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**The ESS Accelerator Project Interface
Management Procedure**

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The ESS accelerator project interface management procedure

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Acronyms

AD – accelerator division

AP – accelerator project

ICD – interface control documents

IMP – interface management procedure

IR – interface requirement

IS – interface sheet

SEO – system engineering officer

SRR – System responsible representatives

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1. PURPOSE

The present interface management procedure (IMP) defines the process according to which all interfaces associated with the design, procurement, installation and construction of the accelerator project are identified and managed.

2. SCOPE

This procedure applies to (see Figure 1):

- Interfaces between pairs of systems.
- Interfaces within a system.

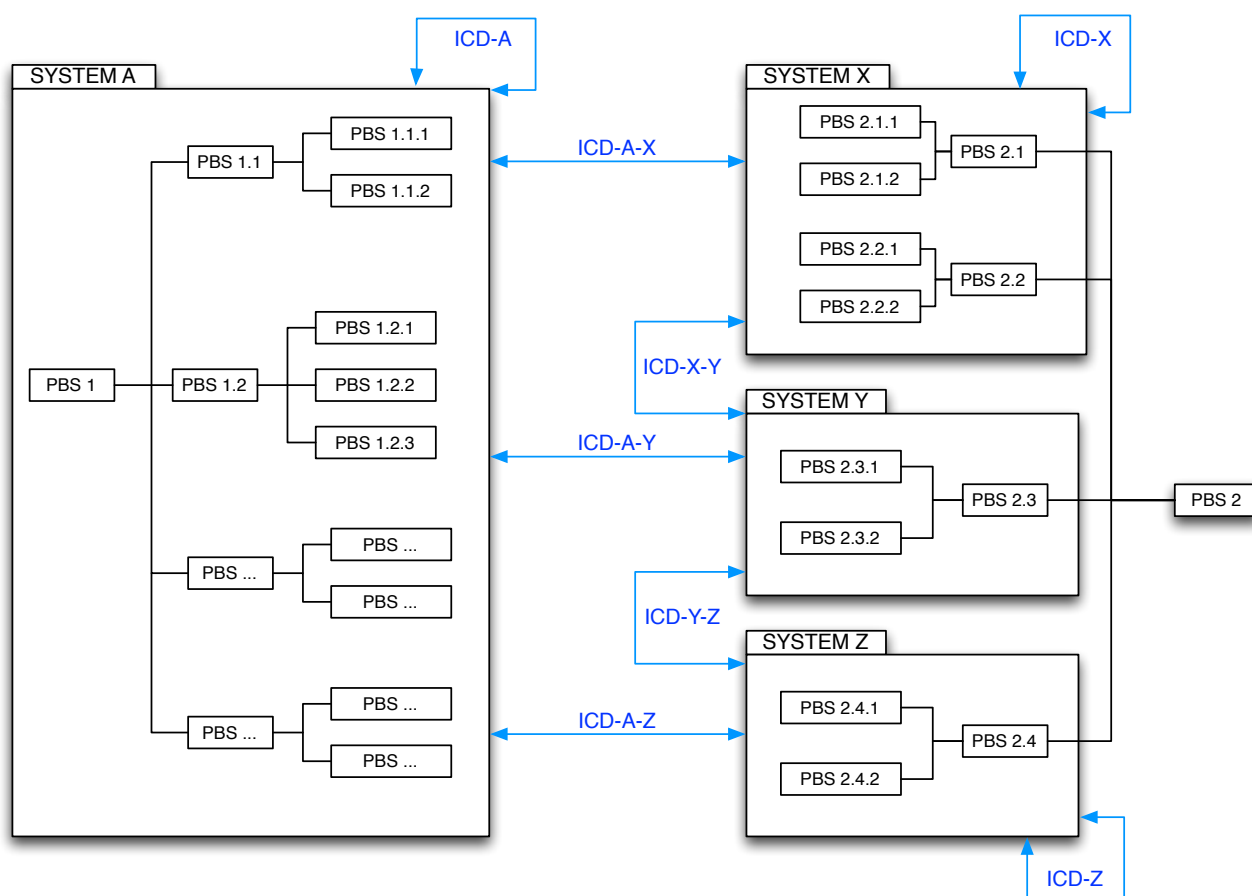


Figure 1 - ICDs establishment between and within systems in the AD interface management procedure.

3. DEFINITIONS

3.1.1. **Product:** a component, a part or any PBS item at level 1, 2 or 3.

3.1.2. **System:** any product defined by a system requirement document.

- 3.1.3. **Service line:** a line supplying a service¹.
- 3.1.4. **Interface:** the boundary shared between products synergistically operating. We can have:
- Functional interface:** an interface related to a specific function between products².
 - Physical interface:** an interface related to the physical boundary between products³.
 - Service interface:** an interface between a service supplier and a client of the service supplier.
 - Building interface:** an interface between a building and a product that does not belong to the building⁴.
- 3.1.5. **Interface requirement (IR):** a requirement on an interface. An interface requirement can be:
- A quantitative constraint*, consisting of the identification of the parameter plus the identification of the item to which the parameter applies plus the definition of the constraint⁵.
 - A qualitative constraint*: consisting of the identification of the item to which it applies plus the definition of a constraint in statement form⁶.
 - A reference to a constraint*: consisting of the identification of the item plus a link to an applicable standard or drawing (constraint document)⁷.
- 3.1.6. **Interface sheet (IS):** a set of interface requirements relevant to two interfacing products within a system or between two systems. An IS is a technical view. An IS need not be a textual document but it may be an (evolving) table.
- 3.1.7. **Interface control document (ICD):** a collection of ISs describing the interfaces for all interfacing products within a system or between two systems. An ICD is a management view. At most a single ICD shall exist per pair of interfacing systems or set of interfacing products within a system. An ICD need not be a textual document but it may be an (evolving) table. Figure 2 provides a graphical representation of the relationship between ICD, ISs and IRs.

Geographical location: in a building, a geographical location is defined by a room or by an area in a room. Outside a building, a geographical location is defined by an area at the ESS site (e.g. an underground gallery). Note. A product may have one or several geographical locations, for instance a pipe passing through several rooms.

¹ Example: electrical cables, water pipes or cryolines are service lines.

² Example: an instrumentation device cooled by the cooling system has a functional interface with the cooling system.

³ Example: the boundary between a pump and the room in which it is installed (mounting points).

⁴ Example: interface between a penetration of a wall and the service lines that penetrate the wall through that penetration.

⁵ Example: The inlet temperature of the cooling water for the LWU quadrupoles is 30 ± 2 °C.

⁶ Example: The {HEBT beam pipe connection} shall be achieved by {ConFlat type flanges}.

⁷ Example: The {support floor anchoring} shall follow the layout according to {ESS dwg. 1234567}.

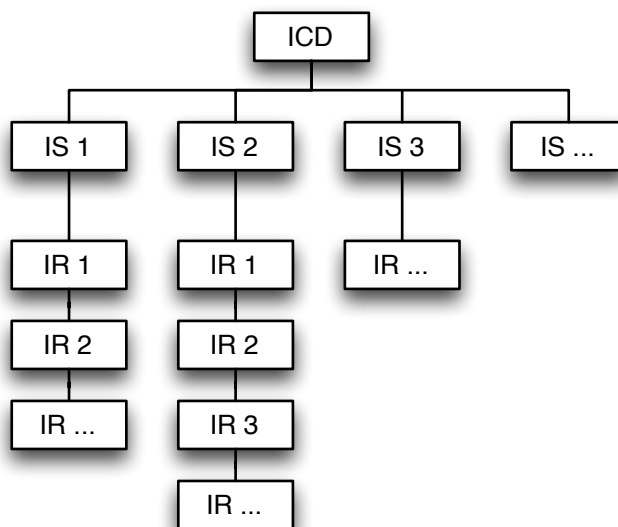


Figure 2 – Relation between ICD, ISs and IRs.

4. NAMING CONVENTIONS

The ICD naming is as follows:

- Between systems: ICD-system1-system2
- Within a system: ICD-system1

The IS naming is as follows:

- IS-product1-product2-###

Where ### is an incremental index assuming that it is necessary to specify more than one IS for the product1 – product2 interface.

Systems and products are named according to the naming convention in [2].

5. ROLES AND RESPONSIBILITIES

5.1. System responsible representatives (SRRs)

- 5.1.1. The system responsible representatives originate and author the ICDs and ISs (occasionally they may delegate authorship and/or assign co-authorship as appropriate).
- 5.1.2. After review by the AD system engineering officer (see §5.2) has taken place, SRRs are also responsible for approving and releasing the ICDs and ISs for their interfacing systems. They must also ensure compliance between the IRs and the applicable information of their system.

5.2. AD system engineering officer (ASEO)

5.2.1. The AD system engineering officer (SEO), together with one or more appointed technical interface controllers (see §5.3), review the ICDs and ISs related to accelerator project systems.

The AD SEO must also:

- 5.2.2. Provide guidance on the use of this interface management procedure.
- 5.2.3. Assess the compliance of the IS and ICDs with this interface management procedure.
- 5.2.4. Request authors to correct their ISs and ICDs if needed.
- 5.2.5. Identify any conflict between authors regarding the preparation of ICDs and ISs and, if any, provide support to the authors for the resolution of such conflict.
- 5.2.6. Make sure the released ICDs are updated into the configuration baseline.

5.3. Technical interface controller

Technical interface controllers assess the ICDs and ISs technical content and verify the IRs compliance with design integration constraints.

6. WORKFLOW

The interface management workflow is shown in Figure 3 and its steps are clarified in the following §§ 6.1- 6.5.

6.1. Interface identification

For each potential interface between their system and another system, each SRR shall identify whether an interface exists, and if it does, define at least one ICD.

6.2. Interface analysis

Each SRR shall

- List the constituent ISs that the interface shall be divided into.
- For each IS within the ICD, define the IRs.

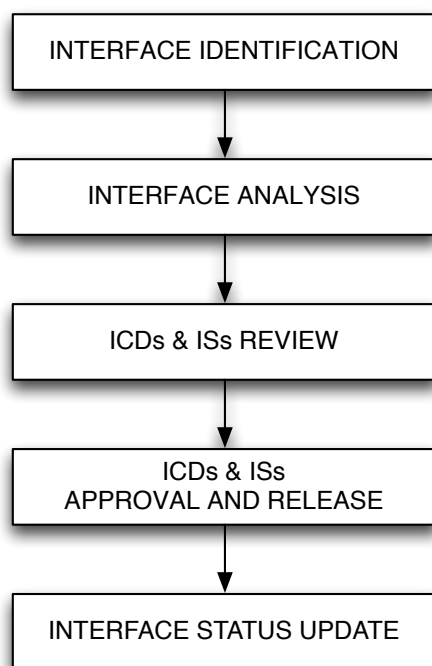


Figure 3 – AD interface management workflow

6.3. ICDs & ISs review

The AD SEO and technical interface controllers perform ICDs and ISs review (see §5.2).

6.4. ICDs & ISs approval and release

Both SRRs approve the reviewed ICDs and ISs. The ICDs are then released into the project baseline. ICDs released in the project baseline are under revision control according to the configuration management plan and cannot be modified without a project change request.

6.5. Interface status update

The SRR shall, for each IS of each ICD of his system, keep track of the evolution of the interfacing systems and update accordingly the existing IRs, issuing if necessary a project change request and following the applicable steps outlined in Figure 3.

7. GUIDELINES

7.1. Ownership

- 7.1.1. When a product is a service line (supplier) connected to another product (consumer), unless formally defined otherwise, the service line and its end connector belongs to the service line supplier and the socket in which the connector is plugged belongs to the consumer.
- 7.1.2. A penetration in a wall belongs to the building (or room) to which the wall belongs. A service line penetrating a wall belongs to the service line supplier.

7.2. Geographical interfaces

- 7.2.1. A product that has one single geographical location has one interface with the room in which it is located. A product that has several geographical locations has one interface per adjacent geographical location⁸.

8. REFERENCES

- [1] G. Lanfranco, "The ESS Configuration Management Plan", ESS-0000254, Rev1
- [2] G. Trahern et al., "ESS naming convention", ESS-0000757
- [3] NASA/SP-2007-6105 Rev1 – NASA System Engineering Handbook

⁸ Example: if a service line connects a product A in room X to a product B in room Z going through room Y, then the service line has an interface with the wall between room X and room Y and one interface with the wall between room Y and room Z.