

Category 1 Standard

S1209

Requirements for systems engineering processes

Issue No.: A4

Issue date: March 2015
Review date: March 2020

Contents

1	Purpose	3
2	Scope	3
2.1	Included in scope of this standard	3
3	Requirements	4
3.1	Applicable Systems Engineering discipline standards	4
3.2	Requirements for systems engineering processes	4
3.3	Requirements for a requirements process	5
3.4	Requirements for an architecture process	5
3.5	Requirements for a verification process	6
3.6	Requirements for a validation process	7
3.7	Requirements for a readiness to dispose process	7
3.8	Requirements for an integration process	7
3.9	Requirements for a transition to operation and maintenance process	8
4	Accountabilities	8
4.1	The Head of Systems	8
4.2	The Project Manager	8
4.3	The Lead Engineer (Systems)	9
5	Supporting information	9
5.1	Background	9
5.2	Mapping to ISO/IEC 15288	9
5.3	Applying this standard	9
5.4	Project characterisation	11
6	References	12
6.1	References	12
6.2	Abbreviations	13
6.3	Definitions	13
6.4	Person accountable for the document	15
6.5	Document history	16

1 Purpose

- 1.1 The purpose of this standard is to define the requirements for systems engineering processes to be implemented by projects, programmes and delivery portfolios that manage the specification, design, delivery, or modification of systems.

2 Scope

2.1 Included in scope of this standard

- 2.1.1 This standard applies to TfL Pathway projects, programmes and delivery portfolios where :
- a) it is necessary to coordinate large teams of people working in multiple disciplines at multiple locations delivering complex products and services ; or
 - b) predictability, stability, repeatability and high confidence of realising benefits and avoiding catastrophic outcomes are key concerns ; or
 - c) close adherence to documented processes is important to meet the project's safety, security, reliability and other key performance objectives.

Note 1: Appropriate systems engineering process control is recommended for all but the simplest of projects.

- 2.1.2 This standard applies to LU and to suppliers contracted to work with TfL Pathway projects.
- 2.1.3 This standard only covers the *Technical* process group as defined in ISO/IEC 15288:2008 for the requirements of system engineering processes.

Note 2: To be effective, additional processes and controls (e.g. as covered in the ISO/IEC 15288 *Agreement*, *Organisational Project Enabling* and *Project* process groups or TfL Pathway) are also needed to compliment the technical processes. Definition of these processes (e.g. Change Management, Risk Management, Business Benefits Analysis) should be addressed through the Project/Programme management activities.

The context of this standard is illustrated in Figure 1.

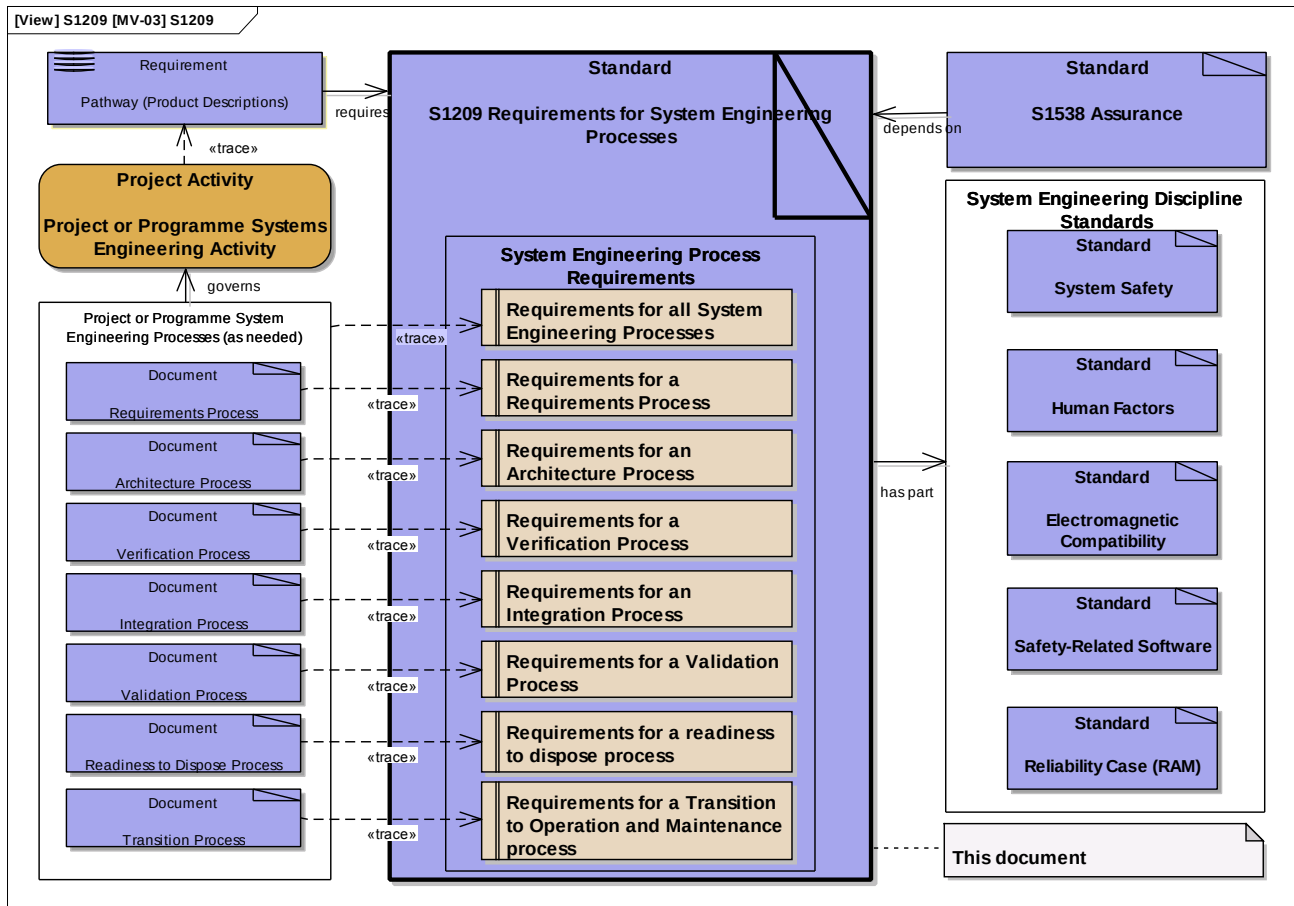


Figure 1 : Context of S1209 – Requirements for Systems Engineering Processes

3 Requirements

3.1 Applicable Systems Engineering discipline standards

The LU Systems Engineering discipline standards apply to support feasibility, requirements, design, delivery and assurance (S1538) activity, and include :

- a) Systems Safety (S1521) ;
- d) Human Factors (HF) (S1217, S1218) ;
- e) Reliability, Availability and Maintenance (RAM) (S1212) ;
- f) Electromagnetic Compatibility (EMC) (S1193, S1222) ; and
- g) Safety-Related Software (S1210).

3.2 Requirements for systems engineering processes

3.2.1 The Systems Engineering processes that are required to deliver the project or programme systems engineering activities must be defined and endorsed.

3.2.2 Each process shall :

- a) provide a definition of the objectives of the process (as a whole and also each of the process activities) ;
- b) provide a definition of the process behaviour and information used (to include inputs, outputs, resources, activities and specific roles of people) ;
- c) provide process validation ;

- d) capture the interactions, dependencies and information flows between processes ; and
- e) provide guidance for the use and applicability of the process.

3.2.3 Each process shall include activities to:

- a) capture a plan for implementing the process ;
- b) pass any risks arising from the process to a project risk management process ;
- c) pass identified constraints (that may have been previously unknown or discounted) to appropriate stakeholders ;
- d) determine the use and destination of the outputs of the process ; and
- e) review how well the implemented process performed and any lessons learned.

3.3 Requirements for a requirements process

The project shall establish a process to define the requirements for a system that can realise the product or service needed by users and other stakeholders in its intended operating environment. This process shall:

- a) document activities for determining and recording the needs articulated (directly or indirectly) by stakeholders ;
- b) document the activities for validating the captured requirements ;
- c) determine stakeholder constraints on a system solution ;
- d) capture how conflicting stakeholder needs are resolved ;
- e) document the activities for supporting consistency and traceability to source stakeholder needs and the design (i.e. architecture, including the relationship and information exchange) ; and
- f) capture the relationships and information exchange with the processes for validating and verifying a product or service.

Note 3: A project may wish to distinguish between different types of stakeholders (e.g. users of a system, maintainers, or developers of a system). Activities to elicit and develop requirements from different types of stakeholder may occur at a number of stages of the project lifecycle. An appropriate requirements process should be used for the activities being undertaken and the type of output being sought.

Appropriate methods for eliciting and assessing requirements include exploring the contexts of use and concept of operation of the system, and through scenarios, stories and use cases.

3.4 Requirements for an architecture process

The project shall establish a process for architecting a product or service that satisfies the needs of stakeholders (requirements). The process activities shall:

- a) identify architecture elements that satisfy stakeholder needs ;
- b) trace architecture elements to stakeholder needs ;