



Systems Engineering Standard

Asset Management

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1. Introduction

The Department for Infrastructure and Transport (The Department) manages and operates, the Adelaide Metropolitan Passenger Rail Network (AMPRN) under the Rail Accreditation assigned to The Rail Commissioner (RCom) by the Office of the National Rail Safety Regulator (ONRSR).

Rail Safety National Law (RSNL) (South Australia) Act 2012 requires RCom to have a structured and disciplined approach to management of the asset lifecycle.

1.1. Purpose

This Standard describes the Systems Engineering (SE) requirements for the department in relation to programs/projects associated with Public Transport Systems (PTS).

All PTS programs/projects will adhere to the Australian Standard *AS/NZS 15288 Systems and Software Engineering – System lifecycle processes* (Ref [1]).

The purpose of this standard is to provide a structured set of SE requirements for use on PTS. These SE requirements at a minimum should:

- Provide guidance on the lifecycle approach for PTS.
- Provide a project approach that is consistent, repeatable and scalable.
- Integrated new PTS with existing transport systems.
- Maintain the integrity of PTS.

1.2. Scope

This standard applies to all projects/programs undertaken by the department that relate to PTS.

1.3. Related Documents (Internal)

Doc [1] Program and Project Management Framework Guidebook ([PMO - PPMF Guidebook - DIT Intranet](#))

1.4. References (External)

- Ref [1] AS 15288 Systems and Software Engineering – System Life Cycle Processes
- Ref [2] AS 24748 Systems and Software Engineering – Life Cycle Management – Part 1: Guideline
- Ref [3] AS 24748 Systems and Software Engineering – Life Cycle Management – Part 2: Guideline
- Ref [4] AS 24748 Systems and Software Engineering – Life Cycle Management – Part 3: Guideline
- Ref [5] AS 24748 Systems and Software Engineering – Life Cycle Management – Part 4: Guideline
- Ref [6] INCOSE Systems Engineering Handbook – A guide to systems lifecycle process and activities.

1.5. Acronym

ACRONYM	FULL NAME
Department	Department for Infrastructure and Transport (known as “ <i>the Department</i> ”)
MoC	Management of Change
PPMF	Program and Project Management Framework
PTS	Public Transport System
PTSA	Public Transport South Australia
SE	Systems Engineering

1.6. Definitions

TERM	DEFINITIONS
Life cycle model	Framework of processes and activities concerned with the life cycle that may be organised into stages, which also acts as a common reference for communication and understanding. Source: Ref [6].
System	A system is an arrangement of parts or elements that together exhibit behaviour or meaning that the individual constituents do not. Source: Ref [1]
Systems Engineering	Systems Engineering is an engineering discipline whose responsibility is creating and executing an interdisciplinary process to ensure that the customer and stakeholder's needs are satisfied in a high quality, trustworthy, cost efficient and schedule compliant manner throughout a system's entire life cycle. Source: Ref [6]

2. Systems Engineering Overview

A system is a combination of interacting elements organized to achieve one or more stated purposes. The system may be configured with one or more of the following system elements; material, product, tool, processes, data, hardware, software, humans, facilities and naturally occurring entities (see Figure 1). For users it may be referred to as products, assets or services.

SE is an interdisciplinary approach governing the total technical and managerial effort required to transform a set of stakeholder needs, expectations and constraints into a solution and to support that solution throughout its life.

The SE approach considers life cycle outcomes measured by performance, reliability, availability, maintainability, safety and cost-effectiveness.

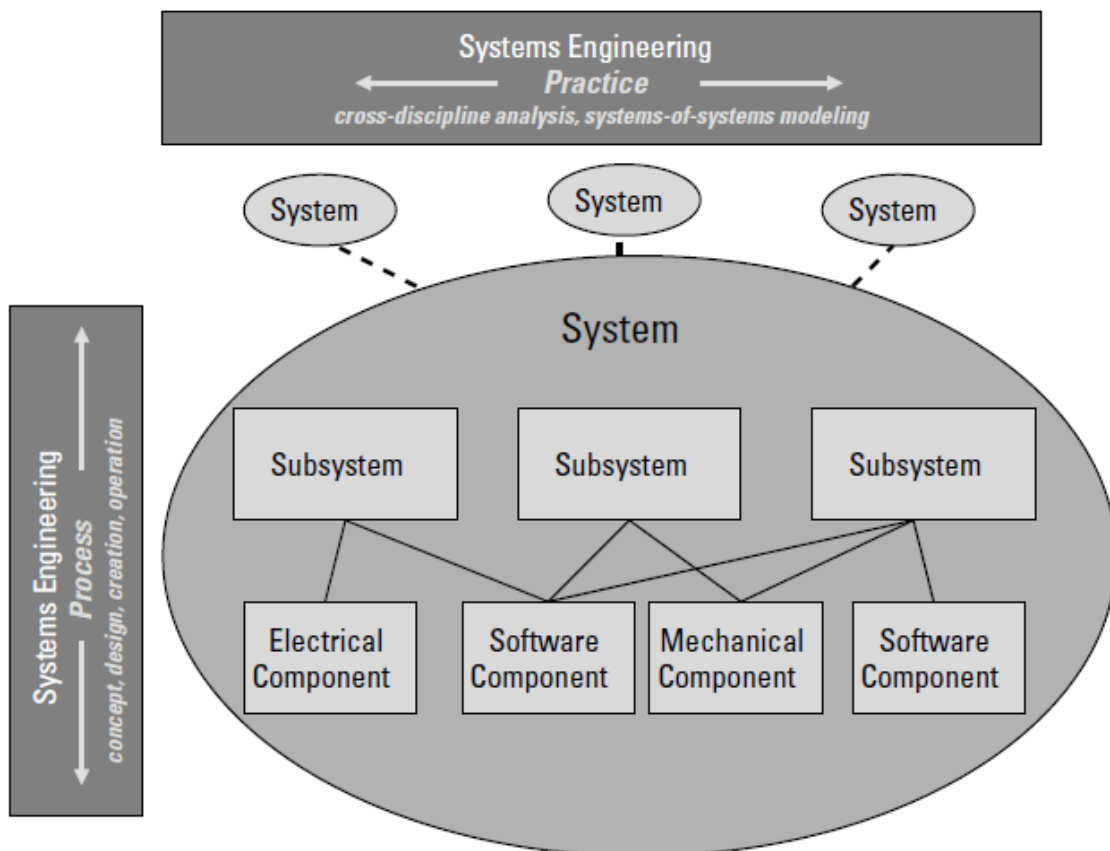


Figure 1 : Systems Engineering (both a practice and process)

2.1. Systems Engineering Management

SE is a methodology for planning, specifying, and delivering complex systems and it supports the public transport asset management framework.

The department has adopted a SE philosophy for all PTS related projects/programs. In all cases the project/program must tailor the SE philosophy to suit the project/program needs.

A project/program must deploy a 'whole of life' SE approach to the planning and acquisition of the new or altered transport systems/assets/infrastructure. The level of SE must be tailored according to an assessment of the complexity and risk associated with introducing the new or altered transport systems/assets/infrastructure.

2.2. System Life Cycle Model

The department's SE life cycle is based on the 'V' model described in AS 15288 (Ref [1]).

The 'V' model aligns to the asset life cycle stages and the department's Project and Program Management Framework (PPMF) gateways process (Doc [1]). The PTS SE lifecycle adds additional gates 4A-4F to align with specific PTS delivery requirements above the PPMF process.

2.2.1. Plan (Gate 1, Gate 2 and Gate 3)

The planning stage of SE is used to assess new opportunities, identify the requirements, stakeholders' needs, explore the feasible solutions/concepts, understand implications for the Rail Accreditation (Rail project only), initiate the Management of Change (MOC) process, develop preliminary system requirements, and produce a feasible concept design solution.

This stage is driven by the requirements to support the delivery of the State and Departmental public transport vision, target, values, and goals.

Key activities and deliverables should consider transport demand and needs analysis, business opportunities/requirements, transport performance modelling, safety impacts, operations concepts/requirements, maintenance concepts/requirements, risk-assessed cost estimate, concept design, 3D plans/visuals and production of an overall business case and systems requirement specification.

2.2.2. Acquire (Gate 4A, Gate 4B, Gate 4C, Gate 4D, Gate 4E, and Gate 4F)

The acquire stages of the SE life cycle is used to develop and produce a system which meets the PTS requirements and includes the commissioning, testing and verification phases of the program/project.

2.2.3. Operate and Maintain (Gate 5)

The operate and maintain stage is used to validate the system in its intended PTS configuration. This includes ensuring that the public transport vision, targets, values and goals are being met.

Key activities and deliverables may include scheduling, ongoing operation, preventative/corrective maintenance, condition assessment, asset management plans, technical maintenance plans, assurance and performance measurements.

2.2.4. Dispose (Gate 6)

The dispose stage is used to remove a system/asset/infrastructure from the operational part of its lifecycle and support its disposal.

Key activities and deliverables shall include a risk assessment to support any decisions to retire the system or part thereof.

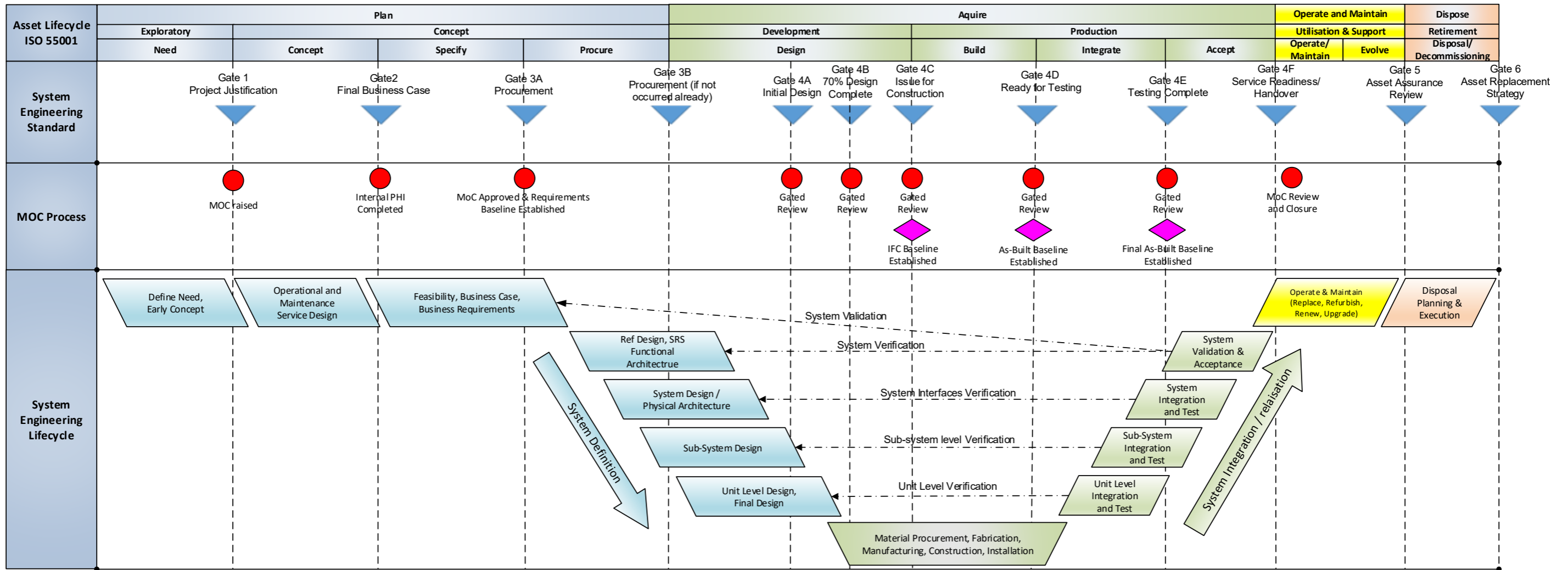


Figure 2 : System Engineering V-Lifecycle

2.3. System Life Cycle Processes

The life cycle of a PTS project/program is categorized into four SE process groups (see **Figure 3**) and must adhere to AS 15288 (Ref [1]). Additional guidance material in support of Systems Engineering can be found in:

- AS24748.1 (Ref [2]) Guideline for the application of the
- AS24748.2 (Ref [3])
- AS24748.3 (Ref [4])
- AS24748.4 (Ref [5])
- INCOSE Systems Engineering Handbook – A guide to systems lifecycle process and activities (Ref [6])

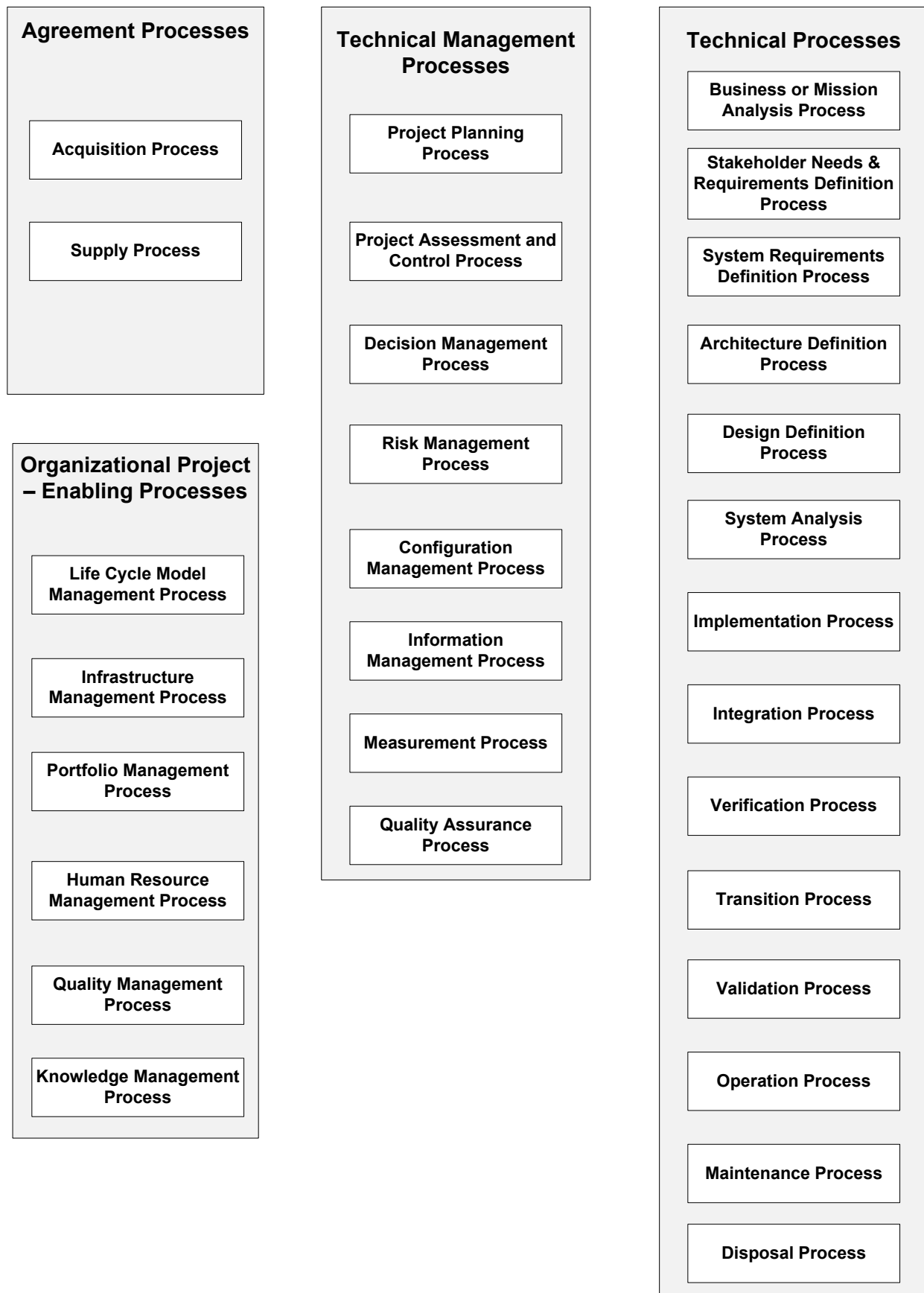


Figure 3 : System Life Cycle Processes¹

¹ AS 15288: Systems and software engineering – System life cycle processes