

B-SPE-STD-005 Functional Description Documentation

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This Engineering Standard was endorsed by an RPEQ on behalf of Seqwater.						

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1. Purpose

This document is part of a suite of Seqwater Engineering Standards which are in alignment with the Seqwater Quality Management System. Their purpose is to provide a consistent approach to the development, modification, and management of Seqwater infrastructure that is fit for purpose, economic over the life of the asset, and meets Seqwater's Work Health and Safety obligations.

This Standard Specification provides the minimum requirements and recommendations for Functional Description documentation. This document must be used in conjunction with the documents it references to assist in ensuring fit for purpose infrastructure. This Standard Specification is not intended to be relied on solely for design, supply, and installation works; advice from specialist engineers and/or manufacturers may be required on a case-by-case basis.

2. Scope

This Standard Specification applies to all Seqwater employees, contractors, suppliers and consultants working for or on behalf of Seqwater unless otherwise stated. It applies to all new assets and to all existing assets undergoing refurbishment or modification. It must be used in conjunction with other relevant Seqwater Engineering Standards and project specific documents to define the technical requirements for infrastructure design and construction.

Where single or discrete components of an existing non-compliant system are to be replaced, refurbished or modified, this standard should not automatically be applied to the entire system retrospectively; however, consideration should be given, in consultation with relevant stakeholders, to the extent of the application of the standard outside of the components requiring replacement, refurbishment or modification, to ensure safe, economic, and fit for purpose infrastructure.

Seqwater Engineering Standards detail Seqwater's minimum requirements and recommendations to provide infrastructure that will be fit for purpose and safe to operate and maintain. However, compliance with these requirements and recommendations does not remove, and cannot be relied on as meeting, the designer's overarching responsibility for ensuring infrastructure designed is fit for purpose and safe to construct, operate, maintain, and demolish. The designer must exercise appropriate due diligence to identify and manage hazards so far as is reasonably practicable.

Designers must also ensure compliance with relevant Australian Legislation, Standards, Codes and Guidelines (including those produced by Water Services Association of Australia). Where no Australian Standard exists for a particular application, work must conform to the most current version of an industry accepted international standard.

Deviation from meeting the minimum requirements in this Standard Specification requires written agreement from Seqwater as per the deviation process detailed in Procedure X-PRO-STD-008 Asset Standards Management and Application. That process includes completion of an X-TMP-STD-022 Asset Standards Deviation Request Form and submission by the Seqwater Project Representative to the Seqwater Engineering Mailbox. Where noted in this Standard Specification that Seqwater approval, agreement, or acceptance shall/must be sought, such approval, agreement or acceptance must be gained through the Seqwater Asset Standard Deviation process as outlined above.

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Responsibility for ensuring compliance with Seqwater Engineering Standards lies with those engaged in the management and execution of design, construction, and modification of Seqwater infrastructure. This includes modifications to the functional design of the infrastructure including technical changes made which would extend an asset outside of its design operating envelope and/or approved operation and maintenance practices.

Any ambiguities or conflicts identified between specific requirements within this Standard and project documents, another Seqwater Engineering Standard or Australian Legislation, Standards, Codes or Guidelines, these must be brought to the attention of the Seqwater Document Owner, via the Engineering Mailbox, for clarification. Where it is proposed to proceed without meeting the requirements of this standard, agreement must be obtained via the Deviation Process as outlined above.

Seqwater undertakes regular updates of its Engineering Standards. Before utilising this Engineering Standard, the complete list of Seqwater Engineering Standards should be reviewed to ensure currency and applicability of standards to be applied to the works. These can be accessed on the Waternet Engineering and Asset Standards page or using the REX Saved Search "Engineering Stds Controlled Documents by CD Owner".

3. Functional Description Documentation

Functional Description documentation describes how an asset is to be controlled from a process and control system perspective. It is comprised of two parts, Parts A and B, each with supporting templates I-TMP-STD-001 Functional Description Part A ([TEM-00221](#)) & I-TMP-STD-005 Functional Description Part B ([TEM-00222](#)).

Each template has guidance or reference text outlined in each section.

The cause and effect matrix ([TEM-00327](#)) and master alarm list ([SPE-00357](#)) accompany the functional descriptions documentation and are to be submitted with Part A & Part B.

Part A & B documents do not include operational procedures. This is to be defined within Operations and Maintenance Manuals for the site.

The following sections describe the minimum requirements of each Functional Description Part A & Part B.

3.1. Part A

Part A describes the process control design of an asset. It outlines the requirements for the functional implementation of an entire plant. It shall reference the Piping and Instrumentation Diagrams (P&ID) and Cause and Effect Matrices (C&E) extensively. The key content is described in the following sub-sections. Where changes are required to an existing plant Part A document it shall comply with Process Control Systems - Information Maintenance Procedure ([PRO-02329](#)).

3.1.1. Process Envelopes & Process Operational Control Narratives

Part A summarises the process envelope, normal and abnormal operation and defines key barriers and mitigations to maintain the process in safe operational bounds. These concepts are described in detail in I-SPE-STD-013 Control Systems Design and Construction ([SPE-00361](#)). For the purposes of this specification, a summary of how it is applied to Part A is shown in Figure 1, in a simple two variable process envelope.

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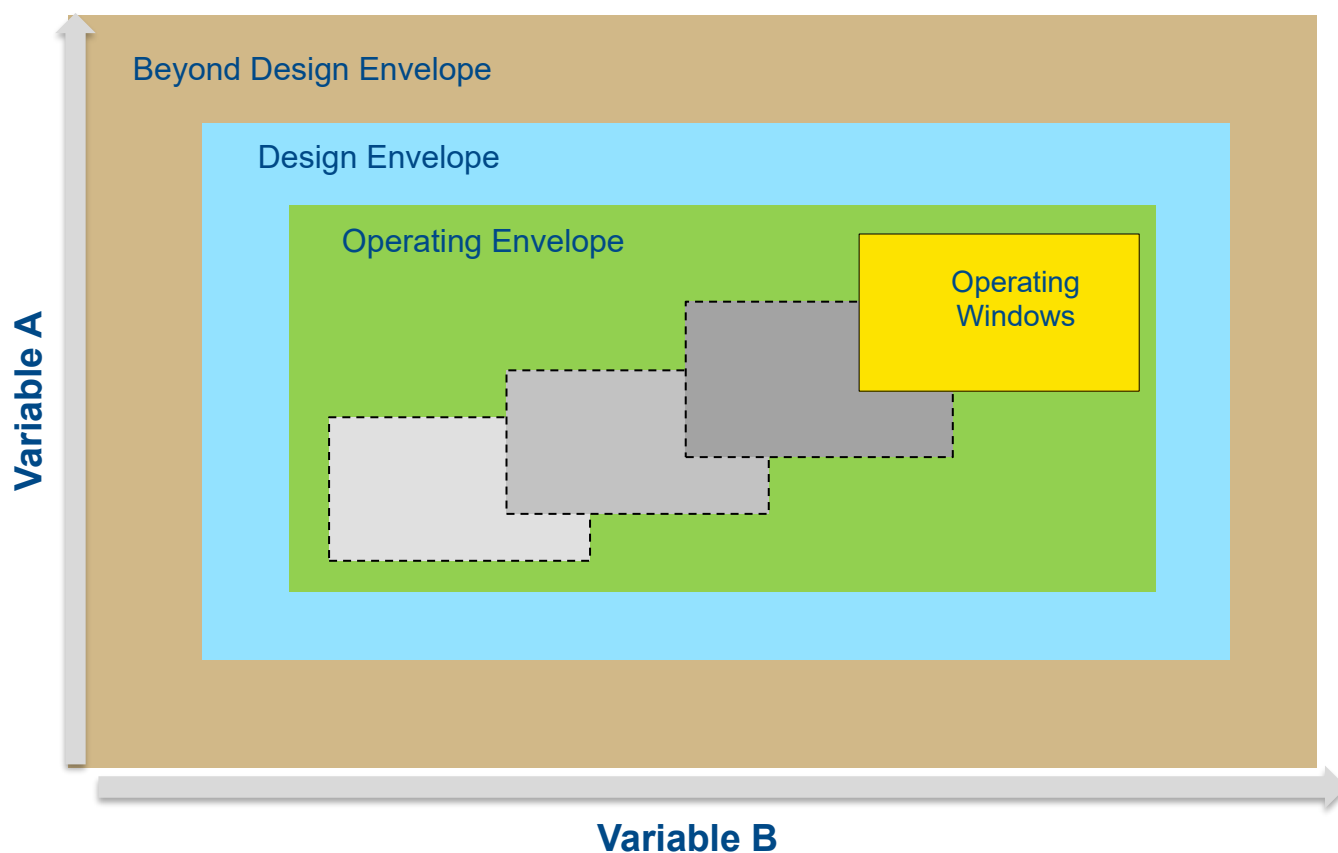


Figure 1 – Two variable process envelope schematic

The schematic represents:

Operating Envelope: In this operation the process would function within bounds that can be considered normal operation. In Part A, all operating envelopes should be described with bounds being quantified. Abnormal operation is also required in Part A, and these should be considered an alternative operating envelope. An example is operation with high turbidity raw water compared to normal operation with typical turbidity values. Processes that require sequences should be described. Limits or conditions as part of sequences that function to transition the process should be considered part of normal operation.

Design Envelope: The design envelope contains the operating envelope and a margin. Interlocks are typical mitigations (or safeguards) applied within this margin.

Beyond Design Envelope: The process should never deviate to beyond the design envelope as this would be an undesirable or unsafe state. In these conditions, the designer would typically turn focus towards minimising impacts of loss of control. A common example is chemical bunding for storage tanks. These types of mitigations can be noted in Part A for completeness.

Functional Description Part A includes the process operational control narrative; a description of how the process will be controlled within the operating envelope. This will include process permissives (previously referred to as process interlocks), start permissives, closed loop control including PID functionality, duty rotation, group control including start-up and shutdown, any process calculations and relevant process monitoring.

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3.1.2. Interlocks

A cause and effect matrix (see I-TMP-STD-013 Cause and Effect Matrix Template [TEM-00327](#)) is initially populated as part of the Part A document, it includes interlocks and must show hardware safety trips and trip interlocks.

Hardware interlocks, which are typically integral to equipment, should not be entered into cause and effect matrices and typically would be noted by exception in Part A.

Process permissives should not be considered as interlocks and should only be described in process operational control narratives.

3.1.3. Alarms

Alarms are often used where operator intervention is considered a sufficient risk mitigation (also called safeguard) to keep the process within its operating envelope or to alert an operator to a condition. These alarms must be documented in Part A and captured in the master alarm list (see I-SPE-STD-006 Alarm and Event Management for more details on alarms management [SPE-00357](#)). Alarm suppression requirements should be included in Part A, where known, for example suppress alarm X on plant start up until condition Y is met. The master alarm list should not be expected to be finalized during design development as alarms will continue to be identified and tuned through to commissioning.

3.1.4. Process Hierarchy

The process hierarchy is of critical importance to how the control system is structured. It is important to create a process hierarchy considering the process requirements first and not the code architecture, which is in Part B.

3.2. Part B

Part B is an extension on detail presented in Part A. It is a detail-oriented document that must provide sufficient detail for design implementation of the control system. Further details on sequencing, calculations, scaling, control system faults, interlocks and alarms are included. Other design documentation, such as IO List, architecture diagrams, electrical schematics or equipment datasheets, may be necessary inputs. PLC signal processing requirements are noted, which are important to consider when implementing changes.

3.2.1. Philosophy & Overview

Using the process hierarchy from Part A, the detail is now expanded to describe the control system hierarchy considering an object orientated approach. Each equipment is defined referencing the objects from Seqwater's block library. The overall plant control is defined for start-up and, shut down. Diagrams and tables should be used to describe the design.

3.2.2. PLC Configuration Details

The PLC that forms part of the control system should be summarised for context. Seqwater's library blocks used must be referenced. Importantly, any site-specific blocks developed with compliance to the requirements in I-SPE-STD-013 Control System Design and Construction ([SPE-00361](#)) shall be noted.

3.2.3. SCADA Configuration & Communication Details

SCADA configuration details should summarise the SCADA system from a functionality perspective. Key details should include SCADA library used, listing of graphic overview pages, reporting configuration and how other SCADA attributes are consistent with requirements noted in I-SPE-STD-013 Control System Design and

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Construction ([SPE-00361](#)). Site Specific SCADA components developed with compliance to the requirements in I-SPE-STD-013 shall be noted.

3.2.4. Process Group Descriptions

The bulk of Part B focusses on process group control and should include details such as calculations, control loops, sequence control, interlocks, permissives, alarms and set points. Part B should include cross references to other documents, for example alarms would be listed in the master alarm list, based on I-TMP-STD-008 Master Alarms Template ([TEM-00254](#)), but bespoke to each site.

Process operational control narratives and sequence descriptions contained in Part A, should not be repeated or re-engineered in Part B. The focus must be on translating Part A into content that can be used for implementation. The Part B template provides guidance and suggests using graphics and charts.

3.2.5. Interlocks

Hardware interlocks must be articulated in text in Part B. These interlocks typically are integral with equipment. Electrical schematics, mechanical datasheets and other sources of design documentation should be used for determination. Trip interlocks shall be documented in the cause and effect matrix from Part A. The cause and effect matrix may require update as part of Part B development.

3.2.6. Alarms

Alarms from the control system design, including standard alarms inherent in Seqwater's library should be listed in the master alarm list. These should augment those process driven alarms already identified in Part A. The master alarm list should develop through the design development.

At some point in the works design and implementation an alarm rationalising and assessment should be completed, see I-SPE-STD-006 Alarm and Event Management ([TEM-00254](#)) for details.

4. Summary

Table1 provides a summary of functional description documents and the key attributes.

Table1 Functional Description Purpose Definitions

	Part A	Part B
Custodian	Process engineer that is involved in process design defines the process envelope. Process engineer that is involved in process control defines process hierarchy and develops the detail for the specification of the control system, notably the barriers and mitigations (cause and effect).	Control systems engineer develops in conjunction with process engineer.

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	Part A	Part B
Context	Description of the process and operating conditions and limits. Maintained current for the life of the asset.	Detailed specification of the implementation of the content from Part A. Maintained current for the life of the asset.
Supplementary documentation	Cause and Effect Matrix Master Alarms List	Master Alarms List
Audience	- Operator - Control Systems Engineer - Project Team	- Engineers (various) - Project Team - Integrator
Outcome	Sets the basis for the Functional Description Part B. Also used for the O&M manual development.	Information is presented in sufficient detail for implementation in the control system. Forms the basis for testing and performance acceptance criteria.
Review Requirements	Document review should occur in alignment with process engineering deliverables.	Document can be started in parallel with completion of Part A, but cannot be completed without Part A, datasheets and schematics from other disciplines. Review should commence at a point in the project where there is still sufficient time allowance for PLC and SCADA programming and testing.
Controlled Document requirements	Maintained active for the life of the asset as per <i>X-PRO-STD-019 Process Control Systems Information Maintenance</i> (PRO-02329)	Maintained active for the life of the asset as per <i>X-PRO-STD-019 Process Control Systems Information Maintenance</i> (PRO-02329)
RPEQ Sign-off	As per X-PRO-STD-009 (PRO-01617), RPEQ signoff is required by an Engineer with appropriate competency. Typically, this is a Process / Chemical Engineer depending on scope and area of competence of the individual engineer.	As per X-PRO-STD-009 (PRO-01617), RPEQ signoff is required by an Engineer with appropriate competency. Typically, this is a Control System Engineer, depending on the scope and area of competence of the individual engineer.

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5. Definitions & Abbreviations

Table 2 Definitions and Abbreviations

Term	Definitions
Contractor	An entity engaged by Seqwater to undertake work in accordance with an agreed contract with a defined scope of work.
C&E	Cause and Effect Matrix
DTI	Digital, Technology & Information
Employees	Means persons employed directly by Seqwater in a permanent, temporary or casual capacity.
Integrator	Person or entity that implements the code in the control system.
I/O	Input / Output
Leader	Means any Level 1, 2, 3 and 4 Leader with responsibility for managing a functional area of the business, including people management responsibilities within their functional area.
Manufacturer / Supplier / Vendor / Original Equipment Manufacturer (OEM)	The entity that manufactures or supplies equipment to meet the specifications of the Contractor.
O&M	Operation & Maintenance manual
Owner / Principal / Seqwater	The entity that engages the Contractor to undertake the work and takes custody of the outcome. The Owner may delegate responsibilities to other entities to act on its behalf (e.g. a consultant).
P&ID	Piping & Instrumentation Diagram
PLC	Programmable Logic Controller
REX	Seqwater Electronic Document and Records Management System.
SCADA	Supervisory Control and Data Acquisition
Seqwater Approval / Agreement / Acceptance	Written sign-off gained via the deviation process, as detailed in X-PRO-STD-008 Asset Standards Management and Application Procedure.
Seqwater Engineering Standard	Includes Standard Procedures and Standard Specifications and associated supporting documents such as Standard Drawings, Guidelines, Lists, Datasheets, Manuals, Registers, and Templates.
Shall / must	Indicates a mandatory requirement.
Should	Indicates a recommendation.
WAN	Wide Area Network

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Term	Definitions
Worker(s)	Includes all permanent, temporary, and casual employees of Seqwater, and: • vocational and work experience placements • volunteers • suppliers, contractors, and consultants temporarily engaged to do work for or on behalf of Seqwater.

6. Roles and Responsibilities

Table 3 Roles and Responsibilities

Role	Responsibility
Leaders	In addition to the responsibilities of a worker, ensure compliance with this Standard Specification by those they lead.
Workers / Employees	Be aware of and comply with this Standard Specification

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7. References and Related Materials

The documents listed in Table 4 below, and the requirements therein, are relevant to this Standard Specification. In their latest editions, these documents form a part of this document. Note that this is not an exhaustive list of documents relevant to the works.

Seqwater undertakes regular updates of its Engineering Standards. Before utilising this document, the complete list of Seqwater Engineering Standards should be reviewed to ensure currency and applicability for the proposed works.

Table 4 Reference Seqwater Documentation

Asset Standard Document Number	Document Title	Waternet Reference
I-SPE-STD-005	High Priority Alarms & Interlocks Management	SPE-00356
I-SPE-STD-006	Alarm and Event Management	SPE-00357
I-SPE-STD-009	Control Systems Architecture	SPE-00358
I-SPE-STD-013	Control Systems Design and Construction	SPE-00361
I-TMP-STD-001	Functional Description Template Part A	TEM-00221
I-TMP-STD-005	Functional Description Part B Template	TEM-00222
I-TMP-STD-008	Master Alarms Template	TEM-00254
I-TMP-STD-013	Cause and Effect Matrix (C&E) Template	TEM-00327
X-PRO-STD-001	Asset Standards Document Classification and Naming Structure	PRO-01873
X-PRO-STD-002	Engineering Drawing Numbers Procedure	PRO-01872
X-PRO-STD-004	Development and Review of Asset Standards Procedure	PRO-01874
X-PRO-STD-006	Equipment Numbering and Naming Convention Procedure	PRO-02190
X-PRO-STD-007	Drawing & Spatial Data Standards Procedure	PRO-02187
X-PRO-STD-008	Asset Standards Management and Application Procedure	PRO-02205
X-PRO-STD-009	Engineering Design, Construction, Operation and Maintenance Procedure	PRO-01617
X-PRO-STD-019	Process Control Systems - Information Maintenance Procedure	PRO-02329
X-TMP-STD-022	Asset Standards Deviation Request Template	TEM-00224

8. Changes from previous version

This Standard Specification will be regularly reviewed in accordance with the requirements of the Seqwater Controlled Document Management Procedure. Reviews will include consideration of suggestions for alteration or improvement made in accordance with Seqwater Procedure X-PRO-STD-004 Development and Review of Asset Standards ([PRO-01874](#)). Changes made from the previous version are summarised in Table 5 below.

Table 5 Changes from previous version

Section Number	Change
New template	Integrated to new standards template.
Table1	Includes RPEQ requirements & supplementary documentation.
Whole document	Updated grammar, clarity on requirements of each document.

9. Version History

Rev	Date	Description	Author	SME	Owner	Approver
1	23/10/2015	Functional Description Documentation	K. Jones	K. Jones	L. Hellowell	G. Henry
2	18/12/2018	Functional Description Documentation	R. Blackburne	R. Blackburne	R. Blackburne	L. Hellowell
3	26/11/2021	Functional Description Documentation	R. Blackburne	R. Blackburne	R. Blackburne	P. Dunstan
4	21/11/2024	Functional Description Documentation	M. Sherman	M. Sherman	R. Blackburne	S. Russell

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