the region.

As a result of the collaboration between Signet Solutions and Ansaldo STS over the past two years, the Ansaldo STS Academy now provides a suite of signal engineering courses for their internal customers. The Ansaldo STS Academy is now expanding to make that suite of courses available to external customers in the Asia Pacific region. '*This is an exciting step to be able to make these high quality courses available to the industry in the region. It follows on from the successful relationship between Ansaldo STS and Signet Solutions in transferring the Signet Solutions courses to the Academy*' comments Les Brearley – Head of ASTS Academy (Asia Pacific) Brisbane.

A programme of "open" course dates will be created, with initial course dates between March and July 2010. The courses in the first instance will be in Basic Signalling Design and Signalling Testing. The courses will initially be based in Brisbane, Sydney and Melbourne and will later be delivered as per market requirements.

The courses will be based on the Signet courses and have been tailored where required to suit local needs and requirements by Ansaldo STS. The courses in the Asia Pacific Region will be delivered predominately by Ansaldo STS staff and also by Signet Solutions where required. The ASTS trainers were coached and trained in the events as part of the initial delivery of the courses carried out jointly by Signet Solutions and Ansaldo STS. Ansaldo STS has subsequently conducted a number of internal courses in Australia, Hong Kong and India.

This has ensured that the courses were reviewed for local conditions and proven internally before being offered to the external market thus ensuring high quality training events for external customers. '*The courses are based on highly reputable programmes that have been delivered in the UK and Europe, but we have now had the benefit of ensuring they are fit for purpose in the Asia Pacific Region*' comments Les Brearley.

The Combination of these companies' skills, Signet as a leader in the development of skilled Signalling Engineers along with the expertise and local presence of ASTS, is seen as a very positive step in providing additional training services to the industry.

If you need more information please contact either Les Brearley or Andy Knight on the contact details below.

Andy Knight – Signet Solutions Limited
Tel – +44 (0) 1332 343585 E-mail: *andyknight@signet-solutions.com*
Les Brearley – Ansaldo STS (Asia Pacific) Brisbane
Tel – +61 7 3868 9385 E-mail: *brearley.les@ansaldo-sts.com.au*

Front Cover: The level crossing at Llanidloes Road near Caersws on the Cambrian Coast line in Mid Wales, has been converted to barriers from gates ready for remote operation as part of the new Cambrian ERTMS. The level crossing has been temporarily interfaced to the existing signalling equipment at that site by Eldin Management Ltd on behalf of Ansaldo STS. Here we see the level crossing from the lineside looking towards Caersws in late January 2010.

Photo: Ian Allison

NEWS VIEW 153

The Challenge is with You !

Whilst the editorial team of this magazine strives to ensure that we portray a truly global perspective regarding the railway signalling and telecommunications industry, from time to time we do have problems in obtaining suitable images from around the world for the front cover.

Therefore we now offer a unique challenge to the readership of this magazine in order for you to provide to us with related photographs without repetition of countries or content. We would request that your photographs are provided in either a JPEG or TIFF format. Please send each one as an individual file which should be a minimum of 1 MB in size and in a portrait orientation. Each photograph should have a caption and have an attribution if relevant. Please feel free to send your contribution to either of the email addresses detailed opposite. Contributors of each photograph used will be welcome to receive their own electronic copy of the particular front cover once it has been published.

As always, we wish to remind the readership that we would also welcome your additional contributions in the form of technical articles with related pictures and diagrams, along with your technical tips, a day in the life of articles, curiosity corner images and your feedback.

Whilst some members have concerns regarding representation of their countries and their technology, please feel free to contact us to have your say, make your contribution and help us to ensure that we continue to provide a truly global perspective!

The IRSE NEWS Team

IN THIS ISSUE — Page

IRSE NEWS is published monthly by the Institution of Railway Signal Engineers (IRSE). The IRSE is not as a body responsible for the opinions expressed in IRSE NEWS.

Editor
Ian J Allison
31 Bainbridge Road, Loughborough, LE11 2LE, UK
Tel: +44 (0) 7794 879286
e-mail: irsenews@btinternet.com

Deputy Editor
Tony Rowbotham
36 Burston Drive, Park Street, St Albans, AL2 2HP, UK
e-mail: irsenews@aol.com

Assistant Editors
(Overseas)
Tony Howker e-mail: ahowker@bigpond.com

(Younger Members)
Nigel Handley e-mail: nigel.handley@lrrail.com

Contributions
Articles of a newsworthy or technical nature are always welcome for IRSE NEWS. Members should forward their contributions to one of the Editors listed above.

Advertising
For advertising rates and deadlines call
Robin Fox at Ten Alps Publishing
Tel: +44(0)20 7657 1831
Fax: +44 (0)20 7379 7118
e-mail: Robin.Fox@tenalps.com
Advertisements are accepted on the basis that the advertiser and agency (if any) warrant that the advertisement contents are true and correct in all respects.

Web Site
For up to date information about the Institution or its activities, or to download a membership application form, log on to the IRSE Web Site: www.irse.org

Production
IRSE: Stuart Angill, Production Manager
Printing and Mailing: Fericon, Reading

London Office
IRSE, 4th Floor, 1 Birdcage Walk, Westminster, London, SW1H 9JJ, United Kingdom

Enquiries
MEMBERSHIP OR OF A GENERAL NATURE
Tel: +44 (0)20 7808 1180
Fax: +44 (0)20 7808 1196
e-mail: hq@irse.org

PROFESSIONAL DEVELOPMENT
Tel: +44 (0)20 7808 1186
e-mail: training@irse.org

LICENSING
Tel: +44 (0)20 7808 1190
e-mail: licensing@irse.org

Level Crossings in the Netherlands

By Jeroen Nederlof

The author is System Manager with Prorail in the Netherlands

Paper read in London on 13 January 2010

Before talking about level crossings on the railways and roads of the Netherlands, it is perhaps useful to sketch a picture of the social and transport environment we are talking about. The Kingdom of The Netherlands is a small nation on the north-western coast of the European continent, situated on the sandy delta formed by the rivers Rhine, Meuse and Scheld (see Figure 1). This makes for a rather flat yet not too boggy landscape, well provided with waterways and generally flat or gently undulating roadways. As a result the countryside is well-suited to sea and river ports, which in turn generate land and water transport to their hinterlands. Virtually every town and city at the coast or along the rivers has been a port of some importance at one time or another.

Despite depicting itself as a nation of windmills, tulips and people in wooden shoes and folklore dresses, for the reasons sketched above the Netherlands has always had an important transport industry. Traditionally it was a major player as far as transhipment of goods and passengers for a wide and international hinterland is concerned, and with the advent of rail, road and air transport this only increased. In addition the nation's population, who must provide the labour for all these services, grew well beyond what the land could sustain based on arable surface, requiring further transport capacity to bring in provisions and take out waste. Cities and smaller conurbations grew to the extent that in the west of the country we now talk of the Randstad, the "bordering cities," heavily-urbanised and industrialised areas where the main national transport interchanges are found (Schiphol Amsterdam airport and the port of Rotterdam) and where much of the wealth of the country is generated.

Following from the above, the Netherlands also became a prodigious industrial manufacturer and provider of support services, which in turn boosted the demand for passenger and goods transport to an enormous extent. Every day more than seven million road vehicles are on their way, comprising 130 billion kilometres of travel per year. Bicycles? Have a look at station bicycle parking facilities, especially at a hub like Utrecht Central Station, and the fact that 16.5 million inhabitants own 19 million bicycles in the country and ride 13 billion kilometres on them annually will strike home. Public transport, dense and frequent, adds its important share to the daily movement of all these people.

The railways form a major part of this transport network. The Netherlands runs the most intensively-used rail network in Europe. The amount of track has been extended constantly since the 1980s, with building of new lines as well as quad-rupling of existing lines. At present it stands at 6800 km, on which 1.2 million passengers travel per day while 100 000 tonnes of freight must also be accommo-dated. That is done with more than 6000 train services per day.

Figure 1. Average population density / square km

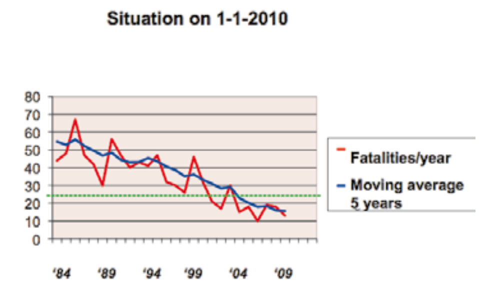


Figure 2. Number of fatalities on level crossings as at 1 January 2010

The forecast for the nearer future (2020) is growth in business activities and in population, and hence in mobility.

Road traffic is foreseen to grow by 40%. Rail traffic is foreseen to grow by 20 to 30%, and half this will be on main lines that are already heavily used.

The programme to quadruple track to separate local traffic from faster through services is well under way.

Putting everything discussed so far together, it is instantly clear that in a relatively flat country like the Netherlands level crossings are inevitable and indeed very necessary to keep local road networks connected. There are in fact about 2700 of them, taking all types into account. Wherever track capacity is extended level crossings will not be tolerated in future, but in the relatively quiet parts of the country they will continue to be an operating and safety problem on existing railway lines for many years to come.

Whilst in comparison the railways of the Netherlands have made major strides in improving level crossing safety since 1984, we are by no means there yet (see Figure 2). So we ask:

- What is the current safety level and how exactly did we get there?
- How did we improve on the previous levels?
- The number of accidents is still falling—can we maintain this positive trend or even improve on it?

The legal framework is characterised by a standstill policy. No new level crossings are authorised; quadrupled track has to be cleared of level crossings; and no decline is permitted in the present standards of level crossing safety. Level crossings are also no longer permitted where the line speed exceeds 140 km/h. The aim is to get the amount of accidents to a level as low as is reasonably practicable, but the

Prorail target is Zero Accidents. Our view on that is that we still believe most road users do not actually want an accident to happen. It is up to Prorail to provide level crossings that prevent the sort of aberrations under which road users get involved in accidents. We need to manage their behaviour.

So far we have succeeded with a range of measures that were first explored in the seminal VVO (Verbeteren Veligheid op Overwegen - Improving Safety on Level Crossings) report of 1992, which had improvement of level crossing safety as its subject. As a result of that, traditional wooden automatic half-barrier (AHB) booms are still being replaced with aluminium ones covered in highly retro-reflective plastic foils and in which fast flashing LED light units are integrated. In their open position these new barriers lean forward at 85 degrees, which makes the actual level crossing location much more conspicuous. An additional advantage is that normal maintenance of the barrier booms is reduced to an occasional clean and a look at the electric equipment inside. There is no more checking for rot, no occasional removal for a repaint any more (see Figure 3).

The tungsten warning lights on the AHB barrier posts were replaced by LED units which give a light that is better adjustable, are far more reliable and most of all allow a higher, visually more arresting flashing rate. We are fully in line with international experience in that respect.

The layout of crossings has been the subject of much research too. As a result we found that we could influence approach speeds—one of the known precursors to level crossing accidents—safely by narrowing the roadway and installing speed humps in the approach, by making the actual crossing a raised traffic-table as is common in road crossings, and by installing median kerbing in the approach road to the level crossing to hinder initiatives such as zigzagging around the barriers by motorists to the maximum possible degree. Another well-proved deterrent to approaching fast and being surprised by the barriers closing is the distant road signal fitted with flashing LED warning lights that indicates that the level crossing is closed. Another important issue is

Figure 3. AHB with barriers leaning in

Figure 4. AHB with raised median kerb and speed bump

Figure 5. Mini AHB with shortened aluminium barriers and integrated led lights

category	cause	'03	'04	'05	'06	'07	'08	'09
1	failure protection system	0	0	0	0	0	0	0
2	victim could not leave the crossing	0	0	0	0	1	2	2
3	victim was not aware of LX	15	7	12	4	5	2	3
4	victim was incapable	2	2	3	0	1	3	1
5	dangerous behaviour	12	6	3	6	12	11	7

Figure 6. Analysis of fatalities per accident cause

separating motorised traffic on the crossing from cyclists and pedestrians. On busier level crossings the latter have their own lanes, often with separate barriers, across the railway lines (see Figure 4).

A third important traffic management improvement is a system that measures traffic speed and density at the exit side of the level crossing, and starts issuing a warning to oncoming traffic to keep the level crossing clear in case of tailback, using a normal road warning signal with yellow flashing lights in the four corners.

The most important measure of all though was the provision of a yearly additional railway safety budget earmarked for the improvement of level crossing safety of 29.5 million Euros between 2001 and 2004 and a one-off budget of 113.4 million Euros for upgrading existing level crossings and replacing several with grade-separated crossings. After that 194 million Euros was provided between 2005 and 2009 for the complete replacement of all automatic open crossings in the Netherlands with AHBs, or mini-AHBs in cases where the width of the road did not allow the normal barrier boom length (see Figure 5).

It was calculated that the AHB was more effective than the automatic open crossing by a factor ten in regulating road traffic across the railway intersection, which in practice would mean an accident every thirty years rather than every three years. It is not that the barriers will physically stop people from crossing, we think, but it is the additional and unmistakeable signal to the road user, plus perhaps the chance of causing damage to the car, that appears to do the trick. And again, most people do not actually want to be involved in a level crossing accident.

As we have improved the most dangerous level crossings we now find that accidents happen on a more random basis, which in all likelihood means that we have successfully filtered out the more predictable or "pattern" accidents. In turn this makes us aware that further improvement may be rather less efficient, as we now start to address risk-taking behaviour in road users, which is the most difficult issue. What further means are open to us to improve safety?

Our approach was based on identifying the cause of the accident from the point of view of the victim (see Figure 6). This involved issues like failure of level crossing equipment (0 cases in fact), the victim being unable to clear the crossing due to the traffic situation (five cases), the victim being unaware of the level crossing (forty-eight cases), the victim being incapable of clearing the level crossing (twelve cases) and risk-taking behaviour (fifty-five cases).

We found that level crossings near stations returned a ten times higher fatality risk than level crossings 1000 metres away from a station. We also found that public open crossings were involved in accidents four times more often than user-worked private open crossings. Surprisingly, but in line with findings in e.g. Australia and Finland, actively protected crossings carry double the risk to the road user of passively protected crossings. This is probably tied in with the higher train service frequency versus the increased amount of road users at such crossings.

We did statistical analysis on incidents per type of level crossing (see Figure 7). We did work on near misses and observed road user behaviour to see what precursors to incidents could be found. We then correlated the distilled indicators from this monitoring to individual level crossing lack of safety. This was followed by the application of expert judgement based on traffic science, which involved road authorities. Subsequently new and innovative measures to reinforce level crossing safety were formulated.

It is well known that the length of waiting time, more specifically the waiting time in which nothing appears to happen on the tracks, triggers risk-taking behaviour in road users at a level crossing. We felt that more research had to be targeted at the causes of extended closure periods of level crossings in the Netherlands.

To gain insight we collected train running data and process events from interlockings, level crossing red-light cameras and station CCTV equipment. What we found was thoroughly analysed, especially in case of incidents. We developed traffic simulations of the events to enable cost/benefit calculations of alternative solutions. Then we went into workshops with railway traffic capacity managers, train dispatching managers, infrastructure managers and representatives of the various train and rail freight operators to identify the optimum solutions for a number of problematic level crossings, addressing the train arrival process, the station handling process and the train departure process.

At 1000 metres from a station, trains are usually travelling at line or maximum permitted train speed. This makes level crossing closure periods minimal and predictable. In turn there is very little risk taking behaviour amongst road users and

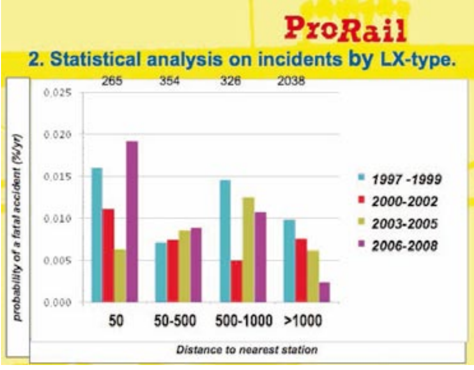


Figure 7. Probability of fatal accident related to distance of LX from nearest station

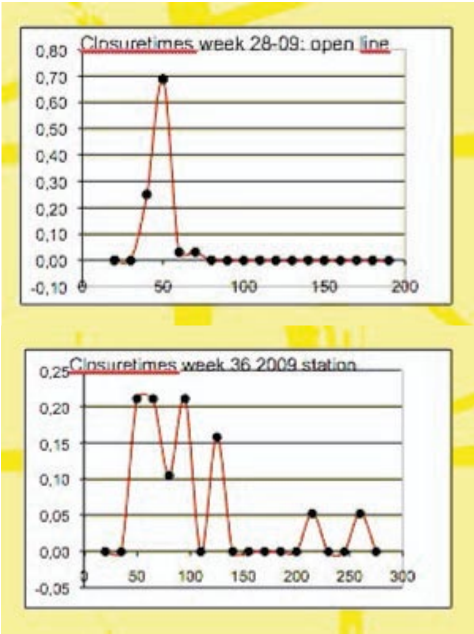


Figure 8. Example of closure time variance related to distance from station

Figure 9. Barrier with skirt at pedestrian crossing in station

Figure 10. Prototype barrier for user worked and public open level crossing

there is consequently not much urgent need for improvement.

The situation is different when a level crossing is situated close to a station and some trains will pass through at speed while others slow down and stop. When a train calls at a station the closure of a level crossing may be postponed until the train crew close the level crossing. Railway signalling (red starting signal) and train-running variations are a major factor in the experience of road users at the barriers, because they can make closure times long and unpredictable. Another important factor that inhibits safety at such locations is increased risk-taking by people, knowingly or unknowingly, when they venture across the tracks (against the warning) to catch a train still in the platform. Or who think that it is the presence of the train in the platform that is keeping the level crossing closed. Trains coming through along another track can catch them out; the Elsenham level crossing accident in Britain in 2005 was a clear example of this. It appears that there definitely is scope for improvement (see Figure 8).

We found that answers were to be found in better timing of level crossing closure and monitoring of the station processes, triggering closure of the level crossing with a pushbutton by the conductor on the station or with an infrared pistol by the train driver from the cab at the time of the actual dispatch of the train. An additional attention signal for the train crew that the barriers are about to be closed is part of this improvement. Furthermore, timetabling might be a tool, bunching arrivals and departures across the level crossing in order to diminish the amount of times the level crossing is closed per hour, whilst better timekeeping is another issue tied in with this arsenal of possible measures. Obviously, there is always the possibility of a complete rethink of the worst cases of level crossing design.

We seek to apply expert opinion in the listing of hotspots based on design features of both the road and the railway interfaces to the level crossing, and accident listing of a level crossing, which enables risk assessment based on accurate statistical analysis. Furthermore there will be joint periodical inspections by relevant road and rail management, as well as increased consultation with regard to crossing geometry.

Irritation is often a precursor to risk-taking behaviour, and so an improved complaints procedure, to obtain feedback from level crossing users and so get an indication of what problems they experience, is due for consideration. So is the clarity of the standards which govern use of the level crossing by road users (as intended by the providers of the level crossing).

Furthermore there is benefit in frequent public information drives about level crossings, the way they work and the specific dangers that are tied in with the location. More education for different groups—but on the other hand more powerful and harder-hitting enforcement measures against those who commit misuse, which is tied in with the plan for more consistent monitoring of the situation at level crossings that are known to be places of risk.

Simulation of rail and road traffic is a tool for predicting future use and enabling timely installation of additional measures to enhance level crossing safety.

New and innovative measures presently being tried (see Figures 9 and 10) are:

- four-quadrant barrier crossings with automatic obstacle detection;
- the re-introduction of skirts attached to barriers on fully closed level crossings for pedestrian use;
- low budget level crossing warning systems in public roads in port areas, where trains shunt in and out of industrial premises, and
- gates or barriers that can be opened and closed from either side without having to cross the track at presently unprotected user-worked and public open level crossings.

A third plan is to influence road traffic through their satellite navigation equipment when a level crossing is in warning state.

Finally, Prorail is committed to further eliminate accidents at level crossings.

The author wishes to acknowledge the immense help of Peter van der Mark in preparing and editing this paper.

Seamless cross border traffic becomes reality as Thalys trains start service with ERTMS

UNIFE, the European Rail Industry, welcomed in December 2009, the entry into service of the first high-speed ERTMS cross-border connection.

"This new Thalys operation represents a major leap forward for European transport as a whole, because with the highly sophisticated ERTMS technology, all technical differences stemming from a rail age prior to European integration are now overcome.

Passengers may now enjoy a faster, even more reliable service at the highest level of safety, and lowest environmental impact conceivable. ERTMS clearly illustrates the competitive advantages of rail over other modes of transport today, and will, once properly installed on other pan-European corridors, facilitate modal shift towards rail transport", said Michael Clausecker, UNIFE Director General.

Previously, seven different types of signalling systems were required to travel between Paris, Brussels, Cologne and Amsterdam. These are gradually being replaced by ERTMS (European Rail Traffic Management System), which is now operational on the high-speed lines between Liège and Aachen, and between Antwerp and Amsterdam respectively.

With a centre-to-centre travel time reduction of 51 minutes between Paris and Amsterdam, and 36 minutes between Paris and Cologne, the Thalys will entice even more passengers away from air travel.

Train operators will equally benefit from ERTMS technology as locomotives will no longer need to be equipped with more than one signalling system for whichever pan-European route they take. It will furthermore help European railway operators to diversify their sourcing: along the high-speed lines used by the Thalys, five different rail manufacturers supply trackside and onboard equipment, which is made possible through the use of ERTMS as a unique European standard.

The entry into service of Thalys trains follows a series of successes for high speed operations using ERTMS.

Whilst the ICE3 runs on the Liege-Aachen section since June 2009, December also marks the putting into service of the Bologna-Florence and Novara-Milan lines in Italy.

High Speed ERTMS service also started recently on the 1000 km-long Wuhan - New Guangzhou line in China.

TecRec

UNIFE and UIC have agreed to work together in the field of voluntary rail standardisation and have decided to jointly publish Technical Recommendations (TecRecs).

A TecRec is a UIC/UNIFE standard of which, the primary field of application will be the European rolling stock domain and its interfaces with other subsystems.

Pending the publication of a European standard a TecRec will serve as a common comprehensive standard, approved by UIC and UNIFE and therefore recognised as a voluntary sector standard aimed to improve the competitiveness of the European railway system.

Control Systems: Are Rail and Air so different?

By Gottfried Allmer

Paper to be read in London on 10 February 2010.

The author is with Frequentis

INTRODUCTION

"The European airspace is fragmented and will become more and more congested, as traffic is forecast to grow steadily over the next 15 years. The air navigation services and their supporting systems are not fully integrated and are based on technologies which are already running at maximum. In order to accommodate future air traffic needs a "paradigm shift", supported by state-of-the-art and innovative technologies, is required."

Does that sound remotely familiar? It is the introductory statement in EUROCONTROL's SESAR programme, which is a vision to create a seamless region of areas of responsibility for air traffic control over the whole of Europe. The first three letters SES stand for "Single European Sky."

Now substitute *railway* for *airspace*, *signalling systems* for *air navigation services* and *rail traffic* for *air traffic* — and we have a statement which is equally true for rail.

This may not be entirely surprising. With increasing size, all transport systems will probably meet similar patterns of problem at some point. But it does get more telling if we look into the detail of how institutions deal with these challenges, and how systems are really set up. This is what this paper intends to do, for perhaps there is some common ground between control centres of different transportation genres which is not really discussed.

HOW DO RAIL AND AIR COMPARE?

This paper will in no way suggest that anything could or should be copied from one field of transport to the other. And by absolutely no means does Rail have to look up to Air to learn how to do things correctly. Indeed there are areas where the opposite is the case. Take the drive to Internet protocol (IP) networks. I for one would expect Rail institutions to change more quickly to IP backbones than their air traffic counterparts (the non-military ones at least), simply because the scale is larger in the case of Rail so that the business case is stronger.

One thing Air does seem to have though is more budget – not in total, but that part of the budget that systems architects can use "to play around with." This is not surprising given that Air does not have to build and maintain the track for its vehicles. This allows solutions to be adopted which do not have a strict justification as being absolutely necessary immediately for operation. Once systems with fancy features are installed, operators will always find ingenious ways to put those features to use for economic advantage – a very human trait. We could look at it this way: Rail now has the advantage of being able to look over the fence and see what such features are worth in air traffic control, without having to take the risk of making the initial investment.

Signalling and radar surveillance

In the world of air traffic control, "signalling" translates into having a correct radar picture and a working radio connection to pilots available at a controller's workstation.

It probably makes little sense to look for synergies in the cores of the two control technologies themselves. They have evolved over considerable time, and each is likely to be the most appropriate approach in its own field, for purely Darwinian reasons if no other.

To show how far "signalling" penetrates communication in air traffic control, here is a short summary. We take as an example NATS[1] , which is the UK's governing body for air traffic control.

Radar data is obtained through connection to the UK radar network, and also through dedicated asynchronous connections to specific radar sites. The latter allow the provision of a radar service to continue in the event that the radar network fails. A radar data processing subsystem processes the data from up to four single radar sources for the same area and builds a coherent picture of the movement of air traffic, which it then distributes to the other subsystems of London Area Control Centre, which controls air traffic over the UK.

The radio connection from the controller to the pilot is delivered by a high performance ground switch. The extremely high availability of the switch is achieved by a combination of a redundant system core, a sophisticated alarm management system and non-interruptive maintenance functionality. The system core is made up of duplicated components with no single point of failure. The alarm management system notifies Technical Maintenance about any component failure. Technical Maintenance can replace the malfunctioning component without interruption of system operation while the system makes use of the appropriate redundant component. A failure of a core system component goes unnoticed by the operational personnel, even if it happens in the middle of an active voice connection.

The interesting thing to note is that, in the control centre, Air-Ground-Air (AGA) communication and Ground-Ground (GG) communication are completely separate, using two different switches. So in the NATS system, the radar screen and the AGA communication represent the signalling system. Air traffic control systems built since then have watered this down somewhat by integrating AGA and GG voice into a single touch-panel unit.

If we treat the two control technologies as black boxes, the technologies into which the black boxes are embedded are remarkably similar.

[1] Note that NATS is the name of a company, and is not an acronym.

Trains and aircraft are controlled in similar ways

Any specific flight follows a pre-defined trajectory (*Rail: route*). An aircraft willing to start the flight asks the Tower controller for permission, and the Tower controller gives permission for the specific flight trajectory. When the aircraft reaches an airway hand-over point, the controller tells it to which frequency to switch. Upon entering the new sector the pilot contacts the new controller. The controller identifies the plane unambiguously with the help of its radio beacon, and then follows the plane on the radar screen to the next hand-over point.

The presence of the plane is represented physically by a flight strip on the controller's desk (see Figure 1, BAW1 A, BAW1 B and BAW1 C). These strips used to be real print-outs, but they are replaced more and more by an electronic representation on a controller's screen. This is currently less sophisticated than what train radio delivers, for in Cab Secure Radio and GSM-R the frequency switching is automated.

Journey data is distributed in a similar way

Flights are coordinated by means of flight plans, electronically stored in a central database for the whole of Europe, the Central Flight Management Unit or CFMU which is located in Maastricht in the Netherlands, the busiest flying region in Europe. Repetitive-flight plans (*Rail: timetable*) are generated half a year in advance by the airlines and submitted to the CFMU, which distributes the data to the various countries' flight data processing systems.

The flight plan is entered into the Air Traffic Controller's flight data processing system automatically, all the databases sitting in an IP cloud which it owns. The controllers access all their data from the flight data processing system to route the planes through the trajectories. The flight plan is normally not changed. In case of small abnormalities, the controllers improvise a modified route up to the next hand-over point. Only in case of major traffic disruption is the data in the flight data processing system changed — in that case by the controller locally and not via the CFMU.

Congestion handling

If there is congestion along the way this is reported to CFMU, which recalculates the global flight plan and distributes the updated version to the flight data processing systems. The Tower controller does not give start permission to the plane and it is held on the ground until CFMU has worked out a slot, an extra-normal trajectory to the plane's destination.

Network Rail currently has a tender out to renew the whole of traffic management, so Rail is going to follow a similar path in the immediate future.

Cost issues show up in similar ways

In both Rail and Air there is potential for cost savings by "removing" country borders.

Rail hopes to eliminate border crossing costs using ERTMS.

In the case of Air, although flight routes are already managed centrally in EUROCONTROL's CFMU, fragmentation of the European airspace still causes higher costs than necessary. This is because airspace always has borders running along country borders, and because most countries in Europe only have narrow airways for civil aviation cutting through immense, largely-unused areas reserved for the military.

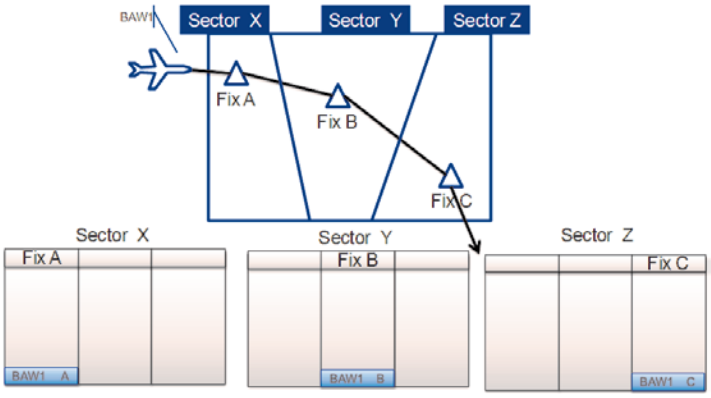


Figure 1 Air traffic control, showing handover between sectors

VISIONS OF THE FUTURE

Rail is pushing for ERTMS, a Europe-wide harmonised train control and communication system, with ETCS for train control and GSM-R the radio system to handle communications, both control and voice. Regarding geographical organisation of systems, we have a trend towards pulling control sites out of the countryside into a far smaller number of larger control centres.

Air avoids some of the standardisation problems that the Rail community faces naturally because most of the traffic has always been international, but it has congestion problems and it has to cut the operating costs of control.

Air Traffic Control in Europe is currently in the process of creating the "Single European Sky" (SESAR). This is an ambitious programme founded by EUROCONTROL and the European Commission. EUROCONTROL is the Brussels-based Air Traffic Management agency with practically all the European states as members. SESAR aims to merge current airspace areas of responsibility into bigger blocks in order to be more flexible in the trajectories. Flight paths should be disentangled to require less involvement by controllers along the route (cutting down on the number of controllers required), and should follow more direct routes for fuel efficiency. This programme was started as recently as 2008.

So again, there is the similarity that Europe-wide programmes of harmonisation are in place (and even have similar timescales). However, while Rail is still struggling more in the control area, Air is already more involved in the specifics of traffic management.

AREAS OF TECHNOLOGICAL ADVANCE

So where are the differences? Currently we are seeing technical improvements in the following areas. No claim is made for completeness.

Single controller's workstation

First there is the quest for prediction functionality, to permit conflicts between trains or aircraft to be seen as they emerge. Rail would seem to be in front here with the time-distance diagram, although it only shows the traffic on two tracks at a time.

Air traffic control centres are currently developing tools which allow prediction for the whole area of responsibility. In the United Kingdom the air traffic control institution NATS is currently rolling out a product named iFACTS which allows controllers to see up to 18 minutes ahead. The motive is to be able to control higher aircraft density without the need of airspace redesign (in effect achieving the ambitions of SESAR with technology on the single workstation).

However while this is being developed in a control context, it will quite probably be used even more extensively in a traffic management context. Route controllers will test the viability of various options, and choose the most economical.

A track diagram where you can make artificial decisions and then "fast forward" into the future to see the situation unfold in the controlled area would seem to be very useful for train route controllers too.

Collaboration among controllers

In the case of Rail, operation is organised by grouping together primary control operators in one control centre area, and grouping together train route control operators in another.

In the case of air traffic control, operators are usually organised in micro-teams, one for each sector of airspace. The team for each sector consists of a Tactical and a Planner. The Tactical has the frequency keyed in and reads the radar screen. The Planner is responsible for coordinating with the other sectors.

Consider this example scenario: a plane enters a sector at an unexpected height (for example because it is heavier than expected). First of all the Tactical must deal with this and act to uphold separation within his own sector. Then the Planner has to ask the Tactical in the next sector whether the plane can stay at that height (there might be crossing point issues). If he gets the OK he passes it on to his own Tactical, and the Tactical communicates with the plane.

System-wide data availability

The SESAR programme foresees the implementation of System-Wide Information Management or SWIM, an integration of all air traffic management data.

A net-centred operation is proposed where the air traffic management network, including the aircraft, is considered as a series of nodes providing or using information. Aircraft operators with operational control centre facilities will share information, while the individual user will be able to do the same via applications running on any suitable personal device. The support provided by the network will in all cases be tailored to the needs of the user concerned. This is not just wishful thinking, for the first step has already been put into operation. The European Aeronautical Information System (AIS) database is a reality. It is a central database for all of Europe's aviation data, flight routes, navigational aids, meteo-rological information, etc. which can be accessed in real time by any air traffic controller.

A similar system for Rail would also have route plans, but would focus more on track and maintenance data instead. With Network Rail's traffic management renewal coming up, we live in quite exciting times here. They too call for involvement from people on the ground in order to ensure that a practical system is drawn up.

Transmission backbone

Finally, what about the physical backbones for communication transmission? As in commercial applications, control centre communications are moving towards IP environments.

This will certainly make economical sense for railway infrastructure companies, because the equipment is standardised and is the same for voice and data transmission. But rail and air traffic control institutions alike are still hesitant. In particular, the mission criticality of large systems has yet to be proven.

So a start is being made by military air traffic control systems. They are never reluctant to take a leading role, they are not short of the required funding and they possess the advantage of dealing with smaller systems than their commercial counterparts. Military air traffic control systems are currently all moving in the direction of IP systems having two separate IP local-area networks accessible from the same workstation. This achieves separation of so-called "red" (unclassified) and black" (classified) voice transmissions.

The principle is that classified voice can only leave the system encrypted. In such a system each voice path is known to be either classified or unclassified. The controller has a visual indication of the classification status of a current party and can thus act accordingly. Classified voice going out is blocked from leaving the system unencrypted.

When Rail systems move towards IP based communication backbones, the challenge might be in the separation of operational and administrative traffic. Looking at the above examples from military air traffic control one could envisage a reversal of the logic, with administrative voice transmission treated as "classified" and so prevented from reaching operational circuits. The hindrance of having to install two large separate IP backbones could be circumvented by splitting a single IP backbone into separate units using multi-protocol label switching (MPLS).

USER VIEW

Here is a selection of features found in air traffic control centres.

Collaboration

As stated above, air traffic control has had more chance to experiment with complexity at the workstation. All concepts have some sort of collaboration on the workstation. A "Main" operator deals with communication with pilots, while the "Assistant" operator beside him handles mainly telephone calls – that is, communication with other operators and administrative business. Collaboration is achieved by having calls ring at both "Main" and "Assistant" positions when they come in, and establishing a kind of quick-join conference when they are picked up. A call does not disappear from one person's workstation if his partner picks it up but remains visible, and he can join a conference at one touch of a button.

The iFACTS system could only be implemented with this collaboration in place, so that there are workstations with old and with new software which both receive the same calls. This enables a rapid switch back in case of unexpected problems.

Integration

In air traffic control a lot of integration on workstation screens is taking place to avoid the need for the controller to take his eyes off the aircraft or runway he or she is observing. But there are also more basic kinds of integration, such as "head-set splitting" for instance.

In the NATS London Area Control Centre, Air-Ground-Air (AGA) and Ground-Ground (GG) communications are completely separated, using two different switches (see Figure 2). Both systems have touch devices at the controller's panel, but they have only one connection governing the presentation of voice in the controller's headset. If there is both Air-Ground-Air and Ground-Ground communication, both are fed to the headset, one to the right and one to the left earpiece.

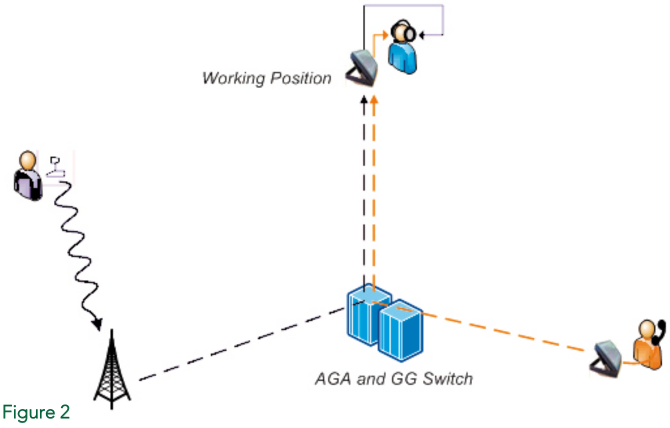


Figure 2
Separation of Air-Ground-Air (AGA) and Ground-Ground (GG) communications

Electronic Mimicking

Some processes have a long history, and controllers do not like giving them up and having to enter endless data into windows on screens with tiny fonts instead. So suppliers have started to mimic the world that existed before, ensuring simply that the underlying data is processed and distributed electronically.

An example is the flight strips mentioned above. They were once a piece of paper. Now they are often represented electronically on pen table displays (see Figure 3.) – but their size and appearance is the same as before!

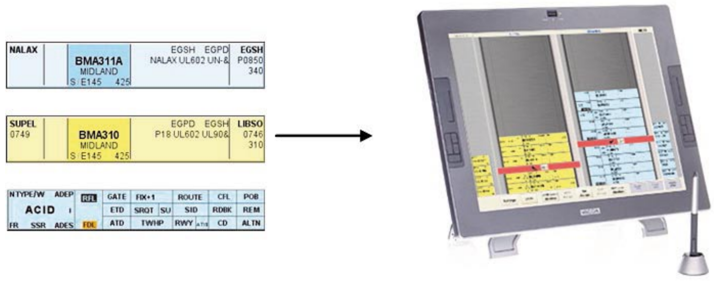


Figure 3 Electronic presentation of Flight Strips

THE REQUIRED FOUNDATIONS

While it is always exciting to talk about new features, they need sound technical foundations. Implementing more features means making software more complex. As Eddie Goddard quite rightly points out in his paper *"Signalling: Have we lost the plot?"* (Reference 1.), it is already impossible to test every path through the logic of a software programme. To mitigate this fact the software industry has developed a range of measures designed to confine software errors to paths that are never tested and never exposed. This works quite well – otherwise we would never see any new signalling software, radar screen software etc. put into operation. But there is a serious drawback in concentrating entirely on the process before operation. If you invest all the effort in the process before commissioning, there is a stifling tendency, once the system is in operation, towards the mindset, "Never change a running system."

So in UK air traffic control NATS has modified the approach. In a first phase there is the traditional, mammoth exercise of making the basic control software fail safe. This ends with the site acceptance (commissioning).

Dealing with software changes in operation

Now comes the change in mindset. In phase two, the time after acceptance and even extending into operation, NATS do not fear that a number of software errors will surface but actually expect it. It is that part of the requirements that only reveals itself when real operators are involved in real operation, the last one per cent that often determines whether the new system presents a real gain as opposed to a mere beautification of the system replaced.

So NATS had to find a way of upgrading their system continuously whilst it was in full operation.

The first challenge is administering the process. NATS solved this by putting in place a rigid update-window grid. Each month there is exactly one date to install software, which may either be used or not. Hence the upgrade process does not have to be planned again for every instance but is formalised. Then a great effort is put into regression testing procedures to prevent the "one step forward, two steps back" symptom.

But the main feature is the system functionality that permits the system to be upgraded while in full operation. In this way, disruption can be prevented and the frequent updating can be hidden from the customers. By doing this NATS averted the danger of political pressures distorting their technical goals.

Such system upgradeability requires some very specific system features.

For an upgrade of the workstations, you need **free seating**. This means that a controller can sit at one of number of workstations and always access exactly the same functionality purely by logging in. Only then can controllers be moved around during the upgrade process without ever losing control of the traffic.

For an upgrade of the switch you need **live-live redundancy**. This means that a switch consists of two halves, each of which carries the same voice/data information at all times. Only then can you upgrade one half while the other half still services the system with the old software. Then you can switch to the upgraded half and upgrade the second half.

Free seating

For free seating, a controller logs in with his appropriate Role at any of the network sites, and can then access all components of the network permitted for that Role. This principle is now entrenched in the control centres for air traffic management, and it is easy to see why. It provides the flexibility needed to deal with extraordinary events without the need to back up every single workstation.

The other part of the story is that it also provides on-line upgradeability. The only way to implement new features is to have a method of frequent upgrades at hand.

Software upgrades

In NATS, software upgrading is made possible by enhancing the operational centre (OPS) with sixty additional workstations, which are used normally as the training unit (TDU).

Technicians re-configure the TDU with OPS software. The TDU is switched operational. Controllers move into the TDU and log in as "Elected-to-take-over." Then in a handover process the TDU controllers take over. Then the OPS section that is being controlled by the TDU has its software upgraded. When this is finished the OPS controllers resume control, and the next part of the OPS is upgraded in the same way (see Figure 4).

Live-live redundancy

This was of course introduced in air traffic control systems with safety in mind. The communication system is mission critical, as if part of the signalling in Rail terms. So systems were demanded that had no single point failures — there must always be a redundant path for the voice or data to take. Once these systems were established, it turned out that this functionality is very handy for upgrades. While one path is upgraded, the other one can still be used.

This in turn led to a further strengthening of the robustness of the software, even as complex features were added, as a constant flow of upgrades is still the best known method to wring errors out of a software. Over time air traffic control has become so accustomed to these mission critical cores that even the largest voice data systems are built with centralised star architectures.

Perfect examples are the flight data database system (CFMU) and the European AIS (Aeronautical Information System) Database system, which are centralised in Brussels.

CONCLUSION

The procedural architectures used in railway control and air traffic control are surprisingly similar, but we find a greater tendency toward controller collaboration and system integration in the case of air traffic control. It may be worthwhile for railways to look into some of them, albeit with slightly different focus. Because of the greater application complexity of railway communication system cores, implementation would require them to be designed for upgrading during live operation.

If the railways follow this path they would reduce further the gap in mindset between themselves and air traffic control, where there is already a firm belief in the ability to build, implement and run systems sufficiently safe to allow the benefits of centralisation to be exploited fully.

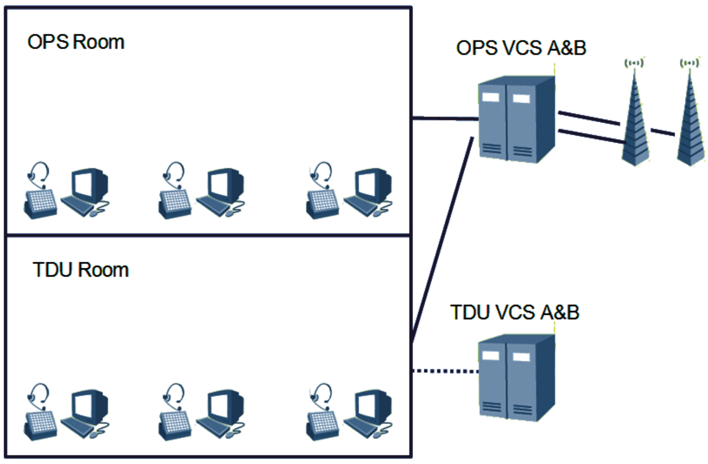


Figure 4 NATS showing OPS and TDU

REFERENCES

1. Eddie Goddard, *Signalling: Have we lost the plot?* IRSE Proceedings 2009-2010
2. European Air Traffic Management Master Plan, Edition 1 (***www.atmmasterplan.eu***)

S. No	Standard	Flame Propagation	
1	IEC	**IEC 60332** Part 1 & Part 2 -- Test on Single wires or cables Max. Charred length – 540 mm. Part 3 – Test on bunched wires or cables Max. Charred length – 2500 mm. Each of the above tests are further categorized as A , B , C & D depending on the amount of combustible material (in litres) for flame generation & time of exposure of in min. (40 min. for A & B) and 20 min. for C & D)	
2	BS	**BS 4066**	
3	UL	**Vertical tray flame test** **UL 1581** Cable does not spread fire to top of tray **UL 1685** Max. charred length - 2500 mm. **ANSI / UL 1666:** Cable capable of preventing of carrying of fire from floor to floor	
4	IEEE	**IEEE1202** Max. Charred length - 1500 mm.	
5	ASTM		
6	NFPA	**NFPA 262** Max. Flame travel distance < 1500 mm	

Table 1 Fire properties vis-à-vis corresponding Standards

Note 1: Available tests for fire properties against various standards have been indicated. Information in blank cells is not available to the author.

FIRE PROPERTIES IN TELECOMMS CABLES

Use of Telecommunication Cables in Underground Metro Systems Fire Properties: An informative study

By Yog Raj Bhardwaj, *IRSSE(vr),FIRSE*

Background

Railway Signalling & Telecommunications Engineering, not being a part of the engineering degree curriculum in most countries, is taught on-the-job and therefore has become a specialised subject. It has been observed that the S&T fraternity is generally so engrossed in S&T technicalities that they tend to neglect major aspects of the project which are equally important from the perspective of the safety & successful commissioning of the project, particularly Metro Railway Projects. Protection against fire emergencies is one such subject. This paper will try to bring out & collate requirements of Fire protection as per international standards particularly from Railway Telecommunications perspective.

Introduction

Protection against fire emergencies is an integral part of design of all sub-systems in a Metro Railway Project. NFPA-130 (National Fire Protection Association) is a Standard inter-alia for Metro Railway Systems which defines fire protection requirements for underground, surface, and elevated fixed guideway transit and passenger rail systems, including trainways, vehicles, vehicle maintenance and storage areas The standard also includes requirements for life safety from fire in fixed guideway transit and passenger rail system stations, trainways, vehicles, and outdoor vehicle maintenance and storage areas.

The NFPA-130 standard is therefore applicable to all fixed guideway transit and passenger rail stations accommodating passengers and employees of the fixed guideway transit and passenger rail systems and incidental occupancies in the stations and defines the minimum requirements for each of the identified subsystems.

For Telecommunication sub-systems also, requirements have been specifically defined in NFPA-130. However considering extensive use of various types of cables in Telecomm sub-systems, this paper will discuss requirements of fire protection properties of various cables used in telecommunications sub-systems.

Fire Resistivity (Circuit Integrity)	Flammability: Oxygen & Temp. Oxygen Index	Smoke Density	Halogen Content Corrosivity Toxicity
IEC 60331 - 11 –Fire alone at 750°C - 12 - Fire with shock at 850°C - 31 - Fire with shock for 0.6/1 kV rated cables (*Part 12 & 31 Applicable for cables > 20 mm ø*)		**IEC 61034** Light Transmission > 60% (Visibility) Test duration > 40 min.	**IEC 60754 -1** Acid content < 5 mg/g (0.5%) (for values less than 0.5% results of IEC 60754-2 to be adopted) **IEC 60754-2** Corrosivity >4.3 (pH value) Conductivity <10 µS/mm
BS 6387 SEE NOTE 2 below	**BS ISO 4589**	**BS 7622 (EN 50268)**	**BS 6425 (EN 50267)**
UL 2196 1850°F for 2 hours Hose of stream after 2 hours		**UL 1685** Smoke density < 95 m^2 Smoke release rate < 0.25 m^2/sec	
		IEEE 1202 Smoke density < 150 m^2 Smoke release rate < 0.4 m^2/sec	
	ASTM D 2863 Oxygen Index > 30 Temp. Oxygen Index > 260	**ASTM E 662** (Test period 4 min.) Specific Optical density of smoke < 200 – Flaming mode < 75– non flaming mode	
		NFPA 262 Optical density of smoke: Peak < 0.5 Max. < 0.15	

Note 2:

Resistance to Fire
650 °C for 3 hours - A
750 °C for 3 hours - B
950 °C for 3 hours - C

Resistance to Fire & Water - W
650 °C for 15 min. with fire & Water

Resistance to Fire & Mechanical shock (Hammer Blow every 30 secs.)
650 °C for 15 min. - X
750 °C for 15 min. - Y
950 °C for 15 min. - Z

FIRE PROPERTIES IN TELECOMMS CABLES

Major Telecomm Systems and Cables used in a typical metro system

Major Telecomm. Systems are:

S.No.	System	S.No.	System
1	Digital Transmission System (DTS)	5	CCTV System
2	PABX System	6	Master Clock System
3	Public Announcement System (PAS)	7	Central Fault Reporting System (CFRS)
4	Public Information & Display System (PIDS)	8	Emergency Radio System

Cables used for commissioning / functioning for the above systems are:-

S.No.	Types of Cable	S.No.	Types of Cable
1	CAT cables	5	Optical Fibre Cables (OFC)
2	Audio Cables	6	Leaky (Radiating) Coaxial Cables
3	Telephone Cables	7	Feeder Coaxial cables
4	Power Cables		

Fire Properties of Cables – Why?

Due to extensive use of Cables in a Metro railway system, cables can be the cause of any of the following hazardous situation in event of any fire:

- Propogate flames from one area to another;
- Act as a catalyst to accelerate the combustion;
- Release excessive smoke, toxic and corrosive gasses.

Most normal cables use PVC (Poly Vinyl Chloride), a plastic compound containing Chlorine (halogen) as an insulation material. In case of fire, the halogen containing plastic insulation would release hydrogen chloride, a poisonous gas which forms hydrochloric acid when it comes in contact with water. Thus cables containing halogens (Chlorides etc.) release poisonous gases (hydrogen chloride gas) & also corrosive fluids in case of fire which converts into corrosive hydrochloric acid on contact with water (fire fighting). These insulations also release a high amount of smoke thus reducing visibility & therefore delay / obstruction in the evacuation process in case of fire. High levels of smoke also increase the level of suffocation & associated hazards to the effected public/passengers.

To avoid above hazardous conditions, cables should have the following fire related properties:-

i) Fire Resistance or Fire rated cable :-
A cable that will continue to operate (for pre-defined time periods) in presence of a fire is termed as a Fire Resistive or Fire Rated or Circuit Integrity cable.

Fire resistance properties in a cable are normally obtained by using Mica or similar tape protection over the conductors.

ii) Flame Retardant cable (Resistance to Propagation)
A cable that will not convey or propagate a fire is termed as a Flame retardant cable. These cables ensure that the flames go out by themselves.

Flame retardant properties are obtained by using Cross Linked Polyethylene (XLPE) or Cross Linked Polyolefin (XLPO) or similar as an insulation material.

iii) Low Smoke emission
This property results in Low smoke emission in case of fire and prevents loss of visibility thus allowing people to be evacuated quickly and facilitating the work of the rescue team.

iv) Toxic gases evolution
This property prevents emission of lethal effects of gases and acids produced by combustion of cables that contain halogens resulting in harm to workers & passengers.

v) Corrosive gases
This property prevents emission of hydrochloric acid on combustion of the cables thus preventing corrosive damage to equipment.

Low Smoke Zero Halogen (LSZH) cable jacketing is composed of thermoplastic or thermosetting compounds that emit limited smoke and no halogens when exposed to high sources of heat i.e. flame.

vi) Ease of Ignition (flammability)
This is an index of ignition i.e. flash (spark) temperature & self ignition temperature of the cable indicating the temperature at which the cable would ignite. Higher spark (flash) temperature as far as feasible is advisable.

vii) Temperature Index
The maximum temperature a material may be safely used in electrical equipment is termed the Temperature Index.

viii) Oxygen Index & Temperature Oxygen Index
This is a relative measure of combustion resistance of materials in the context of atmospheric oxygen.

Oxygen index is the measurement of oxygen content at which the vertically held sample when ignited ceases to burn off on its own within three minutes.

Temperature Oxygen Index is the temperature at which the vertically held sample ceases to burn off on its own within three minutes at an Oxygen concentration of 21% i.e. atmospheric air.

Types of Cable to be used

Cables used for Emergency – Lighting, Communication & other critical life saving circuits are expected to use Fire resistive cables which can maintain circuit integrity for a pre-defined time. All other cables used in Metro Railway systems should have Flame retardant, Low Smoke & Zero Halogen properties.

Engineering Council rebrands to reflect global standing

Reflecting its growing international reach and influence, the Engineering Council has now dropped the "UK" from its name. One of the key deciding factors is that the professional qualifications awarded by the Engineering Council - Chartered Engineer, Incorporated Engineer and Engineering Technician - are fast becoming internationally recognised standards of competence. In an increasingly globalised economy this recognition is vitally important to employers.

Andrew Ramsay, Chief Executive Officer of the Engineering Council says, *"A major benefit for engineers on our register and holders of Engineering Council accredited academic qualifications is that the rigour of the Engineering Council's UK-SPEC assessment of competence is widely recognised by the rest of the world. In fact, the title Chartered Engineer is now one of the most recognisable international engineering qualifications."* A significant 25% of engineers on the Engineering Council's register now work outside the UK, and a further 10-15% of registrants are non-UK citizens. Individuals holding Engineering Council titles are currently present in 45 countries. This includes over 10 500 in Hong Kong, another 7000 plus living in North America and a similar number in Australia/New Zealand.

This makes international issues vitally important to the Engineering Council. It is a leading member of engineering bodies across the globe, through which it works to continually increase global recognition of those who satisfy its standards. Activities include providing the Chair of the International Engineering Alliance (IEA), as well as membership of the European Federation of National Engineering Associations (FEANI) governing board. In addition, it has regular contact with appropriate UK government departments and EU Commission directorates. The Engineering Council has also been granted a licence to award EUR-ACE labels to UK accredited degrees by the European Network for Accreditation of Engineering Education (ENAEE).

To help incorporate understanding of global issues such as sustainability, climate change and poverty into the teaching of engineering, the Engineering Council has joined forces with UK based Higher Education institutions and other relevant bodies, in a project being implemented by independent NGO Engineers Against Poverty (EAP) and funded by a grant from the Department for International Development.

Andrew Ramsay adds, *"With so much importance being placed on our international activities and the growing interest in our titles from engineers outside the UK, it seemed appropriate to drop the UK part of our name, and to simply become known as the Engineering Council in future."*

Standards for fire properties in cables are tabulated below:-

S.No.	Properties	International Standards
1	Fire Retardant	IEC60332, BS4066, UL1581, UL1666, IEEE1202, CSAC22.2, NFPA262
2	Fire Resistant	IEC 60331, BS6387, UL2196
3	Low Smoke	IEC61034, BS7622, UL1685, IEEE1202, ASTME662, NFPA262
4	Halogen Free	IEC60754-1, BS6425
5	Low Toxicity, Low Corrosivity	IEC60754-2, BS6425
6	Oxygen Index	ASTM D2863
7	Temp Index	ASTM D2863

Details of tests and allowable limits for the above properties are tabulated in Table 1.

Conclusions

From the above details it can be concluded that fire properties in cables play an important role in ensuring safety in a Metro railway system more so in the event of a fire incident when these properties prevent fire propagation & damage to material (corrosion) and also ensure working of critical emergency circuits and faster restoration.

Cables used for Emergency – Lighting, Communication & other critical life saving circuits to be Fire resistive which can maintain circuit integrity for a pre-defined time. All other cables used in Metro Railway systems should have Flame retardant, Low Smoke & Zero Halogen properties.

The author with his experience of Signalling & Telecommunication on Indian Railways has felt that S&T engineers tend to neglect various non-S&T facets and Fire properties of cables is one of them. With this article an effort has been made to collate all related information & data for information for the Signalling & Telecommunication fraternity. Not-withstanding the above , the author also acknowledges the fact that there are a number of esteemed IRSE colleagues who are already in the know of the information available in this article and would request them to bear with the same. In my next article a case study on the subject will be presented.

Any correspondence / information / feedback to the author is welcome at ***yog_raj@hotmail.com***.

New Organisation to deliver Embedded and Critical Systems

The launch on Tuesday 19 January 2010 of Altran Praxis creates a powerful new force in delivering engineering, technology and innovation for the world's embedded and critical systems.

Formed through the merger of Praxis, the international specialist in critical systems engineering, and embedded software experts SC2 by Altran, the new organisation will focus on the engineering of software intensive and embedded systems with demanding safety, security or innovation requirements.

Headquartered in Bath, UK, the new organisation will operate globally through offices in France, India and the UK. It currently employs 270 people and plans to expand further in 2010. Both Praxis and SC2 by Altran are already owned by the global €1.65 billion Altran group and the new organisation now forms the centre of excellence for embedded and critical systems within Altran.

"The launch of Altran Praxis will offer our clients a truly unique capability. For example if you are an automotive, aircraft or train manufacturer, we can now build and assure your most critical control systems, such as engine management or braking, and also deliver the most innovative passenger infotainment systems for generating more revenue. With the increasing integration of systems this combined capability is of very high value," said Keith Williams, Managing Director. *"Crucially, our staff are extremely supportive of the merger, as it provides opportunities for them to become involved in different technologies and markets as well as further extending our international reach."*

Building on its joint heritage, the new organisation will operate as a trusted partner to companies in the aerospace and defence, rail, nuclear, air traffic management, automotive, medical and security sectors. Key projects in these sectors include:

- The development of the software for the ground-breaking iFACTS air traffic management system for the UK's National Air Traffic Services (NATS);
- Innovation projects in the field of automotive connectivity and telematics for Renault;
- Development of gesture based HMI technology for medical and control centre applications in sectors such as rail, air traffic management and nuclear;
- Independent Safety Assessment on Tube Lines' new signalling system for the London Underground;
- Technical support for the UK Health and Safety Executive's assessment of new build nuclear reactor types;
- Development of the software for the US National Security Agency's Tokeneer biometric security system;
- Safety partner for the Thales Watchkeeper Unmanned Air Vehicle (UAV).

Altran Praxis will build safety and security critical software; develop innovative embedded software for new products and applications; act as a safety and security partner, consultant or independent assessor; conduct research for clients and develop in-house tools and technology supporting embedded and critical systems.

"Embedded systems, safety and security are all strategic services for Altran, and with the merger of Praxis and SC2 by Altran we have focused and strengthened our offering in these growth areas," said Yves de Chaisemartin, Group Chief Executive Officer. *"The creation of this new centre of excellence is in line with our strategy of investing to benefit our customers by delivering new capabilities based on expertise and innovation, which can be delivered globally across key industry sectors."*

Major Signalling Contracts for Network Rail

Network Rail has awarded Invensys Rail two major signalling contracts; the first for the resignalling of the Water Orton area in the West Midlands under the companies' Type A framework agreement and the second, the Moorthorpe interlocking renewal scheme, a multi-disciplinary Type B project.

The £30 million Water Orton project will see the replacement and renewal of life-expired signalling equipment, including nine interlockings, as well as the delivery of two WESTLOCK interlockings, two WESTCAD control and display systems and ultimately, the transfer of signalling control to the West Midlands Signalling Centre.

Managed through Invensys Rail's Birmingham office, the project will be commissioned in two distinct phases, the first in November 2011 with the final commissioning in April 2012, and will deliver significantly improved traffic in and through the Water Orton area.

The £9 million Moorthorpe and Hickleton Signal Box Interlocking renewals project is being undertaken in partnership with Network Rail London North Eastern. The scheme covers the replacement of the life-expired signalling system and two existing mechanical signal boxes with a single WESTLOCK interlocking solution which will be interfaced and controlled at the York Signalling Control Centre. The Invensys Rail team, based in the company's York office, will undertake all design, testing, installation and commissioning; with final commissioning scheduled for Easter 2011.

Commenting on the news, Invensys Rail Ltd's Managing Director, Mark Wild said: *"This is great news for the business and an excellent way to kick off the New Year. We are delighted to be working closely with Network Rail on both these projects and look forward to delivering modern and highly effective signalling solutions which will deliver tangible benefits both to the operator and the travelling public."*

Chilean Metro Contract

Announced in January 2010, French firm Alstom will provide an automatic communication-based train control (CBTC) system for Santiago de Chile metro's 20 km line 1.

Under the €50m ($70.7m) deal with Chilean operator Metro de Santiago, the company will design, build, install and maintain its Urbalis solution that integrates data transmission by radio.

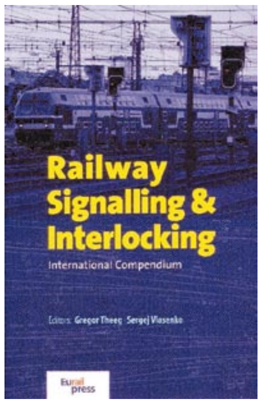
Once finished, the system is expected to cut intervals between trains and boost the hourly passenger traffic potential of 1 million passengers by 20%. Work is expected to begin in September 2010.

Austrian Railways Contract

Austrian Railways ÖBB (Österreichische Bundesbahnen) has awarded a €90m ($129.4m) contract to Alstom to equip 449 vehicles with its ERTMS-based train control solution; it was confirmed in January 2010.

The company will deploy its ATLAS system on three types of vehicles including 332 Taurus locomotives, 50 multi-system locomotives and 67 railjet control-cars (class 8090). Work is scheduled to begin in 2010 and finish in 2014.

The company will also provide its onboard Specific Transmission Module solution, which enables vehicles to run in neighbour countries with their national train control system without traffic interruption.



Railway Signalling & Interlocking International Compendium

Editors: Dipl.-Ing. Gregor Theeg & Dr. Sergej Vlasenko
Other Authors include 23 International Industry Specialists

Published by DW Media Group/Eurailpress

Email: ***info@eurailpress.de***
Internet: ***www.dwmedia.com***,
www.eurailpress.de and ***www.railwaygazette.com***

ISBN 978-3-7771-0394-5
First Edition 2009, Printed in Germany.

Railway signalling has always previously been a nationally applied technical field, however, with the event of globalisation, the future success of interoperability and better working relationships between manufactures, suppliers and maintainers depends on the sharing and understanding of knowledge. The purpose of this book has been stated as providing a generic approach in the summary and comparison of railway signalling and interlocking methods at an international level.

The book itself is very good at setting out the basic principles, breaking down and comparing all items and issues at an understandable level, regarding the applied solutions in the different countries. Whilst being intended for experienced railway signalling experts and operators, the editors and authors recognise the help and assistance it can also provide to students wanting to extend their knowledge to an international level of understanding and thinking.

The book is broken down into 14 chapters, with numerous sub-chapters below that in order to provide the robust detail and information regarding each subject matter. In order to give you a feel for the contents, the main chapters are as follows:

1. Basic Characteristics of Railway Systems and the Requirements for Signalling
2. Safety and Reliability in Signalling Systems
3. Railway Operation Processes
4. Interlocking Principles
5. Detection
6. Moveable Track Elements
7. Signals
8. Train Protection
9. Interlocking Machines
10. Line Block Systems
11. Remote Control and Operation Technology
12. Safety and Control of Marshalling Yards
13. Level Crossings
14. Hazard Alert Systems

With an extensive listing of references, a detailed glossary along with an explanation of symbols in track layout schemes, this book took quite some time to read, however, the extent of the detail regarding the differing equipment types, operating practices and processes between countries were clearly identified. I particularly enjoyed the chapters on Detection, Moveable Track Elements and Level Crossings, based purely on the amount of quality content and detail and the relevance of the issues raised.

Whilst being a very enjoyable book to read, my only concern was that there was only a small reference regarding railway telecommunications and nothing regarding their importance when operating the railway in a degraded mode of operation. Food for thought and comment? Yet another book that should be on your bookshelf for continued reference.

Ian Allison

IRSE MATTERS

Competence Guidance for Train-borne Train Control Systems

The IRSE has published a new handbook, entitled as above. The 40 page document was produced as a result of a request from Industry to consider the competency requirements for those undertaking work on train-borne systems. This request resulted in a working party being organised consisting of experts in Signalling and Automatic Train Control Maintenance, Rolling Stock, Asset Engineering, Safety together with representatives from London Underground Upgrade Projects. A representative from the Institution of Railway Operators was also involved. Although written with Metros principally in mind, the conclusions could also be applied to Mainline and Light Rail systems.

Following an Executive Summary, a Foreword, an Introduction and a short Glossary, there are seven Chapters, concluding with a Closing Remarks section.

1 REGULATORY AND BUSINESS BACKGROUND

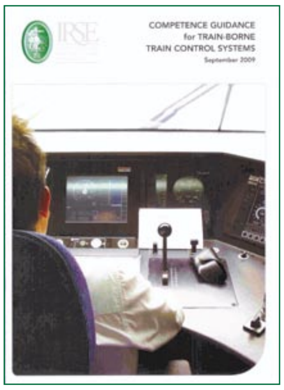
This Chapter firstly lists the UK regulations relating to the requirements for Competence and Competence Management and then suggests the benefits that could result from such management. Interesting statistics are shown detailing the vast improvement in reliability of London Underground Automatic Train Control equipment once knowledge and experience was gained over the years.

2 MANAGING COMPETENCE

This Chapter describes the phases needed to put together a Competence Management System and explains the needs for a system embracing the complete system life-cycle. Diagrams neatly summarise these suggestions. The first shows the phases as suggested by the Office of Rail Regulation (ORR), in which the first phase lays down two principles which are the subject of Chapters 6 and 7.

3 PUBLISHED GUIDANCE MATERIAL

This Chapter lists and summarises four existing publications (from the ORR, the Health and Safety Executive, the Institution of Engineering and Technology and 'The Yellow Book') relating to the subject.



4 UNDERSTANDING THE SYSTEM

This Chapter describes the make-up of a typical system, including the interfaces to other equipment, and the software and data constructs. It concludes with a table showing the different ways that the various functions could be achieved.

5 ORGANISATIONAL ISSUES

This Chapter explains how two different organisations need to be set up: firstly the Project Organisation, responsible up to the commissioning, and secondly the Maintenance Organisation which then takes over. Suggested structures for these organisations are shown, and the competences required discussed.

6 IDENTIFYING ACTIVITIES AND ASSESSING RISKS

This chapter deals with the ORR Principle 1 detailed in Chapter 2. The activities undertaken by the various posts are discussed together with an explanation of how the associated risks could be identified.

7 SELECTING COMPETENCE STANDARDS

This chapter deals with the ORR Principle 2 detailed in Chapter 2. The various competences necessary to address the risks resulting from the previous chapter are discussed.

There follows a page of Closing Remarks.

******

Throughout the chapters attention is drawn to fifteen framed Key Guidance Points emphasised by having a coloured background.

This document, the first Report to be published in the new IRSE Corporate style, is available in pdf format for downloading on the Licensing website page (***www.irselicences.co.uk***) free of charge, and printed copies are available from the office or the publications pages on the main website (***www.irse.org***).

It is priced at £20 for members, £30 for non-members

IRSE goes Online

The IRSE website (***www.irse.org***) has recently had a menu option called IRSEOnline added. With the right permissions this allows you to enter a personal area where it is possible for you to update contact details, reserve places on events, purchase books and other merchandise. Members of the IRSE are also able to view their subscription payment status. Payments made through the site are securely managed and all the usual credit/debit cards are accepted.

To enter the site you will need to have your email address registered with the IRSE and a password. Instructions on how to register and obtain a password are given once you have clicked on the 'IRSEOnline option' within the website. Several hundred people have already registered and used the facilities.

It is planned to add a further facility that enables paid up members to view free of charge additional material such as past papers and reports. This will be introduced progressively as part of an overall programme to further enhance the website during 2010.

The development of the complex functionality of IRSEOnline was carried out by Technology Services Group, the supplier of the IRSE's principle IT system, with input from many people connected with the IRSE. The project was lead on behalf of the IRSE by Martin Govas.

Any comments and ideas you may have on the system can be sent to his email address which is ***martin.govas@irse.org***.

MINOR RAILWAYS SECTION

Winter Technical Meeting – Saturday 7 November 2009

1. Kidderminster Railway Museum *(photo: Ian Allison)*
2. Severn Valley Railway signalling at Bewdley South signal box *(photo: J D Francis)*
3. Example of incorrect signage at a level crossing *(photo: J D Francis)*

On a crisp Winter's morning in early November 2009, over 60 members and guests attended the second event staged by the Minor Railways Section since its inception earlier during the same year. The event was held at the Kidderminster Railway Museum in Worcestershire, some three years since a similar event was held during the Presidency of Mr John Francis.

The Section Chairman opened up the event promptly by welcoming everybody and reminding them about the required health and safety procedures regarding the building and the surrounding area! This was followed by a brief introduction to the background and history of the Institution and the Minor Railways Section. It was then announced that the Section wished to start operating a new award scheme on a yearly basis to encourage a greater interest in railway signalling and telecommunications. This award is open for nominations from minor and heritage railways regarding their particular volunteer or volunteers who they consider to demonstrate their own individual commitment on a regular basis in the art of signalling and telecommunications engineering in a minor railway context. The Chairman ended his spot by thanking everybody for their attendance and by detailing the planned events for the rest of the day ahead.

Opening Address

The opening address was undertaken by Mr John Francis, Past President and a volunteer at the nearby Severn Valley Railway. John spoke highly of the enthusiasm and dedication of the volunteers upon the many minor and heritage railways throughout the United Kingdom. He particularly praised those engaged in signalling and telecommunications activities and gave particular support in recognising individual's efforts with the proposed award from the Section. John expressed the importance of maintaining the skills of mechanical locking fitting amongst others and how this could be achieved by best practise, the exchange of information and the differing railways assisting each other. He also brought to the attention of the meeting, the importance of maintaining the period look and ensuring the installation of the correct, in keeping types of S&T equipment with the surroundings where possible.

Heritage Railway Level Crossings

Mr John Tilly opened up his presentation by stating that vehicular crossings were the probable highest risk area on minor and heritage railways. He continued to say that locals living next to minor and heritage railways considered them to be 'toy' railways, along with local authorities. He considered that there needs to be regular visits to level crossings by those responsible for them to assess the risks, in order to upgrade them accordingly in relation to those identified risks. He pointed out that signage was a major problem on several minor and heritage railways. He demonstrated various problems that can occur and various high risk crossings and the previous events that had taken place relevant to them. In particular, the smaller gauge railways are particularly at risk from derailment at level crossings and the duties of users on private and footpath crossings should continually be reminded to them to avoid incidents. John also identified issues and problems with the reopening of various level crossings on a particular narrow gauge line in Wales and how they have been overcome.

The first signalling job on a minor railway under ROTS?

Mr Ian Hughes of Green Dragon Rail started his presentation by demonstrating the requirements for the provision of a new colour light repeating signal for Ravenglass's down outer home signal, on the Ravengless and Eskdale Railway in Cumbria in late 2008 and early 2009. In particular, Ian discussed the proposal and the safety verification process under ROGS (Railways and Other Guided Transport Systems (Safety) Regulations 2006) which was clearly demonstrated along with the required procedures and paperwork trail in order to gain permission to undertake the required works and to advise all those involved upon the railway as to what was to be achieved. The existing home signal itself was on a particular sharp bend and clearly through reviews, site visits and risk assessment; it was identified to be a particular SPAD risk, thus the provision of the new colour light. *(photo right: Ian Hughes)*

Ian's lighthearted approach made the presentation and a potentially difficult subject easy to take in and grasp.

S&T Recoveries

Mr Martijn Huibers, Section Secretary, discussed the planned setting up of a website as a means of communication between minor/heritage railways and infrastructure owners that have signalling and telecommunications equipment for disposal to credible organisations. This is to achieve the following:

- To maximise the potential availability of redundant S&T equipment;
- To encourage regular contact between relevant organisations;
- To potentially minimize workload for infrastructure owners regarding the disposal of S&T equipment.

The following organisations are involved in the discussions:

- IRSE Minor Railways Section;
- Signalling Record Society;
- National Railway Museum;
- Several Minor/Heritage Railways;
- Network Rail.

This will be achieved via regularly updated mailing lists:

- Individual items for disposal list;
- Major Projects disposal list
- Wish/Requirement list;
- Investigation of potential recovery list
- Coordinated contacts;
- Personal contacts.

The following will be put in place before any recoveries are allowed:

- Memorandum of understanding signed by each organisation involved;
- Identity checks of persons/organisations involved;
- Controls to be in place to access infrastructure owner sites:
  - ◊ PTS/Entry Permit;
  - ◊ COSS/SPIC provision;
  - ◊ Work Package Plans/Task Briefing Sheets/Method Statements;
  - ◊ Road rail machines and equipment management and authorisation.
- The reporting of accidents and incidents.

For further information or to assist regarding this project, please send an email to *sandt.recoveries@btinternet.com*.

A question and answer session took place, which was then followed by refreshments.

Operations – Keep it simple

Mr Richard Lemon from the Ffestiniog/Welsh Highland Railway briefly discussed his background, starting with his childhood interested and his subsequent railway career. He asked the question, who is the customer on minor/heritage railways? Is it the public or is it the operator? Who are the signals for? He stated that he saw drivers as "professional readers of signals" and discussed the standard of information given by signalling. He asked if we provided "information overkill" and are signals really necessary on minor/heritage railways. He stated that we already provided "cab signalling" with the provision of tokens and tickets. He also talked about differing ways of signalling single lines both in the United Kingdom and in other parts of the world, the ease of the usage and operation of the differing systems. Finally, he stated in his conclusion that the simpler each signalling scheme is, the potential of the ROGS safety verification being easier or even not required may be the case! In principle, keep it simple!

The Railways and Other Guided Transport Systems (Safety) Regulations & Safety Verification

Eur Ing David Keay, HM Principal Inspector of Railways, in his presentation spoke about the Railway Safety Directive (RSD) and that it is part of the Second Railway package:

- Changes to the UK and all other Member States driven by implementing the Railway Safety Directive 2004/49/EC;
- Coordination on RSD matters is by European Railway Agency (ERA);
- In the UK RSD has been Transposed as ROGS Regs and has delivered:
  - ◊ Largest change to Rail Safety Regulation since 1994;
  - ◊ 2006 changes affect all Industry stakeholders;
  - ◊ New sets of regulations – ROGS / Interoperability;
  - ◊ Scope of regulations broader;
  - ◊ New approach to safety regulation;
  - ◊ New terminology;
  - ◊ New guidance;
  - ◊ In time will deliver simplification.

A reminder of what ROGS brings in.

- Safety Management Certification & Authorisation in place of Safety Cases
- Safety Verification in place of ROTS
- Annual safety reports (Duty holder to ORR & ORR to ERA)
- Duty of Co-operation
- Changes to SCW & Fatigue

ROGS Duties on "Transport operators"

Main duty is to:

- Establish and maintain a Safety management System (SMS).

ROGS – Safety Verification

- ROGS - includes a provision requiring, in certain circumstances, the introduction of new or altered infrastructure or rolling stock to be subject to Safety Verification (SV);
- Regs 5(4) & 6(4) provide the requirement for Transport Operators to have SV schemes as part of their SMS;
- Schedule 4 sets out the requirements of an SV scheme;
- SV required for both the SMS only and SMS+Certificated / Authorised, Transport Operators

HMRI's approach to ROGS

- Simplified assessment process;
- higher level;
- less evidence;
- Quicker;
- Focus is on high risk elements and showstoppers;
- Post assessment of SMS;
- Post Assessment SMS validation.

Purpose:

- To verify evidence provided in application;
- To check that Safety Management System is effective in practice.

Will take account of:

- Individual duty holder history;
- HMRI strategic issues.

Post Assessment SMS validation.

- Aim - to develop a robust view of the SMS over the 5 year life of the certificate/authorisation
- Validate the SMS elements as set out in ROGS (Schedule 1)
- Build on the assessment process
- Integrate validation into inspections, investigations, assignments etc
- Use information from other sources e.g. RAIB investigations
- Record an SMS validation record.
- Annually review progress

SMS element priority ranking

High priority elements

- Procedures and methods for carrying out risk evaluation and implementing risk control measures;
- Provision of programmes for training of persons carrying out work or voluntary work directly in relation to the operation;
- Arrangements for the provision of sufficient information relevant to safety— within the operation and between operators;
- Procedures to ensure that accidents, incidents, near misses and other dangerous occurrences are reported, investigated analysed and that necessary preventative measures are taken.

Principles of Safety Verification

- Process to provide assurance on initial integrity proportionate to the risks;
- process must identify risks in the design, construction maintenance and intended use of new and altered vehicles or infrastructure;
- Involves principle of second and third party independent competent person inspecting all aspects of the project
- Manage the risks arising from change.

Application of Safety Verification

- Risks posed by the Railway Operation should be controlled by the arrangements in the SMS including the processes for management of change;
- Railways will draw up a SV scheme with a second or third party independent competent person;
- A Safety Verification scheme will include an inspection plan agreed with the independent competent person detailing project strategy, standards compliance and derogations/ non-compliances etc.

For further information and support

- HMRI expect all heritage railways to contact them in respect of new works that may involve Safety Verification;
- HMRI will provide guidance;
- HRA/HMRI training course is available.

The Rail Accident Investigation Branch

Mr Andy Savage, Deputy Chief Inspector, RAIB, presented a detailed account as follows:

- The role of the RAIB;
- Risk in the Industry;
- Derailments;
- Minor /Heritage Railways duties relative to RAIB;
- RAIB investigation.

What is the RAIB?

- The independent railway accident investigation organisation for the UK;
- Sole purpose to improve safety of railways and prevent further occurrences;
- Does not apportion blame or liability, nor enforce laws or carry out prosecutions .

RAIB's key characteristics

Reports to Secretary of State for Transport on investigations:

- part of the Department for Transport, but functionally independent.

Established structure

- organisation based on existing UK models for air and marine investigation.

Lead party

- in rail accident investigations where there is no evidence that criminal action is the cause.

The RAIB will investigate accidents and incidents on:

- Mainline Railways;
- Freight Lines;
- Metros;
- Tramways;
- Minor/Heritage Railways;
- Cable-Hauled Systems.

Risk in the Industry

- Most high risk events can cause derailments;
- Based on accidents seen by RAIB, highest risks are:
  - ◊ Road / Rail interface;
  - ◊ Staff struck by trains;
  - ◊ Derailments;
  - ◊ Possession management (not detailed in this review);
  - ◊ SPADs and SPASs (not detailed in this review).

Road / Rail interface

- Our biggest single area of work, and risk:
  - ◊ High speed derailments;
  - ◊ Level crossing condition;
  - ◊ Vehicle incursion.

Staff Struck by moving trains

- Usually a binary event;
- Three track workforce fatalities;
- Two shunter fatalities;
- One driver fatality (electrocution);
- Series of serious injuries – shunters, track workers, level crossing keeper;
- Several VERY close shaves;
- Very much an issue for operations as well as infrastructure staff.
- RAIB does not investigate worksite accidents if no trains – at least three fatalities from this

Derailments:

- Rolling stock related;
- Particular issue for narrow gauge lines;
- Track failures;
- Earthwork failures;
- Operational error.

Further detail refers to

Track:

- ◊ Twist;
- ◊ Cyclic top;
- ◊ Rail profiles – switches in particular;
- ◊ Gauge;
- ◊ Switch damage.

Vehicle:

- ◊ Wheel profiles;
- ◊ Brake status – locked on, air pressures;
- ◊ Suspension status;
- ◊ Controls;
- ◊ OTMR data.

Andy gave a further review of the do's and don'ts and the issues that will be reviewed in the event of RAIB attendance at site, in the event of a reportable incident and the extent and depth of the investigation process.

A question and answer session then followed the end of the technical papers for the morning session. This was followed by a visit to the Wrangaton Signal Box which is being reconstructed outside, along with a visit around the museum itself and nearby station with the provision of lunch, kindly sponsored by Colas Rail Ltd. Four companies had trade stands at the event in the form of Collis Engineering Ltd, Green Dragon Rail, Invensys Rail Ltd and Timesegment Ltd.

Voice over IP Telephony on the Severn Valley Railway

Mr Steve Bradbury and Mr Chris Wright presented a technical paper regarding the above subject that was featured in the previous IRSE NEWS and therefore not covered in this review.

Signal Structure Renewal

Mr Craig Donald, Signalling & Telecommunications Manager on the North Yorkshire Moors Railway provided a presentation regarding the continual upkeep and renewal of the North Eastern Railway wooden signal structures upon the railway. He talked about the wet and dry rot problems, along with further examples of deterioration and damage that have previously occurred. Faced with the renewal of these signal structures, a signal renewal was undertaken at Levisham to fully understand the issues and requirements in order to achieve renewals to a wide-scale and standardised process. With the provision of the new turn back siding; there was a requirement for a new signal structure with two dolls to be fitted. Craig explained how he went about such a job with relation to providing an authentic looking solution in relation to cost and time. He further explained some of the challenges and problems he and his team overcame in order to commission such a signal structure. These include snow, frost, and rain to name but a few, however, the team overcame the problems and were able to deliver the new signal for the 2009 running season.

Mainline Connections – Keep it simple

Mr John Jenkins, Signalling & Telecommunications Engineer of the West Somerset Railway explained as to the many advantages of having a physical connection to the national network. Apart from the obvious attraction of through passenger trains, there is the ability to receive visiting locomotives and coaching stock delivered by rail. In addition to this, there is also the opportunity to assist the local environment by receiving freight traffic. John then spoke about the differing types of connection to the main line and the effects of that upon operating issues. He then commented about the history of the railway and the connection to the main line at Norton Fitzwarren. Further to that he commented on the agreements that were required and the strategy that was put in place in order to gain the agreement for the current main line connection, along with how it was to be signalled and maintained as a whole. In summary, John said the following:

- Do not try to recreate the past;
- Research thoroughly;
- Aim for the minimum, not the maximum.

A question and answer session was the followed by refreshments once more.

Practical Mechanical Locking

Mr Stuart Ward, Signalling & Telecommunications Engineer of the Swanage Railway made reference to the IRSE Green Book No.3, with regards to Mechanical Locking by W.H.Such. He explained that with any mechanical works you wish to undertake on a lever frame for its new location, you need a starting point, which is the Locking table which is correctly designed and independently checked. This will become part of the scheme plan documentation. Next, when restoring a lever frame, look at the parts that came from the frame and work out the rules that previously applied. Questions that you should ask include the following:

- Does the frame have full or reduced travel tappets?
- Is it table locking?
- Can conflicts occur and how can they be avoided for the new location?
- Is there a requirement for special locking or can it be achieved with conditional or sequential locking?

Stuart then spoke regarding the requirements of drawing a dog chart and how to go about it in an efficient manner. He added then how the required locking can be compressed and the computer drawing programmes that are easily obtained in order to achieve your requirements. Stuart also spoke of the easy way with regard to component manufacture for such as locks, locking bars and the tools required to do so. He also spoke of how to make the tappets along with cutting them and the required installation. He finally expressed the need to undertake a locking test of the frame, and if successful, this should be followed by an independent locking test by proven competent persons at the final commissioning of the signal box.

Peak Rail Signalling Works

Mr Dominic Beglin, Signalling & Telecommunications Engineer of Peak Rail began his presentation by reviewing the previous signalling arrangements at two different sites until 2004, when he began the story of the progress on the railway between Matlock and Rowsley in Derbyshire. He explained of the various issues and problems with regards to existing signalling assets and future expansion requirements. He then detailed his aims which were as follows:

- AIM 1; Some rationalisation of sidings which would allow the passing loop at Darley Dale to be installed to increase traffic during peak occasions;
- AIM 2; Plan the signalling to account for the future extensions to Rowsley and Matlock for e.g. reuse ex Bamford signal box at Rowsley to replace three separate ground frames;
- AIM 3; Make operations staff lives easier with the equipment we acquired e.g. token machines.

Dominic then set about demonstrating how he and his team undertook to change their railway and introduce buried cabling, move exiting ground frames and finally commission the final solution to provide a passing loop at Darley Dale with single line working at either end to Rowsley and Matlock. He also expressed how he intended to achieve his aims two and three

A question and answer session was the followed by the closing address.

Closing Address

Mr Frans Heijnen, President of the Institution of the Railway Signal Engineers gave a positive response and summary to the day's events and was clearly impressed by the technical content and enthusiasm regarding the issues and subject matters. He thanked those who arranged and supported the event and encouraged the next one to be organised soon before bidding a safe journey home to all who had attended.

The Minor Railways Section would like to thank all presenters that took part, along with the sponsors and supporters with regard to their support for this event. The Section would also like to thank Mr Ian Hughes for his extended support. We look forward to your further support at our next meeting. Whilst not all the issues and items have been fully detailed within this review, if you would like a copy of the presentations from the event, please email **minor.railway.sig@btinternet.com** with your request and supporting details.

Ian Allison

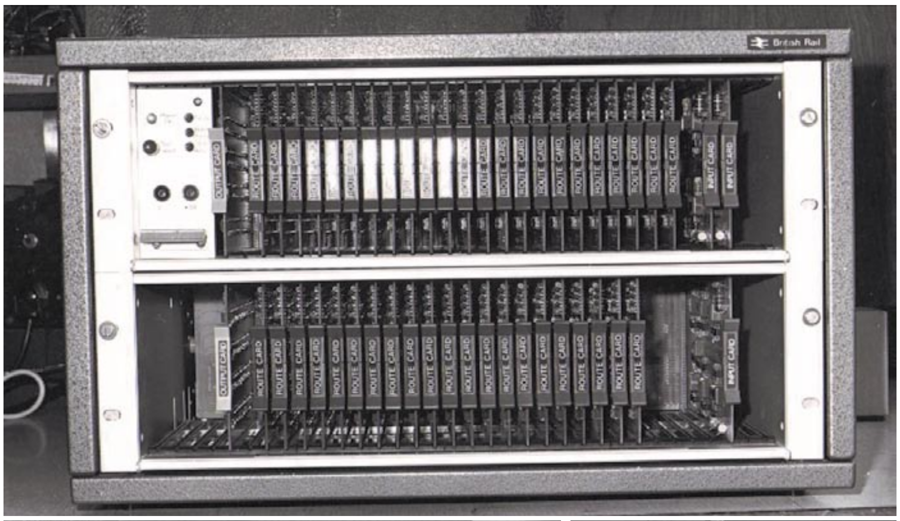
Craig Donald's Presentation *(above)*

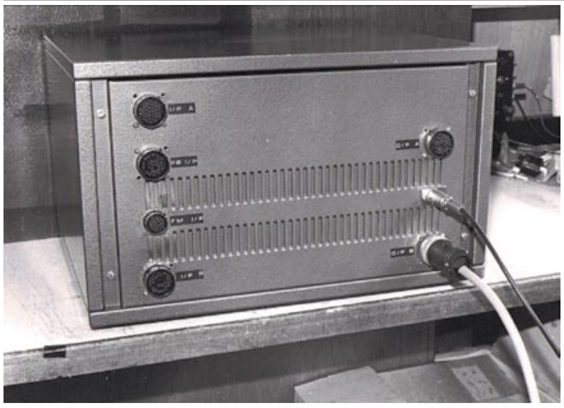
Frans Heijnen's closing remarks *(below)* *(photos: Ian Allison)*

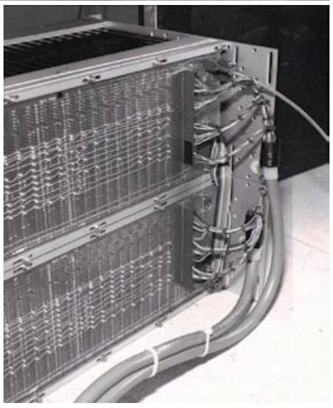
FEEDBACK

Dear Editors

Curiosity Corner Issue 152







Whilst clearing my desk at Network Rail HQ (I have recently taken early retirement), I came across the official pictures taken of the Brockenhurst Electronic Route Setting Equipment (ERSE) system, prior to the installation on site. The pictures are dated 1978, although the system was not commissioned until February 1979. This was the prototype ERSE Mark 1 system that was hand crafted by yours truly. The next installation was the production ERSE Mark 2 system at Dover Priory in 1980, which is still in everyday use today.

After more than 30 years service, the Brockenhurst Mark 1 system was replaced on 15 November 2009 by the GETS Delphin 1024 ERSE Mark 4 system. This equipment is one half of a Delphin TDM with a Panel Interface Unit and updated software. Unlike the original system, there is no need for any hard wiring as all the functionality is defined by geographic data in a database.

Chris Majer

Curiosity Corner Issue 152

I think that the Curiosity Corner photo is of a British Rail ERSE (Electronic Route Setting Equipment). This was used as the panel interface to a free wired interlocking. If I remember correctly it was first used on BR SR and was also used on BR LMR (some ERSE units are still in service). If it is an ERSE unit the inclusion of the name of the supplier of the photo has given it away. Chris Majer designed the ERSE as part of his University course, hence it was also known as "Majpac".

With the photo I hope Chris provided the background details - if not he should be asked to write an article for IRSE NEWS (this could also draw attention to his consultancy - one of the most memorable names I have come across for a long time!).

Melvyn Nash

Australian Competency Management Systems

Martha Gordillo's paper is a good analysis of the current situation in Australia relating to the management of competence and the challenges facing suppliers who have to meet multiple different standards. There is one point that requires some clarification. In the Background section Martha states that "The rail transport operator must ensure that the competency of safety workers is assessed based on qualification and/or units of competence recognised under the Australian Quality Training Framework." Again in the Conclusions Martha states "Under this legislation Signalling Design Engineers are categorised as rail safety workers and must obtain the certification of competency to perform design tasks. In order to obtain this certification they must the trained and/or assessed by Registered Training Organisations."

The NSW Act is not as prescriptive as that and says in Section 21:

(2) For the purposes of subsection (1), the competence of a rail safety worker to carry out rail safety work must be assessed:

(a) By reference to:

(i) any qualification or unit of competence applicable to the work being carried out that is recognised under the Australian Qualifications Framework overseen by the Ministerial Council on Education, Employment, Training and Youth Affairs, or

(ii) If subparagraph (i) does not apply, the prescribed provisions applicable to the rail safety work to be carried out, and

(b) By reference to the knowledge and skills of the rail safety worker that are needed to enable the worker to carry out the rail safety work safely.

There are currently no competency units endorsed under the Australian Qualifications Framework for railway signalling design. There are railway signalling competency units at trade level, but none at engineering level.

Hence the competency of designers is not able to be assessed under the AQF and it is not necessary to use a Registered Training Organisation (RTO) for training or assessment of signal engineers.

The Independent Transport Safety and Reliability Regulator (ITSRR) in NSW has set out guidelines that requires competencies in the Vocational Education and Training Sector to be assessed by RTOs.

It could be argued that goes further than the legislation which does not refer to RTOs. Nevertheless that is not applicable to engineering education which is in the Higher Education Sector. In addition the ITSRR guidelines allow for all certificates of competency to be issued by railway organisations with no requirement for those organisations to also be RTOs.

Les Brearley

Monitoring or Maintenance?

The October and November issues of IRSE NEWS each contained very interesting and thought provoking articles.

The two paper's contents thoroughly covered their subject and were researched and contained much technical information. Indeed so much so I had to re-read much of each paper to assimilate the wealth of information.

Having pondered the contents of the two papers I have at last decided to offer my thoughts regarding these two important initiatives that Network Rail are embarking upon. I realise that having been away from the front line (enjoying retirement) I will not be up to speed with current maintenance specifications etc. but having spent 50 years dealing with on-track signalling equipment I may still have some worthwhile input.

Those 50 years have taught me that the most important factor to consider is the depth of technical knowledge of those tasked with undertaking maintenance and the location of the equipment. Location of course including traffic type and frequency and the line speed the equipment is required to handle. The requirement of operators for a seven day railway is not a new concept, from experience this has always been an operator's quest.

What is new to me is the idea that the current Signal Engineers at Network Rail believe that they can achieve a seven day railway with track equipment that was designed over 50 years ago for the line speeds and axle loadings that were then mandated. Those line speeds and staff discipline allowed them access to carry out essential maintenance. I remind the department heads that as far as many point systems are concerned, it is the same equipment and therefore requires the same amount of maintenance (and perhaps may require more attention due to higher speeds and vibration they are now required to endure). The concept of maintaining point systems at night is a recipe for unreliability for a number of reasons, not least the temperatures differential between maintenance setup and operational use. This was made obvious to me when postal depot points regularly failed at night when they became operational, when their maintenance setup was undertaken on days. The solution to this was a 'dynamic performance' requirement. I see no mention of such an approach in the Network Rail proposals.

I fear an optimistic view is being taken. Expecting point reliability to be improved by the simple process of a passing glance from a monitoring train is overly simplistic if not foolhardy. Were not the points at Grayrigg subject to just such inspection? I could never contemplate such an approach and I urge to Network Rail to reconsider. Continuous daily seven-day examination including bank Holidays of the incoming video information, to guarantee the timely intervention to remove impending safety or reliability issues is essential for such a proposal to be considered for adoption. HMRI may have a view to express upon this proposal, which is a major departure from current practices.

In my experience point systems subjected to and meeting dynamic operation requirements will identify their ability to operate reliably. Their visual inspection by experienced point technicians of passing traffic through them at line speed cannot be substituted by a birds-eye view from a monitoring train.

The idea that point monitoring will provide a step-change in point performance also needs to be tempered. In my experience few point systems retain their originally installed parameters for long. Therefore a general go/no–go window for point system thresholds is unlikely to be achievable. Each point end will require its operational maintenance parameters to be recorded and stored in the data base in order for changes to those individual parameters to be identifiable as leading towards the likelihood of failure i.e each point end requires it's own **functional data**.

Point system design is complex and a number of seemingly minor changes can affect performance. The Clamp Lock for instance, suffered from a problem of failing to unlock. Among others I urged the provision of a force-down feature to overcome this problem. This was refused as being 'unnecessary' on well maintained points by HQ, but was introduced later without acknowledgement of the input to staff on the ground. It was sometime afterwards that I realised that the failure to unlock (an over-tight lock arm) was actually caused by the decision of the Civil Engineer to use 'undercut' switch and stock rails. Interaction of the mating faces of the switch and stock rails was the **fundamental** cause.

Is Network Rail seeking a reduction train delay due to poor point system performance? I ask this as I wrote to Network Rail months ago advising that a design error introduced with the HB point machine and still continued through HW and Style 63 designs was responsible for over 10% of point failures. I am still awaiting an expression of interest by Network Rail regarding this matter.

The HPSS point system was the first point system designed to self -report condition, and was originally designed to operate UIC54 designs. Late in the development programme for HPSS, Railtrack decided to adopt a RT60 rail section. This introduced a number of problems for the HPSS system and early installations using this rail section were considered to be unreliable.

This was from an operators' viewpoint understandable, but in fact the HPSS system was reporting poor switch/stock rail alignment and therefore withholding detection. This led to many within the S&T department to push to keep HW and other point operating systems in preference to HPSS systems believing them to be 'more reliable'. However, I remind everyone that HW systems do not report poor track alignment. The high-speed derailment at Potters Bar is grim testimony to that. The practice of providing a gap at the head cut of the switch rail is in my view a questionable requirement leading to looseness/unreliability. Early Civil Engineers banned such practice.

So, the choice for Network Rail is either to progress their proposals as per the recent papers and risk yet another 'white elephant' by relying on an unproven concept (remote monitoring) and train borne inspections, coupled with a patchy 'minimalist' maintenance regime, in order to accede to an overly demanding Operator's seven day railway they have not invested in. By doing so Network Rail Engineering Heads will carry the risk of more high speed derailments similar to Potters Bar and Grayrigg unless they are strong enough to resist the introduction of unproven but technically attractive concepts and pursue an engineering solution to poor point system reliability.

I would urge that they embark on a search for knowledge from experienced (and retired) Engineers throughout the industry and introduce the required **engineering changes** and introduce 'dynamic' maintenance procedures to point systems that will guarantee improved reliability and improve safety on high speed lines.

M E Tunley, Retired Member

FEEDBACK

Semaphores, the splitting of Hairs and Melbourne Signals

From their earliest days semaphore signals presented a clear silhouette to an approaching driver. Recently, as exemplified by Hastings signal EDL77, this has been compromised by excessively massive platforms and handrails. Have there really been enough fall injuries to lampmen and maintenance staff to justify reducing train safety like this?

Signal engineering is a discipline which requires a degree of accuracy and the avoidance of ambiguity which might be considered unduly pedantic in other contexts. The precise use of language is thus important. In the Hastings article we read that trains can start their London journeys in both directions. Uncoupling in the middle would permit this, but realistically, they must leave in each direction. Then in the Australian article there seems to be confusion between principal engineers and principle engineers, though possibly not, as both kinds exist.

Finally, the letter on Melbourne co-acting signals seems to suggest that the white bar aspects are novel. In fact, they are standard international tramway signals, designed to avoid confusion with colour light signals for hand-steered vehicles. I would expect them to exist on the tramways in Melbourne. Do they?

John Batts

Melbourne trams do not have the International signals with white lights, they use standard traffic signals that show a red, yellow and green "T" in lieu of coloured roundels and at junctions two or more heads are used. (Ed)

MEMBERSHIP

ADMISSIONS AND TRANSFERS

As the Membership Committee has not met since the last Council meeting, there are no recommendations for admissions and transfers.

RESIGNATIONS

Tran	L D

RE-INSTATEMENTS

Jooste	JP
Romet	JA
Govender	P
Lin	H-W

DEATHS

It is with great regret that we have to announce the death of the following member:

Heard	B D

Correction to Membership information

In issue 151 of the NEWS, under 'Resignations' on the Membership page, we showed M F Ridden (Michael) as having resigned. This is not so! The resignation was in fact that of his brother Peter (P B Ridden) who retired earlier last year.

Our apologies for the confusion and consternation caused.

CURIOSITY CORNER

This looks a good idea.

Anyone know where it is?

Current Membership Total is 4487

(Picture right)

Having been constrained to one column in Issue 152, and the Editors having as a result been berated by our man in Oz (Tony Howker), the local organising committee for the technical meeting, 'Freight in the City', which took place in Sydney in November 2009, can now appear in all their glory.

From the left, John Aitken, Steve Lemon, Richard Stepniewski, Dave Bluck, Trevor Moore, Mark Lyons, Martin Dewhurst, and Mark Faviell.

Our thanks to them all, as well as to Ian Roulstone, Warwick Talbot and Peter McGregor who were also members of the organising committee but are not in the photo.

Railway Signalling Program - Recognition and Rewards

The Railway Signalling Program gained recognition at the Australasian Railways Association's 2009 gala dinner held in conjunction with the Ausrail Plus convention in Adelaide with two major Awards presented with strong links to the Program.

Associate Professor Ken Kwong received the IRSE Australasian Section Chairman's award for 2009 in recognition of his significant contribution to the railway industry though his work with the Railway Signalling Program. Ken has been involved in the development of the program from its beginnings in 2002. The academic structure of the program was set out by Ken who convinced the project committee of the benefits of the innovative academic approach he was advocating. These approaches have worked very effectively and have significantly contributed to the success of the program. Ken was involved in the development of the program by reviewing the material from a student's perspective. That is no small task considering there are 54 study guides and six projects in the program. Ken is also deeply involved in the delivery of the course where his expertise in engineering education provides great benefits in guiding and motivating students.

To date there have been 100 students who have completed the Graduate Diploma (two years part time) plus 44 who have completed the Graduate Certificate (one year part time).

When presenting the Award John Aitken, the Australasian Section chairman, said that A/Prof Ken Kwong was a dedicated academic and teacher: one who goes the extra mile in every area. A person who really cares about teaching and about learning. Congratulations Ken and thank you for your contribution.

An example of the potential rewards of the Railway Signalling Program is the achievements of Aaron Fraser from Ansaldo STS who received the Young Achiever of the Year Award. This national award was presented to Aaron in recognition of the contribution he has made to Australia's rail industry. Aaron joined Ansaldo STS's Graduate Development Program in April 2005. He completed the Graduate Diploma in Railway Signalling program in 2008 and received the IRSE Australasian Section's Shining Light Award that year for the best overall result. He was selected to take part in an international work exchange program where he worked for 10 months in Genoa to gain experience in specialist train control technology. The Railway Signalling Program has helped Aaron develop into one of the future leaders in the industry.

Les Brearley

B1802 A4 Rail Signalling Final AW 22/1/10 11:57 Page 1