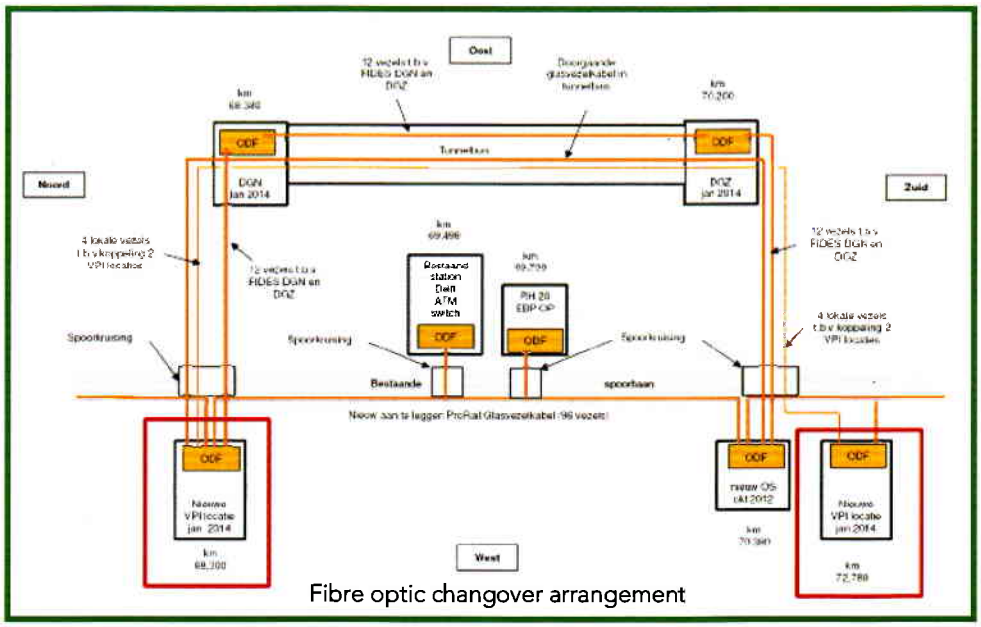
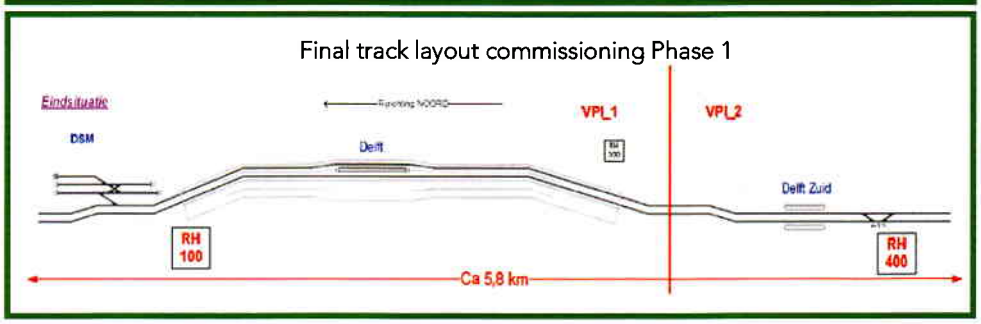
are specific to the particular layout and technology used. They do therefore require "some thought" and are also illustrative of how design philosophies in two separate fields of engineering vital systems (interlocking and tunnel safety systems) can be so different to manage at the interfaces. And finally the entrance to the DSM Rail Yard's connection to the main line, just outside the western tunnel portal, is secured by a moving gate which has to be checked in the route setting to and from the yard, poses a challenge to our colleagues.

The presentations completed, a lively discussion ensued between our hosts and our members, on the specific aspects of these designs and their safety case implications. Finally we were taken on a tour along the project sites. And of course, this being a younger members networking event, on a beautiful day in a city where some of us spent a number of years studying, the continued existence of one of our old watering holes was subjected to a rigorous Verification and Validation process.



Fibre optic changover arrangement



SWISS SECTION

Report by G Raymond

IRSE Swiss Section Seminar

The Future of ETCS in Switzerland

15 June 2012 in Berne

BACKGROUND

Switzerland is implementing ETCS Levels 1 and 2 (L1 and L2). Trains receive movement authorities via balises and lineside signals in L1 and via GSM-R radio in L2. For L1, the Swiss are implementing the Limited Supervision variant (L1LS), which supervises speed on the basis of braking curves only in locations where risk analysis shows this is required. Since 2007, both the new line between Olten and Berne and the Lötschberg base tunnel have operated with L2, as will the Gotthard base tunnel. On legacy lines, L1LS and then L2 will progressively replace Signum and Zugbeeinflussung (ZUB), the conventional Swiss automatic train protection systems.

In his presentation, Bernhard Stamm of Siemens explained that Signum was introduced in 1933, and equips all signals today. ZUB was introduced in 1985, and equips 20% of signals today. Siemens still supplies and maintains both systems. Mr Stamm reminded attendees of the rationales for ETCS, which include cross-border interoperability, cab signalling above 160 km/h, longer equipment life expectancy and lower whole-life costs. He explained that whereas L1LS mostly brings interoperability, L2 has more potential to increase capacity.

MIGRATION

Hanspeter Hänni of the Swiss Federal Office of Transport (BAV) said the installation of ETCS balises began on Swiss tracks in 2003. By 2017, ETCS balises will have replaced all Signum magnets and the whole Swiss standard-gauge network will have either L1LS or L2.

Legacy lines will first be equipped with L1LS to achieve interoperability and later be migrated to L2 as their interlocking systems come up for replacement. All new interlockings must be L2 from 2025.

The first legacy lines to be upgraded to L2 will be:

- the Swiss approaches to the Gotthard base tunnel on Corridor A (Genoa-Rotterdam). The north approach will be equipped with L2 by August 2015 and the south approach by October 2015. The tunnel will open in 2016;
- parts of the Rhône Valley route from outside Lausanne to the Simplon tunnel, whose relatively low traffic makes it a good place to test the "developments and processes" for L2.

Stefan Sommer of Swiss Federal Railways (SBB) said that by 2025, the Rhône Valley will have L2 except for two L1LS gaps: Martigny-Ardon and Turtmann-Raron.

VEHICLES

The ETCS standard foresees that during migration, ETCS on-board equipment is to use a Specific Transmission Module (STM) to read conventional trackside devices. Mr Hänni of BAV said that Switzerland decided to instead create a "reverse STM": trains still equipped with ZUB/Signum use a European Transmission Module (ETM) to read ETCS balises.

Mr Sommer of SBB described the migration path for driving vehicles as follows:

- At first, the vehicle is equipped only with ZUB/Signum and uses the ETM to read the packet P44 information from the ETCS balises;
- Next, the vehicle is also equipped with ETCS, so the train can run on ETCS L2 where this system is installed trackside;
- Finally, the vehicle is equipped only with ETCS once all the lines it uses are ETCS-equipped. All lines will be equipped with L1LS or L2 by the end of 2017.

Mr Hänni said that from 2014, all new driving vehicles in Switzerland must be equipped with ETCS or be prepared for its installation. BAV will offer path price discounts to railway undertakings (RUs) that provide regional passenger services if the RU has to equip its existing trains with ETCS early.

Frank Domanowski presented the unified ETCS software package that Bombardier has developed for all railway vehicles. This software supports: the standard driver-machine interface (DMI) of the European Railway Agency; ERTMS Regional, an application of ETCS Level 3 developed by the International Union of Railways (UIC); IC-based communication; simplified entry of train data for fixed trainsets; and migration to ETCS Baseline 3.0. The software runs in Europe, China and Kazakhstan. He also pointed out the need to coordinate the approval of on-board ETCS signalling with that of the vehicle as whole.

FUNCTIONS AND THEIR STANDARDISATION

Leif Leopold of Thales presented the range of functions whose development ETCS has allowed. For example, in the Gotthard base tunnel, L2 will allow a train to proceed to the end of a block as soon as the first 200 metres of the next block are free, as determined by the L2 Radio Block Centre (RBC), not by a track circuit or axle counters. This increases capacity. An ETCS requirement specific to Switzerland is that it must be able to lead all trains (including freight) backwards out of a tunnel in an emergency.

Mr Hänni said that due to differences in engineering, the functions of the L2 versions on the new Olten-Berne line and in the Lötschberg base tunnel differ from each other in degraded mode, although they are the same in normal mode.

COSTS OF ETCS

Mr Stamm of Siemens outlined factors that raise ETCS costs. He said that suppliers had a monopoly for legacy systems, but have to share the market for ETCS, which reduces each supplier's volumes and raises costs. If the system were standardised, each supplier could sell equipment in multiple countries, but customers tend to add national requirements that hamper re-use.

He also said that even a major L2 rollout requires the building of only two to three RBCs a year, which is not enough to generate significant cost savings. Mr Stamm expressed the opinion that in the long run, many ETCS components will not be sold separately; the ETCS onboard system will become part of the vehicle system and the RBC part of the interlocking system.

SWITZERLAND HAS LEARNED

Mr Stamm said that over the last decade, Switzerland has learned to implement ETCS L2 in the course of three projects: the 2002-2003 test installation on the Olten-Luzern line, which was taken out of service after two years; the new Mattstetten-Rothrist line, on which L2 commissioning was delayed for more than two years until March 2007; and the Lötschberg base tunnel, which started operation on time in December 2007. With each project, ETCS fitting brought fewer problems and became easier to plan and implement.

Having overcome the initial problems, Switzerland is proving that ETCS now works fine and is thus contradicting critics in other countries, Mr Hänni of BAV said. On the Olten-Berne line, ETCS is now more reliable than conventional signalling, with only one or two problems per month among 270 trains a day. Some 600 ETCS-equipped driving vehicles are now approved and in service in Switzerland. Mr Hänni called BAV's system leadership role a key to ETCS' success in Switzerland. It also saved ETCS for Europe, he said, as the failure of ETCS in Switzerland would have killed ETCS elsewhere.

Mr Stamm said deployment of ETCS has been slow in Europe because of the need to create many new bodies, processes and standards (such Notified Bodies and Technical Specifications for Interoperability TSIs). Also, unlike Switzerland, most countries have made no strategic decision to implement ETCS network-wide and thus have no clear implementation plan. In such countries, ETCS raises costs because it is just an additional system.

Mr Hänni said that Switzerland should get other countries to adapt the Swiss ETCS solutions now so they don't impose their solutions and changes on Switzerland later.

OPTIMISM

In a Q&A session, the speakers were optimistic about the long-term prospects of ETCS in Europe. Mr Hänni pointed out that ETCS is EU law. Public investment funds for railway signalling are only available for ETCS. The European Railway Interoperability and Safety Committee (RISC) has now approved ETCS Baseline 3.0, which replaces several older baselines, each of which was some countries' reference. Mr Hänni said that France is also starting to move forward with ETCS deployment.

EXCHANGE OF EXPERIENCE

IRSE Swiss Section President Markus Montigel said he saw the seminar as an example of how the Swiss Section can serve as a centre for the exchange of experience between railways, public agencies, the railway supply industry and educational institutions.

The presentations (in German) can be requested from Heinz Walser at ***walser@irse.ch***.

George Raymond of Railweb GmbH (***http://railweb.ch/***) thanks the participants for their help in preparing this report.