OFFICE OF RAIL AND ROAD

Mr Mark Lincoln
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London
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Your Ref: Thameslink ETCS APIS3

Our Ref:

Case Ref: PRM-IOP-0308

EIN: UK/63/2019/0002

17th May 2019

Contact: Stephen Williams
3rd Floor, Mallard House, Kings Pool,
1-2 Peasholme Green,
York.
YO1 7PX.

Dear Mark

THE RAILWAYS (INTEROPERABILITY) REGULATIONS 2011, AS AMENDED ETCS INFRASTRUCTURE AUHORISATION FOR THAMESLINK APIS3 (EAST-WEST)

I refer to your application for authorisation, received on the 10th May 2019. Following review of your application, I can confirm that ORR grants authorisation under regulation 4(1)(a) of the Railways (Interoperability) Regulations 2011, as amended. This authorisation is for the placing in service of the ETCS control command signalling subsystem located on the lines detailed below inclusive.

Southbound Routes

ELR / Track	Section Description	Start (miles-chains)	End (miles-chains)
ELR: XTD Track: (Line 4 Down)	London Bridge to Spa Road Area	1m 35ch	2m 38ch
ELR: BMJ Track: (Down Snow Hill)	Blackfriars Station to London Bridge Station	0m 60ch	1m 18ch

Northbound Routes

ELR / Track	Section Description	Start (miles-chains)	End (miles-chains)
ELR: XTD Track: (Up Sussex Fast – Line 5 Up)	Spa Road Area to London Bridge	2m 72ch	1m 35ch
ELR: BMJ Track: (Up Snow Hill)	London Bridge Station to Blackfriars Station	1m18ch	0m60ch

Note on demarcation limits:

- At the Level 2 exit locations a train will remain in ETCS Level 2 until the balise antenna passes the balise group on exit; in normal operation this is a maximum of 17m plus a system response time of less than 1.5 seconds. At the maximum line speed of 40 mph this equates to a maximum distance of 44m that the train would remain in ETCS Level 2 beyond the transition boundary.
- In support of the commencement and termination of ETCS Level 2 operation, balise groups are positioned outside of the routes defined above.

The restrictions or limitations of use on the structural subsystem are those contained on the declaration of verification dated 8th May 2019 and contained in your technical files, reference:

- ECDV-TF Ref: N423-NRT-REP-EA-000011 Version 1.0
  (and included NoBo/DeBo TF Refs:
  - Thameslink HCI Project NoBo and DeBo Technical File (CCS) Part 1: ETCS in the Thameslink Core, reference: 193851r01 CCT NoBo-TF Part 1,issue 3.0, dated 8th May 2019)

and are reproduced in Appendix A.

The upgraded infrastructure subsystem authorised by this letter must be operated and maintained in accordance with Regulation 20.

You should be aware that any future modifications to the authorised subsystem may constitute a further 'renewal' or an 'upgrade' as defined in Regulation 2. If a project entity, in relation to the project, considers that the modification meets either of these definitions they may apply, in accordance with the provisions of Regulation 13, to the Department for Transport (DfT) for a decision on whether a new authorisation will be required. Should DfT decide that an authorisation is not required they must consult with ORR whether authorisation is required on safety grounds.

As the project entity you are responsible for retaining the technical file, keeping it up to date and making it available to the ORR in accordance with Regulations 18 and 19.

If you are not the owner of the authorised subsystem you shall within 60 days, in accordance with Regulation 19(3), transfer the technical file, certificate of verification and verification declaration to the owner of the subsystem and the owner shall then be regarded as the project entity. If the owner, in accordance with Regulation 19(4), disposes of his interest in the authorised subsystem, he shall within 60 days of the disposal transfer the technical file, certificate of verification and verification declaration to the person acquiring that interest and that person shall be regarded as the project entity.

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Please note that the person who applied for the authorisation shall send particulars to the owner of the infrastructure to enable the owner of the infrastructure to enter the items on the Register of Infrastructure in accordance with Table 1 Commission Implementing Decision 2011/633/EU. This will include such further information as the registration entity may reasonably require set out in the relevant standard.

The person who applied for the authorisation to place in service may apply to the ORR for a determination of type. You will receive the type authorisation after providing the relevant data to the ORR.

If you are the operator, may I remind you of the need to have adequate arrangements within your Safety Management System to control the risks associated with this upgraded infrastructure subsystem.

Yours sincerely

Steve Fletcher,
Deputy Director, Engineering & AM, DRPP
Cc

Ian Jones	Head of Interoperability, Safety and Standards - DfT
Paul Hooper	Interoperability Manager - ORR
Ian Maxwell	Head of Train Control Systems - ORR
Darren Anderson	HM Principal Inspector of Railways, LNE - ORR
Don Wilson	HM Principal Inspector of Railways, South - ORR

APPENDIX A

The following design choices and implementation environment result in testing limitations and hence areas where full compliance cannot be demonstrated:

- Message 3 - Only single Movement Authority (MA) messages are used (SS-026 clause 3.7.2.1).
- Packet 15 - The distance of the MA is expressed only as the 'End Section', with no use of other 'sections' (SS-026 clause 3.8.3.2, SS-040 clause 4.3.2.1.1a).
- Packet 15 - EoAs are not configured with a Target Speed, i.e. they are all EoAs and not LoAs (SS-026 clauses 3.7.2.2.1, 5.10.3.6.1, 5.10.3.10.1).
- Packet 15 - Section time-outs/timers are not used in MAs (SS-026 clauses 3.8.1.2, 3.8.3.2, 3.8.3.3, 3.8.3.4 and SS-091 clause 10.2.1.5).
- Packet 15 - The distance beyond an EoA in an MA is configured as a Danger Point; Supervised Location is not configured (SS-026 clauses 3.8.3.3 c and 3.13.7.2.1).
    - Note this limitation has been reworded from that stated on the Module SB Type Examination as a result of testing for APIS 2, reported in the Safety Justification [4405a].
- Packet 15 - Release Speed configuration - Use of the national value for release speed is not supported (SS-026 clause 3.13.7.2.1 c).
- Packet 27 - Only basic train category is used i.e. train categories are not used (SS-026 clause 3.11.3.2, SS-040 clause 4.3.2.1.1n, SS-003204 clause 4.2.1.5).
- Packet 42 - The order to contact the RBC passes the train the RBC's phone number. Other options, i.e. 'contact last known RBC' or use of 'short numbers' / 'special values', are not supported (SS-026 clauses 3.5.3.13, 3.5.3.14, 3.5.3.15).
- Packet 65 - TSRs can only be designated as applying to the whole train, i.e. the whole train length must have left the TSR before the TSR ceases to apply (SS-026 clause 3.11.5.3).
- Packet 65 - TSRs are not sent to the train via balise (SS-091 ref ETCS_TR06).
- Packet 65 - TSRs can only be designated as revocable (SS-026 clause 3.11.5.6).
- Packet 254 – indicates a default telegram from a switchable balise. This packet is not used in the default telegram.
- Message 2 - Staff Responsible Authorisation is not required and is inhibited within the system.
    - Note: The system is capable of update to implement this function at a later date if operational rules change to introduce use of SR mode.

Note that since the first issue of the Safety Justification [3219] it is reported in the APIS 2 Safety Justification [4405a] the Thameslink trackside ETCS is not compatible with UK operational requirements for on-boards using Baseline 3.6.0, due to pre-indication issues. There is no impact regarding compatibility with trains currently operating in the UK, however, the Thameslink trackside ETCS is not compatible with on-board ETCS at Baseline 3.6.0.

The Thameslink route environment and various further implementation decisions present additional items which renders compliance with specific requirements as not applicable:

- The RBC does not send any packet 44 (ATO) messages to the train (SS-026 clause 7.4.2.11).
- Only 'Reduced Size' balises are used on TL (i.e. no 'Standard Size' balises) (SS-036 clause 5.7.10.1).
- Only Class B balises are used on TL (i.e. no Class A balises) (SS-036 clause 5.6.2.1).
- There are no 'tuned' balises on TL (SS-036 clause 5.10.7.6).
- No balises are installed on steel sleepers in the TL area (SS-036 clause 5.7.10.2).
- There are no guard rails in the TL area that would impact balise installation (SS-036 clause 5.7.10.4).
- There is no need to exchange keys between the Thameslink Key Management Centre (KMC) with any other KMC (SS-038 is n/a).
- There is no KER equipment on TL routes (SS-040 clause 5.1.1.1).
- Neither the RBC nor balises are confirmed through full system test that they support speeds up to 500km/h. Tests performed only up to the maximum line speed i.e. 60 mph in the Level 2 area on approach to London Bridge (ERA/ERTMS/003204 clause 3.1.1.10, SS-040 clause 4.2.1).
- The function to order 'unfitted operation' is not supported (ERA/ERTMS/003204 clause 4.1.8).
- Train detection systems on TL use track circuits only. i.e. Axle counters are not used (ERA/ERTMS/033821 clauses 3.1.2, 3.1.3, 3.2.1, 3.2.3).
- Electrical traction supply in the core area is 25kV AC and/or 750V DC (SS-033821 clause 3.2.2).
- The TL core area is fitted with operational line side signals i.e. the ETCS system is overlaid onto an existing scheme (SS-091 clause 10.4.1.5).

The following limitation (compatibility issue) has been identified during integration testing with a Class 700 train:

- The start of mission (SoM) procedure differs in the sequence for the start of mission flow chart (Subset-026, Sections 5.4.4 and 5.4.5) between baseline 2.3.0d and Baseline 3 - During testing, at SoM the driver was often instructed to change ETCS operating levels manually between Level NTC and Level 2. Sometimes the driver changed level before entering train data (Flowchart S10), sometimes after entering train data (Flowchart S20). Changing level in S20 is considered invalid in Baseline 2.3.0d and the Thameslink RBC reacts to this invalid state by terminating the communication session with the train. The train re-establishes the session, but in the interim, as the session has been terminated, offers SR mode to the driver (Baseline 3, Subset-026, Sections 5.4.5.1, 5.4.5.3 h) final bullet). This is not considered a 'safe' operation and is managed on Thameslink by driver instruction to change level before entering train data (i.e. only at S10).

The RBC EC Type Examination Certificate 0941/1/CB/2016/CCT/EN/RC104166-01E identifies the following restrictions as applicable:

The following functionality of SUBSET-026-V230 (SRS) and SUBSET-108-V120 has not been implemented and/or validated and cannot be used.

- Reversing
- Axle Load Speed Profiles
- Track Ahead Free
- Route Suitability
- Fixed Text Messages
- Radio Hole as Track Condition
- Initiation of communication session from RBC
- Sent train running number to train
- Use 'Train rejected' in SoM
- Use 'SoM Position Report confirmed by RBC' in SoM
- Manage overlap information
- Send list of balises for SR Authorisation
- SR mode operation
- Send Default gradient information for TSR
- Geographical Position information
- Track condition Change of Traction Power
- List of balises for Shunting mode
- Send Level Transition Order from RBC to leave Level 2 area
- Section timers and multiple sections in Movement Authority
- Radio network registration sent by RBC (Packet 45)
- T_NVCONTACT deactivation of supervision in specific areas

EC Technical File Part 1 Section 3 details the following non-implemented or unsupported ETCS Trackside functions:

- ETCS Level 1 (Packet 12).
- ETCS Level 3.
- Euroloops (Packet 134).
- RBC – RBC handover (Packet 131).
- Radio In-fill (Packets 133,136; Messages 37, 153).
- Transitions to/from ETCS levels other than Level 0 or Level STM (NID_STM=20).
- Shunt mode (Packets 49,132).
- Reverse mode (Packets 138, 139).
- Functions related to 'shifted location reference' are not used (Message 33).
- Request to the driver to confirm 'track ahead is free' (TAF) (Packet 90, Message 34).
- Initiation of a communication session by the RBC (Message 38).
- Rejection of a train by the RBC during start of mission (Message 40).
- RBC confirmation/validation of train position following a Start of Mission report from a train indicating an "invalid" position (Message 43).
- Authorising a train in SR (Staff Responsible) mode to pass a pre-defined set of balises (Packet 63).
- Speed profiles – no different speed profiles dependent on including axle load (Packet 51).
- Sending of 'Track Condition' information to trains (noting that Packet 44 is used to convey traction power information) (Packets 39, 67, 68).
- Sending of "Route Suitability" information to trains (Packet 70).
- Sending of 'fixed' text messages to trains (Packet 76).
- Sending 'Geographical Position Information' to trains (Packet 79).
- Sending of 'Train Running Number' to trains (Packet 140).
- Sending default gradient for TSRs to trains (Packet 141).
- Sending 'Repositioning Information' to trains (Packet 16).
- Baseline 3 additional packets which can be used by Baseline 2 trackside other than Packets 145 and 203 (Packets 135, 200, 206, 207, 239).
- The following operating modes are not supported for operational use: SR, SH, NL, LS, RV, PS & STM (European) – (Packets 49, 132, 138, Message 28).

The GSM-R Type Examination certificates 2673/1/SB/2017/CCT/EN/N20170165 identifies the following relevant items:

- For GSM-R acting as the bearer for ETCS data, operation has been demonstrated up to line speed (up to 60mph on the Thameslink 'core' route). This is a limitation of testing (reference SUBSET-093 v2.3.0 clause 6.3.1.4

which refers to support of trackside to train data communications at speeds up to 500 km/h).

- As a condition of use, a timer modification (or an alternative solution) shall be implemented and confirmed to resolve the 'idle timeout' call drop issue prior to entry of ETCS into operational service
    - Note that the timer modification has been implemented and evidence that it resolved the issue was presented to the NoBo for APIS 2

The following design choices and Thameslink implementation environment result in testing limitations and hence areas where full compliance cannot be demonstrated relating to the applicable NNTRs:

- There are no level crossings within the TL ETCS L3 area (GE/RT8026 clause 7.1.4)
- There are no signals on TL designated as 'Passable signal' or 'intermediate block home signal' (GK/RT0009 clause 2.2.2.4).
- Train detection systems on TL use track circuits only (i.e. axle counters are not used) (GK/RT0028 clause 2.2).
- The block system used on TL is Track Circuit Block (TCB). Any requirements relating to other systems are therefore not applicable e.g. absolute block, radio electronic token block (RETB) (GK/RT0055 Iss 1).

It is noted that Operational Conditions appear on the verification certificates and the Declaration of Management of Risk. It is stated that "SRP will track the closure of the recommendations that place conditions on the introduction of passenger service and confirm to the route when these have been addressed."

1. The ETCS temporary speed restriction function shall not be used for service operation until the users have been re-briefed and re-trained. If TSRs are applied in the area then Level 2 functionality shall be inhibited until training is completed by the end of May 2019. In the meantime, the TSR function may only be used for testing / training purposes.

2. A procedure shall be put in place to manage the inability to an ETCS OS (PoSA) route from signal 4435 to signal 4437 until the issue is rectified. Note the OS (PoSA) route would only be used in the event of a track failure in the route.