

PART E

SCOPE OF SERVICES

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E1 INTRODUCTION AND BACKGROUND

E1.1 INTRODUCTION

The Engineering Design Delivery section of RailCorp is seeking various engineering organisations wishing to apply for registration through this “Application for Panel Registration” (APR) of “Engineering Design Panel Members” (EDPM) to undertake design investigations, concept design, preliminary design, detailed design and documentation, design review and assessment of 3rd party designs, for the upgrading of infrastructure, stations, buildings, railway bridges, per way, civil & structural, electrical, communications works which primarily form part of Major Periodic Maintenance (MPM), and the Capital Works Program for RailCorp.

The term of EDPM Panels will be for a period of 3 years (36 months) with options to extend for two further one year periods. Organisations are able to register for more than one Panel. **(See Note below)**

Once registered, the EDPM will be requested to provide offers of service on a competitive basis for one or more of the Engineering design activities. Because of the fluctuating nature of the capital works program, the demand for engineering design activity is variable and consequently no guarantee is given that all EDPM’s will be involved in quoting for any or every design engagement.

Note:

Organisations are restricted to nominating up to a maximum five (5) individuals for each Panel listed. An individual may be nominated for more than one (1) Panel. Additional individuals can be added during the term of the Panel if assessed and approved by RailCorp.

E1.2 BACKGROUND

The Engineering Standards and Services division operates in an environment where it is required to provide a quality design service which is cost effective and meets time requirements as agreed with the Asset Owner / Program Manager.

The Asset Management Group of RailCorp is the primary client with a need for design and documentation to service the requirements of the annual Works Program, comprising capital, renewal and maintenance components. This currently involves a significant investment on engineering design as a part of an ongoing strategy to provide improvements to infrastructure to further enhance the reliability of the network. It is essential that high quality design and documentation be produced in a cost-effective manner, and within the time constraints imposed by the Asset Owner / Program Manager’s program and associated activities.

Internal design capacity exists through the Chief Engineers (CE’s). External design work will be completed by way of External Design Panel Members (EDPM’s). Procurement of these design resources will be the responsibility of Design Delivery Managers (DDM’s), assisted by the Panel Administrator (PA). Manager Engineering Design Delivery retains the responsibility for the appointment of the PA.

Engineering Design Delivery has undertaken an open tendering process to establish a series of Panels to meet the demand of its Asset Owner / Program Managers and these Panels are available for use by the DDM's.

E1.3 GENERAL

The purpose of this APR is to add further EDPM's to the existing Panels of preferred design services as detailed in this document.

E1.3.1 PANEL ADMINISTRATION

RailCorp will appoint a PA for each Panel and the role of the PA is as follows:

- Oversee the issue of invitations to EDPM's to submit offers by RailCorp Design Engineers;
- Oversee the evaluation of offers and awarding of Contracts for discrete packages of work;
- Select the most suitable EDPM for the assignment as per RailCorp's selection procedures;
- Oversee the progress and payment to EDPM's; and
- Carry out 'Performance Reviews' of EDPM's.

The PA will administer the Panel for RailCorp. Organisations selected from the Panels to provide Services will be expected to work directly with RailCorp's Representative for the delivery of Services in accordance with project and user requirements. The PA will advise the EDPM of the name and particulars of RailCorp's Representative for the assignment.

Detailed administrative procedures can be found in Section D – Special Conditions of Contract.

Note that if the value of a proposed engagement is anticipated to be more than \$150,000, the tendering process will be managed by RailCorp's Strategic Procurement and Supply group.

E2 LIST OF PANELS TO BE ESTABLISHED

Listed below are the Panels that RailCorp intends to establish and there is no restriction as to the number of Panels an organisation may bid for.

PANEL No.	PANEL TITLE	GROUP
10	Track	Track
12	Infrastructure	Various
20	Hydrology	Bridges & Structure
21	Fire & Life Safety	Bridges & Structure
22	Bridge	Bridges & Structure
24	Structural	Bridges & Structure
26	Geotechnical	Geotech
72	(Design) Program Management	Design Delivery

E3 SCOPE – ENGINEERING DESIGN SERVICE (PANELS 10, 12, 20, 21, 22, 24, 26 AND 72)

E3.1 SPECIFIC REQUIREMENTS FOR THE SERVICES

The EDPM selected to carry out particular design Services shall provide the following:

- Carry out Services in accordance with RailCorp Standards, current Australian Standards (AS) and other procedures as approved by RailCorp. The selection of appropriate standards for the assignment will be the professional responsibility of the selected EDPM and their staff.
- Provide all personnel, equipment, and materials necessary to complete the assignment. Unless otherwise stated in the Tender Brief or specifically agreed with RailCorp, the Contractor shall not presume or expect RailCorp to provide any personnel, equipment or materials.

As an indication of the nature of the work to be undertaken, the fields of works to be carried out at each design assignment is broadly described in the Design Stages & Activities and Competency vs. Skills Matrix sheets, but may include associated works as described elsewhere in this APR Document.

E3.2 SPECIFIC REQUIREMENTS OF (DESIGN) PROGRAM MANAGEMENT SERVICES PANEL (PANEL 72)

E3.2.1 OVERVIEW

The term ‘program management’ is used to denote a number (‘package’) of associated or similar projects that RailCorp wishes to implement. The services to be provided under this Brief are to project manage this package by providing the necessary resources up to and including the initial concept stage through the detailed planning and design stages depending on the project brief. The end responsibility of the Service Provider is to deliver a ‘package’ of work that is ready for the calling of tenders and construction.

The project management methodology to be used is to be consistent with that adopted by the Australian Institute of Project Management (AIPM). A typical matrix of activities and deliverable’s is attached.

E3.2.1 QUALIFICATIONS AND EXPERIENCE OF THE SERVICE PROVIDER

It is expected that the key personnel provided by the Contractor will be either qualified under the AIPM accreditation scheme or possess experience equivalent to that required under the scheme. The key personnel will need to be qualified with a Bachelor of Engineering degree relevant to the nominated discipline, and be eligible for the graduate membership of the IEAust.

The key personnel will need to be proficient in Railway engineering, operations, engineering design Co-ordination & management.

The key personnel will also be required to be familiar with relevant Australian Standards, NSW State Government procurement policies and relevant NSW

State legislation. In particular, the Contractor is required to have a sound working knowledge and understanding of the NSW Rail Safety Act 2008 and the current Occupational Health and Safety Regulation.

A matrix of competencies and skills required is attached

E3.2.3 DESCRIPTION OF SERVICES TO BE PROVIDED

For each package of works, the Contractor will be expected to attend an initial briefing with the relevant RailCorp managers, who will provide a hand over of the package of works required to be implemented. The Contractor will then be required to provide the following, but not limited to, services as applicable:

Programme development:

- ☐ Determination of the scope, objectives, costs and benefits of the proposed works;
- ☐ Relationship with other projects including any mutual effects and inter-dependencies;
- ☐ Risk, safety, environmental and heritage appraisals;
- ☐ Financial evaluation;
- ☐ Time schedule;
- ☐ Preparation of a project plan for the works package;
- ☐ Presentation to relevant stakeholders and obtaining sign-off.

Concept design:

- ☐ Preparation of design brief with the assistance and input of RailCorp designers
- ☐ Management of design contract and interfacing with RailCorp;
- ☐ Review of costs, time and risks as above and updating of the project plan;
- ☐ Presentation to relevant stakeholders and obtaining sign-off.

Detailed design:

- ☐ Preparation of design brief with the assistance and input from RailCorp designers
- ☐ Assist RailCorp in management of tendering process and evaluation of tenders;
- ☐ Management of design contract and interfacing with RailCorp;
- ☐ Review of costs, time and risks as above and updating of the project plan;
- ☐ Presentation to relevant stakeholders and obtaining sign-off.

For the concept and detailed design works, the Contractor will first consult RailCorp designers to check their ability to provide designs. If RailCorp designers not available to provide the services, external design Contractor to be drawn from panels of Design Consultants already established by RailCorp.

E3.2.4 PROJECT MANAGEMENT AND PROCUREMENT PROCEDURES

In implementing the services under this Brief, the Contractor will be required to follow standard project management and procurements practices applied within RailCorp.

In the case of employing design contractors, RailCorp will enter into a direct contract with the contractors concerned. The Contractor under this Brief will be required however to administer the contract on RailCorp's behalf.

The Contractor will be required to prepare and supply periodic reports on the progress of the works (minimum monthly), as stipulated by RailCorp for the specific packages including of minimum monthly project status review meetings.

E3.2.5 OFFICE LOCATION

For the services to be provided under this Brief, it is expected that the Contractor may utilise his own office premises and provide at his own cost all necessary office equipment, computing facilities, stationery and administrative support etc.

E3.2.6 BACK-UP FOR KEY PERSONNEL

The Contractor may be required to resource a suitable back-up personnel available in the event that the key person/personnel become unavailable on a particular engagement or additional resources are required.

E3.2.7 PROJECT RECORDS

At the completion of each project, the Contractor will be required to supply to RailCorp a complete set of documentation of the work that he has carried out in RailCorp's filing system. Files as required shall be obtained from RailCorp and returned on project closure for RailCorp's archival. All drawings and papers shall be filed in an organised and a logical manner to facilitate the retrieval of information.

E3.3 SPECIFIC REQUIREMENTS OF DESIGN PANELS

The EDPM is to provide all the necessary resources to provide designs / reports, as required and defined in the relevant Briefs issued under these Panels.

Anticipated delivery stages, activities and skill requirements for each Design Panel are shown on Design Panel specific information sheets contained herein.

PANELNO: 10 - TRACK - DESIGN STAGES & ACTIVITIES

	STAGES IN DESIGN	ACTIVITIES INCLUDED BUT NOT LIMITED	Expected Skill Levels to carry out the Tasks	Systems/Standards required for Consultants to interface seamlessly with RailCorp	DESIGNERS OUTPUT DOCUMENT/DRAWING REQUIREMENTS
A	Investigations, Feasibility/ Concept Design & Reporting	Data collection	Refer to Competency matrix Track Engineering Design Attached	RailCorp CAD AND DRAFTING MANUAL	
		Site Investigation			
		Preliminary alignment layout - horizontal			
		Preliminary alignment layout - vertical			
		Earthworks cross sections			
		Scope of Works plan			
		Transit Space Study			
		Design Co-ordination meetings			
		Presentations/Workshops			
		Concept Design Report			
B	Detailed Final Design	Data collection			
		Site inspection			
		Design/Document alignment - horizontal			
		Design/Document alignment - vertical			
		Design/Document earthworks cross sections			
		Scope of Works plan			
		Transit Space Study			
		Staging			
		Design Co-ordination Meetings			
		Presentations/Workshops			
		Technical Specification - Construction			
		Final Design Report			
C	Track Component Design	General Arrangement - Turnouts, Diamonds, etc			
		Manufacturing Drgs - Switches, crossings, etc			
D	Miscellaneous	Cadastral Drawings			
		Detail Survey Drawings			
		3D Modelling - Mapping			

TRACK DESIGN

[illegible]

PANEL NO: 12 - RAILWAY INFRASTRUCTURE - DESIGN STAGES & ACTIVITIES

[Predominantly Track Engineering with capacity to manage and integrate Signal & Electrical O.H. concept designs]

	STAGES IN DESIGN	ACTIVITIES INCLUDED BUT NOT LIMITED	Expected Skill Levels to carry out the Tasks	Systems/Standards required for Consultants to interface seamlessly with RailCorp	DESIGNERS OUTPUT DOCUMENT/DRAWING REQUIREMENTS (MAY INCLUDE)
A	Investigations, Concept Design & Reporting	Site Inspections	Refer to Competency matrix Railway Infrastructure Design Attached	RAILCORP CAD AND DRAFTING MANUAL	
		Undertake Site Investigations			
		Undertake hydrologic/hydraulic analysis			Hydrology report
		Assess hydrological requirements			
		Undertake geotechnical survey			Geotechnical report
		Assess geotechnical information			
		Undertake site survey			Survey drawings
		Asses survey information			
		Services search			Documentation / Drafts
		Consult with government authorities			
		Ascertain stakeholders' requirements			Concept Drawings
		Assess results of Investigations			
		Prepare Concept Design reports involving perway, signalling and O.H Electricals			Reports
B	Preliminary Design & Reporting	Generate options & configurations			
		Generate configuration options			
		Assess merits of options			
		Preliminary costing of options			
		Preliminary assessment of environmental issues			
		Constructability review			
		Prepare Preliminary Design Reports			Report / Drawings
C	Design Management	Undertake Design Management			
D	Detailed Design	Detailed design			Calculations
		Drafting & preparation of drawings			Detail Design Drawings
		Refine cost estimate			Cost estimate
		Prepare detailed design report			Detail design report
		Prepare written scope of work			Scope of work
E	Tender/Construction Documentation	Assist with tender documentation preparation & enquires			
		Assist with tender evaluation			
F	Contract Management	Undertake Contract Management			
G	Assistance during Construction	Assist with technical enquires			
H	Assistance during Testing/Commissioning	Assist with technical enquires			
I	As Built Drawings	Prepare marked-up as built			As-built drawings

RAILWAY INFRASTRUCTURE DESIGN

[illegible]

PANEL NO: 20 - HYDROLOGY - DESIGN STAGES & ACTIVITIES

	STAGES IN DESIGN	ACTIVITIES INCLUDED BUT NOT LIMITED	Expected Skill Levels to carry out the Tasks	Systems/Standards required for Consultants to interface seamlessly with RailCorp	DESIGNERS OUTPUT DOCUMENT/DRAWING REQUIREMENTS
A	Investigations, Concept Design & Reporting		Refer to Competency matrix Hydrology Design Attached	RailCorp CAD AND DRAFTING MANUAL EM 0149	
				Relevant RailCorp Structures Standards	
B	Preliminary Investigation, Design & Reporting	Site inspection Detailed site survey (unless provided by others) Undertake hydrologic/hydraulic analysis Develop Options Consult with government authorities (if applicable) Ascertain stakeholders' requirements (if applicable) Prepare report			Survey drawings Hydrology report
C	Detailed Design (Drainage)	Detailed design Drafting & preparation of drawings Cost estimate Prepare detailed design report (optional) Review of Environmental Factors (if applicable) Technical Specification (if applicable)			Calculations Drawings Cost estimate REF Report Specification
	Tender/Construction Documentation				
E	Assistance during Construction	Assist with technical enquiries (optional)			
F	Assistance during Testing/Commissioning				
G	As Built Drawings	Prepare marked-up as built (optional)			As-built drawings

HYDROLOGY

[illegible]

PANEL 21 - FIRE AND LIFE SAFETY - DESIGN STAGES & ACTIVITIES

	STAGES IN DESIGN	ACTIVITIES INCLUDED BUT NOT LIMITED TO	Expected Skill Levels to carry out the Tasks	Systems/Standards required for Consultants to interface seamlessly with RailCorp	DESIGNERS OUTPUT DOCUMENT/DRAWING REQUIREMENTS		
A	Skills necessary for Investigations	Data collection					
		Site Investigation					
		Site Inspections					
		BCA Auditors					
		Knowledge of BCA					
		Fire Engineers					
		Fire Auditors					
		Comprehensive knowledge of Fire Codes and Standards					
		Knowledge of Standard Guidelines for Fire and Life Safety in the construction of Underground Railway Facilities.					
		Knowledge of RailCorp Standard TS 34 100 3 01 SP - Design and Installation - Tunnel Fire Safety - New Passenger Railway Tunnels					
		Track Safety Awareness Accreditation					
		Accredited for OH&S Induction Training for Construction Work (Green Card).					
		Appreciation in Safety Management					
		Experience in the management of OH&S issues.					
		Appreciation of Emergency Management Training					
		Appreciation of Rail Safety Management					
		Appreciation of Emergency Management					
		Appreciation in the preparation of Safe Working Method Statements					
		Experience of past railway projects					
		Experience of working under Worksite Protection					
		Experience of working in Possessions					
		Possession Awareness					
		Appreciation of Electrical Design, Traction Supply Design, Signal Design, Civil Design, Hydraulic Design, Mechanical Design and Structural Design.					
		Appreciation of Traction Supply Network and Systems					
		Appreciation of Railway Critical Operating Systems					
		Appreciation of Signalling Network and Systems					
		Appreciation of Current Trends and Developments in Fire Engineering.					
		Knowledge of Hydraulic System Applications					
		Knowledge of Local Railway Geography					
		Knowledge of Network System Diagrams					
		Knowledge of Single Line Diagrams					
		Knowledge of NSW Fire Brigade systems of control, operational procedures and operating standards.					
		Past Experience of dealing with the local operators and asset managers.					
		Experience in conducting and facilitating Stakeholder reviews					
		Experience in conducting and facilitating Risk Assessment Workshops					
		Experience in conducting co-ordination and progress meetings					
B	Concept Detailed Design reporting	Experience in the design of Fire and Life Safety Management Systems					
		Experience in the design of Fire Protection Systems					
		Experience in the design of Emergency Lighting Systems.					
		Experienced in formulating Risk Analysis					
		Experience in Risk Control and Mitigation					
		Experience in the use of BCA Performance based analysis techniques in assessing recommendations					
		Experience in formulating Cost Benefit Analysis to NSW Treasury Guidelines to attain Prioritisations					
		Experience in the interpretation of patronage information for the purposes of assessing evacuation times.					
		Experienced in the use of computerised evacuation simulations.					
		Knowledge and Experience in the use of fire simulation software and Computerised Fluid Dynamic Software.					
		Knowledge of Relevant Australian Standards and Codes					
		Design of Fire Systems, Hydrants, Hoses, Sprinklers, Control systems and fire fighting equipment.					
		Experience in the design of Fire Detection Systems, Early Warning Systems, Fire Suppression Systems and Fire Communication Systems.					
		Report writing					
		Production of Scopes of Works					
		Production of Technical Briefs					
		Production of Concept Design Reports					
		Production of Detailed Design Reports					

PANEL NO: 22 - BRIDGE DESIGN PANEL - DESIGN STAGES & ACTIVITIES

	STAGES IN DESIGN	ACTIVITIES INCLUDED BUT NOT LIMITED	Expected Skill Levels to carry out the Tasks	Systems/Standards required for Consultants to interface seamlessly with RIC	DESIGNERS OUTPUT DOCUMENT/DRAWING REQUIREMENTS
1.1	Investigations, Concept Design & Reporting	Site inspection	Refer to Competency matrix Bridge Design Attached	RIC CAD AND	
		Undertake hydrologic/hydraulic analysis		DRAFTING MANUAL	Hydrology/ hydraulics report
		Undertake geotechnical survey (if not provided by others)		EM 0149	Geotechnical report
		Assess geotechnical information		CM VO.5	
		Undertake site survey (if not provided by others)			Survey drawings
		Assess survey information		RAILCORP BRIDGE	
		Services search		DESIGN STANDARDS	Documentation
		Consult with government authorities			
		Identify & ascertain stakeholders' requirements			
		Undertake heritage assessment (if applicable)			Heritage report
1.2	Preliminary Design & Reporting	Generate structural options			
		Generate configuration options			
		Assess merits of options			
		Preliminary costing of options			Cost estimate
		Preliminary assessment of environmental issues			
		Preliminary Review of Environmental Factors (if applicable)			REF Report
		Heritage assessment (if applicable)			Heritage Report
		Risk Assessment (Design) If Applicable			
		Value Management Study (If Applicable)			
		Constructability review			
		Prepare Stage 1 report			Stage 1 report
1.3	Detailed Design	Detailed design			Calculations
		Drafting & preparation of drawings			Drawings
		Refine cost estimate			Cost estimate
		Prepare detailed design report			Stage 2 report
		Final Review of Environmental Factors (if applicable)			REF Report
		Final heritage assessment (if applicable)			Heritage Report/ Impact Statement
		Prepare written scope of work			Scope of work
		TMP (If applicable)			TMP
1.4	Tender/Construction Documentation	Assist with tender enquiries			
		Assist with tender evaluation			
1.5	Assistance during Construction	Assist with technical enquiries			
1.6	Assistance during Testing/Commissioning	Assist with technical enquiries			
1.7	As Built Drawings	Prepare marked-up as built			As-built drawings
1.8	Others (Pl. specify)				

BRIDGE DESIGN

[illegible]

PANEL NO: 24 - STRUCTURAL PANEL - DESIGN STAGES & ACTIVITIES

	STAGES IN DESIGN	ACTIVITIES INCLUDED BUT NOT LIMITED	Expected Skill Levels to carry out the Tasks	Systems/Standards required for Consultants to interface seamlessly with RIC	DESIGNERS OUTPUT DOCUMENT/DRAWING REQUIREMENTS
A	Investigations, Concept Design & Reporting	Site inspection Undertake hydrologic/hydraulic analysis (if applicable) Undertake geotechnical survey (if not provided by others) Assess geotechnical information Undertake site survey (if not provided by others) Assess survey information Services search (if applicable) Consult with government authorities (if applicable) Ascertain stakeholders' requirements (if applicable) Undertake heritage assessment (if applicable)	Refer to Competency matrix Structural Design Attached	RailCorp CAD AND DRAFTING MANUAL EM 0149 RailCorp Structures Design Standards	Hydrology report Geotechnical report Survey drawings Documentation Heritage report
B	Preliminary Design & Reporting	Generate structural options Generate configuration options Assess merits of options Preliminary costing of options Preliminary assessment of environmental issues Preliminary Review of Environmental Factors (if applicable) Heritage assessment (if applicable) Constructability review Prepare Stage 1 report			Cost estimate REF Report Heritage Report Stage 1 report
C	Detailed Design	Detailed design Drafting & preparation of drawings Refine cost estimate Prepare detailed design report (optional) Final Review of Environmental Factors (if applicable) Final heritage assessment (if applicable) Prepare written scope of work Technical Specification (if applicable)			Calculations Drawings Cost estimate Stage 2 report REF Report Heritage Report/ Impact Scope of work Specification
D	Tender/Construction Documentation	Assist with tender enquiries (optional) Assist with tender evaluation (optional)			
E	Assistance during Construction	Assist with technical enquiries (optional)			
F	Assistance during Testing/Commissioning	Assist with technical enquiries (optional)			
G	As Built Drawings	Prepare marked-up as built (optional)			As-built drawings

STRUCTURAL DESIGN

[illegible]

PANEL 26 - GEOTECHNICAL - DESIGN STAGES & ACTIVITIES

	STAGES IN DESIGN	ACTIVITIES INCLUDED BUT NOT LIMITED	Expected Qualification and Skill Levels to carry out the Tasks	Systems/Standards required for Consultants to interface seamlessly with RIC	DESIGNERS OUTPUT DOCUMENT/DRAWING REQUIREMENTS
A	Investigations, Concept Design & Reporting	Site Investigation	Bachelor in Civil Engineering and preferably Master's in Geotechnical Engineering. Experienced Geotechnical Engineer	Comply to relevant AS and RailCorp standards and specifications	
		Collection of geotechnical site data			
		Sub-soil investigation including drilling			
		In-situ testing	Refer to Competency matrix Geotechnical Design Attached	RailCorp CAD AND DRAFTING MANUAL	
		Laboratory testing		EM 0149	
		Analysis			
		Recommendations			
B	Preliminary Design & Reporting				
C	Detailed Design				
D	Tender/Construction Documentation				
		Contract valuation			
		Bidding Process			
		Evaluation			
E	Assistance during Construction				
		Construction supervision and design review when necessary			
F	Assistance during Testing/Commissioning	Analyse and reporting			
G	As Built Drawings				

Panel 26 Geotechnical - Competency Matrix

															Training					Experience										
		Qualifications & Skills												Technical & Management					Experience			Exposure								
	Competency\Skill	Certificate/Diploma	Bachelor Degree	Post Graduate Degree	TAFE	NATA Certified	In House Training	Specific Skill training	Word	Excel	DigiPro/DMM software	CAD			Slope Stability Software	UDEC	Complex Numerical Analysis software	Technical Report Writing	Risk management		1 project	2 Projects	5 Projects	10 Projects	Other	1 Year	2 Years	3 Years	5 Years	10 Years
A	Conduct Geotechnical Investigations																													
	Log bore holes	x			x		x	x																			x			
	Log engineering test pits	x			x		x	x																			x			
	Laboratory testing of soil/rock/construction materials	x				x			x	x																	x			
	Insitu Testing of soil/rock	x			x		x	x	x	x																	x			
	Ground Movement monitoring	x			x		x	x	x	x																	x			
	Plan Geotechnical Investigations		x				x																	x			x			
	Conduct rock slope stability Investigation		x																									x		
	Conduct soil slope stability Investigation	x																											x	
	Conduct track formation Investigation	x																										x		
	Conduct foundation Investigation	x																											x	
	Carry out site inspection mapping						x																					x		
	Identify Geotechnical Hazards	x																											x	
B	Interpret Geotechnical Information																													
	Drawings/CAD											x																		
	Prepare descriptions of subsurface materials		x																										x	
	Interpret Geotechnical Design parameters		x																											x
	Interpret Rock Foundation Properties		x																											x
	Identify Contributing factors to geotechnical failures		x																											x
	Identify Geotechnical Failure Mechanisms		x																											x
	Evaluate Aggregate Properties		x																									x		
C	Analysis and Review																													
	Bearing Capacity analysis		x																											x
	Foundation Settlement analysis		x																											x
	Retaining wall stability analysis		x																											x
	Pile foundation analysis		x																											x
	Slope stability analysis		x										x																	x
	Review and assess mine subsidence analysis		x														x													x
	Review and assess open cut mine stability assessment		x	x									x				x													x
	Source rock evaluation for ballast		x					x																					x	
	Prepare written geotechnical reports		x																											x
	Geotechnical Risk Analysis		x	x					x										x											x
D	Advice and Design																													
	Advice on Earthworks material properties	x				x																								x
	Advise on contaminated material	x				x																								x
	Track formation design		x					x																						x
	Pavement design																													x
	Prepare conditions for mining near rail infrastructure		x																						x					x
	Develop Risk Assessment systems		x	x															x											x
	Develop Drainage Designs		x			x																						x		
	Design Construction material Properties	x				x																								x
	Prepare Technical Specifications		x						x																					x
	Develop Remedial measures to address soil slope instability		x													x														x
	Develop Remedial measures to address rock slope instability		x						x																					x
	Earthworks and batter slope design		x													x														x
	Shotcrete design		x																											x
	Assessment of rock rippability		x																									x		
	Prepare options reports		x						x																					x
E	Technical Supervision																													
	Provide Technical Support for earthworks construction	x				x		x																					x	
	Provide Technical Support for slope remediation		x																											x
	Technical Review of Geotechnical reports on Track investigation.		x							x	x																			x
	Technical Review of Geotechnical reports on Soil Slope Stability.		x	x						x	x					x														x
	Technical Review of Geotechnical Reports on Rock Slope Stability		x	x						x	x					x														x
	Technical Review on Geotechnical Reports using Finite element analysis		x	x						x	x						x													x
	Review Technical Standards									x	x																			x
	Training and mentoring technical staff	x	x							x	x																			x
F	Management																													
	Project Management		x						x	x	x																			

PANEL NO: 72 - PROGRAM MANAGER - DESIGN STAGES & ACTIVITIES

	PROJECT STAGES	ACTIVITIES INCLUDED BUT NOT LIMITED AND AS APPLICABLE	Expected Skill Levels to carry out the Tasks	Systems/Standards required for Consultants to interface seamlessly with RC	Deliverable's/ documentation
A	Programme development	Attend inception meeting with client	See attached competency/ skill matrix	RailCorp project management and procurement procedures.	
		Collect data			
		Inspect site/s			
		Establish stakeholders			
		Arrange/ conduct stakeholder workshop			Minutes
		Establish project objectives			Statement
		Establish project scope			Statement
		Establish project timeframe			Programme
		Conduct risk assessment			Risk report
		Arrange value engineering/ management			VE/ VM report
		Arrange cost estimates and cash flow forecasts			Cost estimate/ cash flow
		Arrange financial appraisal/ prepare business case			Business case
		Address environmental issues			Environmental report
		Address heritage issues			Heritage report
		Prepare quality plan			Quality plan
		Prepare initial project plan			Project plan
		Obtain client & stakeholder sign-off			Sign-off
B	Concept design	Prepare design brief			Design brief
		Manage design briefing			
		Evaluate responses			Report & recommendation
		Manage design contract			
		Address constructability			Constructability report
		Arrange co-ordination meetings with client/ stakeholders			Minutes
		Arrange concept design report/ prelim drawings			Concept design report
		Review project scope, objectives and timeframe			Updated statements & programme
		Review project costs and cash flow forecasts			Updated cost estimates/ cash flow
		Review business case			Updated business case
		Review project risks			Updated risk report
		Review environmental and heritage issues			Updated reports
		Update quality plan			Updated quality plan
		Update project plan			Updated project plan
		Obtain client & stakeholder sign-off			Sign-off
C	Detailed design	Prepare design brief			Design brief
		Manage design briefing			
		Evaluate responses			Report & recommendation
		Manage design contract			
		Address constructability			Constructability report
		Arrange co-ordination meetings with client/ stakeholders			Minutes
		Arrange detailed design report			Detailed design report
		Arrange construction issue drawings			Drawings
		Review & finalise project scope and timeframe			Updated statements & programme
		Review & finalise cost estimates and cash flow forecasts			Updated cost estimates/ cash flow
		Review business case			Update business case
		Review project risks			Updated risk report
		Arrange final environmental and heritage assessments			Updated reports
		Update quality plan			Updated quality plan
		Update project plan			Updated project plan
		Obtain client & stakeholder sign-off			Sign-off
D	Close Out	Provide copies and records etc			All design files and document
		Close out report			Report
		Feedback on performance of designer etc			Report

Panel No. 72 - (DESIGN) PROGRAM MANAGEMENT

COMPETENCIES	PERSONAL QUALIFICATIONS & SKILLS														TECHNICAL SKILLS														EXPERIENCE	
	PROJECT MANAGEMENT	TRACK AWARENESS	GOOD ORAL COMMUNICATION	GOOD WRITTEN COMMUNICATION	MICROSOFT OFFICE SOFTWARE	TECHNICAL REPORT WRITING	PRESENTATION SKILLS	TIME MANAGEMENT	PROBLEM SOLVING	DECISION MAKING	TEAM WORK	OCCUPATIONAL HEALTH & SAFETY	LEGISLATION	CONTRACT ADMINISTRATION	PROJECT DELIVERY PROCEDURES	LOGICAL THINKING	VALUE MGMT/ ENGINEERING	FINANCIAL APPRAISALS	RISK ASSESSMENT	ENVIRONMENTAL APPRAISALS	HERITAGE APPRAISALS	QUALITY SYSTEMS	COST ESTIMATING	CASHFLOW FORECASTING	PROJECT INTEGRATION	TIME SCHEDULING	PROCUREMENT	RESOURCE MANAGEMENT	5 JOBS	10 JOBS OR MORE
A PROGRAMME DEVELOPMENT																														
Meeting with Client	X		X					X																						X
Data collection	X							X																		X				X
Site inspections	X	X	X					X				X																		X
Establish stakeholders	X								X							X														X
Conduct stakeholder workshop	X		X	X	X		X	X		X	X																			X
Establish project objectives	X								X	X						X										X				X
Establish project scope	X								X	X						X										X				X
Establish project timeframe	X				X				X	X						X										X	X			X
Conduct risk assessment	X		X	X	X				X	X	X	X	X			X			X											X
Value engineering/ management	X		X	X	X			X	X	X	X	X				X	X								X		X	X	X	X
Cost estimates/ cashflow forecasts	X				X				X	X						X							X	X				X	X	X
Financial appraisals	X				X				X	X						X		X						X			X		X	X
Environmental issues	X								X				X			X			X	X				X					X	X
Heritage issues	X								X				X			X			X		X								X	X
Quality plan	X			X	X	X							X			X						X			X					X
Initial project plan	X			X	X	X									X	X									X			X		X
Client & stakeholder sign-off	X			X	X		X	X			X				X	X												X		X
B CONCEPT DESIGN																														
Prepare design brief	X			X	X							X		X		X							X			X		X		X
Manage design briefing	X		X	X				X						X		X											X			X
Evaluate responses	X			X	X				X			X		X		X											X			X
Manage design contract	X		X	X	X			X	X	X	X	X		X		X							X						X	
Address constructability	X								X	X	X	X	X			X														X
Co-ordination meetings with client/ stakeholders	X		X	X	X		X	X		X	X					X														X
Arrange concept design report/ prelim drawings	X																													X
Review project scope, objectives and timeframe	X				X				X							X									X	X				X
Review project costs and cashflow forecasts	X				X				X							X							X	X				X		X
Review business case	X				X				X							X		X					X			X				X
Review project risks	X				X				X	X	X	X				X			X		X									X
Review environmental and heritage issues	X								X				X			X			X	X	X									X
Update quality plan	X			X	X	X						X				X						X			X					X
Update project plan	X			X	X	X						X			X	X										X		X		X
Obtain client & stakeholder sign-off	X		X	X	X		X	X			X				X													X		X
C DETAILED DESIGN																														
Prepare design brief	X			X	X			X				X		X		X							X			X		X		X
Manage design briefing	X		X					X						X		X											X			X
Evaluate responses	X			X	X				X			X		X		X											X			X
Manage design contract	X		X	X	X			X	X	X	X	X		X		X							X						X	
Address constructability	X								X	X	X	X	X			X														X
Co-ordination meetings with client/ stakeholders	X		X	X	X		X	X			X					X														X
Arrange detailed design report	X																													X
Arrange construction issue drawings	X																													X
Review & finalise project scope and timeframe	X				X				X							X									X	X				X
Review & finalise cost estimates/ cashflows	X				X				X							X							X	X				X		X
Review business case	X				X				X							X		X					X			X				X
Review project risks	X				X				X	X	X	X	X			X			X		X	X								X
Final environmental and heritage assessments	X								X				X			X					X	X								X
Update quality plan	X			X	X	X							X			X						X			X					X
Update project plan	X			X	X	X						X				X									X			X		X
Obtain client & stakeholder sign-off	X		X	X	X		X	X			X				X															X

E4 SECONDARY CONSULTANT SERVICES IN ENGINEERING DESIGN ENGAGEMENTS

Secondary consultant services may be required during the contract e.g.: geotechnical, survey or other types of investigation, if this information is not to be provided by RailCorp. Secondary consultants will be under the control of, and be responsible to the principal EDPM. Any secondary consultants proposed to be used in any engagement must be nominated in the Offer of Service. The Offer of Service is to include costs of all secondary consultants including disbursements. In addition, information relating to the secondary consultant's capability to carry out the work in terms of experience, resources and current workload shall be provided.

Secondary consultants nominated require concurrence from RailCorp prior to commencement of the engagement.

E5 DESIGN CONSIDERATIONS

The EDPM, as part of their design assignment, shall be responsible for selecting and making use of appropriate standards, codes and other statutory requirements. RailCorp will rely on the professionalism of the EDPM to make the appropriate judgements in this area and have them vetted by RailCorp's Representative for the assignment.

Note:

The EDPM will take into consideration the information contained in the following appendices:

- **Appendix E3** – Codes & Requirements
- **Appendix E4** – Statutory Requirements, Standards & Codes

E5.1 ASSUMPTIONS & CONCLUSIONS

All assumptions and /or conclusions made, arrived at, or otherwise deemed necessary to complete the project shall be discussed and agreed with RailCorp's Representative prior to proceeding with the relevant section of work, and appropriately justified and described in the relevant report document.

E6 SAFETY ASSURANCE IN DESIGN ASSIGNMENTS

RailCorp has developed 20 Safety System Elements to achieve its safety responsibilities as the owner and maintainer of the NSW Rail Network, in accordance with the requirements of:

- The Transport Administration Act 1988;
- The Transport Administration Amendment (Rev 1 Management) Act 2000;
- Rail Safety Act 2008 and the associated Rail Safety Regulations.
(A copy of "Safety System Elements" is available on request.)

In fulfilling the safety responsibilities the EDPM must consider risks relevant to the assignment brief and manage risks following RailCorp approved processes. In addition, the EDPM will keep RailCorp's Representative informed of any safety or safety related issues.

E7 PROCEDURAL REQUIREMENTS

E7.1 EDPM ACTIVITY – GENERALLY

All detail design and documentation services including:

- Investigation and assessment reports of all existing services to accommodate the proposed facilities;
- Organisation and co-ordination of meetings, workshops, and other EDPM requirements, minutes of all meetings are to be prepared by the EDPM. All formal Review Activities will be organised by RailCorp's Representative;
- Preparation and submission of relevant statutory reports including preparation and submission of contingency plans, safety management plans, environmental management plans, test reports (including for hazardous materials) and finishes, noise and dust prevention audits;
- Preparation and co-ordination of Tender Documentation as required;
- Co-ordination, management, and monitoring of the Design Sub-Consultants' performance;
- Ensuring Design Sub-Consultants' perform their obligations in a professional and timely manner;
- Detail survey, geotechnical and power supply capacity analysis;
- Prepare as required "Technical Maintenance Plans" (TMP);
- Provide assistance to project managers in developing a Project Control Plans (PCP), Job Safety Assessment (JSA), other lower level risk management elements and Safety Management System (SMS) incorporating:
 - Work Management Plan
 - Worksite Protection Plan
 - Site Safety Procedures, and
 - Safe Work Method Statements.

E7.2 PROJECT REVIEW

E7.2.1 REVIEWS AND HOLD POINTS

The EDPM shall submit specific deliverables for formal review and approval at the specified date.

Listed below is a list of indicative ‘Hold Points’

For individual assignments, the EDPM shall submit appropriate ‘Hold Points’ for consideration and approval by RailCorp Representative:

- Review 1 - Project Definition
- Review 2 - Concept Design
- Review 3 - Design Development
- Review 4 - 60% Documentation
- Review 5 - 90% Documentation
- Review 6 - Final review prior to issue to RailCorp

The purpose of the Hold Points is to convene RailCorp’s Review Committee and to obtain the consent from RailCorp and the Stakeholders prior to progressing to the next stage.

The Services provided by the EDPM with regard to particular items or even the whole Scope of Work for the Project may be interrupted immediately following a meeting of RailCorp’s Review Committee. The Services shall not continue until notice in writing is provided by RailCorp’s Representative removing the “Hold Point”.

“Hold points” will not generally examine alternative solutions, other than if requested by and confirmed in writing by RailCorp’s Representative or demanded by the stage of work.

The EDPM is advised that excessive development of design beyond the nominated “Hold Points” prior to approval to proceed may result in wasted effort and shall not warrant payment for wasted fees in this regard.

E7.2.2 MEETINGS

Regular design meetings will be held for the purpose of assessing progress and coordinating the work. These meetings will be held as follows: -

- Initial meeting within 7 days of award of Contract at the offices of RailCorp - 477 Pitt St, Sydney.
- Subsequent meetings shall be held every 2 weeks at the office of the EDPM or as otherwise agreed.

E7.3 DOCUMENTATION

E7.3.1 DOCUMENTATION SUBMISSION REQUIREMENTS

Typical requirements for the document submission shall be as follows:

- As Proposed (concept, preliminary design)
- As Designed
- For Construction or for Installation
- For Testing, Verification or for Commissioning
- As Built.

It may also be required to lodge additional electronic files at the following phases in reference to an asset's life cycle:

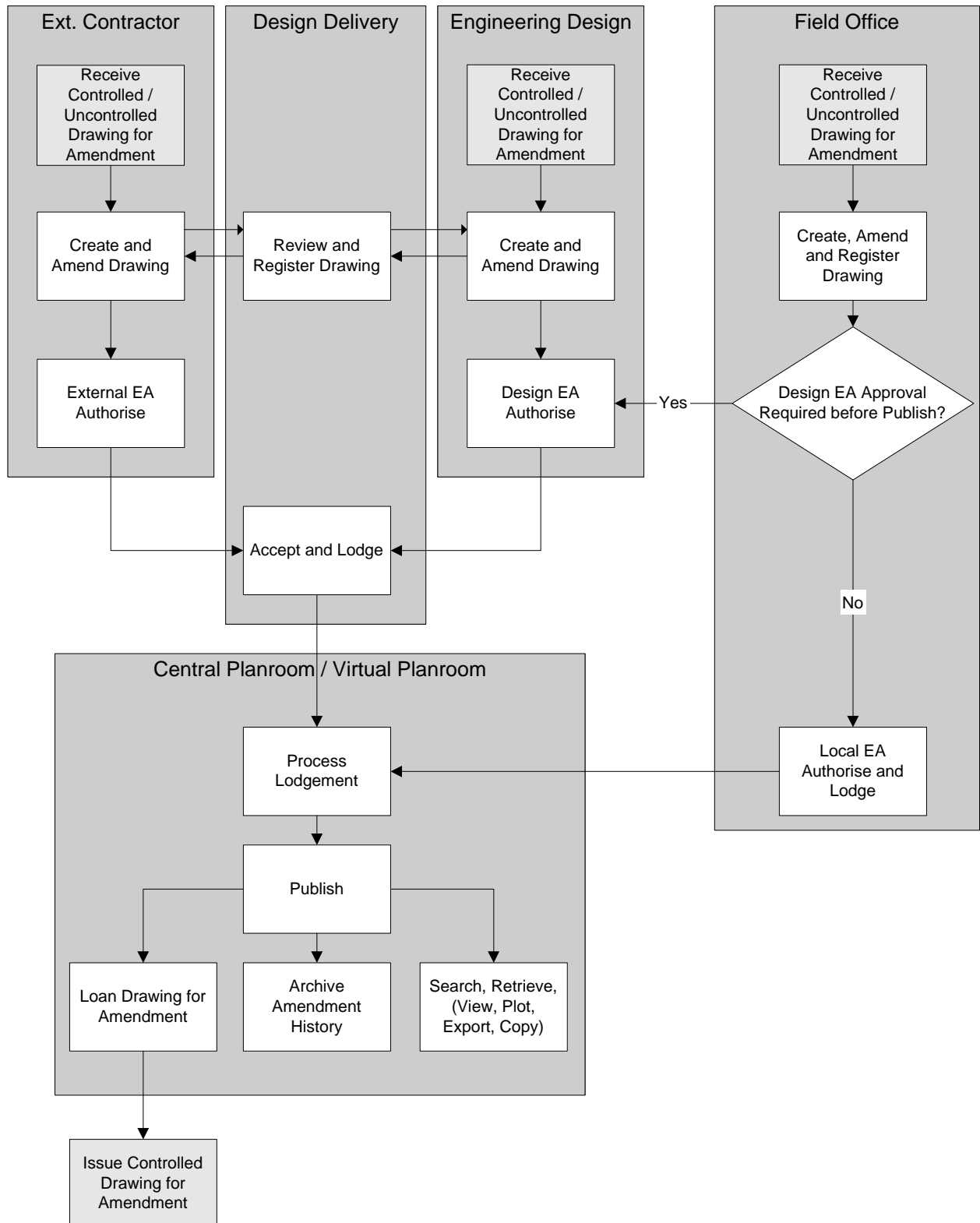
- As supplied (3rd party manufactured drawings)
- As Maintained (field mark up)
- As De-commissioned.

E7.3.2 ARCHIVE PROJECT DOCUMENTS AND DRAWINGS

The EDPM is to ensure that the project documentation that has been generated and finalised throughout the different stages of the project is archived in a manner that allows future access (Refer **Figure 1** below). Unless stated otherwise, the above requirements are the mandatory tollgate stages of documentation of a project for which the EDPM must lodge electronic files into RailCorp's Plan Rooms:

Figure 1

**Proposed Planroom Lodgement Process
(after Planroom Digitisation Project)**



E7.3.3 DOCUMENTATION GENERALLY

Drawings are to be checked by the EDPM for dimensional correctness, taking into account construction tolerances. All items must be fully dimensioned and setout points defined, ensuring practical setout on-site is possible. Nominal “closing” dimensions should be nominated (to match with survey information) as a check to ensure design adequacy. The EDPM shall allow the specified number of drawings and documentation for review of design as it progresses, with hold points at the nominated review stages for approval by RailCorp’s Representative prior to progressing to the next stage.

The EDPM shall incorporate any alterations to the detail design documents as requested by RailCorp’s Representative in writing (which may take the form of mark ups to the documents submitted by the EDPM to RailCorp’s Representative during the course of the design and documentation period). The EDPM shall resubmit the detail design documents for further review.

E7.3.4 CO-ORDINATION

The EDPM shall ensure co-ordination between all documents. Adequate time shall be programmed and allowed for co-ordination, and appropriate staff allocated for the co-ordination function. Co-ordination should include but not necessarily be limited to the following:

- Co-ordination of external specialist advice and incorporation into the documents, including from RailCorp’s Representative and Sub-Consultants nominated by RailCorp’s Representative;
- Co-ordination between drawings, and between drawn, scheduled and specified information;
- Co-ordination within each discipline’s documents;
- Co-ordination between each discipline’s documents.

E7.3.5 MINIMUM REQUIREMENTS FOR CHECKING DOCUMENTS

The EDPM shall ensure that all documentation is fully checked prior to submission to RailCorp’s Representative, at all stages of work. Allow adequate time for checking and rectification. Checking must occur after co-ordination has taken place. The EDPM shall provide a checklist appropriate to each location and each phase of the particular project (each hold point). Submit checklists as part of the Inspection and Test Plan under the Project Quality Plan and submit the completed checklist with the corresponding documentation. Any deficiencies should be rectified prior to submission of the documents. Checking should include, but not be limited to, the following;

- Completeness, appropriate to the stage of work;
- Conformance with briefed requirements and agreed parameters;
- Compliance with Statutes, Regulations, Standards, Codes and Authorities’ Requirements;

- Co-ordination (as defined above); and
- Clarity by ensuring the best possible communication of the information.

E7.3.6 SEPARATION OF DESIGN/DOCUMENTATION AND CHECKING FUNCTIONS

A basic principle of the checking process is that it will be as independent of the design/documentation process as possible. Consequently a requirement of the future contracts is that the Checker shall not have been directly involved in the design/documentation phase of the work. In the case of a design firm with limited staff, this may necessitate the checking phase being undertaken by another firm.

E7.3.7 CERTIFICATION OF CHECK

All drawings shall be signed as approved by the Designer and the Checker relative to the above requirements. Written certification will also be required.

The above actions are to be carried out PRIOR to submission to RailCorp's Representative.

E7.4 DRAWINGS

E7.4.1 DRAWINGS GENERALLY

Drawing Information Requirements are included in **Appendix E1** and an example of specific requirements is provided in **Appendix E6**.

Drawings are to be in accordance with RailCorp's current format on 'A1' size sheets and are to cover all project details. Drawings shall be legible when reduced to A3 size.

All drawings shall be prepared on CAD in a format 100% compatible with RailCorp Microstation system and shall include a Standard Title Block. One complete set of original drawings shall be provided as specified by RailCorp.

E7.4.2 DRAWING NUMBERS

E7.4.2.1 Drawings

The following procedure shall be followed:

- (a) Drawing numbers shall be obtained from the Plan Room, Level 1, 477 Pitt Street Sydney Central, phone (02) 892 21401, fax (02) 892 21404
- (b) Numbers are to be clearly printed in the bottom right hand corner in a RailCorp standard title block. Refer to RailCorp's CAD and Drafting Manual (Procedure no. ED0022P) available on RailCorp's intranet.
- (c) The appropriate official delegated approval and signature shall be annotated.

E7.5 CONTRACT DOCUMENTATION

E7.5.1 TENDER / CONTRACT DOCUMENTATION

Where the assignment includes preparation of the construction Tender Documentation, the EDPM shall incorporate in the documents, all the specific technical requirements as contained in Appendix E2 – 'Technical Specification Requirements'. It is also to include, as well all construction Tender addenda, content

of pre-construction contract negotiation, and particulars contained in the recommended construction Tenderer's Tender (annexure details etc). Stamp the revised documents DRAFT CONTRACT and submit for review by RailCorp's Representative.

Following this review the EDPM shall undertake any corrections required and issue two full sets of paper prints of the documents and an electronic copy of the same material to RailCorp's Representative and up to ten (10) sets to the Construction Contractor. All documents are to be stamped ISSUED FOR CONSTRUCTION, signed and dated. The amended documentation must be delivered within five (5) calendar days of the issue by RailCorp of the Letter of Acceptance to the successful construction Tenderer.

RailCorp will notify the EDPM when this Letter of Acceptance to the successful construction Contractor is issued.

E7.5.2 CONSTRUCTION TENDER PROCESS - RESPONDING TO QUERIES DURING THE CONSTRUCTION TENDER PERIOD

Prepare and issue to RailCorp's Representative documents as specified for each engagement. One set should be unbound. Co-ordinate and respond to Tender enquiries referred by RailCorp in relation to the design and documentation of the Works, raised by Tenderers for the construction of the works during the Tender period, and issue to RailCorp any clarifications requested. Under no circumstances will the EDPM respond directly to queries raised by Tenderers for the implementation of the works during the Tender period. Should any such queries be received by the EDPM during the Tender period for the construction phase of the works, the EDPM is to refer the query immediately to RailCorp's Representative.

E7.6 DRAWING LODGMENT

E7.6.1 LODGEMENT OF ELECTRONIC DOCUMENTS INTO PLANROOM

RailCorp has initiated the lodgement of Electronic files in the Planroom. The Virtual Plan Room (VPR) Project is in the process of being implemented into RailCorp. EDPM will be required to comply with the lodgement standards.

E7.6.2 DRAWINGS

All drawings produced to be used for Tendering for construction purposes shall be officially lodged in the Plan Room, Level 1 477 Pitt Street, Sydney, with a registered RailCorp Drawing number, having been approved and signed by RailCorp's Representative. The original will then be made available for reference purposes. Drawings shall be kept up to date with all amendments or alterations clearly annotated, approved and signed as above with the plan number altered to include an amendment letter from the next available on the alphabet commencing at "A".

It is imperative that the Plan Room is provided with not only the original plans but also that these plans are kept up to date with the latest approved amendments.

Each Drawing must be either scanned or an electronic TIF image and the CAD file supplied to the Planroom. The Planroom will provide details of the scanning standards to be used.

When an amendment to a drawing is made, the originals shall be obtained from EDMS Image Viewer or requested from the Planroom. Amended drawings (TIF Image + CAD file) shall be submitted to the Planroom.

E8 DELIVERABLES

E8.1 DELIVERABLE DETAILS

The EDPM shall comply with the deliverables noted in this APR or as directed by RailCorp's Representative, unless an alternative and detailed deliverable content is agreed at the submission of the resource program at the commencement of the mobilisation phase of the project. No alternative deliverables or deliverable content will be agreed to unless specifically related to the resource program and the content elaborated in detail at that stage. It should be noted that the Project Quality Plan would also be expected to relate directly to the agreed deliverables and proposed program, specifically, quality checklists and procedures.

E8.2 QUALITY SYSTEM

Submit a Project Quality plan for Project Definition, Concept Design, Design Development and Documentation phases of the work, applicable to work required for each project. It should be integrated with the requirements included in the specification for a Construction Quality Plan. Submit all associated checklists, and as the project proceeds submit conformance checking and certification. Note that RailCorp's Representative may undertake periodic quality audits.

E8.3 SAFETY PLAN & CERTIFICATION

Submit the following, in accordance with Part D, for approval 5 working days prior to undertaking the relevant work:

- OHS&R System Documentation with evidence of certification, if any;
- List of Personnel who will be undertaking any work on site, including measuring, inspection, Geotechnical, Survey, Heritage, along with evidence of appropriate safety certification;
- Site Specific Safety Plan (one for each Project); and
- Safe Work Method Statement.

E8.4 DESIGN PLAN

The formal Design Plan shall be based on RailCorp's 'Managing Engineering Design Control'. See Appendix E5 for details.

Prior to commencing design work, prepare and implement a Design Plan for the design component of the Works. The Design Plan is to identify each phase of the design and the key activities for each phase.

Identify in the Design Plan the following:

- the organisation charts for key personnel and design verification personnel showing technical interfaces. Include Sub-Consultant design disciplines in the organisation chart;
- information on personnel identified above including design Sub-Consultants: name and title, reporting relationship, qualifications, authorities and responsibilities;
- design inputs;
- design output documents;
- program including the sequence and duration of activities, design reviews, verification points and internal audits;
- co-ordination and clash avoidance strategy;
- applicable procedures.

Update the Design Plan during the course of the design and submit updates to RailCorp's Representative.

E8.5 EDPM's PROGRAM

The EDPM shall prepare a program based on, and developed from, the indicative Program submitted at the time of tender, applied to the specific projects in the Contract. The EDPM's Program of Services shall meet the following minimum requirements:

- A separate program is required for each Project;
- The program will incorporate costing and resourcing information broken down into grades and disciplines, the same as submitted in the Tender;
- Microsoft Project shall be the software used to develop the EDPM's Program of Services;
- The program shall include sufficient detail to enable progress to be assessed weekly, and for the Monthly Project Progress Report to be prepared based on an assessment of progress to date against this program;
- The program shall itemise all aspects of the Services required to be executed under the Contract, including;
- Identify activities required to be undertaken by the EDPM for each stage of the Services;

- Identify completion and delivery of each stage of the Services;
- Identify the dates when documents are required to be supplied by RailCorp;
- Identify the dates when documents and reports are required to be distributed by the EDPM for review by RailCorp and other Stakeholders;
- Identify RailCorp's "Review and Approval to Proceed" period;
- Include allowance for related activities of RailCorp or other parties which directly effect the performance of the Services by the EDPM;
- Include allowance for hold points, contractual constraints and other key dates;
- The program shall include cash flow forecasts required to be paid by RailCorp to the EDPM.

The agreed Program shall not be varied without the written approval of RailCorp's Representative.

If, and when, requested by RailCorp, the EDPM shall prepare and furnish supplementary Gantt charts to analyse and clarify complicated and questionable areas within the program. Supplementary Gantt charts shall be submitted to RailCorp's Representative within 2 working days from the date on which RailCorp's Representative makes such request or within such other period as shall be mutually agreed.

Without limiting the provisions of the Conditions of Engagement of Professional/Consultancy Services, the EDPM shall maintain sufficient resources at all times during the continuance of the Contract and execute the Services under the Contract in accordance with the approved EDPM's Program or approved revised EDPM's Program.

The supply of a program or revised program and reports by the EDPM and any approval by RailCorp's Representative of such programs under the Contract shall not relieve the EDPM of any obligations and responsibilities under the Contract.

E8.6 PERIODIC REPORTS

The EDPM shall provide RailCorp's Representative with a report every month in such form and on such matters as RailCorp's Representative requires from time to time, including:

- a report on the progress of the works;
- particulars of deviations from the Cost Plan/RailCorp's Budget or the Approved Program or changes to resourcing or design priority;
- a description of any matters which currently have a positive or adverse effect on the execution of the works;
- a description of any matters which in the EDPM's opinion have the potential

to affect the execution of the works; and

- particulars of the preventative and remedial action which has been, is being or may be taken in respect of the items herein before.

E8.7 MEETING MINUTES

The EDPM will chair design meetings and will keep minutes of the proceedings, and shall within two (2) working days provide copies of the minutes for all present at the meetings and others concerned with the matters discussed.

The EDPM will attend and minute various other meetings at the direction of RailCorp's Representative.

E8.8 CERTIFICATION

Supply independent certification that all-final construction documentation:

- If appropriate, complies with the Building Code of Australia (BCA) and all associated Australian Standards (AS). A certifier recognised under the Regulations of the Environmental Planning & Assessment Act must undertake this work.
- Complies with all matters raised in "Checking" above

E9 POST CONTRACT SERVICES

E9.1 CONSTRUCTION PROGRAM

It is anticipated that some Post Contract services will be required, and that rates supplied will be applied to that subsequent phase of the project. An indicative program will be developed during the course of the Services.

E9.2 POST CONTRACT SERVICES

During the course of the construction phase of the project, the EDPM may be required to provide the following post contract services: -

- Inspection of quality of work each fortnight for compliance with the Contract documents, attendance at site meetings for half of one day each fortnight and provide confirmation of the construction contract's progress at the end of each calendar month;
- Inspections for defects and preparation of the defects list prior to the issue of a certificate of practical completion for the construction contract and report on whether the project has been completed in accordance with the design intent and if not, the nature of any deviation;
- Final inspection and report prior to the issue of the final certificate for the construction contract;
- Review/check of shop drawings (or workshop drawings) including the preparation of comments and re-inspection of shop drawings to confirm their

acceptance by both the EDPM and his Design Sub-Consultants within seven (7) days of the date of submission by RailCorp's representative under the contract for the construction of the works;

- Inspect, review and report on the progress of the construction contractor's quality assurance monitoring and reporting each month;
- Responding to queries and matters arising from the documentation and issuing any clarifications requested; and
- Review/check of maintenance manuals, as built drawings, works manuals and electrical services manuals, as built drawings, including the preparation of comments and re inspection of these items to confirm their adequacy and/or adjustment, by both the EDPM and his Design Sub-Consultants. These inspections will also confirm that they represent the work actually carried out (which may have varied from the original design).

The post contract services shall include for all costs associated with the inspections and for providing a written report on each inspection to RailCorp's representative nominated in the contract between RailCorp and the construction contractor engaged for the construction phase of the works.

All issues of information and/or instructions shall be issued to RailCorp's Representative in writing who may, at his absolute discretion countersign these and issue them to the construction contractor engaged for the construction phase of the works.

The EDPM shall not issue instructions or advice to the construction contractor engaged for the construction phase of the works. This shall only be through RailCorp's representative for the construction contract.

The EDPM will be notified when RailCorp's Letter of Acceptance for the construction of the project has been issued and, if appropriate, for post contract services to commence.

APPENDIX E1

DRAWING INFORMATION REQUIREMENTS

APPENDIX E1

DRAWING INFORMATION REQUIREMENTS

The provision by the EDPM of the following listed drawings and documents, and required associated work for the satisfactory operation of equipment is the minimum acceptable to RailCorp's Representative for the services specified or implied and those requirements shall be allowed for by the EDPM and shall be provided under the Contract.

The documentation to be provided by the EDPM for this Contract shall include fully detailed drawings as are required for the construction of the works. Specific drawing requirements shall be described in individual design's Request for Proposal.

Typical drawings and specification that may be required to be produced shall include, but not be limited to the following:

LAND SURVEYOR (IF APPLICABLE)

Preparation of a detailed survey of the specific area;

Detail survey of the Rail corridor. Site plan with RailCorp boundaries, accurate R.L.s, structures, stanchions, O/Head Wire Structures and catenary, signal posts, services, station furniture - 1:200

Location of all above ground and underground services to be shown on survey plan using all available information as well as survey.

GEOTECHNICAL ENGINEER (IF APPLICABLE)

Carry out a geotechnical investigation and preparation of a report.

ARCHITECTURAL/LANDSCAPE (IF APPLICABLE)

Co-ordination/site plan(s) setting out grids - 1:100 or 1:200

Temporary works and Staging plans - 1:100

Demolition plans - 1:100

General arrangement drawings - 1:100

Sections and elevations - 1:100

Details of layouts, plans and elevations - 1:50

Construction and finishes details - 1:20 or larger

Landscaping plan and details

Footing plan superimposed on floor plan

Detailed specification

STRUCTURAL – SCALES TO MATCH THOSE OF THE ARCHITECTURAL DRAWINGS (IF APPLICABLE)

Footing plans

Concrete profiles

Reinforcement layouts

Column schedule

Concrete and reinforcement details

Structural steel marking plan

Structural steel details

Structural specifications

Design calculations including the basis for all calculations including assumptions

ELECTRICAL

The exact documentation requirements for each electrical project will be identified as part of the project definition stage. Listed below are typical diagrams that could be required depending on the project.

Site plans

Distribution boards single line diagrams

Electrical mains & sub-mains single line diagram

Reticulation diagrams

Proposed HV operating diagrams

Schematic diagrams

Cable schedules/conduit allocation schedule

Earthing system diagrams

SCADA schedule

Site plans

Equipment arrangement / layout drawings

Electrical clearance diagrams

Equipment label schedule

1500V DC and Transmission line layout drawings and loading diagrams

MECHANICAL

Design and documentation of air conditioning, ventilation and exhaust systems:

Site plan, legend and drawing schedule

Plant room details {if required} and lift engineering

Air conditioning to lift car, duct work layouts and details

Ventilation duct work layouts and details

Power supply schematic

Condensate water supply layout and details

Equipment schedules

Specification incorporating a detailed scope of works

QUANTITY SURVEYOR

Cost plans and cost checks at 60% and 90% completion to ensure the design remains within RailCorp's budget for the works. Submit the basis of all estimates and cost checks including all calculations and methodologies.

Electronic copies of the cost plans must be submitted in *.xls format and hard copy.

APPENDIX E2

TECHNICAL SPECIFICATION REQUIREMENTS

APPENDIX E2

TECHNICAL SPECIFICATION REQUIREMENTS

The EDPM's technical specification required for construction prepared under this Contract shall as a minimum requirement, conform to the guidelines set out in "Specifying Architecture – A guided learning package" as developed by John Gelder. "Rolling" specifications will be rejected and will not form the basis for any EDPM's claim for additional time and costs.

The document produced, together with the underlying schedules used for the full cost estimates shall form the minimum basis of the Construction Contractor's quality assurance monitoring system. It shall not be sufficient for the specification to be a document based on the document known as "NatSpec" as distributed by CIS, without the inclusion of a detailed scope of works. Requirements for guarantees and schedules of technical data to be submitted by the Tenderer for the construction component of the works are to be spelt out rather than by reference being made to manufacturer's guarantees and data sheets.

The EDPM's specification shall also detail the Quality Assurance Standards to be followed and the reports to be provided by the Construction Contractor. This shall relate to the RailCorp's standard Quality Assurance wording in Parts A, B and D of this Specification.

Each section of the technical construction specification shall include a scope of works clause at the start of the section in addition to the detailed scope of works covering the whole of the project.

In the case of works regarded as a "specialist service", the EDPM shall ensure that any work required to be performed by the construction contractor in connection with the specialist service is suitably documented.

A CD or softcopy of the specification in Microsoft Word for Windows format shall be provided in addition to printed copies. In general, the format and layout of the specification produced shall match that of this document viz. Arial 12 point, alignment justified, headings generally bold, header, Table of Contents, clauses consecutively numbered, the use of tables in lieu of tabs where necessary, etc.

RFT Documents prepared by RailCorp for construction works generally consist of 6 parts: -

Preamble

Section A

Conditions of Tendering

Section B

Tender Schedules

Section C

General Conditions of Contract

Section D

Special Conditions of Contract

Section E

Technical Requirements (including Drawings)

RailCorp prepares the Preamble and Sections A, B, C and D. Section E is to be prepared by the EDPM in accordance with the requirements of the design contract, and are to contain technical details only - there must not be any commercial details within these parts. The EDPM is also to prepare any Schedules of Technical Data required for inclusion in Section B of the Request For Tender (RFT) Documents.

The EDPM shall fully detail the methodology for the implementation of works inclusive of any staging or temporary works required to ensure that the project remains fully operational throughout the construction period and that any inconvenience to passengers is minimised.

The EDPM shall design and specify the works so as to minimise the requirements for Track possessions and a detailed schedule of work required to be carried out during possessions shall be included within the documentation.

The EDPM shall ensure that the various sections of the specification are coordinated and that those sections produced by Design Sub-EDPM's RFT Document are identical in style and format to those of the EDPM. The EDPM shall ensure that all sections of the specification are fully in compliance with the requirements of RailCorp and are suitable for direct inclusion within the overall construction RFT, without amendment.

The EDPM shall ensure that the technical section of the RFT fully describes the works, which are appropriate. A draft copy of this document shall be submitted to RailCorp for review as both a hard and soft copy in Microsoft Word for Windows with final version on CD.

APPENDIX E3

CODES & REQUIREMENTS

APPENDIX E3

CODES & REQUIREMENTS

It is anticipated that the EDPM will be able to access RailCorp's Engineering extranet, or liaise with RailCorp's Representative and seek early advice regarding the currency and detailed application of codes and requirements, as specific design parameters for a specific design assignment. Knowledge of the overall principles of the relevant codes is assumed of all EDPM's as a precursor to registration.

RailCorp will provide access to successful applicants to the RailCorp Engineering extranet on an as needs basis.

APPENDIX E4

STATUTORY REQUIREMENTS, STANDARDS & CODES

APPENDIX E4

STATUTORY REQUIREMENTS, STANDARDS & CODES

➤ **CONFORMITY WITH ACTS, REGULATIONS, ORDINANCES AND RAILCORP'S STANDARDS**

Except where this APR requires a higher standard, the work shall be carried out in accordance with the provisions of all relevant Acts, regulations, codes, rules and the RailCorp's standards. These shall include, but not be limited to, the current editions/revisions of:

- Building Code of Australia;
- AS relevant to all aspects of the Project
- AS 1428 (current edition) - all relevant parts;
- Disability Standards for Accessible Public Transport;
- Health Regulations;
- Work Cover;
- Rail Safe Network Rules & Procedures;
- AS 4292 railway safety management;
- CityRail Standard Guidelines for Fire and Life Safety in the Construction of Underground Railway Facilities (as required).
- Other RailCorp Codes & Standards available on RailCorp's extranet.

➤ **IF REQUESTED IN THE BRIEF**

In making enquires for the purpose of preparing the Development Application, no agreement shall be made with the Consent Authority on conditions. Upon receipt of Consent Authority's conditions, provide a copy to the RailCorp's Representative immediately.

➤ **REQUIREMENTS FOR UNDERGROUND STATIONS**

The Fire Safety Engineering Guidelines (2001) are to be used, as well as the RailCorp's Guidelines for Fire, Life and Safety for Underground Stations for work on underground stations.

APPENDIX E5

MANAGING ENGINEERING DESIGN CONTROL

Attached Managing Engineering Design Control (SMS-12-PR-0371) is an uncontrolled document when printed. Latest version of this document is available on RailCorp ES&S web site.

System Procedure

Managing Engineering Design Control



Version control

Version	Change from previous	Date	Comment
1.0	First release	25/08/06	Release of revised SMS

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1. Purpose and scope

1.1 Purpose

To describe the processes by which Engineering Design of RailCorp assets is controlled.

1.2 Scope

The scope of this document is limited to defining, in broad terms, responsibilities for engineering design of RailCorp assets, including requirements established as part of the design process for construction, maintenance support and eventual disposal of the assets.

It is intended to provide a brief overview of the design management process and call up design management procedures which contain specific requirements for the various stages of the design process.

2. Background

RailCorp has a responsibility as an “owner” and “operator” under the [Rail Safety Act 2002](#) for the safe construction, operation and maintenance of railway assets.

RailCorp also has a responsibility as an “employer”, “controller of premises” and “designer” under the [OHS Act, 2000](#) to provide a workplace and plant that is safe and without risks to health.

Specific requirements also applicable to RailCorp’s design control procedures and activities include:

- the National Accreditation Package (NAP)
- AS4292.1 - 2006 Railway Safety Management, General Requirements
- WorkCover OHS Model for Self Insurers – element 3 “Design Control”
- NSW Government Construction Agency Coordination Committee (CACC) OHS Management System Guidelines

This document identifies the key design management procedures that address the above requirements.

3. Overview

Engineering standards and specifications involve:

- Engineering design
- Interface management
- Construction
- Maintenance
- Removal, demolition and/or decommissioning
- Procurement of materials.

Engineering design outputs developed in accordance with these requirements provide the means by which safety-related work is to be carried out:

- be trained and authorised people
- using approved and documented processes, procedures and methods
- using approved equipment, parts and material
- under appropriate levels of supervision and control.

The engineering design process consists of several components that are applied in concert to achieve control of RailCorp's assets, by exercising engineering design authority. In brief, these components include:

- this document that describes RailCorp's responsibilities and their regulatory drivers; i.e. what we are required to achieve and why. It introduces the other engineering design procedures and provides brief summaries of the requirements for each element of the design process
- high-level engineering design procedures, established for management of engineering design tasks, to make sure that all design work is defined, verified, approved and documented in accordance with established systems engineering principles¹ and that design outputs include requirements for construction, use, maintenance, integrated support of new or altered assets and disposal, decommissioning and demolition.

The summaries in sections 4.1 to 4.5 of this document include cross-references to the relevant engineering design procedure for each activity.²

- the RailCorp Engineering Design Competency System (EM0241), which explains the basis and process for delegation of engineering design authority
- unit-level procedures, created to fit with and provide the detail behind the high-level procedures noted.

4. Process

4.1 Engineering design

4.1.1 General requirements

The Rail Safety Act does not specifically address responsibilities for design, however, these are implied within the definitions of railway safety work and railway operation (sections 4 and 5) and within AS 4292.1, which establish the basis for accreditation under the Rail Safety Act.

¹ IEEE Standard 1220-1998 and ANSI/EIA-632-1998.

² Cross references to legislation and standards within this document are to clauses assessed as the primary source relating to the nominated process. In many cases, additional references occur within other sections of the referenced Act, regulation or standard that amplify the requirement.

The following are general legislative and regulatory requirements that pertain to the process of engineering design by RailCorp:

- AS 4292.1 Railway Safety Management – General Requirements, Clause 6.2 sets out specific requirements for the control and verification of design and development activity.
- NSW OHS Act 2000:
 - Sections 8 sets out the duties of employers to provide a safe and healthy workplace
 - Section 10 sets out duties of controllers of workplaces, plant and substances to provide a safe and healthy workplace
 - Section 11 sets out duties of designers, manufacturers and suppliers of plant and substances for use at work.
- OHS Regulation 2001, sets out detailed requirements relating to work practices, premises, plant and substances, including specific chapters on work premises, plant and construction.
- WorkCover NSW OHS Model for Self Insurers, Element 3 Design Control sets out requirements for establishment of design control procedures to address OHS risk that may be introduced by the design process.
- NSW Government Construction Agency Coordination Committee (CACC) OHS Management System Guidelines – June 2004 Element 5 Design – sets out specific requirements for designers relating to construction safety.

4.1.2 Engineering design management

The following clauses establish requirements for management and execution of all engineering design work undertaken within RailCorp Asset Management Group, to provide the basis for assuring safety in design outputs and for managing the safety and integrity of all assets, including construction methods, use and maintenance, removal, demolition and/or decommissioning.

Table 1 Engineering design management

<i>Element</i>	<i>Requirements</i>
Specification ³	Performance requirements and standards are to be specified for all design tasks. This is necessary for proper definition of the design task to provide the basis for verification and validation of design output. (AS 4292.1 Clause 6.3).
Design standards ⁴	<p>All design work is to be performed to standards identified within the relevant federal and state legislation and regulations or to standards approved by RailCorp. (AS 4292.1 Clause 6.1 and WorkCover Self Insurers Model).</p> <p>For the purpose of this document, standards include those that form the basis for the design, standards for construction (including construction methodology), and standards to which the design must be used and maintained to preserve the safety and functional performance characteristics that are inherent in the design.</p> <p>Where legislation requires design registration (eg of plant in accordance with Chapter 5 of the OHS Reg), this is to be managed through ED 0017 P Design Documentation and Records procedure</p>

³ RailCorp Engineering Design Procedure ED 0004 P Engineering Specifications

Element	Requirements
Documentation ⁵	All design outputs are to be fully and properly documented. Documentation describing the approved configuration of assets is an essential input to the construction and maintenance processes and for the management of future changes. (AS 4292.1 Clause 2.7).
Verification and validation ^{6 7}	All design outputs are to be verified and/or validated to make sure that specification requirements have been met. (AS 4292.1 Clauses 2.3, 6.3 and WorkCover OHS Model for Self Insurers). This includes, but is not limited to, design review, type testing of approved items and standard design configurations, and specific tests and inspections required as part of design documentation, including construction and commissioning.
Risk and hazards assessment ⁸	Hazard identification and assessment of risks is to be performed at every stage of the design process, including: <ul style="list-style-type: none"> • construction methods (including processes and materials) • use and maintenance (especially risk arising out of the nature of the design itself) • Removal, demolition or decommissioning (especially where there is risk arising from the materials or processes used in the design) Hazard identification and risk assessment is to be carried out in accordance with the following: <ul style="list-style-type: none"> • AS/NZS 3931:1998, • Safety Risk Management requirement • Workplace Risk Management procedure • Hazard Identification and Safety Risk Assessment guide. Any unacceptable risks are to be eliminated before the design is approved. Identification of hazards and assessment of risks is to include action to eliminate hazards and where this is not reasonably practicable, determine appropriate controls, and to document procedures for construction and maintenance of the assets concerned. (OHS Reg Clause 11 and Chapter 8, AS 4292.1 Section 3; WorkCover Self Insurers Model and CACC OHS Management System Guidelines). Risk assessment must be undertaken in consultation with affected employees, eg construction workers, end users, maintenance workers, etc. Persons with a thorough knowledge of safety legislation, including applicable Australian Standards, Codes of Practice and how design can affect safety of workers must be involved in the risk assessment. Such persons may include safety facilitators, professionals and/or external consultants, as applicable.

⁴ RailCorp Engineering Design Procedure ED 0006 P Design Standards

⁵ RailCorp Engineering Design Procedure ED 0017 P Design Documentation and Records

⁶ RailCorp Engineering Design Procedure ED 0011 P Design Verification

⁷ RailCorp Engineering Design Procedure ED 0012 P Design Validation

⁸ RailCorp Engineering Design Procedure ED 0008 P Hazard and Risk Analysis

Element	Requirements
Integrated support ⁹	<p>Integrated support requirements are to be considered and documented both as part of the detail design effort and prior to the release of new or modified equipment to the field. (AS 4292.1 Section 6).</p> <p>Requirements for integrated support are outlined separately within this document and include:</p> <ul style="list-style-type: none"> • maintenance • supply support • documentation and manuals. • training and competency requirements.
Design approval ¹⁰	<p>All design output is to be approved prior to release by a suitably qualified and authorised engineer holding an appropriate level of engineering authority, acting under delegation from the General Manager of the Engineering Standards & Services Division of the Asset Management Group. (AS 4292.1 Clauses 2.3, 6.3, WorkCover OHS Model for Self Insurers).</p>

4.2 Interface management¹¹

4.2.1 General requirements

Section 12 of the Rail Safety Act establishes requirements for definition and management of safety interface agreements, which embraces the wider requirement for management of interfaces as part of the design, construction and maintenance processes.

AS 4292.1 Section 7 and Clause 1.6.2 set out specific requirements for the management of interfaces. The RailCorp [Human Factors Integration](#) requirement provides guidelines to make sure human elements and human interactions within the system are considered in a structured and systematic way throughout the design process.

4.2.2 Definition of interfaces

Interfaces are to be defined:

- between RailCorp assets and assets or installations under the control of other individuals or organisations
- between RailCorp asset systems, e.g. track and signalling, OHW and track , rolling stock and track
- between RailCorp assets and operational users of the infrastructure, to define the conditions of use for the asset
- with systems and procedures in use for operational control and Safeworking, to the extent that they affect the design basis for the assets
- between management systems, particularly RailCorp Enterprise Business Systems and those systems used for monitoring and control of the condition of safety systems
- between RailCorp and regulatory agencies, to the extent that these affect the monitoring and reporting of engineering design functions

⁹ RailCorp Engineering Design Procedure ED 0018 P, Integrated Support Requirements

¹⁰ RailCorp Engineering Design Procedure ED 0010 P, Design Approval

¹¹ RailCorp Engineering Design Procedure ED 0007 P, Interface Definition and Management

- between RailCorp people and the products, systems, processes and environments of their work.

Interfaces must be managed in line with [Interface Management](#) requirement. Each interface is to be documented and where appropriate, forms part of the approved configuration documents for the asset. (AS 4292.1 Clauses 1.6.2, 7.3.2).

4.2.3 Verification of interfaces

Applicable interfaces are to be reviewed and verified as part of each design task.

Verification is to include testing and proving of physical and functional interfaces as part of the testing and commissioning phase of individual design and construction projects, and where an interface has been affected by maintenance tasks. (AS 4292.1 Clauses 2.3, 6.3).

4.3 Configuration management ¹²

4.3.1 General requirements

Accurate definition of the approved configuration of all assets including approved changes to the asset is an integral part of design control. The key requirements for Configuration Management, outlined in sections 4.3.2 and 4.3.3 below, form part of the RailCorp engineering design process.

4.3.2 Design and configuration records

A record is to be maintained for all design output, to show the current approved configuration of all assets and the design basis for this configuration. (AS 4292.1 Clause 2.7).

4.3.3 Design change control ¹³

All changes to the design of RailCorp assets are to be managed through an approved configuration change process (AS 4292 .1 Clauses 2.3, 6.3).

Configuration changes are to be documented and approved and the configuration documentation updated to show the effect of the change. (AS 4292 Clauses 6.2, 2.7).

Design change action is to include review and updating of the relevant integrated support provisions affected by the change (AS 4292.1 Clauses 6.2, 2.7).

4.4 Construction

AS 4292.1 covers a number of requirements related to the control of construction activities that are directly influenced by the outputs from the engineering design process.

OHS Regulation 2001 (Chapter 8) sets out specific requirements for the management of construction work.

Element 3 Design Control of the WorkCover OHS Model for Self Insurers has requirements relating to management of risk introduced through the design of facilities, items of plant or equipment. This includes construction methods (including materials and processes), use and maintenance and removal, demolition and decommissioning.

¹² RailCorp Engineering Design Procedure ED 0014 P, Configuration Management

¹³ RailCorp Engineering Design Procedure ED 0015 P, Managing Configuration Changes to Existing Infrastructure

The NSW Government Construction Agency Coordination Committee (CACC) OHS Management System Guidelines – June 2004 Element 5 Design also has specific requirements relating to management of the design process and design procedures to make sure OHS is considered throughout the design process.

This guideline calls up Construction Hazard Assessment Implication Review (CHAIR) which is a tool used to assist designers, constructors, clients and other stakeholders to come together to reduce construction, maintenance, repair and disposal OHS risks relating to design.

The CHAIR framework is intended to be applied to projects where the design process is no longer simple, the design is unique or the project is unusual or high risk. The CHAIR tool is to be used to assist RailCorp design engineering and construction engineering staff in identifying OHS risks.

4.4.1 Design basis for construction

Designs are to be prepared and documented for all new or altered assets. Design documentation is to identify standards for construction, including construction methods, processes and materials, and demolition. (AS 4292.1 Clauses 2.3, 6.3 and WorkCover OHS Model for Self Insurers).

All design output are to be approved by an engineer who has been granted engineering authority for the scope of work performed, before the design (or individual part of the design) is released for construction. (AS 4292.1 Clauses 2.3, 6.3).

4.4.2 Construction variances¹⁴

All variances from the approved configuration that become necessary during the construction phase are to be approved by an engineer who has been granted engineering authority for the scope of the change. All variances from the approved design are to be documented at the time the variance is approved, and becomes part of the “as-built” documentation (AS 4292.1 Clause 2.7).

4.4.3 “As-built” documentation

“As-built” documentation, will consist of the final approved design, including all construction variances which are to be produced for each construction task to establish the configuration baseline for all RailCorp assets at the time they are released / accepted for service use. (AS 4292.1 Clauses 6.2).

4.5 Maintenance¹⁵

Maintenance is essential for the majority of assets in use within RailCorp, to either preserve or verify the safety and integrity of the asset, for continued operation in accordance with the design basis for the asset.

AS4292.1 Clause 6.4 sets out requirements for maintenance inspection and testing of assets. The WorkCover OHS Model for Self Insurers also specifies the need to identify risk in the use and maintenance of a facility and item of plant or equipment during the design process. This is to be achieved by undertaking consultation with proposed end users, including those carrying out unscheduled maintenance work, to identify and eliminate hazards.

¹⁴ RailCorp Engineering Design Procedure ED 0016 P, Design Change Management, New Projects

¹⁵ RailCorp Engineering Design Procedure ED 0018 P, Integrated Support Requirements

4.5.1 Maintenance requirements¹⁶

Maintenance requirements are to be established and reviewed in conjunction with the design process for:

- all configuration changes to existing RailCorp assets
- all new assets introduced by /or delivered to RailCorp.

Maintenance requirements are to be defined in terms of:

- the set of tasks or inspections to be performed for each asset
- the frequency at which each task or set of tasks is to be performed
- responsibility for completion (AS 4292.1 Clause 6.4).

Maintenance requirements are to be documented in a Technical Maintenance Plan (TMP) established for each asset.

Maintenance requirements are to be approved by an engineer who has been granted engineering authority for the scope of work performed, before the relevant TMP or amendment is released for use.

4.5.2 Maintenance procedures and repair standards

Maintenance procedures are to be defined for each type of asset and for each task included in the TMP. Maintenance procedures for each specific type of asset are to include, but are not be limited to:

- detailed instructions for inspection and servicing, in the form of Planned Servicing Schedules (PSS) or equivalent engineering instructions
- operating and maintenance manuals, to include as applicable :
 - asset description and operating instructions, including work methods and competencies
 - removal and installation procedures and fault finding guides (if applicable)
 - damage limits and serviceability criteria, including repair methods, where applicable
 - approved parts lists
 - details of tools, test equipment and other resources necessary to complete the task.

4.5.3 Variance from approved maintenance requirements

Maintenance requirements defined within TMPs are a primary means of preserving asset integrity and condition. Compliance with TMP requirements for assets designated as critical to safety is essential to maintain the design level of safety, and is an integral component of the RailCorp engineering design process. (AS 4292.1 Clause 6.4).

Formal approval, by an engineer holding the necessary delegation of authority from the General Manager of the Engineering Standards & Services Division, is required to vary asset maintenance requirements established within the TMP.

All requests for variance from TMP requirements are to be documented and records maintained for all proposed / approved variances.

¹⁶ RailCorp Engineering Design Procedure ED 0019 P, Maintenance Requirements Analysis

Ongoing compliance with TMP requirements is to be monitored and is to form the basis for compliance reporting.

4.6 Removal, demolition and/or decommissioning

The WorkCover OHS Model for Self Insurers has requirements for OHS risk to be addressed throughout the life cycle of the asset, and specifically including removal, demolition or decommissioning.

4.7 Procurement ¹⁷

The use of materials that conform to the standards and specifications within the approved design is essential to maintain the safety and integrity of the design.

All materials purchased for use in construction and maintenance of RailCorp assets are to conform to specifications approved by the appropriate RailCorp engineering design discipline. Evidence of approval is to be by reference to RailCorp standards and/or specifications or by specific reference within configuration documents for the approved design.

5. Performance requirements

The following requirements are a summary of key performance activities identified in the body of this document. Through full reading of this document, personnel of the identified 'role' or 'position' will establish the context in which a requirement is applied. It should be noted that lower level requirements are likely to exist.

Table 2 Performance requirements

<i>Role or position title</i>	<i>Performance requirements</i>
GM Engineering Standards & Services, GM Communications & Control Systems and GM Rolling Stock	The GM Engineering Standards & Services, GM Communications & Control Systems and GM Rolling Stock must: <ul style="list-style-type: none">• have competent personnel to undertake design• make sure that engineering design procedures are reviewed every 3 years (as a minimum)
Discipline Heads	Discipline Heads must: <ul style="list-style-type: none">• make sure that design procedures and standards reflect legislative requirements, Codes of Practice, Australian Standards and OHS Model for Self Insurers• approve designs of standards within their area of responsibility• make sure that design stage outputs are verified prior to the release of design documentation "for construction"

¹⁷ RailCorp Engineering Design Procedure ED 0020 P, Inventory Management

6. Training and instruction ¹⁸

Competencies of persons undertaking design control activities for RailCorp are addressed in [Engineering Design Competency System](#).

In addition, Design Engineers and Engineers Responsible for Verification must be trained in the [Safety Risk Management](#) requirement and the [Workplace Risk Management](#) procedure.

Outputs from the RailCorp engineering design process that include new processes, design configurations or hazardous substances/dangerous goods must include details of competencies required for construction and maintenance of the asset.

Competency requirements for new designs are to be included in risk assessments carried out in accordance with the requirements of this document.

7. Tools and guidance material

- [Engineering Design Competency System \(EM0241\)](#)
- High-level Engineering Design Management Procedures ED 0001 P to ED 0021 P
- Planned Servicing Schedules (PSS)
- Process Control Plan (PCP)
- Technical Maintenance Plan
- [SMS-05-SR-0152 Asset Life Cycle Management](#)
- [SMS-06-SR-0030 Safety Risk Management](#)
- [SMS-06-SR-0034 Human Factors Integration](#)
- [SMS-09-SR-0151 Configuration Management](#)
- [SMS-06-PR-0104 Workplace Risk Management](#)
- [SMS-06-GD-0031 Hazard Identification and Safety Risk Assessment](#)
- [Construction Hazard Assessment Implication Review \(CHAIR\)](#)

8. Record management

Records are to be maintained in accordance with the [Records Management](#) requirement. Records produced when implementing this procedure include:

- risk assessments
- completed audit checklists and reports
- training records
- inspection reports

¹⁸ RailCorp Engineering Design Procedure ED 0018 P, Integrated Support Requirements

9. Definitions

Term	Means
asset	The railway asset fro which RailCorp is responsible
design	<p>an inclusive term, covering a broad range of activities. Design tasks requiring specific design approval are to include, but are not limited to:</p> <ul style="list-style-type: none">• development of new designs for asset items (both hardware and software elements)• modification or alteration of existing designs (both hardware and software elements), through planned upgrading or to correct identified deficiencies through a configuration change request (CCR). This includes revalidation of design elements to take account of changes in interfaces or conditions of use affecting asset items.• development of repair methods for any item, particularly where the repair would alter strength, durability or functional performance or limitations• identification, development and type testing/approval of new standard equipment or designs• review and approval of changes in the conditions of use for any item, including definition of restrictions or additional inspection requirements where the proposed usage would result in the item being used outside of its original design basis. These include changes to usage parameters such as speed, loading, operating and environmental conditions.• local development and/or modification of tools, test equipment, workshop aids or other plant and equipment• review and approval of substitute or replacement spares for any hardware item, except where this is strictly on a "like-for-like" basis• changes that become necessary during construction work, including that performed as part of major periodic maintenance (MPM) activity. <p>All of these activities must receive design approval by an individual holding the appropriate level of design authority for that activity.</p>

10. References

- [Rail Safety Act 2002](#)
- [OHS Act, 2000](#)
- [OHS Regulation, 2001](#)
- [WorkCover OHS Model for Self Insurers July 2005](#) – Element 3 Design Control
- [NSW Government Construction Agency Coordination Committee \(CACC\) OHS Management System Guidelines – June 2004](#) Element 5 Design
- AS/NZS ISO 9001:2000 Quality Management Systems – Requirements
- HB 90.3-2000 The Construction Industry – Guide to ISO 9001:2000
- [AS 4292.1 2006 “Railway safety management - General requirements”](#)
- AS/NZS 3931:1998: Risk analysis of technological systems —Application guide
- IEEE Standard 1220-1998 Standard for Application and Management of the Systems Engineering Process
- ANSI/EIA-632-1998 Processes for Engineering a System

11. Appendices

Appendix A, Cross reference table

Appendix A Cross reference table

Notes:

1. Cross references shown within the table are to primary sections/clauses relating to nominated process. In many cases additional references occur within other parts of the referenced act, regulation or standard.
2. The primary focus of all references is on safety. In many cases the requirement for assuring safety will be met through procedures and practices having a wider purpose within each of the designated management processes.
3. AS 4292.1 – 2006 “Railway Safety Management Part 1: General requirements”, is a primary reference because of its role as a guide for RailCorp’s accreditation.
4. The WorkCover OHS Model for Self Insurers – July 2005 Element 3 Design Control is a primary reference because of its requirements and RailCorp’s status as a self insured organisation.
5. There is close correlation between the requirements of AS 4292.1 and AS/NZS ISO 9001:2000 “Quality management systems - Requirements”, as defined within AS4292.1.

Process	References		
	<i>Rail Safety Act 2002</i>	<i>OHS Act 2000 / OHS Regulation 2001</i>	<i>AS 4292.1</i>
Design	Section 14 (as part of demonstrated capacity to carry out railway operations).		1.6.2
Specification		Part 5.4	
Standards		Clause 94 (Specific applications)	6.1
Documentation		Clause 96, 97	2.4, 2.7
Design verification and validation		Part 5.3, Division 3 (Specific Applications)	2.3, 6.3
Risk and hazard assessment	Section 9	Part 5.2 Division 1 Clause 86-93	Section 3
Integrated support		Part 5.2 Division 1 Clause 96-97	Section 6
Design approval			2.3, 6.2, 6.3
Interface management	Section 12		1.6.2, 2.3, 6.3, 7.3.2
Design and configuration records		Clause 108 (for items to be registered)	2.7
Design change control			2.3, 2.7, 6.2, 6.3

Process	References		
	<i>Rail Safety Act 2002</i>	<i>OHS Act 2000 / OHS Regulation 2001</i>	<i>AS 4292.1</i>
Design basis for construction		Chapter 8	6.2, 6.3
Construction variances			2.7
"As-built" documentation			Clause 6.2
Maintenance requirements		Part 5.4 Clause 137	Clause 6.4
Maintenance procedures and repair standards		Division 1 Part 5.2	Clause 6.7
Maintenance variances			Clause 6.4
Asset register	Section 15		
Procurement of materials			Clause 5.2
Staff competency and certification	Division 3	Division 2 Part 5.2	Section 4

APPENDIX E6

EXAMPLE OF ENGINEERING DRAWING IMAGE FILE REQUIREMENTS

Specifications for delivery of Engineering Drawing Images Files

1.0 Image Resolution and Orientation

All image files for non-colour drawings are to be produced at a resolution of 300 d.p.i. in both the X and Y dimensions.

All image files for colour drawings are to be produced at a resolution of 200 d.p.i. in both the X and Y dimensions.

All A1 and smaller sized drawings are to be produced so that the drawing is in the correct orientation to be viewed and read on the computer screen. This is achieved by orientating the bottom of the drawing to the bottom of the computer screen.

All drawings of size greater than A1 are to be produced in portrait page orientation with the longest side of the drawing orientated to the vertical plane of the image file. The image shall be orientated so that the bottom of the drawing is on the right hand side of the image.

Refer to Appendix A for examples of Image File Orientations.

2.0 Image Quality

Railcorp will independently assess the quality of the images, and associated index data by reviewing a sample of images for fine line capture, clarity, accuracy, scale, orientation and file size. Images will only be accepted where both the text and graphics on the drawings is legible in the opinion of RailCorp's representative. All engineering information is to be captured in the image.

Index data will only be accepted where the data, for each and every drawing, is an accurate record of the drawing Title Block and specified information in the opinion of RailCorp's representative.

Index data without a corresponding image file will not be accepted.

All colour images which require compression are to be compressed such that they provide the smallest possible file size while retaining viewing and printing integrity of fine lines, text readability and colour trueness. Pixilation is not to be apparent at 100% viewing or printing scale.

Whilst no drawing will be unreasonably rejected, the determination of RailCorp's representative will be final and where drawings are rejected TIDC will re-produce and re-index the affected drawings at no cost to RailCorp.

3.0 File Format

All non-colour raster image files are to be supplied in TIFF MSB (Most Significant Bit) Monolithic CCITT Group IV file format.

All colour raster images are to be supplied in both uncompressed TIFF 24 bit or 8 bit colour file format, and in compressed JPEG2000 colour file format.

4.0 File Size Limits

The maximum size for black and white image files is given in the table below. The limits have been derived from RailCorp's existing images. They allow a generous margin over the mean size for drawings of moderate detail and clear background. For Roll drawings, drawings of high detail and complexity, or drawings with shaded or textured background where these maximum sizes can not be met, TIDC is to notify the RailCorp Configuration Data Management representative for a determination of the required file size limit.

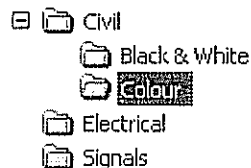
**Maximum File sizes
Black and White image files**

Drawing Size	Maximum File Size
A0	747 KB.
A1	515 KB.
A2	400 KB.
A3	209 KB.
A4	150 KB.
Multi-Page	10 MB.

5.0 Segregation of image files

Image files are to be submitted in a separate container (folder) for each of RailCorp engineering disciplines. Eg. Civil, Electrical, Signals & Fleet.

Colour image files are to be submitted in a separate container (folder) to the black & white image files, within the relevant engineering discipline container (folder). Example:



6.0 Multi-Page Image Files

Each engineering drawing is to be produced as a single page image file.

Certain drawing and document types are pre-approved for delivery as multi-page image files. These types are:

- Signal Circuit books
- Survey Field books
- Maintenance Manuals
- Equipment Manuals

Other group of drawings which would be logically grouped together for ease of use, and would normally be presented as a "book" in hardcopy, may be accepted as multi-page image files providing that prior written approval is received from the RailCorp Configuration Data Management representative.

Multi-page image files are to contain only one RailCorp drawing registration number.

Track layout drawings and general arrangement drawings are not to be produced as multi-page image files or tiled image files. This requirement exists even if the drawings form

part of a linear run of drawings, throughout a specific geographic area, or form a set of drawings for an infrastructure item.

File Names

RailCorp requires that the image files be named as per the individual EDMS ID number which is assigned to each drawing.

Image filenames shall conform to the following protocol, depending on drawing type:

- **NNNNNNNAANA** – 11 characters in total

- a) The first seven numerical characters are the EDMS ID number allocated to the drawing.
- b) Characters eight and nine are an alpha-numeric representation of the Amendment Level of the drawing. When the Amendment Level of the drawing is only one character then character eight will be an underscore and character nine will be the Amendment Level.
- c) Character ten is a numerical representation of the configuration Version level of a drawing and will always be zero ("0").
- d) Character eleven will be a lower case "c" for landscape oriented images and will be a Capital "C" for portrait oriented images.
- e) The extension of the file name is to match the relevant file-type and is to be in lower case eg. **.tif** or **.jp2** etc.

Examples of valid filenames are as follows:

1234567_A0c.tif

0279239_B0C.tif

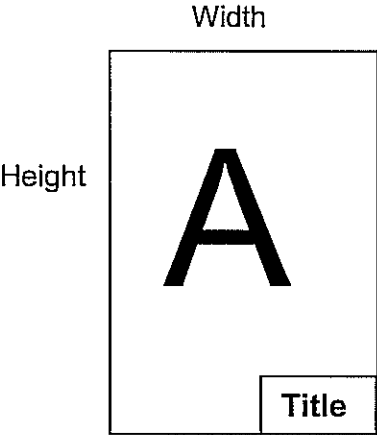
0279248AE0c.jp2

0279276_30c.jp2

0279298040C.tif

Appendix A

Image File Orientations



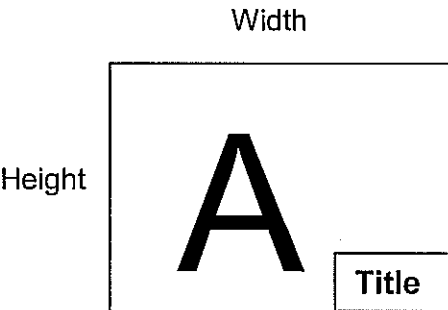
Case 1 (Valid case)

Conditions:

- Drawing Height is greater than Width
- Drawing size is B1 or greater.

Result:

- Drawing is produced in Portrait orientation
- Drawing Title is in bottom Right of image file
- Image filename includes a Capital "C".



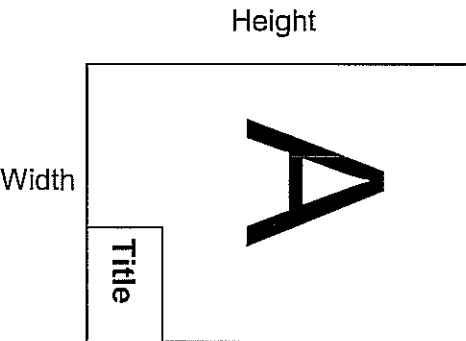
Case 2 (Valid case)

Conditions:

- Drawing Width is greater than Height
- Drawing size is A1 or less.

Result:

- Drawing is produced in Landscape orientation
- Drawing Title is in bottom Right of image file
- Image filename includes a Lowercase "c".



Case 3 (Valid case)

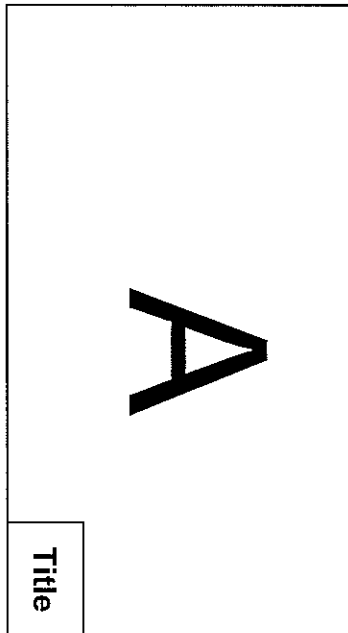
Conditions:

- Drawing Height is greater than Width
- Drawing size is less than B1.

Result:

- Drawing is produced in Landscape orientation
- Drawing Title is in bottom Left of image file
- Image filename includes a Lowercase "c".

Height



Case 4 (Valid case)

Conditions:

- Drawing is a Roll size
- Drawing Width is greater than Height

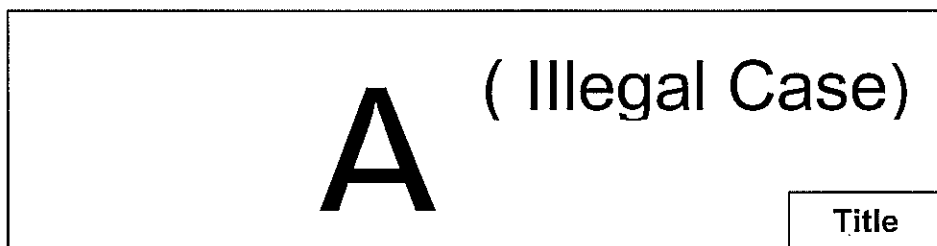
Result:

- Drawing is produced in Portrait orientation
- Drawing Title is in bottom Left of image file
- Image filename includes a Capital "C".

Case 5 (Illegal case)

Width

Height



Conditions:

- Drawing Width is greater than Height
- Drawing is a Roll Size.

Warning : Case 5 is illegal as all Roll drawings must be produced as Portrait Orientation.