

# INTRODUCTION OF CBTC

by John Hawkins

Signal Migration Area SMA 0.5 provides an introduction to Communications Based Train Control, planned for 27 May 2018. It will control train movements in the area between Hammersmith and Latimer Road, including Hammersmith Sidings which were not previously under signalling control. Its unusual numbering results from it being a subset of SMA 1, the original planned inaugural area, which will reach Paddington.

SMA 0.5 is a small area to allow for driver familiarisation on the Hammersmith and Circle lines and will implement passenger carrying revenue service from Latimer Road westbound platform to Hammersmith, and back to the Latimer Road eastbound platform. Hammersmith Depot will become known as Hammersmith Sidings at this time, but limited maintenance will be possible on No.8 road, which will have a section without traction current and CBTC control.

During trial operations, CBTC will be switched on for testing but switched off to revert to legacy signalling for passenger operations. The stage will not be complete until a “no reversion” decision is taken, when Hammersmith signal cabin can be decommissioned. The Connect radio system will require modification to connect trains with the new HSCC as each SMA is commissioned, and to avoid interference with the new CBTC system.

SMA 0.5 will be operated through Vehicle Control Centre VCC1 at the Hammersmith Service Control Centre (HSCC), which will be monitoring train and points movements from east of Edgware Road station to Hammersmith and also to west of Paddington (Circle Line).

Until later stages are commissioned, VCC1 will generate alarms for this full area, but will not control train movements. Trains approaching Edgware Road will be identified if non-communicating, and redirected accordingly. Edgware Road signal cabin will remain in operation until completion of SMA 2. There is doubt that the current track layout there will allow the planned 32tph, and new high-speed points may be installed at both ends in the 2019/20 year. This work was originally envisaged for 2016/17, but was deferred until 2021/22 to avoid clashing with CBTC installation at a time when confidence for 32tph was higher.

There is a desire to have 53 CBTC equipped S7 trains available to operate SMA0.5 in order to meet the current timetable and fleet maintenance requirements. Unfitted trains will need to avoid the area once CBTC is commissioned. No engineering trains will be fitted at this early stage, and they will only operate under possession arrangements on the Hammersmith branch. There is a compatibility issue between battery locos and S Stock regenerative braking due to higher voltages damaging traction batteries, which will only occur when such trains are required to inter-work in later stages.

It is no coincidence that the first area to migrate is adjacent to the HSCC, since signalling equipment rooms (SERs) communicate with adjacent SERs, and through similar links back to the HSCC. Adjacent SERs will therefore be commissioned sequentially along lines, commencing within the central area.

For simplicity, migration areas end at plain-line stations with automatic signalling. The size of area involved in each SMA is restricted by the time required for staff to bag old signals and peg down old train-stops. There may also be a requirement to unbag new signals and test new train-stops in inter-operable areas, and to install new equipment that cannot be done earlier due to signal sighting problems, etc. At times it is also necessary to modify external control systems such as at the Jubilee, Metropolitan and Piccadilly Line control centres. All of this must also be reversed and tested at the end of each trial period.

The initial SMA for each line is intentionally short to ease the number of instructors needed for driver experience of the new system, each driver being accompanied for their initial trips. This seems to be the reason for the initial SMA 0.5 being a part implementation of SMA 1. The latter, planned for 24 June 2018, will introduce reversing moves over the new crossover from Paddington east to westbound, and from Royal Oak west to eastbound.

District branch drivers will first encounter SMA 2 from Paddington to Edgware Road and back, planned for 2 September 2018, whilst Metropolitan drivers will be introduced to CBTC also in SMA 2 between Finchley Road and Euston Square. All 58 S8 trains will need to be equipped by then. 18 battery locos will also be fitted at this stage to take engineers trains through the area during traffic hours. SMA 2

introduces a new signalled move to reverse from Finchley Road northbound platform back towards Baker Street.

District main drivers will commence in SMA 3 between Stepney Green and Monument, not expected before 2019. This area will also reach Euston Square, and all S7 trains will need to be equipped. This is a significant stage, with all S Stock CBTC equipped, and all SSR drivers trained. It also completes all Circle Line junctions, except for the south-west corner. Whitechapel cabin will be closed. The east end of Tower Hill layout will be commissioned, and new reversing moves introduced from inner to outer rail in both Euston Square platforms and also at Moorgate.

SMA 4 will continue CBTC on the south side of the Circle Line to Sloane Square, before the complex SMA 5, which will complete the Circle Line back to Paddington as well as including Earl's Court and the District Line to Barons Court, Fulham Broadway and Olympia. Lillie Bridge Depot will become signalled sidings in this conversion.

Attention then passes to the east end of the District Line, with SMA 6 covering Stepney Green to Becontree. A further 11 battery locos are to be fitted for this stage. This will complete the Circle and Hammersmith lines, allowing for new timetables reflecting the new running times. Barking signal cabin will remain only for control of Dagenham East, being closed along with Upminster cabin when SMA 7 takes CBTC as far as Upminster. This will complete conversion of 'simple' areas.

SMA 8 will cover the Metropolitan Line north from Finchley Road to Preston Road, and will include adjustments to Jubilee Line Transmission Based Train Control (TBTC) where the two lines inter-work. This area was a major problem when the TBTC was first installed. The Metropolitan Line Control System will close. The two new RAT trains will also need to be fitted for this stage. Since there are no platforms on the fast lines at Preston Road, fast trains will need to stop at the signal nearest the station to change between new and old signalling systems until SMA 9 is completed to West Harrow and Moor Park. This latter area involves an overlay of conventional signals onto the CBTC for Chiltern train movements, and makes Harrow-on-the-Hill signal cabin redundant. Metropolitan Line trains will be required to stop at Moor Park to change between signalling systems, but Chiltern trains will not do so as they can continue operating under colour light signals.

Attention then moves to the west end of the District Line, with areas SMA 10 and 11 being combined, covering west of Barons Court to Richmond, Ealing Broadway and North Ealing. The current legacy signalling will remain from Gunnersbury and Chiswick Park, with CBTC overlaid for operation of S Stock. The District Line will no longer serve fast line platforms, and Piccadilly Line trains will no longer serve slow line platforms east of Acton Town, with both lines confined to their own tracks.

SMA 12 will take the new system from Fulham Broadway to Wimbledon, with the current Network Rail signalling remaining, but the CBTC system again overlaid. This completes the District Line conversion, and ends signal control from Earl's Court, with the Piccadilly Line already expected to be in its Interim Control Centre before its own line upgrade.

Completion of the Metropolitan Line branches is then achieved with SMA 13 north from Moor Park to Watford, Chesham and Amersham, replacing Rickmansworth and Amersham cabins. This area again involves an overlay of conventional signals onto the CBTC for Chiltern train movements. Finally, stage SMA 14, expected in 2021, covers the Uxbridge branch from both West Harrow and South Harrow, closing Rayners Lane cabin. This area involves an overlay of conventional signals onto the CBTC for Piccadilly Line train movements.

Redundant equipment will need to be removed, and block joints replaced with continuous rail after each SMA conversion. Farringdon City Sidings will also require signalling when completed. There is no longer mention of fitting the heritage train fleet for CBTC, although a portable CBTC unit has been considered.