

AM2755

Testing, Commissioning, Completion and Handover Standard



Document History

Revision No.	Date	Revision Description
A0	Jan 2017	Original Version
A1	Sep 2017	Updated & reordered appendices
T0	Sep 2017	Addition of Treatment Plant content
2	Jul 2022	Restructure and widespread content change

Revision Working Group

Name	Position
Colin Paxman	Standards & Design Auditing Manager - Strategic Asset Management
Sean Lewis	Program Manager – Resource Recovery
Nick Stetter	Senior Project Engineer - Growth
Brandon Thomson	Senior Technical Advisor - Asset Performance & Resilience
Matthew Murphy	Commissioning Engineer – Operational Technology
Jayson Street	Technical Support Officer - Maintenance
Juha Myyrlainen	Electrical Engineer Technical Officer - Maintenance
Mark Read	Construction Site Supervisor - Resource Recovery
Michael Lowe	Senior M&E Engineer – Strategic Asset Management
Sebastien Piquet	Civil Design Lead - Strategic Asset Management
Marc Peril	Asset Management System Manager - Strategic Asset Management
Rob Jagger	Principal Engineer - CMP Consulting Group

Version 2 Approval

Name	Position	Signature	Date
Anthony Dean	Pipes and Structures Delivery Manager - Growth		14/10/22
Kristina Machena	Asset Integration Manager - Asset Performance & Resilience		21/10/22

Version 2 Authorisation

Name	Position	Signature	Date
Colin Paxman	Standards & Design Auditing Manager - Strategic Asset Management		25/10/22

Table of Contents

1.	Introduction	5
1.1.	Purpose & Scope	5
1.2.	Definitions	5
1.3.	SEW Overview	6
1.4.	Document Creation and Acceptance Process	6
1.5.	Records Management	6
1.6.	Standards	8
1.7.	Required Activities	12
1.8.	Tender Response / Proposal	14
2.	TCCH Plan Requirements	14
2.1.	TCCH Stakeholder Plan	14
2.2.	TCCH Team, Roles and Responsibilities	16
2.3.	TCCH Records Plan	17
2.4.	TCCH Progress Reporting	17
2.5.	TCP Delivery Plan	17
3.	TCP Requirements	17
3.1.	Testing and Inspections Process	19
3.2.	TCP Outline	19
3.3.	TCP Scheduling & Managing Operational Risks	21
3.4.	TCP Records Management	21
3.5.	Inspection and Test Plan (ITP)	22
3.6.	Factory Acceptance Testing (FAT)	22
3.7.	Site Acceptance Testing (SAT)	23
3.8.	SCADA Testing	23
3.9.	Construction Verification Walk	23
3.10.	Single System Testing (SST)	24
3.11.	Final Performance Testing (FPT)	25
4.	Deficiency Technical Resolution	26
5.	Post TCP Activities	27
5.1.	Practical Completion (PC)	27
5.2.	As Constructed Information Handover	27
5.3.	Operations Information Handover	28
5.3.1.	Hazard and Risk Control Information	28
5.3.2.	Operations Manual	28
5.3.3.	Standard Operating Procedures	28
5.4.	Equipment Information	29
5.4.1.	Vendor Information	29
5.4.2.	Recommended Maintenance	30
5.4.3.	Spare Parts and Special Tools	30
5.4.4.	Permits and Certificates	31
5.4.5.	Warranty Register	31
5.5.	Check & Upload of Information to SEW systems	31
5.6.	Training	32
5.7.	Completion	32
5.8.	Operations and Maintenance Transfer	33
5.9.	End of Defects / Warrantee Application	33
5.9.1.	Handover of Updated As Constructed and O&M information	33
5.10.	End of Defects / Warranty Assessment & Acceptance	33

< Appendix A- TCCH Plan Template>	34
TCCH Plan	34
A. Stakeholder Plan	34
B. Roles and Responsibilities	35
C. Progress Reporting	35
D. TCP Outline	35
E. TCP Scheduling & Managing Operational Risks	36
F. Construction Verification Walk	36
G. SST and FPT Approach	36
H. Records Plan	37
i. TCP Records Management	37
ii. As Constructed Information Handover	37
iii. Operations Information Handover	37
iv. Equipment Information Handover	37
Appendix B – Contractor Application for Completion	38
Appendix C – Completion Certificate	39
Appendix D – Transfer to Operations Certificate	40

1. Introduction

1.1. Purpose & Scope

The Testing, Commissioning, Completion and Handover (TCCH) Standard documents the integration measures that shall be implemented as part of bringing newly constructed, upgraded or renewed assets into service. This applies to all Water and Sewerage assets, including pipelines, network facilities and Treatment Plants.

The purpose of the TCCH standard is to ensure assets:

- a) function correctly and meet the project's objectives
- b) are of a suitable durability and reliability
- c) meet all relevant Technical Standards
- d) satisfy SEW's product and material requirements
- e) integrate correctly with other existing and proposed assets
- f) can be safely and effectively operated and maintained once in service
- g) have all necessary records and information loaded to SEW's systems

1.2. Definitions

Table 1: Abbreviations and Definitions

Term	Definition
Acceptance	General agreement that something is satisfactory. Note that SEW acceptance does not abdicate the need to comply with the executed contract, associated schedules or any subsequent written agreements
Critical Assets	Assets which have no redundancy that are necessary for achieving the primary functional objectives of the project
Deficiency	A short coming or failing. An aspect of a plan, design, document or installed asset which does not meet the project requirements
Network Facility	SPS (Sewage Pump Station), ATF (Air Treatment Facility), CDU (Chemical Dosing Facility), WPS (Water Pump Station), WRS (Water Reservoir), WTS (Water Tank), PRS (Pressure Reducing Station)
Punchlist	List of deficiencies, with each Deficiency categorised into levels A, B, C and D, with Deficiency status (eg: identified, under resolution, closed) and a description of proposed action(s).
Specialised items	Items which are not pre-approved or certified to a relevant standard. Items that are not available off the shelf that need to be made to order.
Single system	A hydraulic, electrical, mechanical or biological system, process or plant area. Term only used where there are multiple single systems involved in the project.
IFR	Issued for Review
IFC	Issued for Construction
RACI	Responsible, Accountable, Consulted, Informed
TCCH	Testing, Commissioning, Completion and Handover
TCP	Testing and Commissioning Plan (part of TCCH Plan)
ITP	Inspection and Test Plan (part of TCP)
ITR	Inspection and Test Records (resulting from ITP)

FAT	Factory Acceptance Testing (part of TCP)
SAT	Site Acceptance Testing (part of TCP)
SCADA	Supervisory Control and Data Acquisition (part of TCP)
SST	Sub-System Testing (part of TCP)
FPT	Functional Performance Testing (part of TCP) (of all inter-dependant systems or processes)
WRP	Water Recycling Plant

1.3. SEW Overview

SEW manages a large variety of assets delivered under a variety of asset creation delivery models (eg: Major Projects, Pipes and Structures (Design and Construct), Land Development, Renewals, capital maintenance, Connections, Minor Works etc). While the TCCH approach varies depending on the scale, complexity and delivery model of the project, the same basic principles apply in all cases and this TCCH standard supports asset acquisition through a range of commercial models / agreements.

This standard excludes commercial and contractual requirements which are covered by other project documents. This standard **does not negate** the need to comply with the testing, commissioning, completion and handover requirements specified in other project documents. Refer to section 1.7 for an explanation of the order of precedence of TCCH related documents.

This document sets out the overarching TCCH framework and provides information on the specific TCCH standards and requirements that shall apply to different assets.

1.4. Document Creation and Acceptance Process

Submission of, acceptance of and notification for each element of TCCH shall track the following process:

- a) The Contractor prepares a document in consultation with the parties defined in the approved Stakeholder Plan (refer section 2.1) and in accordance with this standard. Note that this may not be required where a SEW standard form or checklist is being used.
- b) The Contractor submits IFR document to "accountable", "informed" and "consulted" parties in accordance with the approved Consultation Plan.
- c) The relevant parties provide feedback on the document(s).
- d) The Contractor refines the document(s) until SEW acceptance is attained. Acceptance is attained when the parties marked as "accountable" in the Consultation Plan provides feedback in writing to the Contractor that they accept the document. Acceptance is not required from parties that are "consulted" or "informed".
- e) The Contractor marks the document as complete (ie: IFC) and publishes the document.

1.5. Records Management

The TCCH records management system which includes how records are drafted, approved, stored and made available shall be agreed upon by all parties. Prior to Completion, the entire TCCH records directory shall be provided electronically by either:

- A) Handing it over copied on two USB memory sticks, or

B) Making it available on a web based shared file storage system.

All TCCH records shall be provided in electronic format, with scanned images of any work completed on paper.

All TCCH records shall clearly indicate:

- 1) The origin of the record (eg: SEW standard, Contractor standard, project specific document).
- 2) The person(s) (at least first initial and surname) involved in developing, approving and accepting the record.
- 3) The revision of the record.
Any document in draft form (ie: not yet accepted) shall clearly indicated this fact (eg: be in a “draft” directory and have the word “draft” in the document title). Any finalised document (accepted) shall clearly indicate this fact (be in the “finalised” directory and have the word “final” in the document title).
- 4) The date of the revision.
- 5) Signatures for approval and acceptance of the record.

TCCH records shall be kept in a directory, with sub-directories which match the categories and hierarchy adopted which shall conform to the approach demonstrated in Figure 1 below.

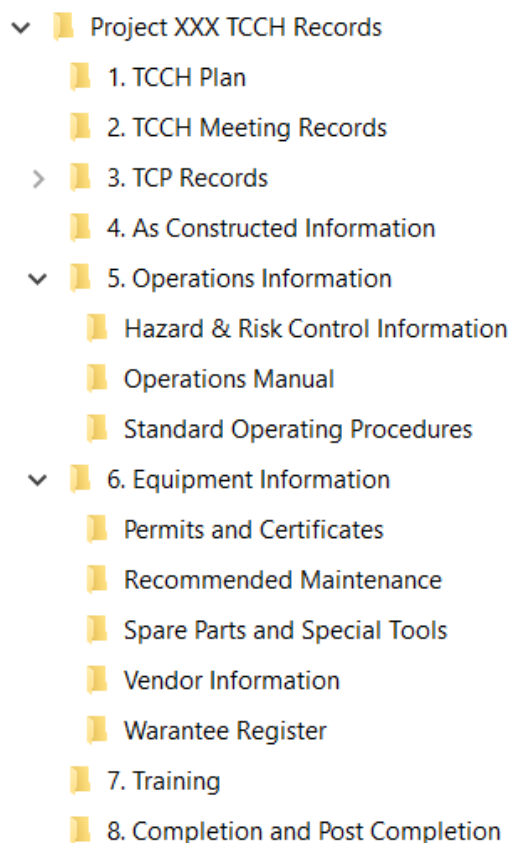


Figure 1: Example Directory Structure for TCCH Records
Refer to section 2.3 for an example of a TCP Records breakdown.

1.6. Standards

There are a number of types of Technical Standards that include TCCH requirements as illustrated in Figure 2 and listed in Table 2. Where a project requires TCCH standards that are not available for facilities, asset types, equipment or asset information systems, this needs to be flagged at project inception and a process agreed on for developing these requirements in the early phase of the project.

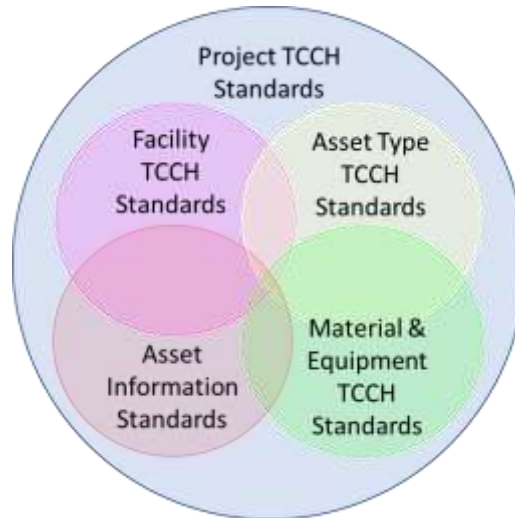


Figure 2: Overview of Types of SEW TCCH Standards

Table 2: Relevant TCCH Documents:

Doc Type	Relevance	TCCH Relevant Document and Intent of the Document
Generic Project Standards	All assets	AM2755 Testing, Commissioning, Completion and Handover (this document). This is an “umbrella” document that provides an overview of TCCH requirements, referencing other existing standards which have more detailed TCCH requirements and providing generic TCCH requirements for Facilities / Asset Types / Materials and Equipment that are not covered completely by existing standards.
Asset Information Standards	All assets	<ul style="list-style-type: none"> • AM2488 SEW Drafting Specification. Provides information on how As Constructed drawings are to be prepared and lodged. • MRWA Survey Manual. Documents the requirements of As Constructed information provided for Water Supply, Pressure Sewage and Sewerage assets (predominantly focused on pipelines). • AM2775 Maximo Facility Data Collection Details. lists the product information to be provided for a large variety of equipment commonly used in water industry assets.
Facility Standards	Sewage Pump Stations	<ul style="list-style-type: none"> • WSA04 Sewage Pump Station Code. Documents the requirements for product and materials checks, acceptance, and quarantine. Broadly outlines the requirements of civil, electrical, mechanical, instrumentation and control system tests and checks, acceptance testing and commissioning. Describes As Constructed asset tolerances.

		<ul style="list-style-type: none"> • SEW Supplement to WSA04. Includes a number of TCCH related checklists / forms that are required to be completed and provided to SEW, including: <ul style="list-style-type: none"> i. Submission of Pre-commissioning Documentation ii. Procedure for Performance Testing of Pumps iii. Schedule of Documents to Submit • AM2780 (refer SCADA standards section)
	Water Recycling Plants	Volume 1 Project Specification Template
	Air Treatment Facilities	AM2776.3 Air Phase Treatment Unit Specification. Includes a commissioning checklist and a section on performance testing requirements.
	Chemical Dosing Units	AM2776.4 Sewerage Chemical Dosing Standard. Includes a section on testing and commissioning.
Asset Type Standards	SCADA, Treatment Plants	<ul style="list-style-type: none"> • WRP SCADA Standards (available on request) Describes the WRP requirements of control and telemetry systems and integration of these systems into the SEW SCADA system.
	SCADA, Network Assets	<ul style="list-style-type: none"> • AM2780 SPS PLC, RTU and SCADA Specification. Describes the SPS requirements of control and telemetry systems and integration of these systems into the SEW SCADA system. • SCADA Commissioning Process – New Network Assets Flow chart of the steps required to commission and place in service new SCADA at network assets. Available on request.
	Electrical, Instrumentation & Control	<ul style="list-style-type: none"> • AM2851 – EIC Inspection, Testing and Completion. Includes details on EIC TCCH requirements. • AM2714 – Electrical Standard. Includes pre-commissioning (ITP) and contractor submission requirements. • AM2832 – Instrumentation & Controls Standards. Includes instrument calibration record standard form and a standard flow meter installation form. • AM2851 EIC Inspection, Testing & Completion. Includes all inspections, testing and final submission requirements for electrical installations, including instrument calibration, communications cable testing and electrical FAT and SAT. • AM2717 Standby Diesel Generator Specification. Includes a section on testing and commissioning and a section on documentation requirements. • AM2847 Communications Standard. Includes a section on testing of communications cables. • AS 3000 – Electrical Installations. Includes section 8 on verification (inspections and testing).

Mechanical Equipment	<p>AS 4024 – Safety of Machinery Provides information on the design, installation and validation of machines, focusing on safety outcomes.</p>
Plant	<p>Worksafe Victoria Compliance Code – Plant</p>
Sewerage Pipelines & Structures	<ul style="list-style-type: none"> • WSA 02 Sewerage Code of Australia. Documents the requirements for product and materials checks, acceptance, and quarantine. Specifies in detail the requirements of pressure / vacuum, ovality, infiltration, inspections and CCTV testing of sewerage pipelines and structures. Describes As Constructed asset tolerances. • MRWA Sewerage Standards. Describes the detailed requirements of sewerage assets, from which ITP checklists would normally be based.
Water Supply Pipelines	<ul style="list-style-type: none"> • WSA 02 Water Supply Code of Australia. Documents the requirements for product and materials checks, acceptance, and quarantine. Specifies in detail the requirements of swabbing, pressure testing, weld testing, coating integrity testing and inspections of water supply assets (applicable to other pressure pipelines). Describes As Constructed asset tolerances. • MRWA Water Supply Standards. MRWA-W-308 and 309 in particular document specific swabbing, testing and chlorination requirements. Describes the detailed requirements of water supply assets, from which ITP checklists would normally be based. • MRWA Water Quality Compliance Specification 04-02. Documents requirements specific to ensuring Water Quality is adequate. Includes storage, handling, hygiene, Water Quality testing and chlorination requirements.
Pressure Sewer Systems	<ul style="list-style-type: none"> • WSA 07 Pressure Sewerage Code. Documents Quality Assurance measures (covering product assessment criteria applicable to ITPs and FATs). Specifies in detail the inspections requirements and a number of tests for pipelines and pump units. Describes As Constructed asset tolerances. • MRWA Supplement to WSA 07 Pressure Sewerage Code. Describes MRWA variations from the standard WSA 07 code. • MRWA Standard Pressure Sewerage Drawings. Describes the detailed requirements of pressure sewerage assets, from which ITP checklists would normally be based.
Buried Pipes and Structures	<p>MRWA Backfill Specification 04-03. This document includes the requirements of testing backfill.</p>
Buildings	<ul style="list-style-type: none"> • National Construction Code and Associated Australian Standards. Describes in detail the requirements of buildings and related services, from which ITP checklists would normally be based. Includes a section in Volume 3 on the Performance Verification requirements of buildings. Includes a Bushfire Verification Method handbook.

		<ul style="list-style-type: none"> • Australian Standard SA TS 5342:2021, Building Commissioning Technical Specification Outlines a standard building commissioning process including HVAC&R, electrical, fire protection and hydraulics, architectural automated building elements and smart building information technology.
Materials and Equipment Standards	Submersible Pumps	<p>WSA 101 – Industry Standard for Submersible Pumps Describes in detail the requirements of submersible pumps, from which ITP checklists would normally be based.</p>
	Pumps	<p>AS 2417 Rotodynamic Pumps Hydraulic Performance. Includes a section on the Testing requirements of submersible pumps.</p>
	Coatings and Linings	<p>WSA 201 – Manual for Selection & Application of Coatings. Documents the testing and inspection requirements for an extensive range of coating and lining systems.</p>
	Concrete and Quarry Products	<p>VicRoads - RC 500.16 Testing of Materials and Work. Lists the testing standards to be applied</p>
	Welded steel fabrications and structures	<ul style="list-style-type: none"> • AS1554.1 covers steel structures jointing and assembly requirements. Refer to Special Purpose (SP). • AS3993 covers testing methodology of welds. SEW requires 100% visual inspection, 5% Magnetic Particle Inspection (MPI) testing for general welds and 100% MPI testing for lifting point, doubler plate and critical welds. • AS1657 appendices cover inspections and testing requirements for fixed platforms, walkways, stairways and ladders. • AS4680 covers galvanising testing and inspection.
	Composite (FRP / GRP) Fabrications	<ul style="list-style-type: none"> • ASTM D638 covers tensile strength testing of composites. • ASTM D790 covers flexural strength testing of composites. • ASTM D4813 covers impact testing of composites. <p>The assumed tensile strength, flexural strength and impact assumed in each Specialised Item laminate design (each combination of reinforcement and plastic) shall be confirmed through testing.</p>
	WSAA Product Specifications	<p>While not stating test requirements explicitly, these specifications do list the criteria and other applicable standards that products should comply to. They outline the product requirements that ITPs should cover.</p>

Where there is an overlap of TCH requirements documented in technical standards or other project documents, the following precedence shall be adopted:

- a) Compliance Codes (ie: Worksafe)
- b) Other Project Documents (eg: contracts (and schedules), land development deeds, property connect arrangements, Montage (works) management arrangements)
- c) SEW Facility Standards
- d) SEW Asset Type Standards
- e) SEW Generic Standards

- f) MRWA Asset Type Standards
- g) WSAA Facility Standards
- h) WSAA Asset Type Standards
- i) WSAA Materials and Equipment Standards.

1.7. Required Activities

Different projects require different TCCH activities. Table 3 describes typical project categories, the types of assets created in each case and the TCCH activities that are typically required in each case. Land Development Projects require some activities in addition to that described in this document. Refer to the Land Development Policies and Pricing Manual for further information.

Table 3: Typical Project Types, Assets Created and TCCH Activities Required:

Protect Type	Assets	Typical TCCH Activities Required
Standard buried pipelines (without specialised items)	Reticulation, and some larger pipelines and connection assets	<ul style="list-style-type: none"> • TCP (only for larger pipelines) • ITP & ITR • FAT (only for pipelines with Specialised items) • Construction Verification Walk
Specialised buried pipelines (with specialised items)	Larger pipelines with steel or GRP special fabrications	<ul style="list-style-type: none"> • WSA 02 &/or WSA 03 &/or WSA04 &/or WSA07 described requirements • PC (only if bringing new assets into operation is urgent) • As Constructed information Handover • Completion / Construction Verification • End of Defects / Defects Liability / Warrantee Period
Affect single plant area / system / process	Standalone Network Facility. Single WRP plant area	<ul style="list-style-type: none"> • Preparation of Commissioning Requirements • TCCH Plan • TCP • Records Plan
Affect multiple plant areas / systems / processes	Integration of two or more Network Facilities (ie: SPS + ATF, or WPS + PRV). Multiple WRP plant areas.	<ul style="list-style-type: none"> • ITP & ITR • FAT & SAT (of specialised items) • SCADA Testing • Construction Verification Walk • SST (only if Multiple systems or plant areas etc) • FPT • PC (only if bringing new assets into operation is urgent) • As Constructed information Handover • Operations Information Handover • Equipment Information Handover • Training • Operations Acceptance Certificate • Completion / Construction Verification • End of Defects / Defects Liability / Warrantee Period

Table 4: Typical TCCH Activity Sequence:

Step	Activity	Accountability	Timeframe
1	Preparation of Commissioning Requirements	Designer	During Design
2	Preparation of TCCH Outline	Contractor	During preparation of the response / proposal.
3	Preparation of the TCCH Plan	Constructor	During design (if D&C contract) or at Project Inception (if construction only contract)
Construction and Table 5 activities			Entire project life
4	SCADA Points Testing		Prior to SST / FPT
5	Construction Verification Walk		Prior to SST / FPT
6	Single System Testing (only if multiple plant areas / processes)		After completion of steps 1 to 5
7	Final Performance Testing		After completion of steps 1 to 6
8	Practical Completion and placement of the asset(s) into service (only if bringing new assets into operation is urgent) *		SEW Project Manager
9	As Constructed, Operations and Equipment Information Handover	Constructor	After completion of steps 1 to 8 and > 2 weeks prior to Completion
10	Training		Before completion
11	Completion (for SEW procured construction)	SEW Project Manager	When all deficiencies resolved, all information provided and necessary training undertaken
	Construction Verification (for Land Development constructed assets)		
12	Go live. Place the asset(s) into service. Transfer to Operations		On finalisation of completion certificate from the SEW Project Manager
13	End of Defects / Warrantee Application	Constructor	After defects liability period has lapsed
14	End of Defects / Warranty Assessment & Acceptance	SEW Project Manager	After constructor application reviewed and accepted

* The Project Contract and/or referenced schedules and/or specification shall specify if PC is required for what aspects of the project.

Table 5: Typical TCCH Activities which May Occur Repeatedly Throughout the Life of Projects:

Activity	Term	Relevant Projects	Accountability	Timeframe
Preparation of Inspection and Test Plan	ITP	All	Refer Table 4	Initial ITP developed at project inception. ITP typically evolves throughout construction
Inspection and Testing Records	ITR	All		Occurs throughout construction
Factory Acceptance Testing (of specialised items)	FAT	All except Specialised Pipelines		Prior to shipping to site from the factory
Site Acceptance Testing (of installed specialised items)	SAT	All except Specialised Pipelines		After installation on site
Deficiency and Improvement Identification		All	All Parties	Until End of Defects / Warrantee period
Deficiency and Improvement Resolution		All	Constructor	

1.8. Tender Response / Proposal

A draft outline of the TCCH Plan shall be provided in the tender response / proposal. It shall include a first draft of the completed TCCH template in Appendix A, at least to a level whereby it is clear what activities will be undertaken and documents will be produced, with an outline of each activity and document.

2. TCCH Plan Requirements

The Contractor shall prepare a TCCH plan which meets the requirements of this document, formatted in accordance with the template provided in Appendix A. The TCCH plan shall include all TCP activities and post TCP activities.

2.1. TCCH Stakeholder Plan

TCCH activities typically require significant consultation with SEW, especially those relating to TCP activities on more complex projects. A TCCH Stakeholder Plan shall be prepared and submitted to describe the approach, timing, duration, personnel and expected meeting intervals for consultation activities.

A RACI Stakeholder Matrix shall be prepared as part of the Stakeholder Plan which shall be completed in accordance with the example shown in Table 6 below:

Table 6: Example RACI Stakeholder Matrix

Item	Activity / Deliverable	Contractor	SEW PM	SEW Planning	SEW Design	SEW Construction Auditor *	Enviro / Engage Teams	SEW People & Safety	Asset Int. ***	SEW O&M ~	Comments
1	TCP Preparation	⊙	⊙	⊙ **	⊙				⊙		
2	TCP Final Draft	⊙	⊙	⊙	⊙	⊙			⊙	⊙	
3	ITP / FAT / SAT Preparation	⊙	⊙		⊙		⊙		⊙		
4	ITP / FAT / SAT Final Draft	⊙	⊙		⊙	⊙	⊙		⊙	⊙	
5	Construction Audits	⊙	⊙			⊙	⊙				
6	Construction Verification Walk	⊙	⊙		⊙	⊙		⊙	⊙	⊙	
7	SST / FPT Preparation	⊙	⊙		⊙		⊙		⊙		
8	SST / FPT Final Draft	⊙	⊙	⊙	⊙	⊙	⊙		⊙	⊙	
9	Deficiency Response Planning	⊙	⊙		⊙				⊙		
10	Deficiency Resolution	⊙	⊙		⊙	⊙	⊙		⊙	⊙	
11	As Constructed Information	⊙	⊙						⊙	⊙	
12	Operations Information	⊙	⊙						⊙	⊙	
13	Equipment Information	⊙	⊙						⊙	⊙	
13	Operations Acceptance	⊙	⊙						⊙	⊙	
14	Completion	⊙	⊙	⊙	⊙				⊙	⊙	
16	End of Defects	⊙	⊙						⊙	⊙	

Table Legend:

- ⊙ Responsible (R) The party responsible for the delivery of the outcome or deliverable.
- ⊙ Accountable (A) The party accountable for accepting the outcome or deliverable.
- ⊙ Consulted (C) Any parties required to be consulted in the development of the outcome or deliverable.
- ⊙ Informed (I) Any parties required to be informed of the outcome or deliverable.
- ⊙ Witness (W) Any parties required to witness the outcome or deliverable.

Table Notes:

* Construction Auditor may be Land Development or P&S team as defined in project documentation.

** Treatment Plant Planning only is involved with TCP Acceptance. Sewer & Water planning not involved.

*** For Treatment Plant projects the stakeholder in this column is to be replaced with SEW O&M.

~ SEW O&M Column activities/deliverables refer to network type projects (not Treatment Plants as per above note).

2.2. TCCH Team, Roles and Responsibilities

The TCCH plan shall include a section which documents the TCCH team members and the roles and responsibilities of each team member. It shall include all participants involved in TCCH activities, including SEW employees. It shall include at least the following information for each participating person:

Table 7: Example Contractor Team Member Details & TCCH Duties

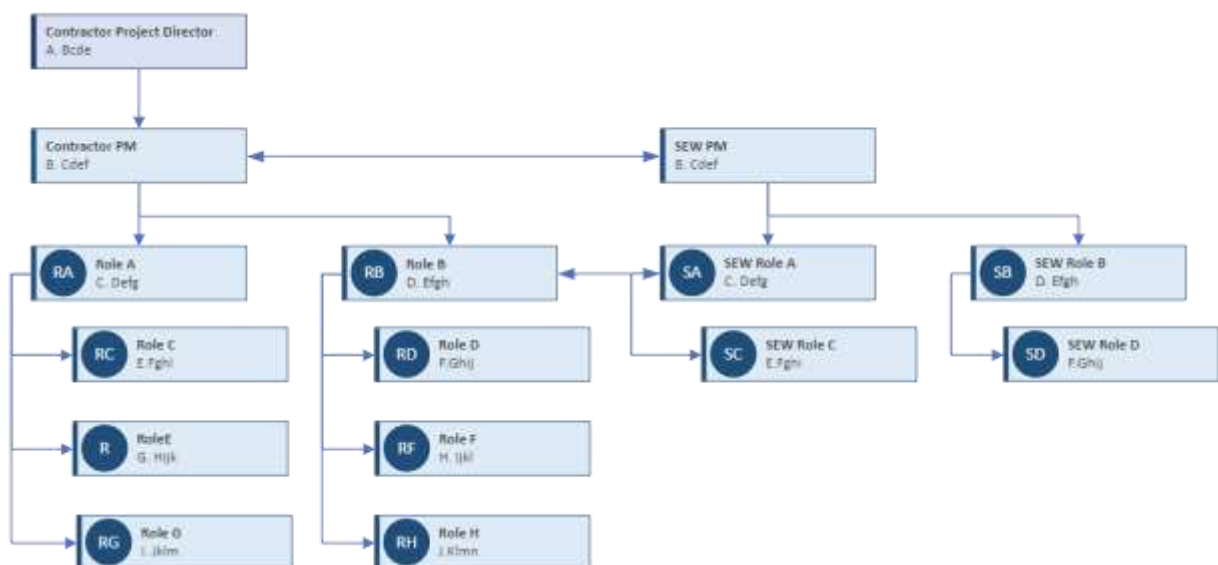
Full Name	Role Title	Email	Phone	ITP/ ITR	FAT / SAT	SCA DA	C.V Walk	SST	FPT	As Con Info	Operations Info	Equip Info
Freya Barli	Position X	f.barli@ ...	XXXX XXX XXX	R	R/W	R/W	R	C	C	I	I	I

The role definitions defined in the table legend under Table 6 shall apply to Table 7.

Table 8: Example of SEW Team Member Details

Full Name	Role Title	Email	Phone	SEW Team
Fred Whey	As Con Officer	f.barli@ ...	XXXX XXX XXX	Operations

This section of the TCCH plan shall also describe the organisational hierarchy of the commissioning team, typically in a diagrammatic fashion as per Figure 3 that clearly shows the chain of authority and the lines of reporting and communication.



2.3. TCCH Records Plan

As part of the TCCH Plan, the Contractor shall provide a schedule a Records Plan outlining all of the documents that will be delivered to SEW prior to Completion.

The Records Plan shall at least include the following information:

- a) What documentation will be delivered.
This Records Plan shall at least include all relevant records described in section 1.4, Figure 1.
- b) The format / standard / basis of the documentation.
- c) The delivery timing of each phase (refer section 1.7) of documentation development.
- d) The directory structure of the Records Plan (refer section 1.4, Figure 1).

Where PC is to be included as a required TCCH activity (refer section 5.1), the Records Plan shall indicate when and what preliminary records and undertakings will be provided prior to PC.

2.4. TCCH Progress Reporting

The TCCH plan shall describe how TCCH progress will be reported. Progress reporting shall be integrated with other project reporting requirements where practical. Typically updates on TCCH activities (planning, execution and results) will be included in the next scheduled project report and/or management meeting, after drafts of plans and procedures have been prepared or after results have been completed.

Reporting on TCCH planning, results and Deficiencies shall be provided regularly through the life of the project within 2 weeks of each event starting / concluding.

2.5. TCP Delivery Plan

Refer Appendix A and section 3 for requirements.

3. TCP Requirements

A TCP may not be required if the asset creation process being used follows a well-established standardised process (eg: small diameter pipeline projects). The TCP activities to be undertaken depend on the asset(s) being constructed as documented in Table 3.

The TCP shall describe how all project requirements will be validated and shall ensure that all requirements determined through the following consultation and engagement processes have been validated:

- a) Community engagement
- b) Environment and heritage engagement
- c) Council and other authority engagement

- d) Safety in Design
- e) HAZOP &/or CHAIR

3.1. Testing and Inspections Process

Submission of, acceptance of, notification of and completion of each element of the TCP shall track the following process:

- a) The Contractor prepares and obtains acceptance for TCP documentation in accordance with section 1.42.2.
- b) The Contractor notifies the relevant parties of intent to carry out inspection and/or testing in accordance with the Stakeholder Plan (refer section 2.1).
- c) The Contractor undertakes inspections and/or testing while the required witnesses are present.
- d) The Contractor submits inspections and/or test results.
- e) SEW accepts inspections and/or test results (if required), or
- f) The Contractor resolves Deficiencies in accordance with section 0.
- g) The Contractor updates the records directory (refer section 3.4).

Table 4 provides an overview of TCP activities and implementation staging.

3.2. TCP Outline

The TCP shall firstly outline the strategy and approach to how all created and affected assets will be inspected, tested and commissioned.

TCP activities shall escalate through the levels as follows:

- | | |
|---------------------------------|---|
| a) Component Level- | ITP / ITR- refer section 3.5 |
| b) Equipment or Assembly Level- | FAT &/or SAT- refer sections 3.6 and 3.7 |
| c) Single System Level- | SST- refer section 3.10 |
| d) Integrated System Level- | SCADA testing – refer section 3.8 |
| | Construction Verification Walk- refer section 3.9 |
| | FPT- refer section 3.11 |

The TCP and associated testing and commissioning procedures and/or checklists shall be prepared for all assets at each level (refer Table 9) and for the entire project (refer Table 10). Inspections and testing of assets should be undertaken as early as possible to ensure that Deficiencies can be corrected before later testing is undertaken.

The optimum way of segregating assets, systems and / or plant areas for inspections and testing should be documented in the TCP outline. **Documents prepared for each of the outlined TCP activities (eg: Ref doc AA, Ref doc AB etc in Table 9 & 10) shall reference the relevant standards from section 1.6 that apply to that asset.**

Table 9: Example of TCP Activity Breakdown (Biological Reactor Project)

Asset		ITP/ ITR	FAT / SAT	SST
Reactor Aeration				Ref doc AA
	Blower		Ref doc AE	
	Mechanical checks	Ref doc AB		
	Power system checks	Ref doc AC		
	Protection and instrument checks	Ref doc AD		
	Pneumatic pipelines	Ref doc AF		
	Diffusors	Ref doc AG	Ref doc AH	
Reactor Hydraulics				Ref doc AI
	Inlet piping	Ref doc AJ		
	WAS pumps		Ref doc AN	
	Mechanical checks	Ref doc AK		
	Power system checks	Ref doc AL		
	Protection and instrument checks	Ref doc AM		
	WAS piping	Ref doc AN		
	RAS pumps		Ref doc AR	
	Mechanical checks	Ref doc AO		
	Power system checks	Ref doc AP		
	Protection and instrument checks	Ref doc AQ		
	RAS piping	Ref doc AS		
	Supernatant collection system	Ref doc AT	Ref doc AU	
Reactor Structure		Ref doc AV		Ref doc BV
	Foundations	Ref doc AW		
	Concrete	Ref doc AX		
	Coatings	Ref doc AY		
Human access structures		Ref doc AZ		
Switchboard		Ref doc BA	Ref doc BB	

Table 10: Example of TCP Activities for the Entire Project

Asset	SCADA Testing	Construction Verification Walk	FPT	Deficiency Punchlist
Entire Reactor	Ref doc BD	Ref doc BE	Ref doc BF	Ref doc BG

Start and finish dates and hold points for the planning and completion of all significant TCP activities (at least Construction Verification Walk, SST and FPT) shall be included in the main project schedule.

3.3. TCP Scheduling & Managing Operational Risks

TCP activities shall be scheduled to ensure that necessary operational requirements can continue to be met as new or altered assets are tested, inspected and then brought into service. Undertaking TCP activities in conjunction with or near operating assets can be complex, time consuming and risky. The scheduling and planning of testing and the cut over of new assets shall be undertaken in accordance with the agreed TCCH Stakeholder Plan (refer section 2.1). Testing and cut over risks shall be adequately managed, temporary operating activities implemented and contingencies put in place where necessary.

3.4. TCP Records Management

TCP records shall be kept in a dedicated sub-directory within the TCCH directory, with sub-directories which match the categories and hierarchy adopted in the TCP outline (refer Table 9 and 10) as demonstrated in Figure 4 below.

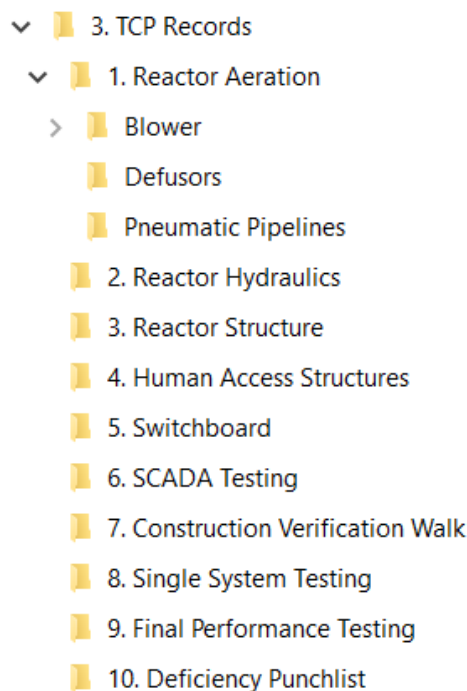


Figure 4: Example Directory Structure for TCP Records

The following information shall be provided for all TCP activities:

- 1) All procedural and methodology information adopted in the test and / or inspection.
- 2) All numerical or qualitative information gathered.
- 3) A comparison of the Requirement VS the Result. This shall include a summary of any inspections and test results that did and did not meet the acceptance criteria (ie: the identified Deficiencies).

- 4) Conclusions from the inspections and testing activity.
- 5) Any Deficiency Technical Resolution correspondence and conclusions (refer section 0).

3.5. Inspection and Test Plan (ITP)

ITP implementation may be considered part of pre-commissioning.

An ITP is required to document when, what and how inspections and testing will be conducted to ensure that work meets the project requirements. It details the critical points at various stages within the construction process for scheduled inspections and verifications to make sure the job is progressing as it should be. The ITP shall be developed, reviewed, approved and accepted in accordance with the TCCH Stakeholder Plan (refer section 2.1).

ITPs often document the initial inspections and testing that should be completed to ensure that later completed SAT, Construction Verification Walk, SST and FPT inspections and testing are successful with minimal Deficiency generation.

ITP inspections and testing would typically be undertaken to confirm:

- 1) That the correct items (products and materials) have been procured.
- 2) That delivered items are in adequate condition prior to installation.
- 3) That items are installed correctly (ie: positioned, aligned, and attached correctly).
- 4) That installed items are configured correctly
- 5) That installed items are in acceptable condition and have the correct physical capacity.
For fluid containing pipes and structures, this typically includes hydrostatic testing.
- 6) That installed items function correctly (ie: open-close (seal), turn on and off etc) **when dry**.
- 7) That installed items function correctly (ie: open-close (seal), turn on and off, pass pressure tests, don't leak, don't excessively deflect etc) when exposed to worst case operating conditions or designated test limits (**when wet**).

Where ITPs need to be undertaken while assets are in an energised state (eg: under pressure, electrically energised), all associated safety arrangements (eg: permits and SWMS) shall be specified (or referred to) and carried out with the ITP.

ITPs are typically performed prior to system or functional testing (SST or FPT).

3.6. Factory Acceptance Testing (FAT)

FAT is normally required for specialised items which are pre-fabricated, assembled or customised in factories. Mass produced, catalogued and off the shelf items which are Type and Batch tested do not normally require FAT. FAT implementation may be considered part of the pre-commissioning. Factory fabricated items which typically require FAT include:

- a) coated mild steel pipeline fabrications (eg: spark and weld testing)
- b) stainless steel fabrications (eg: weld testing and inspection)
- c) made to order GRP or FRP structures with more than 5 pieces (eg: strength, glass fraction and lamination integrity testing)
- d) complex items (ie: items with greater than 10 components)
- e) portable skid or enclosure mounted multi-component assemblies
- f) switchboards

- g) tanks
- h) all registered equipment (ie: pressure vessels, cranes)
- i) Bespoke mechanical equipment designed specifically for a SEW project.

Each FAT, shall be developed, reviewed, approved and accepted in accordance with the TCCH Stakeholder Plan (refer section 2.1). FATs shall compare and validate the equipment's performance to that specified in the accepted equipment datasheet.

Once the FAT has been completed satisfactorily and identified deficiencies corrected, the Responsible person shall authorise the item to be transported and delivered to the site for installation.

3.7. Site Acceptance Testing (SAT)

SAT provides an opportunity for final confirmation that the performance experienced during the FAT is repeated after the item(s) are installed on site, ensuring nothing has changed or been damaged during transportation and installation.

SAT implementation may be considered part of pre-commissioning.

Each SAT, shall be developed, reviewed, approved and accepted in accordance with the TCCH Stakeholder Plan (refer section 2.1). SATs shall compare and validate the equipment's installed performance to that specified in the accepted equipment datasheet.

Where SATs need to be undertaken while assets are in an energised state (eg: under pressure, electrically energised), all associated safety arrangements (eg: permits and SWMS) shall be specified in and carried out with the SAT.

3.8. SCADA Testing

Where a change to SEW's SCADA system is required, the SCADA system shall be configured and tested by an approved SCADA integrator prior to SST and FPT. This shall occur after the installation, configuration, ITP and SAT testing of all control system inputs and outputs, the control system and telemetry hardware.

The Contractor shall liaise with SEW's SCADA team to plan the testing and commissioning of the SCADA system in accordance with standard SEW SCADA commissioning processes (available on request).

3.9. Construction Verification Walk

The Contractor shall schedule sufficient time with SEW representatives to complete a thorough visual inspection of all assets created or affected by the project. A Construction Verification Walk plan shall be provided which shall at least include:

- 1) Determining the availability of participating personnel.
- 2) Determining the likely duration required to complete the inspections.
- 3) Scheduling a suitable time(s) for the inspections, when as much of the created or affected assets as possible will be visible up close and safe to access (ie: not holding water, exposed to hazardous substances or hazardous conditions).

- 4) Establishing how safe access up close to all areas of work can be undertaken at the scheduled time. Provision of temporary access equipment (eg: Confined Space entry equipment, elevated work platforms, ladders with fall arrest etc) and permits as required to provide this access.
- 5) Whether assets need to be isolated and de-energised (eg: switchboards) to enable up close inspection.
- 6) Ensuring participants are adequately inducted and qualified to attend site.

Where direct visual inspection of created or impacted assets is not possible (eg: the asset cannot be removed from service or access is too small for human entry), these assets shall be identified and alternative means of visual inspection proposed. In most cases this will involve the provision within the ITP for high resolution CCTV, video or photographic records of the constructed state of the asset(s) at a time when the asset is completely visible. This evidence may be documented in the ITR.

During the Construction Verification Walk, verify that all requirements determined through the following consultation and engagement processes have been delivered in the constructed assets:

- a) Community engagement
- b) Environment and heritage engagement
- c) Council and other authorities
- d) Safety in Design
- e) HAZOP &/or CHAIR

3.10. Single System Testing (SST)

Single system Integrated Testing (SST) typically needs to be completed where there are multiple inter-dependant systems (ie: facilities containing two or more of biological, hydraulic, pneumatic, chemical or any other systems) or multiple plant areas affected by the project. SST enables systems or plant areas to be tested and validated individually before the entirety of the projects systems are later tested in the FPT.

A review of options shall be undertaken into what conditions each SST should ideally be undertaken. Test options typically consist of:

- 1) A normal operating environment with the typical operating medium at typical operating conditions etc. Where there are a range of normal operating conditions, an analysis shall be undertaken to determine where within this range of conditions the SST should be undertaken
- 2) An operating environment different to the normal operating environment. Such testing is typically undertaken on assets using a different medium than their normal operating medium (eg: tested with water rather than sewage or a chemical). This would only be acceptable if:
 - a. a compelling case could be made that the different test environment would have no impact on the validity of the result and testing in a different to normal environment has significant practical advantages, **and**
 - b. future proposed testing (FPT) would be undertaken at the normal operating environment.
- 3) Simulated conditions (ie: simulated inputs into the controller).
- 4) A hybrid of the above.

The operating conditions under which testing will be undertaken shall be stipulated in the SST procedure. Undertaking SST under anything other than normal operating conditions requires acceptance by SEW.

The SST procedure shall include a monitoring plan that documents what instrumentation, measurement or sampling and analysis will be used to validate that the asset or process is meeting the project requirements. Where possible, the monitoring arrangement shall directly measure the performance parameters specified in the project documentation. Indirect monitoring (of parameters different to those specified in the project documents) may only be used where there is a sound proven methodology for correlating the indirectly measured outcomes with the performance parameters specified in the project documentation. (eg: Turbidity as a means of determining by reduction of filters.)

All SST data collected and all analysis produced shall be included in TCP Records Management.

3.11. Final Performance Testing (FPT)

FPT should be completed to validate the entirety of the systems and assets affected by the works.

FPT shall be undertaken at the full range of reasonably likely operating conditions. Documented FPT arrangements shall clearly specify the various conditions under which FPT will be carried out and the periods of time that each set of conditions will be maintained during each test. Where there is limited control over the operating conditions (eg: inflow into an WRP or SPS), the FPT period may be substantial (ie: a number of weeks or months) in an attempt to test as large a range of operating conditions as is practical.

The duration of FPT shall also be sufficient to establish with a high degree of confidence that the delivered work will meet the project over the design life of the asset. The Contractor shall estimate and propose the preferred FPT period in their Proposal. Should the FPT duration need to be extended, this shall be negotiated with the SEW project manager.

The FPT procedure shall include a monitoring plan that documents what instrumentation, measurement or sampling and analysis will be used to validate that the asset or process is meeting the project requirements. Where possible, the monitoring arrangement shall directly measure the performance parameters specified in the project documentation. Indirect monitoring (of parameters different to those specified in the project documents) may only be used where there is a sound proven methodology for correlating alternate measured outcomes with the performance parameters specified in the project documentation.

Where the FPT occurs over a long period of time (ie: months) and the monitoring plan needs to change over this time, the timeframes within the FPT that each monitoring regime will occur shall be documented in the FPT procedure. All FPT data collected and all analysis produced shall be included in the TCP Records directory.

4. Deficiency Technical Resolution

Deficiencies, matters of concern or improvement opportunities may be identified at any stage of the design (if D&C contract) and construction process. For the remainder of section 0, the term “Deficiency” shall include matters of concern or improvement opportunities. Regardless of when a Deficiency is identified, the following process shall be undertaken:

- 1) Document the Deficiency in the Punchlist with at least: date identified, the person who raised the Deficiency, a description of the Deficiency, the project requirement not being met and evidence for the Deficiency (ie: test data, photograph).
- 2) In consultation with the Contractor, the SEW Project Manager categorises the Deficiency as A, B, C, D or E and specifies the required timeframe for resolution:
 - a. Category A = Deficiencies that will directly affect further progress of the project. Deficiency to be resolved as soon as possible within a timeframe agreed to by Responsible and Accountable personnel.
 - b. Category B = Deficiencies that will have a notable impact on the successful operation of the asset. Deficiency to be resolved prior to PC and/or Completion.
 - c. Category C = Deficiency not Category A or B. Deficiency to be resolved prior to Completion.
 - d. Category D = Improvement (not a Deficiency) or a Deficiency identified after Completion. To be resolved at an agreed time.
 - e. Category E = No further work required.
- 3) Within 2 weeks of step 2) being completed or within the agreed time, the Contractor proposes an outline of resolution options and the preferred resolution and submits this to the SEW Project Manager.
- 4) The SEW Project Manager reviews and if necessary, meets with the Contractor to agree on the resolution.
- 5) Within 2 weeks of step 2) being completed or within the agreed time, the Contractor specifies the works required in detail, schedules the work, prepares the required documentation, and obtains all necessary approvals and permits.
- 6) The Contractor prepares a variation request should it be agreed that some or all costs for the works will be borne by SEW.
- 7) The SEW Project Manager approves the work.
- 8) The Contractor schedules the work, prepares the required documentation, and obtains all necessary approvals and permits.
- 9) The Contractor implements the agreed resolution within the agreed timeframe.
- 10) The Contractor notifies SEW of the intent to carry out testing or witness the outcomes of the work.
- 11) The Contractor inspects and tests the outcome of the work, likely repeating part or all of an existing or revised ITP or SAT etc to confirm this.
- 12) The Contractor submits all evidence to support the successful resolution of the Deficiency (ie: test data, photographs) to the SEW Project Manager or raises another linked Deficiency should the Deficiency not be adequately resolved.
- 13) The SEW Project Manager changes the status of the Punchlist item to “closed” should she/he be satisfied with the result.
- 14) The Contractor reflects the change in all relevant documentation (eg: As Constructed, Operations and Equipment Information)

PC (where PC is part of the project's program) of a project will only be considered when all category "A" and "B" Punchlist items are closed. Completion of a project will only be considered when all category "A", "B" and "C" Punchlist items are closed.

5. Post TCP Activities

Post TCP activities required for different asset(s) are described in Table 3. Table 4 provides an overview of post TCP activities and implementation staging.

5.1. Practical Completion (PC)

Practical Completion does not mean "Completion" as defined in section 5.7. Practical Completion may or may not be used depending on the contract model being used in the project.

Projects which contain assets which urgently need to be placed in service may contain a Practical Completion (PC) step within the TCCH process. PC may be undertaken on confirmation that an asset is reasonably capable of being used for its intended purpose and there are no category A or B Deficiencies. PC may also be granted before all required finalised information is provided to SEW.

PC may need to be staged so that different project assets can be brought into service at different times. The Contractor's TCCH Plan (including the Stakeholder Plan within it) shall consider and schedule in PC (potentially with stages) in consideration of the operational needs of SEW and the needs of the project.

Drafts or final revisions of As Constructed, Operations and Equipment information and preliminary or final Training relevant to assets subject to PC shall be provided to SEW to enable effective asset management after PC.

Work completed on site by the Contractor on assets where PC has been granted shall be completed on approval and under the oversight of SEW. Any changes made by the Contractor after PC shall be reflected in the project documentation (refer Records Plan, section 2.3) submitted prior to Completion.

5.2. As Constructed Information Handover

The contractor shall supply accurate and complete As Constructed information required to enable life-cycle management of the project assets.

At least the following information shall be provided:

- 1) As Constructed drawings (refer AM2488).
All drawings affected by the works, either new drawings prepared to execute the works or modification of existing drawings affected by the works shall be submitted.
- 2) CAD models and drawings, including all 3D models and XREF files.
- 3) Sufficient information to enable the safe management of the asset in accordance with Worksafe Victoria Compliance Code – Plant

- 4) Maximo data.
Asset Register and attributes. This shall include all required mechanical and electrical equipment data (refer AM2775).
- 5) GIS information (refer MRWA Survey Manual).
- 6) Design reports (if project is a D&C project) which capture the rationale of decisions made from beginning to end of design.
- 7) SCADA/PLC programming and configuration documentation (refer AM2566 and SCADA network facility standards).
- 8) SCADA/PLC code (refer SCADA standards).
- 9) Electrical and Instrument As Constructed information (refer Electrical, Instrumentation and Control Standards).

5.3. Operations Information Handover

5.3.1. Hazard and Risk Control Information

For facility projects and trunk network assets (pipelines \geq DN750), the Contractor shall provide all Hazard and Risk control information developed during the design and construction process. (For Example, project documents such as completed HAZOP studies and HAZOP workshop minutes that relates to ongoing risks that need to be managed through operations and maintenance).

5.3.2. Operations Manual

For Facility projects, the Contractor shall provide an Operations Manual to enable the assets to be effectively operated under all likely scenarios and situations. This shall at least include the following:

- 1) A functional description /and control philosophy of the facility(s)
- 2) A list of all equipment / significant items which one labelled.
- 3) Precautions and warnings relevant to personal safety and the protection of the equipment.
- 4) Equipment settings.
- 5) Standard Operating Procedures related to the correct operation of the assets
Refer section 5.3.3.
- 6) Contingency plans to be implemented should Critical Assets fail.
- 7) Capacity and operating limits of the assets (ie: hydraulic, storage and process limits).
- 8) Performance information of the assets (ie: actual pump and system curves).

5.3.3. Standard Operating Procedures

Standard Operating Procedures (SOPs) shall be prepared for all operable systems. The purpose of SOPs is to provide a detailed step-by-step instruction to effectively and safely isolate or operate a process or system. SOPs shall be provided for at least:

- a) Checks before Start-up
- b) Start-up procedures
- c) Checks after start-up
- d) Operational Checks

- e) Shutdown Procedures
- f) Isolation Procedures
- g) Emergency Operation

SEW may have existing SOPs that would be suitable for the situation, in which case they should be adopted as much as practical. Existing relevant SEW SOPs should be provided by the SEW Project Manager.

Any new SOP must contain:

- 1) A brief description and purpose of the procedure.
- 2) A scope for the procedure.
- 3) Define the responsibilities of the Operator.
- 4) Specify the conditions and standards to be adapted with the procedure.
- 5) Specify the tasks and task chronology.
- 6) Identify the hazards control measures to be completed.
- 7) Specify the control measures to be completed.

The SOPs shall be based on the design documentation, HAZOP study outcomes, equipment supplier information, process descriptions, functional descriptions and other reference material where appropriate.

SOPs developed prior to SST or FPT must be updated, approved and accepted after all testing has been completed.

5.4. Equipment Information

The Contractor shall provide all necessary equipment information to enable the assets to be safely and effectively maintained and managed for the life of the asset.

At least the following shall be provided:

5.4.1. Vendor Information

The following vendor information shall be provided for labelled (tagged) equipment:

- 1) A cover page with an index of all vendor information provided.
Vendor information shall follow a systematic approach, typically mirroring the hierarchy adopted in the TCP outline (refer Table 9). Where the same information is applicable to multiple items of equipment, all equipment to which that information applies shall be listed at the beginning of the vendor information.
- 2) Technical data / Datasheets / Technical Drawings.
- 3) Reliability data (MTBF, MTTR and Reliability Block Diagram) shall be provided for each equipment type (where applicable).
- 4) Supplier information, including:
 - a) Name of Supplier.
 - b) Address and telephone numbers for service calls.
- 5) Performance information, ratings and performance curves.

- 6) Vendor trouble shooting and problem resolution information.
- 7) Vendor installation and commissioning instructions, including details of standard procedures for mounting or erecting, wiring and lubricating of equipment and standard commissioning instructions.
- 8) Vendor manuals for major equipment and ancillary equipment.
These shall be provided as individual files.

All documents written by the Principal Contractor or equipment manufacturer specifically for the project (i.e. non-generic information) shall be provided in an editable format (ie: MS Word). All other documents shall be provided in PDF format. Scanned documents are not acceptable.

5.4.2. Recommended Maintenance

The Contractor shall recommend Maintenance Arrangements for the maintenance of:

- 1) Significant mechanical items (ie: > \$2,000 in value).
- 2) Switchboards.
- 3) Instruments.
- 4) All assets which contain consumable items (eg: air or oil filters, oil or grease).
- 5) All Critical Assets.
- 6) Safety equipment.
- 7) Registered items (eg: pressure vessels, cranes etc).

Recommended maintenance arrangements shall be based on:

- a) Existing SEW maintenance arrangements that would be suitable for the situation, in which case they should be adopted as much as practical. Existing SEW maintenance arrangements are available on request from the SEW Project Manager, **and / or**
- b) Maintenance information provided by the equipment supplier or manufacturer.

The Contractor shall recommend maintenance arrangements including Condition Monitoring, Preventative and Predictive maintenance that would be required for the asset to reliably meet the stated performance objectives for the stated asset life. The Contractor shall recommend the frequency of all programmed maintenance.

Step by step maintenance procedures shall be prepared and provided for all recommended maintenance, with reference to any manufacturer's maintenance procedures where appropriate. Required spare parts and consumables for each procedure shall be itemised.

5.4.3. Spare Parts and Special Tools

The contractor shall provide spare parts to enable:

- 1) the maintenance described in section 5.4.2 to be completed for the first two years of operation.
- 2) Critical Asset reactive maintenance to be undertaken in a timely fashion. This shall include critical spares for all Critical Assets which likely have a lead time greater than one month.

Provide a full listing of any special tools or spares or equipment that might be required to carry out any recommended programmed or reactive maintenance.

The following spares information shall be provided with each provided or recommended maintenance spare part:

- a) Equipment name and tag number.
- b) Spare part Manufacturer, Brand and Model.
- c) Spare part Serial Number.
- d) Recommended number to be held in South East Water's stores.
- e) Typical delivery period for each spare part.
- f) Cost (at time of purchase).

5.4.4. Permits and Certificates

All statutory and any other certificates obtained through the project shall be provided. This shall at least include:

- 1) An index page listing all of the permits and certificates included.
- 2) Equipment test certificates.
- 3) Electrical certificates of compliance (as per Electrical standards, refer section 1.6).
- 4) Backflow device compliance certificates.
- 5) Dangerous goods certificates.
- 6) Hazardous area certificates.
- 7) Pressure vessel certificates.
- 8) Lifting gear certificates.
- 9) Building permits and approvals.
- 10) Planning permits.
- 11) Warrantee certificates.

5.4.5. Warranty Register

All warranty documentation shall be compiled and submitted for all components supplied which have a manufacturer's warranty.

The warranty register shall contain an index page and individual electronic files for each warrantee in an appropriate file structure, typically mirroring the organisation adopted in the TCP outline (refer table 9). The file name shall include the item's product name.

5.5. Check & Upload of Information to SEW systems

All finalised information outlined in section 5.2, 5.3 and 5.4 shall be provided to the SEW project manager at least 2 weeks prior to request for Completion. This provides sufficient time for quality checks to be undertaken on this information and for it to be uploaded into SEW systems.

Where deficiencies in the information is identified, the information shall be corrected and re-submitted to SEW. Completion will not be granted until satisfactory information is provided and uploaded to SEW systems.

5.6. Training

Provide training to instruct SEW nominated persons in the operation and maintenance of all equipment and software. The Contractor shall undertake the following process in developing and implementing this training:

- 1) Determine the training requirements, the training units to be run and the participants that ought to participate in each unit. Typically units should be grouped according to the audience (eg: one unit for operators, one unit for maintenance and asset managers and one unit for PLC and SCADA people)
- 2) Develop an objective, scope, course outline, format (online, face to face), location and duration for each unit (typically one to four hours) and submit to SEW. Operations and maintenance units shall typically be undertaken at the asset and face to face.
- 3) Complete and submit all Operations and Equipment information (refer sections 5.3 and 5.4) if not already done so.
- 4) After acceptance of the course outline from SEW, develop the materials for each unit. This will typically be based on the Operations and Maintenance information.
- 5) Schedule the training with suitable agreed participants, providing at least 2 weeks notice.
- 6) Undertake the training at the agreed venue prior to Completion.
- 7) Provide all training materials and attendance forms to the SEW Project Manager
- 8) Update the Operations and Equipment information if any improvements to these documents were identified during training.

5.7. Completion

Completion can be provided when at least the following have been satisfactorily undertaken:

- a) TCP activities completed (refer section 3), **and**
- b) Deficiencies have been resolved, **and**
- c) Required information submitted, **and**
- d) Training completed (refer section 5.6), **and**
- e) All chemical storages have been filled to within 90% of capacity, **and**
- f) The Contractor applies for completion (refer Appendix B, completion application).

Completion shall apply to all projects not undertaken through the Land Development or Connections processes. For Land Development constructed assets, the Construction Verification process shall be followed for Completion.

Once the SEW Project Manager is satisfied that all these activities have been satisfactorily completed, Completion will be granted and the Certificate in Appendix C completed and provided to the Contractor.

Work completed on site by the Contractor after completion shall be completed on approval and under the oversight of SEW.

5.8. Operations and Maintenance Transfer

Once the SEW Project Manager has issued the Completion Certificate to the Contractor, the Certificate in Appendix D shall then be completed, countersigned by Operations and Maintenance personnel so the project assets can be transferred to Operations and Maintenance.

5.9. End of Defects / Warrantee Application

Once the end of defects / warrantee period has elapsed, the Contractor shall submit to the SEW project manager an application for return of all held money with the following information:

- 1) Project Name and Identification
- 2) Date of Completion
- 3) Date of application for return of money held
- 4) Warrantee bond amount held

5.9.1. Handover of Updated As Constructed and O&M information

As part of the End of Defects / End of Warrantee Application process, changes to assets that have been undertaken in the defects / warrantee period shall flow through to updates to the information described in sections 7.2 to 7.4. This updated information shall be re-issued to SEW with or prior to the End of Defects / Warrantee application.

5.10. End of Defects / Warranty Assessment & Acceptance

Upon receipt of the End of Defects / End of Warrantee application, the SEW Project Manager or delegate will undertake a review of the performance of constructed assets and release part or all of the warrantee bond depending on whether there are any outstanding Deficiencies.

< Appendix A- TCCH Plan Template >

TCCH Plan

< Instructions are in blue italics and shall be deleted on completion of the form.

The contractor shall complete the following template to describe the specific measures to be undertaken as part of the project. >

A. Stakeholder Plan

< Describe the TCCH stakeholder management approach that will be undertaken in accordance with section 2.1, including a complete RACI Stakeholder Matrix in accordance with Table A.>

Table A: TCCH Stakeholder Matrix

Item	Activity / Deliverable	Contractor	SEW PM	SEW Planning	SEW Design	SEW Construction Audit	Enviro/Engage Teams	SEW People & Safety	Asset Int	SEW O&M
1	TCP Preparation									
2	TCP Final Draft									
3	ITP / FAT / SAT Preparation									
4	ITP / FAT / SAT Final Draft									
5	Construction Audits									
6	Construction Verification Walk									
7	SST / FPT Preparation									
8	SST / FPT Final Draft									
9	Deficiency Response Planning									
10	Deficiency Resolution									
11	As Constructed Information									
12	Operations Information									
13	Equipment Information									
13	Operations Acceptance									
14	Completion									
16	End of Defects									

Table Legend:

- Responsible (R) The party responsible for the delivery of the outcome or deliverable.
- Accountable (A) The party accountable for accepting the outcome or deliverable.
- Consulted (C) Any parties required to be consulted in the development of the outcome or deliverable.
- Informed (I) Any parties required to be informed of the outcome or deliverable.
- Witness (W) Any parties required to witness the outcome or deliverable.

B. Roles and Responsibilities

< Using the Table B and C templates, describe the TCCH team roles and responsibilities. Refer to section 2.2 for requirements.>

Table B: Contractor Team Member Details & TCCH Duties Template

Full Name	Role Title	Email	Phone	ITP/ ITR	FAT / SAT	SCA DA	C.V Walk	SST	FPT	As Con Info	Opera tions Info	Equip Info

The role definitions defined under Table A shall apply to Table B.

Table C: SEW Team Member Details Template

Full Name	Role	Email	Phone	SEW Team

< Insert figure indicating the hierarchy or personnel in the TCCH team. Refer to section 2.2 for requirements.>

Figure A: TCP Team Member Hierarchy

C. Progress Reporting

< Describe the TCCH Reporting Arrangements to be implemented in accordance with section 2.34. Refer to any other document(s) that cover this topic and attach the relevant sections of the document(s) as an appendix to the TCCH plan. >

D. TCP Outline

< Using the Table D and Table E templates, outline the TCP activities that will be undertaken on what assets. Refer to section 3.2 for requirements. State the documents &/or standards (refer section 1.6) that will apply to each asset or asset component inspection &/or test. >

Table D: TCP Activity Breakdown by Asset Template

Asset – Asset Grouping		ITP/ ITR	FAT / SAT	SST

Table E: TCP Activities for the Entire Project Template

Asset	SCADA Testing	Construction Verification Walk	FPT	Deficiency Punchlist

E. TCP Scheduling & Managing Operational Risks

< Describe the operational risks, controls and the scheduling of TCP activities that will be undertaken in accordance with section 3.3. Refer to any other document(s) that cover this topic and/or attach the relevant document(s) as an appendix to the TCCH plan.

Where Practical Completion is to apply (refer section 5.1), outline the approach to be taken, including: 1) The assets that PC shall apply to, 2) the timing / staging of PC activities, and 3) the information that will be submitted prior to each PC stage. >

F. Construction Verification Walk

< Describe the approach that will be taken for the Construction Verification Walk which will need to be undertaken in accordance with section 3.9. In particular, explain the timing of inspections, isolations required and access arrangements that will need to be implemented so that up close inspection of all assets can take place. Refer to any other document(s) that cover this topic and/or attach the relevant document(s) as an appendix to the TCCH plan. >

G. SST and FPT Approach

< Describe the approach that will be taken for SST / FPT which will need to be undertaken in accordance with section 3.10 and 3.11. In particular, explain the timing of testing, the monitoring arrangements to be implemented, the analysis to be undertaken (ie: comparing measured results and project performance requirements) and the conditions under which testing will take place. Refer to any other document(s) that cover this topic and/or attach the relevant document(s) as an appendix to the TCCH plan. >

H. Records Plan

< In accordance with section 2.3, describe the documents that will be submitted prior to Completion. Provide a screenshot of the directory structure to be adopted. Provide a brief outline of each. Refer to any other document(s) that cover this topic and/or attach the relevant document(s) as an appendix to the TCCH plan. >

i. TCP Records Management

< Describe what TCP records will be created and the structure of these records, which need to be created and stored in accordance with section 3.4. Provide a screenshot of the directory structure to be adopted. Refer to any other document(s) that cover this topic and/or attach the relevant document(s) as an appendix to the TCCH plan. >

ii. As Constructed Information Handover

< List the As Constructed Information to be handed over as part of the project. Refer section 5.2 for requirements. Refer to any other document(s) that cover this topic and/or attach the relevant document(s) as an appendix to the TCCH plan. >

iii. Operations Information Handover

< List the Operations Information to be handed over as part of the project. Refer section 5.3 for requirements. Refer to any other document(s) that cover this topic and/or attach the relevant sections of the document(s) as an appendix to the TCCH plan. >

iv. Equipment Information Handover

< List the As Constructed Information to be handed over as part of the project. Refer section 5.4 for requirements. Refer to any other document(s) that cover this topic and/or attach the relevant sections of the document(s) as an appendix to the TCCH plan. >

Appendix B – Contractor Application for Completion

Project: [P NO.] **Project Name:** [PROJECT NAME]

Contractor’s Project Manager: [NAME]

TCCH Element	Comments	Date	Checker Initials
Meeting and workshop records			
TCP records			
All Deficiencies Closed			
As Constructed Information			
Operations Information			
Equipment Information			
Training Completed			
SEW Systems Updated (eg: Property Connect)			
Chemical storages full (if relevant)			

(The Checker shall be the Contractor’s authorised person. Elements should reflect the requirements of the specific project.)

I testify that all the required works nominated in the above table for the aforementioned project have been satisfactorily completed. This includes rectification of all items requiring attention and the supply of all required documentation.

Signed for and on behalf of **XXXX (the Contractor)** by its authorised representative:

Signature:

Name:	[NAME]	Date:	[DATE]
--------------	--------	--------------	--------

Position:	[POSITION]
------------------	------------

Appendix C – Completion Certificate

Project: [P NO.] **Project Name:** [PROJECT NAME]

South East Water Project Manager's Name: [NAME]

TCCH Element	Comments	Date	Checker Initials
Meeting and workshop records			
TCP records			
All Deficiencies Closed			
As Constructed Information			
Operations Information			
Equipment Information			
Training Completed			
Chemical storages full (if relevant)			

(The Checker shall be South East Water's Project Manager)

I testify that all the required works nominated in the above table for the aforementioned project have been satisfactorily completed by the Contractor. This includes rectification of all items requiring attention and the supply of all required documentation.

Completion is agreed to from receipt of this document. Defects liability will commence as of this date and will run for a period of 12 months. South East Water will also authorise the release of retention money collected during the delivery of these works.

Signed for and on behalf of South East Water by its authorised representative:

Signature:	
-------------------	--

Name:	[NAME]	Date:	[DATE]
--------------	--------	--------------	--------

Position:	[POSITION]
------------------	------------

Appendix D – Transfer to Operations Certificate

Project: [P NO.] **Project Name:** [PROJECT NAME] **Operating Team:**
 Choose an item.

South East Water Project Manager's Name: [NAME]

System Updates	Comments	Date	Checker Initials
Electronic Plan Room			
Maximo			
SCADA			
GIS			

(The above items are an example only. Update the systems items as required)

South East Water Asset Creation have accepted the aforementioned asset following an assessment of completed works against documented project requirements, and the requirements of subsequent South East Water generated project instructions. Issuing of the Certificate of Completion initiated a defects liability period as a warranty for completed works. Any defects during the Defects period should be directed to the South East Water Project Manager for rectification.

Details of Defects Period:

Date of Certificate of Completion: Click here to enter a date.	End Defects Period: Click here to enter a date.
--	---

This document represents the transfer of this project from the design and construction phase to the operational phase.

Signatures:

SEW Capital Delivery: **Asset Integration** **Maintenance:** **Operations:**

_____	_____	_____	_____
[Name]	[Name]	[Name]	[Name]
[Title]	[Title]	[Title]	[Title]
[Date]	[Date]	[Date]	[Date]