



Assets Planning and Delivery Group
Engineering

DESIGN STANDARD DS 30

Mechanical Design Process

VERSION 1
REVISION 2
JUNE 2023

FOREWORD

The intent of Design Standards is to specify requirements that assure effective design and delivery of fit for purpose Water Corporation infrastructure assets for best whole-of-life value with least risk to Corporation service standards and safety. Design standards are also intended to promote uniformity of approach by asset designers, drafters and constructors to the design, construction, commissioning and delivery of water infrastructure and to the compatibility of new infrastructure with existing like infrastructure.

Design Standards draw on the asset design, management and field operational experience gained and documented by the Corporation and by the water industry generally over time. They are intended for application by Corporation staff, designers, constructors and land developers to the planning, design, construction and commissioning of Corporation infrastructure including water services provided by land developers for takeover by the Corporation.

Nothing in this Design Standard diminishes the responsibility of designers and constructors for applying the requirements of the Western Australia's Work Health and Safety (General) Regulations 2022 to the delivery of Corporation assets. Information on these statutory requirements may be viewed at the following web site location:

[Overview of Western Australia's Work Health and Safety \(General\) Regulations 2022 \(dmirs.wa.gov.au\)](https://dmirs.wa.gov.au)

Enquiries relating to the technical content of a Design Standard should be directed to the Senior Principal Engineer, Mechanical Section, Engineering. Future Design Standard changes, if any, will be issued to registered Design Standard users as and when published.

Head of Engineering

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REVISION STATUS

The revision status of this standard is shown section by section below:

REVISION STATUS						
SECT.	VER./REV.	DATE	PAGES REVISED	REVISION DESCRIPTION (Section, Clause, Sub-Clause)	RVWD.	APRV.
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DESIGN STANDARD DS 30

Mechanical Design Process

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1 Introduction

1.1 Purpose

The purpose of this Standard is to:

- (a) Provide guidance to Designers and other stakeholders involved in the design of the following types of mechanical design:
 - Simple Design;
 - Major Design;

in accordance with the requirements of the Engineering Design Manual (EDM),

- (b) Ensure Project Requirements are clearly determined,
- (c) Define the design process for each design type in order to ensure appropriate engineering, review and evaluation of design solutions,
- (d) Clarify the Corporation's expectations for inputs, considerations and outputs at the various stages of mechanical design for each type - to ensure appropriate documentation is delivered to the Scoping or Delivery phase.

This Standard focuses mainly on inputs, considerations and output requirements of the mechanical design process, and does not necessarily address all matters that will need to be considered by the Designer in respect to a particular project. Reference will still need to be made to the EDM for these matters e.g. engineering design process objectives, applicability, process documentation etc. In the event of an apparent conflict between the requirements of this Standard and those of the EDM, this Standard shall take precedence.

1.2 Scope

1.2.1 Simple Design

The scope for Simple Design covers preparation and review of the mechanical design of simple mechanical works - as documented in the Design Summary Report and accompanying drawings and specifications (as applicable). The process applies to designs which are technically straight-forward, examples of which are provided in table 1.1.

1.2.2 Major Design

The scope for Major Design covers:

- (a) Preparation of the mechanical design outputs relating to:
 - Concept Design Report (where required by the Design Alternatives Review),
 - Engineering Summary Report,
 - Design Summary Drawings, and
 - Detail Design.
- (b) Applies to mechanical works forming part of major projects - examples of which are provided in table 1.1
- (c) Third Party Review of the design of major mechanical works as documented in (as applicable) the Concept Design Report and Engineering Summary Report and accompanying drawings including Design Summary Drawings and Detail Design Drawings.

1.3 References

Reference should be made also to the following:

Engineering Design Process Manual of Requirements

Strategic Products Register

DS

30-01 Glossary – Mechanical

30-02 General Design Criteria - Mechanical

31-01 Pipework - Mechanical

31-02 Valves and Appurtenances - Mechanical

32 Pump Stations – Mechanical

32-01 Pump Stations – Borehole- Mechanical

33 Water Treatment Plants - Mechanical

34 Wastewater Treatment Plants - Mechanical

35 Ancillary Plant – Mechanical

35-01 Surge Vessels

38-01 Installation - Mechanical

38-03 Flange Bolting

62 Standard Security Treatments (and Guidance Notes for Security Treatments)

80 WCX CAD Standard – Water Corporation eXternal (WCX) Manual

1.4 Definitions

The terminology used in this document generally aligns with the definitions contained in the Engineering Design Manual (EDM) and the following:

Engineering Technologist:

An engineering technologist who has recognised capabilities which would include the following duties:

- Assisting in the planning and performance of engineering tasks without detailed supervision, but with professional engineering guidance under special circumstances, and
- Is engaged on engineering work requiring previous engineering experience.

Design Summary Drawings:

Drawings which describe the critical aspects and statutory requirements of the engineering design and which consequently must be reviewed and verified prior to the purchase, construction and operation of the associated plant and machinery.

Detail Design:

Design based on the Primary Design Drawings as amended following design review and carried out to the level of detail necessary to allow the works to be constructed.

Detail Design Drawings:

Drawings which are required to supplement the Primary Design Drawings, to describe the design to the level of detail necessary to direct the construction of the work.

Design Job Types:

The following table, which is intended to provide guidance to Designers and stakeholders, should not be considered exhaustive:

Table 1.1 – Summary of Design Process Types and Application

Design Process Type	Includes	Excludes	Examples
Simple	<p>Simple brief e.g. single page;</p> <p>Low risk;</p> <p>Mechanical design only;</p> <p>Simple/single design task;</p> <p>Single/limited stakeholder input;</p> <p>Single design output e.g. report/drawing;</p> <p>A planset of up to 5 drawings;</p> <p>Procurement via Strategic Product Specifications (SPS);</p>	<p>Multi-discipline design;</p> <p>Planning review;</p> <p>Multiple stakeholders.</p> <p>Significant constructability / operability considerations;</p> <p>Staging requirements;</p> <p>Requirement for detailed specifications other than Strategic Product Specifications</p> <p>Significant Engineering e.g. Hydraulic Analysis.</p> <p>External Approvals</p>	<p>Minor PS mechanical upgrade or renewal;</p> <p>Single trunk main valve design;</p> <p>Small single control valve design;</p> <p>Treatment plant landing modification;</p> <p>Prevention of Falls upgrade works.</p>
Major - Without CDR	<p>Any Major project where a single design alternative has been approved (in activation) for scoping.</p>	<p>Any mechanical design where the development and analysis of a number of design concepts - to justify the selection of a single concept - is essential to ensuring a fit-for-purpose solution at lowest life-time cost.</p>	<p>Minor PS design;</p> <p>Small to medium borehole submersible pumpsets;</p> <p>Major PS equipment renewal;</p> <p>Treatment plant equipment & chlorine module renewal;</p> <p>Dam Guard Valve design;</p> <p>Small Treatment Plants of 'standard' design</p>
Major	<p>Planning review;</p> <p>Medium and high risk;</p> <p>Mechanical component >\$1M</p> <p>Multi-discipline design;</p> <p>Innovative or complex design and/or functionality;</p> <p>Numerous stakeholders;</p> <p>Medium to large PS e.g. >150 kW or >315 kW transformer;</p> <p>Third Party Review.</p>	<p>Any project where a single design alternative has been approved for scoping.</p>	<p>Major PS design;</p> <p>Large borehole submersible pumpsets</p> <p>Significant treatment plant upgrades;</p> <p>Minor complex PS & PM design;</p> <p>Major control valve complexes.</p>

Design Reviewer:

The consulting engineer who, not having been involved in the preparation of design reports, drawings and tender documents; carries out the detailed review of such documents.

Engineer

A professional engineer who has recognized capabilities which would include the following:

- Planning and performing professional engineering work without detailed supervision, but with professional engineering guidance under special circumstances, and
- Is engaged on engineering projects requiring substantial professional engineering experience.

Minor Pump Station:

Pump stations having individual drives rated not greater than 150 kW and an incoming supply rated not greater than 315 kVA.

Principal Engineer:

Principal Mechanical Infrastructure Design Branch, Water Corporation.

Supervising Engineer

An experienced professional engineer who has recognised capabilities which would include the following:

- Project definition and performing engineering work,
- Reviewing engineering work for technical accuracy and adequacy, and
- Planning, directing, coordinating and supervising the work of other professional engineering and technical staff.

Third Party Reviewer:

A person (independent consulting engineer) engaged by the Designer to undertake a Third Party Review and report on the outputs of the design job.

1.5 Mandatory Requirements

In general the requirements of this Standard are mandatory. If there are special circumstances which would justify deviation from the requirements of this Standard, the matter shall be referred to the Principal Engineer for his consideration. No deviation from the requirements of this Standard shall be made without the written approval of the Principal Engineer.

2 Design Process for Simple Mechanical Works

2.1 General

2.1.1 Purpose of Simple Mechanical Design

The Simple Mechanical Design Process shall be undertaken for minor upgrades, additions or alterations to existing infrastructure (refer Table 1.1), which are considered low risk and can be achieved using standard proprietary equipment. It is not intended for design work that is complex, requires significant engineering or multidisciplinary input or third party review (refer TPR checklist)

It is intended to ensure:

- That all changes to mechanical Infrastructure are subject to engineering evaluation and Designer review consistent with ensuring efficient, safe, fit for purpose solutions.
- The timely and efficient delivery of design;
- Appropriate inputs are received, and defined documented outputs are produced.

2.2 Design Process

Design development and review for simple mechanical works shall:

- (a) Follow the Simple Design requirements contained in this section of this Standard
- (b) Be undertaken by a Mechanical Engineer or Engineering Technologist (Mechanical) with experience in the water industry.
- (c) Be reviewed and authorised as required below.

The role of the Designer shall be to provide technical design for the job, co-ordination of all design activities, reporting as required in the EDM and to provide technical advice during design, construction and through to the end of commissioning.

The input documentation for Simple Design and Drawings shall be the Design Brief (including Approved Requirements Baseline) and the relevant Corporation design standards.

2.3 Design Report Development

The key design output document is the Design Report and/or Design Drawings, the requirements for which are detailed in both the Corporation's EDM and the following:

2.3.1 Related Documentation

The following requirements and documentation relate to the Simple Design Process:

- (a) Development, review and management requirements for the Design process, which are detailed in the EDM;
- (b) Input documents for the Design process shall be the Design Brief Summary (1 page) and associated Corporation design standards and specifications;
- (c) Specific mechanical requirements relating to the Design Report and/or Drawings, which are detailed in this section of the Standard.

2.3.2 Basic Information Required

Design shall not proceed until:

- (a) An Approved Requirements Baseline (produced by operational asset management) has been formally agreed.
- (b) For existing pump station capacity upgrades:-
 - receipt of a recent planning report / technical advice - indicating future growth and recommending the required initial and any future duty(s)
 - receipt of tests results confirming existing pump performance, system resistance curves and pressure main operating pressure envelope,
- (c) Documented ‘in principle’ agreement from a Supervising or Principal Engineer, confirming compliance of the proposed solution with statutory and design standards; suitability in terms of capacity to meet future demand, etc.
- (d) Site survey has been undertaken, which is sufficient to accurately determine dimensions, arrangement and parameters (capacity, rating, etc) of existing infrastructure.

2.3.3 Issues to be Determined

The Designer shall determine the following (the list below shall not be considered exhaustive):

- (a) Receipt of an Approved Requirements Baseline (ARB)
- (b) Scope of mechanical work required to meet the ARB
- (c) Relevant Health and Safety requirements and risks to be considered in design and construction.
- (d) Deficiencies in existing plant or machinery;
- (e) Pipework and valve requirements;
- (f) Adequacy of condition monitoring and protection equipment;
- (g) That proposed system performance changes do not exceed existing infrastructure capability e.g. Surge pressure > pipe rating; station outflow > sewer capacity; duty power > switchboard.

2.3.4 Plant and Machinery

The Designer shall select the item of plant or machinery based on the following requirements:

- (a) Be fit for purpose,
- (b) Be proven, functional, maintainable and reliable;
- (c) Embody the latest technology;
- (d) Materials of construction and coatings shall be appropriate for the operating environment;
- (e) Prohibit prototype plant and machinery;
- (f) Use authorised product only (where applicable) in accordance with the Strategic Products Register;
- (g) Use standard or “off the shelf” plant or machinery.

2.3.5 Operation and Maintenance

The Designer shall consider the following operation and maintenance requirements when selecting plant and machinery:

- (a) Embody safety, functionality, operability, maintainability and reliability;
- (b) Suitability of existing condition monitoring and protection equipment;
- (c) Interchangeability of components, plant and machinery to reduce spares inventory and allow ease of maintenance;
- (d) Satisfy all operating and maintenance requirements for vendor supplied plant and machinery.

2.4 Simple Design Drawings

2.4.1 General

Design Drawings shall be prepared to:

- (a) Document the Design for review and records purposes,
- (b) Provide information to enable tendering and construction.

Design Drawings shall be allocated to bundle numbers in accordance with DS-80

2.4.2 'Hold' Points

The Simple Design Drawings shall document critical aspects of the design completely, except for pending aspects of the design which are by necessity unresolved or vendor specific.

Items for which, at the time of drawing production, final dimensions or configuration are not known, and items which are impacted by these, shall be indicated as such by use of 'reverse cloud' diagrams and the word '**Hold**' with descriptive text to highlight outstanding or vendor specific information to be provided after Tender award. Where default AutoCAD images have been used in the preparation of Design Drawings they shall be similarly highlighted pending receipt of vendor specific data or related AutoCAD images.

The 'Hold' indicates to the constructor that further information is required prior to construction and to the Designer and design manager that further information is required to complete the design.

2.4.3 Types of Simple Design Drawings

Design Drawings for the mechanical work shall include the following information, and may be combined where appropriate:

- (a) A general arrangement drawing consisting of a plan and elevation for tendering or other purposes;
- (b) A technical summary drawing, showing all technical attributes of plant and equipment to be installed (make, model, duty, impeller size, pressure rating, etc)
- (c) For pumps, a system curve, onto which is superimposed a typical H-Q curve for the pumping duty, and including typical efficiency, power and NPSHr information;
- (d) For ancillary equipment e.g. vacuum pump, compressor - a typical performance curve;
- (e) For a control or regulating valve selection - max and min system curves showing the H-Q operating envelope for the valve;

Designers shall generally specify items of plant and machinery generically. Specific make and model may be used where compatibility, spares optimization, or project timelines are paramount.

2.4.4 Revisions to Simple Design Drawings

Design Summary Drawings shall be revised to incorporate:

- (a) Details of equipment recommended by the procurement tender process, prior to placing of orders, to ensure, operability and maintainability requirements (e.g. sufficient space, access and ergonomics) are satisfied.
- (b) Removal of 'Hold' points as equipment orders are placed
- (c) At the completion of the Construction Stage and prior to commissioning, the Design Drawings shall be revised, using the current issues of the Simple Design Drawings, to document the design as it was constructed.

2.5 Detail Design

2.5.1 Tender Preparation

Where required by the procurement process the Designer shall prepare tender documentation for the supply of mechanical plant and machinery using relevant Strategic Product Specifications (where applicable), and for installation services.

The Corporation's Strategic Product Specifications include basic information which shall be completed by the Designer in Appendix A - Project Specific Requirements. Additionally information shall be provided by the tenderer in accordance with Appendix B – Technical Compliance Schedules.

The drawings included within the tender documentation shall be formal signed Drawings or sketches appropriately signed and numbered so as to be traceable.

2.5.2 Tender Analysis

Tender analysis shall comply with the following:

- (a) Be carried out by the Designer to verify that the recommended tender complies with the approved Simple Design Drawings.
- (b) Be based on the tendered information contained in the Technical Compliance Schedules of the Corporation's Strategic Product Specification.
- (c) If no offers are received which comply completely with the Simple Design Drawings, the matter shall be referred to the Design Manager for resolution by the Principal Engineer.
- (d) The recommendation made to the Corporation shall be in the form of a brief report from the Designer. The report shall clearly state the issues that require consideration by the Design Manager and the recommended offer's level of compliance with the tender documentation.

2.6 Simple Design Authorisation

Simple Design output documents (reports, drawings, specifications) shall be signed by the Engineer undertaking the design and reviewed / counter-signed by a Supervising or Principal Mechanical Engineer, representing the Designer.

2.7 Records Management

The following records (where relevant) shall be provided to the design manager and held on the job file:

- Approved Requirements Baseline (ARB)
- Simple Design Brief;
- Simple Design Report and/or;
- Simple Design Drawings:
- A copy of the critical engineering calculations;
- Copies of related emails and correspondence;
- Copy of Tender documents and recommendations

3 Design Process for Major Mechanical Works

3.1 General

3.1.1 Purpose of Mechanical Design Process

The Mechanical Design Process shall be undertaken for major upgrades, additions or alterations to existing infrastructure, which are generally Capital Investment Program requirements. The process is intended to ensure:

- Where viable alternative design concepts exist, they are identified and evaluated to determine the best value ('fit-for-purpose' at lowest 'whole-of-life cost') solution.
- Rigorous consideration of technical issues to ensure a robust engineering solution
- Sufficient Stakeholder consultation to promote 'ownership' and acceptance of the design.
- Appropriate survey, 'hold points' and drawing revision to minimize construction 're-work'.
- Adequately detailed design documentation to enable an efficient project delivery phase.

3.1.2 Planning Review

It is the IDB Design Manager's responsibility to ensure that Technical Advisors are appointed (Electrical, Mechanical and/or SCADA) as appropriate for the scope of design work. For design involving significant mechanical works, the Mechanical Technical Advisor shall participate in the Planning Review meeting(s) and seek to ensure that planning is consistent with an efficient and deliverable design solution (e.g. achievable pump duty points).

3.1.3 Approved Requirements Baseline - Review and Verification

The Approved Requirements Baseline (ARB) is created prior to significant engineering design and may include requirements which are subsequently found to be difficult to deliver or inconsistent with an efficient and cost affective solution. It is the Designer's responsibility to progressively review the Approved Requirements Baseline and to **challenge** any requirements that could impact on the delivery of an efficient design. Where considered appropriate the Designer shall submit a request to the design manager, together with justification, for variation(s) to the ARB.

The Designer shall also review the ARB for completeness and request clarification or additional information on any matters upon which the design is based. All inputs shall be verified in writing. The Designer shall not base the design on assumed information unless written and specific direction is received from the Design Manager.

3.2 Design Process

Except where modified by this Standard, the design process with respect to mechanical designs shall be carried out in accordance with the Corporation's EDM and involve:

- Concept Design (unless a single design alternative has been agreed in a Design Alternatives Report)
- Engineering Design
- Detailed Design

3.3 Concept Design Development

A Concept Design Report is required where a number of (substantially different) design alternatives are possible; and where significant investigation and development is required to enable evaluation and

selection of a single option. The key document is the Concept Design Report (CDR), the requirements of which are detailed in the Corporation's EDM and below.

Concept design development shall progress with sufficient and continuous stakeholder consultation to promote understanding, acceptance and timely approval of the recommended solution.

3.3.1 Related Documentation

The following requirements and documentation relate to the Concept Design Process:

- (a) The objectives and outputs relating to the Concept Design Process which are covered in general in the EDM;
- (b) Input documents for the Concept Design Process which shall be the Concept Design Brief, the Approved Requirements Baseline (ARB) and associated Corporation design standards and specifications;
- (c) Specific mechanical requirements relating to the Concept Design Report and Concept Drawings in accordance with the requirements of this section of the Standard.

3.3.2 Basic Information Required

The basic information (as applicable) shall be determined by the Designer:

- (a) An Approved Requirements Baseline (by others).
- (b) Initial, intermediate and ultimate duties required and future staging schedule;
- (c) Maximum allowable downtime for the plant, contingencies & consequences if exceeded;
- (d) Preliminary plant system design parameters and information e.g. for pump stations:
 - (i) system operating curves or operating envelope;
 - (ii) suction and delivery main longitudinal cross section;
 - (iii) pump station and pipeline preliminary surge analysis;
- (e) Modes of operation for the plant;
- (f) For existing pump station capacity upgrades - site tests shall be commissioned by the Designer to determine actual system resistance curves (Note. this is a mandatory requirement as there can be significant differences between theoretical / actual curves, particularly for older assets);
- (e) For pump station upgrades on major existing pipelines (>DN300) site pressure log tests shall be commissioned by the Designer to determine hydraulic characteristics (celerity, transient pressure envelope) for the purpose of hydraulic model calibration.
- (f) Stakeholder agreement, where existing pipelines are to be used, of pipeline pressure capability.
- (g) Site survey shall be undertaken, as required, to determine dimensions, arrangement and parameters (capacity, rating etc) of existing infrastructure. All 'as-constructed' information shall be verified.

3.3.3 Issues to be Determined

The Designer shall determine the following (the list below shall not be considered exhaustive):

- (a) Scope of mechanical works required;
- (b) Number of duty and standby units (e.g. pumpsets, compressors etc.) to be installed initially and for each future stage
- (c) Strategic importance of the facility;
- (d) Security risk category;
- (e) Identification of, and Financial Impact Statement for - alternative design solutions;

- (f) Constructability and integration strategy, particularly with respect to 'brown-field' sites;
- (g) Operability, maintainability and safety requirements;
- (h) Operating speed of machinery;
- (i) Pipework and valve requirements;
- (j) Condition monitoring and protection requirements;
- (k) Identification of deficiencies in existing plant, machinery or systems;
- (l) The capability of existing infrastructure to which the plant will integrate; e.g. accepted pipeline pressure rating, downstream sewer and pump station capacity;
- (m) Hydraulic analysis to determine steady state and transient pressure envelope, proposed mitigation equipment;
- (n) Where Surge Vessels are proposed for surge mitigation, input data required by DS35-01 Appendix A and third party review of surge analysis report required.
- (o) SCADA requirements;
- (p) For sites other than simple duty/standby control - the functional description of the plant.

3.3.4 Information Required to Enable Electrical Design

The Designer shall determine following information to enable electrical design:

- (a) Individual plant duty power requirements - kW;
- (b) Individual plant non-overloading power requirements - kW;
- (c) Torques speed curves;
- (d) Number of units to be installed initially;
- (e) Number of units to be installed in accordance with the staging requirements;
- (f) Facility maximum power demand - kW;
- (g) Facility future staging maximum power demand - kW;
- (h) Nominal speed of the units - rpm;
- (i) Indoor or outdoor facility;
- (j) Estimated operating hours and seasonal / diurnal distribution;
- (k) Estimated motor starts per hour or per day;
- (l) Unit configuration e.g. horizontal or vertical;
- (m) Machinery direction of rotation.
- (n) Equipment starting and control requirements e.g. fixed, variable speed;

3.3.5 Alternative Designs

In accordance with the requirements of the EDM, the Designer shall identify and evaluate alternative designs and options and recommend a solution giving consideration to:

- (a) Whether a new asset is really required,
- (b) Whether the deferral, upgrading or reuse of an existing asset is a viable option,
- (c) Whether an alternative philosophy or mechanical plant and machinery would provide a better solution,;
- (d) Analysis of the options in terms of Net Present Value (NPV) analysis, risk, constructability, operability, maintainability, and integration with existing infrastructure;

The recommended option would be the one selected as an output in the Concept Design Report.

3.3.6 Site Selection and Layout

The Designer shall select a site which is optimal with respect to:

- (a) Aesthetics;
- (b) Applicability e.g. with surrounding location;
- (c) Buffer requirements;
- (d) Environmental sensitivity;
- (e) External influences such as adjacent pump stations, reservoirs, tanks and control valves;
- (f) Environmental noise regulation compliance – with particular regard to intermittent noise from machinery e.g. standby generators, pump starts and stops and associated valve closures;
- (g) Hazard zones which shall be determined and designs shall utilize components and materials appropriate for the type of hazard;
- (h) Hazardous material storage and transportation facilities, which shall comply with statutory safety regulations and requirements; e.g. fuel or process chemicals (solid, liquid or gaseous);
- (i) Odours of a permanent or temporary nature;
- (j) Layout, which shall provide for adequate, clear and safe access to all plant and machinery;
- (k) Pipeline route and costs;
- (l) Power supply availability and capacity;
- (m) Safe access to and from adjacent roadways;
- (n) Security classification accordance with DS 62;
- (o) Site costs;
- (p) Size for future staging, bypass, standby power requirements etc;
- (q) Value for money;
- (r) Construction site amenities including vehicle parking, construction offices, toilets etc.

3.3.7 Building or Facility Design Considerations

The Designer shall provide building or facility designs which are optimal with respect:

- (a) Appropriate size in terms of growth projections;
- (b) Areas for loading and unloading plant and machinery;
- (c) Eliminating potential confined spaces;
- (d) Capable of being upgraded to suit future staging;
- (e) Conventional building versus partial or below ground e.g. submersible pump station versus drywell;
- (f) Configuration e.g. vertical versus horizontal pumpsets;
- (g) Emergency or standby power requirements shall be determined in accordance with Corporation policy and requirements;
- (h) Footprint requirements;
- (i) Insulation requirements;
- (j) Lifting requirements e.g. overhead or mobile cranes, or hoists, complete unit or component lift;

- (k) Lighting;
- (l) Noise treatment to meet OSH requirements, gain environmental approvals;
- (m) Pit style versus level floor slab;
- (n) Safe access to all facilities, plant and machinery for operational and maintenance purposes;
- (o) Sound attenuated machinery enclosure versus a building e.g. generating set;
- (p) Structure, cladding and architecture is appropriate to the surroundings;
- (q) Ventilation requirements for personnel and machinery.
- (r) The possible requirement (and provision if required) for toilet facilities

3.3.8 Plant and Machinery Considerations

The Designer shall select plant and machinery based on the following requirements:

- (a) Be safe, fit for purpose, proven, functional, maintainable and reliable;
- (b) Be rotatable, where appropriate, with other equipment to minimize spare holding (SDR input required);
- (c) Embody the latest technology;
- (d) Major plant and machinery shall be selected on minimum life-cycle cost principles in compliance with the Corporation's Financial Impact Statement contained in DS 30-02;
- (e) Materials of construction shall be appropriate for the operating environment;
- (f) Prohibit prototype plant and machinery;
- (g) Provide redundancy for all critical plant and machinery in order to provide 100% availability unless otherwise authorised by the Corporation;
- (h) Size based on relevant process flow diagrams, P&IDs and process data sheets;
- (i) Use authorised product only (where applicable) in accordance with the Strategic Products Register;
- (j) Use standard or "off the shelf" plant and machinery where available;
- (k) Vendors of plant and machinery systems shall be aware of their responsibilities under the Worksafe Occupational Safety and Health Act 1984 and Regulations 1996.

3.3.9 Operation and Maintenance Considerations

The Designer shall consider the following operation and maintenance requirements when selecting plant and machinery:

- (a) Safety of access – avoidance of confined space; 'prevention of falls' compliance etc.
- (b) Embody functionality, operability, maintainability and reliability;
- (c) Determine the extent of condition monitoring required for mechanical equipment;
- (d) Interchangeability of components, plant and machinery to reduce spares inventory and allow ease of maintenance (e.g. use of 'standard' pumps where practical - SDR input required);
- (e) Satisfy all operating and maintenance requirements for vendor supplied plant and machinery;
- (f) SCADA requirements shall be determined in accordance with Corporation policy, requirements and standards.

3.3.10 Health and Safety Considerations

The Designer shall ensure that the design complies fully with all relevant National, State and the Corporation's safety standards and guidelines.

3.4 Concept Design Outputs

3.4.1 Design Alternative Review (DAR 1)

Where an initial Design Alternatives Review (DAR 1) has approved the development of a single Design Alternative, the Engineering Summary Report forms the primary record of the mechanical engineering design of the project. In this case the Engineering Summary Report shall record the basis of engineering decisions made in the development of Engineering Design (e.g. equipment configuration, material selection etc)

3.4.2 Design Alternative Review (DAR 2)

Where DAR 1 recommended a number of alternatives be considered, these are developed in the Concept Design Report. The purpose of the second review is to consider a draft Concept Design Report and approve a single option by sign off of the final Concept Design Report.

3.4.3 Concept Design Report

The key concept design output document is the Concept Design Report (CDR). The CDR shall:

- (a) Record the design inputs
- (b) Describe the options considered, NPV analysis and the basis for recommendation of the selected option;
- (c) Record compliance with / agreed changes to - the Asset Requirements Baseline
- (d) Address and record, as applicable and as required to ensure the viability of the recommended option; the issues, considerations and information listed (in section 3.3) above;
- (e) Provide sufficient detail (together with drawings) to enable the +50% -10% estimate to be prepared using the PMB template.
- (f) Include the Concept Design Drawings and Associated Documents listed in the following sections

3.4.4 Concept Design Drawings

Concept Design Drawings shall be prepared, during the Concept Design Stage to demonstrate and record the options considered, with sufficient detail to support the recommendation.

Concept Design Drawings for the recommended option are required in sufficient detail to clearly demonstrate the concept; to enable the +50% -10% estimate to be prepared using the PMB template, and to provide a platform for Engineering Design.

Design Drawings and information required for components of the **recommended design option** shall include, but not be limited to the following:

- (a) Preliminary:- PFD's, Hydraulic Profiles, P&ID's, Site Locality, Site Layouts, Plant Layouts, Building Layouts, GA's, Prelims to Work (as required by the Engineering Design Manual)
- (b) For each pump selection alternative: - a set of maximum and minimum system curves, onto which is superimposed typical H-Q curves for the pumping duty(s), and including typical efficiency, power, and NPSHr curves;
- (c) For ancillary plant and machinery such as compressors, blowers etc. a set of typical performance curves;

- (d) For control and regulating valves a preliminary set of maximum and minimum system characteristic (H-Q) curves showing the required operating envelope for the valve;
- (e) A preliminary construction staging plan, where appropriate (e.g. operational brown-field sites) indicating temporary works required. Areas shall be allocated to meet construction amenity requirements such as vehicle parking, toilets and construction offices for existing and brown-field sites.

Concept Design Drawings shall be allocated to bundle numbers 95-99 in the project drawing plan set as specified in DS 80.

3.4.5 Associated Documents

In addition to the Concept Design Drawings the Designer shall provide the following information as part of the CDR:

- (a) Capital cost estimate for the mechanical component for each alternative; prepared using the PMB template, to an accuracy of +50% -10%
- (b) Operating cost and energy consumed estimates for the mechanical plant and machinery component.
- (c) Financial Impact Statement (FIS) prepared using the corporations FIS template and inputs (a) and (b), for each alternative.
- (d) A schedule (Gantt chart) for supply of long-lead-time mechanical plant and equipment,
- (e) Preliminary lists for Equipment, Valves and Pipework
- (f) A preliminary construction and staging plan, (where appropriate - e.g. operational brown-field sites) for the selected option, with sufficient detail (e.g. bypass pumping, temporary power, control and monitoring arrangements) to verify constructability and for estimating purposes.
- (g) A surge analysis report or desktop study to determine any surge mitigation equipment requirements.
- (h) Third Party Review Report (where required by the design brief - refer TPR checklist).

3.5 Engineering Design Development

Engineering design development shall not progress until a single design alternative has been approved

The key engineering design output document is the Engineering Summary Report (ESR), the requirements of which are detailed in the Corporation's EDM and below. The purpose of the ESR is to record the Engineering Design of the approved Concept Design; to enable a +20% -5% estimate for financial and stakeholder approval, and to provide a basis for detailed design.

Engineering design development shall progress with sufficient and continuous stakeholder consultation - to promote understanding, acceptance and timely approval of the final design.

3.5.1 Related Documentation

The following requirements and documentation relate to the Engineering Design Process:

- (b) The objectives and outputs relating to the Engineering Design Process which are covered in general in the EDM.
- (c) Input document for the Engineering Design Process shall be the Approved Requirements Baseline, Engineering Design Brief, Concept Design Report, Concept Design Drawings and where appropriate - existing drawings (survey verification required), site surveys, site performance tests, pipeline pressure logs and operational data for existing infrastructure.
- (d) Specific mechanical requirements relating to the Engineering Summary Report and Design Summary Drawings in accordance with the following section of this Standard.

3.6 Engineering Design Outputs

3.6.1 Engineering Summary Report

The key engineering design output document is the Engineering Summary Report (ESR). For Mechanical Aspects of the design the ESR shall include / record:

- (a) Compliance with the Approved Requirements Baseline.
- (b) How the issues, considerations and information listed (in section 3.3) have been addressed.
- (c) Hydraulic Analysis of the complete system and required surge mitigation equipment; to be revised and re-issued when final equipment characteristics (e.g. pipe selection, pump inertia, non-return valve performance) are known.
- (d) Mechanical Equipment selections (as agreed for long lead-time items) with justification.
- (e) A schedule (Gantt chart) for supply of mechanical plant and machinery.
- (f) A list of all valves required including ID No, type, SPS No, size, pressure class, service, actuation, etc
- (g) Indicative 'future' pump selections - to confirm viability of future staging duties.
- (h) Design Summary Drawings as further detailed in this standard.
- (i) Class 3 capital cost estimate for mechanical works component (accuracy of +20% -5%) prepared using the PMB template.
- (j) Operating cost and energy consumed estimates for the mechanical plant and machinery component
- (k) A construction and staging plan, (where appropriate - e.g. operational brown-field sites) for the selected option, with sufficient detail (e.g. bypass pumping, temporary power, control and monitoring arrangements) to verify constructability and for the Class 3 estimate...
- (l) Third Party Review Report (where required by Engineering Design Brief).
- (m) Functional description of the control philosophy, monitoring and protection.

3.6.2 Design Summary Drawings

Design Summary Drawings shall be prepared during the Engineering Design Stage in order to:

- (a) Document the engineering design for review and record purposes relating to the selected option from the Concept Design,
- (b) Enable the **+20%-5%** estimate to be prepared for the Delivery Business Case using the PMB template
- (c) Provide input information to the Detail Design Stage of the design process,
- (d) Provide tender document drawings for the purchase of major mechanical plant and machinery (such as pumps, valves etc.)
- (e) Identify and manage incomplete engineering data via 'Hold' points and a 'Hold Point Schedule'
- (f) Provide tender document drawings for the installation services.

Design Summary Drawings shall be produced and revised by the Designer at various stages of the Engineering Design and Detail Design process as further specified hereunder.

Design Summary Drawings shall be allocated to bundle numbers 90 in the project drawing plan set as specified in DS 80.

3.6.3 Design Summary Drawings – ‘Hold’ Point Management

The Design Summary Drawings shall document critical aspects of the design completely, except for pending aspects of the design which are by necessity unresolved or vendor specific.

Items for which, at the time of drawing production, final dimensions or configuration are unknown or may be subject to change, and items which are impacted by these, shall be indicated as such by use of ‘reverse cloud’ diagrams and the word ‘**Hold**’ together with an ascending numeral (**H001, H002 etc**) and descriptive text to highlight outstanding or vendor specific information required. Where default AutoCAD images have been used in the preparation of Design Drawings they shall be similarly highlighted pending receipt of vendor specific data or related AutoCAD images.

The ‘Hold’ indicates to project management and construction that further information is required, or that design may change, prior to construction; and to the Designer and design manager that further information is required to complete the design.

Where the number of ‘Hold’ points on drawings is significant, the Designer shall create and maintain a ‘Hold Point Schedule’ as shown in Appendix 1, until all such drawings have been revised and re- issued with ‘Hold’ points removed. Each ‘Hold’ Point numeral shall be unique for the project and shall not be re-used.

3.6.4 Design Summary Drawings - Detail Design Stage

- (a) At the completion of the Tender process and prior to placing firm orders, the Design Summary Drawings shall be revised to include all vendor specific critical information and other outstanding information (as shown by ‘hold’ points and ‘reverse cloud’ diagrams). The input documentation shall be:
 - (i) current issues of the Design Summary Drawings, and
 - (ii) final tender response schedules or shop drawings from the recommended vendor.
- (b) At the completion of the Detail Design Stage and prior to the commencement of Construction of the ‘hold point’ items, Design Summary Drawings shall be revised to incorporate final configuration, dimensions and details of the items on ‘hold’. Final revisions shall have all ‘hold points’ removed.

3.6.5 Design Summary Drawings – Post Construction Stage

At the completion of the Construction Stage and prior to final commissioning, the Design Summary Drawings shall be revised, using the current issues of the Design Summary Drawings and change information recorded during construction, to document the ‘as constructed’ design.

3.6.6 Types of Design Summary Drawings

Design Drawings and information required for components of the **recommended design option** shall include, but not be limited to the following:

- (a) PFD’s, Hydraulic Profiles, P&ID’s, Site Locality, Plant Layouts, GA’s, Building Layouts, Site Layouts, Prelims to Work (all required by the Engineering Design Manual)
- (b) For the final pump selection: - a set of maximum and minimum system curves, onto which is superimposed typical H-Q curves for the pumping duty(s), and including typical efficiency, power, and NPSHr curves - to be revised post contract award.
- (c) A Mechanical Equipment Summary drawing showing all mechanical equipment (including ancillary equipment - blowers, compressors etc) showing key parameters - power and performance curves; protection settings etc. Combine with (b) for simple pump stations
- (d) For control and regulating valves a revised and accurate set of maximum and minimum system characteristic (H-Q) curves showing the required operating envelope for the valve;

- (e) For Brownfield sites: A construction staging site plan, where appropriate, showing all stages of all temporary works required to enable continued secure delivery of service (including standby equipment) during construction e.g. bypass pumping arrangements, temporary pipe-work, temporary generators, switchboards, etc. Areas shall be allocated to meet construction requirements such as vehicle parking, toilets and construction offices for the brown-field sites.
- (f) A signage and label plan listing all signs and labels required for the facility in accordance with the 'Signage and Labels' section of DS 30-02.

Concept Design Drawings shall be allocated to bundle numbers 95-99 in the project drawing plan set as specified in DS 80.

General Arrangement Drawings shall be created in sufficient elevations and sections to demonstrate the operability requirements such as access, equipment removal passage etc. Where necessary and required in the design brief, 3D modeling may be required (treatment plants etc) for this purpose. GA's and layouts shall show size, type and pressure class of pipes, valves and appurtenances.

Design Summary Drawings shall be revised, as an output from the Tendering process, to designate all the recommended plant and machinery by size, type, rating, make, model and performance including populating all outstanding 'hold points'

3.6.7 P&I Diagrams

Design Summary P&I Diagrams shall show:

- (a) Type, size and ratings of all driven and/or controlled loads,
- (b) Type, size and ratings of all valves and ancillary equipment.

3.6.8 General Arrangement and Site Layout Drawings

Design Summary general arrangement and site layout drawings prepared as output from the Engineering Design stage shall show overall dimensions and include the following:

- (a) Backflow prevention devices for individual, zone and containment protection;
- (b) Crane and lifting arrangements;
- (c) Elevation, plan and sectional arrangements of major items of mechanical plant and machinery both within buildings and outdoors on the site of the installation;
- (d) Foundation, floor and thrust block arrangements;
- (e) Hard standing, vehicle access and unloading areas;
- (f) List of safety and other signage and labeling;
- (g) Pipework, valves and access manholes;
- (h) Pits and chambers;
- (i) Safety clearances and access ways;
- (j) Security fencing;
- (k) Type of ventilation and/or air conditioning.

As an output from the Detail Design stage, Design Summary Drawing general arrangement and site layout drawings shall be updated to show any minor changes found to be necessary during the Detail Design stage.

3.6.9 Condition Monitoring and Protection Drawings

Design Summary Drawings, shall include a list of the condition monitoring and protection equipment required for the plant and machinery in accordance with the relevant sections of DS 30-02, DS 32 and

DS 32-01 (as applicable), which shall be prepared as output from the Engineering Design Stage, identifying:

- (a) Condition requirement e.g. pump no-flow protection,
- (b) Type of detection device, and
- (c) Functionality e.g. alarm, monitoring, protection...

As an output from the Tendering stage, Design Summary Drawing mechanical condition monitoring and protection diagrams shall be updated to show the make, model, ratings, setting ranges and actual settings for each device.

3.6.10 Revisions to Design Summary Drawings

Design Summary Drawings shall be revised to incorporate:

- (a) Details of equipment recommended by the procurement tender process, prior to placing of orders, to ensure, operability and maintainability requirements (e.g. sufficient space, access and ergonomics) are satisfied.
- (b) Removal of 'Hold' points as equipment orders are placed.

3.7 Detail Design Development

The key input document for the Detail Design Process shall be the Engineering Summary Report and Design Summary Drawings.

The objectives and outputs relating to the Detail Design Process are covered in general in the EDM. For specific mechanical Detail Design outputs the Designer shall refer to this Standard. The primary input documents for the Detail Design Process shall be the Engineering Summary Report and Design Summary Drawings. The ARB shall be constantly referred to during Detailed Design.

3.8 Detail Design Outputs

3.8.1 General

The Detail Design outputs relating to major mechanical design, in order of process are:

- (a) Provision of Strategic Product Specifications and;
- (b) Preparation of Tender Drawings;
- (c) Production of Tender Documents (including specifications for non-strategic products);
- (d) Assessment of tender response and compliance schedules;
- (e) Tender recommendation(s) and placement of order(s);
- (f) Revision of Design Summary Drawings in accordance with 3.6.10 (above)
- (g) A project schedule for supply of long lead time mechanical plant and machinery;
- (h) Revised operating cost estimate for mechanical plant and machinery component in accordance with Major Design Brief Appendix 2, Item 4.1.9 of the EDM;
- (i) Detail Design and/or Contractor(s) Drawings;
- (j) Schedules of plant and machinery, valves and pipe specials;
- (k) Signage and Label Plan;
- (l) Workshop drawings for manufacture and installation of mechanical plant and machinery;
- (m) Operation and Maintenance manuals;
- (n) Commissioning Plan;

- (o) Review Report.

3.8.2 Detail Design Drawings

Detail Design Drawings may be prepared by the Designer or by the relevant contractor depending on the requirements of the project and the following:

- (a) Those Detail Design Drawings which are to be prepared by the Designer and those which are to be prepared by the contractor(s) shall be identified in the Engineering Summary Report.
- (b) In instances where Detail Design Drawings are to be prepared by the contractor, the titles and content of the drawings required shall be specified in the tender document and the preparation of such drawings shall be shown as a separate item in the associated contract bill of quantities.
- (c) Detail Design Drawings shall not be prepared until the relevant Design Summary Drawings have been approved.
- (d) Detail Design Drawings shall be based on the approved Design Summary Drawings.

3.8.3 Detail Design Drawing Content

Detail Design Drawings shall be consistent with the requirements of the approved Design Summary Drawings and the following:

- (a) The repetition of information shown on the Design Summary Drawings onto the Detail Design Drawings shall be kept to the practical minimum.
- (b) Detail Design Drawings shall include, but not be restricted to, the following types of drawing.
 - (i) final site and building arrangements showing locations of mechanical plant and machinery,
 - (ii) arrangement drawings for plant and machinery (including driving and driven machines) and baseplate, showing foundation block, connecting pipework and manifolds, dismantling couplings, valves (showing valve and actuator orientation), and appurtenances,
 - (iii) arrangement drawings for control valves or other valve types showing valve and actuator orientation, pipework and associated appurtenances
- (iv) Arrangement drawings showing foundation and thrust blocks for mechanical plant, machinery, and pipework respectively.
- (v) Piping detail drawings showing pipe 'special', flange and coupling details.

3.8.4 Tender Preparation

Where required by the procurement process the Designer shall prepare tender documentation for the supply of mechanical plant and machinery using relevant Strategic Product Specifications; project specific specifications for non-strategic products; and for installation services.

The Corporation's Strategic Product Specifications include basic information which shall be completed by the Designer in Appendix A - Project Specific Requirements. Additionally information shall be provided by the Tenderer in accordance with Appendix B – Technical Compliance Schedules.

The drawings included within the tender documentation shall be formal signed drawings, or sketches appropriately signed and numbered so as to be traceable.

3.8.5 Tender Analysis

Tender analysis shall comply with the following:

- (a) It shall be performed by the Designer to verify that the recommended tender complies with the approved Design Summary Drawings.

- (b) It shall be based on the tendered information contained in the Technical Compliance Schedules of the Corporation's Strategic Product Specification, or relevant technical specification tender response schedules prepared by the Designer.
- (c) If no offers are received which comply completely with the Design Summary Drawings, the matter shall be referred to the Design Manager for resolution by the Principal Engineer.
- (d) The recommendation made to the Corporation shall be in the form of a report from the Designer. The report shall clearly state the issues that require consideration by the Design Manager and the recommended offer's level of compliance with the tender documentation

3.9 Engineering Design Review

The Engineering Design review shall be conducted by a Third Party or other Reviewer required by the Corporation's EDM and the following:

3.9.1 Input Documentation

The input documents will vary depending on the type of review and design process stage as follows:

- (a) Input documentation presented to the Third Party Reviewer for the Engineering Design Review shall include:
 - (i) Engineering Summary Report and associated Design Summary Drawings;
 - (ii) an explanation of the reasons behind major and/or unusual engineering decisions (usually being part of the associated design report), and
 - (iii) the Approved Requirements Baseline;
- (b) Input documentation for other than Third Party Review shall be:
 - (i) Contractors drawings;
 - (ii) Vendor plant and machinery drawings;
 - (iii) computer modeling information e.g. surge analysis for pipelines and pump stations.

3.9.2 Review Requirements

In carrying out the Third Party Review, the Third Party Reviewer shall employ the following tasks:

- (a) Perform alternative calculations;
- (b) Compare the design to the Principal's requirements as stated in the review input documentation;
- (c) Compare the design to statutory requirements;
- (d) Compare the design with the requirements of the Corporation's Design Standards and with the requirements of appropriate national and international standards;
- (e) Compare the design to similar proven designs, including Corporation standard designs, and
- (f) Compare the design to mechanical industry recognised best practice.

3.9.3 Third Party Reviewer

The Design Reviewer shall:

- (a) Be a senior mechanical engineer with appropriate engineering experience in the water industry and specifically related to specialist areas being reviewed (e.g. surge analysis), and shall comply with section 8.1 of the EDM.
- (b) Carry out his review independently of the Designer and without access to the Designer's calculations or methods of calculation.

- (c) Not be expected to verify the results of every calculation made by the Designer, nor is the Designer relieved of his liability for the correctness of the design by the Third Party Review..
- (d) Not comment adversely on the design simply because the design does not conform to the Reviewer's own personal preferences or is not in accordance with unspecified requirements. However the Third Party Reviewer shall comment where the design differs markedly from generally accepted good engineering practice.

3.9.4 Review Issue Resolution

The design and associated documentation shall be revised promptly to resolve all issues raised by the Third Party Design Reviewer or other reviewer. Any issues which cannot be resolved promptly between the Third Party Reviewer or other reviewer and the Designer shall be referred immediately to the Design Manager for resolution by the Principal Engineer. If the specification is in dispute, purchase of plant and machinery shall not proceed until the dispute is resolved.

3.9.5 Design Review Verification

The Third Party Reviewer shall:

- (a) Limit the review to acceptability of the design outputs compared to the project brief inputs for the Concept Design Stage (as applicable),
- (b) Limit the review to the various issues and subsequent revisions of the Design Summary Drawings in the Engineering Design Stage.
- (c) Verify that the design as documented on the Design Summary Drawings:
 - (i) has been completed to an appropriate level,
 - (ii) is in accordance with Principal's requirements as specified in the input documents,
 - (iii) is in accordance with statutory requirements,
 - (iv) is in accordance with previous approvals and Corporation standards,
 - (v) is safe in respect to both personnel and plant, and
 - (vi) will result in plant which is practical both in respect to construction and operation.
- (d) Verify that the Design Summary Drawings are suitable for use in the next stage of the overall design process including their use as part of tender documents.

3.9.6 Review of Cost Effectiveness

The Third Party Review is not required to review the cost effectiveness of the design and the Third Party Reviewer shall not comment on this aspect except where the design differs markedly from accepted good engineering practice.

3.9.7 Design Review Evidence

The Third Party Reviewer shall submit a separate report for each stage of the engineering design reviewed. Each stage review report shall include evidence of the Third Party Reviewer's review which shall include:

- (a) Copies of alternative calculations performed,
- (b) Comments on the design as it is documented on the Design Summary Drawings (drawing by drawing),
- (c) References to any similar drawings which were used for comparison purposes,
- (d) References to relevant sections of Corporation standards,
- (e) References to relevant statutory documents, and

- (f) References to relevant sections of national standards or international standards.

The Third Party Reviewer shall sign the Design Summary drawings once all review issues raised have been resolved and the Design Summary drawings have been corrected accordingly. Design Summary drawings shall not be presented to the Corporation as part of the 'final version' of the Engineering Summary Report until all Design Summary drawings have been signed by the Third Party Reviewer.

3.9.8 Tender Documentation Review

- (a) The Third Party Reviewer shall review tender documents for items which are critical to the project outcome (e.g. large pumps, compressors etc) to verify that the correct Strategic Product Specifications have been used; and related Project Specific Requirements and Technical Compliance Schedules accurately reflect the approved design summary report and drawings.
- (b) Tenders shall not be called until the Third Party Reviewer has verified that the tender document specifications are correct.

NOTES:

1. The Third Party Reviewer is not expected to review tender documents in respect to commercial conditions.
2. At the discretion of the Design Manager, the tender recommendation (or major plant and machinery selection) shall be either reviewed independently or by qualified technical personnel within the Corporation prior to approval and placement of the order, or not reviewed depending upon the circumstances of each project.

3.9.9 Detail Design Drawings Review

Detail Design Review shall be undertaken in accordance with the following:

- (a) Detail Design Drawings prepared by the Designer shall be reviewed by a nominated internal reviewer in order to verify compliance with the approved Design Summary Drawings.
- (b) Detail Design Drawings prepared by the contractor shall be reviewed by the Designer in order to verify compliance with the approved Design Summary Drawings and associated contract documentation.

3.9.10 Vendor Drawings Review

In order to verify compliance with the contract document (and design intent) and in order to update the Design Summary drawings, the Designer shall review the vendor plant and machinery drawings (for approval prior to construction) presented by the supplier of plant and machinery.

3.9.11 Recommended Updates to Corporation Standards

The Third Party Reviewer may come across instances where changes to the Corporation's Mechanical Design Standards appear to be warranted. In such cases the Third Party Reviewer shall highlight these matters in the Review Report. The Design Manager will forward these to the Principal Engineer for consideration.

END OF DOCUMENT