

StateRail

State Rail Authority of New South Wales



Contract N°: C03005
Design and Build
New Outer Suburban Cars

Part C – Statement of Works
Volume 2 of 4

Design and Build New Outer Suburban Cars

Contract C03005

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Design and Build New Outer Suburban Cars

Contract No.: C03005

Part C

Statement of Work

Volume 2 of 4

NEW OUTER SUBURBAN CARS
STATEMENT OF WORK
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The following Acronyms and Abbreviations are used in this Statement of Work.

ACRONYM	Meaning
CASE Tool	Computer Aided System Engineering Tool
CDR	Critical Design Review
CDRL	Contract Deliverables Requirements List
CM	Configuration Management
CMP	Configuration Management Plan
COTS	Commercial off the Shelf
CWBS	Contractor's Work Breakdown Structure
EE	Equipment Examiner
FMECA	Failure Modes, Effects And Criticality Analysis
FRACAS	Failure Reporting And Corrective Action System
ISP	Integrated Support Plan
ITP	Integrated Test Plan
MCO	Mechanical Control Office
MTTR	Mean Time to Repair
PCA	Physical Configuration Audit
PDR	Preliminary Design Review
PMP	Project Management Plan
PQP	Project Quality Plan
RCM	Reliability Centred Maintenance
SAP	Systems Assurance Plan
SDR	System Definition Review
SOW	Statement Of Work
SVR	System Verification Review
TMP	Technical Maintenance Plan
WBS	Work Breakdown Structure

NEW OUTER SUBURBAN CARS

STATEMENT OF WORK

1. STATEMENT OF WORK - GENERAL REQUIREMENTS

1.1. Purpose and Scope

The Cars must exhibit a high level of safety, reliability and availability to meet the on-time running performance requirements of the Principal. In addition the Cars must be capable of being maintained in a cost effective manner throughout the service life of the Sets to ensure that support costs are maintained at the lowest possible level.

This Statement of Work ("**SOW**") establishes requirements for processes and services to be implemented and delivered by the Contractor as part of the work under the Contract. These processes are intended to ensure that operating performance, safety reliability, dependability and maintainability requirements are met at the lowest risk to both the Contractor and the Principal and include:

- (a) Contract Management;
- (b) Systems Assurance;
- (c) Integrated Support;
- (d) Quality Assurance; and
- (e) Design and Engineering Support Services.

1.2. Operating and Maintenance Environment

Operation of the Cars will be fully integrated into the NSW CityRail system and the Principal's maintenance system.

Attachment 1 to this SOW describes the current general operating environment for the system and establishes the intended operating environment for the Cars. Attachment 2 describes the current Minimum Operating Standards of the Principal, that must be used in support of reliability and maintainability decisions within the design phase.

The Principal will maintain the Cars. The existing maintenance concept employed by the Principal is included at Attachment 1. This sets out the way in which the Principal currently supports and maintains its rolling stock, as well as information covering the resources and equipment available in support of maintenance.

1.3. Requirements - Design and Build phase

The Contractor must design, build, test, commission and deliver the Cars in accordance with the requirements of the Contract.

The Contractor must implement a Project Management system and controls for the work under the Contract to meet the detailed requirements of Clause 2 of this SOW.

The Contractor must implement a Systems Assurance program to meet the detailed requirements of Clause 3 of this SOW.

The Contractor must develop an Integrated Support Plan to meet the detailed requirements of Clause 4 of this SOW in support of the Principal's operating and maintenance concept as described at Attachment 1.

The Contractor must implement a Quality Assurance program to meet the requirements of Clause 5 of this SOW.

The Contractor must develop and submit to the Principal's Representative documentation separately specified within Clauses 2, 3, 4, and 5 of this SOW at the times required by the Contract Deliverable Requirements List ("**CDRL**") at Attachment 3.

2. CONTRACT MANAGEMENT REQUIREMENTS

2.1. General Requirements

The Contractor must implement Project Management systems and controls, which ensure that:

- (a) Work to be completed as part of the work under the Contract is fully specified and planned;
- (b) Plans are developed for the completion of all tasks and requirements;
- (c) Controls provide clear visibility of progress toward completion of all tasks; and
- (d) Risks are identified and managed continuously throughout the Contract.

For the purposes of this Contract, Project Management requirements include:

- (e) Organisation and identification of responsibilities;
- (f) Project planning;
- (g) Schedule management;
- (h) Cost management;
- (i) Risk management;
- (j) Subcontract management; and
- (k) Reports and meetings.

2.2. Organisation and Responsibilities

2.2.1. Contractor's Project Organisations and Responsibilities

The Contractor must establish and maintain a clearly defined management and responsibility structure for the Contract. Full details of the Contractor's team to be engaged in connection with the work under the Contract, including the specific responsibilities and accountabilities of each senior member of the team, must be submitted as part of the Project Management Plan ("PMP"). The Project Management Plan must be submitted to the Principal's Representative for review in accordance with Attachment 3 to this SOW.

The Contractor must appoint a dedicated Project Manager, who will have primary responsibility for all matters relating to the work under the Contract within the Contractor's organisation. The Project Manager will be supported by a dedicated team for all of the Contract. The Project Manager will be the Contractor's Representative for the purposes of the General Conditions of Contract.

The Contractor must provide responsibility statements for all Key Persons. Responsibility statements are to provide a clear description of the scope and limits of responsibility for each Key Person.

The Contractor must provide a Key Person who will have *primary responsibility* for at least each of the following aspects of the work under the Contract:

- (a) Project Management;
- (b) Contract Management;
- (c) System Technical Design, including Design Approval/Certification;
- (d) Systems Assurance;
- (e) Integrated Support Planning;

- (f) Quality Assurance;
- (g) Configuration Management; and
- (h) Cost and Financial Accounting.

2.3. Project Planning

The Contractor must develop and maintain detailed plans that identify all significant activities to be completed as part of the design and construction phases of the contract. Project plans will be continuously updated during execution of the work under the Contract. They will serve as a basis for controlling the Contractor's effort and for establishing progress toward completion of individual tasks and commitments and toward the achievement of project milestones.

Project planning and controls to be implemented by the Contractor under this Clause 2.3 as part of the work under the Contract must be generally in accordance with the principles established in AS/NZS 3905.16:1998, Quality system guidelines Part 16: Guidelines to quality in project management.

2.3.1. Contractor's Work Breakdown Structure

The Contractor must develop and provide a Contractor's Work Breakdown Structure ("CWBS") as a basis for all planning activity undertaken in connection with the work under the Contract. The CWBS must be used as the basis for project planning and control, for development of the Project Master Schedule and for schedule management purposes.

The Principal has developed a Work Breakdown Structure ("WBS") to the third level. The WBS is at Attachment 4 to this SOW. This WBS identifies major subsystems of the prime equipment (the Sets) as well as major activities to be undertaken in compliance with this SOW.

The Contractor must develop the WBS prepared by the Principal to at least the fourth level and where necessary to lower levels, to include all discrete products and services to be provided as part of the work under the Contract. The CWBS must be included as part of the Project Management Plan, and once the Principal's Representative reviews and has not rejected the PMP, will supersede Attachment 4 to this SOW.

Development of the CWBS for prime equipment is to follow the structure evident in WBS Element .01, to include each *significant* subsystem/item forming part of the Level 2 system. Elements .02, .03, .04 and .05, as set out in Attachment 4 to this SOW, covering the work under the Contract have been broken down to the third level within the WBS structure defined by the Principal. Services to be provided by the Contractor must be included in the CWBS and further breakdown is to follow the same pattern as shown in the WBS.

The CWBS must include a brief description of the scope of each CWBS element, which must be tabulated as a CWBS Dictionary.

The CWBS provided as part of the PMP will form part of the planning baseline for the work under the Contract and is to be further and progressively developed by the Contractor during the course of the execution of the work under the Contract.

2.3.2. Project Management Plan

The Contractor must develop, deliver and maintain a Project Management Plan ("PMP").

The Contractor is to submit the PMP to the Principal's Representative for review in accordance with the requirements of item CDRL PM-01 of Attachment 3 to this SOW.

The PMP must define the Contractor's approach to meeting the management requirements of the Contract. The PMP will form the top level plan within a set of plans including the Project Management, Systems Assurance, Integrated Support and Quality Assurance Plans.

The PMP must include, but is not limited to, information on each of the following aspects:

- (a) Management organisation and responsibilities, including resumes for key persons;
- (b) Project planning and schedule management, including CWBS information;
- (c) Risk management;
- (d) Systems assurance, including design and configuration management within the project;
- (e) Integrated support planning; and
- (f) Quality assurance.

Information included in the PMP for Systems Assurance, Integrated Support planning and Quality Assurance should be presented at the summary level and cross referenced to the separate plans to be prepared for these requirements, to ensure that the level of redundant information is minimised. The purpose of the PMP is to establish details of the Contractor's intended approach to management of the work under the Contract. Detailed information on the approach within each speciality area should be covered in subsidiary plans issued as part of the PMP.

The Contractor must update and re-issue the PMP to include any significant change in project management arrangements during the course of the Contract. Each revision is to be submitted to the Principal's Representative for review.

2.3.3. Contract Deliverable Documentation

The Contractor must deliver documentation and data which includes, but is not limited to, documents defined by the CDRL.

Project plans and schedules must clearly identify each CDRL item and assign specific responsibility for each within the Contractor's organisation.

The Contractor may propose changes to these plans and submit such changes for review by the Principal's Representative.

Each document is to be uniquely identified and is to include an issue/revision number and date. All documents covered by the CDRL are to be controlled within the Contractor's quality system.

2.4. Schedule Management

Schedule management is an integral part of the project management function and must be used as a primary tool to ensure that the delivery dates and milestones are achieved for the work under the Contract.

The Contractor must use a commercially available computer based schedule management tool. Tools to be used are at the option of the Contractor provided that the minimum reporting requirements of this SOW are met. The Contractor must include details of the selected scheduling tools in the PMP.

2.4.1. Project Master Schedule

The Contractor must establish a schedule management system for the Contract.

The Contractor must prepare a Project Master Schedule to include all major activities, milestones and deliverables associated with the work under the Contract. The Contractor must submit the Project Master Schedule to the Principal's Representative for review in accordance with item CDRL PM-02 of Attachment 3 to this SOW.

The Project Master Schedule must be displayed in Gantt format or other format approved by the Principal's Representative. The schedule is to be structured to display progress on each CWBS element. Interdependencies between elements and activities are to be clearly identifiable from the schedule information.

Subcontractor activities must be integrated into the Project Master Schedule. This may be achieved either through direct compatibility with schedules prepared by the Contractor, or by manual means, at the Contractor's option.

Second tier schedules must be prepared to provide a more detailed breakdown of the activities within individual Level 2 CWBS element for the Sets eg Car body, Bogie and for other Level 2 CWBS elements as required, eg the Test and Verification program. Each second tier schedule must include all significant activities necessary for the design, construction and test of the Level 2 item to which it refers.

Second tier schedules are to include major subassemblies and associated software, and must display associated events, such as Preliminary Design Reviews and Critical Design Reviews to be conducted for the item in accordance with the requirements of Clause 3.5 of this SOW. The schedules are to include Subcontractor design activity as well as the integration of Subcontractor responsibilities with elements of the activity for which the Contractor is responsible. The objective is to establish second tier schedules that can be used to plan, monitor and review progress on Level 2 CWBS items from initial specification through design and test stages to delivery for inclusion in the Sets.

Additional second tier schedules may be required for major project activities, such as the management of the test and verification program. The purpose in this case is to be able to monitor the progress of development and completion of the requirements of the Integrated Test Plan (see Clause 3.11.8).

In some cases it may be necessary to develop third tier schedules, to describe detailed events and tasks within an activity shown on second tier schedules. This would typically be required for complex tasks, or where the critical nature of an activity leads to a need for intensive management.

Second and third tier schedules must be linked to the Project Master Schedule, to ensure that it is automatically updated to reflect changes at the lower level. Schedules are to include the float for individual activities as well as milestones and major events, such as completion of Critical Design Review. Resource balance information must be made available to the Principal's Representative on request.

The Project Master Schedule is to be computer based and must provide the means to evaluate progress by individual CWBS elements. Schedules at each level must display the critical path for the work under the Contract as a whole, or for individual activities, as applicable.

2.4.2. Schedule Update and Reporting

The Contractor must submit the initial issue of the Project Master Schedule to the Principal's Representative for review in accordance with item CDRL PM-02 of Attachment 3 to this SOW. Updates of the Project Master Schedule must be provided in hard copy and electronic format at least monthly, to coincide with the submission of progress reports as defined at Clause 2.8.2 of this SOW.

Updates must display actual progress against planned achievement for the Contractor's and subcontractors' tasks and must be based on the latest approved program and delivery milestones. Assessment of progress is to be based on physical evaluation of the status of each activity and task.

Each issue of the Project Master Schedule must identify significant deviations from the previous approved Project Master Schedule, changes in critical path, and is to be cross referenced to the risk assessment required as a part of the Contract progress report submitted by the Contractor in accordance with Clause 2.8.2 of this SOW.

Proposed recovery actions and planned dates for making good any delays are to be included within schedule reports. The Principals Representative may request additional second or third tier schedules as part of the schedule report as required.

2.5. Cost Management

2.5.1. Contractor's System

The Contractor must maintain an effective cost accounting and reporting system for the duration of the performance of the work under Contract.

The Principal's Representative may require detailed cost information in respect of variable elements and in support of Variations proposed under Clause 29.1 of the General Conditions of Contract. Clause 36.1 of the General Conditions of Contract covers the Principal's right to audit the Contractor's system.

2.6. Risk Management

2.6.1. General Requirements

The Contractor must implement a risk management program as part of the project management task. The risk management program will form a primary means for identifying potential problems and deviations, and for implementing corrective actions before major delays are incurred in carrying out the work under the Contract.

The risk management approach must be defined by the Contractor, to meet the minimum criteria set out in this Clause 2.6.

2.6.2. Risk Assessment

The Contractor must prepare, maintain and perform a formal risk assessment generally in accordance with the requirements of AS/NZS 4360:1999, Risk management. The risk assessment must cover a systematic appraisal of the major elements of the work under the Contract and the risks and opportunities associated with each. For this purpose a risk is defined as any event which could have a significant effect on the achievement of or compliance with the Contract requirements.

As a minimum, risks must be assessed and categorised under the following headings:

- (a) **Schedule.** Schedule risks are those which may adversely affect the Contractor's ability to complete a task or activity (including, without limitation, a Contract Deliverable) by the date shown in the Project Master Schedule;
- (b) **Technical.** Technical risks cover those which are likely to be encountered in achieving the technical and performance requirements of the Contract; and
- (c) **Financial.** Financial risk relates to the potential failure to achieve project outcomes within the Contractor's budget established for the Contract.

Most significant risks are likely to have an impact in one or more of the above categories. A high level of technical risk is also likely to impact on schedule performance, if the required level of performance cannot be achieved without significant redesign or rework, and is also likely to have an adverse financial impact. Each identified risk must be assessed in terms of its likely impact in each of the above categories.

Identified risks are to be classified in terms of their potential impact on the Cars and the execution of the work under the Contract. Classifications to be used are:

- (d) **High Risk.** High risk outcomes are those which have a high probability of occurrence and which have the potential to prevent the achievement of critical technical performance requirements, or which are likely to incur major schedule or cost overruns, or both. Identification of a high risk warrants immediate and intensive management action until the source of the risk has been overcome or substantially reduced;
- (e) **Medium Risk.** A medium risk exists where there is a substantial chance of a problem occurring and would result in the project failing to achieve a significant performance requirement or would result in significant cost or schedule overrun. Medium risks warrant special management attention until the source of the risk has been reduced or overcome; and
- (f) **Low Risk.** Low risks are those which have the potential to develop into a more serious problem and which warrant specific surveillance to ensure that a high or medium risk situation is avoided.

Risk assessment by the Contractor must be a continuous process. The status of identified and potential risks must be included as part of the regular progress reports to be submitted by the Contractor in accordance with Clause 2.8.2 of this SOW and will be reviewed as part of schedule and project progress review meetings held in accordance with Clause 2.8.3 of this SOW. The Contractor's risk management plan must provide the means to identify potential high risk situations and to initiate corrective action more frequently than monthly, where indicated by the urgency or consequences of the risk.

2.6.3. Risk Mitigation

Risk mitigation involves action to avoid or minimise potential risks.

The Contractor must develop risk mitigation plans for all risks classified as Medium or High. The risk mitigation plan must identify the assessed cause of the risk and identify specific action instituted to minimise or remove the cause, including proposed risk mitigation action if the event or occurrence constituting the risk actually occurs.

2.6.4. Risk Management Plan

The Contractor must develop, deliver and maintain a risk management plan as part of the Project Management Plan. Information to be included in the risk management plan must cover, but is not limited to:

- (a) The Contractor's intended approach to risk management;
- (b) Assigned responsibility for risk management within the Contractor's organisation;
- (c) A preliminary assessment of potential risks for the Contract and the source and classification of each;
- (d) Proposed mitigation plans for each identified risk classified as medium or high; and

- (e) The method proposed for identification of individual risks, to enable them to be tracked as the Contract progresses.

The risk assessment that forms the basis for the plan is to be updated as part of each project progress report.

2.7. Subcontract Management

2.7.1. General

The Contractor must include information covering the status, progress and risks associated with all significant subcontracts within the progress reports submitted in accordance with Clause 2.8.2 of this SOW.

The Contractor must ensure that the requirements for project management and reporting are included in all Subcontracts. Similar provisions are to apply to Systems Assurance, Integrated Support and Quality Assurance aspects, as appropriate to the scope of the Subcontract.

2.8. Reports and Meetings

2.8.1. General

The Contractor must submit regular progress reports in accordance with Attachment 3 to this SOW and must participate in regular meetings with the Principal's Representative to review Contract progress and status.

2.8.2. Reporting

The Contractor must submit progress reports to the Principal's Representative in accordance with item CDRL PM-03 of Attachment 3 to this SOW unless otherwise agreed between the Contractor's Representative and the Principal's Representative.

Progress reports are to be submitted in a form acceptable to the Principal's Representative. Each report is to include details of the following range of activities as appropriate to the stage of completion of the work under the Contract:

- (a) Schedule progress. This must be included in all updates of the Project Master Schedule, and accompanied by a narrative section explaining any significant variations from the previous report, causes for the deviation and, where adverse, planned corrective action. Where possible the status report is to follow the CWBS structure and is to address progress on each major subsystem and item;
- (b) Technical progress. This section of the report is to include details of progress on the specification/design of individual sub-systems and items as well as problems encountered in meeting or achieving requirements of the Contract. Summary details are to be provided covering Engineering Change Requests submitted or planned in accordance with the Configuration management processes defined at Clause 3.6;
- (c) Risk assessment. The risk assessment may be combined with schedule and technical progress reports and is to provide information on the status of previously identified risks as well as any new risks identified since the previous report;
- (d) Status and progress in achieving aspects of the Systems Assurance, Integrated Support and Quality Assurance programs;
- (e) Information on the progress and status of each task or activity (including, without limitation, each Contract Deliverable), including the intended delivery date;

- (f) Status of Variations submitted or proposed under the Contract, including the potential impact of each Variation on project cost and schedule;
- (g) Intended submission dates for milestone/progress payment claims;
- (h) A general assessment of the status of the work under the Contract, including any unresolved issues which may impact on the achievement of or compliance with Contract requirements and any additional factors that may impact on the work under the Contract; and
- (i) Details of any claim or continuing event the subject of Clause 26.6(b) or Clause 33.4 of the General Conditions of Contract.

One electronic copy and four hard copy reports are to be submitted to the Principal.

2.8.3. Meetings

Contract progress meetings will be held monthly or at such other times as determined by the Principal's Representative.

The purpose of the meeting will be to review progress, to identify significant issues arising from the progress report and to agree corrective actions.

Meetings will be held at either the Principal's Representative's offices or at the Contractor's premises, at the direction of the Principal's Representative. Representation at the meetings should be limited to those project staff who will be required to make a contribution to the outcome.

Unless otherwise stated, the Principal's Representative will prepare an agenda for the meeting taking into account recommendations from the Contractor. Minutes will be recorded by the Principal's Representative and will be distributed within 7 days of the meeting taking place.

Formal progress meetings will be supplemented as required by working level meetings to review and resolve specific issues.

Subcontractors may be invited to participate in progress meetings by agreement between the Contractor and the Principal's Representative, or as required by the Principal's Representative, where such representation is important for resolution of a specific aspect or matter for concern.

3. SYSTEMS ASSURANCE

3.1. Scope of Systems Assurance Program

The Contractor must implement a Systems Assurance program as an integral part of the work under the Contract. The Systems Assurance program must provide the means of ensuring that systems engineering processes are followed to develop, review and optimise the design, to ensure that it meets the requirements of the Contract and will provide a cost effective solution, capable of delivering the specified level of performance.

The Systems Assurance program must incorporate the following requirements:

- (a) Design and design management requirements;
- (b) Technical reviews;
- (c) Configuration management;
- (d) Reliability program;
- (e) Maintainability program;
- (f) Availability prediction;
- (g) Testing and verification;
- (h) Safety; and
- (i) Integration between the design and the integrated support program.

3.2. Systems Assurance Planning and Reporting

3.2.1. General

The Systems Assurance process is aimed at ensuring that the activities of design, construction and integrated support planning result in an integrated product solution, capable of meeting the technical and performance requirements of the Contract and of being supported during operation and maintenance of the Sets. Critical relationships must be established between different aspects of the process, technical risks must be identified and quantified, and management procedures implemented.

3.2.2. Systems Assurance Plan

The Contractor must submit a Systems Assurance Plan ("**SAP**") to the Principal's Representative for review in accordance item CDRL SA-01 in Attachment 3 to this SOW. The SAP will be subsidiary to the Project Management Plan and must include specific information and plans covering the Contractor's intended approach to systems assurance requirements of the Contract.

The SAP may be prepared in the Contractor's format. The scope and content of the SAP must include, but not be limited to:

- (a) Systems Assurance organisation and responsibilities within the Contractor's organisation. This must include the names and details of experience of key staff to be employed on systems assurances and is to identify design signatories and approvals;
- (b) Reference to specific standard procedures and instructions for systems assurance within the Contractor's organisation, including design procedures;

- (c) The intended approach to requirements analysis, including allocation and traceability of the requirements of the Technical Specification;
- (d) Specification hierarchy, including the identification of additional specifications to be developed or used as part of the design development. This may be accomplished by reference to the Configuration Management Plan prepared in accordance with Clause 3.6 of this SOW;
- (e) The intended approach to managing individual sets of requirements under the Technical Specification including, but not limited to:
 - (i) Reliability;
 - (ii) Maintainability;
 - (iii) Produceability;
 - (iv) Electromagnetic compatibility;
 - (v) Interchangeability;
 - (vi) Software development/integration; and
 - (vii) Human interfaces;
- (f) Integration of design activity with integrated support planning;
- (g) Integration of design activity with test and verification requirements and plans; and
- (h) Technical risks and intended actions for mitigation of these risks.

The SAP must be updated and resubmitted to the Principal's Representative in accordance with the requirements of item CDRL SA-01 of Attachment 3 to this SOW.

3.2.3. Reporting Progress of Systems Assurance Activity

Progress on Systems Assurance activities must be reported as a specific heading within progress reports submitted in accordance with Clause 2.8.2 of this SOW.

Reports are to address specific status and progress against each Level Two CWBS element and are to include details of:

- (a) Design status of each element, including details of specific issues affecting lower level items within that CWBS element, as applicable;
- (b) Details of development testing planned or completed to demonstrate compliance with design requirements;
- (c) Technical risks associated with meeting Contract requirements for each CWBS element and planned risk mitigation action; and
- (d) Planned major engineering changes for each CWBS element, as applicable.

3.3. Design Management

3.3.1. General

Design management represents a major aspect of systems engineering. For the purposes of this Contract, design management includes, but is not limited to:

- (a) Analysis of Technical Specification requirements to ensure that they are complete in terms of the functional performance requirements and do not conflict with any other requirement of the Technical Specification or the Contract;

- (b) Allocation of requirements to specific sub-systems and configuration items;
- (c) Tradeoffs and optimisation of the design, including simulation and modelling where appropriate to ensure that the final product is compliant with the Contract requirements;
- (d) Consideration of specialty engineering aspects such as reliability, maintainability and produceability and incorporation of the results into the design;
- (e) Preparation and submission of Design Documentation by the Contractor as part of the design development task;
- (f) Definition and management of interfaces, both external to and between Sets sub-systems;
- (g) Selection of parts and materials; and
- (h) Design verification, including independent verification of Design Documentation, design assumptions and calculations as required.

The Contractor must include details of the systems and controls to be provided for design management as part of the Systems Assurance Plan. Specific requirements for some aspects are included within this Clause 3.3.

3.3.2. Requirements Analysis

The Technical Specification incorporates a series of requirements to be met within the final design of the Sets. Each requirement within the Technical Specification represents a single functional or physical characteristic or linked group of characteristics for an item or system.

The Contractor must implement a process of functional analysis, to ensure that each requirement is allocated and traceable to a specific configuration item within the Design. This process is intended to ensure that each characteristic required by the Technical Specification has been recognised within the design process, that the final product will be capable of delivering the specified level of performance, and as a basis for verification and testing.

The Contractor must clearly establish that the Design complies with the Contract requirements. The verification and test program will provide the means of demonstrating compliance.

3.3.3. Requirements Traceability and Allocation

Details of the requirements and functions allocated to individual items must be provided as traceability records in a form approved by the Principal. The Contractor must submit the traceability records to the Principal's Representative in accordance with item CDRL SA-03 of Attachment 3 to this SOW.

This data must include, but is not limited to:

- (a) Requirements hierarchy, showing how the technical requirements of the Contract, including the Technical Specification in particular, have been interpreted and allocated by the Contractor within the requirements analysis process;
- (b) Functional hierarchy, showing how the functions of the Sets defined in the Technical Specification have been interpreted and allocated by the Contractor;
- (c) Definition of the physical hierarchy of the major items (including software), interfaces and links that are incorporated in the design;

- (d) Definition of the purpose of each component, interface or link, including the functions it performs, its capabilities, capacity, operating states and modes;
- (e) Identification of the non-functional requirements allocated to each component; and
- (f) Cross reference indexes showing the test methods and specific test procedures to be applied to validate the requirements, functions, capabilities, capacity, operating states and modes for each component (see also Clause 3.11).

Without limiting the General Conditions of Contract, the Contractor must conduct functional analysis and allocation, using a method proposed by the Contractor and reviewed by the Principal's Representative, to demonstrate that all requirements have been incorporated within the Design.

Requirements must be allocated to the Lowest Replaceable Assembly level (as defined in the CWBS) for items to be developed as part of the work under the Contract and to end item level for previously developed (bought-in) items.

3.3.4. Software Design and Development

Functional requirements for software are incorporated in the Technical Specification.

The Contractor must implement specific procedures and controls for the development, integration and documentation of software. As a minimum, procedures used must be consistent with the requirements of ISO 9000-3:1991, Guidelines for the application of ISO 9001 to the development, supply and maintenance of software.

Procedures must clearly specify the approach to the development of new code as well as to the integration and testing of previously developed software that is to be modified as part of the work under the Contract.

Software development procedures appropriate to the level of new development included within the Design Documentation must be submitted to the Principal's Representative for review before software development work is commenced. Software testing requirements and procedures must be incorporated by the Contractor in the Integrated Test Plan prepared in accordance with Clause 3.11.8 of this SOW and must require the application by the Contractor of a systematic process of development, integration and qualification tests prior to the release of software for incorporation or use within the design.

The Contractor must manage the configuration of all software developed or supplied as part of the work under the Contract using the same configuration management procedures applied for hardware items. This includes the requirement to identify and manage each software element that is to be developed or substantially modified as Computer Software Configuration Items ("CSCIs").

At the System Definition Review conducted in accordance with Clause 3.5.2.1 the Contractor must identify:

- (a) software components to be developed or modified for use in the Sets and identification of individual CSCIs;
- (b) programming languages to be used, including interpreters, compilers, databases and fourth generation languages ("4GLs"); and
- (c) software development environment, including hardware and software components.

3.3.5. Software Documentation

The Contractor must develop and submit software documentation to the Principal's Representative for review in accordance with item CDRL SA-04 of Attachment 3 to this

SOW. The software documentation must provide sufficient detail to enable the software to be supported and maintained throughout the planned life of the Sets.

As a minimum the following documentation must be provided for all software developed or significantly modified for this Contract:

- (a) A Software Detail Design Document; and
- (b) A Software Product Technical Specification, including source code and details of the software development environment.

3.3.6. Design Certification

The Contractor must provide design certification for the Cars and additional information and support as may be required by the Principal to meet certification and licensing requirements. This may include independent verification of design assumptions and calculations for critical items and subsystems.

Design certification must take the form of a certificate to be provided by the Contractor's senior design representative, to the effect that the design complies with the Technical Specification and other relevant standards and codes and has completed and passed the verification and test program required to be carried out under the Contract including all Commissioning Tests. The design certificate as described in Attachment "H" to the General Conditions of Contract must be provided in accordance with item CDRL SA-02 of Attachment 3 to this SOW as a condition precedent to Practical Completion of Set 1.

Without limiting Clause 10.1 or Clause 10.1A of the General Conditions of Contract, the Contractor must provide all information and support to the Principal necessary to obtain acceptance by the Rail Infrastructure Corporation ("**RIC**"), licensing by the Environment Protection Agency ("**EPA**") and Department of Transport accreditation. The minimum requirement for acceptance by RIC comprises information in the format defined in the RIC document titled Rolling Stock Unit Appendix A4.

3.3.7. Exterior and Interior Appearance

Designs for both the exterior appearance and the interior arrangement and furnishings will be established early in the design phase in conformance with the concept established as part of the Development Baseline prepared in accordance with Clause 3.6.3 of this SOW. Minor changes will be permitted from the Development Baseline, to accommodate requirements arising from the design optimisation process, but primary characteristics of the appearance, unless rejected by the Principal's Representative during the Preliminary Design Review required by Clause 3.5.2.2, must be preserved.

The Contractor must provide a detailed tradeoff study covering development of the exterior and internal appearance and design of the Sets, including the advantages and disadvantages of various alternatives considered as part of the development process. Aspects which must be considered include operating efficiency, durability, maintainability (including cleaning and restoration of damage through vandalism), passenger comfort and aesthetic considerations and life cycle cost considerations. The tradeoff study must include detailed sketches and layouts of the proposed design and may include mockups, models and other visual aids at the Contractor's option.

The tradeoff study must be submitted in accordance with the requirements of item CDRL SA-05 of Attachment 3 for the review by the Principal's Representative.

3.3.8. Vandal and Graffiti Management

The Sets must incorporate features to maximise anti-vandal and anti-graffiti measures. The tradeoff study provided under Clause 3.3.7 of this SOW must include details of all features to be incorporated in the Sets in order to minimise the impact of vandalism and graffiti. The Contractor must specifically identify the features of the following items including, but not limited to:

- (a) windows;
- (b) seat bases and seat backs;
- (c) light fittings;
- (d) interior and exterior walls;
- (e) grab handles;
- (f) hand rails;
- (g) door systems and components;
- (h) interior trim (including, without limitation, ceiling and floor finishes);
- (i) climate control vents;
- (j) component fixings;
- (k) internal destination indicators;
- (l) public address and passenger information system, including intercom components;
- (m) surveillance cameras and housings;
- (n) crew cab and equipment;
- (o) toilet fixtures and fittings; and
- (p) help and other buttons.

As a minimum, the details provided within the tradeoff study must cover:

- (q) The Contractor's intended approach to minimising vandalism and graffiti damage;
- (r) The methodology adopted to identify and address the high risk items; and
- (s) Features incorporated to facilitate quick repair and replacement of items.

3.4. Mockup Requirements

3.4.1. General

The Contractor must construct:

- (a) full scale mockup/s that shall include:
 - (i) a crew cab including the nose cone of the front carriage; and
 - (ii) a half carriage compartment including a complete end saloon area and inter-car area, a complete door entry vestibule area including passenger bodyside doors, a complete set of stairs (up and down) and half length lower deck and half length upper deck;
- (b) a layout to include two adjacent end vestibules showing the placement of inter-car connections, seating arrangements, toilet, side and end door systems. The end

vestibule layout must provide sufficient definition to permit full assessment and demonstration of accessibility provisions for mobility challenged passengers.

In addition to the physical model, the Contractor must provide a three dimensional ("3D") computer model showing all features including floor, ceiling, walls, windows, seats, fittings, handrails, stairs and safety features.

The 3D model must be designed with the capability of automatically changing colours and materials on walls, floors, ceiling, seats and other components.

The 3D model must allow a walk through visualisation of end vestibules and upper and lower saloon areas providing a realistic impression of lighting, colours, reflectivity and be representative of the Cars as designed.

The mockups must enable the Principal's Representative and other persons nominated by the Principal or the Principal's Representative to effectively assess the Contractor's proposed design of the interior and exterior appearance of the Sets. Review of the mockups will form part of the Preliminary Design Review to be conducted in accordance with Clause 3.5.2.2.

3.4.2. Inclusions

The mockup must be fitted with all items, gauges, seating, hand rails, etc, which will be built into the Sets.

Many items such as gauges, controls etc may be simulations of the real item. Seating, although not necessarily the final product, must be adequate to give an indication of passenger and crew space such as shoulder and leg room, as well as contributing to the ambience of the Sets.

3.4.3. Crew Cab Mockup

The crew cab mockup must be constructed so that it provides the Principal's Representatives and anyone nominated by the Principal or the Principal's Representative with sufficient indication of the proposed finished product to permit review of the proposal.

The mockup must include:

- (a) Nose cone of the Set;
- (b) Terminal end emergency sufficient to provide an understanding of its operation;
- (c) Fully simulated layout of all desks, cupboards, controls, doors, lights, and windows, monitors, screens, instruments, gauges, windows, blinds, air-conditioning vents, controls, heaters, etc. These may be actual items or simulations, and must be included in the mockup;
- (d) All crew controls on driver and guard desk must move as intended in the final design; and
- (e) Surface finishes while not necessarily being of the final design material must simulate the expected final design and be in the finished colour.

3.4.4. End Saloon and Vestibule Mockup

The mockup for the passenger compartment must include:

- (a) All the proposed handrails, windows, seating, hand grabs, doors, flooring, lighting, etc. These items need not be the final products but must provide an indication or simulation of the customer interface and ambience of the Set; and

- (b) All equipment storage facilities, air conditioning, ducting, vents, PA systems, help points, etc.

The mockups must be sufficiently robust to permit adequate inspection by the Principal's Representative and nominated stakeholders and representatives.

Easy access into the mockups must be provided. In particular, easy access for disabled commuter representation must be catered for.

3.4.5. Mockup Program

The mockups must be delivered in accordance with the delivery schedule in the Project Master Schedule.

The Contractor must provide the Principal's Representative with fourteen days written notice of when the mockups will be ready for assessment.

The Contractor must initially allow 14 days for the Principal's Representative to assess the mockup for the driver's cab layout, following which the Contractor must allow a further fourteen days for the Principal's Representative to access, review and approve the mockup, its design and layout. Any proposed changes to the approved design and layout must be submitted to the Principal's Representative for review.

3.5. Technical Reviews

3.5.1. Technical Review Process

Technical reviews form part of the risk management process and must be conducted for the purpose of monitoring progress toward achievement of technical and integrated support requirements of the Contract. The reviews provide the opportunity to:

- (a) assess the Contractor's intended approach to meeting all of the Contract requirements;
- (b) review any specific requirements which are to be confirmed at nominated stages; and
- (c) resolve problems associated with the design of the Sets or technical and support aspects of the work under the Contract.

The Contractor has the primary responsibility to manage and conduct the reviews, and to achieve the objectives of each review. The Principal's Representative will participate in the review process and may offer his or her view as to the likely compliance of the offered design with the requirements of the Technical Specification.

3.5.2. Technical Review Program and Objectives

Technical reviews and a Physical Configuration Audit must be conducted as part of the work under the Contract. The reviews will be conducted in accordance with the principles established in Technical Reviews Policy Manual, AM 0022 PM, to meet the objectives set out within this Clause 3.5.2.

Each of the reviews may be completed as a single event or may take place progressively, subject to agreement between the Contractor and the Principal's Representative. Reviews may be conducted for the Cars as a whole, or may be held for separate sub-systems, groups of sub-systems, or configuration items as appropriate.

Technical reviews must take the form of a presentation by the Contractor setting out details of key assumptions, processes and results of the design activity that has taken place prior to the relevant review. The reviews must be conducted following the submission of relevant documentation by the Contractor in accordance with Attachment 3.

The Contractor must conduct technical reviews of systems, sub-systems or Configuration Items with its Subcontractors prior to the commencement of each technical review with the Principal's Representative. The Contractor must keep the Principal's Representative informed of the outcome of all Subcontract technical reviews.

3.5.2.1. System Definition Review

A System Definition Review ("**SDR**") must be completed within 90 days after the Date of the Deed of Agreement.

The SDR must:

- (a) Compare the requirements of the Technical Specification to the Contractor's concept design;
- (b) Resolve any inconsistencies, differences or misunderstandings arising from the initial functional analysis of the requirements of the Technical Specification;
- (c) Review key design assumptions and concepts proposed for the design of the Cars, including observations arising from the draft exterior and interior appearance tradeoff study prepared and submitted by the Contractor in accordance with Clause 3.3.7 and 3.3.8 of this SOW; and
- (d) Review the Contractor's intended approach to the systems assurance effort required as part of the work under the Contract.

The SDR must include a review of individual systems, sub-systems and, where appropriate, configuration items proposed by the Contractor as part of the concept design.

3.5.2.2. Preliminary Design Review

One or more Preliminary Design Reviews ("**PDR**") must be conducted to assess the likely compliance of the proposed design with the requirements of the Technical Specification. PDRs may be conducted progressively for individual systems and sub-systems, to a schedule to be proposed and submitted by the Contractor for review by the Principal's Representative. All scheduled PDRs must be completed within 240 days from the Date of the Deed of Agreement.

The PDR for each system and subsystem must address key aspects as described within this Clause 3.5.2.2 and further explained in AM 0022 PM. The Contractor must propose a tailored approach to the PDR for review by the Principal's Representative, to take account of the extent to which previously developed items will be incorporated in the final design.

As a minimum, each PDR must address:

- (a) Functional analysis and requirements allocation, including functional flow block diagrams, performance requirements and the status of the development of additional specifications;
- (b) Key design assumptions for individual configuration items, including any proposed departures from specified requirements;
- (c) Preliminary design detail, including sketches, drawings, analysis and trade off studies carried out in developing the preliminary design, mass and centre of gravity calculations for the Sets;
- (d) Interface definition, in the form of specifications and/or drawings;
- (e) Environmental design criteria;
- (f) Preliminary plans for qualification of the item/system;

- (g) Proposed configuration of computer resources including processor type operating systems, development environment, capacity, interfaces and timing diagrams;
- (h) Preliminary reliability allocations to individual sub-systems and major items;
- (i) Maintainability features proposed for incorporation in the design, including self test and built in monitoring systems and accessibility;
- (j) Produceability aspects, including special materials tooling and processes to be developed or used in the building of the Sets;
- (k) Preliminary design for the exterior and internal appearance of the Sets based on the results of the tradeoff study conducted and submitted in accordance with Clauses 3.3.7 and 3.3.8 of this SOW, including models and samples of materials to be used;
- (l) Operational interfaces and their effect on the system design;
- (m) The design status of previously developed hardware items and COTS software, including compliance with specification requirements, the status of previous qualification testing, planning for additional qualification and integration testing, definition of interfaces, the level of documentation available and integrated support aspects; and
- (n) Establish the Development Baseline in accordance with Clause 3.6.3 of this SOW.

3.5.2.3. Critical Design Review

One or more Critical Design Reviews ("**CDR**") must be conducted for the Cars as a whole, their sub-systems and Configuration Items, to a timetable to be proposed and submitted by the Contractor for review by the Principal's Representative. CDRs must be conducted when the detailed design for each of the major sub-systems is substantially complete and generally before construction begins.

Without limiting Clause 21 of the General Conditions of Contract, the Principal reserves the right to reject any part of the work under the Contract found not to be in accordance with the Contract for which the Contractor has commenced manufacture before CDR.

The purpose of the CDR is to review the likely compliance of the proposed design to the requirements of the Technical Specification and to provide the Principal's Representative with the opportunity to review the Design Documentation.

The Contractor must present Design Documentation covering the detail design proposed for the Sets, its sub-systems and major configuration items, including trade-offs and decisions on alternatives as well as key design assumptions and constraints. Each CDR must address the same range of detail as defined at Clause 3.5.2.2 of this SOW and the Contractor must present information covering the results of detailed design effort for each major system including significant departures from the design concepts presented at the PDR.

The CDR for each subsystem or item must be conducted following the Contractor's submission of relevant documentation in accordance with Attachment 3 of this SOW. The CDR will be accomplished by:

- (a) Review of drawings, Design Documentation and reports, including the results of modelling, analyses and tests carried out to verify the adequacy of the proposed design;
- (b) Review of reliability models and predictions;
- (c) Establishing areas of the proposed design that require further effort in parallel with the build phase of the Contract;

- (d) Review of progress on the development of integrated support elements of the work under the Contract; and
- (e) Review the intended approach to verification testing, including the results of any testing completed prior to the CDR.

The CDR process is intended to provide the Principal's Representative with an opportunity to review the Design Documentation. It is further intended to provide an overview of the intended design for each complete system and the expected compliance with Technical Specification requirements.

The Preliminary Production Baseline will be finalised for Set 1 following successful completion of the CDR (see Clause 3.6.4).

3.5.2.4. System Verification Review

A System Verification Review ("SVR") must be conducted when all verification and test activity identified within the Integrated Test Plan (except the In-Service Evaluation) has been completed, for the purpose of:

- (a) Reviewing the results of completed verification tests, including any outstanding corrective actions identified within the Failure Reporting and Corrective Action System ("FRACAS") referred to in Clause 3.11.10 of this SOW;
- (b) Verifying compliance of the test results with test objectives;
- (c) Agreeing corrective action; and
- (d) Establishing readiness for the delivery phase.

The Contractor must present details and results of testing completed and must identify any areas requiring further action to fully conform to the requirements of the Technical Specification.

3.5.2.5. Physical Configuration Audit

A Physical Configuration Audit ("PCA") will be conducted by the Principal's Representative prior to delivery of Set 1 and Set 5, for the purpose of auditing compliance of the physical product with Design Documentation. The primary objectives of the PCA are to establish conformity between the physical product and the Design and to confirm the Production Baseline for Set 2.

The PCA may be performed progressively on a sampling basis during the build phase and must include physical checks of completed hardware against the Design Documentation, to verify compliance of the final product with the Design Documentation.

The Contractor must support the process by making equipment available to meet an agreed program and by providing suitable inspection facilities.

3.5.3. Contractor's Responsibilities - Technical Reviews

Reviews must take place at the Contractor's premises, unless otherwise agreed.

The Contractor must:

- (a) Develop a detailed agenda for each review;
- (b) Deliver drawings and other information progressively with the final submission to be made not later than 14 days prior to the scheduled date for each review. The 14 day requirement may by notice in writing be reduced for individual reviews at the discretion of the Principal's Representative. In addition, detailed design reports,

analyses etc to be presented in support of the material being reviewed does not need to be delivered prior to the review but must be available at the review;

- (c) Provide a suitable venue and facilities for each review meeting;
- (d) Present information at each technical review, in support of previously delivered data;
- (e) Prepare minutes of each technical review meeting covering, but not limited to, actions and decisions taken as a result of the review; and
- (f) Manage Contractor actions arising from each review to meet agreed time-scales.

3.5.4. Principal's Representative's Role in Technical Reviews

The Principal's Representative may:

- (a) Evaluate Design Documentation in preparation for each review;
- (b) Chair technical review meetings;
- (c) Endorse the minutes of each review;
- (d) Manage the Principal's Representative's actions arising from each review, to meet agreed time-scales; and
- (e) Establish the scope and timing of PCA activity in conjunction with the Project Master Schedule.

3.6. Configuration Management

3.6.1. Requirements

The Contractor must implement a Configuration Management Plan ("**CMP**") that complies with the requirements of Australian/New Zealand Standard AS/NZS 3907:1996-Quality management-Guidelines for configuration management.

The primary objectives of the CMP process will be to:

- (a) Precisely define the configuration of both hardware and software elements of the Sets and associated systems, including interfaces. This is to be accomplished by defining and documenting a series of Baselines as defined within this Clause 3.6;
- (b) Establish and manage a system of change control, which ensures that all changes to the Design are identified, properly authorised and incorporated in Design Documentation and result in changes to support requirements where necessary;
- (c) Establish a system to identify and submit for review by the Principal's Representative, any departures from the approved configuration, for every Set delivered. This includes management of non-conforming product fitted to any Set; and
- (d) Audit the physical product to ensure that it complies with the Design.

The CMP must fully and precisely define the configuration of the Sets at any time. This definition is required for the initial production standard (Set 1) and for each subsequent Set.

Requirements for configuration management should be met to the greatest possible extent by systems and procedures in place within the Contractor's organisation. Where systems in place do not comply with the requirements of AS/NZS 3907:1996, the Principal's Representative may approve the use of the existing system based on review and audit of the Contractor's system, to ensure that it meets the requirements of the Contract.

The Contractor must maintain an active configuration management process until Practical Completion of the final Set of Stage 1 and all relevant Design Documentation is handed over to the Principal.

3.6.2. Baseline Management

The "**Functional Baseline**" will comprise the specifications and applicable interface control documents established by the Principal, and the Design Documentation prepared and developed by the Contractor as at the Date of the Deed of Agreement.

The Functional Baseline must describe the functional, physical and performance requirements for the system to be delivered. The Cars, and each item described at Level 3 of the WBS, must be defined as "**Configuration Items**" for the purposes of configuration management.

The Functional Baseline must include the established exterior and internal appearance for the Sets.

The Contractor must define, document and deliver Development, Preliminary Production and Production Baselines in accordance with item CDRL SA-06 of Attachment 3 to a format and standard of presentation to be approved by the Principal's Representative.

Each Baseline must comprise a listing of Design Documentation and other documents to enable the configuration to be established at any point during the performance of the work under the Contract. Documents must be listed by unique reference number (drawing, specification or report number), including issue and revision number and date

3.6.3. Development Baseline

A "**Development Baseline**" must be defined as a result of the Preliminary Design Review.

The Development Baseline must describe the complete Sets and must identify Design Documentation developed by the Contractor as the basis for the detailed design phase, including specifications for previously developed items included in the concept design. The Development Baseline will form the basis for the detail design phase.

The Contractor must prepare and submit the Development Baseline for review by the Principal's Representative within 14 days of completion of each PDR.

3.6.4. Preliminary Production Baseline

A "**Preliminary Production Baseline**" must be defined to describe the configuration of Set 1.

The Preliminary Production Baseline must describe the configuration of the complete Set including Level 3 CWBS items, in sufficient detail to permit the manufacture of Set 1 and must include reference to such elements of the Design Documentation as may be required for this purpose.

The Contractor must prepare and progressively submit a Preliminary Production Baseline not later than 14 days prior to each CDR, for review by the Principal's Representative during the CDR. The Principal recognises that the Baseline may not be complete at that stage but it will be required to include sufficient definition to accurately establish the intended configuration of Set 1. The 14 day requirement may by notice in writing be reduced for individual reviews at the discretion of the Principal's Representative.

The Preliminary Production Baseline must be fully defined and documented prior to delivery of Set 1.

Failure by the Principal's Representative to reject the Preliminary Production Baseline as a basis for production will not prejudice, limit or otherwise affect the Contractor's obligations under the Contract.

3.6.5. Production Baseline

A "**Production Baseline**" must be defined by the Contractor to describe the configuration of all subsequent Sets to be delivered under the Contract.

The Production Baseline must be developed by the Contractor from the Preliminary Production Baseline, to incorporate changes required by the Principal's Representative as a result of the CDR and those defined and approved by the Principal's Representative during the build phase.

The Contractor must progressively prepare and submit the Production Baseline.

The Contractor must update the Production Baseline not later than 30 days following completion of the PCA and the Operational Testing of Set 1 in accordance with Clause 4.2.4 of the Technical Specification. Any failure by the Principal's Representative to reject the Production Baseline as the agreed configuration for Sets to be delivered under the Contract will not prejudice the responsibilities of the Contractor to propose or introduce changes to correct design faults or areas where the design does not meet specification requirements.

The Contractor must maintain and update the Production Baseline up until the expiry of the last Warranty Period, by the addition of all agreed changes incorporated in the Design.

The Contractor must, at its own cost, modify all Sets as well as any spare parts delivered or otherwise to comply with any amendments to the Production Baseline where those amendments were the result of the Design not complying with the requirements of the Contract. If the Production Baseline is amended after one or more Sets have been delivered to the Principal, the Contractor must carry out such modification work at the times reasonably directed by the Principal's Representative.

3.6.6. Change Management

The Contractor must implement a system of change management as part of the configuration management system.

The Contractor must describe the operation of the change management system in detail in the Configuration Management Plan ("**CMP**"). As a minimum, the change management system must provide the means of:

- (a) Formally identifying and describing proposed changes in terms of their impact on performance and support aspects. This includes aspects such as reliability, maintainability, interchangeability;
- (b) Managing the incorporation of changes, including complementary changes in support provisions such as maintenance plans, technical publications and spares support; and
- (c) Ensuring that details of the change are incorporated in Design Documentation and support documents.

The Contractor's change management system must provide for the following:

- (d) Prior to the finalisation of the Production Baseline the Contractor may incorporate any change that does not lead to non-compliance with the Contract or an increase in the Contract Price, without reference to the Principal or the Principal's Representative; and

- (e) Without limiting Clause 7.7 of the General Conditions of Contract, changes to the Design following finalisation of the Production Baseline are subject to review by the Principal's Representative.

3.6.7. Configuration Management Plan

The CMP must form part of the Systems Assurance Plan.

The CMP must include, but not be limited to:

- (a) A description of the configuration management system in place within the Contractor's organisation, including computer systems used to establish and maintain the configuration records for the Cars throughout the performance of the work under the Contract;
- (b) Responsibilities and systems in use for defining configuration and control of change; and
- (c) A Technical Specification hierarchy, showing Configuration Items and potential additions to the Configuration Items list should be included in the baseline definition wherever possible.

3.6.8. Design Documentation Package

After all CDR's have been completed in accordance with Clause 3.5.2.3 and the Preliminary Production Baseline has been finalised in accordance with Clause 3.6.4 so that there are no outstanding issues or comments which have not been addressed to the satisfaction of the Principal's Representative, the Contractor must prepare and submit a comprehensive Design Documentation package (the "**package**") to the Principal's Representative for review. The package must be clearly marked as being submitted pursuant to this Clause 3.6.8. The package must include data produced by the Contractor in support of the technical reviews described at Clause 3.5 of this SOW.

The package must include, but need not be limited to :

- (a) Drawings. A complete set of design and manufacturing drawings must be provided as part of the work under the Contract. Drawings are to comply with the general requirements of Australian Standard AS 1100 or equivalent and are to be prepared in the Contractor's format and use the Contractor's standard numbering system. All drawings must incorporate a comprehensive Parts List for the purpose of establishing the integrated documentation record further defined at Clause 4.9 of this SOW. The Contractor must deliver:
 - (i) Three microfilm copies and one electronic copy of all drawings. The electronic copy must be provided in AutoCAD DXF format or as otherwise agreed by the Principal's Representative; and
 - (ii) Three printed copies and one electronic copy of the drawing index. The electronic copy must be in Microsoft Access format;
- (b) Specifications. Specifications prepared as part of the work under the Contract or necessary for full understanding of the drawing requirements, such as product or procurement specifications, form part of the design package. Specifications may be provided in the Contractor's format, but must also be provided in electronic format;
- (c) Test Specifications. The design package must include copies of all test specifications required to construct or commission the Sets;

- (d) Reports. Design reports necessary to understand or interpret the design drawings or other reports specifically identified within this Contract, such as reliability prediction reports, must be included as part of the design package;
- (e) Software Documentation. Software documentation developed in accordance with Clause 3.3.5 of this SOW as part of the work under the Contract form part of the design package; and
- (f) Vendor Drawings. Drawings and specifications for vendor items which form part of the design of the Sets must be incorporated within the design package.

3.7. Reliability Program

3.7.1. Objectives

The Contractor must implement a Reliability Program that complies with the general requirements of AS 3960 as part of the design phase of the work under the Contract.

Major objectives of the program are to:

- (a) Provide a means of establishing a quantitative baseline for assessing the likely compliance of the proposed design with reliability and availability targets established in the Technical Specification and thus the likelihood of achieving the required levels of availability and on time running performance for the Sets;
- (b) Identify areas of the design which require modification or improvement to meet the required reliability performance;
- (c) Introduce design improvements and changes that will ensure that the specified targets are met; and
- (d) Measure the levels of reliability achieved during the operation of the Sets.

3.7.2. Reliability Modelling and Prediction

The Contractor must develop reliability block diagrams and models to quantitatively estimate and predict the reliability performance of the Design.

Models must be developed to represent the system to at least the lowest replaceable subassembly level for items to be developed as part of the work under the Contract and to replaceable unit level for previously developed items incorporated within the Design. Commercially available computer modelling tools may be used at the option of the Contractor.

Data for inclusion in the models must be based on:

- (a) Demonstrated performance for previously developed items, where available. Such data must reflect the operation of equipment in an environment which can be shown to be representative of the environmental and dynamic performance conditions specified for the Sets. The Contractor is responsible for providing evidence in support of the validity of operating performance data; and
- (b) Estimated performance for newly developed items, based on manufacturer data or other method agreed by the Principal's Representative.

The results of modelling efforts are to be submitted by the Contractor as a formal Reliability Predictions Report and incorporated in each Baseline established under Clause 3.6 for the system. The Contractor must submit the Reliability Predictions Report in accordance with item CDRL SA-09 of Attachment 3.

3.7.3. Failure Modes, Effects and Criticality Analysis

The Contractor must complete, document and maintain a Failure Modes, Effects and Criticality Analysis ("FMECA") and submit the FMECA in accordance with item CDRL SA-10 of Attachment 3.

The purpose of the FMECA is to review and analyse the Design to establish:

- (a) Potential or demonstrated failure modes for each significant item within the Design. This will be carried out at the replaceable subassembly level;
- (b) The likelihood of failure for each identified failure mode, where possible expressed in terms of failure probability;
- (c) The effect of failure in terms of the impact on safety, operating performance, environmental impact and economic consequences, including damage to other equipment; and
- (d) The criticality of failure in terms of operation of the system, ie. whether a Set can continue to operate after the failure has occurred.

The FMECA process is closely linked to the reliability modelling and improvement program. FMECA serves to identify potential failure modes that must be considered as part of the reliability estimation process for a specific item and to provide information on those which should receive highest priority for reliability improvement. FMECA also provides the basis for development of programmed maintenance requirements and for identifying failure modes and effects for consideration as part of the System Safety Hazard Assessment required at Clause 3.12 of the SOW.

The FMECA process may be completed and documented to the Contractor's standard, provided that the approach meets the basic objectives set out within the Potential Failure Mode and Effect Analysis Handbook, which forms part of the set of documentation for the QS 9000 supplement to QS 9000 Quality Systems Standard.

The initial analysis is to be completed in conjunction with the reliability modelling and prediction activity and results are to be available for consideration as part of the Critical Design Review.

3.7.4. Reliability Demonstration Plan

The process to be followed for both phases referred to in Clause 3.7.5 will be documented in a Reliability Demonstration Plan, to be prepared by the Contractor and delivered for review by the Principal's Representative in accordance with the requirements of item CDRL IS-09 of Attachment 3 of this SOW. The Reliability Demonstration Plan must set out the program, processes and procedures for the reliability demonstration process.

3.7.5. Reliability Demonstration Program

The Contractor must implement a reliability demonstration program. The purpose of this program is to establish evidence that reliability predictions provided as part of the reliability program will be achieved in practice.

The reliability demonstration will include two separate phases, as follows:

- (a) The first phase will be undertaken during the initial evaluation of the performance of Set 1, and will continue until the final Set of Stage 1 is delivered. The first phase will be aimed at identifying any areas where there appears to be a substantial departure from the predicted reliability for the Sets and for developing and implementing reliability growth proposals. This may require a re-assessment of the assumptions

made in arriving at the predictions. Corrective actions necessary for reaching reliability targets will be identified and agreed as a result of this initial assessment, for incorporation in all Sets; and

- (b) The second phase will begin on the Date of Practical Completion of Set 10 and will continue until all Reliability Targets have been achieved or 7 years after Practical Completion of the last Set to reach Practical Completion (whichever is earlier). This phase will involve the continuous assessment of achieved reliability under service conditions and will also result in the identification and incorporation of agreed improvements to correct identified deficiencies.

3.7.6. Reliability Targets

3.7.6.1. Definitions

In this Clause 3.7.6:

"Calculation Date" has the meaning given in Clause 3.7.6.2.

"Failure" means where:

- (a) a Set is removed from passenger service;
- (b) a Set operating in a suburban region is delayed by four minutes or more;
- (c) a Set operating in an outer suburban region is delayed by six minutes or more; or
- (d) a Set which is scheduled to enter passenger service cannot be dispatched at the scheduled time of departure,

as a result of one or more train equipment faults.

"MDBF", in relation to any 6 month period ending on a Calculation Date ("**calculation period**"), means the amount determined in accordance with the following formula:

$$\text{MDBF} = \frac{\text{Aggregate distance}}{\text{Relevant Failures}}$$

where:

Aggregate distance = the aggregate of the distances (in km) travelled by all of the Cars in Relevant Sets during the calculation period (that is Car km)

Relevant Failures = the total number of Failures occurring in relation to all Relevant Sets during the calculation period less any Failures that are to be excluded in accordance with Clause 3.7.6.2

"Relevant Set", at a particular time, means a Set that reached Practical Completion at least 6 months previously.

"Reliability Target" means any one of the seven reliability targets referred to in Clause 3.7.6.3.

3.7.6.2. Reliability Calculation

On the date which is one month after the Date of Practical Completion of Set 10, and on the dates which occur at monthly intervals thereafter (each a **"Calculation Date"**) until all Reliability Targets have been achieved or 7 years after Practical Completion of the last Set to reach Practical Completion (whichever is earlier), the Principal's Representative must calculate the MDBF for the 6 month period that ended on the Calculation Date.

The Principal will ensure that each Relevant Set travels a minimum average distance of 8,500 km per month except for such periods as the Relevant Set is affected by a Failure.

If a fix has been identified for a particular type of Failure and the Principal's Representative has notified the Contractor in writing that it is satisfied that the fix, when implemented, will prevent the particular type of Failure from reoccurring, then any Failures of that type that occur up to 6 months after the Principal's Representative's notice will be excluded from the calculation of MDBF. Failures of that type that occur more than 6 months after the Principal's Representative's notice will be included in the calculation of MDBF.

The process of implementing fixes will be jointly reviewed on a regular basis to ensure suitable progress is being made to implement the fix. Without limiting the next sentence, the Contractor must implement the fix to all Sets within 6 months after the Principal's Representative's notice under the previous paragraph. The Contractor must ensure that rectification of significant operational faults or faults with safety implications is implemented within the shortest practicable period.

The following Failures will also be excluded from the calculation of MDBF:

- (a) Failures whose causes are unknown to the Principal's Representative, or are crew related, passenger related or vandalism related;
- (b) Failures caused by maintenance practices which depart from the O&M Documentation (other than Approved Departures); and
- (c) where a Set experiences a Failure, subsequent Failures of the same type on the same Set which occur before the next time the Set is returned to the maintenance depot.

A Failure will only be treated as crew related if the crew, being familiar with the O&M Documentation, should reasonably have been in a position to prevent the Failure.

Where practicable the Train Operating System will be used to confirm the nature of the train equipment fault. Each defect that causes a Failure will be reported to the Contractor at the earliest reasonably practicable time. Without limiting the Principal's Representative's power under Clause 28.2 of the General Conditions of Contract to issue a Reliability Report, a process will be jointly developed to review the contents of the Reliability Report prior to the Reliability Report being issued in accordance with that Clause 28.2.

3.7.6.3. Reliability Targets

The Reliability Targets are:

- (a) an MDBF of 100,000 km or greater before the date that is 4 years after Practical Completion of Set 10;
- (b) an MDBF of 150,000 km or greater before the date that is 4 years after Practical Completion of Set 10;
- (c) an MDBF of 200,000 km or greater before the date that is 7 years after Practical Completion of Set 10;
- (d) an MDBF of 150,000 km or greater before the date that is 4 years after Practical Completion of Set 30;
- (e) an MDBF of 200,000 km or greater before the date that is 7 years after Practical Completion of Set 30;
- (f) an MDBF of 150,000 km or greater before the date that is 4 years after Practical Completion of Set 40; and

- (g) an MDBF of 200,000 km or greater before the date that is 7 years after Practical Completion of Set 40.

For the avoidance of doubt, the MDBF calculated for the purposes of the Reliability Targets in paragraphs (d) and (e) above will include the aggregate distance and Relevant Failures for the Relevant Sets in both Stages 1 and 2, and the MDBF calculated for the purposes of the Reliability Targets in paragraphs (f) and (g) above will include the aggregate distance and Relevant Failures for the Relevant Sets in Stages 1, 2 and 3.

3.7.6.4. Achievement of Reliability Targets

In order for a particular Reliability Target to be achieved, all of the following conditions must be satisfied as at a Calculation Date:

- (a) all of the Sets in Stage 1 must have reached Practical Completion and be operational;
- (b) the aggregate of the distances travelled by all of the operational Sets in Stage 1 must be at least 1,000,000 km;
- (c) subject to paragraph (d), each Relevant Set must have travelled a minimum average distance of 8,500 km per month since it became a Relevant Set;
- (d) where as a result of an accident a Set is withdrawn from service for an extended period of time, paragraph (c) will not apply to that Set; and
- (e) the MDBF calculated for the 6 month period that ended on the calculation date must be at least the level set out in Clause 3.7.6.3 for the particular Reliability Target.

3.8. Maintainability Program

3.8.1. Objectives

The Contractor must develop and implement a maintainability program as an integral part of the design effort. Objectives of the program will be to demonstrate that maintainability features have been considered and incorporated in the design and that the specified Mean Time To Repair ("MTTR") requirements can be achieved for nominated items within the specified resource constraints.

Maintainability is a characteristic of design. It is used as a measure of the ease with which failures can be repaired and the time required to perform scheduled maintenance and replacement procedures, using nominated resources. The MTTR is a quantitative measure of maintainability.

The Technical Specification requires that suitable maintainability features be considered and incorporated within the Design of the Sets. These may include features such as built-in-test and diagnostic provisions, access, interchangeability, modular replacement, permanent lubrication, cleaning and other condition monitoring features.

In addition the Technical Specification establishes specific MTTR requirements for individual items installed in the Sets. For this purpose the MTTR is defined as the average time taken to complete the repair or servicing task, including fault diagnosis, removal, replacement and test of the replaced item.

3.8.2. Maintainability Estimation

Technical reviews to be conducted under Clause 3.5 will review the maintainability features incorporated within the Design together with Contractor's ability to achieve MTTR estimates.

The Contractor must provide the estimated MTTR for a selection of most common faults and for completion of inspection and replacements required as part of the scheduled maintenance program.

3.8.3. Maintainability Demonstration

The Contractor must, as a condition precedent to Practical Completion of each Set, demonstrate to the satisfaction of the Principal's Representative that the required MTTR specified in the Technical Specification for unscheduled repairs of each component of the Sets can be achieved in practice using the resources specified in the Technical Specification.

The Contractor must develop and submit a Maintainability Demonstration Plan for review by the Principal's Representative, in accordance with item CDRL IS-10 of Attachment 3 to this SOW. The Maintainability Demonstration Plan must propose methods and responsibilities for demonstration of maintainability features and will include aspects such as the time required for replacement of major items of equipment for which specific MTTR targets have been defined in the Technical Specification.

The Maintainability Demonstration Plan will be used to establish confidence in the MTTR estimates for the Sets and thus the potential availability that can be achieved during normal operation.

3.9. Availability

3.9.1. Availability Requirements

The level of availability to meet timetabled services is an essential feature of the Sets.

The Contractor must establish a process to estimate and predict the availability based on the reliability and maintainability characteristics of the Design.

3.9.2. Availability Prediction and Measurement

Availability predictions will be reviewed at CDR. The approach for calculation of availability will follow the following principles.

Achieving the required level of availability depends on the long term or underlying availability characteristics for the Sets. This is a function of both the reliability and maintainability characteristics of the Design, as well as the support provisions implemented as part of a maintenance program, including the availability of spares, trained staff and facilities, among other things.

Estimates for downtime exclude extreme vandalism, external graffiti damage, collision damage or other planned withdrawals of Sets by the Principal. Logistic and administrative delay times including the lead times for supply of spares, and other variables such as the availability of suitable maintenance facilities that are within the control of the Principal are also excluded.

Unscheduled failure rates are to be based on reliability predictions included in the Reliability Predictions Report (CDRL SA-09). Scheduled maintenance estimates are to be consistent with the Maintenance Manual for the Design.

3.10. Cost Management

3.10.1. Life Cycle Cost Prediction

The Contractor must provide cost data requested by the Principal or the Principal's Representative for use by the Principal in evaluating the Life Cycle Cost for proposed

changes arising during the design period and for changes requested or proposed during the Warranty Period.

Life cycle cost data will be used when considering possible changes to the Design of the Sets, and to assess the probable cost of ownership over the expected life of the system arising from such changes.

3.11. Testing and Verification

3.11.1. Objectives

The objectives of the test and verification effort are to demonstrate:

- (a) that the Design of the Sets conforms with the requirements of the Contract;
- (b) that the Design is capable of meeting the requirements specified in the Technical Specification and is fit for purpose; and
- (c) that the Cars conform to the Design and the requirements of the Contract.

This section of the SOW defines the management and conduct of the testing and verification activities. The Contractor's test activities must include, but not be limited to, the tests referred to in the Technical Specification.

The Contractor must develop and implement a test and verification program to achieve this objective. The testing of the Sets must involve the following processes as described in the Clauses below:

- (d) development testing of individual equipment;
- (e) Integration testing of systems and sub-systems;
- (f) qualification, operational and software testing of Set 1;
- (g) production and delivery testing of all Sets; and
- (h) the combined operational testing of Set 1 in accordance with Clause 3.11.7 of this SOW.

The Principal's Representative may witness any test proposed by the Contractor or required by the Contract.

Without limiting Clause 23.4 of the General Conditions of Contract, the Contractor must provide the Principal's Representative with at least seven working days' written notice for tests to be performed in Australia, at least 21 days written notice for tests to be performed overseas, or such other time as determined from time-to-time by the Principal's Representative, to enable the Principal's Representative to make arrangements for attendance.

3.11.2. Development Testing

The Contractor will perform development tests during the design phase of the work under the Contract to verify the performance or characteristics of designs developed or modified in accordance with this Contract.

The Contractor is responsible for identification and conduct of development tests required as part of the design effort. Information on significant tests planned, and the results of completed tests, are to be included in the progress reports submitted in accordance with Clause 2.8.2 of this SOW and during the technical reviews.

3.11.3. Integration Testing

The Contractor must conduct formal integration testing as part of the development process, to ensure that the operation of newly developed or modified items or systems, including both hardware and software elements, is verified prior to delivery of Set 1.

Integration testing must include progressive functional testing of integrated systems and sub-systems. Tests must be conducted under both normal operation and fault conditions over the full operating range, to ensure that the complete system operates as expected and that there are no unintended consequences associated with failure of any item. This includes the integration of hardware and software elements of the Design.

The Contractor must propose and carry out to the satisfaction of the Principal's Representative an integration test program to demonstrate that each system or sub-system which incorporates new items or significant modifications is subjected to comprehensive integration testing prior to operational testing of Set 1.

3.11.4. Qualification (Type Testing)

Qualification or Type Testing is the process of demonstrating that the proposed design is capable of meeting the requirements of the Technical Specification. This includes demonstration that equipment will continue to function at the extremes of the defined operating environment eg at elevated temperatures and humidity and under specified levels of vibration.

The Contractor must provide evidence of compliance with each requirement of the Technical Specification, using one of the methods described in Clause 3.11.8 of this SOW. Additional and special test verification methods required to be employed by the Contractor are also set out in the Technical Specification.

The Contractor may propose the use of relevant operating data in support of the qualification requirement for equipment which has previously been used in a design, and for which a substantial body of actual operating experience has been accumulated. Where the use of operating experience is proposed as a qualification method the Contractor must demonstrate that the data is valid for the design offered by the Contractor.

The Contractor must propose a test program to demonstrate that newly developed equipment, or equipment that has been substantially modified is capable of meeting functional and physical performance requirements over the specified range of operating conditions. Functional testing under normal ambient conditions will not be satisfactory evidence of compliance.

Where formal testing is not feasible or appropriate the Contractor may propose alternative methods, including a combination of test and analysis, to demonstrate compliance of the Design with the requirements of the Technical Specification.

3.11.5. Production and Delivery Testing

The Contractor must, as part of the Integrated Test Plan required by Clause 3.11.8 of this SOW, develop, document and deliver a formal test schedule covering all tests to be performed on each Set prior to delivery.

The Contractor must provide the Principal's Representative with a record of the tests performed on each Set, including the results achieved.

3.11.5.1. Production Testing

The Contractor must perform inspections, tests and audits of requirements during the production process to ensure that product quality and variations is maintained within specified

limits throughout the Sets. These tests must be performed during the manufacture and integration of each Set.

3.11.5.2. Delivery Testing

The Contractor must perform delivery testing of each Set prior to Practical Completion of the Set. These tests must be performed upon the integration of the Cars into a Set.

3.11.5.3. Delivery Testing Period

During the delivery testing period for Set 1 the Contractor is responsible for:

- (a) Supporting the Principal in obtaining approval from RIC and other relevant authorities to allow on track commissioning and type testing;
- (b) Providing all test resources except those for signal interference testing;
- (c) The preparation of a plan to complete all necessary testing to demonstrate that Sets meet the Contract requirements within a three month period; and
- (d) Paying for any crew or other resources to be supplied by the Principal required beyond the three months test plan.

The Principal's responsibilities during the delivery testing period (as set out in this Clause 3.11.5) and for any subsequent tests required by the Principal's Representative will be:-

- (e) Providing crews for delivery and testing for the first 3 months;
- (f) Providing locations for testing of the Sets eg, brake tests, signal interference tests;
- (g) Providing test equipment resources to test signal interference. All other test resources will be provided by the Contractor;
- (h) Not used;
- (i) Meeting RIC access charges;
- (j) Meeting SRA costs associated with attending/witnessing test activities; and
- (k) Providing a facility for the purposes of commissioning in accordance with Attachment 5 of this SOW.

3.11.6. Software Testing

The Contractor must develop and submit a formal program of tests to be undertaken on newly developed or modified software for review by the Principal's Representative.

These tests serve the same purpose as the development, integration and qualification testing covered by the preceding Clauses, and must be conducted under conditions which are consistent with good software development practice.

Test requirements for any software which may be classified as critical to safety of the Sets will be accorded particular attention as part of the software test program.

3.11.7. In-Service Evaluation

Further to the requirements of Clause 4.2.5 of the Technical Specification, Set 1 must undergo a program of operational testing and evaluation after Practical Completion for a minimum period of 3 months.

The purpose of the In-Service Evaluation period will be to assess all aspects of performance of Set 1 under actual operating conditions, prior to updating the Production Baseline for subsequent Sets. This must include:

- (a) Operating performance;
- (b) Initial assessment of reliability; and
- (c) Operator, maintenance and customer interfaces.

Information gained through the operational evaluation will be used to assess the performance of the Set against the requirements of the Contract and to identify any changes or corrective actions necessary before finalising the Production Baseline.

The Principal's Representative may select Set 2 and/or subsequent Sets to be tested in accordance with this Clause to the same extent as Set 1.

The Contractor must support the operational test period through the provision of integrated support aspects defined within Clause 4 of this SOW and through the Failure Reporting and Corrective Action System required by Clause 3.11.10 of the SOW.

3.11.8. Integrated Test Plan

The Contractor must develop, document and deliver an Integrated Test Plan ("ITP") covering all tests and test procedures to be applied by the Contractor, for review by the Principal's Representative. The Contractor must submit the ITP for review by the Principal's Representative in accordance with item CDRL SA-11 of Attachment 3 to this SOW.

The ITP is to be presented in the Contractor's format. An initial issue of the ITP is to be provided not later than 14 days prior to the CDR. The ITP must be progressively updated to include specific details of the facilities and schedule to be followed.

The ITP must include details of:

- (a) The range of tests proposed within each category of tests;
- (b) The purpose of each series of tests;
- (c) The equipment, facilities and personnel required during each test, including any resources and facilities to be provided by the Principal; and
- (d) Schedule for completion of all tests.

The ITP must be supplemented by specific test plans, specifications and procedures covering individual requirements within each series of tests. Test plans are to be provided by the Contractor for review by the Principal's Representative progressively through the period of the Contract, as required by the ITP.

The ITP must include a "**Requirements Verification Matrix**", defining how each functional, performance and design requirement will be verified, the stage at which testing will occur during integration, the test method and acceptance criteria to be applied. The Requirements Verification Matrix must address all specification requirements identified in the requirements analysis undertaken in accordance with Clause 3.3.2.

The methods of verification must include the following:

- (a) Nil (No verification required)
This identifies Clauses within the Technical Specification that do not represent requirements and do not require any form of validation.
- (b) Analysis
This identifies requirements, performance indices, physical characteristics, constraints or functions which will be validated by mathematical modelling, analysis of compliance with lower-level requirements, or by the achievement of other (related) performance objectives.

(c) Similarity

This identifies requirements, performance indices, physical characteristics, constraints or functions that will be validated by comparisons with similar existing equipment performing similar tasks in a similar environment. This includes components for which prior tests have been conducted elsewhere which show that the component satisfies the requirements allocated to it, and where appropriate test results are available.

The Contractor must provide evidence in support of previous tests where similarity is offered as a qualification method, including actual test results or certificates issued by an accredited test facility as applicable.

(d) Demonstration

This identifies requirements, performance indices, physical characteristics, constraints or functions that will be validated by means of a demonstration. This includes abstract parameters which cannot be quantified, such as aesthetics and appearance.

(e) Inspection

This identifies requirements, performance indices, physical characteristics, constraints or functions which do not need to be quantified, or for which a yes/no result can be obtained directly by means of a simple physical inspection. Examples include colour, elimination of internal corners, labelling.

(f) Test

This identifies the performance characteristics that will be validated by means of direct tests during qualification, integration or commissioning. The results will be used to demonstrate compliance with the performance requirements of the Contract. Examples of test activities include functional tests, physical tests, configuration audits, testing of the materials used, and environmental tests.

(g) Simulation

This identifies requirements, performance indices, physical characteristics, constraints or functions that will be validated by means of a simulation undertaken by the Contractor. This includes mathematical modelling, finite-element analysis, computer-based simulation as well as physical simulators which attempt to recreate part or all of the functionality of the deliverable system, including its interaction with the environment and other external systems. Simulation models used for qualification purposes will normally require validation by physical test results at selected points over the operating envelope.

3.11.9. Test Specifications and Reports

The Contractor must provide "**Test Specifications**" describing the step-by-step procedures to perform a specific test activity. Each Test Specification must be written to satisfy the requirements of the Integrated Test Plan, and must be submitted to the Principal's Representative in accordance with item CDRL SA-12 of Attachment 3 to this SOW.

Test Specifications must include, but are not limited to the following information as applicable to the scope of the test:

- (a) Relationship to the data in the Integrated Test Plan and Verification Requirements Matrix;
- (b) The components or interfaces to be validated by the test procedure;

- (c) Nomenclature and identification of the test article(s);
- (d) The assumptions, requirements, capability, capacity or constraints to be validated by the test procedure;
- (e) The location and/or facilities required during the test including requirements for certification of the facilities as required;
- (f) Identification of the objectives and criteria established for the test;
- (g) Identification of computer software required;
- (h) Characteristics and design criteria to be inspected or tested, including values, with the ranges or tolerances for acceptance or rejection;
- (i) Description of the steps and operations to be taken to perform the task;
- (j) Certification that computer hardware and software, and test equipment have been verified prior to use during the test activity;
- (k) Any special instructions for operating data recording equipment or other automated test equipment;
- (l) Layouts, schematics or diagrams showing identification, location and interconnection of test equipment, test articles and measuring points;
- (m) Identification of hazardous situations or operations;
- (n) Precautions and safety instructions to ensure the safety of personnel and prevent the degradation of test articles, test equipment or facilities;
- (o) Environmental conditions to be maintained during the test, with tolerances;
- (p) Constraints on inspections;
- (q) Instructions for dealing with non-conformance or anomalous occurrences or results; and
- (r) Specifications for facilities, calibration, equipment maintenance, housekeeping, certification, inspection, safety, handling and packaging before, during and after the test activity.

The Contractor must prepare a "**Test Report**" for each test carried out. Test Reports must include a copy of the Test Specification, together with the results of the tests carried out.

The Contractor must provide the following information as part of each Test Report:

- (s) Test Number;
- (t) Test Date;
- (u) Car number;
- (v) Set number;
- (w) Equipment designation;
- (x) Test location and facilities used, including verification of calibration if applicable;
- (y) Equipment serial number;
- (z) Tested parameter designation;
- (aa) Test value obtained;
- (bb) Target value (equal to or better than the specified value); and
- (cc) Date of Certification.

The Contractor must provide a "**Test Report Summary**" including the following information, for all equipment tested up to that date, as required during the course of testing:

- (dd) Equipment designation;
- (ee) Quantity of each type of equipment tested; and
- (ff) Quantity of test failures for each type of equipment tested.

For each test parameter the data must state:

- (gg) Actual results achieved during the test;
- (hh) The target value (equal to or better than the specified value);
- (ii) The mean (average) of all recorded values and standard deviation if applicable; and
- (jj) Whether the test results comply with the requirements of the specification.

Test Reports must be delivered to the Principal's Representative within 14 days of completion of the test and will form part of the Design Documentation.

During performance tests, if any equipment does not meet all of the specified performance or specified design requirements, or if the test is unsuccessful due to other circumstances within the responsibility or control of the Contractor, the test is deemed to have failed. In the event of a test failure, the Contractor must provide the Principal's Representative with a Test Failure Report which describes the following:

- (kk) Equipment designation;
- (ll) Test Description;
- (mm) Test Results obtained;
- (nn) Description of Failure;
- (oo) Failure Investigation;
- (pp) Mechanics of Failure;
- (qq) Cause of Failure;
- (rr) Corrective Action Proposed; and
- (ss) Proposal for Retesting.

Failures occurring during a test must be documented using the Failure Reporting and Corrective Action system and a proposed resolution should be defined before testing resumes.

3.11.10. Failure Reporting and Corrective Action

The Contractor must develop and implement a "**Failure Reporting and Corrective Action System**" ("**FRACAS**"). The purpose of FRACAS is to provide a systematic method of recording, investigating and correcting defects or deficiencies observed during the test program. This must be applied during the formal integration, qualification test and operational test programs and during an initial period of operation, until all Reliability Targets have been achieved in accordance with the Contract and the Maintainability Demonstration has been passed.

Essential features to be incorporated by the Contractor as part of the FRACAS process are:

- (a) A means of identifying and recording significant faults;
- (b) A process for investigating and determining the primary cause of the fault; and

- (c) A process for determining and agreeing corrective action, where the investigation shows that the fault is indicative of a shortcoming in the design.

The Contractor must submit FRACAS for review by the Principal's Representative in accordance with item CDRL SA-13 of Attachment 3, and must maintain a consolidated record of reports raised and the status of each. The status of FRACAS action must be reviewed at the System Verification Review.

3.12. System Safety Hazard Assessment

The Contractor must complete and submit to the Principal's Representative for review, a System Safety Hazard Assessment in accordance with the requirements of item CDRL SA-14 of Attachment 3.

This assessment must identify potential hazards to the Sets, customers, Principal's employees including Contractor staff employed in support of the Principal's activity, the public and the environment as a result of using and maintaining systems offered as part of the work under the Contract.

The hazard assessment is to be carried out in accordance with the general requirements of AS 4292.3 and AS/NZS 3931:1998. Risk Analysis of Technological Equipment. The analysis is to be linked to the FMECA process required as part of the reliability demonstration and growth program prepared by the Contractor in accordance with Clause 3.7.4 of this SOW, and is to include an estimate of the probability of occurrence of the hazard, possible consequences and methods proposed to mitigate or to remove the hazard. The Contractor must consider the Hazard Identification and Control Systems used by RIC and SRA comparing these with the system adopted for the Sets.

The Hazard Assessment must include:

- (a) a review of pertinent historical safety experience and data for similar designs;
- (b) a categorised listing of basic energy sources, toxic substances and environmental hazards incorporated in the Design;
- (c) a categorised listing of the hazards associated with operation or failure of a Set and its sub-systems, with analysis of how these affect the overall safety of the Sets;
- (d) a categorised listing of the hazards associated with the operation, support and disposal of the Cars, its sub-systems and components for passengers, crew, maintainers, external systems and facilities and the environment;
- (e) combinations of more than 1 failure that can cause hazards to the Sets, passengers, crew or maintainers, external systems and facilities;
- (f) examination of sub-system interfaces for compliance with the safety requirements of the Technical Specification;
- (g) how normal operations of the Sets can degrade the safety of the Sets; and
- (h) identification of the pertinent safety requirements and regulations with which the system will comply.

The hazard assessment is to consider the hazards associated with all operating states and modes as defined in the Technical Specification.

The hazard assessment must be completed prior to completion of the detail design phase and is to be submitted in the form of a formal report to the Principal's Representative. Summary information covering the outcomes of the hazard assessment must be included as part of the CDR presentation. A preliminary hazard assessment must be presented as part of the PDR.

4. INTEGRATED SUPPORT REQUIREMENTS

4.1. Objectives of the Integrated Support Program

The Contractor must establish an "**Integrated Support Program**".

The objective during the design and build phase will be to develop "**Integrated Support Plans**" for implementation by the Principal during the operating and maintenance phase. The Integrated Support Program must provide the capability for the Principal to operate and maintain the Sets throughout their operational life, in a cost effective manner and to a level which is consistent with the planned operational performance and usage of the Sets.

The Integrated Support Program must provide the means of ensuring that:

- (a) Support requirements are taken into account from the earliest stages of the design phase;
- (b) Support provided for the system is aligned to the planned operational usage and maintenance concept and represents a cost effective approach during the operating phase; and
- (c) Support arrangements reflect the Design and that processes are defined to maintain the integrity of the support program during operation and maintenance.

For the purpose of this Contract the Integrated Support Program must comprise the following elements:

- (d) Maintenance requirements and plans;
- (e) Spares support requirements;
- (f) Publications and manuals;
- (g) Training; and
- (h) Support equipment, facilities and special tools.

The Integrated Support Program must include preparation and delivery of an integrated database that links support requirements for each Configuration Item and maintainable assembly within the Sets. This requirement is further defined in Clause 4.9 of the SOW.

4.2. Integrated Support Plan

The Contractor must develop, document and update an Integrated Support Plan ("**ISP**") setting out the planned approach for developing support provisions required within this Clause 4. The Contractor must submit the ISP and all updates of the ISP for review by the Principal's Representative.

The ISP must include, but is not limited to, information covering each of the following aspects of the integrated support program:

- (a) Responsibility for integrated support planning and management within the Contractor's organisation, including details of key staff or Subcontractors who will be employed for specific aspects of the program;
- (b) The intended approach to developing each element of the support program, including methods and tools to be used for analysis and documentation of support proposals;
- (c) Integration with other aspects of the Systems Assurance program; and
- (d) Updating of integrated support plans following completion of the design and build phase, to respond to system configuration changes and changes in operating environment during the design and maintenance support period.

The initial issue of the ISP must be submitted in accordance with the requirements of item CDRL IS-01 of Attachment 3. The initial issue is to focus on the intended approach for development of Integrated Support Plans during the design and construct phase.

The ISP is to be updated and reissued as required by item CDRL IS-01 of Attachment 3 following completion of the CDR, to include more detailed information relative to the proposed support methods for the Sets that are aligned to the proposed design.

4.3. Maintenance Requirements

4.3.1. Scheduled Maintenance

The Contractor must develop and document the planned maintenance requirements for the Sets. Planned maintenance requirements are to include the following, to the extent applicable for the Design:

- (a) Pre and post running inspection, including crew preparation procedures;
- (b) Regular maintenance, including preventive tasks, condition monitoring requirements, wheel condition monitoring and maintenance, lubrication, adjustment, cleaning, testing and any other tasks considered appropriate for all installed systems and equipment;
- (c) Recommended overhaul requirements, including the recommended overhaul interval and
- (d) Details of any items subject to finite replacement or inspection lives, including structural inspections where applicable.

The Contractor must define maintenance checklists and procedures necessary to carry out the proposed tasks.

Maintenance checklists and procedures must include information on consumable items used as part of the task and reference to any special tools, facilities or equipment needed to perform the task as well as any special skills and/or training necessary for the task.

The recommended maintenance requirements established as a result of this activity must be documented in the form of a "**Technical Maintenance Plan**" as defined at Clause 4.3.3 of this SOW.

4.3.2. Maintenance Analysis Procedure

The term "maintenance analysis" is used within this SOW to describe the process of determining the range of tasks that will preserve the inherent levels of reliability of the Design and which provide an effective and efficient means of keeping the Sets in the condition required by the Contract.

The Contractor must establish a formal maintenance analysis process and procedures based on "**Reliability Centred Maintenance**" ("**RCM**") methodology. Details of the proposed approach for development of maintenance requirements must be included in the ISP.

The Contractor must document and deliver the results of the maintenance analysis in support of the recommended maintenance program included in the Technical Maintenance Plan in accordance with item CDRL IS-02 of Attachment 3 to this SOW.

4.3.3. Technical Maintenance Plan

The Contractor must document the recommendations resulting from the maintenance analysis process in the form of a "**Technical Maintenance Plan**" ("**TMP**") for the system.

The TMP must include details of:

- (a) All scheduled maintenance, including programmed inspections of the Sets and "off Sets" maintenance of equipment recommended for the Sets;
- (b) The intervals (frequency) at which each task should be performed;
- (c) Skills and competencies for completion of each major task. Note that for the purposes of the TMP a "task" may comprise a number of actions performed as part of a scheduled inspection;
- (d) Recommended location at which the task is to be completed eg depot;
- (e) Details of special facilities or equipment necessary for completion of the task;
- (f) Reference to technical data or inspection schedules required for completion of the task; and
- (g) Checklists for recording the results of the maintenance processes.

The Contractor must submit the TMP for review by the Principal's Representative as required by item CDRL IS-03 of Attachment 3.

4.4. Spares Support

4.4.1. General Requirement

The Contractor must develop and provide a recommended spares list, based on the list which the Contractor originally provided with its Tender and is set out in Attachment "Q" to the General Conditions of Contract, in accordance with item CDRL IS-04 of Attachment 3.

The recommended spares list must define the recommended range and quantity of Rotables, Repairable Components, Consumables and Insurance Spares to support the planned operational usage of the Sets and the maintenance of the Sets in accordance with the O&M Documentation.

4.4.2. Spares Assessment Methodology

The Contractor must determine the need for Spare Parts and must develop lists of the recommended Spare Parts for the Sets to support the O&M Documentation and the Operating and Maintenance Concept in Attachment 1.

The Contractor must establish and define a methodology for assessment of Spare Parts requirements based on forecast failure rates and the O&M Documentation. In addition, the computation must ensure that a sufficient range and quantity of Spare Parts is available at any time to maintain Sets' availability requirements. The need for Insurance Spares to meet unplanned needs must be fully recognised, and a separate assessment process applied to identify, quantify and list the Insurance Spares.

Details of the proposed method to be used for assessment of Spare Parts requirements must be included in the ISP.

4.4.3. Recommended Spares List

The Contractor must develop and refine the recommended spares list during the design and build phase of the work under the Contract, to ensure that it is properly representative of the Design. The list must include Consumables, Rotables, Repairable Components and Insurance Spares.

In this Clause 4.4 the following terms have the following meaning:

- "Rotables"** Major equipment components which may be removed from their operating positions on the Sets for scheduled maintenance and subsequently reinstalled or replaced with serviceable components eg. traction motors, compressors, wheel sets etc.
- "Consumables"** Non repairable components which are damaged or wear due to use and are replaced with new components when necessary or where predetermined wear limits are reached eg. brake pads, A/C filters, compressor filters, pantograph carbon strips, lights, compressor oil, vandalism items such as windows, glass, lighting diffusers, seat covers etc.
- "Repairable Components"** Equipment components which may be removed from their operating positions on the Sets for maintenance, restored to a predetermined serviceable condition and reinstalled for a further use eg. brake control equipment, high speed circuit breaker, seat frame etc.
- "Insurance Spares"** Equipment components purchased and stored as replacement components for use in repairing a Sets to serviceable condition subsequent to a collision up to 55 km per hour.
- Insurance spares are normally components which are susceptible to sustaining damage beyond economical repair if involved in a collision and have excessive lead times for replacement.

The spares list must include:

- (a) Item identification (Name, Manufacturer's Part or Reference Number and specification, as appropriate);
- (b) Recommended quantity;
- (c) Price;
- (d) Source and delivery leadtimes; and
- (e) Predicted usage rate. This must include information as to whether the item is consumable or is used in support of scheduled maintenance.

4.4.4. Modifications in Design

Further to the requirements of Clause 3.6.5, in the event of modifications to correct any non-compliance aspect being introduced into the work under the Contract that causes amendments to be made to the Production Baseline, the Contractor must, at no cost to the Principal, introduce the same modifications into any spare parts whether delivered or otherwise, or must replace such parts by the parts of the modified design.

4.5. Operating and Maintenance Manuals

4.5.1. General Requirements, Range and Quantities

The Contractor must supply **"Operating Manuals"** and **"Maintenance Manuals"** for the Sets, installed equipment and support facilities. The Operating Manuals and Maintenance Manuals must be submitted to the Principal's Representative for review in accordance with items CDRL IS-05 and CDRL IS-06 of Attachment 3.

The manuals must include, but not be limited to:

- (a) Operating Manuals for use by drivers and other operating staff; and

- (b) Maintenance Manuals for use by maintenance and engineering staff, including:
 - (i) Fault finding guides, for use at the operating maintenance level;
 - (ii) Illustrated parts catalogues;
 - (iii) Inspection, servicing and maintenance schedules; and
 - (iv) Component manuals covering maintenance and repair of all major items of installed equipment.

Manuals required as part of the Integrated Support Program are in addition to engineering data to be supplied as part of the Systems Assurance program and training material required as part of the training program.

The Contractor must supply the following quantity of each manual for use by the Principal:

- (c) Operating Manuals (30 copies);
- (d) Maintenance Manuals (30 copies); and
- (e) an electronic copy of each manual in a data format to be agreed by the Principal.

4.5.2. Standards for Preparation of Manuals

Manuals should generally conform to the SRA Engineering Publication Management Manual, ESR 0002 and SRA Fleet Publication Architecture RS 0040 CM. They are to be suitable for field use and must be easily updated and amended.

Vendor manuals may be provided for major items of bought in equipment, provided that they meet the general standards specified in this Clause 4.5.

4.5.3. Validation of Manual Content

Manuals prepared specifically for the Sets must be validated prior to delivery of Set 1 and used as part of the training program. The purpose of the validation process is to systematically review and correct the content of each manual through application and comparison with the physical product.

Within 9 months after the Date of the Deed of Agreement, the Contractor must propose a program for validation of manuals to be provided under the Contract, for review by the Principal's Representative. The validation process will include participation by staff nominated by the Principal, particularly for Operating Manuals and those for use at the operating level of maintenance.

The validation of the manuals must be completed after the configuration of Set 1 is defined but prior to delivery of the first Set. Further evaluation will be carried out by the Principal's Representative during operational evaluation of Set 1.

4.5.4. Manuals Change Management

Until Practical Completion of the last Set in Stage 1 the Contractor must implement a system for regular review and update of all manuals supplied under the Contract, to ensure that they remain consistent with the configuration of the Sets. This process is to be integrated with the engineering change management process required as part of the Configuration Management Program.

The Contractor must deliver an updated set of manuals to the Principal's Representative as a condition precedent to Practical Completion of the last Set of Stage 1. The update must incorporate all changes arising from engineering changes or modifications introduced during

the build program, as well as corrections identified during validation/usage of the manuals for operation/maintenance of the Sets.

The Contractor must deliver the electronic masters of all manuals provided as part of the work under the Contract concurrently with the delivery of the updated manuals.

4.6. Training

4.6.1. Training Requirements

The Contractor must develop and provide a training program. Specific requirements of the training program will be to:

- (a) Establish training objectives and recommended training methods for operations and maintenance staff employed by the Principal;
- (b) Develop and provide training documentation, aids and material for use in support of the training objectives; and
- (c) Provide training for the Principal's employees, to enable them to support testing and operational evaluations and to conduct training for other staff nominated by the Principal in the operation and maintenance of the Sets.

The scope of the training must be linked to Technical Maintenance Plan, the Design of the Sets, and must acknowledge the role of the "**Train Operating System**", the crew and other staff in the Principal's organisation in the operation of the Sets.

4.6.2. Operations Staff Training

The Contractor must develop a training program and must train up to 30 operations staff nominated by the Principal. Training will be required for:

- (a) Driver Instructors/Inspectors. Training for Driver Instructors/Inspectors must provide an extensive grounding in operating techniques and procedures, including emergency procedures, and is to include an introduction to technical aspects, including fault diagnosis and rectification; and
- (b) Guard Instructors. Guards will control passenger entry/egress and passenger communications including those associated with the proposed Digitised Voice Announcement system. The guard is also required to be capable of moving the Sets should the driver become incapacitated. Introductory training will be required to equip Guard Instructors to conduct training in these duties.

Drivers nominated for initial training will be qualified instructors and will be experienced in the operation of existing trains of the Principal.

Initial training must be provided for the drivers who will be selected by the Principal to conduct formal delivery and operational testing of the Sets, until such time as other drivers are trained and assessed by the Principal as competent to undertake this role.

4.6.3. Maintenance Training

The Contractor must train up to 120 staff nominated by the Principal to support the level of maintenance to be carried out by the Principal as envisaged in the maintenance concept at Attachment 1 to this SOW, and must train maintenance instructors to continue training other Principal's staff.

Specific maintenance training requirements are as follows:

- (a) Equipment Examiners/Instructors. The role of Equipment Examiners ("EE's") is to provide assistance to trains that experience a failure during operation. EE's are typically multi-skilled and require a sound understanding of system operation as well as training in fault finding and rectification. EE Training should be structured to provide a broad level of understanding of the Sets and its systems;
- (b) Maintenance Staff. Maintenance staff will be responsible for completion of all routine servicing and repair of the Sets, including repair of damage caused through vandalism, collision or other unscheduled event. Training for maintenance staff should be structured to ensure that selected individuals receive a sound grounding on the operating principles of the system as well as specialist processes such as fault finding, removal and replacement, functional or post installation testing to a level necessary to support the Sets;
- (c) Maintenance Instructors. Maintenance instructors must receive similar training to that provided to maintenance staff but at a more detailed level that will enable them to deliver ongoing training to the Principal's maintenance staff;
- (d) Presentation staff. Presentation staff are responsible for repairing vandalism damage and cleaning of cars between peak periods. Presentation staff supervisors must be trained on cleaning procedures and techniques specific to the Sets, as well as entry and start-up procedures to enable them to carry out their duties; and
- (e) Engineering staff. Training must be provided on specific systems for a limited number of engineering staff, to provide them with a basis for engineering management following delivery of the Sets.

4.6.4. General Requirements

Specific objectives must be developed for each course in conjunction with the Principal. Staff nominated by the Principal for training will be appropriately qualified to receive specialised training on the Sets.

The Contractor must prepare individual training syllabus, course outlines, training notes and other material meeting the defined objectives for training courses to be provided under the Contract, for review by the Principal's Representative.

All training must be provided by staff provided by the Contractor who are competent in the field and who have completed formal training in instructional techniques.

Scheduling of initial training courses must take into account of the optimum course sizes and the number of staff as per Clause 4.6.2 and 4.6.3 of the SOW, or such other numbers as agreed between the Principal's Representative and the Contractor. Initial training is to be scheduled such that agreed numbers of staff will receive training prior to the delivery and in advance of operational testing requirements for Set 1.

Training courses for replacement or additional staff may be directed by the Principal at any time prior to the issue of the Final Payment Notice. Additional training will be at the Principal's expense based on an agreed schedule of rates. Special courses may also be requested for new or modified equipment. Training is to be conducted at locations approved by the Principal.

4.6.5. Training Aids and Material

The Contractor must provide and, where necessary, develop and manufacture, training aids and material in support of all training conducted as part of the work under the Contract. The

Contractor must submit all such material for review by the Principal's Representative in accordance with item CDRL IS-07 of Attachment 3.

The Contractor must deliver three full sets of training aids and material to be used by the Principal to conduct follow on training.

Training aids and material are to be of good commercial standard and appropriate for the level of training to be conducted.

4.7. Packaging, Storage & Handling

The Contractor is responsible for packaging, storage and handling of any equipment and spares purchased by the Principal in connection with the Cars.

4.8. Support Equipment and Tooling

4.8.1. Special Tools, Facilities and Equipment

The Contractor must develop and deliver (and update as required) a list of Special Tools, Facilities and Equipment required for operation and maintenance of the Sets, based on the list which the Contractor originally provided with its Tender and is set out in Attachment "O" to the General Conditions of Contract.

The list of Special Tools, Facilities and Equipment is to identify the items required to perform specific maintenance, repair and recovery tasks on the Sets. Tasks to be covered will include scheduled maintenance of the Sets, removal, installation and test of rotatable and repairable items and other procedures, such as jacking and lifting during normal maintenance as well as emergency recovery of derailed Sets.

The list is to include any special purpose test equipment and facilities needed in support of the maintenance tasks, including specialist handtools. The list of Special Tools, Facilities and Equipment must be submitted for review by the Principal's Representative in accordance with item CDRL IS-08 of Attachment 3.

This list of Special Tools, Facilities and Equipment must include:

- (a) Details of each item;
- (b) Purpose of the item;
- (c) Supplier;
- (d) Price and validity period;
- (e) Delivery date; and
- (f) Details of any maintenance /inspection requirements for the equipment, including calibration, where applicable.

4.8.2. Equipment in support of Principal's Responsibilities

The Principal's Representative may notify the Contractor in writing of the range and quantities of Special Tools, Facilities and Equipment to be supplied by the Contractor under Clause 27.1(c) of the General Conditions of Contract, following review of the list or any update submitted under Clause 4.8.1 of this SOW.

4.8.3. Production Tooling

The Contractor must design, develop and manufacture all tooling including patterns, jigs, moulds and other production equipment necessary to build the Sets.

4.8.4. Software Support

The Contractor must supply two (2) sets of all hardware and software sufficient for the Principal to modify and/or maintain those software components which have been developed or modified specifically for the Sets. This must include any special equipment, cables, interfaces, documentation and tools required to program, download or upload data or software from/to the Sets.

4.9. Integrated Support Database

The Contractor must develop and deliver an integrated support database that provides the means for the Principal to use the Mincom LinkOne system (or similar) for support of maintenance activity.

As a minimum the database must provide the necessary cross references to permit the Principals maintenance and support staff to:

- (a) Identify the full range of breakdown spares for individual items of the Sets, based on the Parts Lists supplied with individual drawings and the related parts catalogues;
- (b) Identify the relevant maintenance manual and/or instruction covering fault finding, removal, installation and test of the item; and
- (c) Identify special tools, equipment and other facilities necessary to perform the maintenance task.

5. QUALITY ASSURANCE

5.1. General Requirements

The Contractor must implement a quality assurance program.

The quality assurance program will form an integral part of each phase of the work under the Contract and must ensure that:

- (a) Appropriate processes and procedures are in force within the supplier organisation from the earliest stages of the design program;
- (b) Effective processes are in place for ensuring conformance of delivered product to the approved design; and
- (c) Effective product support systems are in place to ensure that integrated support services remain consistent with customer requirements.

5.2. Quality System Requirements

5.2.1. Quality System Certification

The Contractor must hold and maintain "Quality System Certification" to Australian/New Zealand Standard AS/NZS ISO 9001:1994 Quality systems-Model for quality assurance in design, development, production, installation and servicing, or recognised equivalent.

Software development must be conducted in accordance with the requirements of ISO 9000-3:1991, Quality management and quality assurance standards - Part 3: Guidelines for the application of ISO9001 to the development, supply and maintenance of software.

5.2.2. Subcontractors

Subcontractors employed on any significant portion of the work under the Contract must hold similar levels of Quality System Certification, appropriate to the scope of the task.

The Contractor must ensure that quality requirements are included in all Subcontracts approved under the provisions of the General Conditions of Contract.

5.2.3. Project Quality Plan

The Contractor must prepare and submit a "**Project Quality Plan**" ("**PQP**") for review by the Principal's Representative in accordance with item CDRL QA-01 of Attachment 3.

The Project Quality Plan ("**PQP**") must be prepared in accordance with the requirements of ISO 10005:1995, Quality Management-Guidelines or AS/NZS ISO 9004.5 for quality plans.

5.2.4. Organisation and Responsibilities

The organisation for quality in place within the Contractor's organisation is an essential element of the overall system as is the specific organisation and responsibilities to be put in place in relation to the work under the Contract.

The Contractor must provide the following information as part of the Project Quality Plan ("**PQP**"):

- (a) quality organisation, including specific responsibilities for work under the Contract;
- (b) The relationship between the quality organisation and the Contractor's established quality systems; and

- (c) Specific responsibilities for quality connected with the work under the Contract. The names and resumes for staff holding key appointments within the quality organisation, including those who will fill designated appointments in connection with the Contract are to be included.

Organisation and responsibility assignments included in the PQP should focus on quality aspects of the work under the Contract. This information is supplementary to that to be provided within the Project Management Plan covering the overall Contractor's organisation and responsibilities.

5.2.5. Acceptance of Supplies

The Contractor must use and employ only products and/or services that meet the requirements of the Contract.

The Contractor must provide objective evidence that products or services to be used or employed in connection with the work under the Contract meet the requirements of the Contract and are fit for their intended purpose.

5.2.6. Audit of Contractor's System

The Principal reserves the right to audit the Contractor's quality system to establish compliance with the requirements of the PQP and other processes required under the Contract. The frequency of the audits will be determined by the Principal's Representative, who will provide reasonable notice of the intention to conduct an audit. The Contractor must provide all necessary assistance to facilitate such audits.

6. DESIGN/ENGINEERING SUPPORT SERVICES

The Contractor must, at its own cost, investigate, develop and implement solutions for Defects which arise during any Warranty Period. Implementation of corrective action must include updating and maintaining the Contract Documentation to reflect the physical configuration of the Sets consequent to any change.

The Contractor must provide additional design and engineering support to the Principal, at the cost of the Principal, when requested. The Contractor will only be obliged to provide additional design and engineering support, and will only be entitled to additional payment pursuant to this Clause 6, where the Principal's Representative has requested the additional design and engineering support in writing specifically making reference to this Clause 6. This will include, but is not limited to:

- (a) Developing engineering changes and modifications to the design at the Principal's request, including changes to software;
- (b) Investigating design improvements which do not result from a design defect or fault, at the request of the Principal;
- (c) Certifying or obtaining certification of design changes on behalf of the Principal;
- (d) Engineering investigations as requested by the Principal;
- (e) Maintenance and updating of operating and maintenance manuals to reflect engineering changes;
- (f) Maintenance and update of the integrated support database prepared in accordance with Clause 4.9 of this SOW to reflect engineering changes; and
- (g) Advising of any impact of the proposed change on design warranty and support provisions, including tooling.

ATTACHMENT 1

OPERATING AND MAINTENANCE CONCEPT

ATTACHMENT 1 OPERATING AND MAINTENANCE CONCEPT

1.0 OPERATING AND MAINTENANCE CONCEPT

1.1 Operations

The Sets will be integrated into the Principal's Passenger Fleet Operations and Maintenance regime. The Sets will be required to operate across the Principal's system from Kiama in the Illawarra, Macarthur in the south, Springwood in the west and Newcastle in the north. Timetabling is generally structured to maximise utilisation of Sets involving operating a combination of InterCity, Outer Suburban or Suburban service on a daily basis for up to eighteen hours.

Sets operating in the Outer Suburban and InterCity zones will travel short to medium distances between stations. These station platforms can vary in length requiring doors to be selectively activated by crew and operated by customers.

Sets operating in the Suburban zone, including the proposed Parramatta Rail Link, would require frequent stopping and all doors would be opened by the crew activation at all station stops.

1.2 Crew

The Sets will be crewed with a train driver and a train guard. The train driver will be responsible for the safe management of the Set and will operate from the front "control car" in the Set. The driver's role includes driving to conditions nominated on wayside boards and signals, communications with signallers and train operations staff.

For trains operating in the Outer Suburban zones, the guard is located in the end carriage of the train. For trains operating in the Suburban area, the guard is generally located in the fourth car of a four car set or the fourth or fifth car where two four car sets are coupled together. On some cars the guard operates out of the unoccupied control cab in undertaking his duties. Guards are responsible for the safe management of customers. Their responsibilities include door operation and providing train right of way, management of passenger information, receipt of messages from Help Points and communication with drivers and passengers.

1.3 Stabling

Sets could be stabled at any of the Principal's stabling locations across the New South Wales electrified system. Stabling locations generally have tracks close together with limited access between sets to undertake maintenance. Some locations have bitumen paths, water supply, waste water and effluent removal and high and low level lighting for crew and presentation staff to undertake their duties.

At stabling locations, the Principal's staff undertake set presentation as detailed in section 3 of this Attachment 1.

While Sets could be stabled at any of the Principal's stabling locations there are presently three locations used for Suburban and InterCity train stabling, being:

- (a) Gosford;
- (b) Newcastle; and
- (c) Port Kembla,

where decanting can be undertaken and water supply can be provided. Sets will be timetabled into these locations at intervals of at least each two days.

1.4 Maintenance

Sets will be returned to maintenance facilities at approximately thirty days for exterior and interior cleaning. Exterior cleaning is undertaken using fixed wash plants, which use foam alkaline detergent on a weekly basis. The Principal is presently looking at daily washing of the exterior using water and brushes and drying trains with compressed air or large fans.

If corrective maintenance is required Sets may be re-timetabled into maintenance facilities for repairs.

Support of Sets is addressed under two areas:

- (a) Maintenance; and
- (b) Presentation.

The maintenance of trains is undertaken at four levels:

- (a) Organisational Maintenance;
- (b) Intermediate Maintenance;
- (c) Depot Procedural Maintenance; and
- (d) Refurbishment which may be condition based replacement of components or half life replacement of specified components.

Presentation is undertaken at four levels:

- (a) Walkthrough;
- (b) Turnaround;
- (c) Daily; and
- (d) Major.

Details of the maintenance and presentation support are addressed in section 2 and section 3 of this Attachment 1.

2.0 MAINTENANCE

2.1 Organisational Maintenance

Organisational maintenance is undertaken by various staff prior to sets entering service and during service. The seven areas of organisational maintenance are:

- (a) *Drivers*

The drivers rostered for the Sets will be trained on the Sets prior to its introduction. Training may be supported with the use of a driving simulator.

The driver's training will include a limited level of fault finding/rectification. This knowledge will be supported by a high level of fault condition monitoring and on-line help via the Train Operating System.

For trains located in stabling yards, drivers generally look over trains at the start of each day for integrity, safety and to ensure systems are operating. In-service drivers will have available a shifter and are authorised to replace failed air hoses, reset circuit breakers, operate valves if available and isolate equipment if controls are available.

Drivers are responsible for reporting train defects that they become aware of during their duties.

- (b) *Equipment Examiners ("EE's")*

A number of equipment examiners (typically up to 6 per shift) are located throughout the CityRail system to come to the assistance of trains which may have a failure during its timetabled service. These EE's, who are qualified trades persons with experience in train maintenance, will undertake limited fault finding and corrective repairs.

The EEs carry a limited level of tools.

(c) *Mechanical Control Office ("MCO")*

The driver's first contact when reporting a train system defect is with the MCO officers. In some instances the MCO officer will assist the train driver to diagnose train faults. The MCO will direct EE's to assist in fault rectification if practical. MCO personnel are trained in train maintenance, operations, fault finding and repairs.

(d) *Driving Inspectors*

Driving inspectors will be used to assist in the dissemination of the train system knowledge during the introduction of Sets. These inspectors are trained in train operations, as well as limited fault finding and repairs.

(e) *Guard*

Guards will assist the driver and advise of defects identified on Sets.

(f) *Presentation Staff*

Presentation staff report vandal damage and undertake Set cleaning between peak hours.

(g) *Mobile Repairs*

Some depot staff may operate as mobile repair teams in stabling locations. These teams can undertake basic repairs where trains are accessible. Typical repairs include window pane replacement, etc.

2.2 Intermediate Maintenance (Level 1, Maintenance)

Intermediate maintenance of sets is undertaken at specialist maintenance facilities located at Hornsby, Flemington and Mortdale. Sets are timetabled into the facility at times required in the Technical Maintenance Plan for inspection, servicing and other maintenance and repair work.

Inspection, maintenance and repairs undertaken typically include:

- (a) Routine inspection and servicing;
- (b) Repairs and/or replacement of components;
- (c) Fault finding and testing;
- (e) Out of course repairs;
- (f) Maintenance management;
- (g) Configuration management;
- (h) Provision of support and design management;
- (i) Collection of data and analysis of data on Set performance; and
- (j) Provision, storage and management of spare parts.

Maintenance facilities typically have equipment and staff as listed in Figure 2.1. Details of equipment, depot layouts, etc. are set out in Appendix N to the Technical Specification.

It is expected that the Sets will be designed to operate within the existing system. Specialist equipment, facilities, etc. required to maintain the Sets will be nominated by Tenderers and included in the Whole of Life Evaluation of Tenders.

Figure 2.1

Rolling Stock Maintenance Facilities, Equipment and Staffing

Facilities and Resources	Support Location	
	Intermediate	Depot
Staff		
Supervisory Staff	√	√
Engineers	√	√
Mechanical Fitters	√	√
Electrical Mechanics	√	x
Car & Wagon Assemblers, Fitters	√	√
Trimmers	√	x
Painters	√	√
Labourers	√	√
Presentation Staff	√	x
Facilities		
Wash Roads (internal and external ends)	√	x
Automated External Car Wash Facility	√	x
High level access platforms	√	√
Pit roads	√	x
Lift shop	√	√
Drop table	√ (1)	x
Brake roads	√	x
Fork lift	√	√
Road trucks	√	√
Multi-function Roads	√ (1)	x
Stores	√ (2)	√
Machining facilities	√ (2)	√
Car Weighing facilities	√	√
Shore supplies	√ (2)	√
Test facilities	√ (2)	√
Weld facilities	√ (2)	√
Jacking road (4 car)	x	√
Under Floor on train Wheel Profiling and Automatic Train Progression System	√ (3)	x

Facilities and Resources	Support Location	
	Intermediate	Depot
Component/assembly/overhaul facilities	x	√
Wet and Dry Interior Vacuum Cleaning	√	x
Shunting vehicles	√	√
Wheel press	x	√
Bogie wash	x	√
Traverser	x	√
Painting facilities (Bogie Frame)	x	√

Legend: √ available

x not available

(1) Hornsby only

(2) Minor facilities only

(3) Flemington only

2.3 Depot-Producer Maintenance (Presently Level 3 Maintenance)

Depot-Producer Maintenance is undertaken through the Auburn Rolling Stock Maintenance facility. Sets are programmed through the facility at various intervals from two to twelve years depending on the type of work program under the Technical Maintenance Plan.

The Principal will consider options for Depot-Producer Maintenance including the use of Intermediate Maintenance Facilities, which would provide a lower Life Cycle Cost for Sets.

Figure 2.1 provides details of staff skills and equipment in the facility. Details of common spare parts, platforms, pits, equipment, tools, etc. are set out in Appendix N to the Technical Specification.

2.4 Refurbishment

The present procedures include a combination of "half life" and continuous refurbishment of sets to restore their condition and provide additional regulatory, safety, customer and operating features. Half life refurbishment typically includes:

- (a) Crew compartment upgrade;
- (b) Floor and floor cover replacement;
- (c) Window replacement;
- (d) Interior repainting;
- (e) Upgrade of interior lighting;
- (f) Door systems repair/upgrades;
- (g) Upgrade of exterior appearance; and
- (h) Seats replacement/recovering.

Installation of new equipment or features to meet customer and regulatory requirements are undertaken on an as required basis.

This work is undertaken at either the Auburn Rolling Stock facility or another off site facility.

2.5 Logistics

Support for set maintenance is undertaken in a number of areas:

- (a) Spare Parts;
- (b) Training;
- (c) Technical Support; and
- (d) Systems.

2.5.1 Spare Parts

Spare parts are either managed via:

- (a) Intermediate Maintenance Facilities at Flemington, Hornsby and Mortdale; and
- (b) Auburn Depot-Producer Maintenance Facility.

Intermediate Maintenance Facilities carry commonly used spare parts, consumables, windows, seat cushions, filters, etc. used for routine servicing and maintenance of sets. A small number of major components such as airconditioning, motor alternator sets and compressors are also held at the Intermediate Maintenance Facility.

Other spare parts are stored or procured from the Auburn Depot-Producer Maintenance Facility.

The Principal will consider options for spare parts management as part of the Whole of Life cost of the Sets.

2.5.2 Training

The Principal has adopted a competency based training regime for its staff. Training is continuous and included as part of the introduction of new equipment and/or systems.

2.5.3 Technical Support

Technical support of trains is supplied by engineering and trades staff located at maintenance facilities and the Quality and Technical Support Engineering Group within Passenger Fleet Maintenance. The Quality and Technical Support Engineering Group provides expertise, advice, fault finding, statistical analysis, research and options for upgrade and improved maintenance of sets.

2.5.4 Systems

Systems used to support sets include:

- (a) The Metre database of all cars, running on an ORACLE platform, is used to record changes, modifications, and repairs on the Principal's Double Deck fleet.
- (b) Configuration Management is presently controlled by hard copy documents and plans and records on the same ORACLE platform. It is proposed to implement an electronic system as part of the Sets' integration into the CityRail fleet.

3.0 PRESENTATION

3.1 General

Presentation and cleaning of sets is undertaken through four main schedules:

No.	Type	When/Where
1.	Walkthrough	On moving trains or at terminating stations.
2.	Turnaround	At Intermediate Maintenance Facilities and at stabling yards.
3.	Daily	At Intermediate Maintenance Facilities, stabling yards and terminal stations, includes Eveleigh Train Presentation Centre.
4.	Major	At Intermediate Maintenance Facilities.

The details of cleaning for each of the schedules is enclosed as Figure 3.1.

3.2 Equipment

Typically cleaning is undertaken by staff with the use of:

- (a) brooms;
- (b) buckets and mops;
- (c) cleaning rags; and
- (d) specialist cleaning products.

Full details of equipment and processes are included in the SRA Presentation Staff Cleaning Manual.

3.3 External Wash

3.3.1 Sides

Sets are externally washed via the external car wash facilities located at Hornsby, Flemington and Mortdale Intermediate Maintenance Facilities. The wash plants use high pressure water foam detergent and brushes for cleaning train sides.

The Principal is presently investigating the option of installing secondary wash plants consisting of high pressure water sprays, brushes and high pressure air dryers in stabling locations. These plants may be bi-directional and will wash trains each evening at completion of their services and/or in the morning prior to entering service.

Trains would be self propelled at a speed of 2km/hr to 5km/hr through the train wash plants.

3.3.2 Ends

Washing of train ends is typically rostered or timetabled every thirty (30) days at Intermediate Maintenance Facilities.

3.3.3 Cloth Seating

Cloth seating with non-removable covers is generally cleaned of major dirt, stains, etc. on a daily basis and shampooed each thirty (30) days using the wet and dry vacuuming system installed in Intermediate Maintenance Facilities.

Removable seat covers are programmed for change out and cleaned at the period required to maintain the specified level of presentation.

Figure 3.1

Scheduled and Unscheduled Cleaning Routines

Area	Details	Walkthrough Clean	Turnaround Clean	Daily	Major
Frequency		Frequently	Frequently	Daily	30 Days
Time (mins.)	Minutes allocated per Car.	10 - 15	15 - 20	40	240
Location		Moving Train	Destination and Stations	Destination and Terminals	MC
Crew Cab	1) Clean inside windows	√	√	√	√
	2) Pick up rubbish	√	√	√	√
	3) Damp wipe driver's console, telephone and intercom	√	√	√	√
	4) Damp wipe sills, ledges and rails	√	√	√	√
	5) Damp mop floors	√	√	√	√
	6) Clean outside windows		√	√	√
	7) Sweep floor			√	√
	8) Scrub sills, ledges and rails				√
	9) Damp wipe both driver's and guard's seat and the car compartment walls				√
	10) Scrub driver's footplate				√

Area	Details	Walkthrough Clean	Turnaround Clean	Daily	Major
Passenger Areas	1) Pick up rubbish	√	√	√	√
	2) Spot clean spills and stains	√	√	√	√
	3) Mop spill areas to get rid of all stains and smells	√	√	√	√
	4) Damp wipe sills, ledges, doors, windows and dirty seats		√		
	5) Spot mop all stains on floors		√		
	6) Sweep up all rubbish			√	
	7) Damp wipe dirty marks on walls, sills, poles and rails, doors and window glass in vestibule				
	8) Damp wipe windows, sills, ledges, seats and sides of stairs in passenger areas			√	
	9) Spot clean dirty marks in passenger areas, walls, windows, light fittings, air-conditioning vents, handrails and scuff marks on stairs			√	√
	10) Remove and clean under all mats				√
	11) Sweep up all rubbish, dirt and grit				√
	12) Scrape chewing gum and lollies from the floor				√
	13) Scrub vestibules with scourer or brush walls, ceiling, sills, poles, rails, door and window glass				
	14) Scrub between carriages with scourer and brush				√
	15) Clean door tracks and water drains				√
	16) Damp wipe or scrub passenger areas window sills, ledges, seats, sides of stairs, metal edges and trimmings, light fittings, ceilings and sills behind seats				√
	17) Clean all inside windows, including end car windows				√

Area	Details	Walkthrough Clean	Turnaround Clean	Daily	Major
	and glass in intercar doors				
	18) Take out vestibule box seats, clean the box and scrub the seat fixture ledges				√
Toilets	1) Pick up all rubbish		√	√	
	2) Clean toilet bowl and seats		√	√	
	3) Damp wipe basin taps and mirror		√	√	
	4) Damp wipe sills and ledges		√	√	
	5) Top up soap and toilet paper		√	√	
	6) Damp mop floor		√	√	
Water Tank	1) Check and fill water tank			√	
Effluent Storage	1) Decant all toilets as scheduled			√	
Cloth Seats	1) Shampoo				√

4.0 EMERGENCY

4.1 Set Failure

Failed Sets, which are not capable of completing their mission using their own equipment, are removed from service by towing or pushing by another train or Set. In these emergencies, the Sets must be able to be coupled together using the existing emergency coupler and brake pipe and main reservoir connected to facilitate removal from service.

4.2 Emergency Detraining of Customers

In accidents or emergencies customers remain on-board the set until directions are issued by the crew via DVA or voice communication which must operate with reduced train lighting under emergency conditions, i.e. no Overhead Power Supply. If customers are to be detrained, the first option is to drive/push etc, the set to a station and use the passenger doors. If this option is unavailable, then use:

- (a) the front emergency door; or
- (b) the crew door; or
- (c) the steps provided at passenger doors, which must operate under emergency conditions.

The Sets should facilitate safe and efficient detraining of passengers to track in emergencies.

In the City Underground and Airport Line systems, step ladders and rail cover platforms are provided on tunnel walls for disembarking passengers from the front and rear of sets. This equipment will be used to detrain passengers from the Sets in emergencies in these locations. An equivalent system would be included in future underground railway systems including the proposed Parramatta rail link.

4.3 Derailment

Following derailment, breakdown gangs are used to re-rail sets and effect emergency repairs.

Re-railing of carriages is undertaken by the SRA Emergency Response Team. The Emergency Response Team has specialist equipment, lifting beams, jacks to enable carriages to be re-righted and re-railed with minimum damage. Pony bogies are also part of the equipment used by the Emergency Response Team for emergency movement of trains. Details of the equipment are set out in Appendix N to the Technical Specification. Specialist equipment required to effect emergency re-righting and re-railing of carriages not included in the list is addressed in Clause 4.8.1 of the Statement of Work.

ATTACHMENT 2

OPERATING STANDARDS

ATTACHMENT 2 OPERATING STANDARDS

The Operating Standards that will be applicable for the Cars are structured into two levels, as shown below. It is anticipated that these Operating Standards may require some amendment (in accordance with the principles of safety and operational effectiveness) to take account of the specific OSC design.

Level 1 – Faults

Faults at this level will allow the Sets to enter service and continue to run after a fault develops. Repairs are to be effected within the time nominated.

Level 2 – Failures

Failures at this level will result in the Set being withdrawn from service.

Equipment	Item	LEVEL 1 Fault	Repair to be effected within	LEVEL 2 Failure
00 Train Integrity and Safety				
	Any item or subsystem that introduces a safety risk to passenger, crew or RIC Infrastructure.	N/A	N/A	Contractor responsibility if not in accordance with Technical Specification.
01 Body				
	Crew Hand Rail			
	Draughts			
	Water Leaks			
	Damaged washers and wipers			
	Body Side Windows			
02 Bogie				
	Suspension	1 off air spring failure on a Set	24 hrs	2 off air springs failure on a Set
	Wheel Condition			
03 Inter Car				
	Nil			
04 Access				
	Crew Doors	1 door failed on either side of Set.	12 hrs	1) 2 doors failed on one side of one Set; and/or 2) Door unable to be closed and locked.
	Passenger Doors	1 defective door	12 hrs	1) 2 doors unable to be closed and locked; and/or 2) More than one Car with defective doors.
05 Brakes				
	Electronic Pneumatic Brake Failure	N/A	N/A	Any failure
	Brake Defective	N/A	N/A	1 or more brakes defective on bogies in a Set.

Equipment	Item	LEVEL 1 Fault	Repair to be effected within	LEVEL 2 Failure
	Park Brake	1 bogie park brake can be cut out	24 hrs	2 or more park brakes on a Set cut out.
06 Climate Control				
	Crew Area	N/A	N/A	Non operational.
	Passenger Area	1 unit out in a Car.	12 hrs	2 or more units out in a Car.
07 Traction				
	Traction System	One traction system out or not operating in the Set.	24 hrs	Two traction systems out or not operating in a Set.
08 Auxiliary Power				
	Air System	N/A	N/A	1 air compressor non operational in a Set or Sets.
	Electrical	1 auxiliary supply unit non operational in a Set or Sets.	12 hrs	> 1 auxiliary supply unit non operational in a Set or Sets.
09 Main Power				
	System	N/A	N/A	Any failure of system.
10 Crew Control				
	Train Radio	If one unit fails.	24 hrs	If no system is operational in a Set.
	Train Horn	If not operational.	12 hrs	
	Train Speedo	If unit not working.	24 hrs	If no operational speed in cab.
	Vigilance System	N/A	N/A	If not operational
	Dead Man	N/A	N/A	If not operational
	Master Controls	N/A	N/A	If not operational in a Set
	Brake Controller	If one unit fails Assist	12 hrs	
	Bell	Use alternative crew or cab intercom.	12 hrs	If both bell and crew intercom out.
11 Lighting				
	Internal Lights	Main lighting system non operational on a Car (emergency lighting available).	12hrs	Any car without any lighting.

Equipment	Item	LEVEL 1 Fault	Repair to be effected within	LEVEL 2 Failure
	Headlights	Low or high beam not operational.	12 hrs	Lights non operational in low and high beam.
	Marker Lights	Any failed light to be repaired.	12 hrs	Less than one red and one white light operational on each end of Set.
	Crew Intercom		24 hrs	Must be operational.
12 Communication				
	Passenger Communication	Speaker not operational.	24 hrs	Greater than 50% of speakers not operational in a Car.
	Others			
13 TMS/TOS		N/A	N/A	If not operating from lead Car.
14 Fire and Emergency				
		SRA Issues		
15 Toilet and Water System				
		SRA Issues.		

Note: N/A in the "Fault" and "Repair" columns indicates that there can be no fault in relation to that item with which a Set will be allowed to enter service or continue to run.

ATTACHMENT 3

CONTRACT DELIVERABLES REQUIREMENT LIST

ATTACHMENT 3 CONTRACT DELIVERABLES REQUIREMENT LIST

NOTES:

1. Delivery requirements are in days after Date of the Deed of Agreement, unless otherwise specified.
2. Documents are to be in Microsoft Office formats unless otherwise specified.
3. Principal's Representative will review and advise of rejection within 21 days of receipt where Principal's Representative's review is required.
4. Contractor must resubmit plans and documents within 21 days of being notified of rejection.

CDRL NO.	DOCUMENT NAME	PREPARATION STANDARD	DELIVERY REQUIREMENT	UPDATE REQUIRED	PRINCIPAL REJECT YES/NO	NOTES
IS-01	Integrated Support Plan	Contractor Format SOW Clause 4.2	60 days	Within 60 days of completion of the CDR.	YES	Initial issue is to establish proposed methods for Integrated Support analysis and planning. Updated plan is to incorporate specific information related to the proposed design presented at CDR.
IS-02	Maintenance Analysis Documentation	Contractor Format SOW Clause 4.3.2	To be submitted with TMP (IS-03)		NO	
IS-03	Technical Maintenance Plan	Contractor Format SOW Clause 4.3.3	90 days before scheduled delivery of Set 1.	30 days after Production Baseline is issued	YES	
IS-04	Recommended Spares List	Contractor format SOW Clause 4.4.1	Not later than 90 days prior to delivery of Set 1	30 days after Production Baseline is issued	NO	
IS-05	Operating Manuals	Contractor Format SOW Clause 4.5.1	Not later than 90 days prior to scheduled delivery of Set 1	After delivery of last Set. Electronic Master to be delivered with update.	YES	Manuals to be available prior to start of training. Manual content to be validated during training.
IS-06	Maintenance Manuals	Contractor Format SOW Clause 4.5.1	Not later than 90 days prior to scheduled delivery of Set 1	After delivery of last Set. Electronic Master to be delivered with update	YES	Manuals to be available prior to start of training. Manual content to be validated during training.
IS-07	Training Material	Contractor Format SOW Clause 4.6.5	At completion of training courses.		YES	Training documentation to be available for review prior to start of training. Other material and aids may be used by Contractor for initial training of Principals staff.

CDRL NO.	DOCUMENT NAME	PREPARATION STANDARD	DELIVERY REQUIREMENT	UPDATE REQUIRED	PRINCIPAL REJECT YES/NO	NOTES
IS-08	List of Special Tools, Facilities and Equipment	Contractor Format SOW Clause 4.8.1	Preliminary List within one year.	Final List Not later than 30 days prior to the system CDR.	NO	Information on long lead items to be provided in sufficient time for essential items to be purchased and available prior to delivery of Set 1.
IS-09	Reliability Demonstration Plan	Contractor Format SOW Clause 3.7.6	Not later than 90 days prior to scheduled delivery of Set 1		YES	May include maintainability aspects
IS-10	Maintainability Demonstration Plan	Contractor Format SOW Clause 3.8.3	Within 60 days of scheduled delivery of Set 1.		YES	
PM-01	Project Management Plan	Contractor Format SOW Clause 2.3.2	60 days	As Required	YES	To include CWBS and Risk Management Plan
PM-02	Project Master Schedule	Contractor Format SOW Clause 2.4.1, 2.4.2	60 days	Update every 30 days	YES	Computer scheduling , tools to be selected by Contractor.
PM-03	Progress Reports	Contractor Format SOW Clause 2.8.2	Every 30 days		NO	
QA-01	Project Quality Plan	ISO 10005:1995 SOW Clause 5.2.3	30 days	As Required	YES	
SA-01	Systems Assurance Plan	Contractor Format SOW Clause 3.2.2	60 days.	As Required	YES	To include Configuration Management Plan prepared in accordance with AS 3907:1996 SOW Para 3.6 refers.
SA-02	Design Certificate	Attachment "H" to General Conditions SOW Clause 3.3.6	Prior to delivery of Set 1		In accordance with CI 7.3 of the General Conditions	Submitted in accordance with Clause 7.2 of the General Conditions
SA-03	Traceability Records	Contractor Format SOW Clause 3.3.3	14 Days prior to CDR		NO	Format for traceability records to be agreed
SA-04	Software Documentation	ISO 9000-3:1991 SOW Clause 3.3.7	14 Days prior to CDR		YES	To include Software Detail Design Document and Software Product Specification
SA-05	Exterior and Interior Appearance Tradeoff Study	Contractor Format SOW Clause 3.3.7	14 Days prior to PDR		YES	Preliminary version to be provided as part of Tender response

CDRL NO.	DOCUMENT NAME	PREPARATION STANDARD	DELIVERY REQUIREMENT	UPDATE REQUIRED	PRINCIPAL REJECT YES/NO	NOTES
SA-06	Configuration Baselines	Contractor Format SOW Clause 3.6.2	As defined in SOW		YES	This CDRL covers submission of Functional, Development, Preliminary Production and Production Baselines as defined in the SOW
SA-07	Drawings and Specifications	AS1100/Contractor Format SOW Clause 3.6	See notes	As required to incorporate design changes	NO	Preliminary issues to be delivered in advance of SDR, CDR and SVR As built documentation to be delivered within 14 days of Production Baseline being agreed.
SA-08	Design Documentation	Contractor Format SOW Clause 3.6	After completion of CDR and finalisation of Preliminary Production Baseline	As required as a result of Principal's Representative's Review	In accordance with CI 7.3 of General Conditions	This CDRL covers the comprehensive package of Design Documentation to be delivered under SOW Clause 3.6.8..
SA-09	Reliability Predictions Report	Contractor Format SOW Clause 3.7.2, 3.9.2	14 Days prior to PDR and CDR	Update prior to each issue.	NO	Preliminary data to be provided as part of Tender response.
SA-10	Failure Modes, Effects and Criticality Analysis Documentation	Contractor Format SOW Clause 3.7.3	14 Days prior to CDR		NO	Preferred format is MS Access
SA-11	Integrated Test Plan, including Test Plans	Contractor Format SOW Clause 3.11.8	Initial 14 days prior to CDR and as required		YES	To include details of sub-contractor testing
SA-12	Test Procedures and Reports	SOW Clause 3.11.9	Test specifications 30 days prior to testing		YES	Completed Test Reports to be provided after completion of each test activity.
SA-13	Failure Reporting and Corrective Action Reports	Contractor Format SOW Clause 3.11.10	As required		YES	Reports to be submitted for failures experienced during all formal testing within 7 days of failure
SA-14	Systems Hazard Assessment	Contractor Format SOW Clause 3.12	14 days prior to CDR		YES	

ATTACHMENT 4

WORK BREAKDOWN STRUCTURE

**ATTACHMENT 4
WORK BREAKDOWN STRUCTURE**

WBS ELEMENT NUMBER	LEVEL 0	LEVEL 1	LEVEL 2	LEVEL 3
OSC.00	Outer Suburban train			
OSC.01		Prime equipment		
OSC.01.1			Car body	
OSC.01.2			Bogie	
OSC.01.3			Intercar interface	
OSC.01.4			Access	
OSC.01.5			Brake system	
OSC.01.6			Climate control	
OSC.01.7			Traction	
OSC.01.8			Aux. Power	
OSC.01.9			Main power supply	
OSC.01.10			Lighting system	
OSC.01.11			Operator controls	
OSC.01.12			Communications	
OSC.01.13			Train Operating System	
OSC.01.14			Fire & Emergency	
OSC.01.15			Toilet and Water Systems	
OSC.02.1		Project Management		
OSC.02.2			Project Planning	
OSC.02.3			Schedule Management	
OSC.02.4			Risk Management	
OSC.02.5			Subcontract Management	
OSC.02.6			Reports and Meetings	
OSC.03		Quality Assurance		
OSC.03.1			Planning	
OSC.04		Systems Assurance		
OSC.04.1			Planning and reporting	
OSC.04.2			Configuration management	
OSC.04.3			Design management	
OSC.04.4			Technical reviews	
OSC.04.5			Reliability program	
OSC.04.6			Safety program	
OSC.04.7			Verification and test	
OSC.05		Integrated support		
OSC.05.1			Planning	
OSC.05.2			Maintenance	
OSC.05.3			Spares	
OSC.05.4			Manuals	
OSC.05.5			Support equipment	
OSC.05.6			Training	
OSC.05.07			Integrated support database	

ATTACHMENT 5

COMMISSIONING FACILITY

ATTACHMENT 5 COMMISSIONING FACILITY

1.0 FACILITY

The Principal will provide 24 hour access to a Facility within the Sydney metropolitan area for commissioning of the Sets.

The Contractor will have access to equipment and other facilities as detailed below.

2.0 SAFETY

The Contractor must comply with the Principal's specific safety and operating procedures.

3.0 EQUIPMENT

The Facility will have available the equipment nominated in Figure 3.1.

Other plant and equipment may be made available in accordance with Figure 3.2. This plant and equipment may not necessarily be in one location and may require the Contractor to move the OSC to another facility.

Figure 3.1

Facilities and Equipment Available on Commissioning Road

EQUIPMENT	
(a)	High Level Access Platform
(b)	Pits
(c)	Power 240 Volt AC
(d)	Power 415 Volt AC
(e)	Power 120 Volt DC
(f)	Air Supply
(g)	Overhead Wiring Isolation

Figure 3.2

Plant and Equipment Available

FACILITIES AND EQUIPMENT			
1.	Pit Road	6.	Car Weighing Facility
2.	Lift Shop	7.	Shore Supply
3.	Drop Table	8.	Wet and Dry Interior Vacuum Cleaning
4.	Brake Road	9.	Shunting Vehicle
5.	Fork Lift		

4.0 FACILITIES AVAILABLE TO CONTRACTOR

The Contractor will be provided with the following:

(a) **Office:**

An office with telephone, desk and chairs.

(b) **Amenities:**

The Contractor's staff will have access to the Principal's amenities and meal room.

(c) **Equipment Storage:**

The Contractor will be provided with space to locate a container or secure building at the Contractor's cost, to store spare parts, equipment, tools, etc. Security of the Contractor's equipment, tools, spare parts will be the responsibility of the Contractor.

5.0 OPERATIONS

Train movements within the Facility shall be made in accordance with the Principal's procedures. The Facility Manager or his appointed representative shall facilitate train movements within the Facility Yard for the Contractor.

The Principal will provide a train driver for moving and testing of Sets.

6.0 COMMISSIONING

The Principal will arrange train paths for testing and trailing of Sets as required under the Contract.