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Crossrail Central Operating Section Timetable Planning Rules 2023

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Document History

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1	12/07/2022	The 2023 TPRs contain numerous updates and revisions from the 2022 TPRs resulting from: <ul style="list-style-type: none"> i) CBTC signalling system software updates; ii) Experience gained from Dynamic Testing, Trial Running and Trial Operations prior to revenue service; iii) Systems and iv) consultations under the Crossrail Timetable Working Group (includes MTREL, Siemens and Network Rail).

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Specify any Holds within the document.

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Specify significant change from previous revisions of the document. (From Rev. 1.0 onwards)

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1. Introduction and General Notes

1.1 Purpose

- 1.1.1 The purpose of this document is to define the Timetable Planning Rules (TPR) governing the standard timing of trains between stations and junctions for the Crossrail Central Operating Section (CCOS) Working Timetable in accordance with Rail for London Infrastructure Limited (RFLI) CCOS Network Code Part D.
- 1.1.2 The CCOS TPR is one of a pair of documents along with the CCOS Engineering Access Statement (EAS), when consulted by RFLI with the relevant users of the railway provide rights of access that, with track access agreements of train operators, are described as 'firm rights' and enjoy priority in the timetabling process.
- 1.1.3 CCOS TPR contains essential information such as standard timing points, sectional running times for specific train types, headway and margin limits to be maintained between trains, station working rules and route capability data.
- 1.1.4 The rules provided herein support both the National Rail timetable development processes and are consistent with the functionality and capabilities of the CCOS signalling and control system.

1.2 Scope

- 1.2.1 This document is applicable to the CCOS owned and operated by RFLI.
- 1.2.2 Routes covered are given in Table 1-1 below.

Table 1-1: Index of Routes

CODE	LINE OF ROUTE
XR001	WESTBOURNE PARK JUNCTION TO PUDDING MILL LANE JUNCTION
XR002	STEPNEY GREEN JUNCTION TO ABBEY WOOD (ALSIKE ROAD JUNCTION)

1.3 Applicable Sectional Appendix and Rule Book

- 1.3.1 The CCOS Sectional Appendix available via the National Electronic Sectional Appendix (NESA) applies.
- 1.3.2 The RFLI Central Operating Section Rule Book applies to CCOS.

1.4 CCOS Planning Definitions

1.4.1 Train Description

Trains shall be described in the working timetable using the standard industry four character identification code (headcode): Classification (Table 1-2); Destination (Table 1-3); and two-digit sequence number (00-99) for example '9W05'.

Table 1-2: First Character (Train Classification)

First Character	Description
9	Passenger trains operating on the Crossrail Central Operating System
3	Empty Coaching Stock (ECS) movements between Paddington (Crossrail) and Westbourne Park; Priority ECS if specially authorised.

5	Other ECS
6	Maintenance trains which can run up to 50mph

Table 1-3: Second Character (Destination)

Second Character	Description/ Destination
C	To Chadwell Heath or Gidea Park
E	To West Ealing/ West Ealing Loop/ ECS CCOS Eastbound in Contingency Timetable)
G	Special service identifier (note: not for use in disruption)
N	To Maidenhead
P	ECS and maintenance trains to Plumstead Infrastructure Maintenance Facility
R	To Reading
T	To Hayes and Harlington and to Heathrow Airport
U	To Abbey Wood via Canary Wharf
W	To Shenfield/ ECS CCOS Westbound in Contingency Timetable)
Y	To Paddington (Elizabeth Line) via Tottenham Court Road To Old Oak Common and Westbourne Park sidings(incl. ECS and maintenance trains)

1.4.1 Days of Operation

Table 1-4: Days of Operation

Abbreviation	Description
M	Monday
T	Tuesday
W	Wednesday
Th	Thursday
F	Friday
S	Saturday
Su	Sunday
EWD	Every Weekday (Monday to Saturday)
Suffixes	
O	Adding this indicates that the train will run only on that day or those days shown
X	Adding this indicates that the train will not run on that day or those days shown
General	
BHX	Denotes that this train does not run on a bank holiday

1.4.1 Traction and Rolling Stock

Table 1-5: Traction and Rolling Stock

Abbreviation	Description
EMU	Any electric multiple unit
ECS	Empty Coaching Stock (electric multiple units only)
OTM	On Track Machine - Infrastructure Maintenance Units/ Vehicles

1.4.1 Activity and Other Codes

Table 1-6: Activity Codes

Abbreviation	Description
RM	Reverse Move (line or platform codes for each timing point may be used to provide route detail)

1.4.1 Trip Associations

As part of the timetable instantiation and to support the automatic code insertion process, the CBTC ATS system creates next trip associations not provided by the timetable CIF file from TPS. All trips of the same seasonal timetables will be checked as possible next trip, but only one trip will be referenced as next trip if the following conditions are fulfilled:

- Previous trip and next trip must either both be optional or non-optional.
- The main period of the previous trip must be in the main period of the next trip. Further, both trips must have identical days of operation (defined in 1.3.2 above).
- Previous trip must end, and the next trip must start at the same station and platform
- Previous trip does not leave the CCOS area.
- Next trip does not start outside the CCOS area.
- Next trip must start after previous trip but before a pre-configured maximum time of 45 minutes.
- Previous trip has no pre-existing association.

2. Route Description

2.1 Planning Geography

2.1.1 Figure 2-1: Timetable Relevant Locations in the Signalling and Control System. Source: C620-SIC-R2-RSP_CR001-50022 C620/NR Time Table Data. Below provides a schematic diagram of the relevant locations for timetables in the CCOS.

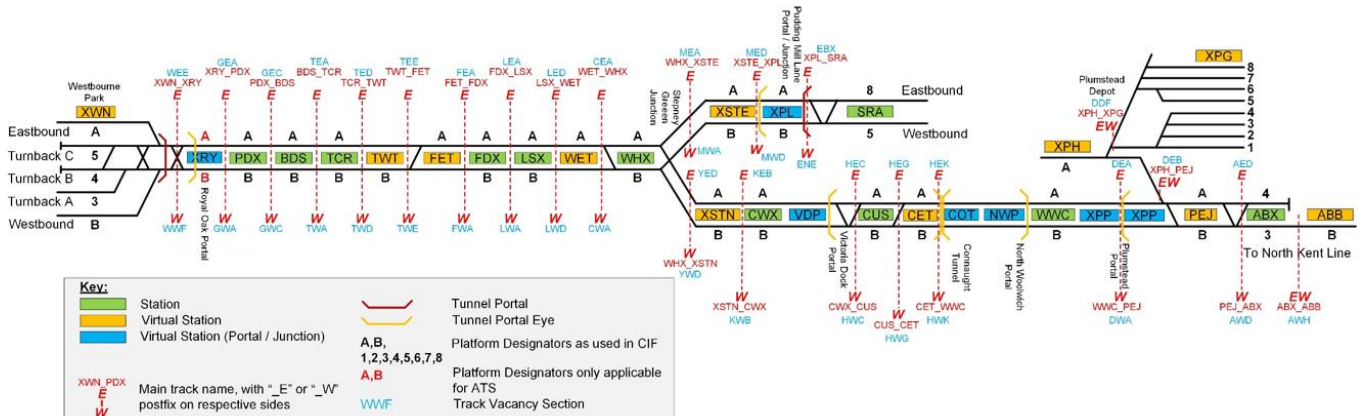


Figure 2-1: Timetable Relevant Locations in the Signalling and Control System. Source: C620-SIC-R2-RSP_CR001-50022 C620/NR Time Table Data

2.1.2

2.1.3 Table 2-1 and Table 2-2 below. Timing Points shown in **bold** are mandatory.

2.1.4 The required platform code (e.g. A, B etc.) shall be given for each station stop. Notice should be taken of the additional platform and line coding requirements for planned moves using the bi-directional signalling capability against the normal direction.

2.1.5 If the platform field is blank the ATS will use, dependent of the pathing, a preferred path, then the 1st alternative path and then the 2nd alternative path for this TIPLOC. The ATS will provide two alternative pathways at maximum, pathways must physically exist.

2.1.6 The following codes apply:

- F Only non-passenger trains are timed at this location
- S Only stopping trains are timed at this location
- X Only trains crossing from one running line to another are timed at this location

Table 2-1: CCOS XR001 Timing Points

XR001 WESTBOURNE PARK JUNCTION TO PUDDING MILL LANE JUNCTION						
XR Loc.	Timing Point	NR TPS TIPLOC	East-bound	West-bound	Cod e	Notes
	Portobello Junction	PRTOBJP	CRE CRW	3 4 5 6 CRL		<i>To/from Great Western Main Line (GW103)</i> Line 3 SN109 Not available from Eastbound line (SN99) Line 4 SN111 Not available from Eastbound line (SN99) Line 5 SN113 Available from all 3 exits Line 6 SN115 Available from all 3 exits CRL SN117 Crossrail Depot Line 1 (beyond Gantry 8) over P8054 reverse
XWN	Westbourne Park	WBRNPKS				Virtual platform detail shall determine the line used (refer to Table 3-4) Where the TT does not contain a specific turn-back siding (e.g. only defines the station Westbourne Park; the Station Platform is set to "blank"), ATS will automatically generate preferred and alternative Station Platforms during import
<i>XRY</i>	<i>Royal Oak Crossover</i>	<i>N/A</i>				<i>Not included in schedules</i> <i>Route determined by platform codes at Westbourne Park and Paddington</i>
PDX	Paddington (Elizabeth Line)	PADTLL		CRE		Westbound traffic only: ARS default route is via Westbound line towards SN91. All Passenger trains to the West of Paddington must be planned via SN91. CRE route code must be specified for westbound traffic using the Eastbound line towards Portobello Jn via Westbourne Park CS Virtual Platform A and SN99.
BDS	Bond Street	BONDST				
TCR	Tottenham Court Road	TOTCTR				
TWT	Fisher Street Crossover (West)	TOTCFST			X	Timing point for: Reversal at virtual platform B; Crossing moves; Eastbound trains on Westbound Line (input

						platform code B); and Westbound trains on the Eastbound Line (input platform code A).
FET	Fisher Street Crossover (East)	FRNDFST			X	Timing point for: Reversal at virtual platform A; Crossing moves; Eastbound trains on Westbound Line (input platform code B); and Westbound trains on the Eastbound Line (input platform code A).
FDX	Farringdon (Elizabeth Line)	FRNDXR				
LSX	Liverpool Street (Elizabeth Line)	LIVSTLL				
WET	Valence Road Crossover	WCHAVRD			X	Timing point for: Reversal at virtual platform A; Crossing moves; Eastbound trains on Westbound Line (input platform code B); and Westbound trains on the Eastbound Line (input platform code A).
WHX	Whitechapel	WCHAPXR				
XST	Stepney Green Junction	SPNYGNJ				To/from Abbey Wood Elizabeth Line (XR002)
XSTE	Stepney Green XR205/XR207	SPNY205			S	Timing point for Westbound trains planned to stop on approach to Stepney Green Jn
XPL	Pudding Mill Lane Junction	PUDGMLL	EL			To/from Seven Kings (EA1010)

Table 2-2: CCOS XR002 Timing Points

XR002 STEPNEY GREEN JUNCTION TO ABBEY WOOD (ALSIKE ROAD JUNCTION)						
XR Loc.	Timing Point	NR TPS TIPLOC	Eastbo und	Westbo und	Code	Notes
XST	Stepney Green Junction	SPNYGNJ				To/from Westbourne Park Junction (XR001)
XSTN	Stepney Green XR201/XR203	SPNY201			S	Timing point for Westbound trains planned to stop on approach to Stepney Green Jn
CWX	Canary Wharf	CANWHRF				
VDP	Victoria Dock Portal (Custom House West) Crossover	CUSTWBT			X	Timing point for: Crossing moves; Eastbound trains on Westbound Line (input platform code B); and Westbound trains on the Eastbound Line (input platform code A).
CUS	Custom House	CUSTOMHS				Platform detail must be shown
CET	Custom House East Crossover	CUSTEBT			X	Timing point for: Reversal at virtual platform A; Crossing moves; Eastbound trains on Westbound Line (input platform code B); and Westbound trains on the Eastbound Line (input platform code A).
NWP	North Woolwich Portal	N/A				Not included in schedules
WWC	Woolwich (Elizabeth Line)	WOLWXR				
XPP	Plumstead Portal	N/A				Not included in schedules
	Plumstead Infrastructure Maintenance Facility	N/A				This location must be planned as Plumstead Carriage Sidings for the purpose of timetabling.

XPG	Plumstead Carriage Sidings	PLMSXCR			S	Timing point for: Trains to/from the Stabling Sidings; and Timing point for trains entering/leaving RFLI Maintenance Facility sidings (" <i>Maintenance Sidings</i> ")
XPH	Plumstead Sidings Headshunt (Plumstead Reversing Siding)	PLMSRS			S	Timing point for trains to/from the Stabling Sidings or to/from Infrastructure Maintenance Facility Sidings (" <i>Maintenance Sidings</i> ")
PEJ	Plumstead East Junction	PLMSEJ				Platform detail shall be shown for trains exiting Plumstead sidings towards Abbey Wood to ensure the appropriate route is selected.
ABX	Abbey Wood (Elizabeth Line)	ABWDXR				Platform detail must be shown
ABB	Abbey Wood Bolthole Berth (Abbey Wood Crossrail Siding)	ABWDXRS				
	Abbey Wood Engineering Road (Transfer Line)					Moves to the Engineering Road are manually routed and not available to import into the signalling timetable manager.
	Alsike Road Junction				F	To/from Dartford Junction (SO290)

2.1.7 Pathing Time required at Westbourne Park shall be inserted as a Westbourne Park stop.

2.1.8 All schedules running to or from Network Rail Anglia Route must include a timing at Pudding Mill Lane Junction.

2.1.9 All schedules running to or from Network Rail Western Route must include a timing at Portobello Junction.

2.2 Route Opening Hours

2.2.1 The Elizabeth Line Route Control Centre is manned on a 24hour, seven days per week basis.

2.2.2 The timetable operational day shall commence at 02:01 and end at 02:00 the following day.

2.2.3 Standard engineering possession opportunities are detailed in Section 4 of the CCOS Engineering Access Statement.

3. Infrastructure Restrictions

3.1 Bi-Directional Operation

- 3.1.1 The CCOS running lines are designated as Eastbound or Westbound in terms of principle traffic direction. However, all are fully signalled for bi-directional operation.
- 3.1.2 Train movements planned against the normal direction of traffic ('wrong' direction) require all line codes and platform entries according to the Timing Points provided Table 2-1 and Table 2-2 above.
- 3.1.3 When scheduling train movements across interfaces with Network Rail operated infrastructure at Pudding Mill Lane or Westbourne Park against the normal designated traffic direction, not all routes have the automatic route setting (ARS) function. ARS route codes are not currently available for the following moves:
- Pudding Mill Lane portal east towards Stratford platform 5 or 8 via the Up Electric Line from L243 signal on the Westbound line in the reverse direction.
 - From Stratford platform 5 or 8 towards Stepney Green Junction via the Down Electric Line to the Eastbound Line reverse direction.
 - From XR027 route marker board at Royal Oak Portal west towards Ladbroke Grove Junction via Line 6 using Turnback A at Westbourne Park.
 - From SN126 on the Down Relief at Ladbroke Grove towards any route in the CCOS.
- 3.1.4 An additional half minute should be allowed for the following move:
- From XR027 route marker board at Royal Oak Portal west towards Ladbroke Grove Junction via Line 6 using either the Westbound or Eastbound Line.
- 3.1.5 Royal Oak Crossovers
- It is not currently possible to plan moves over a specific crossover at Royal Oak.
 - Routes are determined automatically by the signalling and control system in accordance with ARS routing tables (preferred) and the automatic train regulation (ATR) system.
 - Line and platform codes should be used to influence the routing selected by the ARS.

3.2 Capacity Constraints

- 3.2.1 The core route between Paddington and Stepney Green Junction has a maximum planning capacity of 24 trains per hour(tph) in each direction.
- 3.2.2 Route XR002 (Stepney Green Junction to Abbey Wood (Alsike Road Junction)) has a nominal maximum capacity of 16tph however, the practical capacity is limited by the occupation of the platforms at Abbey Wood to 12 tph in normal operation.
- 3.2.3 Please also refer to the CCOS EAS Section 4.

3.3 Traction Power Supply Restrictions

- 3.3.1 Under normal operating conditions, the 25kV traction power supply shall not place any restrictions on the use of approved electric traction.
- 3.3.2 Under maintenance conditions, sections of the electrified network may be blocked to electric traction. These restrictions are identified within the CCOS EAS.
- 3.3.3 Under normal conditions, Plumstead stabling sidings traction power shall be kept energised. However, there are some occasions (for example maintenance at Stepney Green Junction) where it is necessary for and isolation of the sidings. Trains may be required to relocalise on the signalling system in Staff Accountable Mode. Notice shall be given in the CCOS Weekly Operating Notice Section B Traffic Remarks for the relevant Engineering Item.
- 3.3.4 Further restrictions may arise in connection with engineering possessions which shall be requested via the CCOS EAS amendment process.

3.4 Ventilation System Restrictions

- 3.4.1 The CCOS is designed to allow two trains to occupy a single ventilation section. This restriction shall be enforced via the signalling and control system (refer to paragraph 4.1 below).
- 3.4.2 Eastbound and westbound running line tunnels and stations are considered as separate ventilation sections. The sections are listed in Table 3-1 below.

Table 3-1: XR001 Ventilation Sections

XR001 WESTBOURNE PARK JUNCTION TO PUDDING MILL LANE JUNCTION		
Code	Tunnel	Description
VS01E	EASTBOUND	Royal Oak Portal to Paddington (Elizabeth Line) [exc.]
VS02E		Paddington (Elizabeth Line) station
VS03E		Paddington (Elizabeth Line) [exc.] to Bond Street [exc.]
VS04E		Bond Street station
VS05E		Bond Street [exc.] to Tottenham Court Road [exc.]
VS06E		Tottenham Court Road station
VS07E		Tottenham Court Road [exc.] to Farringdon (Elizabeth Line) [exc.]
VS08E		Farringdon (Elizabeth Line) station
VS09E		Farringdon (Elizabeth Line) [exc.] to Liverpool Street (Elizabeth Line) [exc.]
VS10E		Liverpool Street (Elizabeth Line) station
VS11E		Liverpool Street (Elizabeth Line) [exc.] to Whitechapel [exc.]
VS12E		Whitechapel (Elizabeth Line) station
VS13E		Whitechapel [exc.] to Stepney Green
VS14E		Stepney Green to Eleanor Street
VS15E		Eleanor Street to Pudding Mill Lane Portal



VS15W	WESTBOUND	Pudding Mill Lane Portal to Eleanor Street
VS14W		Eleanor Street to Stepney Green
VS13W		Stepney Green to Whitechapel (Elizabeth Line) [exc.]
VS12W		Whitechapel station
VS11W		Whitechapel [exc.] to Liverpool Street (Elizabeth Line)
VS10W		Liverpool Street (Elizabeth Line) station
VS09W		Liverpool Street (Elizabeth Line) [exc.] to Farringdon (Elizabeth Line) [exc.]
VS08W		Farringdon (Elizabeth Line) station
VS07W		Farringdon (Elizabeth Line) [exc.] to Tottenham Court Road [exc.]
VS06W		Tottenham Court Road station
VS05W		Tottenham Court Road [exc.] to Bond Street [exc.]
VS04W		Bond Street station
VS03W		Bond Street [exc.] to Paddington (Elizabeth Line) [exc.]
VS02W		Paddington (Elizabeth Line) station
VS01W		Paddington (Elizabeth Line) [exc.] to Royal Oak Portal

Table 3-2: XR002 Ventilation Sections

XR002 STEPNEY GREEN JUNCTION TO ABBEY WOOD (ALSIKE ROAD JUNCTION)		
Code	Tunnel	Description
VS16E	EASTBOUND	Stepney Green to Canary Wharf [exc.]
VS17E		Canary Wharf station
VS18E		Canary Wharf [exc.] to Victoria Dock Portal
VS19E		Connaught Tunnel
VS20E		North Woolwich Portal to Woolwich [exc.]
VS21E		Woolwich station
VS22E		Woolwich [exc.] to Plumstead Portal
VS22W	WESTBOUND	Plumstead Portal to Woolwich [exc.]
VS21W		Woolwich station
VS20W		Woolwich [exc.] to North Woolwich Portal
VS19W		Connaught Tunnel
VS18W		Victoria Dock Portal to Canary Wharf [exc.]
VS17W		Canary Wharf station
VS16W		Canary Wharf [exc.] to Stepney Green

3.5 Platform Lengths

- 3.5.1 Table 3-3 below gives the maximum length of train (in metres) that may use each of the platforms at the following passenger stations.
- 3.5.2 The quoted lengths are the useable lengths from headwall to headwall unless otherwise specified (e.g. ramp to ramp).
- 3.5.3 Passenger trains longer than the quoted lengths shall not be accepted into CCOS.

Table 3-3: Platform lengths

XR Code	NR TPS TIPLOC	Station	Platform	Effective Length (m)	Notes
PDX	PADTLL	Paddington (Elizabeth Line)	A	205	Stations have head walls and all platforms are equipped with platform edge screen doors.
		Paddington (Elizabeth Line)	B		
BDS	BONDST	Bond Street	A		
		Bond Street	B		
TCR	TOTCTRD	Tottenham Court Road	A		
		Tottenham Court Road	B		



FDX	FRNDXR	Farringdon (Elizabeth Line)	A	
		Farringdon (Elizabeth Line)	B	
LSX	LIVSTLL	Liverpool Street (Elizabeth Line)	A	
		Liverpool Street (Elizabeth Line)	B	
WHX	WCHAPXR	Whitechapel	A	
		Whitechapel	B	
CWX	CANWHRF	Canary Wharf	A	
		Canary Wharf	B	
CUS	CUSTMHS	Custom House	A	
		Custom House	B	
WWC	WOLWXR	Woolwich	A	
		Woolwich	B	
ABX	ABWDXR	Abbey Wood	3	
		Abbey Wood	4	

Open air platforms without platform edge screens

Platforms equipped with platform edge screen doors.

Open air platforms without platform edge screens

3.6 Siding Lengths

3.6.1 The Table 3-4 below provides the maximum length of train (in metres) that may use each of the sidings at the following locations.

Table 3-4: Siding Lengths

XR Code	Code (TIPLC)	Location	Siding/ Virtual Platform	Effective Length (m)	Notes
WBK	WBRNPKS	Westbourne Park	XWN B	205	Westbound running line
		Westbourne Park	XWN 3		Turnback 'A' / through siding
		Westbourne Park	XWN 4		Turnback 'B' - reversing only
		Westbourne Park	XWN 5		Turnback 'C' - reversing only
		Westbourne Park	XWN A		Eastbound running line
XPH	PLMSRS	Plumstead	XPH A	247	Reversing headshunt for access to Plumstead Stabling Sidings
			XPG 1-8	240	Plumstead Stabling Sidings roads 1-8 (signalled)
			N/A	150	Plumstead Infrastructure Maintenance Facility Sidings ("Maintenance Sidings") roads 9-12 (not signalled).
ABB	ABWDXRS	Abbey Wood	ABB B	397	Bolthole Berth (Abbey Wood Crossrail Siding beyond platform 3)
N/A	ABWDER	Abbey Wood	Engineering Road	376	Non-passenger connection to Network Rail North Kent Line

4. Rolling Stock Restrictions

4.1 Signalling System Compatibility

- 4.1.1 Rolling Stock shall be fitted with a Communications Based Train Control (CBTC) signalling system¹ compatible with Siemens Rail Automation “Trainguard MT” Communications Based Train Control signalling system to operate over the CCOS.
- 4.1.2 Rolling stock must be compatible with the signalling and control systems on the adjoining rail Networks at Westbourne Park Junction (West) and Pudding Mill Lane Junction (East).
- 4.1.3 Rolling Stock traversing the interfaces is expected to be capable of transition between respective signalling systems whilst moving at the highest permissible speed without interruption.
- 4.1.4 Planned movements onto and off the CCOS at Abbey Wood Alsike Road Junction, shall be controlled under special arrangements.
- 4.1.5 Trains stabled at Plumstead sidings 1-8 may require relocalising under Staff Accountable Mode following a traction power isolation. This shall be conducted in accordance with the “*Supplementary Instructions For Signallers At Romford RCC For Trains That Have Delocalised At Plumstead Sidings 1 To 8, Including On Track Machines (OTM) Movements To/From The Maintenance Sidings*” (effective from 27th March 2021 @ 0001 hrs) in addition to the rules and regulations contained in S5 of the RFLI CCOS Rule Book, and Unit 6 of the COSOI. An additional timing allowance of [5]minutes.

4.2 Vehicle Restrictions

- 4.2.1 All vehicles must comply with Standard CRL1-XRL-O6-STD-CR001-50005 Crossrail Central Operating Section Requirements for Maintaining Infrastructure Clearances².
- 4.2.2 Dangerous goods are not permitted in the CCOS and may not be conveyed.
- 4.2.3 Vehicles shall be cleared for operation on adjacent rail infrastructure by the relevant infrastructure manager.
- 4.2.4 Access beneficiaries should refer to the provisions of CCOS Network Code Part F (Vehicle Change) for the introduction of other new or modified vehicles.

4.3 Route Availability

- 4.3.1 Maximum axle load is 16.5 tonnes (RA 4).
- 4.3.2 A heavier loading of up to 23.0 tonnes may be permitted subject to formal assessment by the RFLI Track Engineering and speed restrictions may be imposed to limit track forces.

4.4 Traction Restrictions

¹ A derogation from regulation 14 (2) (d) of the Railways (Interoperability) Regulations 2011 was granted to CCOS 26/01/2012 pending future migration to Level 3 ETCS.

² Subject to issue of a Statement of Compatibility from RFLI Engineering.

- 4.4.1 The CCOS is provided with 25kV AC overhead traction current supply.
- 4.4.2 Locomotives operating independently of the overhead traction current shall not exceed the prescribed emissions limit for tunnel operations³.
- 4.4.3 Proposals to operate higher nominal emissions locomotives may be permitted subject to assessment by the RFLI Engineer against tunnel ventilation system capability and these may be subject to operating restrictions such as working under reduced power.
- 4.4.4 Shall be fitted with a suitable fire suppression system for working in tunnels.

4.5 Automatic Train Operation (ATO)

- 4.5.1 Trains shall generally be operated in Automatic Train Operation (ATO) mode under normal conditions.
- 4.5.2 The ATO operation limits are given in Table 4-1 below.

Table 4-1: Automatic Train Operation Limits

XR001 Westbourne Park Junction to Pudding Mill Lane Junction			
Route Section	Passenger	ECS	OTM
Westbourne Park Junction to Stepney Green Junction	Mandatory	Permitted	Not available
Stepney Green Junction to Stratford - Maryland transition zone	Mandatory	Permitted	Not available
XR002 Stepney Green Junction to Abbey Wood (Alsike Road Junction)			
Route Section	Passenger	ECS	OTM
Stepney Green Junction to Abbey Wood	Mandatory	Permitted	Not available
Plumstead East Junction to Plumstead Reversing Siding	Mandatory	Permitted	Not available
Plumstead Reversing Siding to Stabling Roads 1-8	N/A	Permitted	Not available
Plumstead Reversing Siding to Plumstead Infrastructure Maintenance Facility Sidings 9 to 12	N/A	N/A	Not Permitted
Abbey Wood station to Alsike Road Junction	N/A	Not Permitted	Not Permitted

- 4.5.3 Engineers’ trains or on-track machines (OTM) may operate in ATO mode if suitably equipped.

4.6 Auto-Drive Operation

- 4.6.1 When it becomes available⁴, an automatic reversing facility⁵ (auto-reverse) shall permit movement of rolling stock without a vigilant driver present in the leading cab.
- 4.6.2 This facility is primarily to expedite the reversal of westbound passenger trains terminating at Paddington (Elizabeth Line) station returning eastbound via the turn-back sidings at Westbourne Park and to move empty coaching stock in either direction between Abbey Wood station platforms and the Plumstead Stabling Sidings⁶ minimising platform occupancy and increase system resilience to perturbation.
- 4.6.3 System logic determines the services in the daily timetable that the CBTC system will ‘offer’ auto-reverse to the driver by default based on the moves outlined in 4.6.1 above.

³ Subject to assessment by the RFLI Engineer against tunnel ventilation system capability and operating restrictions such as working under reduced power and no restrictions placed on the ventilation system.

⁴ Auto-reverse capability at Westbourne Park is anticipated to be available from late December 2022.

⁵ Subject to rolling stock compatibility.

⁶ Availability date to be announced.

There is no code available to plan this facility in the timetable received via the National Rail Timetable CIF file transfer process.

- 4.6.4 The driver must accept the 'offer' of auto-reverse from the CBTC system for it to be invoked. If a driver is required to manually drive a default auto-reverse move created by the process in 4.3.2, then this should be instructed to the driver by the train operator.
- 4.6.5 The auto-reverse facility may potentially be used at Fisher Street, Vallance Road and Custom House crossovers. However this is not available as a planned move without specific arrangements being made within the Route Control Centre for direct input to the CBTC Control Guide Timetable Editor.
- 4.6.6 Auto-reverse operation of ECS services may be planned for the following moves:
- Woolwich to Plumstead Stabling Sidings via Plumstead East Junction;
 - Plumstead Stabling Sidings to Woolwich via Plumstead East.
- 4.6.7 Auto-Reverse Operation 'Z' Moves of trains in passenger service shall be permitted at the following crossovers:
- Fisher Street;
 - Vallance Road; and
 - Custom House East.

- 4.6.8 When planning an auto-reverse move, the train headcode must change for each direction change.

4.7 Train Length Limits

- 4.7.1 The maximum length of any train consist that can be accommodated in platforms is limited to 205metres.
- 4.7.2 Engineering trains (e.g. measurement and recording) shall be limited to a maximum length of 150metres.
- 4.7.3 Minimum technical consist length is 40.1 metres
- 4.7.4 Maximum technical consist length is 374 metres

4.8 Passenger Stock Restrictions

- 4.8.1 Passenger doors shall be compatible with the Platform Screen Doors provided at all subterranean stations.

4.9 Engineers Train Restrictions

- 4.9.1 Only trains fitted with a compliant CBTC signalling and control system may be permitted to operate outside of an engineering possession.
- 4.9.2 The Robel Multi-Purpose Vehicle must be planned to operate with a minimum consist of <power car–transport wagon–power car> unit formation.
- 4.9.3 A maximum of 3 engineering train paths shall be permitted between 21:00EWD and 07:00EWD or between 21:00S and 08:00Su for positioning moves only.
- 4.9.4 The Multi-purpose vehicle and Rail Milling Machine need to transition manually and run with both CBTC and TPWS active in the COS.
- 4.9.5 The Multi-purpose vehicle and Rail Milling Machine leaving Plumstead Maintenance Sidings are required to operate in Staff Accountable mode until CBTC localisation has taken place.

5. Running Times, Margins and Allowances

5.1 Sectional Running Times

- 5.1.1 Sectional Running Times (SRT) provided in the tables 5-1 to 5-4 below are given in minutes derived from C620-SIC-R2-GIN-CR001-50006 *ATS Running Time Engineering Calculation*.
- 5.1.2 SRTs are split by type into 4 different timing links:
 - 1) Start to Stop (S-S) – wheels start at first timing point to wheels stop at second timing point
 - 2) Start to Pass (S-P) – wheels start at first timing point to front of train passing the second timing point
 - 3) Pass to Stop (P-S) – the front of train passing first timing point to wheels stop at second timing point


4) Pass to Pass (P-P) – front of the train passing the first timing point and passing the second timing point

5.1.3 SRTs for passenger and ECS are based on the technical performance of the Alstom Aventra Model LV-BXR-13 (Class 345) and verified during the dynamic testing phase of the Crossrail programme.

Table 5-1: Eastbound Sectional Running Times – all units

EASTBOUND				Timing Link				
From	To			Line	S-S	S-P	P-S	P-P
PRTOBJP	Portobello Junction	WBRNPKS	Westbourne Park				1	½
WBRNPKS	Westbourne Park	PADTLL	Paddington (Elizabeth Line)		2	2	1½	1½
PADTLL	Paddington (Elizabeth Line)	BONDST	Bond Street		2½	2	2	1½
BONDST	Bond Street	TOTCTRD	Tottenham Court Road		1½	1	1	1
TOTCTRD	Tottenham Court Road	FRNDXR	Farringdon (Elizabeth Line)		2	2	2	2
TOTCTRD	Tottenham Court Road	FRNDFST	Fisher Street Crossover East (FET)	EB	1½	1½	1½	1
TOTCTRD	Tottenham Court Road	TOTCFST	Fisher Street Crossover West (TWT)	WB	1	1	1	1
TOTCFST	Fisher Street Crossover West (TWT)	FRNDFST	Fisher Street Crossover East (FET)		½	½	½	½
FRNDFST	Fisher Street Crossover East (FET)	FRNDXR	Farringdon (Elizabeth Line)	EB	1½	1½	1½	1
FRNDXR	Farringdon (Elizabeth Line)	LIVSTLL	Liverpool Street (Elizabeth Line)		1½	1	1	1
LIVSTLL	Liverpool Street (Elizabeth Line)	WCHAPXR	Whitechapel		2	2	2	1½
LIVSTLL	Liverpool Street (Elizabeth Line)	WCHAVRD	Valence Road Crossover	EB	2	2	2	1½
WCHAVRD	Valence Road Crossover	WCHAPXR	Whitechapel		1½	1	1	½
WCHAPXR	Whitechapel	SPNYGNJ	Stepney Green Jn			1		1
SPNYGNJ	Stepney Green Jn	PUDGMLL	Pudding Mill Lane Jn				2½	2½
SPNYGNJ	Stepney Green Jn	CANWHRF	Canary Wharf				2	2
CANWHRF	Canary Wharf	CUSTOMHS	Custom House		3	3	3	2½
CANWHRF	Canary Wharf	CUSTWBT	Custom House West Crossover		3	3	3	2½
CUSTWBT	Custom House West Crossover	CUSTOMHS	Custom House		½	½	½	½
CUSTOMHS	Custom House	WOLWXR	Woolwich		3½	3	3	3
CUSTOMHS	Custom House	CUSTEBT	Custom House East Crossover		1	1	1	½
CUSTEBT	Custom House East Crossover	WOLWXR	Woolwich		3	3	3	3
WOLWXR	Woolwich	PLMSEJ	Plumstead East Jn		2½	2	2	2
PLMSRS	Plumstead Rev Siding	PLMSEJ	Plumstead East Jn		2½	2		
PLMSRS	Plumstead Rev Siding	PLMSXCR	Plumstead Stabling Sidings		2			
PLMSEJ	Plumstead East Jn	ABWDXR	Abbey Wood (Elizabeth Line)		2	1½	1½	1
ABWDXR	Abbey Wood (Elizabeth Line)	ABWDXRS	Abbey Wood Crossrail Siding		2	1½	1½	1
ABWDXRS	Abbey Wood Crossrail Siding	ABWDER	Abbey Wood (ENGINEERING ROAD) NK501		3			

Table 5-2: Westbound Sectional Running Times – all units

WESTBOUND		Timing Link
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From		To		Line	S-S	S-P	P-S	P-P
ABWDER	Abbey Wood Alsike Road XR397	ABWDXRS	Abbey Wood Crossrail Siding		3			
ABWDXRS	Abbey Wood Crossrail Siding	ABWDXR	Abbey Wood (Elizabeth Line)		2	1½	1½	1
ABWDXR	Abbey Wood (Elizabeth Line)	PLMSEJ	Plumstead East Jn		1½	1	1½	1
PLMSXCR	Plumstead Stabling Sidings	PLMSRS	Plumstead Rev Siding		2			
PLMSEJ	Plumstead East Jn	PLMSRS	Plumstead Rev Siding		3		2½	
PLMSEJ	Plumstead East Jn	WOLWXR	Woolwich		2½	2	2	1½
WOLWXR	Woolwich	CUSTEBT	Custom House East Crossover		3	3	3	2½
WOLWXR	Woolwich	CUSTOMHS	Custom House		3½	3½	3½	3
CUSTEBT	Custom House East Crossover	CUSTOMHS	Custom House		1	1	1	½
CUSTOMHS	Custom House	CUSTWBT	Custom House West Crossover		½	½	½	½
CUSTOMHS	Custom House	CANWHRF	Canary Wharf		3	2½	2½	2½
CUSTWBT	Custom House West Crossover	CANWHRF	Canary Wharf		3	2½	2½	2½
CANWHRF	Canary Wharf	SPNY201	Stepney Green (XSTE)		2½		2	
SPNY201	Stepney Green (XSTE)	SPNYGNJ	Stepney Green Jn			½		
CANWHRF	Canary Wharf	SPNYGNJ	Stepney Green Jn			2		2
PUDGMLL	Pudding Mill Lane Jn	SPNY205	Stepney Green (XSTN)		3		2½	
SPNY205	Stepney Green (XSTN)	SPNYGNJ	Stepney Green Jn			½		
PUDGMLL	Pudding Mill Lane Jn	SPNYGNJ	Stepney Green Jn			2½		2½
SPNYGNJ	Stepney Green Jn	WCHAPXR	Whitechapel				1	1
WCHAPXR	Whitechapel	WCHAVRD	Valence Road Crossover		1½	1	1	½
WCHAPXR	Whitechapel	LIVSTLL	Liverpool Street (Elizabeth Line)		2	2	2	1½
WCHAVRD	Valence Road Crossover	LIVSTLL	Liverpool Street (Elizabeth Line)		2	2	2	1½
LIVSTLL	Liverpool Street (Elizabeth Line)	FRNDXR	Farringdon (Elizabeth Line)		1½	1	1	1
FRNDXR	Farringdon (Elizabeth Line)	FRNDFST	Fisher Street Crossover East (FET)	EB	1	1	1	1
FRNDXR	Farringdon (Elizabeth Line)	TOTCTRD	Tottenham Court Road		2	2	2	1½
FRNDXR	Farringdon (Elizabeth Line)	TOTCFST	Fisher Street Crossover West (TWT)	WB	1½	1½	1½	1½
FRNDFST	Fisher Street Crossover East (FET)	TOTCFST	Fisher Street Crossover West (TWT)		½	½	½	½
TOTCFST	Fisher Street Crossover West (TWT)	TOTCTRD	Tottenham Court Road	WB	1½	1	1	1
TOTCFST	Tottenham Court Road	BONDST	Bond Street		1½	1	1	1
BONDST	Bond Street	PADTLL	Paddington (Elizabeth Line)		2½	2	2	1½
PADTLL	Paddington (Elizabeth Line)	WBRNPKS	Westbourne Park CS		2	1½	2	1½
WBRNPKS	Westbourne Park	PRTOBJP	Portobello Junction			1		½

5.1.4 Engineering trains capable of operating fully under CBTC shall use the section timings in Table 5-1 and Table 5-2 above plus the minimum dwell value as detailed in Table 5-6 below.

5.2 Headways

5.2.1 Headway values in the CCOS are applied on depart to depart basis.

5.2.2 Headway values are given in minutes.

5.2.3 All routes are shown.

Table 5-3: Headway Values

XR001 Westbourne Park Junction to Pudding Mill Lane Junction			
Timing Points Included	Down	Up	Notes
Westbourne Park Junction to Stepney Green Junction	2	2	When an OTM follows a Class 345, the headway value of 2 minutes can be used in timetable planning. When a Class 345 operates behind an OTM, the headway value of 4.5 minutes shall be used in timetable planning.
Stepney Green Junction to Pudding Mill Lane Junction	2	2	
XR002 Stepney Green Junction to Abbey Wood (Alsike Road Junction)			
Timing Points Included	Down	Up	Notes
Stepney Green Junction to Abbey Wood	2	2	
Abbey Wood (Elizabeth Line) to Abbey Wood Crossrail Siding			Single Line – one train in section
Abbey Wood Crossrail Siding to Abbey Wood (Alsike Road Junction)			Single Line – one train in section
Plumstead Sidings using Auto Reverse facility	5	5	When trains require relocalisation on CBTC signalling system 15 minutes shall be used.
Plumstead Sidings when Auto Reverse not used	10	10	

5.2.4 The scenarios and TPR planning values for mixed traffic operations on CCOS shall be reviewed as per 5.1.4.

5.3 Junction Margins and Station Planning Rules

5.3.1 Junction Margins and Station dwell times are given in Table 5-4 below. All times shown are in minutes. Where adjustments to SRTs are shown, the value must be added to the normal SRTs. Negative adjustments are specially identified.

5.3.2 Minimum station allowances are the minimum practical for specific rolling stock. These are shown with exceptions being listed by line of route where applicable.

5.3.3 It is permitted to time a departure from a siding at Westbourne Park with a higher number at the same time as an arrival at a lower number (for example, a departure from Siding 5 may be timed to coincide with an arrival in Siding 4).

5.3.4 The junction margin values given in the table below shall apply to conflicting moves.

5.3.6

Table 5-4: Standard Junction Margins and Station Dwell Times

STANDARD PLANNING VALUES	
Dwell Time Allowance (general planning advice)	Allowance
Bond Street, Custom House, Farringdon, Whitechapel and Woolwich	30 Seconds
Canary Wharf, Liverpool Street, Paddington and Tottenham Court Road	60 seconds
Minimum Technical dwell time	15 seconds
Passenger service to ECS with no change of direction	60 seconds
Junction Margin	
Standard Value	90 seconds
Departure following conflicting arrival	30 seconds
Minimum Reversal Timings	
Without Auto-Reverse capability	7 minutes
Class 345 With Auto-Reverse	3 minutes
Multi-purpose vehicle/ Rail Milling Machine/ On Track Machines CBTC fitted	7 minutes
Platform / Siding Re-occupation	
Same direction	90 seconds
Opposite direction (except Plumstead Rev Siding)	120 seconds
Opposite direction at Plumstead Rev Siding	180 seconds
Zorro ('Z') Moves	
Standing time between each leg of the Z Move	30 seconds
Definition of Peak Services	
AM Shoulder Peak [SX only]	0700-0744*, 0915-0959*
AM Peak [SX only]	0745-0914*
<i>*arrival time at Tottenham Court Road</i>	
PM Shoulder Peak [SX only]	1600-1644**, 1815-1859**
PM Peak [SX only]	1645-1814**
<i>**departure time from Tottenham Court Road</i>	

5.4 Timing Allowances

- 5.4.1 A 10% engineering allowance uplift is included in the SRT calculation method (see 7.4.4 and 7.4.8 below) for each timing link.
- 5.4.2 When planning the Robel multipurpose vehicle, a positive adjustment of plus 2 minutes shall be added to the relevant timing link after reversal to allow for CBTC sieving under Staff Accountable Mode.

6. Timetabling Considerations

6.1 National Timetable Integration

- 6.1.1 Timings at boundaries with adjacent IM infrastructure shall integrate fully with the National Rail timetable.
- 6.1.2 Midnight: Network Rail TPS does not allow use of 00:00. Use of extended dwells and pathing time shall be used to accommodate. Use of minus time is not permitted as sub-standard planning values are prevented by the timetable upload facility.
- 6.1.3 Operators shall bid working timetables and short-term variations to Network Rail Capacity Planning for validation and deconfliction in accordance with the timescales outlined in CCOS Network Code Part D.
- 6.1.4 Alternative timetables for operational contingency planning shall be handled under separate arrangements

6.2 Station Dwell Times

- 6.2.1 Variation from the standard station dwell values provided in Table 5-4 (e.g., to 45 seconds) may be permitted subject to the provision of a timetable download mechanism from Network Rail Capacity Planning or the agreement of a working timetable overlay facility.
- 6.2.2 Where a facility indicated in 6.2.1 exists, station dwells should be bid at ½ or whole minute values. For example, two consecutive stations requiring 45seconds dwells should be planned as Station Y ½ minute and Station Z 1 minute.
- 6.2.3 The CBTC timetable management system enforces a minimum value of 15 seconds for all stations (except Woolwich platform B at 30 seconds) and any planned dwell below this value will be rejected during the timetable upload process.
- 6.2.4 Stops with a zero-dwell time (often known as 'dot stops') should not be planned at any physical or virtual station platform within the CCOS.
- 6.2.5 Prior to submitting timetable bids, TOCs should seek guidance from the RFLI Strategy and Performance Team.
- 6.2.6 Departures shall be advertised in the public timetable at the truncated minute value.
- 6.2.7 Where planned dwell time is greater than the planning values provided in Table 5-4 it shall not exceed the planning headway without prior agreement.
- 6.2.8 The CBTC timetable management system enforces a technical maximum of 15 minutes for all stations and planned dwells exceeding this value shall be rejected.

6.3 Single Line Working

- 6.3.1 CCOS is bi-directionally signalled throughout. It is therefore permissible to construct timetables based on single line working based upon available infrastructure. Where 'wrong' direction moves are planned, all station and virtual station platforms should be used to correctly identify the route required to the signalling system.

6.4 Light Locomotive Movements

- 6.4.1 All 'light engine' movements in timetable hours shall be scheduled but shall be subject to fitment of CBTC signalling equipment and the minimum consist length restrictions in the CCOS given in para. 4.7.3 above.
- 6.4.2 All CBTC unfitted movements may only be undertaken within a possession.

7. Procedure for Amending the Values in the Timetable Planning Rules

7.1 General Considerations

- 7.1.1 TPR should provide for current and anticipated service levels, taking cognisance of the Decision Criteria set out in D4.6 of the CCOS Network Code and CCOS Specialised Infrastructure designation.
- 7.1.2 Values generated under this section are subject to condition D2.2 of the CCOS Network Code.

7.2 Guiding Principles

- 7.2.1 Where a gap or deficiency in the delivery of the timetable has been identified, there are four potential courses of action to consider:
- i. Review operational activities;
 - ii. Timetable amendment;
 - iii. TPR review; or
 - iv. Infrastructure interventions.
- 7.2.2 TPR values may be calculated in a few legitimate ways including (in order of priority):
- a. CBTC system recorded actual timing values;
 - b. On Train Monitoring Recorder (OTMR) systems;
 - c. Output from recognised software simulation tools (e.g., Dynamis, Railsys etc.); or
 - d. Manual timing in a quantity agreed with RFLI.

- 7.2.3 Prior to proposal of upwards revisions of TPR values, the aim should be to enhance operational delivery prior to altering TPR values. This approach must be agreed by the parties with defined outputs and delivery timescales, whereby all parties accept the risk of performance under delivery in the interim as a result of delaying TPR change. All stakeholders are responsible for reviewing and optimising their own operational delivery performance.
- 7.2.4 The impact of a proposed TPR value change must be considered by all parties concerned and where deemed necessary, a timetable impact assessment undertaken.
- 7.2.5 A timetable impact assessment may not be necessary in circumstances where TPR value reduction is proposed, but opportunities to improve the timetable should still be taken.
- 7.2.6 All TPR change proposals must be considered in the context of any potential need to apply increased and decreased values together as part of a holistic improvement.
- 7.2.7 TPR values generally cannot be less than the minimum technical value except for SRTs to allow for integration with National Timetable planned to 30seconds. The process for the generation of SRTs is covered in 7.4 below.
- 7.2.8 Changes to individual TPRs shall be supported by evidence supporting the values proposed. Sources of evidence shall be agreed by the affected parties.
- 7.2.9 Supporting information must be stored in a format accessible to both RFLI and Timetable Participants and made available upon request.
- 7.2.10 The CBTC automatic train regulation facility requires planning values to be defined in seconds. However, compatibility with industry planning systems shall be maintained and timings provided in agreed multiples of half minutes in the National Timetable.

7.3 Procedure for Amending Timetable Planning Rules

- 7.3.1 When producing TPR change proposals, RFLI and/or the Timetable Participant will set out why the change is proposed, and the planned date for implementation.
- 7.3.2 The proposal will consist of:
- A proposal number, provided by the appropriate RFLI TPR forum
 - Source data and assumptions for both infrastructure and rolling stock
 - Supporting evidence as agreed by RFLI and affected parties
 - Outputs from simulation models or other methodology, Technical values, planning values, and any rounding applied expressed in seconds and/or %age uplift
 - RFLI will consult in accordance with the CCOS Network Code
 - RFLI will document responses and decisions taken on implementation or otherwise, so that each TPR entry has an audit trail

7.4 Amendment of Sectional Running Time

- 7.4.1 Section 5.1 above contains the current SRTs for Passenger, ECS and non-passenger trains.
- 7.4.2 An SRT is the time taken for various train types (Timing Loads) to traverse a Network Link, representing the fastest route of that Network Link.
- 7.4.3 All SRTs are compiled individually by:
- Direction of travel
 - Each track on multiple lines using the bi-directional signalling capability
 - Optimal performance possible for line and rolling stock, including acceleration or deceleration impact as appropriate
- 7.4.4 To take account of factors such as permissive moves, slow speed junctions, crossovers and platform sharing, additional time in the form of adjustment allowance should be added to schedules and listed in Section 5.3 above. If this additional allowance applies to all trains using the SRT, this allowance should be included in the SRT.
- 7.4.5 SRTs are agreed between TOCs and RFLI as part of the agreement of the CCOS TPR. Normally they will not change from one timetable to the next.
- 7.4.6 New and revised SRTs are agreed between TOCs and RFLI on an individual basis and are supplied by the method agreed in each instance.
- 7.4.7 RFLI will, however, re-calculate SRTs for specific train/ route combinations in the following circumstances:
- a. Where a TOC anticipates using a train/route combination for which no SRT exists;
 - b. Where RFLI anticipates a change to route data, e.g. line speed changes;
 - c. SRTs are unrepresentative of actual train performance;
 - d. Where it is cost-effective to re-calculate all SRTs on a route at the same time as a re-calculation for specific rolling stock.

- 7.4.8 A 10% allowance for engineering shall be included in the TPR calculation.
- 7.4.9 Network Rail national timetable protocols require rounding of the calculated SRTs to obtain values in half minutes. Rounding shall be carried out cumulatively over a route, with intermediate times being rounded down and arrival at destination being rounded up. The accumulative value of the SRTs must not be more than +/- half-a-minute from the accumulative value of the 'raw' data at key junctions and stations.
- 7.4.10 RFLI may carry out other adjustments to the rounded SRTs, e.g. to remove obvious anomalies
- 7.4.11 RFLI may adjust proposed SRTs for different train types to show the same numeric values in order to make maximum use of available line capacity.

7.5 Headways

- 7.5.1 Current headway values are listed in Table 5-3 above.
- 7.5.2 The planning headway is the minimum planned time interval between two successive train schedules at a specific timing point on the same line in the same direction, such that the second train can meet its SRT. This is expressed in multiples of half minutes and is derived from the technical headway rounded to at least the next half minute or above by agreement.
- 7.5.3 Where necessary and appropriate, differential planning headways shall be created for different combinations of:
 - Train type (including weight, length and speed)
 - Stopping pattern
 - Diverging or converging movements
 - For example, two trains departing from a terminal station may have a different headway depending on whether they depart towards the same line (converging), or to different lines (diverging), as in the latter scenario the route of the second train can be set earlier with least restrictive aspects. In the case of a non-stopping train following a train through a platform, the headway needs to allow the first train to accelerate from the platform without the second train seeing restrictive aspects on approach. This is also the case in scenarios where stopping trains follow one another into a station platform.

7.5.4 The technical headway is the minimum permissible time interval between two successive trains at a specific timing point on the same line in the same direction, such that the second train can meet its SRT. This is expressed in seconds.

7.6 Junction Margins

7.6.1 Current standard junction margins are listed in Table 5-4 above.

7.6.2 A Junction Margin is the minimum permissible time interval between two trains that are performing conflicting moves at a timing point, such that the second train can meet its SRT. This is expressed in multiples of half minutes derived from the technical value expressed in seconds.

7.6.3 Where necessary and appropriate, differential junction margins shall be created for different combinations of:

- Train type (including weight, length and speed)
- Stopping or passing movements
- Diverging or converging movements
- For example, a train accelerating from rest across a junction will require a greater margin to avoid impact on the second train, than a train crossing the same junction at line speed. The stopping pattern of both trains must also be considered so that acceleration or deceleration relative to line speed is considered.

7.6.4 The calculation of a junction margin consists of several components:

1. Time taken between the front of the first train passing the timing point and its rear clearing the relevant axle counter
2. Time taken for the CBTC system to reset the route and give a movement authority to the second train
3. Time taken between the second train commencing movement and its front passing the timing point

7.6.5 A basic junction margin is the sum of 1, 2 and 3 above rounded to the next half-minute above to form the planning margin.

7.7 Platform Reoccupation

7.7.1 Platform reoccupation is defined as the time between first train departing and second train arriving at a specific platform in the same direction. This commonly defaults to, but should not exceed, the applicable headway.

7.7.2 Platform Reoccupation is measured separately to station dwell time.

7.7.3 The calculation of a platform reoccupation consists of:

1. Time taken between the first train departing the timing point and its rear clearing the relevant berth;
2. Time taken for CBTC to reset the route and give movement authority to the second train; and
3. Time taken between the second train commencing movement and its arrival at the timing point

7.7.4 Platform reoccupation is the sum of 1, 2 and 3. rounded to the next half-minute above to form the planning value.

7.7.5 The current standard platform reoccupation times are listed in Table 5-4 above.

7.8 Station Dwell Times

7.8.1 Current standard station dwell values are listed in Table 5-4 above.

7.8.2 Station dwell times are the minimum time shown in timetables for trains to be at a stand in a station, from when train wheels stop on arrival to when wheels start on departure.

7.8.3 It includes time for doors to be released open, for passengers to leave and join the train, doors to be confirmed shut and for the train to be dispatched.

7.8.4 Where necessary and appropriate, differential station dwell times shall be created for different combinations of:

- Time of day (e.g. peak hours and weekends);
- Loading patterns;
- Rolling stock; and
- Station staffing arrangements.

7.8.5 Where no station-specific minimum value is specified a standard value of half a minute will apply.

7.8.6 Timetable Participants are responsible for ensuring that station dwell times are robust for operational usage.

7.9 Turnaround Times

7.9.1 Current standard turnaround times are listed in Table 5-4 above.

7.9.2 Turnaround Times are the minimum time required for rolling stock to be prepared on completing one service before it forms the next service.

7.9.3 Where necessary and appropriate, differential turnaround times shall be created for different combinations of:

- Time of day;
- Rolling stock;
- Station staffing arrangements;
- Train operating staff agreements;
- Journey distance; and
- Miscellaneous operational instructions

- 7.9.4 Timetable Participants are responsible for ensuring that turnarounds are robust for operational usage and takes account of local operational railway characteristics.
- 7.9.5 Engineering Recovery Allowances
- 7.9.6 Engineering Recovery Allowance is additional time included in train schedules to cover the impact of planned temporary speed restrictions associated with engineering works on the network.
- 7.9.7 A 10% allowance shall be included in the SRT calculation for each timing link. This has been applied to tables Table 5-1 and Table 5-2 above.

8. References

8.1 RfL company documents

- CCOS Network Code Part D
- CCOS Network Code Part H
- CCOS Network Code Part J
- RFLI COS Rule Book
- RFLI Central Operating Section Operating Instructions (COSOI)
- C620-SIC-R2-RSP-CR001-50022: IRS ATS-001-TSD C620/NR Time Table Data
- C620-SIC-R2-GIN-CR001-50006: ATS Running Time Engineering Calculation

8.2 References

- The Secretary of State. (2006). Railways and other Guided Transport System (safety) regulations.

8.3 Abbreviations

ATO	Automatic Train Operation
CBTC	Communications-Based Train Control
CCOS	Crossrail Central Operating Section
EAS	Engineering Access Statement
IM	Infrastructure Manager
LOR	Line of Route
NR	Network Rail
OTM	On Track Machine
RfL	Rail <i>for</i> London
RFLI	Rail <i>for</i> London (Infrastructure) Limited

ROGS	The Railway and Other Guided Transport Systems (Safety) Regulations
SRT	Sectional Running Time
TIPLOC	Timing Point Location (7 Character Code)
TfL	Transport <i>for</i> London
TPR	Timetable Planning Rules

8.4 Definitions

Automatic Train Operation	Train speed control, starting and stopping functions undertaken by the train (supervised by the Automatic Train Protection component of CBTC).
Auto-Drive	ATO with the driver or operator situated in the leading cab relative to the direction of travel
Auto-Reverse	ATO with the driver or operator not situated in the leading cab relative to the direction of travel
Communications-Based Train Control	Train-borne determination of a train's location, length and integrity. Employs a continuous data communications link between the train-borne equipment and wayside equipment.
Infrastructure Manager	As defined in Part 1 Section 2 of the Railway and Other Guided Transport Systems (safety) regulations (2006)
Zorro ('Z') Move	Facilitates the movement of a train to another running line for same direction working using a trailing crossover by use of Auto-Reverse.