SPC 203

TRACK DESIGN

Version 1.6

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Engineering Specification

Document control

Version	Date	Summary of change
1	December 2008	First issue as a RailCorp document.
1.1	May 2009	Complete document – Format Change; Appendix A - Track Services Checklist ED-001 – Addition of reference to Appendix L Guidelines for Catchpoint Design; Appendix A - Concept Design Guidelines Checklist ED-002 – Addition of reference to Appendix L Guidelines for Catchpoint Design; Appendix L - New appendix - Guidelines for catchpoint design
1.2	December 2009	Change of titles to suit organisation changes
1.3	July 2010	Appendix H - Change Figure A7-8 to more appropriate example
1.4	February 2011	Section 5.2.6 & 5.2.7 Addition of requirements for detailing joints/welds behind monobloc crossings; App B - Change “Acute” crossing angles to “Blunt” crossing angles; App D - Add Checkbox for “Location of joints and/or welds behind monobloc crossings shown” to Tangential & Conventional Timber & Plating Layout – Documentation Checklists
1.5	August 2011	Section 5.2.7 – addition of requirements for angle of attack and switch pad protectors; Appendix B - Addition of switch pad protectors to guidelines
1.6	June 2012	Changes detailed in Summary table below

Summary of changes from previous version

Summary of change	Section
Control changes	Document Control
Reformatted to new template	All
Added guidance on transition ramp limits	Appendix B

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1 Scope and Application

This Specification sets out RailCorp's requirements for the preparation, content and presentation of track design documentation and drawings by designers external to RailCorp.

It covers the following track design activities:

- Horizontal Alignment Design
- Vertical Alignment Design
- Turnout & Special Trackwork Components (Alignment) Design
- Special Trackwork (Manufacture / Installation)
- Permanent Speed Design
- Transit Space Studies (including Cross Sections)

It also provides guidance on design through the use of guidance notes and model checklists.

It is suitable for use as a general technical specification. Particular requirements may need to be added for specific works.

It DOES NOT include the following items that may be required in any particular contract:

- Commercial conditions
- Project management and supervision;

The specification applies to the design of all new and altered track infrastructure to be installed in RailCorp's network.

2 References

2.1 Australian and International Standards

Nil

2.2 RailCorp Documents

Network Rules

OS 001 IM – Train Operating Conditions Manual (TOC Manual)

ESC 200 – Track System

ESC 210 – Track Geometry and Stability

ESC 215 – Transit Space

ESC 240 – Ballast

ESC 250 – Turnouts and Special Trackwork

ESC 410 – Earthworks and Formation

SPC 204 - Track Product Approval

ED 0022P - CAD and Drafting Manual – All Design Areas

ED 0026P - CAD and Drafting Manual - Track

EM 0149 - CAD and Drafting Manual

EM 0241 - Engineering Design Competency System

2.3 Other References

Nil

2.4 Definitions

General Terminology in this specification is detailed in Engineering Standard ESC 200.

The following particular definitions apply to this specification

RailCorp	Rail Corporation of New South Wales (hereinafter referred to as "RailCorp"), the owner of the infrastructure.
Maintenance District	An area of the RailCorp network.
External design firm	The person, company, corporation or authority which is contracted to perform the Works. The term "External design firm" shall be taken to include all employees and sub-contractors under the control of the External design firm.
Chief Engineer Track	The person responsible for the acceptance of track designs for installation on the RailCorp network.
Designer	a suitably experienced competent track design engineer who has the responsibility for: • undertaking the design, • ensuring design achieves the required system performance, and • ensuring the safety and integrity of the design. The designer must have design authority for the work issued by RailCorp and must sign-off the design and all design drawings.
Checker	a suitably experienced competent track design engineer who has the responsibility for: • checking the design, • verifying calculations and methodologies and • verifying that the design achieves the required system performance and safety and integrity. The design checker must have design authority for the work issued by RailCorp and must sign-off the design and all design drawings
Approver (or equivalent)	a person empowered by the external design firm to release designs carried out and verify the external design firm's procedures and protocols have been carried out. Approvers may carry out some level of final "sanity" checking at the discretion of the external design firm. Design Authority from RailCorp is not required to be an Approver. The external design firm is accountable for utilising appropriate persons for this role.
Independent Checker (sometimes referred to as Independent Verifier(Note 1)	This is an additional role as for Checker but with the added proviso that the person must be independent from the group carrying out the design. In addition the verification may not involve directly checking the design calculations but must involve equivalent calculations sufficient to establish the integrity of the design.
Design Verification	Design verification is the process of reviewing and attesting that the output of each design stage conforms to design input requirements for that stage. It is conducted before the documentation is released for the stage. Design verification is not to be considered a single sign-off. Design verification includes the following activities: **Designer sign-off** The designer is responsible for achieving the required design outcome

	Design checking • Design checks are systematic reviews of the activities undertaken by a designer. **Technical Reviews (if required)** • Technical Reviews for projects take place at or close to the completion of each design phase. **Peer Technical Reviews (if required)** • Similar to Technical Reviews, Peer Reviews will be conducted within the External design firm's organisation. **Independent Design checking (if required)** **Design approval** • Design approval is separate and distinct from design checking. • Design approval is required prior to the release of design documentation for construction or alteration of the asset.
Engineering Authority	Track design, review and verification shall only be performed by persons whose qualifications and experience have been submitted and accepted by the Chief Engineer Track to perform the specified work.
Drawings	Layouts, plans, diagrams, tables, schematics and the like that set out the design and/or configuration of track infrastructure assets (e.g. physical dimensions and composition, temporal and/or spatial arrangements and physical interconnections).
Documents	Technical documents relating to the infrastructure asset. It DOES NOT include documents relating to correspondence, administration, finance, marketing, human resource management, project management, contract management and the like.
General review	General review at a high level, rather than a detailed review. Broad verification of general thrust, obvious anomalies including with respect to interfaces with RailCorp.
Acceptance	Acknowledgment that the design meets RailCorp's specified requirements for inclusion as part of RailCorp's track infrastructure and that all required design elements have been completed.

Note 1: An Independent Verifier undertakes part of the process of Design Verification.

3 General Requirements

3.1 Review of Brief/Specification

The client is primarily responsible for developing the technical brief/specification.

Where projects are managed by RailCorp, the Chief Engineer Track will develop the track technical requirements of the brief, or if developed by others, will approve them.

Where a project is managed by TCA or other external agency, the Chief Engineer Track will review the Brief and issue a "no objection".

In either case the Chief Engineer Track may;

1. Nominate the type and extent of reviews to be undertaken at each stage of the design process. The extent of review will be dependent on the perceived risk to RailCorp of the design solutions developed in satisfying the nominated technical brief/specification.

2. Nominate Safety critical design elements that will be subject to a process of independent review.

3. Nominate design elements requiring separate acceptance.

3.2 Design Personnel

Track design activities detailed in this specification may only be undertaken by persons with the appropriate Engineering Authority for each task. RailCorp's requirements for allocation of Engineering Authority are detailed in Engineering Manual EM 0241 – "Engineering Design Competency System"

The allocation of Engineering Authority for design requires that:

- A person is competent to undertake the particular design activity
- The person is in a position that requires this Authority to carry out the design tasks.
- Established procedures exist for carrying out the tasks.

The external design firm is primarily responsible for identification of resources to undertake the design

On behalf of RailCorp the Chief Engineer Track will

1. Undertake a general review of the competencies of the design personnel nominated for the project/task (including changes to nominated designers). Where necessary he will also undertake a detailed review.

2. Sign an agreement to proceed that confers engineering design authority on the selected staff resources for the nominated technical brief/specification.

3.3 Design Procedures

The External design firm shall have design procedures that include systems to monitor the competence and suitability of personnel for whom they may seek Engineering Authority.

RailCorp may, at its discretion, audit the system and review independent audit reports supplied by design firm(s) to confirm the existence and appropriateness of design procedures and assignment of design personnel.

3.4 Track Design

The external design firm's design resources are primarily responsible for design development and verification.

Guidance Note
As a minimum track designs carried out for RailCorp by External Design Firms must have the following: • *Designer: The designer must have design authority for the work issued by RailCorp and must sign-off the design and all design drawings.* • *Checker: The checker must have design authority for the work issued by RailCorp and must sign-off the design and all design drawings.* • *Approver (or equivalent): The approver must sign-off the design and all drawings.* *Note: The Checker and the Designer cannot be the same person.* *In addition RailCorp may specify the requirement for additional independent checking/ verification.* *Independent Checker (sometimes referred to as Independent Verifier); must sign-off the design and all drawings or alternatively provide a separate signed endorsement which references all the relevant design documents. A form of Independent Verification Checklist is provided in Appendix E. Specific approval must be obtained from RailCorp where an external design firm seeks to use an independent checker from a different work group in the same organisation as the designer.*

The external design firm shall:

1. Be responsible for the provision and submission of all documents and drawings necessary for the satisfactory completion and performance of the Works under the Contract.

2. Nominate in the design record the person who has undertaken each design activity.

3. Provide a safe, reliable and fit-for-purpose track design in accordance with the requirements set out in this Specification, referenced standards and other documents forming the contract.

4. Comply with the requirements, practices and procedures set out or referenced in this Specification, except as otherwise expressly approved in writing by the Chief Engineer Track or his/her duly appointed Representative.

5. Produce and present documents and drawings in accordance with RailCorp's documentation and drawing practices, including templates and formats, title blocks, numbering and naming conventions, symbols and nomenclature, indexing and version control practices, and addition and deletion annotation practices. RailCorp's standard practices are detailed in EM 0149 - CAD and Drafting Manual and Section 4 of this Specification

6. Provide data in the required format, for changes that affect RailCorp's survey control system data sets.

7. Provide configuration control of designs and drawings including the preparation of and delivery of all configuration documents and design drawings such that future corrections, additions, deletions, amendments or presentation changes can be readily made by others and are not dependent on any proprietary process that is not an industry standard or on expensive conversion before the change can be made.

8. Provide and maintain a register of all drawings and copies of drawings issued for the Works and work under the Contract, showing all identification details of each drawing issued e.g. drawing number and/or title, type of drawing, purpose of

copy, version number and date, copy number, copy holder name and receipt acknowledgment, issue date, history and current status.

9. Transmit all documents and drawings using standard Transmittal Forms detailing the issue, register the issue details and record and follow up receipt acknowledgments.

10. Provide new and altered final drawings so that they fit into RailCorp's existing series of drawings to form an ordered, comprehensive, consistent and cohesive set in accordance with RailCorp's standard documentation and drawing practices, including drawing registration numbering practices, without the necessity for any modification to the existing series of drawings that are not affected by the work under the Contract.

3.5 Technical Review of External Designs

On behalf of RailCorp the Chief Engineer Track will undertake general reviews of design elements at Concept and Detailed design stages. Where necessary he will also undertake detailed reviews.

The extent of review will be dependent on the perceived risk to RailCorp of the design solutions developed in satisfying the nominated technical brief/specification.

3.6 Acceptance

The Chief Engineer Track (or persons to whom he has assigned appropriate Engineering Authority for the activity) will, on behalf of RailCorp, accept the design for use in RailCorp. ALL designs MUST be accepted for use before they can be applied to RailCorp infrastructure.

The Chief Engineer Track (or persons to whom he has assigned appropriate Engineering Authority for the activity) will sign individual drawings presented by the external design firm as "Design Accepted for use by RailCorp" or, alternatively, may signify acceptance of a schedule of drawings or other documents.

The Chief Engineer Track does not, by any action or omission, accept responsibility for the design. This responsibility remains with the designer. The Chief Engineer Track is accepting the design on behalf of RailCorp based on the assurances provided by the firm, and any independent auditor of the firm, that designers certified as qualified have followed approved procedures, using approved tools, under appropriate supervision.

4 Design Requirements

RailCorp Standards provide for track design options to be selected that require justification and or separate approval by the Chief Engineer Track or other parties.

A checklist (Form ED 001) containing these options is provided in Appendix A. Part 1 of the checklist is normally filled out by RailCorp as part of the design brief. It describes the key design parameters.

Part 2 provides a checklist of the different design options both as a reference and for the external designer to fill out to confirm:

- the design limits used,
- that the relevant documents have been provided, and that
- the required approvals have been obtained.

For the Design Parameter column RailCorp may specify which parameters are to apply and/or cross out sections not applicable. Otherwise the designer shall nominate what he/she has applied, including all relevant approvals, and nominate which sections are not applicable.

Guidelines are provided to External Designers that cover:

- Matters that should be addressed at Concept Stage (Form ED 002 see Appendix B).
- Matters that should be addressed at various stages in the Final Design (Form ED 003 30%, 70% and 100%) (see Appendix C).
- checklists for various design activities (Form ED 004, Form ED 005 and Form ED 006 see Appendix D).

These do not need to be submitted to RailCorp. Review of designs by RailCorp will, however, assess if the matters referred to have been addressed.

In addition to the above RailCorp Track Services' internal procedural documents can be made available to designers on request and at the discretion of RailCorp, on condition that these do not relieve the designer of responsibility for any aspect of the design. The designer should also note that these are regularly updated.

5 Documentation and Drawings

5.1 General Requirements

All Design Drawings shall be produced in accordance with the conventions detailed in RailCorp manuals ED 0026P - CAD and Drafting Manual - Track and ED 0022P - CAD and Drafting Manual – All Design Areas, and the following requirements:.

1. All drawings shall include a RailCorp drawing number (also called an EDMS number), placed in the dedicated position in the drawing title block.

2. CAD files may be transmitted electronically in standard DGN format or, if required, in DXF or DWG formats after converting the file. A paper copy of these drawing should also be issued if practicable.

3. All document transmittals, whether paper or electronic shall be recorded.

4. If a CAD file is to be issued as a work in progress, i.e. preliminary drawing, it shall be treated as an uncontrolled document and the “preliminary” and “uncontrolled” stamps replicated electronically on the drawing. If control is required, a controlled and stamped paper copy shall be provided in parallel with the CAD file. The CAD file itself cannot be controlled.

5. The signature block of drawings shall be signed as shown in Figure 1 below.

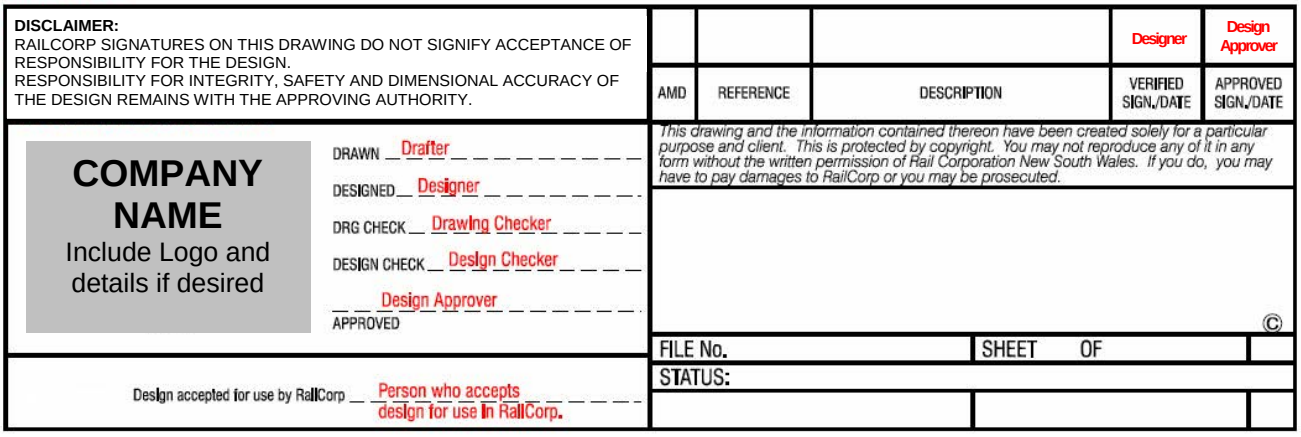


Figure 1 – Title Block

6. When a drawing has been completed and signed, the names (first initial and surname) of the people who have signed the actual drawing shall be shown in printed form in the signature spaces on the CAD file.

7. When a drawing is amended, the initials of the designer and approver shall be placed in the Amendment Box. An asterisk ([) shall be placed next to Designer, Design Checker, Approver and Accepter and the words "[in title block means signed on original issue" added to the signature block (See Figure 2).

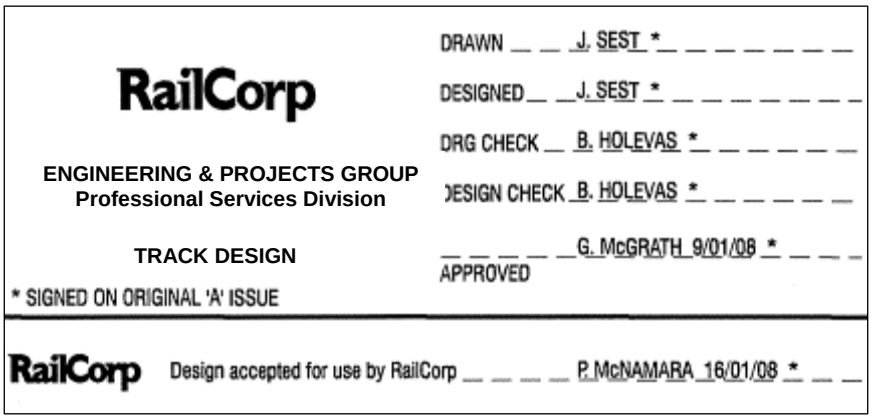


Figure 2 - Title block on amended Drawings

5.2 Drawing Presentation Standards

5.2.1 General

- All drawings should be documented in accordance with the EM 0149 - CAD Manual
- The Title Block shall appear in the bottom right hand corner of each drawing as shown in Figure 1. An alternative arrangement is also available.

Track design involves the production of distinctive drawings depending on the design activity. Each drawing type has some unique presentation requirements. The following sections detail the presentation requirements for each specific drawing type. Reference is made to examples of each drawing type and to examples of individual requirements. It should be noted that the examples shown do not necessarily match the detail on the sample documents.

5.2.2 Horizontal Alignment

The following information should be displayed. (See Appendix F).

Requirement	Comment	Figure Ref
Detail survey	*Show in background as half tone / 75%* *Surveyed features to have annotation for all relevant/significant information*	A5-1
Tracks	*No more than two tracks to be documented on one sheet* *Document tracks in pairs* *Track subject to design to be shaded as shown in Legend*	A5-2
Co-ordinates for frame points.	*Point description, kilometrage, Centre Line name [based on Line Name], Easting & Northing* *Separate schedules for the Down and Up track frame points*	A5-3
Design centreline	*Information for each sheet should be documented on each sheet. You should not have to refer back to an index sheet to sort the alignment*	
Horizontal alignment	*Documented in schedule form*	A5-3
Curve Details	*Show Track Name, Radius and direction, Arc Length, Velocity, Ea, Deficiency, Centre-Easting & Northing*	A5-4
Transition Details	*Show Track Name, Radius, Length, Xc, M & Ramp Rate* *Show non standard ramps by dimension with start and finish km noted (E_a Points)*	A5-5
Straight Details	*Show Bearing & Distance*	A6-7
Track Centres	*Show "6ft" / variable*	A6-7
Turnouts	*Show at scale - Document full detail on the setting out drawing*	A6-9
	Show turnout details in schedule form. Tangential and Conventional as separate schedules)	A5-6
Design Speed	*Show in notes*	
Grid.	*Show at 50m intervals over the whole sheet. This can be scale dependent*	A5-8
Kilometrage Values	*Place at 90° to track.* *Orient so that they can be read in the direction of increasing kilometrage from top to bottom when drawing is rotated 90° clockwise*	A5-9
Kilometrage adjustments	*In accordance with ESC 210*	A6-13
Survey Control Marks	*Show in schedule form. Include identification number, if any, type of mark (SSM / BT etc) and location.*	A5-7
	Show mark location on drawing	A5-10
Co-ordinate System	*Show Horizontal co-ordinate origins, Vertical datum origins and co-ordinate system (eg NGA, ISG, Plane Rectangular) in notes*	A6-12
From & To.	*Show "From XXX" (usually "From Sydney") and "To YYYY" with Sydney on left of the drawing sheet*	A5-11
Multiple sheets	*All drawing detail other than the rails is to be deleted beyond the join lines*	A5-12

Requirement	Comment	Figure Ref
Notes		A5-13
References		A5-14
Legend		A5-15
Scale		A5-16
North Point		A5-17

5.2.3 Track Setting Out Details

The following information should be displayed. (See Appendix G).

Requirement	Comment	Figure Ref
Detail survey	*Show in background as half tone / 75%* *Surveyed features to have annotation for all relevant/significant information*	A6-1
Tracks	*No more than two tracks to be documented on one sheet* *Document tracks in pairs* *Track subject to design to be shaded as shown in Legend*	A6-2
Co-ordinates for frame points.	*Point description, kilometrage, Centre Line name [based on Line Name], Easting & Northing* *Separate schedules for the Down and Up track frame points*	A6-3
Design centreline	*Information for each sheet should be documented on each sheet. You should not have to refer back to an index sheet to sort the alignment*	
Horizontal alignment	*Arrowed in*	A6-5
Curve Details	*Show Track Name, Radius and direction, Arc Length, Velocity, Ea, Deficiency, Centre-Easting & Northing*	A5-4
Transition Details	*Show Track Name, Radius, Length, Xc, M & Ramp Rate* *Show non standard ramps by dimension with start and finish km noted (Ea Points)*	A5-5
Straight Details	*Show Bearing & Distance*	A6-7
Track Centres	*Show "6ft" / variable*	A6-7
Turnouts	*Document Full detail*	A6-9
	Show turnout details in schedule form. Tangential and Conventional as separate schedules)	A6-4
Insulated joint information	*Standard GIJ units or special units fabricated into closure*	A8-4
Traction rail	*Show whether Single rail or Double rail and note approximate stagger* — *for Double Rail*	A6-16
	Show whether Single rail or Double rail and note approximate stagger — *for Single Rail*	A8-5
Clearance Points		
Design Speed	*Show in notes*	
Grid.	*Show at 50m intervals over the whole sheet. This can be scale dependent*	A6-8

Requirement	Comment	Figure Ref
Kilometrage Values	*Place at 90° to track.* *Orient so that they can be read in the direction of increasing kilometrage from top to bottom when drawing is rotated 90° clockwise*	A6-12
Kilometrage adjustments.	*In accordance with ESC 210*	A6-13
Survey Control Marks	*Show in schedule form. Include identification number, if any, type of mark (SSM / BT etc) and location.*	A6-6
Co-ordinate System	*Show Horizontal and Vertical co-ordinate origins and co-ordinate system in notes*	A6-10
From & To.	*Show "From XXX" (usually "From Sydney") and "To YYYY" with Sydney on left of the drawing sheet*	A6-14
Multiple sheets	*All drawing detail other than the rails is to be deleted beyond the join lines*	A5-12
Track pulls	*Show pulls required to get existing track back to design*	A6-15
Notes, references, legend & scale		A5-13 - 16

5.2.4 Vertical Alignment

The following information should be displayed. (See Appendix H)

Requirement	Comment	Figure Ref
Line name	*Show as heading in top left corner of section*	A7-1
Kilometrage location	*The running kilometrage should include labels for the horizontal and vertical alignment frame points. Include kilometrage adjustments*	A7-2
Diagrammatic representation of the horizontal alignment	*With the cardinal points, Ea and radius noted.*	A7-3
Existing rail levels	*Interpolated to 20m intervals*	A7-4
Track Lifts and Lowering	*From existing to design*	A7-5
Grade and Intersection points	*IP metrage and RL*	
Design Rail Levels	*Note to be added to the rail profile nominating the adjoining grades*	A7-6
Grade Values	*Grades to be rounded in accordance with ESC 210*	A7-7
Grading	*With included km*	
Vertical Curve Details	*IP value to be shown*	A7-8
Construction or Interim Grades	*Tie in-grades to existing to be included at concept stage. Helps define the scope for survey*	A7-9
Control and Bench Marks		
Existing and Design Profile		A7-10
Formation Profile	*When required. (i.e. 750mm below rail)*	A7-10
Line diagram		

Requirement	Comment	Figure Ref
Existing & Proposed Design Structures	*Overbridges, Underbridges, tunnels, pipes, culverts, Turnouts, Platforms (level or standard) Topographic Features. Show above and describe the profile at their longitudinally plotted location.*	A7-12
	Underside of girder levels. (Overbridges)	A7-13
	Deck levels. (Underbridges)	
Ballast depth when available		A7-14
Contact and catenaries	*When required for Over Head Wire design*	A7-11
Notes	*Design velocity (speed)*	A7-15
	Datum, km and survey origin	
	Special super ramps	
Scale	*Preferred ratio 100:1000 or other recognised scales*	A7-16
References, legend		A7-17 - 18

5.2.5 Field Layout for Tangential Turnouts

Description

This drawing is intended to provide a plan, laid out in correct orientation, for the track crew carrying out pre-assembly. Position of Insulated Joints, type of IJ units and cant sets requirements are shown. Initial layout of ties (bearers) allows 'rough' layout to be as close as possible to final layout. This minimises inaccuracies as well as reducing re-work.

The following information should be displayed. (See Appendix I)

Requirement	Comment	Figure Ref
Turnout Type and parameters		
Tie Layout	*Initial Layout for Turnout & End infill ties*	A8-1
	Final Layouts for Turnout & End infill ties	A8-2
Setting Out dimensions	*for turnout & end infill steelwork*	A8-3
Insulated joint information	*Standard GIJ units or special units fabricated into closure*	A8-4
Traction rail	*Show whether Single rail or Double rail and note approximate stagger*	A8-5
In-bearer	*Tie arrangements at points (where required)*	
Closure details	*including specials with built in GIJs*	A8-6
Closure and check rail carrier labels	*A,B,C,D,E,F,G,H,K etc – in traditional sequence (See Figure 3)*	A8-7
Additional plating	*Adjacent to GIJs*	A8-9
Notes, references, drawing number & scale		A8-8

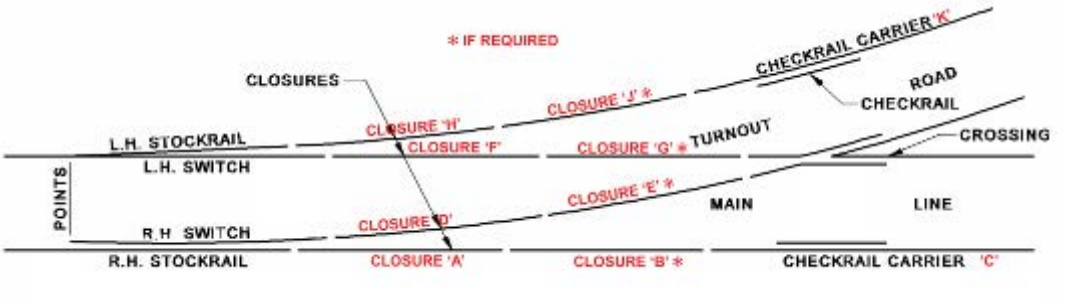


Figure 3 - Closure naming conventions

5.2.6 Tangential Turnouts – Tie Layout and Details

The following information should be displayed. (See Appendix J)

Requirement	Comment	Figure Ref
Turnout details	*Location, points numbers, type, length*	
Concrete Turnout Tie Layout	*Spacing of bearers (between bearers and cumulative on both sides) from commencement of cant reducing plates at either end.*	A9-1
Bearer Details	*Length of each bearer*	A9-1
	Identification No. of each bearer	A9-1 & A9-6
Pad Details	*Pad dimensions for all turnout base plates*	A9-2
Closure details	*including specials with built in GIJs*	A9-3
Closure and check rail carrier labels	*A,B,C,D,E,F,G,H,K etc – in traditional sequence (See Figure 3)*	A9-4
Screw spike inserts	*Typical details*	A9-5
Method of securing rails with double clip washers	*(where required)*	
Insulated joint information.	*Standard GIJ units or special units fabricated into closure*	A9-7
Traction rail	*Show whether Single rail or Double rail and note approximate stagger*	A9-8
In-bearer	*Tie arrangements at points*	
Notes, references and scale.	*The location of joints/ welds and any special requirements must be included. There are minimum lengths required behind monobloc crossings (to maintain a minimum distance to the flashbutt weld in the monobloc). This may require, for example, a weld within the checkrail carrier which can be carried out with modern designs. Similar issues could arise with the positioning of GIJs. For example a note could be added to the joint location "joint location is critical, welding requires removal of guard rail."*	A9-9

5.2.7 Conventional Turnouts – Timber and Plating

The following information should be displayed. (See Appendix K)

Requirement	Comment	Figure Ref
Timber & Plating Details	*Length and spacing of bearers from commencement of cant reducing plates at either end.* *Identification No. of each plate*	A10-1
Table of materials	*Item numbers to be referenced to components on drawing. Includes:*	A10-2
	Table of pandrol base plates	A10-3
	Table of timber bearers	A10-4
	Table of closures	A10-5
	Table of heelblock dimensions	A10-6
	Table of standard plates	A10-7
Setting out dimensions for turnout steelwork	*includes offsets to mainline and turnout for field layout and check purposes*	A10-8
Switch, stockrail and checkrail details	*includes offsets, mid-ordinates, radii and curvature direction of these components*	A10-9
Crossing Details	*Crossing rate and XL catalogue number shown in Material List with reference to detail drawing*	
Insulated joint information.	*Show standard GIJ units or special units fabricated into closure*	A9-7
Traction rail	*Show whether Single rail or Double rail and note approximate stagger*	A9-8
Closure details	*including specials with built in GIJs*	
Closure and check rail carrier labels	*A,B,C,D,E,F,G,H,K etc – in traditional sequence (See Figure 3)*	A10-10
Notes, references and scale.	*The location of joints/ welds and any special requirements must be included. There are minimum lengths required behind monobloc crossings (to maintain a minimum distance to the flashbutt weld in the monobloc). This may require, for example, a weld within the checkrail carrier which can be carried out with modern designs. Similar issues could arise with the positioning of GIJs. For example a note could be added to the joint location "joint location is critical, welding requires removal of guard rail."* *Include whether switch pad protectors are provided in accordance with the requirements of ESC 250*	A10-11

5.3 Control of Drawings

1. The issue and revision of technical drawings during the design process shall be controlled so that the status of all copies of drawings is clearly identifiable and verifiable, and all design work based on copies of drawings is carried out using the latest revision.

2. The status of master drawings and controlled copies is to be evident at all times. The status of numbered drawings and their copies is to be evident from amendment identification and stamps.

3. The first issue of approved drawings and any subsequent revisions shall be marked with capitalised alpha characters ("A", "B", "C" etc). DO NOT use capitalised alpha characters for version control of documents prior to approval.

4. External Designers shall nominate the numbering system used for pre-approval drawings.

5. Approved drawings shall be issued in whatever format has been agreed (eg paper prints, plastic, .pdf or .tiff file). When first issued, the drawing will be amendment "A" and shall be marked accordingly in the title block.

6. Note: When a design is complete and the drawing/s are accepted for use by RailCorp, the original plans will be lodged by Rail Corp in RailCorp's Plan Room.

7. Where design amendments are required after drawings have been accepted by RailCorp and registered, they shall be verified and approved by the external design firm in the same manner as initial design, and shall be accepted by the Chief Engineer Track. Appropriate notation shall be made on the amended drawing/s.

8. If "As-Built" drawings are specified in the Brief, and upon receiving work-as-executed information from the field, a final amendment incorporating this information shall be made to the drawing, with the words "as-built details" in the amendment block

Guidance Notes
• *Drawing amendments are design changes. Design changes are undertaken by following the same process as initial design. Design sign-off, design checking and approval and acceptance for use in RailCorp are required as is all appropriate documentation.* • *On the drawing, increment the previous amendment letter shown in the title block (eg amendment "B" becomes "C"). Indicate the new amendment letter in the body of the drawing beside the amendment.* • *Add the description of the change to the amendment block on the drawing.* • *When a drawing is prepared in such a way as to supersede a previously registered drawing, and a new number is issued, if required place a note, in 5mm high upper case, immediately above the title block to draw attention to this fact,. This note shall be in the form of "this drawing supersedes CV 1234567" and also a note "this drawing superseded by CV 9876543" shall be added to the superseded drawing.*

9. All documentation and drawings including those submitted for review, shall be laid out in a clear and logical fashion and shall be such as to facilitate understanding, checking, construction and maintenance.

10. All drawings and documentation applicable to temporary works including stage work, interface work etc. shall be clearly endorsed as such on each drawing sheet. All details necessary for such temporary works should be added to a reproducible copy of the existing arrangements and/or to a reproducible copy of final arrangements as appropriate to facilitate production of the temporary or stage work drawing.

11. The practice for showing work comprising alterations shall include the detailing of existing track and structures to be removed, as they exist, but with linework preferably dotted. New work shall be shown in full linework highlighted with filled arrows. To assist in clarity of the changes, areas may be circled or clouded to highlight.

12. All copies of documents and drawings shall be designated as to their purpose

Guidance Notes	
Drawing Control Stamps (or electronic equivalents) are used to identify the reason the copy of the plan was created. The following categories are used:	
Status	
RECEIVED ..../..../....	*Drawing prepared outside Track Services Unit and received on this date.*
PRELIMINARY	*Not complete at issue and likely to be changed and revised before approval. It should not be relied upon for any purpose other than that stamped, or otherwise shown on the drawing.*
Note, a drawing is complete and approved when it is signed as approved.	
Control	
CONTROLLED Only if in Red Ink	*A preliminary copy issued for a design, or other quality purpose. The issuing authority has registered the issue, will increment the revision number as significant change occurs, and will then issue revised copies to the holder.*
UNCONTROLLED	*A preliminary copy which is not controlled or registered. The issuing authority will not issue updates as revisions occur.*
Intended Use	
FOR TENDERING	*The drawing is sufficiently developed to be relied upon for tendering purposes.*
FOR DESIGN CHECKING	*This copy is issued for use in checking the design/ drawing.*
FOR CONSTRUCTION The Constructing Authority is responsible for "As Built" drawings	*This drawing is issued for construction work.*
FOR TESTING	*This drawing is issued to facilitate testing.*

AS-BUILT

Please review the status of installation/construction at completion of key milestones, mark up alterations in RED PERMANENT INK and return to the Designer within 1 Week of Key Milestone AND/OR Practical Completion.

Project Status: ☞ Work in Progress
☞ As-Built at Practical Completion
(Strike out where Not applicable)

Signed:

Construction Supervisor

.....

Signature Date

Site Engineer

.....

Signature Date

The 'AS -BUILT' drawing stamp shown above when applied to a 'construction' drawing indicates that the drawing has been marked-up to show the actual 'as-built' configuration of the work installed on site. 'As-built' drawings are provided if requested by the client and stated in the scope of works. They can be prepared at either a key 'milestone' during the work in progress or at the completion of the work following Practical Completion.

Colour of Stamps

All the above stamps (or electronic equivalents) are coloured in red ink. This facilitates identification of unofficial copies because where a stamped drawing has been copied, the stamps will appear the same colour as the rest of the drawing and the copy of the drawing is not to be relied upon for any purpose.

Appendix A Track Services Checklist

External Design Service Providers : Mandatory RailCorp Approvals - TRACK SERVICES CHECKLIST	Checklist ED-001 Page 1 of 4

PART 1 *To be completed by RailCorp*

Project Identification

Location		Design Stage	❑ Concept ❑ …… % Final
Description		Project ID	
External design firm		Organisation responsible for obtaining RailCorp Approvals	##

Engineering Authority

Design Activities Required	❑ Horizontal & Vertical Alignment (Plain Track)		❑ Transit Space Studies
	❑ Turnout & Special Components (Alignment)		❑ Speed Board Configuration
	❑ Special Trackwork (Manufacture / Installation)		❑ Track Structure
	❑ Other ……		
Documentation Submitted	❑ Key Personnel Register incl. Project Responsibilities for Designing, Checking, Verifying, etc		
	❑ Relevant Work Experience	❑ CV's	❑ Other ……
RailCorp Allocation**	❑ Chief Engineer, Track	*or under delegation to*	❑ Principal Engineer Design, Track
Comments	……		

Design Controls

Traffic Classification	T……..	Track Structure Classification	……./……../…… OR ❑ Designer to determine	
RailCorp Design Standards applied	❑ ESC 200	❑ ESC 210	❑ ESC 215	❑ ESC 250
	Others ……			
Platforms	❑ Level Access	❑ Standard Access	❑ Existing	❑ None
Rolling Stock Outline	❑ Narrow Electric	❑ Medium Electric	❑ Extended Medium Electric	
	❑ Wide Electric	❑ Other ……		
	Applicable to Platforms also	❑ *Yes*	❑ *No*	…… *(applies)*
Service Corridor Requirements	❑ Standard Service Corridor with Road Access	❑ **one side**	❑ **both sides**	
	❑ Standard Service Corridor without Road Access			
	❑ Other……			
	Designer is required to get maintainer's approval	❑ YES	❑ NO	

Organisation responsible for obtaining RailCorp Approvals, during the Design Process Stage. (could be the External design firm).

External Design Service Providers : Mandatory RailCorp Approvals - TRACK SERVICES CHECKLIST	Checklist ED-001 Page 2 of 4

PART 2 *To be completed by designer (except where completed by RailCorp)*

Location		Design Stage	❑ Concept
Project ID			❑ …… % Final

Design Process

Infrastructure Item	Design Parameter	Documentation to be prepared by External design firm	RailCorp Approvals ** (Minimum)
Design Limits (Geometry) ***(ESC 210)***	❑ Normal Limits (preferred)	N/A	
	❑ Max / Min Limits	❑ Submission of documented justification, including identification of applicable Infrastructure	☞ ❑ Maintainer
	❑ Exceptional Limits	❑ Submission of documented justification, including identification of applicable Infrastructure	☞ ❑ Chief Engineer Track
Transit Space ***(ESC 215)***	❑ Normal Structure Gauge	N/A	
	❑ General Kinematic Structure Gauge – tolerances complying with Standard	❑ Submission of documented justification, including identification of applicable Infrastructure	☞ ❑ Maintainer
	❑ Structure Gauge Waiver (**non compliant** to General Kinematic Structure Gauge)	❑ Submission of documented justification, including identification of applicable Infrastructure, in form of Waiver ❑ Transit Space Infringement Risk Assessment	☞ ❑ Chief Engineer Track
	❑ Platforms - existing track alignment varies from design track alignment. This is an issue if existing track alignment is retained after platform coping installed to design alignment.	❑ Submission for approval where impact on platform clearances does not conform to Standard.	☞ ❑ Chief Engineer Track
Platform Gaps ***New Corridor Design (ESC 210)***	❑ Compliant to ESC 210-Section 7.5	N/A	
	❑ Non-Compliant to ESC 210-Section 7.5	❑ Submission of documented justification, including extent of gaps, in form of Waiver. Include any special gap reduction measures. ❑ Waiver Risk Assessment	☞ ❑ ☞ ❑ Chief Engineer, Track AND General Manager Station Operations
Platforms Gaps ***Existing Corridor – Normal & Max/Min Limits (ESC 210)***	❑ Compliant to ESC 210-Section 7.5	N/A	
	❑ Non-Compliant to ESC 210-Section 7.5	❑ Submission of documented justification, including extent of gaps, in form of Waiver. Include any special gap reduction measures. ❑ Waiver Risk Assessment	☞ ❑ ☞ ❑ Chief Engineer, Track AND General Manager Station Operations

External Design Service Providers : Mandatory RailCorp Approvals - TRACK SERVICES CHECKLIST			Checklist ED-001 Page 3 of 4
Location		Design Stage	❑ Concept
Project ID			❑ …… % Final

Design Process (continued)

Infrastructure Item	Design Parameter	Documentation to be prepared by External design firm	RailCorp Approvals ** (Minimum)
Speed Boards (ESC 210)	❑ Configuration of Boards including requirements in bi-directionally signalled sections	❑ Submission of Speed board configuration diagrams and spreadsheets.	☞ NOTE: Final approval by Chief Engineer, Track (or delegate)
	Interface Input ❑ Signalling ❑ OHW ❑ Bridges and Structures ❑ RailCorp District	❑ Detail all matters affecting the speed – eg catchpoint risk, buffer stop limits, level crossing site distance	
Turnouts (ESC 210)	**Horizontal alignment**		
	❑ In tangent track	N/A	
	❑ In curves > 600m radius	❑ Submission of documented justification	☞ ❑ Maintainer
	❑ In curves < 600m radius	❑ Submission of documented justification including impact on individual components (ie switch/crossing)	☞ ❑ Chief Engineer, Track
	Vertical Alignment		
	❑ On constant grade	N/A	
	❑ VC ≥ 3000m radius	❑ Submission of documented justification	☞ ❑ Maintainer
	❑ VC < 3000m radius	❑ Submission of documented justification including impact on individual components (ie switch/crossing)	☞ ❑ Chief Engineer, Track
	❑ Long Bearers (≤ 6.4m timber) (≤ 6.6m Concrete)	N/A	
	❑ Long Bearers (> 6.4m timber) (> 6.6m Concrete)	❑ Submission of documented justification	☞ ❑ Maintainer
	❑		
Track Products (General)	❑ Standard	N/A	
	❑ New or non-conforming	❑ Type Approval documentation including Hazard Assessment & FMECA Analysis	☞ ❑ Chief Engineer, Track
Special Trackwork	❑ Diamonds ❑ Slips ❑ Other ……	❑ Submission of documented justification	☞ ❑ Chief Engineer, Track

External Design Service Providers : Mandatory RailCorp Approvals - TRACK SERVICES CHECKLIST			Checklist ED-001 Page 4 of 4
Location		Design Stage	❑ Concept
Project ID			❑ …… % Final

Design Process (continued)

Infrastructure Item	Design Parameter	Documentation to be prepared by External design firm	RailCorp Approvals ** (Minimum)
Catchpoints, runaway turnouts *(See Appendix L for Guidance on Catchpoint design)*	❑ 40 metre clear runoff areas (speed < 25kph)*	N/A	
	❑ 40 metre clear runoff areas (speed > 25kph)	❑ Submission of documented justification in form of Waiver ❑ Waiver Risk Assessment	☞ ❑ Chief Engineer, Track
	❑ < 40 metre clear runoff areas	❑ Submission of documented justification in form of Waiver (including Design Solutions) ❑ Waiver Risk Assessment	☞ ❑ Chief Engineer, Track
Formation	❑ Ballast Depth outside the standard requirement	❑ Submission of documented justification in form of Waiver ❑ Waiver Risk Assessment	☞ ❑ Chief Engineer, Track
	❑ Capping crossfall, continuous, under multiple tracks (Single turnouts to be assessed)	❑ Document drainage impacts	☞ ❑ Chief Engineer, Track
Interfaces	❑ Signalling (including the configuration of the point operating equipment) ❑ OHW ❑ Structures ❑ Platforms ❑ Drainage	❑ Document impact of Track Alignment on other Discipline infrastructure *Submit through RailCorp's Design Delivery Delivery Manager or ##*	☞ ❑ Chief Engineer, Signals, Civil, Electrical

Design Documentation Deliverables *(to be completed by RailCorp)*

Design Document	Control Documentation	RailCorp Approvals **
❑ H & V Alignment	❑ RailCorp CAD Manual	❑ ☞ ❑ Chief Engineer, Track OR Principal Engineer Design, Track
❑ Earthwork Cross Sections	❑ Track Services Design Presentation Standards	
❑ Speed Board Configuration	❑ Other system specification	
❑ Special Trackwork		
❑ Transit Space Analysis		
❑ Detail Survey		

*Speed can be achieved by signalling system if failsafe (eg Timed trainstops on Passenger sidings)

**RailCorp Approvals are Mandatory and must be provided prior to commencement of next Stage of the Design Process

Appendix B Concept Design Guidelines

***Guideline* - Concept / Reference Design ~ Basic Issues for External Design Service Providers**			**Checklist ED-002**
Infrastructure	**Specific Issues to be identified and addressed during this Stage** (Note 1)	**Impact**	**Reference**
Platforms	Proximity of turnouts	Platform gaps, height	ESC 210, Section 7.5
	Sharp radii curves		
	Level or Standard Access		
	Design Track alignment adopted		
	Rolling Stock outline		
	Existing / Design track alignment	*If the existing track alignment and design track alignment vary then the impact on a new platform or platform extension needs to be addressed. Particularly where the track stays in its existing location and is not placed on design alignment, for any length of time*	
	Existing level crossings	Affect of platform height	
Turnouts	Type – Non Standard Configurations	Design not available	ESC 250, Sect 7
	Blunt crossing angles	Reduced main line speed, Increased wheel rail impact, increasing wear and component failure	ESC 250, Section 7.2
	In curves	Special componentry such as crossings and switches, Increase in maintenance and risk Operating speed in turnout direction (impact of turnout radius and negative super elevation)	ESC 250, Section 7.1.1.1, Section 7.1.7
	In curves < 600m radius	Increase maintenance, risk Special componentry	ESC 250, Section 7.1.1.1
	Vertical Alignment (ie turnout in VC)	Switch binding or not supported by plating (depends on direction of VC) Crossing is rigid (not bent to VC radius)	ESC 250, Secton 7.1.1.2 & ESC 210, Section 7.3.1.5
	Nesting	Turnouts should be separated where practical so that they may be maintained and replaced independently	ESC 250, Section 7.1.1.1,
	Switch protection pads	To be installed to protect conventional switches in siding turnouts where the crossing rate is ≤ 1 in 8.25	ESC 250, Section 6.1.6.1
Rolling Stock	Clearances	Clearance points	
		Location of OHWS, retaining walls, abutments, all track side structures	ESC 215
		Platforms	
		Track Centres	
Speed Boards	Placement (incl sighting)	Interface with Signalling, Electrical, Bridges and Structures, District Staff	ESC 210, Sect 8 RailCorp - Network Rules, TOC Manual
Special Trackwork	**Crossovers**		
	In curves	Operating speed, D^{roc}	ESC 250, Section 7.1.5.1, 7.1.1.1
	Long Beams under multiple tracks	Tracks need to be co-planar if centres result in long beams under both tracks. Maintenance - Tamping	
	Diamonds		
	Blunt crossing angles	Reduced main line speed, Increased wheel rail impact, increasing wear and component failure	ESC 250, Section 7.2
	New Products	Type approval	SPC 204
Catchpoints	Run off area – 40m (min) 25kph (max)	Earthworks (traps and impact barriers) Placement of structures Train speed	ESC 250, Section 5.4 *Design Guidelines Appendix L*
Buffer Stops	Track speed	Length of Sidings Over run area and hence Earthworks Placement of structures	Refer to Chief Engineer Civil for buffer stop type

***Guideline* - Concept / Reference Design ~ Basic Issues for External Design Service Providers**			**Checklist ED-002**
Infrastructure	**Specific Issues to be identified and addressed during this Stage** (Note 1)	**Impact**	**Reference**
Track Structure	Ballast depths (min/max)	Open Track Bridge decks, direct fixation, temporary Under-track crossings	ESC 200 Section 5, 6 & ESC 240
Signalling Interface	Train Speed control	Buffer Stop placement / design	
	Point Operation	Location of point motors, use of in-bearers, independent switches Turnout beams re drilling for point motor type Speed boards	
		Relocation of turnouts (points position in particular) relative to location of existing GIJs and signals/	
		How far points are moving – impact on OHWS, signals, structures	
Track Formation	Safe places	Location of Refuges, hand holds	ESC 215 & ESC 350
	Cross section	Location of drainage pits and lines, cess drains	ESC 410 & ESC 420
	Access for maintenance – turnouts, special trackwork	Access to track by staff and vehicles, drivers walkways *check proximity to features that may affect the ability to safely maintain new track and turnouts*	ESC 215
Plain Track	Alignment and impact of Design Speed	Normal limits for radii, transition parameters, superelevation, superelevation ramp (Note 3), cant deficiency, D^{roc} *note the potential impact of proposals for future works such as quadruplication, turnbacks, upgrades, etc*	ESC 210 – Table 1
General	Maintenance and Constructability	Possession regime, site access	
NOTES :	1. The process for RailCorp approval/resolution of the Issues above is provided in the Checklist – "Mandatory RailCorp Approvals". 2. Where issues are identified at this Stage of the Design Process they must be resolved prior to progressing to the Final Design Stages. 3. Consideration needs to be given to the implications for Base Operating Conditions for track geometry. Rates less than 1 in 650 will impact on track maintenance for speeds more than 60kph		

Appendix C Final Design Guidelines

***Guideline* - Final Design ~ Basic Issues for External Design Service Providers**		**Checklist ED-003** **Page 1 of 2**
The Design Brief should identify the Track Classification / Operating Class (ESC 200) and as a minimum the brief should allow the designer to determine clearly the *Design Brief- Criteria* indicated in Column 1 of the Table below.		
Design Brief - Criteria	**Design Applications /Impact**	**Standards**
Track Classification		
	Track Structure – main line or siding, rail & sleeper type, ballast depth, fastenings, etc	ESC 200
Existing Infrastructure		
Future Upgrading Works	Allowance for future track centres, train operations, etc	
Operational		
Speed		
Plain Track, crossing loops	H & V Alignment & Speedboard configuration	ESC 210 – Sects 6, 8 and TOC Manual
Turnouts, crossovers	Selection of Type	ESC 250 – Sect 5.1
Terminating Roads, stabling facilities, yards,	Length Buffer Stop (type) Grade limits for yard operation	See "Design Guidelines for Train Stabling Yards & Turnback Sidings
Reference Design		
including Train Movements	Track configuration including location of turnouts, crossovers, platforms	
Transit Space Requirements		
Rolling Stock Gauge	Platform Clearances	ESC 215 – Sect 11
	Track Centres	ESC 215 – Sect 7.1.6
	Location of C'pts	ESC 250 – Sect 5.4
	Location of Trackside Structures (H & V)	ESC 215 – Sect 6
Train Lengths	Standing Room	
Platform Type (ie Level or Standard access)	Platform Gaps	ESC 215 – Sect 12
	H & V Track Alignment	
Platform configuration (ie straight / curved)	H & V Track Alignment	
	Turnout location	
	Platform Gaps	
Protective Devices		
Catchpoints	Run off areas	
	Location of structures	
Buffer Stops	Over run requirements - speed	
	Type	
Future track configuration		
Quadruplication, duplication, etc	H & V Track Alignment	
	Location of future turnouts	
Formation		
Maintenance Access and Walkways	Track Centres	
	Earthwork X- Section, drainage	
	Safe places	
Design General Issues		
Design Limits	Track Alignment design	ESC 210 – Section 7.1.1
Design Presentation	RailCorp's Documentation requirements	Track Services Manual, RailCad Manual for Track
Engineering Authority		
	Written delegation by RailCorp on evidence provided by Design Contractor. Project specific.	

***Guideline* - Final Design ~ Basic Issues for External Design Service Providers**		**Checklist ED-003 Page 2 of 2**
30% Design Issues	**70% Design Issues**	**100% Design issues**
At this Stage the following criteria need to be identified and reported upon :		
❑Issues outside normal design limits but meeting max/min limits ❑Justification and application for RailCorp approval for those issues covered by Exceptional Design Limits ❑Infringements to Standard Structure Gauge requirements ❑Requirements for waivers for non compliance to Standards ❑Special track componentry adopted ❑Impact on existing rail infrastructure particularly Track alignment ❑Clearance to track side structures such as over bridges, signals, retaining walls, etc ❑Ballast depths and formation profile ❑Vertical and horizontal clearance to OHW and OHWS ❑Train run off areas associated with catchpoints and buffer stops ❑Friction buffer stops require additional siding length ❑Requirements for “Safe Places” in locations with restricted clearances ❑Crossovers and requirement for tracks being co-planar for long crossover beams ❑Constructability of track infrastructure ❑Impact of track alignment and turnout location on platform gaps. ❑Impact of the variation between existing alignment and design alignment on Platform Gaps ❑Impact of walkways, lighting, train inspections requirements, etc, on track centres in stabling sidings.	❑Type approval documentation for all componentry outside approved RailCorp configurations ❑Response to Stakeholder feedback at 30% Design Stage ❑Access for maintenance and requirements for special track componentry ❑Rail Safety and Risk Management issues ❑Design co-ordination (all disciplines)	❑Response to Stakeholder feedback at 70% Design Stage ❑Submission of completed Checklists for Design Documentation including Alignment Design, Special Trackwork, Track Structure, Speedboard Configuration, Transit Space and Product Approval
Track Design Documentation		
Should at least provide details of: ❑Basic alignment framework for both Horizontal and Vertical alignment ❑Horizontal curve parameters including speed, applied super and deficiency ❑Vertical alignment should include grades, location and description of vertical curves and location of turnouts and platforms ❑Standing Room ❑Track Classification ❑Turnout and special trackwork details ❑Track Centres (structures in “6ft”) ❑Platform clearances and design parameters ❑Typical cross sections indicating clearance to structures, formation profiles ❑Location of catchpoints and buffer stops, indicating type and runoff requirements. ❑Sign off by personnel with RailCorp’s Engineering Authority for the Design, Checking and Approval functions for the Project	Will provide details of : ❑Horizontal and Vertical alignment ❑Earthwork cross sections for track formation ❑Scope of Works associated with trackwork construction ❑Location of insulated joints in and around turnouts ❑Documentation to be presented in a format suitable for approval by RailCorp’s Principal Design Engineer, Track ❑Sign off by personnel with RailCorp’s Engineering Authority for the Design, Checking and Approval functions for the Project	Will be suitable for Construction and provide details of: ❑Horizontal and Vertical alignment ❑Earthwork cross sections for track formation ❑Staging plans ❑Speedboard configuration for inclusion in TOC Manual ❑Sign off by personnel with RailCorp’s Engineering Authority for the Design, Checking and Approval functions for the Project

Appendix D Documentation Checklists

Alignment Design Documentation Checklist				Checklist ED-004
Project Identification				
Location		**Project ID**		
Description		**Design Stage**	❑ **Concept** ❑ **……**	**% Final**
Design Contractor		**Design Approver**		
Checklists are not comprehensive and are subject to change				

Interface Definition ***Check the following interfaces for relevance***

- ❑ Transit Space
- ❑ Wheel/rail
- ❑ Track/Survey Control – alignment, level
- ❑ Track/drainage
- ❑ Earthworks/drainage
- ❑ Track/OHW – alignment, mast clearance, wire height at mast and mid-span
- ❑ Track/signalling/track circuits
- ❑ Track/Level Crossings
- ❑ Track/Turnouts
- ❑ Track/Structures
- ❑ Track/Tunnels
- ❑ Track/Bridges (under and over) alignment, level, width, clear space
- ❑ Track/Signal structures
- ❑ Track/platforms – alignment, level, foundation, drainage
- ❑ Track/buildings
- ❑ Track/walkways
- ❑ Rail Corridor Boundaries
- ❑ Future Projects (Quad., Turnback's, Upgrading, etc)
- ❑ Existing Track/New track/realigned track alignment and level
- ❑ Alignment change at connection between existing and new work
- ❑ Gradient change at connection between existing and new work
- ❑ Effect of superelevation, super ramps through turnouts, grade/level differences through crossovers, etc.
- ❑ Turnouts – operating equipment type, in-bearers, conflict with beams between adjacent turnouts
- ❑ Others …….

Concept Track Layout - Documentation

- ❑ Legend
- ❑ Notes
- ❑ References
- ❑ Running kilometrage
- ❑ From Sydney …..To ?
- ❑ Track classification
- ❑ Curvature
- ❑ Turnout type
- ❑ Indicative earthwork cross-sections
- ❑ Track identification
- ❑ Track centres
- ❑ Impact on existing infrastructure (Platforms, OHW, Signals, drainage, etc)
- ❑ Standing room
- ❑ Property Boundaries
- ❑ Requirement for retaining walls, culvert extensions and / or amplification.
- ❑ North Point
- ❑ Correct Title
- ❑ Is drawing sheet size correct.
- ❑ Is content orientation correct (Sydney on left with tracks as horizontal as possible)

Horizontal Alignment Setting Out - Documentation

- ❑ Legend
- ❑ Notes
- ❑ References
- ❑ Running kilometrage
- ❑ From Sydney …..To ?
- ❑ Kilometrage of frame points
- ❑ Co-ordinates of frame points *(Are there any issues with differences between InRail computations and Survey definitions)*
- ❑ Relevant distances - T.P. to Xing, Pts to Pts, etc
- ❑ Co-ordinates of turnouts - TOTP, PTS, XING, TOEP
- ❑ Curve and transition details, straight details (length and bearing) superelevation.
- ❑ Clearance points
- ❑ Indicative location of Insulated Joints with NOTE regarding Track circuits
- ❑ Existing alignment and associated labelling.
- ❑ Track identification
- ❑ Track centres
- ❑ Grid
- ❑ Turnout table - with turnout descriptions, signal points number, etc.
- ❑ North Point
- ❑ Scale
- ❑ Correct Title
- ❑ Sheet break-up join lines
- ❑ Adjoining sheet references
- ❑ is drawing sheet size correct.
- ❑ Is content orientation correct (Sydney on left with tracks as horizontal as possible)

Alignment Design Documentation Checklist	Checklist ED-004
Vertical Alignment Setting Out - Documentation	
❑ Legend ❑ Notes ❑ References ❑ Running kilometrage and kilometrage adjustments ❑ From Sydney …..To ? ❑ Design alignment detail as a line diagram within the section. ❑ Track layout diagram showing crossovers/turnouts where necessary. ❑ Kilometrage of frame points ❑ Track identification ❑ Design rail profile with proposed design rail levels, proposed lifts, proposed design grades, grade intersection points, vertical curves and associated radii etc.	❑ Existing profile with kilometrage and existing rail levels or natural surface. ❑ Formation profile ❑ Is drawing sheet size correct. ❑ Is scale correct ❑ Datum. ❑ Underbridge and overbridge location that includes kilometrages, underside of girder levels, deck levels and clearances. ❑ Existing platform coping levels and clearance to design.
Cross Sections - Documentation	
❑ Existing and proposed profile ❑ Offsets from existing or design alignment centreline ❑ Kilometrage location and offset location for each cross section ❑ Are cross sections viewed and compiled in the direction of ascending chainage ❑ Datum level on each cross section. ❑ Offset origin ❑ Positive and negative offset values ❑ Features indicated and labelled.	❑ Approximate railway boundary ❑ Location of fences ❑ Railway tracks labelled. ❑ Existing and proposed rail/sleeper profile. ❑ Proposed design rail level and superelevation. ❑ Proposed design formation. ❑ Areas and volumes calculated to earthworks level. ❑ Typical cross section showing batter slopes, ballast profile, capping layer etc. and all associated dimensions.

Special Trackwork Design Documentation Checklist

Checklist ED-005

Project Identification **Page 1 of 2**

Location		**Project ID**			
Description		**Design Stage**	❑	**Concept**	
			❑	**……**	**% Final**
Design Contractor		**Design Approver**			

Design Parameters - ***Check the following parameters for relevance***

- ❑ Rolling Stock types
- ❑ Wheel profiles
- ❑ Maximum Axle loads
- ❑ Annual Tonnages
- ❑ Train Operating Speeds
- ❑ Rail Profiles
- ❑ Point operating motor type
- ❑ In bearer operation
- ❑ Long Bearers
- ❑ Interlacing/Splicing of bearers
- ❑ Track Centres
- ❑ KE clearances to operating equipment
- ❑ Location of points motors
- ❑ Location of Insulated Joints
- ❑ Requirements for back drive / spring assist
- ❑ Swing nose crossings
- ❑ Other Signal Interface Issues
  ……
  ……
- ❑ Operational service life
- ❑ Access for maintenance
- ❑ Type approval of all components proposed for use in design.
- ❑ Final horizontal and vertical track design alignment available
- ❑ Construction Issues (eg size of turnout panels to meet site constraints)
- ❑ Others
  ……

Tangential Timber & Plating Layout - Documentation

- ❑ Is drawing sheet size correct.
- ❑ Does drawing orientation match the horizontal alignment drawing.
- ❑ Is drawing scale correct
- ❑ Are dimensions in mm.
- ❑ General arrangement of turnout / turnouts in plan view, showing full timbering layout.
- ❑ All timber spacings and orientations shown.

If bearer spacing is non-standard

- ❑ Has note been added to track setting out drawing flagging this?
- ❑ If constructor is expected to make minor adjustments to suit has this been flagged on the setting out drawing?
- ❑ If more than minor adjustments are required has timbering drawing been supplied for the non-standard component?
- ❑ All switches and stockrails identified.
- ❑ All crossings identified with catalogue numbers.
- ❑ All closure rails identified.
- ❑ Location of insulated joints
- ❑ Location of joints and/or welds behind monobloc crossings shown
- ❑ Relevant notes and references.
- ❑ Correct Title
- ❑ Is content orientation correct (Sydney on left with tracks as horizontal as possible)
- ❑ Special handling instructions ❑ Yes ❑ No
- ❑ Setting out for field assembly (eg special turnouts)
- ❑ Installation manual
- ❑ Maintenance manual

Conventional Timber & Plating Layout - Documentation

- ❑ Is drawing sheet size correct.
- ❑ Does drawing orientation match the horizontal alignment drawing.
- ❑ Is drawing scale correct
- ❑ Are dimensions in mm.
- ❑ General arrangement of turnout / turnouts in plan view, showing full timbering layout.
- ❑ All timber spacings and orientations shown.
- ❑ All plating to be shown and identified with catalogue numbers.
- ❑ All switches and stockrails identified
- ❑ Switches and stockrails curvature / setting shown.
- ❑ All crossings identified with catalogue numbers.
- ❑ All closure rails identified.
- ❑ Location of joints and/or welds behind monobloc crossings shown
- ❑ Location of insulated joints
- ❑ Material, plating, timbers and closure lists shown.
- ❑ Relevant notes and references.
- ❑ Correct Title
- ❑ Is content orientation correct (Sydney on left with tracks as horizontal as possible)
- ❑ Special handling instructions ❑ Yes ❑ No
- ❑ Setting out for field assembly (eg special turnouts)

Project Identification			**Page 2 of 2**
Location		**Project ID**	
Track Components - Documentation			
❑	Is drawing sheet size correct.	❑	Flangeway widths and depths
❑	Does drawing orientation match the Timber & Plating Drawing	❑	Crossing nose profile, shape and ramp rate
❑	Is drawing scale correct	❑	Checkrail height above running rails
❑	Are dimensions in mm.	❑	Maintenace requirements
❑	Is First Angle Projection used.	❑	Scale
❑	General Arrangement showing plan, elevation, end elevation and sections as required to fully detail the component.	❑	Correct Title
❑	Assembly drawings and procedures.	❑	Sheet break-up join lines
❑	Material specifications and finishes.	❑	Adjoining sheet references
❑	Welding procedures.	❑	is drawing sheet size correct.
❑	General shape and orientation and full listing of insert coordinates for concrete ties.	❑	Is content orientation correct (Sydney on left with tracks as horizontal as possible)
❑	Relevant notes and references.	❑	Type approval documentation for new products, manufacturing processes.

Sundry Design Documentation Checklists

Checklist ED-006

Project Identification **Page 1 of 1**

Location		**Project ID**	
Description		**Design Stage**	❑ **Concept** ❑ …… **% Final**
Design Contractor		**Design Approver**	

Permanent Speed Design Documentation Checklist

- ❑ Effect of applied superelevation, rate of change of super deficiency,
- ❑ turnouts and adjacent infrastructure. - Track/OHW – alignment, structure and track centre clearances
- ❑ Type of rollingstock to be allowed for
- ❑ Speed differentials approaching turnouts
- ❑ Track configuration (concrete/steel/timber – ballast/slab)
- ❑ Signal braking distances (overlaps)
- ❑ Level crossing warning times
- ❑ OH traction capacity
- ❑ Network Rules compliance (placement of speed signs)
- ❑ Platforms
- ❑ Bridge capacity to handle increased speed
- ❑ Permanent speed restrictions due to other than geometry design (bridge capacity etc)
- ❑ temporary speed restrictions in the immediate section of track
- ❑ Unprotected level crossings
- ❑ inspection/maintenance regime etc - will it need to change? - Sighting times for maintenance staff working under NAR rules
- ❑ Access issues, maintenance and emergencies
- ❑ Any change to track possession arrangements
- ❑ Driver sighting of speed signs
- ❑ Speed sign density
- ❑ Documentation
- ❑ TOC Manual
- ❑ Others

……

Transit Space Documentation - Checklist

- ❑ Maximum Infringement/s to Structure Gauge Checked
- ❑ Minimum Clearances to Kinematic Envelope Checked
- ❑ Track/OHW – alignment, mast clearance, wire height at mast and mid-span
- ❑ Existing Track/New track/realigned track alignment, level
- ❑ Track configuration (concrete/steel/timber – ballast/slab)
- ❑ Effect on Track Centres Checked
- ❑ Type of rolling stock to be used checked - NR Locos have extra clearance requirement
- ❑ Do clearances take account of transitions and turnouts (turnouts at platforms a trap) - Platform gap, minimum radius
- ❑ Speed
- ❑ Inspection/maintenance regime etc - will it need to change?
- ❑ Access issues, maintenance and emergencies - Safe places for staff under safeworking conditions – embankments, multiple tracks, platforms etc
- ❑ Any change to track possession arrangements
- ❑ Usage factors such as numbers of trains.

Detail Survey Documentation Checklist

- ❑ Topographical details such as embankments, cuttings, rivers, creeks or watercourses including direction of flow.
- ❑ All fixed points
- ❑ Buildings
- ❑ OHW structures
- ❑ Signal equipment, huts troughing and signal rodding.
- ❑ Bridges (under and over) and openings
- ❑ Level Crossings
- ❑ Platforms and platform number.
- ❑ Drainage details ie sumps, culverts, headwalls and pipes.
- ❑ Known underground services
- ❑ Boundaries
- ❑ Fences and gates.
- ❑ Roads, road names
- ❑ Access roads and walkways
- ❑ Existing trackwork and track nomenclature
- ❑ Turnouts
- ❑ Kilometrages.
- ❑ Schedule of survey marks/control.
- ❑ Reduced level.

Appendix E Verification Checklist

Design Verification & Approval Checklist					**Checklist ED-007**
Project Identification					**Page 1 of 1**
Location		**Project ID**			
Description		**Design Stage**	❑	**Concept**	
			❑	……	**% Final**
Designer		**Design Approver**			

Verification Checklist

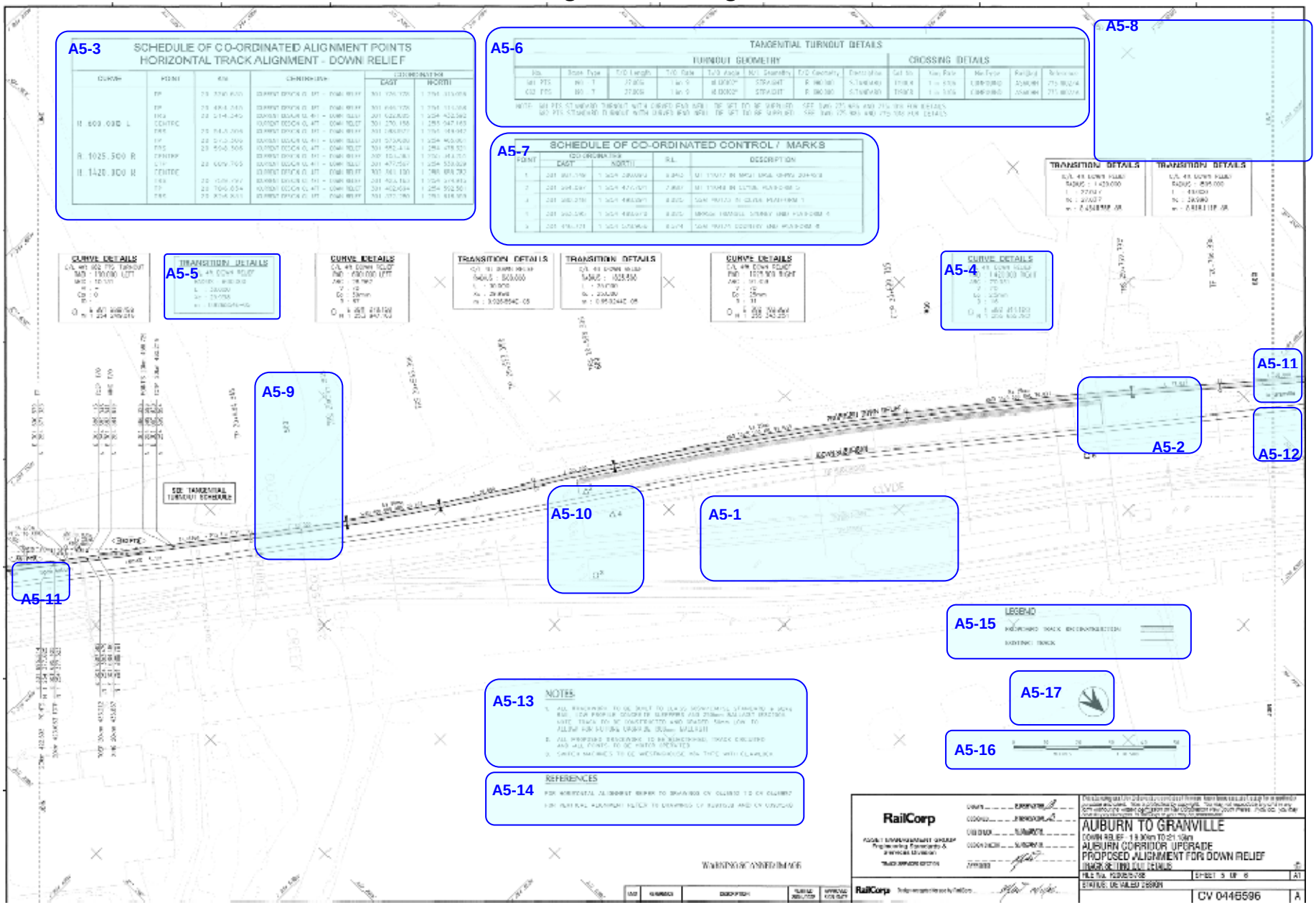
Aspect to be checked & verified	Required	Completed	Independent Checker Signature	Reference documents
Detailed Design Requirements in Accordance with Discipline Checklist	YES ❑ NO ❑	YES ❑ NO ❑		
Are key design assumptions and Standards appropriate for compliance to Works Brief /Project Specification	YES ❑ NO ❑	YES ❑ NO ❑		
Engineering Authority delegated in accordance with RailCorp Policy	YES ❑ NO ❑	YES ❑ NO ❑		
Design checks completed and report available?	YES ❑ NO ❑	YES ❑ NO ❑		
Hazard and Risk Analysis completed and results available?	YES ❑ NO ❑	YES ❑ NO ❑ ONGOING ❑		
Interface requirements verified?	Track ❑ Signals ❑ Civil ❑ Comms ❑ OHW ❑ Power ❑ Drainage ❑ Operating ❑ Safeworking ❑	YES ❑ NO ❑ YES ❑ NO ❑ YES ❑ NO ❑ YES ❑ NO ❑ YES ❑ NO ❑ YES ❑ NO ❑ YES ❑ NO ❑ YES ❑ NO ❑ YES ❑ NO ❑		
Statutory Approvals and Licenses obtained	YES ❑ NO ❑	YES ❑ NO ❑		
Design Documentation completed and ready for use	YES ❑ NO ❑	YES θ NO θ		
Test requirements defined and test plans available	YES ❑ NO ❑	YES θ NO θ		
Maintenance requirements reviewed and updated	YES ❑ NO ❑	YES ❑ NO ❑ ONGOING ❑		
Operating and Maintenance Manuals Updated	YES ❑ NO ❑	YES ❑ NO ❑ ONGOING ❑		

Comments : ……
……
……

Certification and Design Approval

I certify that all required actions have been completed or are planned and that the design is ready for release to construction and/or use	Signature	Printed Name	Date

Appendix F Plan Presentation – Horizontal Alignment Design



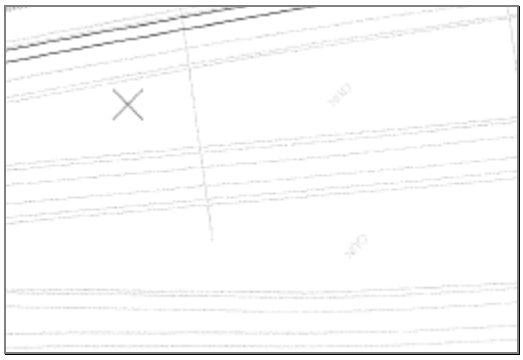


Figure A5-1

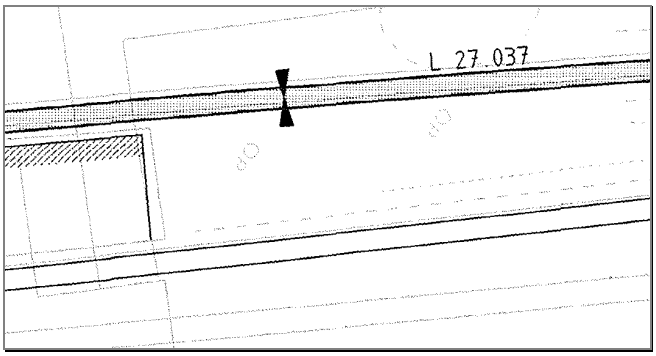


Figure A5-2

SCHEDULE OF CO-ORDINATED ALIGNMENT POINTS
HORIZONTAL TRACK ALIGNMENT - DOWN RELIEF

CURVE	POINT	Km	CENTRELINE	COORDINATES EAST	COORDINATES NORTH
	TP	20 320.635	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 776.778	1 254 315.056
	TP	20 484.345	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 646.778	1 254 414.558
	TRS	20 514.345	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 622.805	1 254 432.592
R.600.000 L	CENTRE		CURRENT DESIGN CL 4FT - DOWN RELIEF	301 270.158	1 253 947.163
	TRS	20 543.306	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 598.972	1 254 449.042
	TP	20 573.306	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 573.608	1 254 465.061
	TRS	20 598.306	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 552.414	1 254 478.321
R.1025.500 R	CENTRE		CURRENT DESIGN CL 4FT - DOWN RELIEF	302 103.363	1 255 343.251
	CTP	20 689.765	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 477.567	1 254 530.829
R.1420.000 R	CENTRE		CURRENT DESIGN CL 4FT - DOWN RELIEF	302 344.100	1 255 655.782
	TRS	20 759.797	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 423.163	1 254 574.915
	TP	20 786.834	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 402.694	1 254 592.581
	TRS	20 826.834	CURRENT DESIGN CL 4FT - DOWN RELIEF	301 372.280	1 254 618.559

Figure A5-3

CURVE DETAILS

C/L 4ft UP ILLAWARRA
RAD 1012.810 LEFT
ARC 395.630
V 105
Ea 55
D 75
E 308 291.550
N 1 239 143.295

Figure A5-4

TRANSITION DETAILS

C/L 4ft DOWN RELIEF
RADIUS : 600.000
L : 30.000
Xc : 29.998
m : 0.926854E-05

Figure A5-5

TANGENTIAL TURNOUT DETAILS

TURNOUT GEOMETRY									CROSSING DETAILS				
POINTS No.	BASE TYPE	TOTAL LENGTH (OTP to TBP)	T/O LENGTH (Rx to Thou Pt)	T/O RATE	T/O ANGLE	H/L GEOMETRY	T/O GEOMETRY	DESCRIPTION	CATALOGUE No	XING RATE	NIN TYPE	RAIL(kg/m)	REFERENCE
1082A PTS	250:8.15	50.104	26.288	1 In 8.25	4.911227°	TRANSITION	TRANSITION	SIMPLEX LH	10139	1 In 9.3	COMPOUND	AS3911	CV 0471042
1082B PTS	190:1	27.0058	22.062	1 In 7	4.130182°	STRAIGHT	R 190.000	STANDARD LH	1190CL	1 In 8.11	COMPOUND	AS3911	CV 0471040

NOTES: 1082A & B Pts COMPRISES A LEFT HAND CROSSOVER WITH VARIABLE TRACK CENTRES.
1082A PTS COMPRISES A SPECIAL TURNOUT WITH FULLY CURVED END INFILL - FOR DETAILS SEE DRG No's CV0170198 & CV0170180 - FOR FIELD LAYOUT DETAILS SEE DRG No. CV0278541
1082B PTS COMPRISES A STANDARD TURNOUT WITH FULLY CURVED END INFILL - FOR DETAILS SEE DRG No's CV0215622 & CV0202236 - FOR FIELD LAYOUT DETAILS SEE DRG No CV0278542

Figure A5-6

SCHEDULE OF CO-ORDINATED CONTROL / MARKS				
POINT	CO-ORDINATES		R.L.	DESCRIPTION
	EAST	NORTH		
1	301 687.149	1 254 380.093	6.843	BT 11077 IN MAST BASE OHWS 20+428
2	301 564.067	1 254 477.701	7.987	BT 11048 IN CLYDE PLATFORM 5
3	301 580.218	1 254 498.291	8.025	SSM 40173 IN CLYDE PLATFORM 1
4	301 563.595	1 254 488.670	8.025	BRASS TRIANGLE SYDNEY END PLATFORM 4
5	301 446.721	1 254 578.966	8.574	SSM 40174 COUNTRY END PLATFORM 4

Figure A5-7

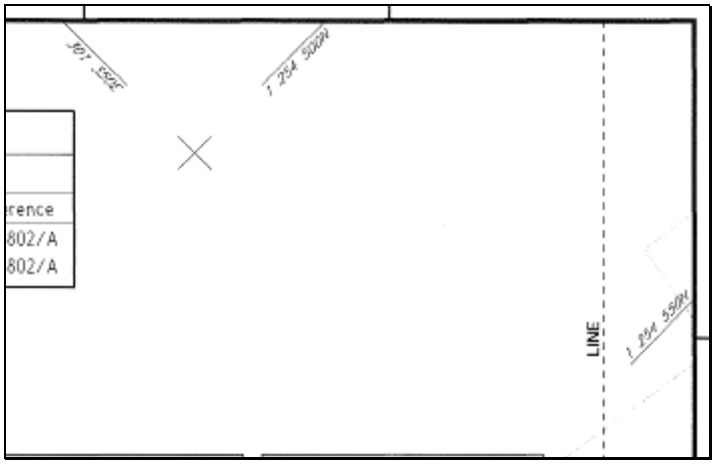


Figure A5-8

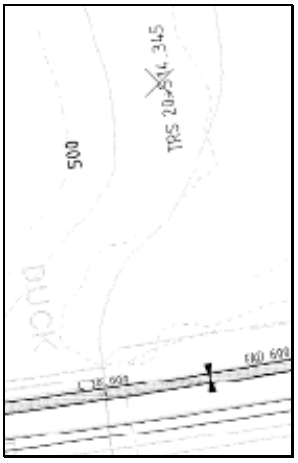


Figure A5-9

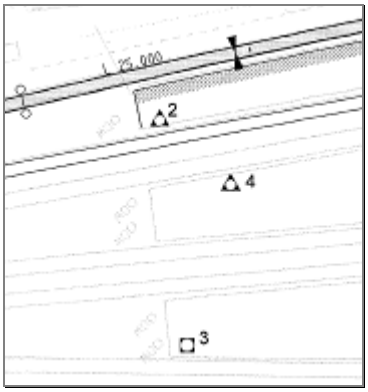


Figure A5-10

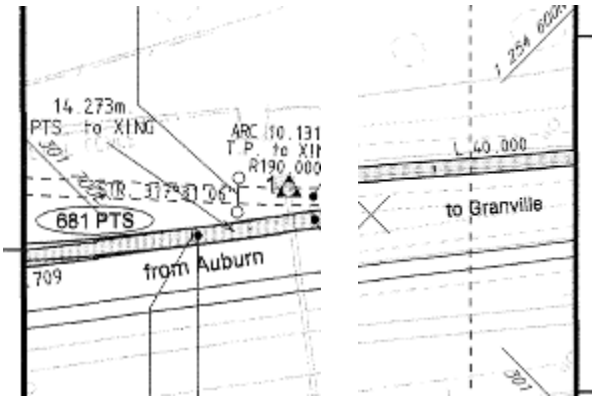


Figure A5-11

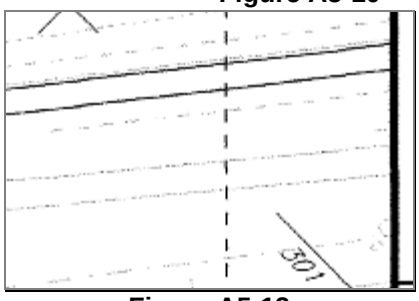


Figure A5-12

NOTES

1. ALL TRACKWORK TO BE BUILT TO CLASS 60SW/CM/SL STANDARD ie 60kg RAIL, LOW PROFILE CONCRETE SLEEPERS AND 250mm BALLAST (ESC200)
   NOTE: TRACK TO BE CONSTRUCTED AND GRADED 50mm LOW TO ALLOW FOR FUTURE UPGRADE (300mm BALLAST)
2. ALL PROPOSED TRACKWORK TO BE ELECTRIFIED, TRACK CIRCUITED AND ALL POINTS TO BE MOTOR OPERATED
3. SWITCH MACHINES TO BE WESTINGHOUSE M84 TYPE WITH CLAWLOCK

Figure A5-13

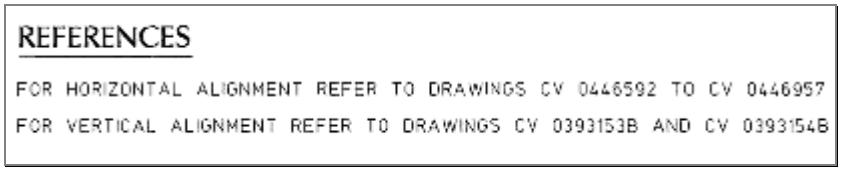


Figure A5-15

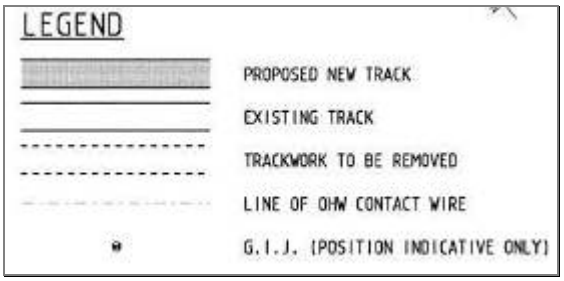
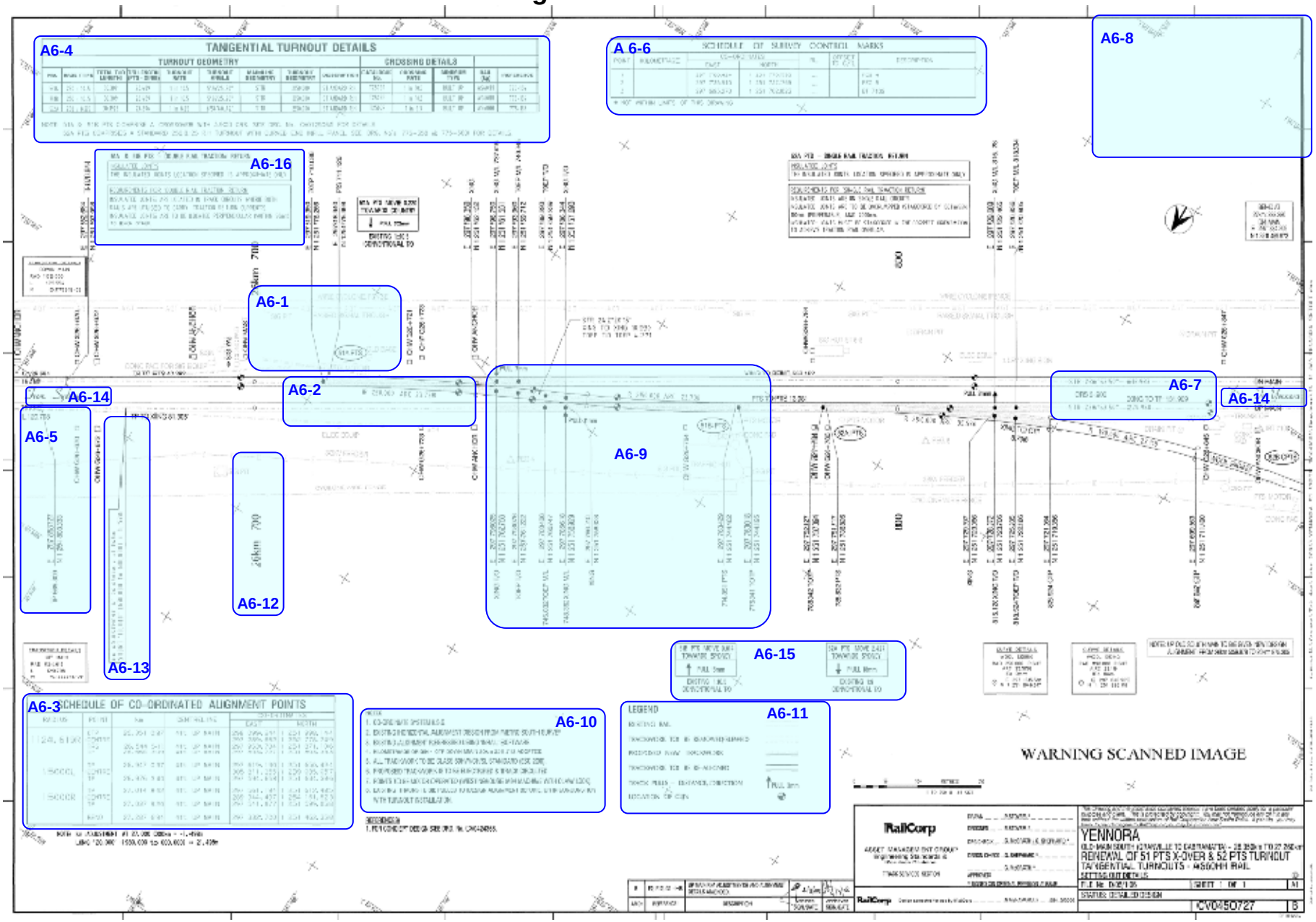


Figure A5-14

Appendix G Plan Presentation – Track Setting Out Details



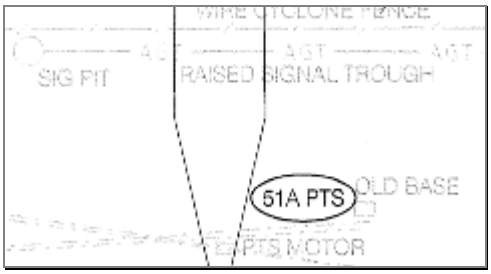


Figure A6-1

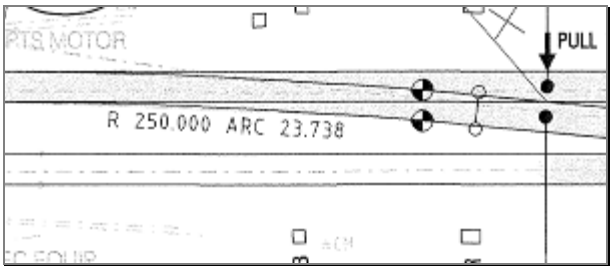


Figure A6-2

SCHEDULE OF CO–ORDINATED ALIGNMENT POINTS

RADIUS	POINT	km	CENTRELINE	CO-ORDINATES EAST	CO-ORDINATES NORTH
1124.619R	CTP	26.351 087	4ft UP MAIN	298 099.244	1 251 998.144
	CENTRE			297 289.662	1 252 778.749
	TRS	26.544 511	4ft UP MAIN	297 953.704	1 251 871.106
	TP	26.665 309	4ft UP MAIN	297 853.727	1 251 803.333
15000L	TP	26.947 037	4ft UP MAIN	297 619.190	1 251 650.424
	CENTRE			305 811.355	1 239 085.057
	TP	26.976 340	4ft UP MAIN	297 594.658	1 251 634.396
15000R	TP	27.014 842	4ft UP MAIN	297 561.194	1 251 612.485
	CENTRE			289 344.497	1 264 161.823
	TP	27.037 920	4ft UP MAIN	297 541.877	1 251 599.858
	BEND	27.287 694	4ft UP MAIN	297 332.700	1 251 463.358

Figure A6-3

TANGENTIAL TURNOUT DETAILS

	TURNOUT GEOMETRY								CROSSING DETAILS				
POINTS No.	BASE TYPE	TOTAL LENGTH TCP to TOP	T/O LENGTH Pts to Tang Pt	T/O RATE	T/O ANGLE	M/L GEOMETRY	T/O GEOMETRY	DESCRIPTION	CATALOGUE No.	XING RATE	MIN TYPE	FAILkg/m	REFERENCE
1082A PTS	250 R 25	30.104	26.200	1 in 8.25	6.911027°	TRANSITION	TRANSITION	SIMPLED LH	T0130	1 in 9.5	COMPOUND	AS60HH	CV 0479042
1082B PTS	190.7	27.0058	22.462	1 in 7	8.130102°	STRAIGHT	R 190.200	STANDARD LH	T1990L	1 in 8.11	COMPOUND	AS60HH	CV 0479040

NOTES: 1082A & B Pts COMPRISES A LEFT HAND CROSSOVER WITH VARIABLE TRACK CENTRES
1082A PTS COMPRISES A SPECIAL TURNOUT WITH FULLY CURVED END INFILL – FOR DETAILS SEE DRG No's CV0370778 & CV0372700 – FOR FIELD LAYOUT DETAILS SEE DRG No. CV0278654
1082B PTS COMPRISES A STANDARD TURNOUT WITH FULLY CURVED END INFILL – FOR DETAILS SEE DRG No's CV0255522 & CV0322233 – FOR FIELD LAYOUT DETAILS SEE DRG No CV0278542

Figure A6-4

Figure A6-5

SCHEDULE OF SURVEY CONTROL MARKS

POINT	KILOMETRAGE	CO–ORDINATES EAST	CO–ORDINATES NORTH	RL	OFFSET TO C/L	DESCRIPTION
1		297 788.424	1 251 770.598	_		PEG 4
2		297 735.910	1 251 732.769	_		PEG 5
3		297 693.270	1 251 702.823	_		BT 7109

Figure A6-6

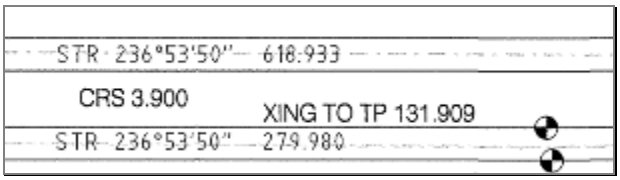


Figure A6-7

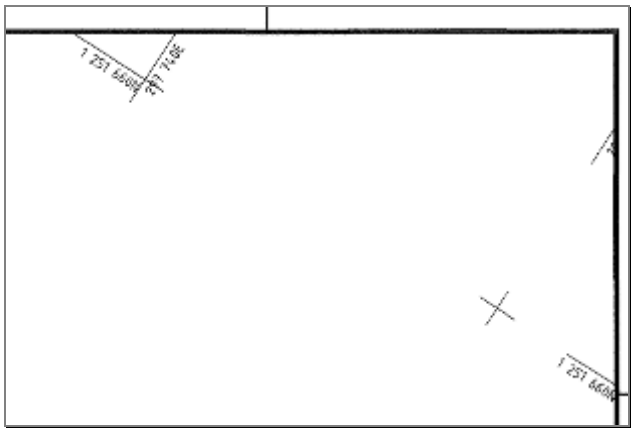


Figure A6-8

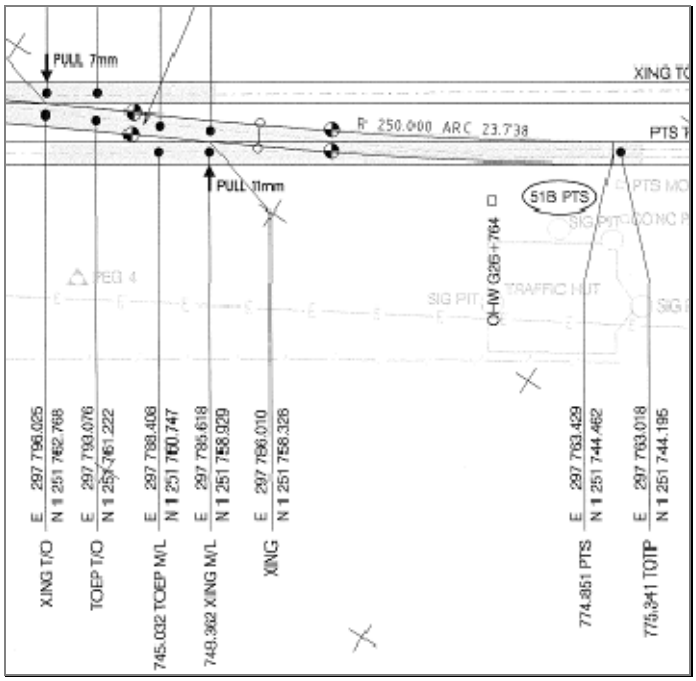


Figure A6-9

COORDINATES

COORDINATE SYSTEM: I.S.G (RAILCORP SURVEY CONTROL)
ORIGIN: PM 53355 – E 307 37' 552, N 1 239 562.993
(KILOMETRAGE 17km 117.786)
AZIMUTH: PM 53355 TO BT 6691 = 200° 19' 28"
– 85.934m (CALC. HORIZONTAL DISTANCE)
SOURCE: RAILCORP HURSTVILLE SURVEY OFFICE (LSTING 05058con)
KILOMETRAGE ORIGIN: CTRS (DOWN MAIN) 17km 906.592
E. 307 427.380 N. 1 239 659.208
(RAILCORP MAINTENANCE ALIGNMENT – Dm01-25.TRK)

Figure A6-10

LEGEND

EXISTING RAIL
TRACKWORK TO BE REMOVED/SLEWED
PROPOSED NEW TRACKWORK
TRACKWORK TO BE RE-ALIGNED
TRACK PULLS – DISTANCE, DIRECTION — PULL 3mm
LOCATION OF GIJ's

Figure A6-11

Figure A6-12

Figure A6-13

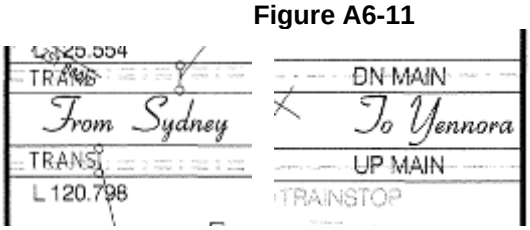


Figure A6-14

Figure A6-15

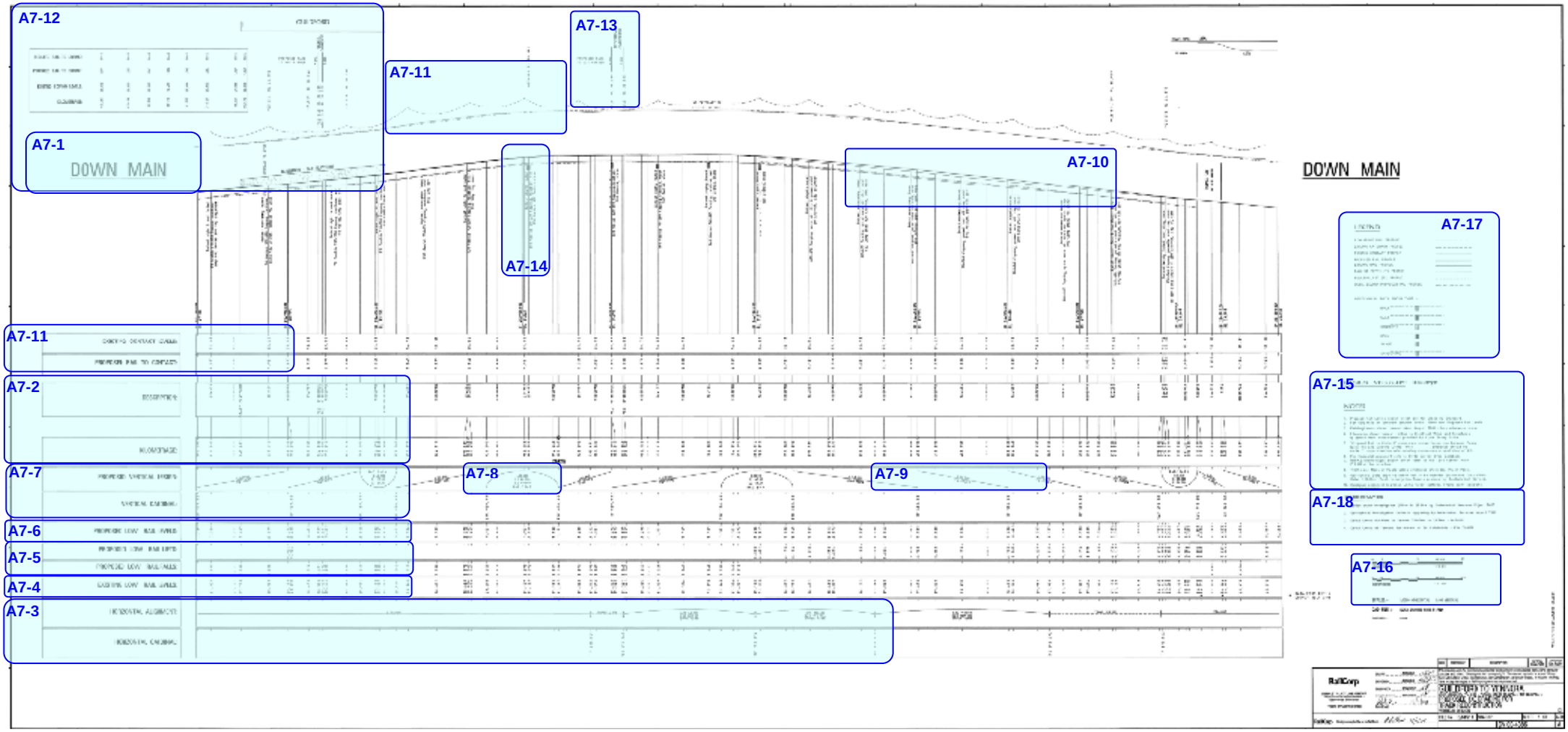
51A & 51B PTS – DOUBLE RAIL TRACTION RETURN

INSULATED JOINTS
THE INSULATED JOINTS LOCATION SPECIFIED IS APPROXIMATE ONLY

REQUIREMENTS FOR 'DOUBLE RAIL TRACTION RETURN'
INSULATED JOINTS ARE LOCATED IN TRACK CIRCUITS WHERE BOTH RAILS ARE UTILISED TO CARRY TRACTION RETURN CURRENTS.
INSULATED JOINTS ARE TO BE LOCATED PERPENDICULAR (WITHIN 50mm) TO EACH OTHER.

Figure A6-16

Appendix H Plan Presentation – Vertical Alignment Design



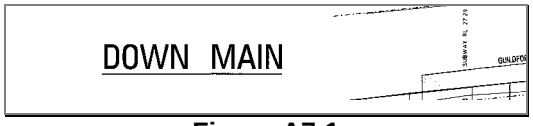


Figure A7-1

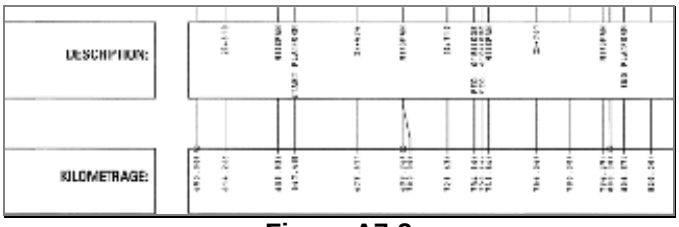


Figure A7-2

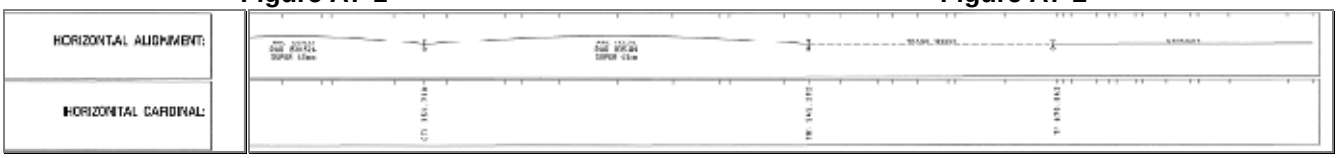


Figure A7-3

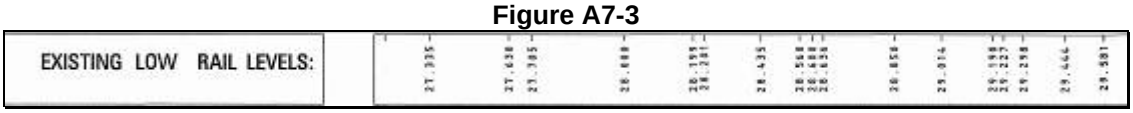


Figure A7-4

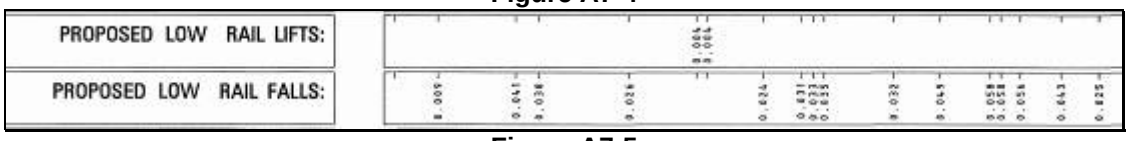


Figure A7-5

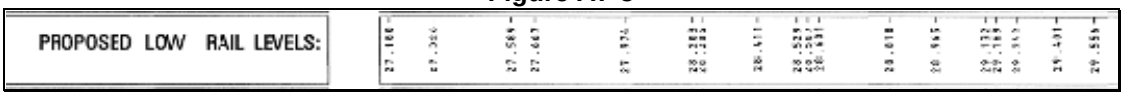


Figure A7-6

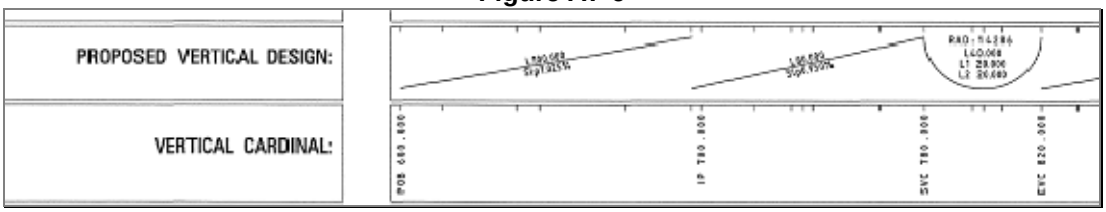


Figure A7-7

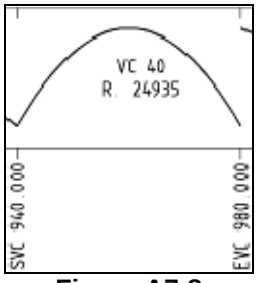


Figure A7-8

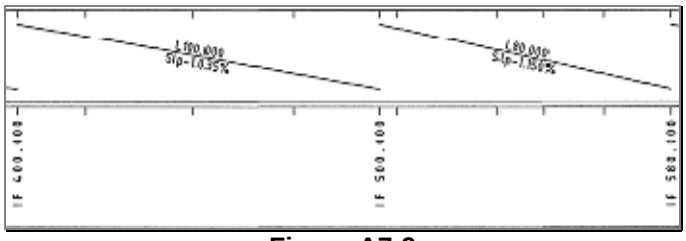


Figure A7-9

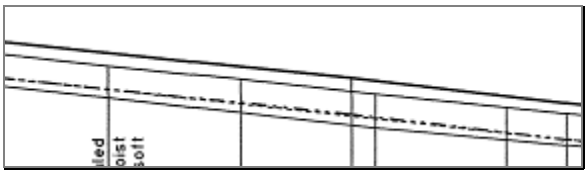


Figure A7-10

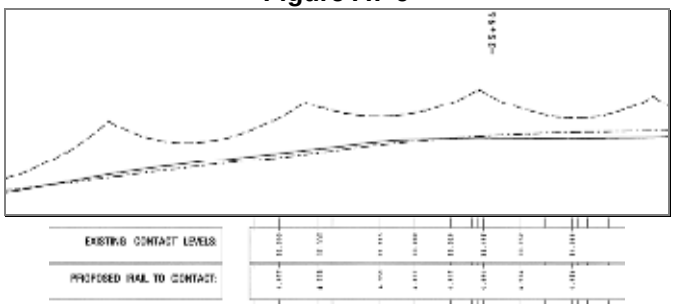


Figure A7-11

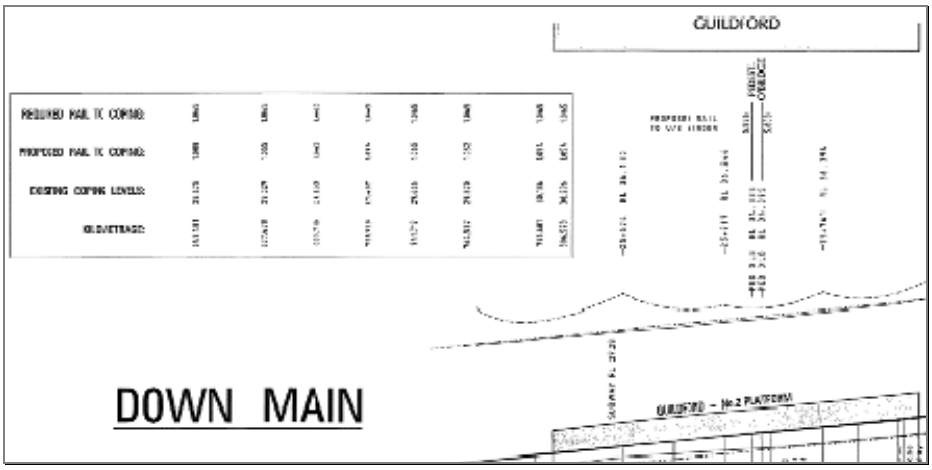


Figure A7-12

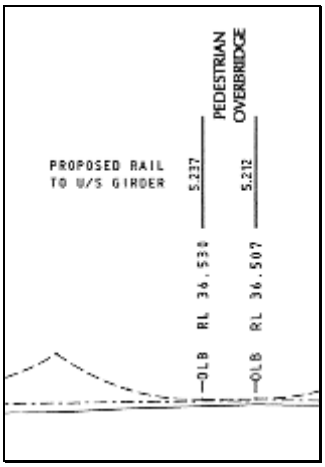


Figure A7-13

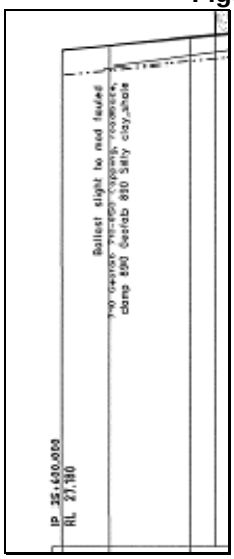


Figure A7-14

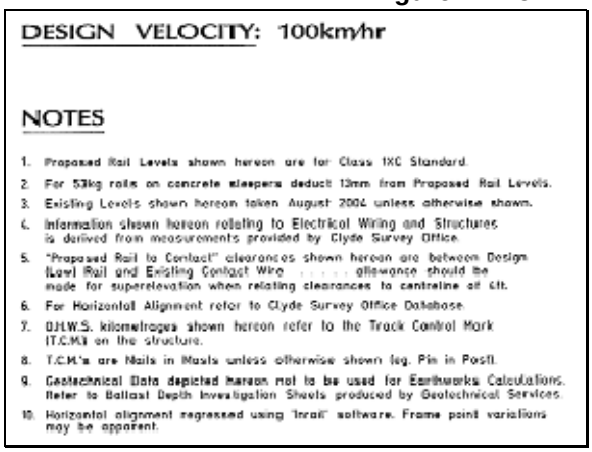


Figure A7-15

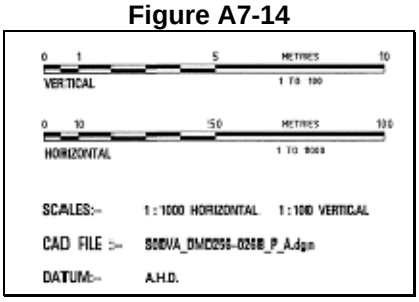
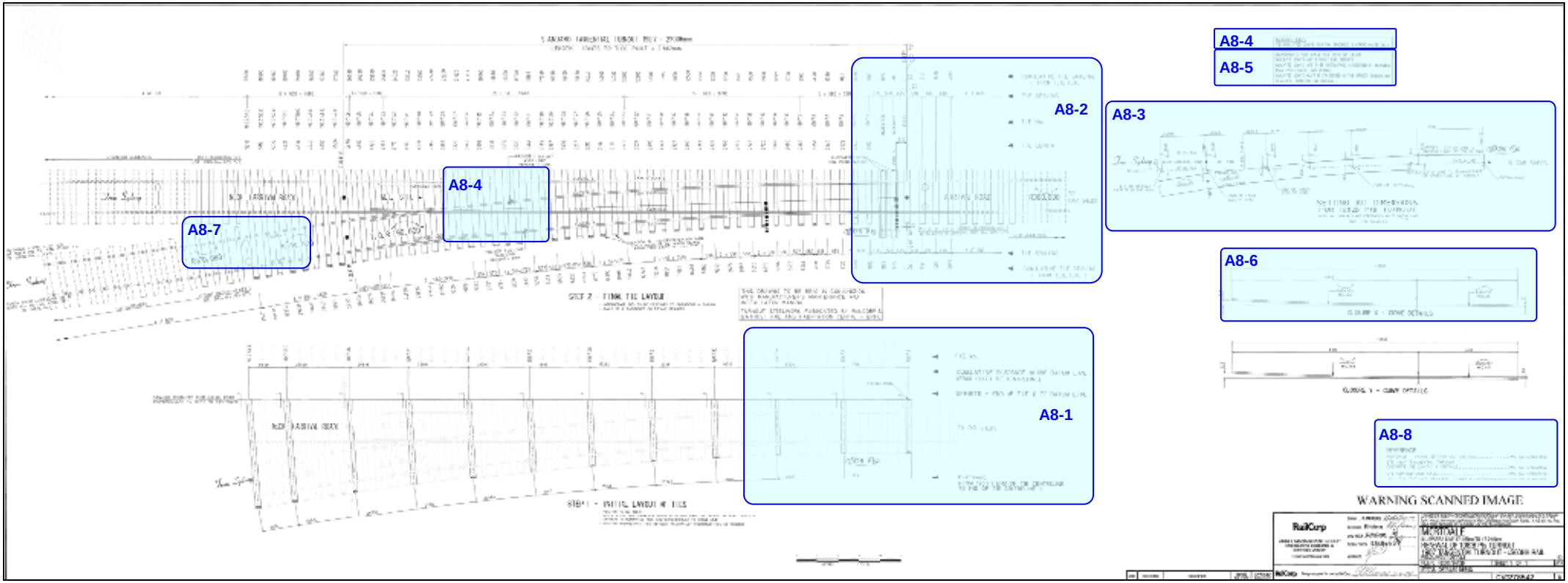


Figure A7-16

Figure A7-17

Appendix I Plan Presentation – Field Layout for Tangential Turnouts



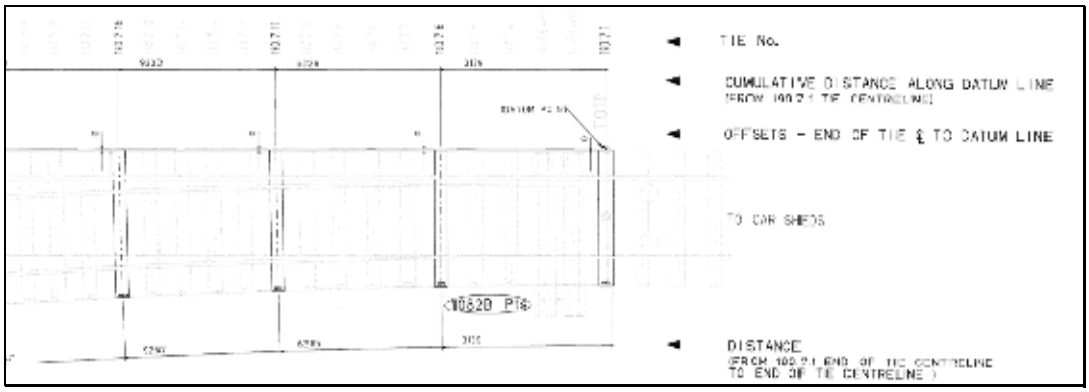


Figure A8-1

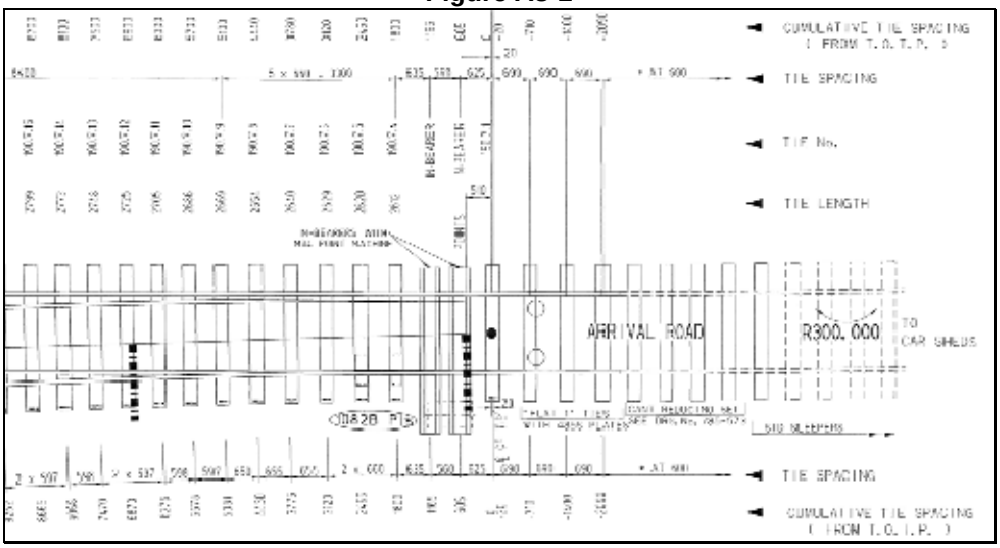


Figure A8-2

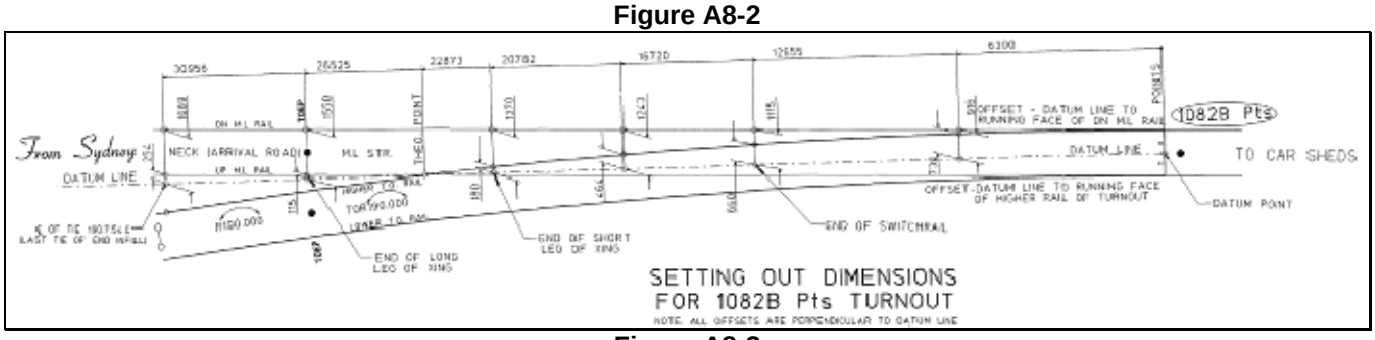
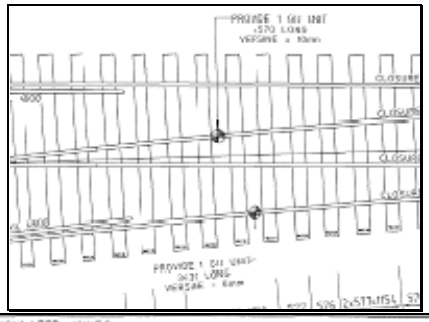


Figure A8-3



INSULATED JOINTS
THE INSULATED JOINTS LOCATION SPECIFIED IS APPROXIMATE ONLY

Figure A8-4

REQUIREMENTS FOR 'SINGLE RAIL TRACTION RETURN'
INSULATED JOINTS ARE IN SINGLE RAIL CIRCUITS.
INSULATED JOINTS ARE TO BE OVERLAPPED (STAGGERED) BY BETWEEN 100mm (PREFERABLE), AND 2000mm.
INSULATED JOINTS MUST BE STAGGERED IN THE CORRECT ORIENTATION TO ACHIEVE TRACTION RAIL OVERLAP.

Figure A8-5

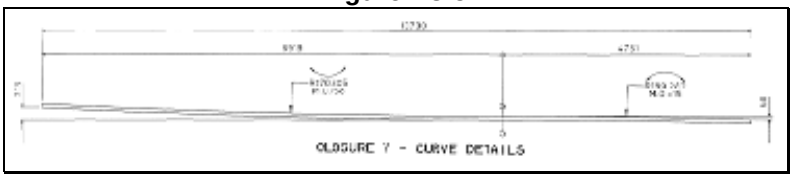


Figure A8-6

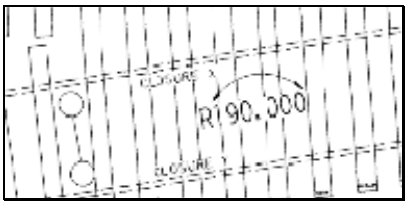


Figure A8-7

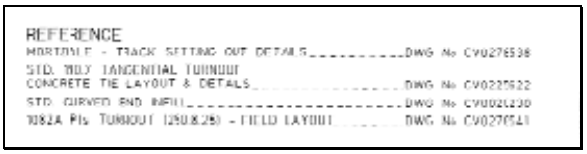


Figure A8-8

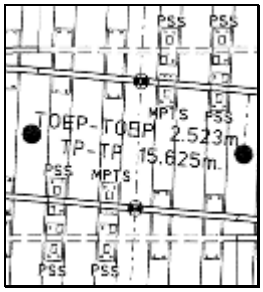
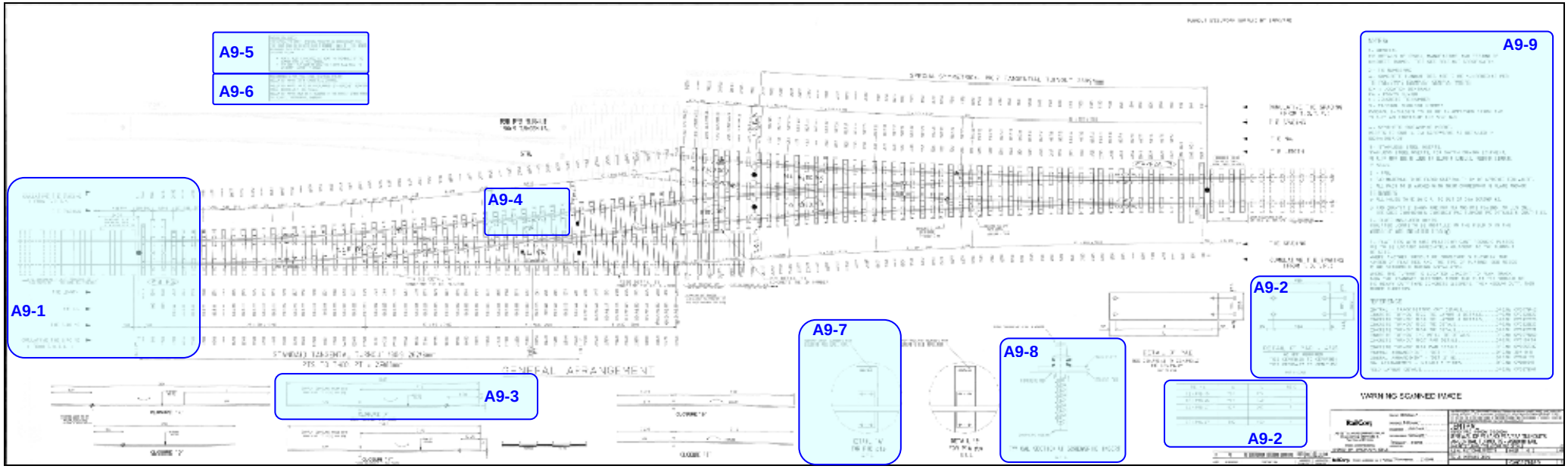


PLATE	REFERENCE	COMMENTS	REQ'D
PSS	CV0142613	REQUIRED FOR 250:10.5.3734.12.R 250:10.5.3734.13.R	6
MPTS	CV0142615	REQUIRED FOR 250:10.5.3734.13.R	2

Fig A8-9

Appendix J Plan Presentation – Tie Layout and Details for Tangential Turnouts



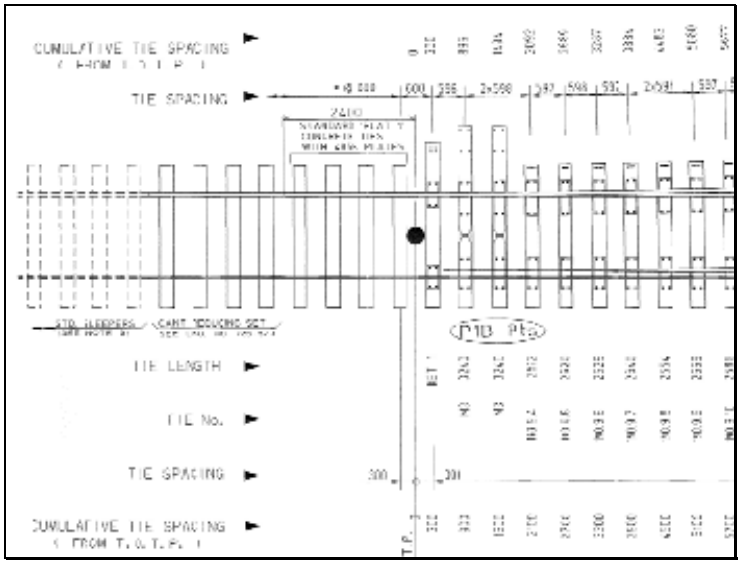
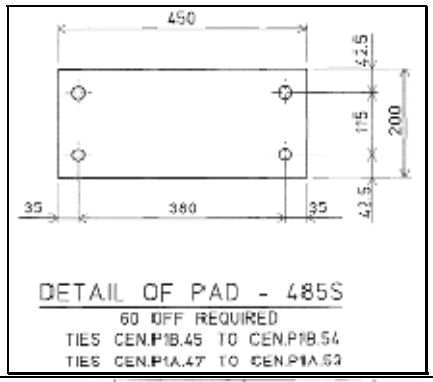


Figure A9-1



TIE No.	A	L	REQD
CEN.P1B.45	704	774	1
CEN.P1B.46	770	840	1
CEN.P1B.47	837	907	1
CEN.P1A.47	887	952	1

Figure A9-2

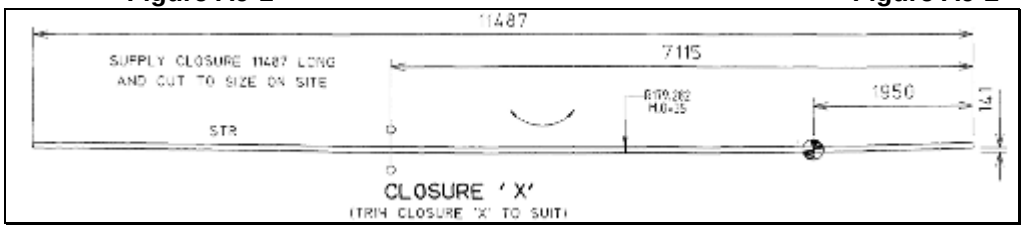


Figure A9-3

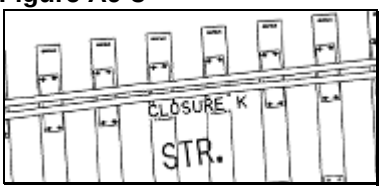


Figure A9-4

INSULATED JOINTS

THE INSULATED JOINTS LOCATION SPECIFIED IS APPROXIMATE ONLY. THE JOINT MAY BE LOCATED 1 OR 2 BEARERS AWAY BY CIVIL STAFF, PROVIDED THIS DOES NOT CONFLICT WITH THE REQUIREMENTS SPECIFIED BELOW :

- JOINTS MUST BE LOCATED AS NEAR TO THE MIDDLE OF THE BEARER BAY AS PRACTICABLE.
- THE JOINT MUST NOT BE LOCATED CLOSER THAN 75mm TO ADJACENT SUPPORT PLATING.

Figure A9-5

REQUIREMENTS FOR 'SINGLE RAIL TRACTION RETURN'

INSULATED JOINTS ARE IN SINGLE RAIL CIRCUITS.
INSULATED JOINTS ARE TO BE OVERLAPPED (STAGGERED) BY BETWEEN 100mm (PREFERABLE), AND 2000mm.
INSULATED JOINTS MUST BE STAGGERED IN THE CORRECT ORIENTATION TO ACHIEVE TRACTION RAIL OVERLAP.

Figure A9-6

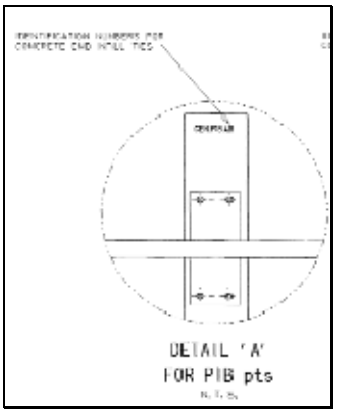


Figure A9-7

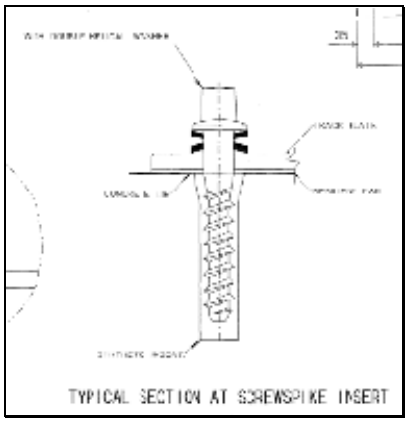


Figure A9-8

NOTES:

1 - GENERAL
FOR DETAILS OF DESIGN, MANUFACTURE AND TESTING OF CONCRETE TURNOUT TIES SEE RELEVANT SPECIFICATION.

2 - TIE NUMBERING
ALL CONCRETE TURNOUT TIES ARE TO BE NUMBERED AS PER THE FOLLOWING EXAMPLE:- CENPIA4 WHERE
CEN - LOCATION (CENTRAL)
PIA - POINTS NUMBER
4 - CONCRETE TIE NUMBER

3 - PANDROL SHOULDER INSERTS
PANDROL SHOULDERS TO BE OF AN APPROVED DESIGN AND TO SUIT AN E2003 CLIP AND 5mm PAD.

4 - SYNTHETIC SCREWSPIKE INSERTS.
INSERTS TO SUIT 24 DIA SCREWSPIKE AS DETAILED ON DRG No.205A-381

5 - STAINLESS STEEL INSERTS.
STAINLESS STEEL INSERTS, FOR SWITCH DRIVING EQUIPMENT TO SUIT M20 BOLTS AND TO HAVE A MINIMUM THREAD LENGTH OF 50mm.

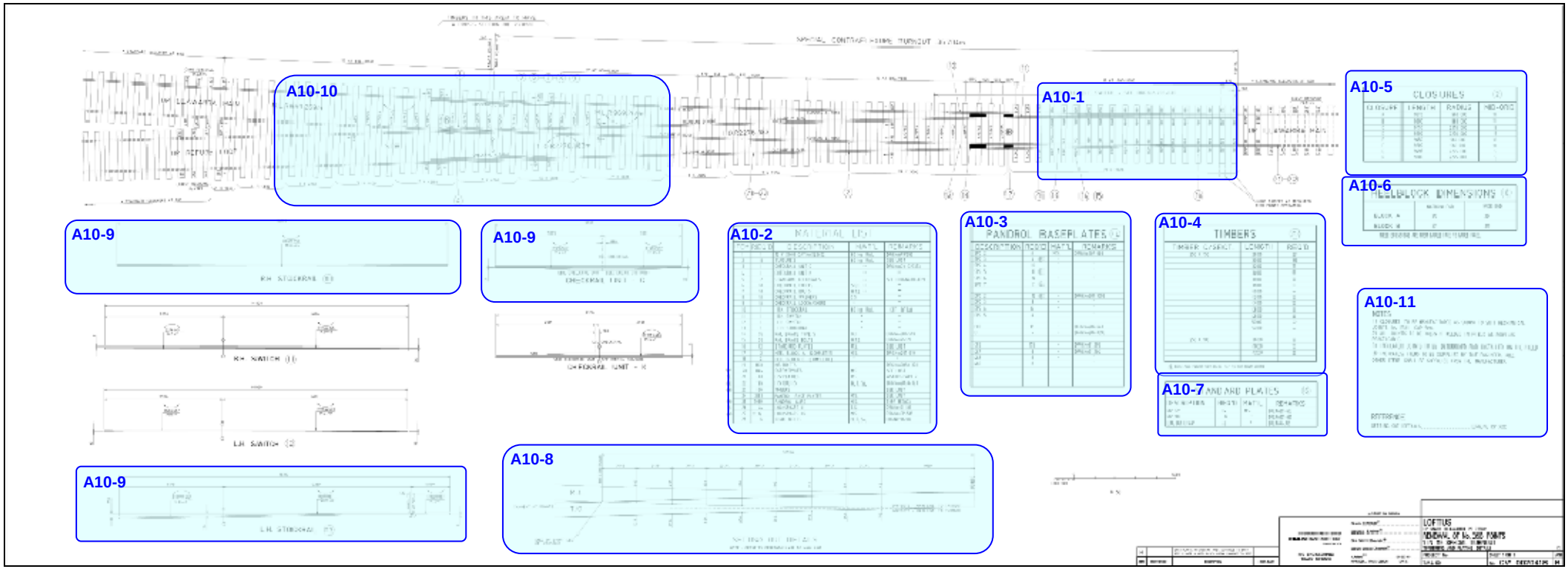
6) - PAD.
a) PAD MATERIAL TO BE FABCO SJ47 5mm THICK OR APPROVED EQUIVALENT.
b) ALL PADS TO BE MARKED WITH THEIR CORRESPONDING PLATE AND/OR TIE NUMBERS
c) ALL HOLES TO BE 30 DIA. TO SUIT 24 DIA SCREWSPIKE.
d) PAD QUANTITIES SHOWN ARE FOR PIA AND PIB Pts END INFILLS ONLY.
SEE DWGS CV0168768 & CV0255037 PAD TURNOUT PAD DETAILS & QUANTITIES.

7 - GLUED INSULATED JOINTS
INSULATED JOINTS TO BE INSTALLED IN THE FIELD OR IN THE WORKSHOP ARE INDICATED THUS

8 - FLAT TIES WITH ABSS PLATES OR CANT REDUCING PLATES ARE TO BE LOCATED IMMEDIATELY ADJACENT TO THE TURNOUT TIE SETS.
WHERE ANOTHER TURNOUT OR CROSSOVER IS CLOSE BY THE NUMBER OF FLAT TIES AND THE TYPE OF PLATING USED NEEDS TO BE DETERMINED DURING INSTALLATION.
WHERE THE TURNOUT IS LOCATED ADJACENT TO PLAIN TRACK THEN THE STANDARD SLEEPERS AFTER THE FLAT TIES SHOULD BE THE HEAVY DUTY TYPE CONCRETE SLEEPERS, THEN MEDIUM DUTY, THEN TIMBER SLEEPERS.

Figure A9-9

Appendix K Plan Presentation – Timber and Planting for Conventional Turnouts



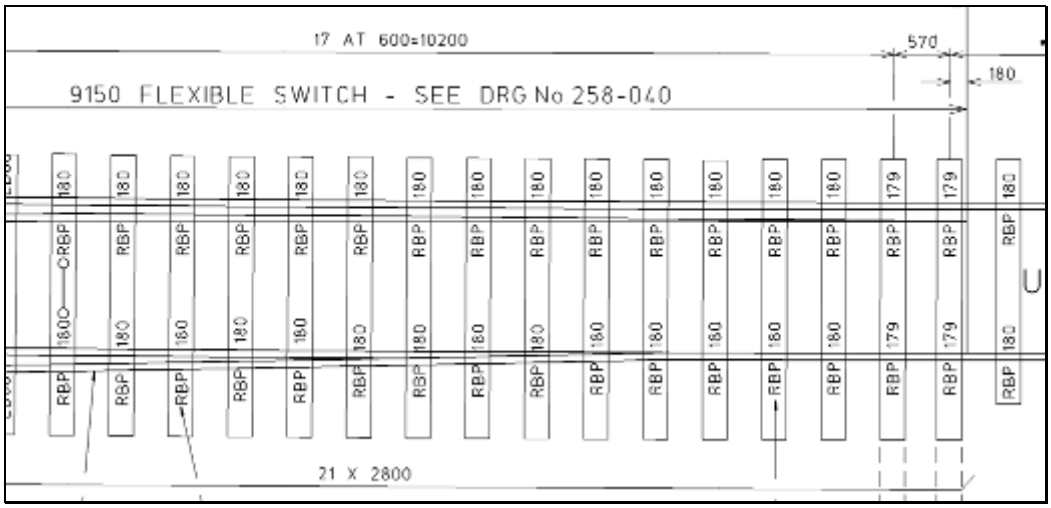


Figure A10-1

MATERIAL LIST				
ITEM	REQ'D	DESCRIPTION	MAT'L	REMARKS
1	1	15 V XING CAT.No.XL2402	60 kg RAIL	DRG.NoPW293
2	8	CLOSURES	60 kg RAIL	SEE LIST
3	1	CHECKRAIL UNIT C	"	DRG.NoCV 023373
4	1	CHECKRAIL UNIT K	"	"
5	2	STANDARD CHECKRAILS	"	SEE DRG.No310-1019
6	18	CHECKRAIL CHOCKS	S.G.I. "	"
7	18	CHECKRAIL BOLTS	H.T.S. "	"
8	18	CHECKRAIL WASHERS	C.S.	"
9	18	CHECKRAIL LOCKWASHERS	"	"
10	1	R.H. STOCKRAIL	60 kg RAIL	SEE DETAIL
11	1	R.H. SWITCH	"	"
12	1	L.H. SWITCH	"	"
13	1	L.H. STOCKRAIL	"	"
14	36	RAIL BRACE TYPE 5	M.I.	DRG.No207-599
15	36	RAIL BRACE BOLTS	H.T.S.	DRG.No91-170
16	42	STANDARD PLATES	M.S.	SEE LIST
17	2	HEEL BLOCK A (COMPLETE)	M.S.	DRG.No207-619
18	2	HEEL BLOCK B (COMPLETE)	"	"
19	108	NIB BOLTS		DRG.No205A-370
20	144	SCREWSPIKES	M.S.	SEE LIST
21	48	FISHPLATES	M.S.	AS1085-PART 2
22	96	FISHBOLTS	H.T.S.	DRG.No205A-323
23	86	TIMBERS		SEE LIST
24	293	PANDROL BASE PLATES	M.S.	SEE LIST
25	580	PANDROL CLIPS	M.S.	TYPE E2003
26	24	LOCKSPIKES L1	S.S.	DRG.No91-189
27	1132	LOCKSPIKES L6	M.S.	DRG.NoSP-516
28	6	CHAIR BOLTS	H.T.S.	DRG.No91-187

Figure A10-2

PANDROL BASEPLATES (24)			
DESCRIPTION	REQ'D	MAT'L	REMARKS
SPC 2	6	M.S.	DRG.No207-603
SPC 3	4 (5)	"	"
SPC 4	10	"	"
SPC 5	10 (8)	"	"
SPC 6	14	"	"
SPC 7	2 (8)		
DPC 2	12 (8)	"	DRG.No207-090
DPC 3	8	"	"
DPC 4	12	"	"
DPC 5	4		"
PCR	18	"	DRG.No207-951
U	-	"	DRG.No207-098
485	179	"	DRG.No91-205
487	6	"	DRG.No91-204
488	6	"	"
489	6		"

Figure A10-3

TIMBERS (23)		
TIMBER C/SECT.	LENGTH	REQ'D
250 X 150	2800	21
	3000	16
	3200	7
	3400	5
	3600	7
	3800	3
	4000	-
	4200	3
	4400	5
	4600	4
	4800	4
	5000	2
	5200	-
250 X 180	3800	2
	4000	5
	4200	2

✳ PLUS LONG TIMBERS SUPPLIED BY SEC. TO SUIT POINTS MOTOR

Figure A10-4

CLOSURES (2)			
CLOSURE	LENGTH	RADIUS	MID-ORD
A	9270	968 000	11
B	9200	968 000	11
C	9450	1275 000	5
D	9200	1276 000	5
E	9450	969 000	12
F	9200	969 000	11
G	9496	1275 000	5
H	9200	1275 000	5

Figure A10-5

HEELBLOCK DIMENSIONS (18)		
	NARROW END	WIDE END
BLOCK A	151	224
BLOCK B	151	275

THESE DIMENSIONS ARE FROM GAUGE FACE TO GAUGE FACE.

STANDARD PLATES (16)			
DESCRIPTION	REQ'D	MAT'L	REMARKS
RBP 179	4	M.S.	DRG.No207-603
RBP 180	32	"	DRG.No207-605
LONG D60 CHAIR	6	"	DRG.No91-312

Figure A10-6 ***Figure A10-7***

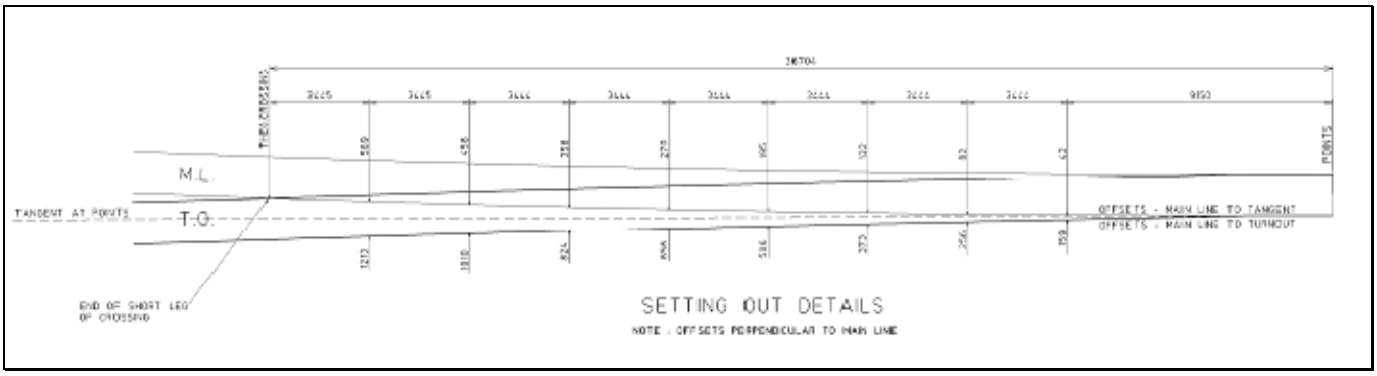
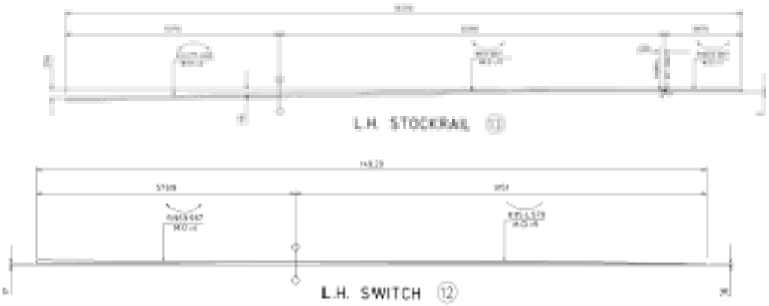


Figure A10-8



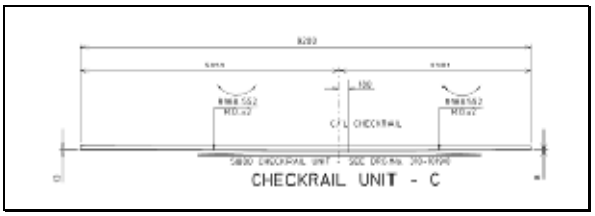


Figure A10-9

Figure A10-9

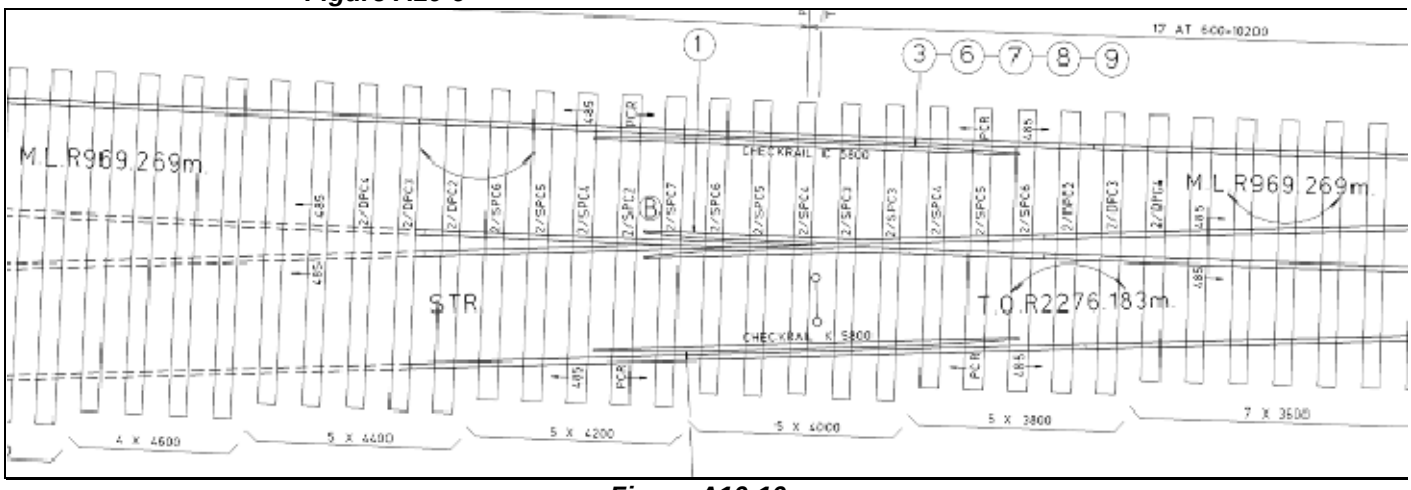


Figure A10-10

Appendix L Guidelines for Catchpoint Design

The requirement for catchpoints and the operational scenarios for function are determined by the Chief Engineer Signals. This includes any preliminary controls such as trainstops.

There is a need to consider the different vehicle types that may operate over the catchpoints, such as freight trains and track machines. The risk consequences need to be balanced. For abnormal operations (work trains or track machines on passenger only lines) the risk exposure is low.

The track designer must select the most appropriate mechanism of derailment using different catchpoint design features. Standard devices that can be used include throw off rails, guard rails or ballast drags. Deflecting devices need to be secure enough to fulfil their intended function. Strategies for managing the derailed train are at the discretion of the track designer.

The design intent is to provide a minimum clear landing area appropriate for the vehicles being derailed. For passenger trains the standard design for speeds up to 25kph is a landing area 40m long as shown in ESC 250.

The design rules for passenger trains for more complex situations are as follows:

- The maximum speed allowed will normally be the permitted track speed.
- Allow for a deceleration of 1m/sec^2 from the point of derailment (note that the overhang of the vehicle needs to be considered).
- If a train trip has taken place prior to the point of derailment the Chief Engineer Signals will provide the expected speed at the catchpoints.
- Where the train enters a ballast drag or equivalent (min 300mm deep) a deceleration of 3m/sec^2 can be used.

Clear landing areas must be assessed for any unusual consequence e.g. Public facilities or geographical features.

For light locomotives or track machines similar rules can be used (though train trips will not be effective).

The design rules for freight trains are as follows:

- For freight trains the degree of control provided by the signalling system needs to be considered in the catchpoint design (consult with the Chief Engineer Signals).
- Catchpoints are effective in situations where a driver might inadvertently miss or misread a signal particularly when coming out of a yard. Where a freight train repeatedly runs through red signals it could as easily run into the back of another train. Catchpoints do not address this kind of scenario.
- An appropriate low speed and a nominal deceleration rate of 0.5m/sec^2 should be assumed from the point of derailment.

Note that the landing for derailed vehicles must provide an even ramp (so the train doesn't tilt over) and must be clear of obstacles that could impact significantly on the train or if struck by the train cause an untoward consequence (e.g. damage a portal structure and potentially impacting on main line trains running at track speed) and minimise the potential for damage to other infrastructure.