Communications Based Train Control (CBTC) systems

Purpose

To prescribe the rules for using the CBTC system of Safeworking in the MTS Network.

System principle

The CBTC system utilises a continuous data communication link between train-borne CBTC equipment, wayside CBTC equipment and central Automatic Train Supervision (ATS) equipment.

CBTC is defined as “a continuous, automatic train control system utilizing high-resolution train location determination, independent from track circuits; continuous, high-capacity, bidirectional train-to-wayside data communications; and train-borne and wayside processors supporting the implementation of:

- Automatic Train Protection (ATP), and
- Automatic Train Operation (ATO), and
- Automatic Train Supervision (ATS) functions, including Automatic Train Regulation.”

If the CBTC system fails, a method of special working may be introduced.

Grade of Automation

The MTS Network’s CBTC system is designed to achieve a Level 4 Grade of Automation (GoA-4), featuring Unattended Train Operation (UTO) where starting and stopping, operation of doors and handling of specified emergencies are fully automated without any on-train staff.

CBTC system features include:

- determination of each train’s location, length and integrity, and
- detection of the presence of rail traffic in a block, and
- regulation of safe distances between rail traffic in all modes of operation, and
- bi-directional train running capability on all lines, and
- capacity for Qualified Workers to intervene and board and manually operate a train when UTO is not available.

Entry to and exit from blocks is authorised through Automatic Train Supervision (ATS) during normal Unattended Train Operations (UTO), and through Point Position Indicators (PPIs) for manually operated rail traffic during degraded and/or maintenance operations.

System description

The CBTC signalling system features a moving block signalling system overlaid on a Computer Based Interlocking (CBI) fixed block signalling system.

Fixed block

Computer Based Interlocking of axle counters and points through the Central Logic Computer prevents a point position indicator from displaying a proceed indication unless:

- the block beyond the Point Position Indicator is not occupied, and
- there are no conflicting routes set, and
- the points are correctly set.

Moving block

The moving block system allows the real time regulation and safe separation of unattended rail vehicles using Automatic Train Supervision (ATS) and Automatic Train Protection (ATP).

Rail movements correctly activating the signalling system continually communicate speed, location and status of vehicles to generate safe zones around each train.

This information is sourced from:

- beacons
- mechanical odometer
- Car-borne Controller.

The CBTC system obtains information from numerous sources including rail vehicles, Central Logic Computer and Automatic Train

Supervision to prevent a Point Position Indicator from displaying a PROCEED indication unless:

- distances between rail vehicles are within system tolerances, and
- points are set in the correct position, and
- there are no conflicting routes.

Proceed Authority

For rail traffic operating in UTO or PM mode, the Proceed Authority is expressed as a target speed displayed on Train Operator's console.

For manually operated rail traffic, authority to enter and proceed through a block is given by a PROCEED authority displayed by the signal that controls entry to that block.

If manually operated rail traffic is not standing at the fixed signal controlling entry to the block ahead, the Proceed Authority from the rail traffic's current location to that fixed signal or other nominated location is issued verbally by the Traffic Controller.

Rail Traffic Operators must:

- obey PPIs, and
- pass signals at STOP only in accordance with *MSG 608 Passing signals at STOP.*

Rail traffic operating in Unattended Train Operation (UTO) mode or Protected Manual (PM) mode will act in accordance with system information obtained through the CBTC system.

In the unlikely event that UTO or PM rail traffic passes a signal at STOP or breaches an End of Authority, the Traffic Controller must act in accordance with *MSG 608 Passing signals at STOP.*

Issuing a Proceed Authority

For manually operated rail traffic, clearing of the relevant signal gives a Proceed Authority.

For trains operating in UTO or PM mode, the CBTC system will give the Proceed Authority in the form of a target speed.

Implementing Temporary Speed Restrictions (TSRs)

General

TSRs are electronically applied to affected track sections by Traffic Controllers and/ or Engineering Controllers using an ATS Workstation.

When implemented, TSRs automatically reduce the maximum permissible speed of rail traffic operating in either Unattended Train Operations (UTO) mode or Protected Manual (PM) mode.

Traffic Controllers must issue a CAN warning to Rail Traffic Operators when TSRs affect manually operated rail traffic.

TSRs for engineering purposes

TSRs implemented in response to an engineering issue such as a Condition Affecting the Network (CAN) may only be applied, altered or removed by the Engineering Controller, on the authority of the relevant Maintenance Representative.

TSRs implemented for engineering purposes must remain in place until the Maintenance Representative says that normal track speed can be resumed.

TSRs for operational or work on track purposes

TSRs implemented for operational or work on track purposes may only be applied, amended or removed by Traffic Controllers in accordance with the requirements of the Network rules.

Transfer of ATS workstation control

Qualified Workers must only transfer control from the Operations Control Centre (OCC) to an individual station's ATS workstation control (or vice versa) with:

- the authority of the Traffic Controller currently responsible for the control of the station area, and
- the agreement of the Protection Officer, if a work on track authority has been issued for the portion of track.

Transfer of control of a station must not occur:

- whilst rail traffic is closely approaching the station, or
- whilst rail traffic is travelling under manual block working for the affected portion of line, or
- if signals within that station's area of control are being used to prevent rail traffic entry into a worksite.

Procedures

MPR 713 Implementing Temporary Speed Restrictions

MPR 721 Spoken and written communication

MPR 737 Transfer of ATS workstation control

MPR 746 Authorising rail traffic to pass signals at STOP

Effective date

28 April 2025