

PART D82 DESIGN – RAILWAY SIGNALLING AND COMMUNICATIONS

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1. GENERAL

This Part specifies the requirements for the design of the Railway Signalling and Communications System.

2. DESIGN REPORTS

At a minimum, the Design Reports provided at the following stages for the Signalling and Communications System must include the documentation listed in this Part.

3. REQUIREMENTS DEFINITION (notionally 15% complete)

- (a) Detailed Site Survey Drawings containing:
 - i) Major monuments (eg Railway Stations, Side Roads, over bridges, etc);
 - ii) Existing Master Signalling Plan and trackside signalling equipment including asset numbers and descriptions;
 - iii) Existing railway services;
 - iv) Existing Utility Services;
 - v) Track and civil plan;
 - vi) Existing OHW infrastructure;
 - vii) Existing railway corridor access points;
- (b) Concept Master Signalling Plan
- (c) Concept Design for Primary Cable Containment Route:
 - i) Proposed location of the Primary Cable Containment (Up/Down track side) and Under Track Crossings;
 - ii) Indicative make up of the Primary Cable Containment (Conduit, Ground Level Trough, Galvanised Steel Trunking);
 - iii) Number of conduits where the Primary Cable Containment consists of a pit and conduit system.
- (d) Identification of signalling assets requiring connection via a Secondary Cable Containment Route
- (e) Design Basis Report

4. PRELIMINARY DESIGN (notionally 30% complete)

- (a) Preliminary Impedance and Cross bonding plans
- (b) Combined Services Plan (aerial photograph) overlaid with:
 - i) Master Signalling Plan;
 - ii) trackside signalling equipment including asset numbers and descriptions;
 - iii) major monuments: Railway Stations, Side Roads, over bridges, etc;
 - iv) existing railway services;
 - v) existing Utility Services and indicative clashes;
 - vi) Track and civil plan (inc. drainage);
 - vii) Existing railway corridor access points;
 - viii) OHW mast locations & booster transformers; traction power cable containment
- (c) Preliminary Primary Cable Containment Route, including:

- i) Proposed location of the Primary Cable Containment;
 - ii) Containment Type: Conduit, Ground Level Trough, Galvanised Steel Trunking;
 - iii) Number of conduits;
 - iv) location of pits
 - v) Clash review identifying potential clashes of the Primary Cable Containment with other services including drainage infrastructure.
- (d) Preliminary Secondary Cable Containment Route, including:
- i) identification of signalling assets requiring connection via a Secondary Cable Containment Route,
 - ii) preliminary location of trackside signalling equipment,
 - iii) preliminary location of under track crossings;
 - iv) location of pits.
- (e) Preliminary arrangements for special Cable Containment: on gantries, across creeks, waterways, bridges, embankments, cuttings, subways, station platforms and tunnels.
- (f) Typical details of cable pits
- (g) Preliminary Cable running plans
- (h) Design Development Report including a list of Engineering Waivers to be sought
- (i) Asset List skeleton
- (j) A list of construction specifications
- (k) A list of Inspection and Test Plans

5. **DETAILED DESIGN (notionally 70% complete)**

- (a) Signalling Arrangement
- (b) Level Crossing Control.
- (c) Level crossing focussing plans
- (d) Equipment and generator room layouts
- (e) Stagework designs
- (f) Bills of materials
- (g) Signal Sighting Forms
- (h) Combined Services Plan:
 - i) Chainage,
 - ii) Major monuments (eg Railway Stations, Side Roads, over bridges, etc);
 - iii) Existing Master Signalling Plan and trackside signalling equipment including asset numbers and descriptions;
 - iv) Existing railway services;
 - v) Existing Utility Services and detailed design of Utility Services to be relocated;
 - vi) Track and civil plan;
 - vii) OHW mast locations, booster transformers, etc
 - viii) Traction power cable containment
 - ix) Existing railway corridor access points;
 - x) The combined services plan may be overlaid on aerial photography.
- (i) Primary Cable Containment Route including:
 - i) Location of the Primary Cable Containment (Up/Down track side), Under Track Crossings and Under Road Crossings;
 - ii) Primary Cable Containment detailing sections of Conduit, Ground Level Trough, Galvanised Steel Trunking;
 - iii) Typical trench, Ground Level Trough, Galvanised Steel Trunking cross sections,
 - iv) Number of conduits where the Primary Cable Containment consists of a pit and conduit system,

- v) Detailed construction methodology for conduits (open trench, directional bore, etc),
 - vi) Detailed arrangement across creeks, waterways, bridges, embankments, cuttings, subways, station platforms and tunnels.
 - vii) Closed out clash review of all previously identified clashes
 - viii) Clash review updated to include all clashes of the Primary Cable Containment with other services including drainage infrastructure.
- (j) Secondary Cable Containment Route including:
- i) Detailed location (typically within 10-25 m of the final position) of trackside signalling equipment
 - ii) Location of Secondary Cable Containment Route Under Track Crossings,
 - iii) Construction methodology of each Under Track and Under Road Crossings
 - iv) Secondary Cable Route connections to trackside signalling equipment
 - v) Arrangement of Secondary Cable Containment on gantries, across creeks, waterways, bridges, embankments, cuttings, subways, station platforms and tunnels.
 - vi) Clash review identifying potential clashes of the Secondary Cable Containment with other services including drainage infrastructure
 - vii) Details of cable pits
 - viii) Pits detailed on Drawings:
 - Primary cable / UTX pit
 - Secondary cable / UTX pit
 - Location Case Pits
 - Under Road Crossing pit
 - Secondary cable break out pit
 - Fibre optic joint pits
 - Fibre optic make-off loop pit.
 - ix) Pit Schedule for all pits on Primary Cable Route
 - x) Detailed design of all pits to be used. Where proprietary pits are to be used Product Technical File of pits.
 - xi) Proposed details of cable containment (pit and conduit, Ground Level Trough, Galvanised Steel Trunking) pit entry details
- (k) Location case position:
- i) Preliminary Identification of location case, Up/Down track, approximate chainage
- (l) Location case position including
- i) Detailed position of location case (within 10m of the final position)
 - ii) Concept of safe construction and maintenance access
- (m) Signals
- i) Concept safe construction and maintenance access provisions
- (n) Detailed Design Report including:
- i) Completed Engineering Waivers of issues identified in the Preliminary Design stage,
 - ii) A summary of any additional Engineering Waivers sought due to development of the Detailed Design
- (o) Preliminary Asset List in accordance with PTS-MS-05-AM-PRC-00000091.
- (p) 70% developed Construction Specifications
- (q) 70% developed Inspection and Test Plans.
- (r) Test certificates for the final commissioning and any stageworks

6. **FINAL DESIGN (notionally 100% complete)**

- (a) Signalling Arrangement

- (b) Track Circuit Bonding and Signal Apparatus Plans
- (c) Impedance and Cross bonding plans
- (d) Level Crossing Control.
- (e) Level crossing focussing plans
- (f) Equipment and generator room layouts
- (g) Signalling Diagram
- (h) Stagework designs
- (i) Bills of materials
- (j) Signal Sighting Forms
- (k) "As in service" alterations to circuit plans and application data as required to be completed after each level of stagework. Final "As in Service" plans must be provided after the test copies have been returned and the commissioning is complete.
- (l) Test certificates for the final commissioning and any stageworks
- (m) Combined Services Plan:
 - i) Chainage,
 - ii) Major monuments (eg Railway Stations, Side Roads, over bridges, etc);
 - iii) Master Signalling Plan and trackside signalling equipment including asset numbers and descriptions;
 - iv) Existing and relocated railway services;
 - v) Existing and relocated Utility Services;
 - vi) Track and civil plan;
 - vii) OHW mast locations, booster transformers, etc
 - viii) Traction power cable containment
 - ix) Existing railway corridor access points;
 - x) Details of signalling and communications assets to be decommissioned and/or recovered.
- (n) Primary Cable Containment Route
 - i) Location of the Primary Cable Containment Under Track Crossings and Under Road Crossings;
 - ii) Primary Cable Containment detailing Conduit, Ground Level Troughing, Galvanised Steel Trunking;
 - iii) Trench cross sections for all arrangements including identification of conduits and compartments within Ground Level Troughing
 - iv) Construction methodology for conduits (open trench, directional bore, etc),
 - v) Closed out clash review of all clashes
 - vi) Final design arrangement including all mechanical, structural and civil design across creeks, waterways, bridges, embankments, cuttings, subways, station platforms and tunnels.
- (o) Secondary Cable Containment Route
 - i) Final location of all trackside signalling equipment
 - ii) Secondary Cable Route connections to trackside signalling equipment
 - iii) Final arrangement on gantries, across creeks, waterways, bridges, embankments, cuttings, subways, station platforms and tunnels.
 - iv) Closed out clash review of all clashes
- (p) Details of cable pits
 - i) Final Design of all pits
 - ii) Final location of all pits detailed on plans
 - iii) Pit Schedule detailing the location, size and type of all pits
 - iv) Pit identification labels
 - v) Final design of cable containment (pit and conduit, Ground Level Trough, Galvanised Steel Trunking) pit entry details

- (q) Location case position including
 - i) Final position of location case
 - ii) Safe construction and maintenance access
 - iii) Assessment of sighting issues, eg at pedestrian crossings
- (r) Signals
 - i) Safe construction and maintenance access provisions
 - ii) Cable running plans
- (s) Final Design Report including all Engineering Waivers completed
- (t) Final Asset List in accordance with PTS-MS-05-AM-PRC-00000091.
- (u) Final Construction Specifications
- (v) Final Inspection and Test Plans
