Rail Delivery Group

National Rail

RDG Guidance Note:
L2 & L3 ETCS Principle Considerations for Driver Training

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About this document

Explanatory Note

The Rail Delivery Group is not a regulatory body and compliance with Guidance Notes or Approved Codes of Practice is not mandatory; they reflect good practice and are advisory only. Users are recommended to evaluate the guidance against their own arrangements in a structured and systematic way, noting that parts of the guidance may not be appropriate to their operations. It is recommended that this process of evaluation and any subsequent decision to adopt (or not adopt) elements of the guidance should be documented. Compliance with any or all of the contents herein, is entirely at an organisation's own discretion.

Other Guidance Notes or Approved Codes of Practice are available on the Rail Delivery Group (RDG) website.

Executive Summary:

This document provides support to Train Operators in evaluating the work streams required for L2 and L3 ETCS Operation.

Issue Record

Issues 1 to 2 of this document were published as: ATOC/GN ERTMS 002

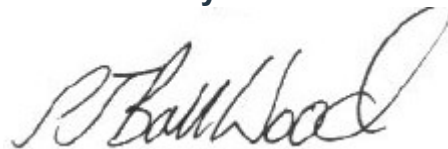| Issue	Date	Comments
1	July 2014	Original document
2	January 2017	Updated and reissued – Digital Railway revised plan
3	January 2020	Reviewed, updated and reissued.

This document is reviewed on a regular 3 year cycle.

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1 Purpose and Background

1.1 Purpose

This document provides guidance to Train Operators on the introduction of ETCS (European Train Control System) fitted infrastructure through the national ETCS deployment schemes. It specifically deals with the operational changes required for L2 (Level 2) and L3 (Level 3) operation and suggests the actions an Operator should consider when implementing change.

These include:
- Identification of the Scheme plan 'go live' (route fitment date).
- The migration states proposed for the route.
- Impact of the operational changes.
- Updating Competency and Safety Management Systems.
- Identifying training requirements and timelines.
- Exploring options to best manage competency retention.

1.2 Scope

This document is designed to assist Train Operators in responding with a common approach to the implementation of ETCS L2 or L3 schemes or whilst supporting routes or national programmes in analysing scheme feasibility. Guidance is given on the work streams Operators will encounter and suggested outputs they will need to achieve.

1.3 Background

ETCS is a train control-command system developed in Europe and adopted by the European Union (EU). The EU directives state ETCS is to be used to achieve interoperability between EU railway administrations. Its operation provides Automatic Train Protection (Class A) functionality and was independently recommended by the Uff and Cullen accident reports as a superior technology to the UK's Class B Train Protection Warning Systems (TPWS). ETCS operates on the principle of speed-based signalling and requires the train to accurately report its location, monitor speed and braking, and intervene where necessary. On-board equipment required for ETCS includes a European Vital Computer (EVC), an ETCS juridical recording unit (JRU), a Driver Machine Interface (DMI) and GSM-R data radio.

2 L2 – L3 Principle

L2 and L3 are the operational levels of an ETCS-fitted train over ETCS-fitted infrastructure. L2 being where active train detection is available through track circuits and L3 being where train odometry positioning alone is used to identify the presence of a train. To achieve this, the onboard ETCS equipment must be active and the route infrastructure supportive of the correct baseline (software). This allows the train to operate under the full supervision of the ETCS. Full supervision (FS) provides movement authority from the signalling centre to the driver via the GSM-R data connection and in cab DMI screen together with a speed profile over the length of the issued movement authority. A pre-determined braking algorithm for the traction type is then given by the EVC to determine braking requirements. Should a reduction of speed or end of authority be supervised by the system (and not the driver) it will apply a full service brake application until speed is reduced below the calculated braking curve, where it will return the brake control to the driver.

There are other modes of operation provided by ETCS and are designed for specific operational needs. These include a mode for shunt, moving 'on sight' or when staff have to be responsible for safe movement during failures (This list is not exhaustive).

3   Scheme Planning Stage

3.1   Migration States

The deployment of ETCS identifies migration states, these are a perceived plan or 'model' of how a Network Rail (NR) Route *might* choose to deploy digital signalling solutions, taking into account all of the known technologies and aspirations. Each scheme will be subject to a business case review to identify the optimal pathway/migration and be subject to a benefit analysis, this will include social and economic data alongside train timetabling and performance.

The migration states are –
- As is today (Multiple Aspect Signalling).
- As is today with optional C-DAS (Connected Driver Advisory System).
- As is today with prediction engine and preferred C-DAS.
- As is today with TM (traffic Management) isolated and preferred C-DAS.
- As is today with TM interfaced and preferred C-DAS.
- As is today with TM integrated and preferred C-DAS.
- L2 Overlay with ATO (Automatic Train Operation), TM and C-DAS Optional or Preferred.
- L2 Underlay with ATO, TM and C-DAS Optional or Preferred.
- L2 High capacity with ATO, TM and C-DAS Optional or Preferred.
- L2 signals away, with ATO, TM integrated and C-DAS Optional.
- As is today, with high capacity L3 hybrid high capacity overlay with ATO, TM and C- DAS Optional or Preferred.
- L3 hybrid with no signals, TM integrated, C-DAS and ATO optional.
- L3 virtual block with no signals, TM integrated, C-DAS and ATO optional.
- L3 Moving block with no signals, TM integrated, C-DAS and ATO optional.

The technologies identified in the migration are in various stages of development.

Prior to a route being converted to ETCS it will pass through a similar negotiation and planning process to conventional signalling schemes, however the complexity of the system reference designs aligned with the limited experience available for operational applications suggest train operators will need to consider employing an ETCS scheme specialist to ensure they maximise route flexibility and capacity to meet their franchise and service delivery commitments. Additionally, train operators will need to identify the least disruptive go live options for the route.

4   Go-live Options

There are several potential options for the change or 'go live' of a route from conventional signalling to L2-L3 ETCS, these are – (This list is not exhaustive)

4.1   Pseudo – Overlay

Whilst ETCS infrastructure is being fitted and commissioned prior to go live, the infrastructure will reach a 'pre commissioned' state ready for live testing. This will be whilst conventional signalling remains. It may be as early as 6 to 9 months before the go live date and could provide opportunity for operators to run trains in a 'live' ETCS environment during night-time or weekend testing.

4.2   Overlay

A section of the route fitted with ETCS whilst fixed signals remain in operation. Overlays will enable trains not fitted with ETCS to operate over a L2-L3 route and drivers not trained in ETCS to continue to work over the route. Therefore, operators can use these routes for driver ETCS training. Overlay infrastructure may be provided as a permanent solution or as a short-term step towards a signals away ETCS end state.

4.3 Underlay

A section of the route fitted with and optimised for ETCS whilst also fitted with temporary fixed signals to allow for unfitted trains or driver training. This is ideal where a scheme plan requires complete remodelling. Underlay infrastructure may be provided as a permanent solution or as a short-term step towards a signals away ETCS end state.

4.4 Single Line Working

A section of the route is converted to ETCS through pseudo- overlay (A – above) and during commissioning one line remains open to traffic but under conventional Single Line Working arrangements (Pilotman). This will allow for driver training on the other line until there are sufficient drivers trained to operate the service. This is an option where two track routes have moderate passenger movement and cannot sustain a full line closure whilst the scheme plan requires a straight removal of conventional signalling. It will cause temporary timetable disruption, however does enable both training and service trains to operate simultaneously.

4.5 Line closure

The route is closed for a period of time to allow for testing, commissioning and driver training. This is ideal for rural routes with light passenger numbers, especially single-track lines where out of season commissioning is viable.

4.6 Driver cross-cover

This is an option for operating companies to use existing L2-L3 skilled drivers across different routes whilst driver training takes place.

4.7 Driver migration

This is the reverse of the cross-cover option, where an operating company can temporarily migrate Drivers to a L2 route for training before their normal route goes live.

4.8 Test Track Driver Training

Operators may consider formal access to test track infrastructure and provide a trainset to the test track for a period of intensive driver training prior to the go live date.

5 Competency Management System (CMS)

Operators will need to consider changes to competency management systems, and plan for:
- The initial L2-L3 scheme go live plan (above – Go live options).
- The type of go live and whether overlay will be present and for how long.
- The scheme dates for the routes.
- The method of training and assessment during L2-L3 deployment.
- L2-L3 operation becoming more extensive than current signalling for driver depots or routes.

6 Driver Training Modular Delivery System

The national programme will provide a modular delivery approach for driver training materials which will allow operators the flexibility to train drivers within their own business model whilst following the national programme.

This programme will include:
- A communication phase, where information and knowledge are made available via various

media including web based and eLearning packages together with simulation. This information will be accessible to the operator, and directly by drivers.
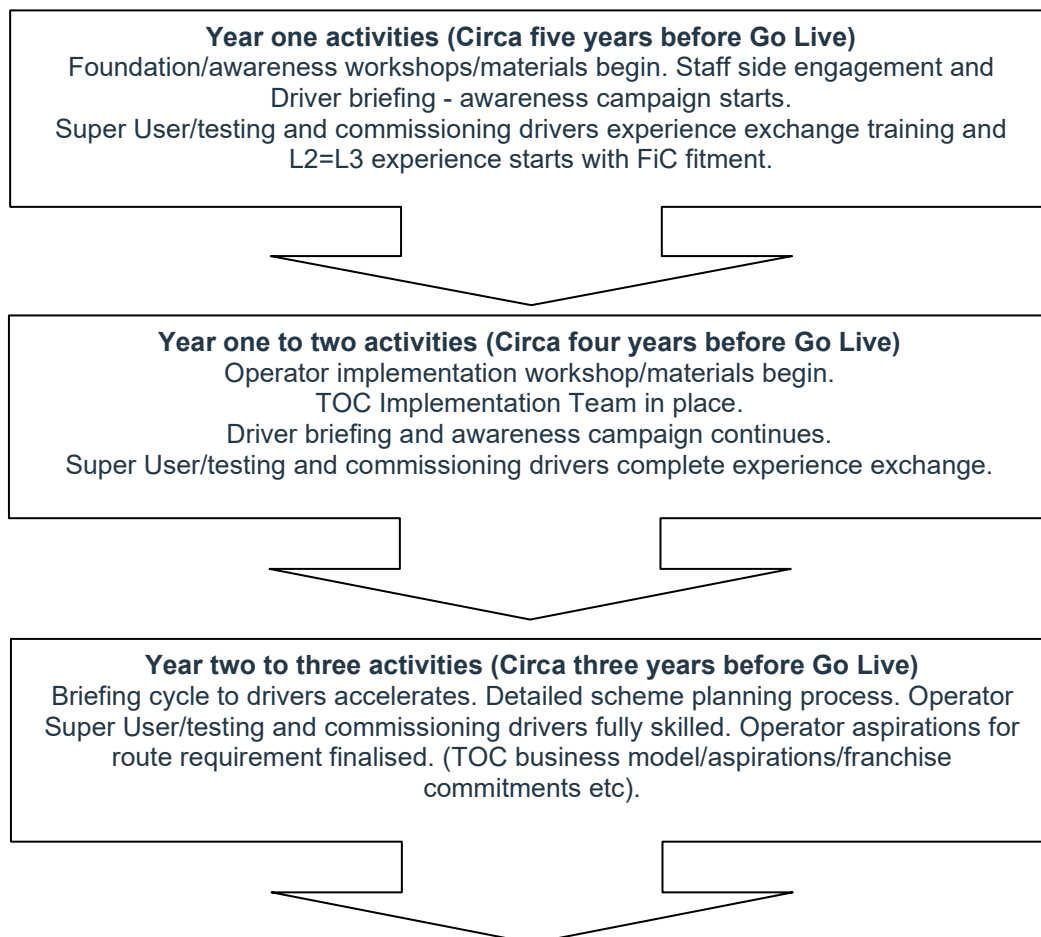
- A formal training and assessment phase, where the operational rules of L2-L3 are replicated through simulation.
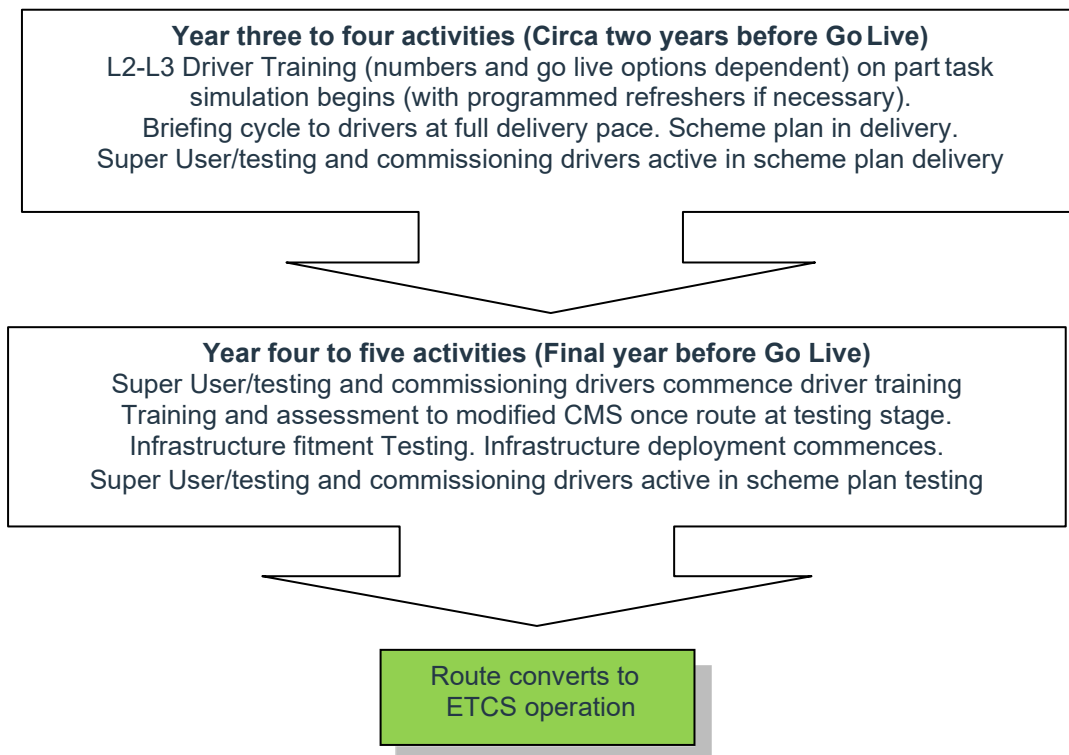- Guidance on operator specific material to be added or considered.

The operator will need to consider the final stages of satisfying their competency management system drivers, this will include:

- The practical handling required in L2-L3 operation.
- The assessment required in L2-L3 operation.
- The route knowledge required for go live.
- The traction knowledge required for go live.

7 Timelines

Operators will need to consider the lead in time to a functioning L2-L3 operation, this timeline is merely an 'assumed' example and individual scheme plans may differ with shorter lead in times. This list is also not exhaustive.

Year one activities (Circa five years before Go Live)
Foundation/awareness workshops/materials begin. Staff side engagement and Driver briefing - awareness campaign starts.
Super User/testing and commissioning drivers experience exchange training and L2=L3 experience starts with FiC fitment.

Year one to two activities (Circa four years before Go Live)
Operator implementation workshop/materials begin.
TOC Implementation Team in place.
Driver briefing and awareness campaign continues.
Super User/testing and commissioning drivers complete experience exchange.

Year two to three activities (Circa three years before Go Live)
Briefing cycle to drivers accelerates. Detailed scheme planning process. Operator Super User/testing and commissioning drivers fully skilled. Operator aspirations for route requirement finalised. (TOC business model/aspirations/franchise commitments etc).

> **Year three to four activities (Circa two years before Go Live)**
> L2-L3 Driver Training (numbers and go live options dependent) on part task simulation begins (with programmed refreshers if necessary).
> Briefing cycle to drivers at full delivery pace. Scheme plan in delivery.
> Super User/testing and commissioning drivers active in scheme plan delivery

> **Year four to five activities (Final year before Go Live)**
> Super User/testing and commissioning drivers commence driver training
> Training and assessment to modified CMS once route at testing stage.
> Infrastructure fitment Testing. Infrastructure deployment commences.
> Super User/testing and commissioning drivers active in scheme plan testing

> **Route converts to ETCS operation**

8   Supers Users, Testing and Commissioning

Operators will need to consider how knowledge transfer into their business will occur and who will deliver the competency management, validation and assurance processes. This is most likely to be through the safety and operational standards/driver manager or driver trainer/instructor teams and will necessitate a (small) group extracting the maximum amount of knowledge from:

- FiC (First in Class) vehicle fitment process
- Programme Operational Specialist Experience Exchange (Cambrian – see below [1])
- Scheme planning stage
- Infrastructure testing stage.

These super users will need to be identified and given sufficient time prior to the operators' first FiC to become familiar with L2-L3 ETCS principles.

[1]The Rail Delivery Group, Digital Railway, Network Rail Training and Transport for Wales have (at the time of writing) established and Operational Specialist Experience Exchange programme that offers Train Operators the opportunity to send key managers to learn and drive ETCS on the Central Wales Route (Cambrian). This project is designed to enable Train Operators the opportunity to start the ETCS competency management process within their business.

9   Principle Considerations

Each operator will need to understand the ETCS programme schemes, the critical dates for their route, the deployment of ETCS fitted trains, fleet cascades or new build trainsets, the timeframes these will be delivered in, the likely impacts of the changes brought by ETCS infrastructure and the wider deployment of new technologies likely to be implemented over their operational area. It is recommended the operator nominates a 'point of contact' for ETCS and the wider national digital enablers, who can focus on the project and provide guidance to the operations and engineering teams.

Consideration should also be given to the operators existing structure in readiness for ETCS, with a review of route knowledge and link structures against ETCS planned infrastructure go live schemes

together with driver numbers and likely exposure to ETCS fitted infrastructure.

Franchise commitments and the inclusion of new trains may also change the training timeline for driver training into ETCS. New trains may be delivered with a degree of ETCS readiness, however differing approaches by operators and train builders has seen some trains arrive with the system either removed, dormant or isolated.

Additionally, where an operator has not undertaken the FiC or has chosen cab reversion for FiC, consideration should be made as to the time required for trainers and managers education prior to fleet fit and L2-L3 commissioning. The changes to data recorder data acquisition and analysis should also be considered.

10   Demand Forecasting

Each operator will need to identify at the earliest opportunity the likely route programme for ETCS to assist in accurate demand forecasting for driver manager, driver instructor/ driver training and driver numbers. Operators will need to consider:

- Current and potential churn rate of drivers
- Age profile
- Pension profile
- Existing technology (skills) being worked
- Additional infrastructure schemes
- Fleet cascades/Traction training requirements
- Service/timetable expansion
- FiC and Fleet fit patterns against L2-L3 infrastructure
- Franchise durations and commitments

This list is not exhaustive.

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