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COURSE BROCHURE

CBTC Communications-Based Train Control Advanced Training Course

jupiterprime.uk

info@jupiterprime.uk

Registered in the United Kingdom and Saudi Arabia

CBTC Communications-Based Train Control Advanced Training Course

CBTC Communications-Based Train Control is a 2-week advanced training course for metro signalling engineers, rail systems integrators, operations managers and safety assurance staff who specify, deliver or run train control on urban lines, and each participant completes a CBTC Migration and Commissioning Plan. Growing ridership, driverless ambitions and ageing fixed-block equipment are pushing operators to raise line capacity without closing the railway. The course is delivered by Jupiter Prime Training.

Why CBTC Communications-Based Train Control Matters Now

Three pressures shape train control decisions on urban railways today: demand for shorter headways on lines that cannot be widened, the move towards higher grades of automation, and the need to resignal busy lines while passengers keep travelling. Operators, suppliers and safety assessors each judge a project by different measures. An organisation that specifies and migrates carefully gains capacity, reliability and a clear safety case; one that does not faces long disruption, interface disputes and systems that never reach their design performance. The course rests on IEEE 1474.1, the standard for CBTC performance and functional requirements, read alongside general railway safety assurance practice.

Who Gains Most from CBTC Communications-Based Train Control

- Signalling design leads responsible for train control architecture, interlocking interfaces and track layouts
- Systems integration leads responsible for onboard, wayside and radio subsystems working as one
- Operations planners responsible for timetables, headways, degraded modes and staff procedures
- Safety assurance specialists responsible for hazard logs, safety cases and independent assessment
- Project and asset owners responsible for procurement, staging and acceptance of resignalling works

A metro operator or resignalling project team gains most when its signalling, operations and assurance specialists attend together, because migration succeeds only when design choices, operating rules and the safety case move in step.

CBTC Communications-Based Train Control Capabilities

Participants follow a CBTC line from its first headway target to the night it carries passengers under the new system.

- Specify CBTC functional and performance requirements for a line — project owners and procurement leads
- Assess moving block headway gains against civil and rolling stock constraints — operations planners
- Design zone controller, onboard and radio interfaces with clear boundaries — systems integrators
- Test subsystem and integrated behaviour on test track and in shadow running — commissioning teams
- Build the hazard log and safety argument for each migration stage — safety assessors
- Communicate staged migration and degraded mode plans to operators and passengers — senior operations leaders

Key CBTC Communications-Based Train Control Terms

- Moving Block — a principle where safe separation follows each train's actual position and braking curve rather than fixed track sections.
- Zone Controller — the wayside computer that tracks trains in its area and issues movement authorities to each one.
- Movement Authority — the limit up to which a train is permitted to travel safely under current conditions.
- Onboard Controller — the train-borne unit that determines position, supervises speed and enforces braking when limits are exceeded.
- Data Communication System — the radio and fibre network carrying continuous train-to-wayside data in both directions.
- Grade of Automation — a scale describing how far train operation is automated, from driver supervision to unattended running.

CBTC Communications-Based Train Control Day by Day

Day 1: Urban Rail Capacity and Train Control

- Fixed Block Signalling Limits — Explaining Why Headways Stall
- Ridership Growth and Line Capacity Models — Setting the Business Case
- Grades of Automation — Choosing the Operating Concept for the Line
- Metro, Light Rail and People Mover Examples — Comparing CBTC Deployments
- Stakeholder Map for Resignalling — Aligning Operator, Supplier and Assessor

Day 2: System Architecture

- IEEE 1474.1 Functional Requirements — Framing the CBTC Specification
- Automatic Train Protection, Operation and Supervision — Separating Core Functions
- Wayside, Onboard and Central Subsystems — Allocating Responsibilities
- Interlocking Interface Options — Integrating or Replacing Existing Interlockings
- Interoperability and Supplier Lock-In — Weighing Proprietary Architectures

Day 3: Moving Block and Movement Authority

- Safe Braking Model Parameters — Calculating Separation Distances
- Movement Authority Generation Logic — Handling Points, Platforms and Obstacles
- Headway Simulation — Testing Timetable Targets Before Procurement
- Train Location Uncertainty — Balancing Odometry, Beacons and Margins
- Non-Communicating Train Handling — Protecting Mixed Fleet Operation

Day 4: Zone Controllers and Wayside Equipment

- Zone Controller Boundaries and Handover — Designing Seamless Transitions
- Trackside Beacons and Secondary Detection — Choosing Fallback Detection
- Platform Screen Door Interfaces — Coordinating Doors With Train Stopping
- Wayside Redundancy Architectures — Sizing Availability Targets
- Equipment Room and Power Design — Planning Space Within Existing Stations

Day 5: Onboard Systems and Rolling Stock

- Onboard Controller Fitment — Retrofitting Existing Fleets or Specifying New Trains
- Speed Sensors, Accelerometers and Odometry — Securing Position Accuracy
- Traction and Brake Interface Testing — Confirming Predictable Train Response
- Driver Machine Interface Design — Supporting Staff in Every Mode
- Fleet Fitment Sequencing — Matching Train Availability to Migration Stages

Day 6: Radio Data Communication

- Wi-Fi and LTE Data Communication Options — Selecting the Radio Technology
- Radio Coverage Surveys in Tunnels — Planning Access Points and Antennas
- Latency, Handover and Packet Loss Targets — Protecting Movement Authority Updates
- Cybersecurity Zones and Conduits — Defending Train Control Networks
- Interference and Spectrum Coordination — Avoiding Conflicts With Other Users

Day 7: Safety Assurance

- Hazard Identification Workshops for CBTC — Building the Hazard Log
- Safety Integrity Allocation — Assigning Requirements to Subsystems
- Safety Case Structure — Arguing Evidence for Each Migration Stage
- Independent Safety Assessment Interfaces — Planning Reviews Without Delay
- Degraded and Emergency Modes — Defining Safe Operation After Failures

Day 8: Testing and Commissioning

- Factory and Integration Test Strategy — Catching Defects Before Site
- Test Track and Dynamic Testing — Proving Performance on Real Trains
- Shadow Mode Running — Comparing New and Legacy Systems in Service
- Reliability Growth Monitoring — Deciding Readiness for Passenger Service
- Defect Tracking and Acceptance Criteria — Closing Out Contractual Milestones

Day 9: Migrating From Fixed Block

- Overlay Versus Replacement Strategies — Choosing the Migration Path
- Night and Weekend Possession Planning — Limiting Passenger Disruption
- Mixed Mode Operation Rules — Running Fitted and Unfitted Trains Together
- Operations Staff Training and Rule Book Changes — Preparing People for Cutover
- Legacy Equipment Decommissioning — Removing Old Signalling Safely

Day 10: Practising the CBTC Migration and Commissioning Plan

- Line Capacity Case Review — Applying Headway Simulation to the Case Line
- Architecture and Interface Register — Applying Subsystem Boundaries to the Design
- Staged Safety Argument — Applying Hazard Log Methods to Each Cutover
- Test and Shadow Running Schedule — Applying Commissioning Criteria to Milestones
- CBTC Migration and Commissioning Plan — Completing Stages, Risks and Acceptance Gates

Applying CBTC Communications-Based Train Control After the Course

- Run a headway simulation on one existing line to test whether the current CBTC specification meets the timetable target set by operations.
- Lead an interface review between signalling, rolling stock and radio leads to close open boundary questions in the project interface register.

CBTC Communications-Based Train Control Questions FAQ

What is CBTC communications-based train control, and why does it matter now?

It is a train control method that uses continuous radio data to separate trains by their actual positions. It matters now because metro operators need more capacity and automation from existing tunnels, and CBTC is the main route to both.

Which roles gain most from CBTC communications-based train control training?

Signalling designers, systems integrators, operations planners and safety assurance specialists gain most. You will see how each role's decisions affect headway, reliability and the safety case, so you can coordinate them across a resignalling project.

How does CBTC communications-based train control training differ from a mainline signalling course?

It focuses on dense urban lines, moving block and high automation rather than long-distance routes with lineside or cab signalling for mixed traffic. Topics such as platform screen doors, tunnel radio and staged metro migration receive far more attention here.

What do you bring back from CBTC communications-based train control training?

You bring back a staged migration and commissioning plan for a metro line. It covers capacity targets, interfaces, safety arguments, testing and acceptance gates that your project team can adapt to its own line.

CBTC Communications-Based Train Control: The Way Forward

The CBTC Migration and Commissioning Plan first informs which migration path, overlay or replacement, a line should follow. Project owners, signalling leads and safety assessors use it to agree stages and acceptance gates. After its first use, revisit the radio and cybersecurity sections, because data network performance and threats tend to change faster than the train control logic they carry.