IDM UID
VYJ7U2
VERSION CREATED ON / VERSION / STATUS
06 Jul 2020 / 1.4 / Approved
EXTERNAL REFERENCE / VERSION

MQP Level 3

Procedure for Labelling on Physical Items

This MQP Level-3 document provides procedure for physical labelling complying the MQP Level-2 Procedure for Identification and Controls of Items [U344WG].
This MQP Level-3 procedure describes necessary four types of labelling on hardware (to be) manufactured, delivered, stored and installed in the ITER project.

Approval Process			
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Approver	**Salamon B.**	**28 Jul 2020:approved**	**IO/DG/ENGN/CIO/CMD/DCC**
Document Security: Internal Use *RO: Khomutnikov Aleksei*			
Read Access	**LG: SQD Managers, LG: Quality Control Group, AD: ITER, AD: External Collaborators, AD: IO_Director-General, AD: External Management Advisory Board, AD: OBS - Quality Management Division (QMD) - EXT, AD: OBS - Quality Management Division (QMD), AD: Auditors, AD: ITER Management Assessor, project admi...**		

Change Log			
Procedure for Labelling on Physical Items (VYJ7U2)			
Version	***Latest Status***	***Issue Date***	***Description of Change***
v0.0	In Work	04 Jan 2018	
v1.0	In Work	04 Jul 2018	First issue - Document created as per MQP Doc Request https://user.iter.org/?uid=WEYWHH .
v1.1	Signed	04 Jul 2018	A duplicated sentence is deleted from the section, "Scope"
v1.2	Revision Required	04 Jul 2018	PDF error corrected (a blank page eliminated)
v1.3	Approved	26 Jul 2018	Reference document [4ALJEU v2.4] is added. Wording were corrected respecting the reviewer's comments. Suggestion for specific information, e.g. font size is currently declined respecting the guideline given by QMD. All evidences justifying the fast track process are attached.
v1.4	Approved	06 Jul 2020	As per approved MQP doc request https://user.iter.org/?uid=YWE8UC the changes are: 1. Figure 1 at page 7 has been updated to the new warehouse label layout 2. Table 1 at page 8 has been adapted to the new layout of the warehouse label

Table of Contents

1 Purpose

Labelling physical items is indispensable to control them through design, manufacture, storage, and installation and to realize the ITER plant. This MQP Level-3 document provides general definition and procedure for physical labelling, complying the MQP Level-2 Procedure for Identification and Controls of Items [U344WG]. Detailed requirement shall be specified in Technical Specifications, Annex B of Procurement Arrangements, etc., respecting this MQP L-3 procedure.

2 Scope

The scope is the physical labelling on Individually Distinguishable Items, IDIs to be assembled and/or installed in the ITER plant. Following types of items and the labels are in the scope:

- Physical product, e.g. equipment, component (Product Label)
- Shipping container or crate (Shipping Label)
- Stored product or package in the warehouse in the site (Warehouse Label)
- Product installed at IO as a plant-component (Plant Component Label)

The following are explained in this procedure:

- Environmental durability and convenience,
- Material of label or tag,
- Methodology,
- Dimension, font size, and language,
- Location,
- Contents and format.

2.1 Out of Scope

All others are out of scope, especially:

- Any other labelling / signs not related to control of items
  - Labels for safety waring, lockout-tagout (LOTO) ,
  - Sign for operation and maintenance,
- Labels on followings are out of scope:
  - Supply or properties, e.g. personal computers,
  - Chemical substances,
  - Measuring instrument.
- Maintenance labelling after the installation.[1]

[1] Maintenance Label is affixed to an item in addition to Product and Plant Component Labels. To be specified in Operation and Maintenance, OM process.

3 Definitions and Acronyms

3.1 Definitions

Terminology	
Individually Distinguishable Item, IDI	1) IDI is: • Item of as-delivered configuration • Item to be assembled, e.g. kit of interface components • Item to be dismantled and re-assembled • Sub-assembly in the site may be an IDI 2) Non-IDI is, for instance, an item assembled before shipping, e.g. interior of IDI, even those may be listed in Manufacturing BOM and/or As-Built BOM. 3) Depending on Purpose • Items assembled and/or enclosed before shipping and to be physically integrated at the site, e.g. signal conditioner, are not IDIs for logistics or warehouse, but IDI's for construction. Because the connections to be done.
Tagging	Affixing only identifier(s) to an item is called "Tagging." Tagging instead of labelling can happen, when 1) full set of information is not required and/or 2) area for labelling is not large enough. See examples for cabling [4H5DW6], [UD7GFX].

3.2 Acronyms

	Description	Reference
BOM	Bill Of Material	
CON-C	Contractor for Construction	
CON-M	Contractor for Manufacture	
CRR	Construction Readiness Review	
CST	Construction Department	
DRR	Delivery Readiness Review	
ESP	French Order concerning Pressure Equipment	
ESPN	French Order concerning Nuclear Pressure Equipment	
FR	Functional Reference Number	[28QDBS]
GRR	Goods Receipt Report	[QZ4UEK]
IDI	Individually Distinguished Item	
IRR	Assembly and Installation Readiness Review	
MN	Manufacturer Part Number	[28QDBS]
PA	Procurement Arrangement	
PBS	Plant Breakdown Structure	
PNI	Part Number of ITER	[28QDBS]
RO	Responsible Officer	
SN	Serial Number	[28QDBS]

4 Applicable and References Documents

4.1 Applicable documents

[1] Procedure for Identification and Controls of Items [U344WG v1.2]
[2] Sign-Off Authority for Project Documents [2EXFXU v4.0]
[3] ITER Numbering System for Components and Parts [28QDBS, Latest]
[4] Article 30 of EU Directive 765/2008

4.2 Reference documents

[5] Procedure for Cataloguing Type References [UYGU3S]
[6] IO Cabling Rules [335VF9]
[7] I&C Cubicle Internal Configuration [4H5DW6]
[8] Specification for Labelling of Equipment on ITER Project [TL25DK]
[9] Identification of Parts, Components and Physical Items within PBS11 Magnet Systems [UD7GFX]
[10] Procedure for the Import and Export of Goods [LF4QST]
[11] Procedure for Transportation of Components to ITER Site [RY5C6Q]
[12] Procedure for Reception of Components at the ITER Site [RXCTBZ]
[13] Procedure for the Storage and Preservation of ITER Components at the ITER Site [RWYED5]
[14] Procedure for Issue of Components from IO Storage [RW25TC]
[15] ITER Site Signage & Graphics Standards [4ALJEU v2.4]

5 Basic Principles

Labelling is necessary:

- For “Right item in right place”
- No mixing up and no missing item
- To allow people working effectively and communicating with each other, in order to handle items properly.

This section describes general requirements, which shall be specified in each Technical Specification of IDIs to be assembled and/or installed in the ITER plant , e.g. [TL25DK], [UD7GFX], Annex B of Procurement Arrangement, PA.

Firstly, general requirement for all types of labels is described. Then individually 4 types of labels, i.e. 1) Product Label, 2) Shipping Label, 3) Warehouse Label and 4) Plant Component Label are explained.

5.1 Environmental Durability and Convenience

The labelling contents shall be clear enough for users over the necessary period, e.g. throughout the IDI lifecycle. Since quality of labeling will degrade, attention should be paid to materials and methods in particular. Typical requirements, as applicable for each specific case, are as follows:

- Visibility
- Adhesion retention
- Chemical resistance
- Outdoor durability
- Fire safety characteristics

- Temperature resistance (high-temperature and cryogenic)
- UV resistance
- Flame retardancy
- Moisture resistance
- Flexibility

Depending on the purpose and/or the environment of the label to be used, attention should be paid in

- Considering environment and technical feasibility to be ensured,
- Selection of material and method of labelling,
- Considering on if the label is permanent or temporary.

5.2 Materials of Label or Tag

- Material shall be selected taken into account of environmental durability and the duration,
- Respect vacuum handbook [2DVBF7], when applicable.

5.3 Methodology

- Typical types of labelling are handwriting, stamps, labels, engraving, ink jet printers, laser markers, and hanging tags,
- Tagging instead of labelling can happen, when 1) full set of information is not required and/or 2) area for labelling is not large enough,
- Tagging, namely only identification code to be allowed as IO-CT and DA/CON-M agreed on the Tech. Spec., etc.

5.4 Dimension, Font Size, and Language

- English and European Number (Translation to mother language can be added for domestic purpose)
- Human readable sizes of characters
- QR or bar code shall be scannable
- Shall be specified in the drawing and/or the Tech. Spec.

5.5 Location

- Labels shall be located visible areas after the production, packing, storage and installation,
- Labels shall not pose any risks in the performance of the IDI (e.g. engraving a label onto a weld),
- Shipping Label is the upper left corner of the largest face of the carton, at least,
- Cables labelling/tagging shall be carried out in one of the following ways [335VF9] and [4H5DW6]

5.6 Contents and Format

There are four types of labelling:

1) Product Label: it is affixed to a product and provides the minimum information to identify the Individually Distinguishable Item, IDI;

2) Shipping Label: it is a temporary label providing necessary information for delivery;

3) Warehouse Label: it is a temporary label to handle the item properly in a warehouse of the ITER site; it is affixed to either a single IDI or to a package;

4) Plant Component Label: it is affixed to IDI installed in the ITER plant.

Fig. 1 shows examples of four types of labels. Note that necessary contents in each label is specified with the Technical Specification.

Fig. 2 shows the schematic illustration for the generations and the attachments of those labels within the project life cycle. Regardless status of item, PNI is always attached to the item.

The content of each label is summarized in **Table 1.** Regarding Product and Shipping Labels, the minimum information shall be discussed and agreed between IO-CT and DA/CON-M. Since all relevant data is available in the database with identifier(s), it is not necessary to put full information into a label. Additional explanation for each type of label is as follows:

Product Label

- DA and/or CON-M shall specify Product Label in the product technical specification, the manufacturing drawing etc. for approval by IO-CT, respecting the contractual document taken into account of all the considerations afore mentioned.

Shipping Label

- No additional remarks

Warehouse Label

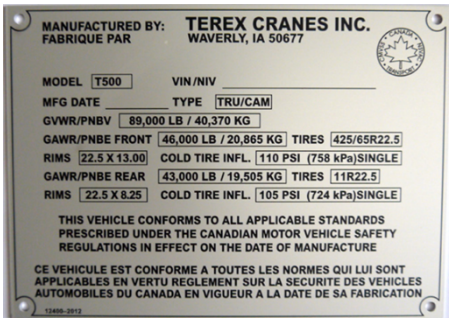
- For a package enclosing multiple items, not necessary to describe individual PNI's, MN's, etc. Packing List Ref. Num. is the critical data to retrieve all relevant information about those items,
- The warehouses mean those in the ITER Site and off-site storages warehouse, e.g. Port Saint Louis, France.

Plant Component Label

- Technical specification applicable in the construction site is [TL25DK] and according to section 4.5 of [4ALJEU],
- As another accompanying sign is, for instance the location of the electric power shut-off button.

5.7 Others

- For identical products, materials, methods, formats and locations shall be the same.
- Warehouse and Plant Component Labels are entirely managed by IO-CT with CON-C.
- Multiple types of labels, e.g. Product Label and Plant Component Label, can be attached to the same item throughout its lifecycle.
- Since PNI and SN are already included in the Product Label, only FR comprised in the Plant Component Label is finally added at the installation.



1) Product Label

2) Shipping Label

PO	4200002484 Rev:2		
Supplier	SHULTZ		
GRR	GRR-02263	Date	04-Nov-19
RN	25FD2G-PL011162	Date	30-Oct-19
PCK	25FD2G-PL011162-01		
PO Item	1600-1-1-4	Qty	5.6460 m
CC	PPPABRBEA7APDBAA	TAG/ FR	---
PNI/ Ident Code	I15901900 250 x S-40S PIPE, ASME-B36.19M, BE , ASTM A312-TP304L-SML (S30403), MAX.		
SR/HN/Ref	722409_SO2.TCWS.9		
HN 2	004709-014	PIC / SL	YES / C
Certif/IDM	CS177551-022-1 / 23B4F8	ESPN / Hazard	YES / N
		Preserv	SOP / Y6SDPP

3) Warehouse Label

4) Plant Component Label [TL25DK]

Fig. 1 Four Types of Labelling (Examples)

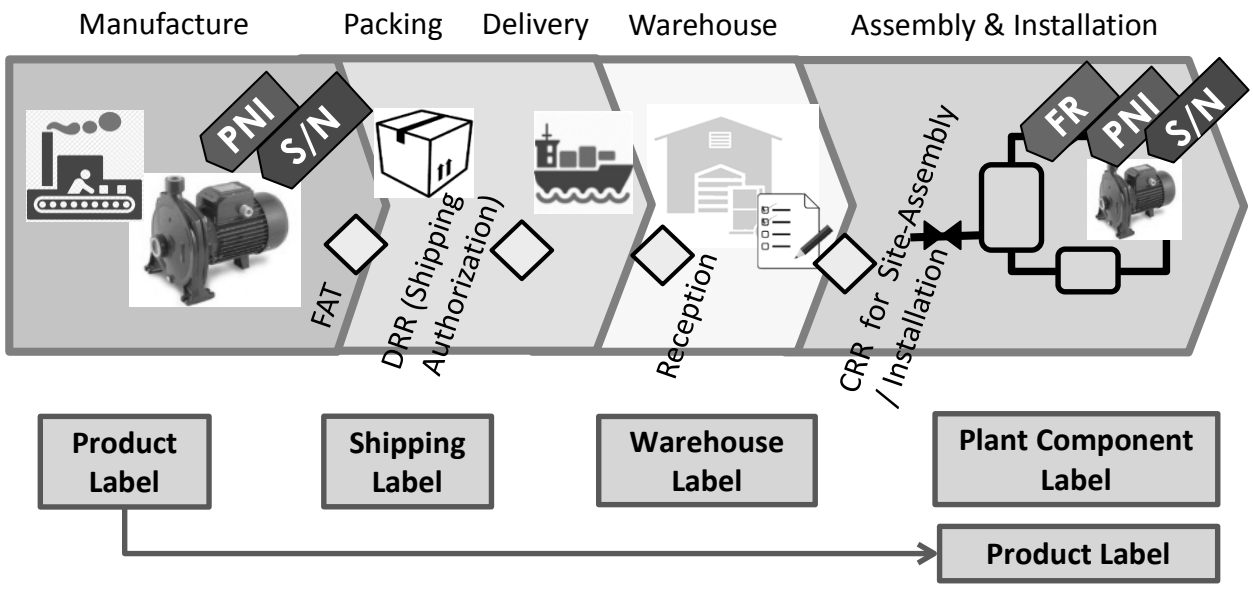


Fig. 2 Four Types of Labelling within Project Lifecycle

Table 1 Summary for Physical Labels

Label	By whom	When	Lifecycle	Mandatory contents	Additional information may be specified in Tech. Spec., etc.	Note
Product	CON-M	After production	Permanent	1) Title of Product, 2) Manufacture Part Number, MN, 3) PNI, 4) SN, 5) Safety Classification, e.g. PIC/SIC, ESPN, 6) Quality Class.	1) Other Ref. Num., 2) Dimensions, 3) Weight, 4) Supplier, 5) Production Date (MM/YYYY), 6) CE marking, as required [4].	PNI to be provided by IO-CT [28QDB5], [UYGU3S].
Shipping	DA and/or CON-M	After packaging	Temporary	1) Title of crate, 2) Purchase Order, PO, Contract Number, PA code, etc., 3) Shipping/Crate Num., 4) Supplier Ref. Num., 5) MN, 6) PNI, 7) SN, 8) Safety Classification, e.g. PIC/SIC, ESPN, 9) From (CON-M) / To, 10) Net / gross weight, 11) Responsibility, 12) Packing Date (MM/YYYY).	1) Dimensions, 2) Other Ref. Num., 3) Quantity in the crate	For PNI as mentioned above. Accompanying signs, e.g. sign of handling precaution during transportation.
Warehouse	IO-CST with CON-C	After the reception	Temporary	1) PO, Supplier 2) GRR No &Reception Date, 4) 3) Release Note Number & Date 4) Packaging Number 5) PO item & quantity 6) Commodity Code or TAG number(FR) 7) IdentCode/PNI and description of the PNI 8) SN (field SR/HN/Ref.) 9) HN 2 (heat number field 2 in SMat) 10) PIC (Yes/No/SOP) 11) SL (storage level) 12) Certif/ IDM (certification number for qualified material & IDM UID) 13) ESPN	1) SN, Lot/Batch Num. and/or Heat Num., 2) Ship Load, 3) Delivered Dock, 4) Commodity Code, 5) Intentional FR to install, 6) Export License Num., 7) Other Ref. Num., etc.	Accompanying signs, e.g. sign of handling precaution.

				14) Hazard (dangerous goods material) 15) Preservation (Yes/No) and IDM UID		
Plant Component	IO/CST with CON-C	At assembly and/or installation	Permanent	1) Title, 2) FR, 3) Safety Classification, e.g. PIC/SIC, ESPN, 4) QR Code.		Tech. Spec. [TL25DK]. Accompanying signs, e.g. safety labels for hazardous materials, high pressures and/or temperatures.

6 Workflow

Timing of affixation of a label is listed in **Table 1**.

7 Responsibilities

Responsibility assignments are specified in **Table 1**.

8 Link with Other Processes

MQP Processes	Uid	Descriptions
Configuration Management, CM	TZV743	• Identify items and ensure the installation to the right positions.
Design Control, DC	U34DDZ	• Designate designed items and design physical identification taken into account of the environment.
Handling, storage and transportation, HS	LF4QST, RY5C6Q, RXCTBZ, RWYED5, RW25TC	• Generate Tech. Spec. or specific procedure respecting this MQP procedure. • Identify items in transportation and storage.
Inspection and Testing, IN	TVL3Y5	• Ensure a label at each inspection or test. • Describe results of inspection in the Maintenance Label.
Manufacturing, Assembly and Installation, MA	ECBZWE	• Perform manufacturing design, e.g. manufacturing drawing, Tech. Spec. ensuring physical items are properly labelled. • Affix Plant Component Label at the installation.
Nuclear Safety, NS	9KAZ8T, 347SF3	• Ensure all PIC/SIC components are clearly labelled with Plant Component Labels.
Operation and Maintenance, OM	VH9LAB	• Utilize labels and tags attached to physical items for operation and maintenance.
Quality Assurance, QA	24VQES	• Quality classification

9 Outputs (Records, Deliverables, Implementation Plans….)

Not Applicable, N/A.

ITER • QA	RELEASE NOTE	*Note number:*

Section 1 *To be completed by the performer*

1-	**ITER PA Number / Contract Number:**
2-	**PA/Contract title:**
3-	**Performer:**

Section 2 *Conformity statement to be completed by the performer*

1- With the exception of the deviations listed below (point 6), we certify that the following equipment/service: (describe)

No	*Equipment / services description*	*PNI**	*SN**	*Quality class / Safety class*	*PE/ NPE**	*Quantity*
1.						
2.						
…						
…						

PE/ NPE – Pressure Equipment / Nuclear Pressure Equipment

2- Has been manufactured/performed, inspected and tested in accordance with the requirements described in the following documents: (technical specification and/or drawings and/or diagrams specifying requirements *as per Annex 1 see point 3)*

3- That the equipment/service is complete.

4- That all relevant verifications, inspections and tests are complete and satisfactory (*as per documentation indicated in Annex 1 see point 5).*

5- That the following documents are those required by the contract: *(*detailed list)
(Example / typical content of Manufacturing Dossier is presented in the Annex 1)

6- List of any deviation request and non-conformance report: *(see Annex 1 – point 6)*
*Further actions/ remain points to be addressed in the next stages of the project *:*

Performer's Responsible Officer			Performer's Quality Officer		
Name	*Date*	*Signature*	*Name*	*Date*	*Signature*

Section 3 *To be completed by ITER*

ITER Responsible Officer Decision:			ITER Quality Management Division (QARO) Comments:		
Name	*Date*	*Signature*	*Name*	*Date*	*Signature*

**Note:* *ITER Part Number (PNI) and Serial number (SN) shall be agreed with IO before delivery. In case the information (regarding PNI, SN or different others sections) is not available at the delivery time, this shall be mentioned in Section 2, point 6 of present Release Note as a further action / remaining point to be addressed on the next stage of the project. In case the information is not applicable, the respective section will be filled with N/A.*

Annex 1 of Release Note:

Manufacturing Dossier (provided as example/ typical content):	**IDM link**
1 – Description of delivery: Description of equipment / component / spare part Description of services Main spare parts list / Bill of Materials – BoM (if applicable)	
2 – Conformity: Certificate of conformity (conformance) / Declaration of conformity as per applicable directives, regulations and contractual requirements.	
3 – Design documentation; Manufacturing drawings/ diagrams; Design reports / Design calculations (if required); Technical specifications (if applicable).	
4 – Management Documents 4.1 Procedures: ○ Functional test procedures / Final acceptance tests and inspections procedures; ○ Pressure Test Procedure (if applicable); ○ Helium Leak test procedure (if applicable); ○ Non-Destructive Examination procedures - VT, PT, MT, RT, UT (if applicable); ○ Destructive examination procedure (if applicable); ○ Welding/Brazing Documents - WPS, PQR, WPQ etc.(if applicable); ○ Electrical and Insulation Tests procedures (if applicable); ○ Cleaning and packaging procedure. Surface Treatment Specification 4.2 - Qualification documents ○ Welders and NDE inspectors qualification (if required). ○ Other qualifications (if required). 4.3 Operational and functional documents: ○ Operation manual. Installation instructions. ○ Maintenance (preservation) instructions (if applicable). ○ Manufacturer handling instructions (if applicable).	
5 - Assembly, inspections and test documents: Completed Manufacturing and Inspection Plans (MIP) / Inspection and Test Plans (ITP) / Control Plans, Inspection and test reports and records (Visual Examination, Non-Destructive Examination, Destructive examination, Electrical and Insulation Tests, Leak Tests, Pressure Test, Certification of Cleanliness, etc.). Drawings marked “As Built” accepted by IO.	
6 – Deviations and Nonconformities; Deviation request approved by IO; Nonconformity reports - NCRs (close status); NCRs conditionally released	
7 – Raw materials; Material Certifications traceable to components (Certificate type 3.1 as per EN 10204);	

Note 1: The manufacturing dossier (MD) content may be changed considering the specificity of each delivery, following the contractual requirements. The MD content shall be agreed with IO before delivery.

Note 2: For construction, installation and assembly activities, Manufacturing Dossier is replaced by Mechanical Completion Dossier (MCD) prepared as per ITER_D_UYUSEE - Working Instruction for Completion Dossier Preparation.

IDM UID
46FN9B
VERSION CREATED ON / VERSION / STATUS
08 Mar 2012 / 2.1/ Approved
EXTERNAL REFERENCE

User Manual

ITER Dimensional Metrology Handbook

This Metrology Handbook outlines the mandatory requirements for dimensional control of the components, assemblies and systems for the ITER machine. In addition this handbook provides significant guidance and helpful information on best practise for large volume metrology applications which can be used in the production of procurement specifications. The handbook also provides information on the ITER metrology infrastructure and the provision of alignment and metrology services during assembly of ...

Approval Process			
	Name	*Action*	*Affiliation*
Author	**Wilson D.**	**08-Mar-2012:signed**	**IO/DG/DIP/CIE/AOP/MAI**
CoAuthor			
Reviewers	**Higuchi M.**	**08-Mar-2012:recommended**	**IO/DG/SQS/QA**
Previous Versions Reviews	**Blackler K.** **Kondoh M.** **Shaw R.**	**31-Jan-2012:recommended v2.0** **07-Mar-2012:recommended v2.0** **31-Jan-2012:recommended v2.0**	**IO/DG/DIP/CIE/AOP** **IO/DG/DIP/CIE** **IO/DG/DIP/CIE/AOP/MAI**
Approver	**Haange R.**	**08-Mar-2012:approved**	**IO/DG/DIP**
Document Security: level 1 (IO unclassified) *RO: Wilson David*			
Read Access	**LG: M&I ext, AD: Only-staff, AD: Division - Diagnostics - EXT, AD: Directorate - Central Integration and Engineering - EXT, AD: Division - Magnet - EXT, AD: DA-US, AD: DA-RF, AD: DA-KO, AD: DA-JA, AD: DA-IN, AD: DA-EU, AD: DA-CN, project administrator, RO**		

Change Log				
Title (Uid)	***Version***	***Latest Status***	***Issue Date***	***Description of Change***
ITER Dimensional Metrology Handbook (46FN9B_v2_1)	v2.1	Approved	08 Mar 2012	Reference to Design Authority Policy removed Hyperlink to SRD 62-13 corrected
ITER Dimensional Metrology Handbook (46FN9B_v2_0)	v2.0	Signed	25 Jan 2012	Version for senior management approval after internal review.
ITER Dimensional Metrology Handbook (46FN9B_v1_4)	v1.4	Signed	20 Jun 2011	M Kondoh and D Sands added as reviewers at the request of K Blackler
ITER Dimensional Metrology Handbook (46FN9B_v1_3)	v1.3	Signed	15 Jun 2011	Following technical review, document issue raised to add reviewers/approver for sign off Authority.
ITER Dimensional Metrology Handbook (46FN9B_v1_2)	v1.2	Signed	16 May 2011	references to Manual replaced with Handbook +/- 1mm value removed Reference to temperature control requirements added note on MQP requirements added
ITER Dimensional Metrology Handbook (46FN9B_v1_1)	v1.1	Signed	03 May 2011	Comments included following review
ITER Dimensional Metrology Handbook (46FN9B_v1_0)	v1.0	Signed	04 Mar 2011	

Table of Contents

1 Purpose

The purpose of this document is to supply information relating to dimensional metrology to all Departments of the ITER Organisation and Domestic Agencies. To define strategies and infrastructure provision, identify requirements and best practises and provide a standardised approach to dimensional control and alignment processes.

2 Scope

The Dimensional Metrology Handbook (DMH) outlines the mandatory requirements for dimensional control of the components, assemblies and systems for the ITER machine. In addition the handbook provides significant guidance and helpful information on best practise for large volume metrology applications. The handbook also provides information on the ITER metrology infrastructure and the provision of alignment and metrology services during assembly of the machine and its ancillary components and systems.

The DMH is issued as a supplement to project requirements documents, since it is necessary that the requirements contained in this handbook are followed by the ITER Organisation, the Domestic Agencies and industry to ensure the successful construction and operation of ITER.

3 Definitions

Abbreviations and Acronyms

3D	Three Dimensional
A&M	Alignment and Metrology
AIMS	Advanced Integrated Mathematical System
ASCII	American Standard Code for Information Exchange
CAD	Computer Aided Design
CBD	Cryostat Base Datum
CCL	Current Centreline
CCR	Corner Cube Reflector
DA	Domestic Agency
DCM	Design Compliance Matrix
DMH	Dimensional Metrology Handbook
DMIS	Dimensional Measurement Interface Standard
GD&T	Geometric Dimensioning and Tolerancing
GPS	Geometrical Product Specifications
ICD	Interface Control Document
IDM	ITER Document Management System
IGES	Initial Graphics Exchange Specification
IO	ITER Organisation
IS	Interface Sheet
LVM	Large Volume Metrology
MIP	Manufacturing Inspection Plan

MQP	Management and Quality Program
MRP	Mandatory Requirements for Procurement
NRK	New River Kinematics
PA	Procurement Arrangement
PF	Raw 3D Scan data Format
PIF	Parametric Image Format
PIT	Pit Datum
POL	InnovMetric's Binary Format
RO	Responsible Officer
SA	Spatial Analyzer
SAT	Standard ACIS Text
SMR	Spherically Mounted Reflector
SRD	System Requirements Document
STEP	Standardised Exchange of Product
TAD	Tokamak Assembly Datum
TRO	Technical Responsible Officer
TF	Toroidal Field
TFGS	Toroidal Field coil Gravity Support
TGCS	Tokamak Global Coordinate System
VVGS	Vacuum Vessel Gravity Support

4 Communications and acceptance

To satisfy the requirements of this handbook, processes and procedures relating to alignment and dimensional control must be clearly documented and where stated: approved or accepted by the Metrology RO or nominated representative.

Section 11 and its sub-sections "Process control and best practise" identify areas that will be reviewed prior, during and on completion of the activity and will require IO acceptance at predefined stages. *Acceptance/Approval* is to be a positive and recorded action, either by signature or by electronic means.

A possible route of communication and acceptance could be:-

Supplier (Contractor) ↔ Domestic Agency Contract Responsible Officer ↔ ITER Technical Responsible Officer ↔ ITER Metrology Responsible Officer.

5 Alignment and Metrology (A&M) Classifications

Machine components and plant systems requiring alignment and/or dimensional control shall be given an A&M classification by the applicable TRO. The classification shall reflect the importance placed on A&M for the system to function and the consequence of failure on the project. This classification shall be reviewed with the Metrology RO and accepted

Alignment & Metrology (A&M) Class 1

Components or assemblies requiring alignment and/or dimensional control, where failure to comply in these areas will significantly impair or prevent machine assembly and/or operation and could potentially cause schedule delay in excess of one month or cost risk in excess of 1M€.

A&M Class 2

Components or assemblies requiring alignment and/or dimensional control, where failure to comply in these areas will significantly impair or prevent machine assembly and/or operation and could potentially cause schedule delay in excess of one week or cost risk in excess of 0.1M€.

A&M Class 3

No dimensional control oversight by IO is required through the supply chain or on receipt at the ITER site. No component alignment requirements however; setting out points/lines will be required from the IO metrology team to facilitate the installation.

Unclassified

No IO infrastructure required or support from the ITER metrology team

Note: It is the responsibility of the Technical RO to make an assessment of the A&M requirements for his system following the processes in this document in order to determine the A&M class, which is be reviewed by the metrology RO.

6 Mandatory requirements for A&M Tasks

For the ITER machine to operate to specification it is essential that the supply of its constituent parts is controlled throughout their life cycle from raw material through manufacture, assembly commissioning and operation. From a metrology perspective this means that dimensional control processes must be qualified and traceable.

The Metrology RO shall be available to provide technical advice to system ROs during preparation of PAs and Technical Specifications, reviewing metrology related documentation and providing support where necessary during manufacture, assembly/installation and acceptance.

In the following sections, information is provided on best practise guidance for metrology related processes and will be used as the basis for reviewing process documentation relating to dimensional control activities.

Within this section are the mandatory requirements relating to A&M for the supply and assembly/installation of the systems for ITER. If an exceptions to a mandatory requirement is requested it must be agreed by the IO MAI section through a deviation request.

Mandatory requirements relating to A&M are dependent on the A&M classification applicable (section 5) to the component or assembly concerned. These requirements are detailed in the following sub-sections:

6.1 Mandatory Requirements for Site (MRS) based A&M Class 1 activities

A&M Class 1 activities are critical to the successful assembly/installation and operation of the ITER machine and as such require the highest level of qualification and control. Listed below are the mandatory requirements, as applicable for the system concerned, identifying responsibilities for their delivery and acceptance. The Metrology RO or his delegate shall review all key documents pertaining to A&M tasks within this classification.

[MRS1] The System Requirements Document (SRD), Interface Control Document (ICD) or other document, shall define the alignment and/or dimensional control requirements. These shall be included in the DCM and the methods to achieve them shall be reviewed and approved as part of the ITER Design Review Procedure with the Metrology RO accepting the process for the A&M tasks.

[MRS2] The ITER RO shall identify all A&M quality documentation that will form part of the supply for the applicable system. The dossier of documents shall be certified compliant with the requirements of the technical specification or shall be supported by a non-conformance report. This shall be in place prior to any A&M work commencing at the ITER site.

[MRS3] For items requiring goods inwards, in-process or final inspection, a list of key characteristics shall be compiled by the RO to identify the scope of the inspection. Datums and tolerances shall be identified in a drawing or other medium acceptable to the inspection team carrying out the task. A method statement or procedure shall be prepared by the party responsible for the inspection which shall be accepted by the Metrology RO or his delegate.

[MRS4] For items requiring setting out, pre-alignment and/or final alignment at the ITER site, a procedure shall be prepared detailing the requirements, process description, reference data, output data together with reporting and acceptance criteria. This procedure shall be accepted by the Metrology RO or his delegate prior to task commencement.

[MRS5] The coordinate/datum systems used during inspection and alignment tasks on the ITER site shall be clearly defined in the A&M procedure for the task and applicable drawings. Where datums evolve to reflect as-built variation in the assembly/installation process the logic shall be traceable back to the nominal requirement.

[MRS6] Inspection reports shall identify the nominal dimensions, applicable tolerances and the dimension achieved for the feature, with non-

complying values flagged in red on the report. These features shall be the subject of rework or a non-conformance report.

[MRS7] All metrology equipment used for A&M tasks shall hold a current calibration certificate issued by an accredited laboratory (Reference standard BS EN ISO/IEC: 2005). The equipment selected by the supplier shall be fit for the requirements of the measurement process considering areas such as: measurement uncertainty, speed of data acquisition, measurement geometry, local environmental conditions etc.

[MRS8] Measurement uncertainty shall be calculated for all reported measurements at a confidence level of 2σ. As a general rule, the uncertainty value shall not exceed 20% of the tolerance applicable to the feature measured. Maintaining an uncertainty of 10% or less is recommended to optimise the available tolerance applicable to the feature concerned.

[MRS9] The IO drawings specify dimensions at the reference temperature of 20˚C. The environmental conditions for A&M will depend very much on the location in which the activity is to be carried out. The RO shall make an assessment of the impact of thermal expansion/contraction on the A&M task and specify controls to be put in place as necessary to compensate. Consideration shall be given to the thermal inertia of the components being measured, where necessary allowing sufficient soak time in the measurement environment to ensure thermal stabilisation. For critical items Temperature measurements (better than ± 1°C) shall be recorded throughout the measurement task of both the component and the environment, logged against time and saved with the measurement file. For large components, multiple measurements shall be required to enable the detection of thermal gradients.

[MRS10] For measurement surveys utilising multiple instrument stations, bundle adjustment algorithms shall be utilised to ensure error propagation, via multiple best-fit alignments, does not occur.

[MRS11] All “as-built” drawings/3D models/electronic data shall be supplied in a format agreed with the IO to demonstrate compliance with the design. The IO does not prescribe which software should be used however; it is critical that measurement data can be easily transferred been all parties requiring access to it.

[MRS12] All inspection/dimensional control and alignment reports shall include, as a minimum, the following information:

- Identification of measuring instruments used including calibration certificate number
- Identification of ancillary equipment, as applicable, used including type, make unique identifier and calibration certificate number i.e.
    - Test unit
    - Probes (dimensions, frequencies)
    - Targets and tooling

- Scale bars
- Identification of the part examined
- Reference drawing or CAD model identification defining the tolerances, datum etc. which the part has been inspected to, including issue status
- Time and place of the inspection plus signature of the operator
- Name and qualification of the operator and his employer.
- Procedure followed and issue status
- Meteorological data (temperature, humidity, pressure)
- Identification of all computer files generated during the inspection, all raw and processed data must be in a format acceptable to the IO
- Written values tabulated to provide: nominal dimensions, applicable tolerances and the dimension achieved for the feature, with non-complying values flagged in red on the report. Graphical data may be used if agreed by IO.
- Interpretation of results, including an explanation for any readings considered invalid.
- Identification of any non-conformity reports raised.

[MRS13] All drawings and/or electronic data used for A&M activities shall be issued through the ITER document control process and certified at the status to which they shall be used.

6.2 Mandatory Requirements for Site (MRS) based A&M Class 2 activities

Components or assemblies with an A&M class 2 will require a significant amount of dimensional control on the IO site. They may need to go through a pre-alignment process to provide references (fiducials) for assembly/installation and may also need inspections during and on completion of assembly/installation.

A&M class 2 tasks however have a reduced impact on cost and schedule in the event of failure therefore requiring a reduced level of input by the Metrology RO.

The A&M class 1 mandatory requirements [MRS1] through to [MRS13] shall be maintained for this classification, as applicable to the task, but the requirement for review/approval by the Metrology RO is removed.

6.3 Mandatory Requirements for Site (MRS) based A&M Class 3 activities

A&M class 3 activities only require setting out points/lines to facilitate their installation therefore the mandatory requirements for these activities are [MRS4], [MRS7] and [MRS13].

6.4 Mandatory Requirements Procurement (MRP) for A&M Class 1 activities

A&M Class 1 activities are critical to the successful assembly/installation and operation of the ITER machine and as such require the highest level of qualification and control. Listed below are the mandatory requirements, as applicable for the system concerned, identifying responsibilities for their delivery

and approval. The Metrology RO or his delegate shall be given the opportunity to review all key documents pertaining to A&M tasks within this classification.

[MRP1] The System Requirements Document (SRD), Interface Control Document (ICD) or other document, shall define the alignment and/or dimensional control requirements relating to the subject of the procurement. These shall be included in the DCM and shall be reviewed as part of the ITER Design Review Procedure.

[MRP2] The A&M requirements for the procurement shall be included within the Technical Specification (Annex B for PA's) with design drawings and associated design documents defining the fundamental design dimensions and tolerances. The supplier shall produce shop floor documentation that demonstrates how the manufacturing and/or assembly process shall be controlled throughout the production cycle. This shall include tolerance requirements for relevant stages of the manufacturing process that shall be agreed with the IO prior to commencement of manufacture.

[MRP3] Prior to contract commencement the supplier shall produce an implementation plan defining all quality related activities to be carried out during the contract. Elements relating to A&M shall include:

- Reference standards
- Design change control procedures – Drawings and CAD models
- Document control
- Instrument calibrations and test procedures
- Control of non-conformities
- Data management procedures
- Measurement procedures- data acquisition, post processing and validation
- Reporting procedures

The Metrology RO shall be given the opportunity to review the implementation plan and any documents referenced within it, prior to contract commencement.

[MRP4] Inspections shall be carried out at all crucial stages of the manufacturing process to guarantee adherence to final tolerances and set as early as possible corrective measures where necessary. The frequency and details of these inspections shall be defined by the supplier in the MIP for the procurement which the IO will be given the opportunity to witness at their discretion.

[MRP5] The coordinate/datum system used during inspection and dimensional control processes shall be as defined in the design drawings. Inspection reports shall identify the nominal dimensions, applicable tolerances and the dimension achieved for the feature with non-complying values flagged in red on the report.

[MRP6] All metrology equipment used for A&M tasks shall hold a current calibration certificate issued by an accredited laboratory (Reference standard BS EN ISO/IEC: 2005). The equipment selected by the supplier shall be fit for the requirements of the measurement process considering areas such as: measurement uncertainty, speed of data acquisition, measurement geometry, local environmental conditions etc.

[MRP7] The supplier shall draft a dimensional control plan (DCP) that shall include all inputs and outputs relating to the measurement process, see section 9. The DCP shall be supplied to the IO for acceptance, prior to commencement of manufacture.

[MRP8] Measurement uncertainty shall be calculated for all reported measurements at a confidence level of 2σ. As a general rule, the uncertainty value shall not exceed 20% of the tolerance applicable to the feature measured. Maintaining an uncertainty of 10% or less is recommended to optimise the available tolerance applicable to the feature concerned.

[MRP9] The IO drawings specify dimensions at the reference temperature of 20˚C. Dimensional control for factory acceptance shall be carried out in a controlled environment with a maximum temperature variation of ± 2˚C. Key dimensions shall be measured at the reference temperature or corrected to this temperature therefore temperature stability during the measurement process is critical. Raw measurement data and corrected values shall be made available to the IO. Consideration shall be given to the thermal inertia of the components being measured allowing sufficient soak time in the measurement environment to ensure thermal stabilisation. Temperature measurements (better than ± 1°C) shall be recorded throughout the measurement task of both the component and the environment, logged against time and saved with the measurement file. For large components, multiple measurements shall be required to enable the detection of thermal gradients.

[MRP10] For measurement surveys utilising multiple instrument stations, bundle adjustment algorithms shall be utilised to ensure error propagation, via multiple best-fit alignments, does not occur.

[MRP11] The supplier shall produce “as-built” drawings/3D models/electronic data, in a format agreed with the IO demonstrating compliance with the design. The IO does not prescribe which software should be used however; it is critical that measurement data can be easily transferred between the parties to the ITER agreement. During manufacture this data may be required to qualify measurement processes, address non-conformance issues, and consider concession requests. In addition, the data may be used to construct a configuration model representing the true geometry of the item concerned.

[MRP12] Deviations from the design requirements shall be the subject of a non-conformance (NCR) report with corrective measures involving geometric or material property changes requiring the prior approval of

the IO. To enable a decision to be made the supplier shall furnish the IO with documents justifying their proposal delivered within the NCR system.

[MRP13] All inspection/dimensional control reports shall include, as a minimum, the following information:

- Identification of measuring instruments used including calibration certificate number
- Identification of ancillary equipment, as applicable, used including type, make unique identifier and calibration certificate number i.e.
  - Test unit
  - Probes (dimensions, frequencies)
  - Targets and tooling
  - Scale bars
- Identification of the part examined
- Reference drawing or CAD model identification defining the tolerances, datum etc. which the part has been inspected to, including issue status
- Time and place of the inspection plus signature of the operator
- Name and qualification of the operator and his employer.
- Procedure followed and issue status
- Meteorological data (temperature, humidity, pressure)
- Identification of all computer files generated during the inspection, all raw and processed data must be in a format acceptable to the IO
- Written values tabulated to provide: nominal dimensions, applicable tolerances and the dimension achieved for the feature, with non-complying values flagged in red on the report. Graphical data may be used if agreed by IO.
- Interpretation of results, including an explanation for any readings considered invalid.
- Identification of any non-conformity reports raised

In order to avoid unnecessary duplication, some of the information listed above can be provided in documents identified by the supplier and attached to the report.

6.5 Mandatory Requirements Procurement (MRP) for A&M Class 2 activities

Components or assemblies with an A&M class 2 for procurement will require a significant amount of dimensional control during manufacture, overseen by the IO. They may need to go through a pre-alignment process to provide references (fiducials) for assembly/installation at the ITER site and may also need some form of inspection during factory acceptance or on receipt by the RO.

The TRO for the system involved shall need to consider the level of control to be applied during the procurement process and identify the mandatory requirements in the technical specification applicable to the procurement.

As a minimum the following mandatory requirements from A&M class 1 shall be applied: [MRP1], [MRP2], [MRP3], [MRP4], [MRP5], [MRP6], [MRP7] and [MRP12]. Other requirements may be added at the discretion of the RO.

Note: Components of A&M Class 3 or below require no specific dimensional controls of alignment activities during the procurement process.

7 Standards

There are a large number of standards relating to dimensional metrology which can broadly be grouped under the scope of two Technical Committees within the International Standards Organisation (ISO) namely:

TC 213 - Dimensional and geometrical product specifications and verification

Standardisation in the field of geometrical product specifications (GPS), i.e. macro- and microgeometry specifications covering dimensional and geometrical tolerancing, surface properties and the related verification principles, measuring equipment and calibration requirements including the uncertainty of dimensional and geometrical measurement. The standardisation includes the basic layout and explanation of drawing indications (symbols).

TC 176 - Quality management and quality assurance

Standardization in the field of quality management (generic quality management systems and supporting technologies), as well as quality management standardization in specific sectors at the request of the affected sector and the ISO Technical Management Board.

Note:

ISO/TC 176 is also entrusted with an advisory function to all ISO and IEC technical committees to ensure the integrity of the generic quality system standards and the effective implementation of the ISO/IEC sector policy on quality management systems deliverables.

Non ISO standards useful for reference:

Guidelines for the Evaluation of Dimensional Measurement Uncertainty (Technical Report) (B89.7.3.2 - 2007)

Performance Evaluation of Laser-Based Spherical Coordinate Measurement Systems (B89.4.19 - 2006)

8 Infrastructure - Survey Networks and datums

All measurement tasks need a fixed reference base (the datum) from which measurements can be made and calculated. For large volume metrology (LVM) applications this reference

typically takes the form of a survey network consisting of a collection of target nests and/or instrument stations of known geometry and computed uncertainty.

The accuracy and precision of the survey network(s) directly affects the measurement accuracy that can be achieved for subsequent alignment tasks. Accuracy and precision are terms that often get confused therefore for the purposes of this document their definitions are as follows:

Accuracy:	The degree of conformity of a measured or calculated quantity to its actual (true) value
Precision:	The degree of repeatability achieved when the same quantity is measured a number of times

The survey network design process starts with a specification detailing how the network will be utilised and defining the ultimate measurement tolerances to be achieved. A perfect measurement does not exist therefore it is important to be able to determine the measurement uncertainty for each stage of the measurement process and thus create a tolerance budget.

Measurement uncertainty:	The parameter, associated with the result of a measurement (e.g. a calibration or test) that defines the range of values that could reasonably be attributed to the measured quantity. When uncertainty is evaluated and reported in a specified way it indicates the level of confidence that the value actually lies within the range defined by the uncertainty interval.

The survey networks for ITER will cover the whole of the site, providing a global coordinate matrix for survey instruments to reference against. The accuracy requirements for each network will vary, dependent on the alignment tasks for which they are being supplied. As such, interface control documents need to clearly define the alignment requirements of ITER components, assemblies and systems.

8.1 Primary Survey Network

The first survey network installed was the Primary Survey network which defines the site reference system for buildings construction, provides the datum for monitoring stability and is the global datum for dedicated secondary networks installed throughout the site.

The network consists of a collection of geodetic pillars, spread around the site and tied into foundations designed to optimise stability. A common interface for force-centring survey instruments and survey targets is embedded in the top of each pillar.

The network was installed and measured in the summer of 2010. A least squares adjustment was made to optimise the network and determine the co-ordinate and uncertainty values for each survey monument. The measurement uncertainty for the network was calculated to be ~1mm when initially measured. The network will be periodically monitored for stability.

The coordinates of the primary survey network are reported within the Lambert III mapping projection with elevations relative to sea level. The Tokamak Global Coordinate System (TGCS) is an orthogonal system with the gravity vector defining the Z-axis at machine centre, the Y-axis points towards site north (37˚ counter-clockwise from geographic north) with the X-axis mutually perpendicular to Z & Y in an easterly direction. The origin of the

coordinate system is at the nominal tokamak centre. For more information on ITER co-ordinate systems refer to document ITER_D_2A9PXZ.

8.2 Tokamak Pit Network

Machine assembly activities within the tokamak pit shall require accurate and precise alignment of components. The design specification for the network is to achieve an uncertainty no greater than ± 0.2 mm within a temperature controlled environment of ± 2˚C (ref. SRD 62-13), this requirement is achievable if the environment remains stable. However, it is clear that with the immense transfer of loads occurring during construction that the network will move and distort to a certain extent. This distortion will need to be monitored and modelled during machine assembly to ensure that the final machine is aligned to specification. Both dynamic and passive measurement systems are being considered to provide an efficient system for monitoring the network movement and thus enable adjustments to be calculated and employed.

The initial network shall consist of many targets, or target nests, distributed around the pit wall covering the full height of the pit and extending into the adjacent port cells. The best fit centre of the pit shall be derived from the pit wall targets defining the vertical datum axis for machine assembly. The datum for toroidal position and elevation will be derived from the best fit position of the port cells.

Once the lower cryostat cylinder is installed, lines of sight to the lower pit wall targets will be blocked however, lines of sight from the pit into the port cells and vice versa shall be maintained. The pit wall targets above the cryostat lower cylinder shall remain visible throughout the vacuum vessel construction, only becoming obscured when the cryostat upper cylinder is installed. The port cell targets are very important to the pit network as they provide the link to systems external to the pit within the adjacent galleries.

It is likely that a number of different instrument types will be used during the tokamak build process such as photogrammetry cameras, laser trackers and total stations. Laser trackers and total stations measure to similar spherically mounted reflectors called SMRs or corner cube reflectors CCRs, different names for the same item. Photogrammetry uses retroreflective however, common targeting mounts are readily available from suppliers such as Hubbs and Brunson enabling interchangeability of instruments utilising the network.

8.3 Tokamak Galleries Networks

Survey networks shall be installed external to the bio shield wall within the port cells and galleries. These multi-level networks shall provide the dimensional control for all systems external to the tokamak pit within the tokamak building and will be linked to the Tokamak Pit Network via the port cells. The network shall consist of a collection of wall and floor mounted target nests distributed throughout the galleries. These will be a standardised design as used for the pit network thus allowing flexibility of instrument selection for measurement tasks.

Provision shall be made to link the tokamak hall network to the primary network. This will be carried out with a total station and level and will be periodically checked for stability whist lines of sight remain available.

8.4 Generic Buildings Networks

There are various buildings around the site having different requirements for dimensional control. Users of these buildings need to consider their requirements at an early stage so that fit for purpose networks can be installed and measured in a timely manner.

Where required, building networks shall be linked to the primary survey network thus providing a global position for all setting out, alignment and measurement tasks. Where a local reference is required co-ordinate transformations into the building co-ordinate system can be made (ref. ITER_D_2A9PXZ).

8.5 Assembly Datums

During assembly of the ITER machine it will be necessary to adjust the build datum to optimise the assembly process with respect to the as-built geometry of key machine components. Each build datum shall define the position and orientation of a coordinate frame within which the coordinates of the targets/target nests of the Tokamak Pit Network shall be valued.

The pit datum (PIT) as described in section 8.2 will be the initial datum used to align the following components:

- Cryostat Column Baseplates
- Cryostat Columns
- Cryostat Base Section assembly

The as-built position of the cryostat base shall be used to define the cryostat base datum (CBD) this shall be used to align:

- Cryostat lower Cylinder
- TF Coils

The key characteristics on the cryostat base that are used to establish the CBD are the gravity support interfaces for both the TF coils (TFGS) and the vacuum vessel (VVGS).

The key characteristic of the coils to be aligned is the current centre line (CCL) of the winding back, its position defined with respect to fiducials on the coil case.

When the 18 TF Coils are in place, the Tokamak Assembly Datum (TAD) shall be established representing the Least Square best Fit of the 18 TF Coils. This datum shall be used for final alignment of the vacuum vessel, remaining magnet systems and the internal vacuum vessel components.

9 Survey and Alignment during buildings construction

During the construction phase of the ITER buildings there will be many requirements for accurate alignment. ROs need to carefully consider the alignment requirements of their systems especially in areas of restricted access where opportunities to define reference points may be limited.

The alignment path of systems that will ultimately be separated by physical barriers, such as concrete walls, may not be restricted at an early stage of the project. Providing the alignment references at this early stage may be the only opportunity to carry out the task and therefore guarantee the success of the installation.

Some large or heavy pieces of plant and equipment may have to be installed during the construction process if access to deliver such component will not be possible once construction is complete. In these instances, alignment references will need to be established in advance to facilitate the setting out and alignment as required.

Generally speaking; if a piece of equipment needs to be installed accurately to a global co-ordinate i.e. not positioned to local features like adjacent walls, building columns etc., then access to a survey network or pre-defined and established reference points will be required. Local alignment tasks need clear lines of sight or a network or dedicated reference points to facilitate the task.

The installation of the primary survey network is complete however the addition, pace and sequence of secondary networks will be driven by the requirements defined by the various system ROs on the project and should be clearly defined in the project schedule.

10 Design for Alignment and Metrology

The ITER machine is made up of many complex components and assemblies which need to interact in specific ways for the experiment to be successful. The design process will identify the optimum configuration for these systems identifying key characteristics to be focussed on with realistic parameters for manufacture and assembly, achieving a fit for purpose design.

From a metrology perspective, measurement uncertainty is a key contributor to the overall tolerance budget and as such needs to be carefully considered. For example; if a component can be manufactured to a perceived tolerance of +/- 1 mm but the measurement process can only deliver to +/- 2 mm then the overall process is clearly out of control.

It has already been identified that survey networks can be designed and installed to provide the datum for alignment activities. This however is only part of the requirement; the components themselves also need to be equipped with alignment features, designed to interface with the most appropriate measurement instruments and positioned to deliver the required alignment accuracy. In addition, the survey features need to be positioned with due consideration to the kinematics of the alignment system. There is no point in having an accurate and precise measurement system if the alignment mechanism cannot respond efficiently to the data provided by the measurement survey.

The list below identifies areas for consideration when designing components for alignment:

Alignment tolerances

- Position
- Elevation
- Angle: Roll, Pitch,
- Yaw

Datum references

- PIT
- CBD
- TAD
- Local to component

Alignment features

- Target nests
- Tooling Ball
- Retroreflective targets
- Scribed reference lines

Adjustment Mechanisms

- Screw threads
- Jacks
- Cams

Alignment Geometry

- Plane
- Line
- Centre of rotation
- Coupled or decoupled

Metrology Instruments

- Laser Trackers
- Total Stations
- Theodolites
- Articulated measurement arms
- Photogrammetry
- Laser Scanners
- Levels

During the design and planning stages for ITER and in support of the procurement arrangements (PAs), the Metrology RO is available to give advice on aspects relating to geometrical and dimensional control for the project. Inspection and alignment surveys can be simulated at the design stage enabling qualification of measurement processes and the determination of uncertainty values for measured points and features within the survey.

11 Process control and best practise

The control of dimensional measurement is an essential part of the supply chain for the ITER components and the subsequent assembly activities to be carried out at the ITER site. For all critical inspections/surveys the measurement process needs to be clearly defined, controlled and accepted by the IO.

Inputs to the process may include:

- design specifications, drawings, CAD models
- quality plans, procedures, method statements
- measuring instruments, calibrations, reference artefacts
- components and assemblies
- plant and equipment
- personnel, skills, training
- computer software, simulations, uncertainty analysis

With outputs such as:

- raw measurement data
- Meteorological corrections
- Scale adjustments
- co-ordinate frame transforms
- quality control inspection reports
- best-fit analyses and transformation matrices
- aligned component / assemblies
- fiducially referenced components / assemblies
- survey uncertainty analyses
- signed off method statements, procedures, quality plans
- Survey Report

The measurement process needs to be fit for purpose; delivering the required outputs in an efficient manner and providing assurances that the process is under control. The IO shall be given the opportunity to review the process documentation prior to commencement and to witness inspections/surveys during manufacture, hold points shall be specified in the Manufacturing and inspection Plan (MIP) as required. In exceptional circumstances the IO reserves the right to carry out its own dimensional control measurements utilising its own personnel or a third party supplier.

The IO shall identify key interfaces which must be inspected during manufacture and monitored during assembly operations, such as welding, which may affect the fit, form or function of the assembly. The control of such operations shall be clearly defined in the process documentation with measurement data recorded in an appropriate format.

11.1 Large volume portable measurement systems

For large volume metrology it is often necessary to bring the measuring instrument to the job. Portable co-ordinate measurement systems such as Laser trackers, total stations, theodolites and photogrammetry, enable the surveyor/inspector to carry out the measurement task in the workplace however, with this flexibility comes added variables that must to be controlled.

The workshop environment is unlikely to be as rigorously controlled as a dedicated metrology lab. Changes in temperature, humidity and pressure all contribute to measurement variance and therefore need to be recorded and compensated for.

Measuring a large component or assembly will often require the use of multiple instrument stations. This may be due to line of sight constraints or as a means of reducing observation lengths within the survey to minimise measurement uncertainty. Whatever the reason, if the results are to be considered within a single coordinate system then a network solution to the fit will be required. Best practice is to carry out a bundle adjustment of the network; this iterative process will optimise the network by minimising the combined pointing errors of the measurements. With the instrument stations optimised the uncertainty of the measured points within the network can be calculated through a variance algorithm.

Minimising the potential for error will come from a good understanding of the technical specification, consideration and compensation for the working environment and by applying best practice processes.

11.2 Best-fit analysis and alignment transformations

Initial measurements taken during a survey will be valued within the measuring instrument’s local co-ordinate system. Their relationship to each other will be clearly defined but they will require aligning to the part or assembly to which they relate.

The alignment can be defined by geometry measured within the measurement session i.e. points, lines and planes or by referencing measured points to features within the CAD model such as faces, surfaces etc.

Unlike the CAD model, the measured points will not fit perfectly to the design nominal therefore a series of weighted best-fits will need to be applied to optimise the alignment. The IO shall identify the key characteristics to be used for the alignment and prioritise their importance. This information shall either be provided within engineering drawings, annotated to the CAD model or as written instructions.

The supplier's measurement procedure shall identify best fit processes to be carried out including any data filtering that will be applied. In general, all raw data shall be maintained and stored for ease of recall and review by the IO.

11.3 Control of inspection measurement and test equipment

All measuring equipment must be fit for purpose to deliver to the tolerances specified. A documented calibration system must be in operation traceable to national standards and certificated through an accredited body. A calibration schedule must be in place with all calibrations logged within a register and all calibration certificates filed for ease of recall.

A Quality document shall clearly identify where and when measurement equipment has been used. Each piece of equipment shall be uniquely identified and must only be used when its calibration status is within date.

For critical measurements it may be necessary to calibrate a measuring instrument more frequently than the suppliers recommended interval. Where the IO deems this necessary it shall mark up the quality plan accordingly.

11.4 Coordinate systems and measurement units

In general, when conveying results of a survey/inspection the co-ordinate system used shall be coincident and of the same type as that used to specify the design. The measurement units shall be as defined in the drawing or model and the deviation from nominal of the as-built dimensions shall be reported in the same manner as they are toleranced.

Results from an inspection shall be expressed in quantative terms when a design characteristic is expressed in numerical units. Attribute data may be used (e.g. go/no-go) if no inspection technique resulting in a quantative measurement is feasible. Where this is the case the gauge used for the process shall be traceable to an appropriate national standard.

11.5 Metrology software and data formats

The ITER organisation has adopted Spatial Analyzer (SA), supplied by New River Kinematics (NRK), as its preferred metrology software. The software interfaces with the vast majority of measurement instruments; its architecture maintains full traceability of the measurement process storing all raw measurement data and environmental monitoring corrections.

The software has been specifically designed for large volume metrology applications; its optimisation algorithms for network configurations, computes measurement uncertainty by default and analyses instrument performance in the process. The system can be used offline for measurement simulations by utilising constructed geometry within the application or by directly importing Catia V5 models, complete with embedded GD&T if required.

The IO does not prescribe which software should be used however; it is critical that measurement data can be easily transferred between the parties to the ITER agreement. During manufacture this data may be required to qualify measurement processes, address non-conformance issues, consider concession requests and certainly to build up as-built models of the supply.

The following data formats can be read into SA:

ASCII, STEP, IGES,VDA, SAT, DMIS, AIMS-TDF, Polyworks (POL, PIF, PF, DPI), Direct Catia V4 V5 *.CGR process, Direct UG process, Direct ProE process, VSTARS .xyz file, VSTARS Cameras (outstar.txt), xyz ijk File (IJK), Digital network levels, IMETRIC, 1-D data (Datamyte).

In all cases measurement data must include uncertainty values, see following section.

11.6 Measurement uncertainty

Measurement uncertainty is the parameter, associated with the result of a measurement (e.g. a calibration or test) that defines the range of values that could reasonably be attributed to the measured quantity. When uncertainty is evaluated and reported in a specified way it indicates the level of confidence that the value actually lies within the range defined by the uncertainty interval.

No measurement is complete unless its uncertainty can be quantified. In a similar way that a tolerance relays the acceptance specification for a given dimension, the measurement uncertainty must be considered when determining whether a measured characteristic meets the design criteria.

For example: if the distance between 2 points is required to be 10m +/- 0.003m then a measurement returning a value of 10.0025m appears to be acceptable however; if the measurement uncertainty for each point is +/- 0.001m then the reality is that the measured dimension could be out of spec by up to 0.0015m.. Figure 1 demonstrates this pictorially

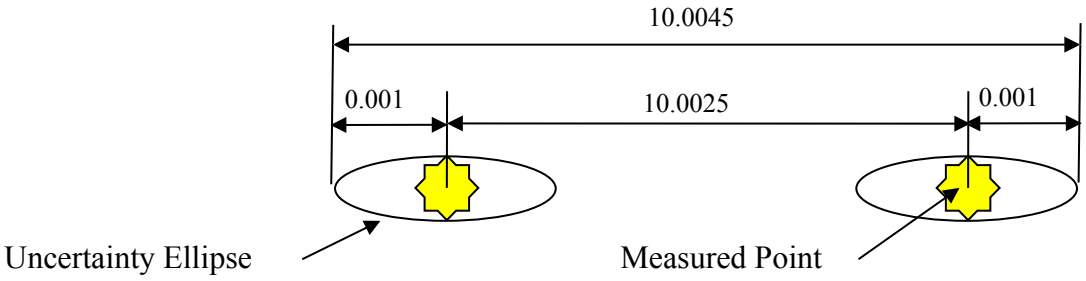


Figure 1: example of an uncertainty analysis for a linear dimension

11.7 Measurement scale

Components for the ITER machine are dimensioned nominally at 20˚C. For large objects the effects of temperature change on the physical size of the object can be considerable and as such must be taken into account during the measurement process.

Measurements, especially those carried out over a prolonged period, must be carried out in thermally stable conditions. The measuring instrument and component must be given time to acclimatise to the environment and the temperature must be monitored throughout the measurement task.

Where the measurements cannot be taken at 20˚C a scale factor will need to be applied to the measurement job. In consideration of the components orientation and fixturing, the scaling vector(s) shall be identified in the measurement plan for acceptance by the IO.

When using optical measuring systems such as laser trackers or total stations consideration needs to be given to distance measurements from these instrument's interferometers or absolute distance meters. Environmental factors such as changes in atmospheric pressure, temperature and humidity will affect the wavelength and as such need to be corrected. All environmental monitors used for this process must be calibrated in line with the manufactures recommendations and traceable to national standards.

Intersecting theodolite systems and photogrammetry rely on defined calibrated length measurements to scale the measurement job. Scale bars, interferometer measured distances or a controlled and traceable network of stable points can all be used to introduce scale. The important factor is that the scale system is controlled, fit for purpose and traceable.

11.8 Component orientation and fixturing for measurement

There are many large and heavy components which are assembled together to make the ITER machine. These components will distort to varying degrees depending on how they are supported during manufacture and assembly therefore it is essential that these parameters are considered and clearly defined within the measurement procedure.

Where a component is to be supported, machined and inspected in one orientation but put into service in another, the effects of the transformation need to be established.

By default, CAD models describe a components shape and size in a state of equilibrium, unaffected by external influences such as gravity. Computer added manufacturing and inspection systems often use the CAD model to drive the manufacturing and inspection processes therefore the CAD model either needs be morphed to reflect the geometric condition for inspection or offset values need to be supplied for the specific areas of interest.

11.9 Fiducialisation

Fiducialisation is the process used to define reference points (fiducials) on a component or assembly with respect to a reference coordinate frame. The position and orientation of the frame is constructed from as-built measurement data and reflects the optimum alignment achievable from the data set measured.

To define an object's 3D position and orientation, a minimum of 3 fiducials are required however, utilising more fiducials will add redundancy to the survey and provide a better representation of the measurement volume. The quantity and position of the fiducials will be driven by the design specification and qualified through tolerance assessment and uncertainty analysis.

Where fiducials are required to facilitate an alignment at the ITER site, their design, position and orientation will be defined by the IO. Fiducials used by the supplier shall either be permanently attached to the object or fitted temporarily during the measurement via a standard interface as descried in section 11.10.

11.10 Targets and tooling

Laser trackers and total stations measure to similar spherical targets called SMR retroreflectors or corner cubes. Photogrammetry also uses retroreflective targets but of a different type however, interchangeable targeting mounts are readily available.

A typical interface for these mounts could be an H7 hole of diameter 6, 8, or 10 mm reamed perpendicular into a reference face. The important thing to note is that whilst the mount will position the target coincident with the axis of the hole, the target will be offset from the reference face by a defined amount.

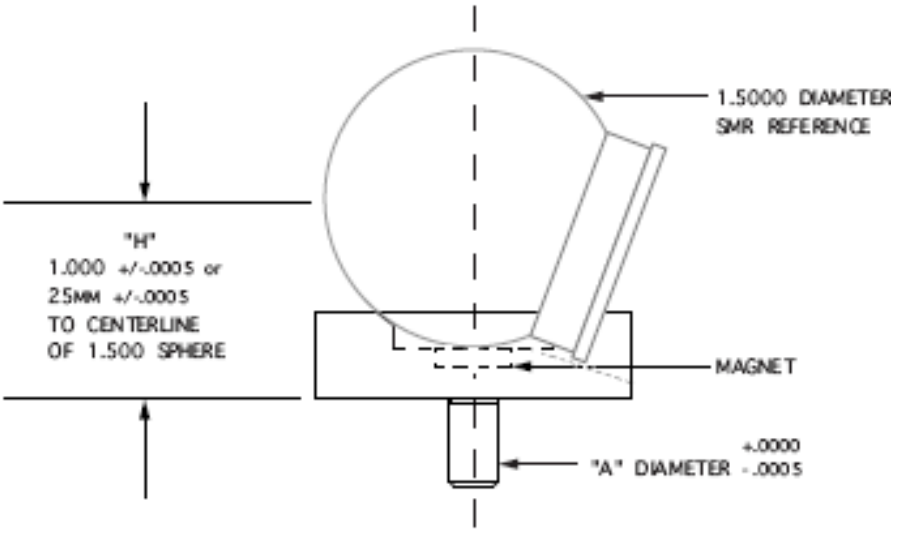


Fig. 1 Example of an SMR mounted in a pin nest

The example above shows a laser tracker SMR retroreflector mounted within a target mount. Dimension “H” identifies the offset applied and the manufacturing tolerance.

All targeting mounts or generically speaking tooling, that contributes to the measurement process shall be controlled within the supplier’s calibration system and shall be uniquely identified. The measurement process shall specifically record when such tooling has been used defining the offset applied and its direction.

12 Coordination for metrology activities

Many of the components for the ITER machine have extremely demanding tolerances with respect to alignment and dimensional control. Their installation locations are often very constrained and their large size makes adjustment all the more difficult. These components may be standalone items or an embodiment of constituent parts combined to deliver a specific function. Whatever the requirement, if metrology is a contributor then it is an interface that needs to be resourced and managed.

The Metrology RO is available to give technical advice during the design phase of the project and is tasked to put in place and manage the requisite infrastructure to support the machine build and its associated systems. This will include the design and realisation of survey

networks (section 8) development of alignment strategies, procurement of equipment and the day to day management of the metrology team.

The ITER metrology team shall be assembled to support the programmed metrology requirements of the ITER project therefore it is important that these needs are identified as early as possible to optimise the resourcing with respect to equipment and personnel.

12.1 Interface control

ROs for components, assemblies and systems requiring support from the ITER metrology team shall specify their requirements in an appropriate technical document i.e. SRD, ICD, dedicated IS.

Typical details required shall include:

- General description of the measurement task detailing processes and required outputs
- Reference datum systems to be used i.e. site primary datum system, pit datum system, locally defined system etc.
- Tolerance requirements for dimensional control and or alignment i.e. position angularity, elevation, level etc.
- Fiducialisation requirements (section 11.9)
- Location where the survey / inspection is to be carried out
- Scheduled date for the task and sub-tasks
- State of plant during the task(s); component orientation, supporting structures, scaffolding, adjacent work activities etc.
- Environmental controls envisaged during the survey

From the above information the Metrology RO will elaborate a measurement plan, detailing the work scope, equipment and tooling requirements, estimated task duration and manpower allocation. Any inputs required from the customer such as drawings, CAD models etc. will be identified and their required delivery dates included in the metrology schedule.

The ITER 'Assembly and Installation Management Manual' details the processes and procedures to be followed in preparation for and during implementation of assembly and installation activities. Reference 3 of the document details the 'System Assembly Compatibility Assessment Procedure' this procedure will be used by the Machine Assembly and Installation Section to assess compliance with assembly methodologies and standards and to determine readiness for development of assembly operating procedures. Appendix 1 to the document 'ITER System Assembly Compatibility Assessment Form' includes an input table specific to metrology activities; 'Table 6: Dimensional control and Alignment'. This table shall be completed by the Metrology RO in conjunction with the RO for the system applicable providing information, as applicable, relating to the following requirements:

- First article inspection
- Goods inwards inspection
- Datum references and setting out
- Pre-alignment (fiducial measurement)
- Final alignment

- Data processing
- As-built measurements
- Measurement simulation

12.2 Design reviews

Alignment and metrology requirements and processes will typically be reviewed at the design reviews for the system to which they apply. Design reviews will be carried out in accordance with ITER Design Review Procedure (2832CF) current at the time.

The conceptual design review shall demonstrate that the alignment requirements and tolerances for the system under review have been identified and included in the Design Compliance Matrix (DCM). Specific details shall be included in the interface sheet of the appropriate interface control document as they are developed and must be in place before the final design review.

At the preliminary design review the outline processes for alignment should be presented to provide an overview of the scope of the task including an indicative schedule. At this time it should be clear where responsibilities lie for the various stages of the installation be it with the IO the DA(s) or as a combined effort.

Alignment and Metrology activities could include:

- Goods inwards dimensional inspection of system components
- Fiducialisation of components for assembly (section 11.9)
- Provision of reference datums, network points, elevation lines (section 8.0)
- Setting out for enabling activities: marking out for location systems, stillages etc.
- As-built reconstruction for customisation of interfaces
- Alignment of components: position, orientation, elevation….

Following the preliminary design review the alignment and metrology processes will be elaborated by the responsible officer(s) concerned. The level of elaboration will be dependent on a number of contributors such as the uniqueness of the task, the complexity of the process, access restrictions, required accuracy etc. The preliminary design review will define the scope of this elaboration which will subsequently identify the metrology input for the final design review.

The final design review shall demonstrate that dimensional control and alignment processes have been sufficiently addressed to ensure that the system under review can be successfully manufactured and subsequently installed at the ITER site. The Metrology RO will use the metrology handbook as reference for the review process and the DCM to assess compliance with the design requirements, contributing to the overall acceptance process.

13 QA and documentation

All components, processes, documents and data within the scope of this handbook shall be subject to the ITER Quality Assurance Program (IDM Ref; ITER_D_22K4QX) and its related Management and Quality Programme (MQP) (IDM Ref; ITER_D_2NS3UH).

IDM UID
2LZJHB
VERSION CREATED ON / VERSION / STATUS
17 Dec 2024 / 9.1 / Approved
EXTERNAL REFERENCE / VERSION

MQP Level 3

Procedure for the management of Deviation Request

The purpose of this document is to describe the Deviation Request (DR) processes to be followed for the ITER project. This procedure defines the requirements and provides the detailed workflows for management of DRs project wise addressed to and generated by the ITER Organization.

Approval Process			
	Name	*Action*	*Affiliation*
Author	**Redon T.**	**17 Dec 2024:signed**	**IO/DG/ESD/DO/ICAS**
Co-Authors	**Clochard V.**	**17 Dec 2024:signed**	**IO/DG/SID/CID/CMS**
Reviewers	**Bartels H.- W.** **Cortes P.** **Jung C. Y.** **Khomutnikov A.** **Perrier G.**	**07 Jan 2025:recommended** **07 Jan 2025:recommended** **19 Dec 2024:recommended** **06 Jan 2025:recommended**	**IO/DG/SID/CID** **IO/DG/SID/CID/NSI** **IO/DG/SQD/QMD** **IO/DG/SQD/QMD** **IO/DG/SQD**
Approver	**Orlandi S.**	**15 Jan 2025:approved**	**IO/DG/CP**
Information Protection Level: Non-Public - Unclassified *RO: Khomutnikov Aleksei*			
Read Access	**LG: Quality Control Group, AD: ITER, AD: External Collaborators, AD: IO_Director-General, AD: External Management Advisory Board, AD: IDM_Controller, AD: OBS - Quality Management Division (QMD) - EXT, AD: Nuclear Safety Inspectors, AD: OBS - Quality Management Division (QMD), AD: DA, AD: Auditors, A...**		

#drn#

Change Log			
Procedure for the management of Deviation Request (2LZJHB)			
Version	***Latest Status***	***Issue Date***	***Description of Change***
v1.0	Signed	02 Jun 2009	
v1.1	Approved	10 Jun 2009	Minor change in para 4.1.2 at the request of SAS DGG
v2.0	In Work	26 Oct 2010	- General revision showing IDM review & approval for Deviation Requests - Incorporated Domestic Agencies in review process for Deviation Requests
v2.1	In Work	27 Oct 2010	New lay-out through IDM auto-generated covering page.
v2.2	Approved	22 Dec 2010	Changed from "DDG/Directorate Head" to "Directorate Head" on para. 4.1.3 , 4.2.2 and Appendix A.
v3.0	Signed	22 Sep 2011	Introduction of a filter for deviations affecting Regulatory Files
v3.1	Approved	22 Sep 2011	Minor change to tidy up role activity chart
v4.0	Approved	04 Sep 2013	- modification of title - modification of the flow chart for DR - addition of a flow chart for NCR - addition of the following steps for NCR: root causse analysis, corrective action (if needed) and closure of NCR
v4.1	Approved	25 Jul 2014	- Scope: include addition of a requirement - WBS RO and TRO change to IO RO and acronym with definition added - Responsibilities: addition of any dispute solved by Head of QA - Flow chart: refer to paragraph listing the reviewer 7.1.4 for DR and 7.2.1.4 for - Flow chart: addition of root cause analysis for NCR - Addition of "Send a link of the signed form to DAs if they are impacted" for DR and NCR - Modification of the paragraphs of the text to be coherent with the flow charts
v4.2	Approved	12 Mar 2015	Changes according to MQP doc Request - QV6CHN: - Update of title “Procedure for IO Deviation Request and Non-conformance Report” - Addition of an explanatory footnote for PIC and PIA - Addition of PIA with PIC - Addition of details for the steps in IDM for the closure of NCRs
v5.0	In Work	01 Sep 2017	The purpose of this document is to specify the Deviation Request, hereinafter DR, processes from the initiation to the implementation. The processes for following two types of DR’s are described: - Deviation Request issued by DA, (Sub-)Contractor and/or Supplier, hereinafter “DA/CON-DR,” and - Deviation Request issued by IO, hereinafter “IO-DR” Roles and/or responsibilities of each stakeholder are also specified.
v5.1	Signed	01 Sep 2017	Compared to the Version 4.2: - DR and NCR processes are separated. - IO technical change request is out of scope. - Work flow and responsibilities are specified clearly. - Criteria for the escalation is specified. - Added all required contents in the new template, MQP Document Template (ITER_D_438T76 v2.5)
v5.2	Signed	20 Sep 2017	Implemented QA Process Owner's comment regarding the approvers. In this version, the approvers are as specified in; Sign-Off_Authority_for_Project_Documents_2EXFXU_v3_3
v5.3	Approved	25 Sep 2017	As commented by CIO/CMD head, rev. nums. of the latest approved versions of the applicable documents are added.
v5.4	Approved	15 Dec 2017	Revision of the flowcharts The flowcharts are revised back into the ones in [2LZJHB v4.2], which had

			been accepted by ASN The specific changes are: 1) “IO-SRO” is replaced by “EPNS-DH” 2) Logic in the flowcharts, e.g. explicit description for escalation to PCR, safety pre-assessment first. Revised user-friendly 1) Basic principle (definition, rule, criteria), process flow and responsibility assignment are separated clearly by section. 2) Deleted needless and/or non-mandatory contents, e.g. some foot notes, KPI. 3) Flowcharts, description of the process steps, and responsibility assignment (RACI matrix) are correlated by paragraph number, #.#.#. 4) Some TYPOs are fixed.
v5.5	Approved	14 Mar 2018	1) "Approval with condition is not allowed" is changed into more realistic statements: • Regarding DA/CON-DR, all conditions shall be documented and agreed between the DA officer representing the initiator and the approver via exchanges in IO-IDM metadata. In case of direct contract between IO and CON, the initiator and the approver shall agree on. • Regarding IO-DR, all conditions shall be documented and agreed between the approver and the accepter, who are IO-CT and DA/CON, respectively. 2) Mandatory and optional reviewers are specified as in Section 7.2. Added some statements telling "SOA [22F4E5] to be consistent later."
v5.6	Revision Required	11 May 2018	As per MQP doc Request - WK73BR Includes Module H needs
v6.0	Revision Required	07 May 2019	Chapter 2.1 to clarify the scope of DR in relationship with MQP procedures changes. CMA audit finding (NC 02) regarding DR scope ITER_D_XYKVBE - Quality Audit Report_IO-QMSA-18-08-CMA Audit Chapter 3.1 - add definition of Equipment, Manufacturer, PE/ NPE and ESPN – maintained as per previous revision of procedure in the scope of PE/ NPE network. Chapter 3.2 – add abbreviation PT- project team Chapter 4.2 – add references - maintained as per previous revision of procedure in the scope of PE/ NPE network. [11] French Order dated 30 December 2015 concerning Nuclear Pressure Equipment [12] Implementation plan for design & manufacture of PE/NPE [VE2DSP] Chapter 5 - add reference to other specific Sign-Off Authority related to PT and construction and PE / NPE responsibilities - maintained as per previous revision of procedure in the scope of PE/ NPE network. Chapter 6.2.2 – add reference to other specific Sign-Off Authority related to PT and construction Chapter 6.3.3 - add reference to other specific Sign-Off Authority related to PT and construction Chapter 7 add reference to other specific Sign-Off Authority related to PT and construction and PE / NPE responsibilities - maintained as per previous revision of procedure in the scope of PE/ NPE network. Table of Mandatory or Optional Reviewers improved - add PT staff review and PE/ NPE review - maintained as per previous revision of procedure in the scope of PE/ NPE network. Eliminate RACI tables.
v7.0	Signed	14 Jun 2019	New version according to additional MQP doc Request - YPKLTV and and essential data YTKAKK, which are documenting list of changes as per reviewers comments.
v7.1	Signed	16 Jul 2019	Revision required for implementation of reviewer comments.

			The following changes/ clarifications are applied: - Chapter 2 - Scope of procedure - add clarifications to allow IO to raise DR for technical deviations with no impact on cost, schedule and without changing the PAs documentation - Main, annex B , annex A) - Chapter 2.1 - add clarifications to eliminate the discrepancies with DR definition - Chapter 3.1 - Chapter 3.1 - clarify definition of "Equipment". Add clarification for Deviation request definition to eliminate conflicts with chapter 2.1 requirements. - Chapter 5 - first bullet - add clarification regarding deviation to IO requirements. - Chapter 6.2.10 - Confirmation of DR implementation. add clarification regarding criteria for "required" DR implementation confirmation. - Chapter 9 - correction chapter numbering (9.1, 9.2 9.3 and 9.4) - F4E comments regarding interface with Supply process / application of PA change notice are implemented in the chapter 2.1 and chapter 9.
v7.2	Signed	18 Jul 2019	The following minor changes are applied: - Chapter 5 - Basic principle - eliminate 7th bullet regarding IO DR. - Fig 6.2 - Work flowchart of IO -DR - add clarification: Not applicable in the scope of PA changes - Chapter 6.3.3 - IO -DR Decision - Eliminate DA / CON responsibilities for decision since IO-DR is not applicable for PA changes. - Chapter 7 - Mandatory or Optional Reviewers - for IO-DR the responsibility for DA-RO review is Optional instead of Mandatory (IO-DR is not applicable for PA changes)
v7.3	Approved	18 Jul 2019	New version according to additional MQP doc Request - YPKLTV and and essential data YTKAKK, which are documenting list of changes as per reviewers comments The following minor changes are applied: - Chapter 5 - Basic principle - eliminate 7th bullet regarding IO DR. - Fig 6.2 - Work flowchart of IO -DR - add clarification: Not applicable in the scope of PA changes - Chapter 6.3.3 - IO -DR Decision - Eliminate DA / CON responsibilities for decision since IO-DR is not applicable for PA changes. - Chapter 7 - Mandatory or Optional Reviewers - for IO-DR the responsibility
v8.0	In Work	25 Nov 2019	As per approved MQP doc request https://user.iter.org/?uid=27JZVH the main changes are: - Clarification of the DA/CONT DR and IO-DR workflows (even though no major steps were added or removed); - Clarification of the roles of approvers for the DA/CONT DR and IO-DRs; - Inclusion of the IO supplier DR to IO, that follows the same process as the DA DR; - Clarification of the text, notably sects. Main principles and main requirements; - Editorial changes, which make the procedure much easier to understand and implement;
v8.1	Approved	25 Nov 2019	Minor update due to technical problem with pdf conversion. All changes are listed for the previous version 8.0
v9.0	Signed	10 Dec 2024	In accordance with CSAJJV the changes are: - Update due to the ASN Decision 2017-DC-0616 of November 30, 2017 amended by Decision 2023-DC-0770 on noticeable modifications to INBs (C58DCJ): any DR that is categorized as a Noticeable Modification shall trigger a PCR - Update due to the NCR-IO.NCR-0171 - SRO review of Deviation Request (8TZQDH): clarification that the DR review by the SRO is mandatory only

			when PIC/PIA are impacted - New mandatory field introduced: Impacted Requirement Document - Approver for DR purely related to MQP process is changed from the MQP Process Owner to the approver of the MQP document from which the DR requests to deviate. The MQP Process Owner is now a mandatory reviewer - CID Head removed as mandatory reviewer - SIROs added as mandatory reviewers - CMS Section Leader added as observer - The DR Database, which today is used for IO Supplier DR only, is recommended to be used as well for DA-DR and IO-DR - Addition of the section 8.4 Interactions with MQP Process Management Process: it is recommended, but not mandatory, to apply the DR procedure to track any deviation to MQP requirement - Use of the MQP Document Template 438T76 v5.0 - Integration of various needs consolidated in CAT-4915
v9.1	Approved	17 Dec 2024	Changes compared to the last approved version v8.1 are those described in the Version Change Description of the v9.0, plus the following additional changes from v9.0 to v9.1: - In accordance with the MQP Process Management Process, for DRs related to the MQP process, impacted original document's stakeholders are mandatory reviewers of the DR - For IO-DRs related to the MQP process, the first check (step 4) can be done by the MQP Process Representative instead of the MQP Requirement Document Approver

Table of Contents

1 Purpose

The purpose of this document is to describe the Deviation Request (DR) processes to be followed for the ITER project. This procedure defines the requirements and provides the detailed workflows for management of DRs project wise addressed to and generated by the ITER Organisation.

2 Scope

This procedure is a MQP Level-3 document within the process of Configuration Management (QAP sect. 3.1, ref. [1]), as shown in the Management and Quality Programme (MQP) map:

https://portal.iter.org/qa/SitePages/Home.aspx.

This procedure shall be applicable for managing the following DRs:

- **Deviation Requests from DAs to IO:** e.g. deviations from the PA baseline. To be noted that DAs follow their internal processes to manage the first steps of this procedure as well as their Supplier Deviation Requests;
- **Deviation requests from IO suppliers to IO:** e.g. deviations from IO supplier contract baseline for In-Cash contracts;

  Note: Hereby, the deviation requests from DA to IO, and IO suppliers to IO, are commonly defined as the DA/CONT-DR process, see sect. 6.3.1.
- **IO Deviation Requests**: deviations from defined requirement(s) or punctual departures from the authorized high level configuration documentation belonging to the ITER Technical and/or Management baselines (e.g. ASN approved safety files, Project Requirements (PR)).

  Note: This DR process is known as IO-DR, for the remaining of the document, see sect. 6.3.2.

3 Definitions and acronyms

The definitions of the configuration management terms used in this procedure are given in the Configuration Management Glossary, ref. [2].

Acronym	Definition
ANB	Agreed Notified Body
CID	Central Integration Division
CONT	Contractor (i.e. supplier of IO, excluding DAs)
CMS	Configuration Management Section
DA/CONT-DR	Domestic Agency/Contractor – Deviation request
DA PA TRO	DA Procurement Arrangement Technical Responsible Officer
DR	Deviation Request
ESR	Essential Safety Requirement
IO Contract RO	ITER Organization Contract Responsible Officer
IO-DIRO	IO Design Integration Responsible Officer
IO-DR	ITER Organization Deviation Request
IO-PARO	IO Procurement Arrangement Responsible Officer
IO PA TRO	ITER Organization Procurement Arrangement Technical Responsible Officer
IO-QARO	IO Quality Assurance Responsible Officer

IO-SIRO	IO System Integration Responsible Officer
IO-SRO	IO Safety Responsible Officer
IO-TRO	IO Technical Responsible Officer
MQP	Management and Quality Programme
PA	Procurement Arrangement
PA-CN	Procurement Arrangement Change Notice
PIA	Protection Important Activity
PIC	Protection Important Component
PCR	Project Change Request
PT	Project Team
QAP	Quality Assurance Program
SIC	Safety Important Class
SL	Section Leader

4 References

[1]	ITER Quality Assurance Program (QAP) (22K4QX)
[2]	Configuration Management Glossary (X2SH46)
[3]	Procedure for the Preparation, Review, Approval, Award and Amendment of Procurement Arrangements (2W4F7A)
[4]	IO Deviation Request Template (2LRNQP)
[5]	Project Change Procedure (22F4E5)
[6]	Procedure for Configuration Control, Review and Audit (TZY7YV)
[7]	Sign-Off Authority (SOA) for Project Documents (2EXFXU)
[8]	Procedure for the Management of Safety Modifications (U34EB9)
[9]	Pressure Equipment Directive 2014/68/UE (RZ6PAK)
[10]	French Order dated 30 December 2015 concerning Nuclear Pressure Equipment (SMP384)
[11]	Implementation plan for design & manufacture of PE/NPE (VE2DSP)
[12]	Design Planning Procedure (U34ACR)
[13]	Design Change Control Procedure (U2QPDS)
[14]	ITER Integrated Safety, Environment and Security Management System (ISMS) Manual (4HCWJU)
[15]	In-Cash Procurement Procedure (658PD4)
[16]	MQP Process Management Procedure (7M445D)

5 General principles

5.1 Main principles

The main principles that shall be respected for management of a DR are as follows:

i. The DAs, suppliers of IO, and IO staff, can issue DRs for IO Approval.

ii. As per ref. [2], DRs are punctual departures from a particular requirement(s) from the current authorized configuration documentation and prior to the execution of the actions that have an impact on meeting the original specified requirement(s).

Note: A deviation permit is generally given for a limited quantity of items, period of time, and for a specific use.

iii. The DR process for both DA/CONT-DR and IO-DRs is composed of four main steps:

1) **Submission**, see sect. 6.3.1.1 and 6.3.2.1
2) **Review**, see sect. 6.3.1.2 and 6.3.2.2
3) **Decision, dispute and resolution**, see sect. 6.3.1.3 and 6.3.2.3
4) **Closure**, see sect. 6.3.1.4 and 6.3.2.4.

iv. DRs can impact different authorized configuration documentation (e.g. the PA baseline, the ITER technical baseline, etc.) depending on the DR submitter (see chapter 6).

v. DRs shall be managed using a dedicated IT system (DR Database[1] or IDM) from initial submission to closure, as per guidelines given in this procedure.

Note: DAs can use their internal IT applications/platforms to manage DRs before submission to IO.

5.2 Main requirements

i. Deviation Requests shall be submitted for IO review and approval/rejection before implementation of related activity(ies) (e.g. manufacture of the item).

ii. Before submission to IO, the DA/CONT DRs shall be internally reviewed by competent and authorised specialist(s) of the DA/supplier and approved for the submission to IO.

iii. IO DRs shall not be used to request to deviate from an agreed PA baseline or IO direct contracts (In-Cash contracts).

Note: IO requested changes impacting PAs, shall be managed according to the procedure Preparation, Review, Approval, Award and Amendment of Procurements Arrangements (PA), ref. [3]. In line with this procedure, in most cases the vehicle for changing PA baselines is the PA Change Notice (PA-CN).

Note: IO requested changes impacting IO direct contracts (e.g. In-Cash contracts), shall be managed according to the In-Cash Procurement Procedure, ref. [15].

iv. The DRs shall be issued using the DR Database or the DR Template (ref. [4]). If applicable, the DA/CONTs can provide their DRs using their internal template (ensuring that the file contains the IO cover page), as follows:

- Upload the internally approved DR into IDM so that the DR has a well-defined UID.
- Ensure that the DR respects the mandatory information as per sect. 5.2 v. of this procedure;

v. DR submitted forms shall contain (as a minimum) the information requested in the DR Template (ref. [4])":

- **Type of DR**: either DA, supplier of IO or IO submitter;
- **DR Reference Number**;

[1] A DR Database (https://user.iter.org/default.aspx?uid=FA2VRS) is currently in place to support IO construction sub-contractors DRs. It is strongly recommended that this DR Database be used for DA-DR and IO-DR as well.

- **DR Title**;
- **Type of Impact:** item or MQP process;
- **Quality Class** (QC[2])

  Note: For DRs impacting more than one activity or component with different QC classes, the submitter shall choose the highest QC in the DR Template (ref. [4]). A detailed description of the components impacted with individual QCs shall be provided in sect. 2 (Description of deviation) of the DR template (ref. [4]).
- **Safety Class**: SIC-1, SIC-2, SR, Non-SIC, PIA if applicable; For activities or components with different safety classes, the same approach as for QC applies.
- **IO PE or NPE**: yes/no, incl. PE/NPE, pressure category and radioactive level (N2-N3).
- **Impacted Requirement Document**: provide the reference, with a clear link to the IDM UID, of the document that contains the requirement(s) from which the submitter requests to deviate.

  Note: this can be a technical requirement document (such as a System Requirement Document, a Technical Specification, etc.) or a process requirement document (MQP document).

  Note: there may be several Impacted Requirement Documents, in such case they shall all be listed.
- **Description of Deviation**: provide a clear description (and indicate the document IDM UID) of the original requirement(s) (before), the proposed alternative requirement(s) (after), and a detailed justification for the proposed departure (e.g. impact on critical path, etc.). In addition, provide a detailed safety justification if PIC/PIA are impacted.
- **Impact Assessment**: expected additional technical impacts to the best knowledge of the submitter, including an assessment of other impacted PBS, PAs, performance, maintainability, operability, reliability, etc., if known. All impacts shall be assessed, including cost, schedule, performance and logistics.
- **List of expected impacted documents**: exhaustive list of all documents with a clear link to the document IDM UID to the best knowledge of the submitter, that are expected to be impacted should the DR be approved. The impacted documents are technical documentation that uses as input the requirement(s) that the submitter request to deviate from.

vi. DRs **shall not**:

- Lead to a modification of the Performance Baseline. The ITER Performance Baseline is the authorized configuration that comprises the ITER integrated cost, schedule and scope documentation.
- Constitute a permanent change to a document of the ITER Technical Baseline. If a DR leads to a permanent change of the ITER Technical Baseline, a Project Change Request (PCR, see ref. [5]) shall be triggered prior to acceptance of the change. The rationale for the request of a PCR is detailed in sect. 6.3.1.2.

Note: Changes impacting one of the ITER Project's baselines shall be managed using the Configuration Control procedure, ref. [6].

[2] Quality Class to be determined as per the Quality Classification Determination document.

6 Workflow

6.1 Flowchart

The flowcharts for the DA/CONT-DR and IO-DR processes are shown in Figure 1 and Figure 2 below.

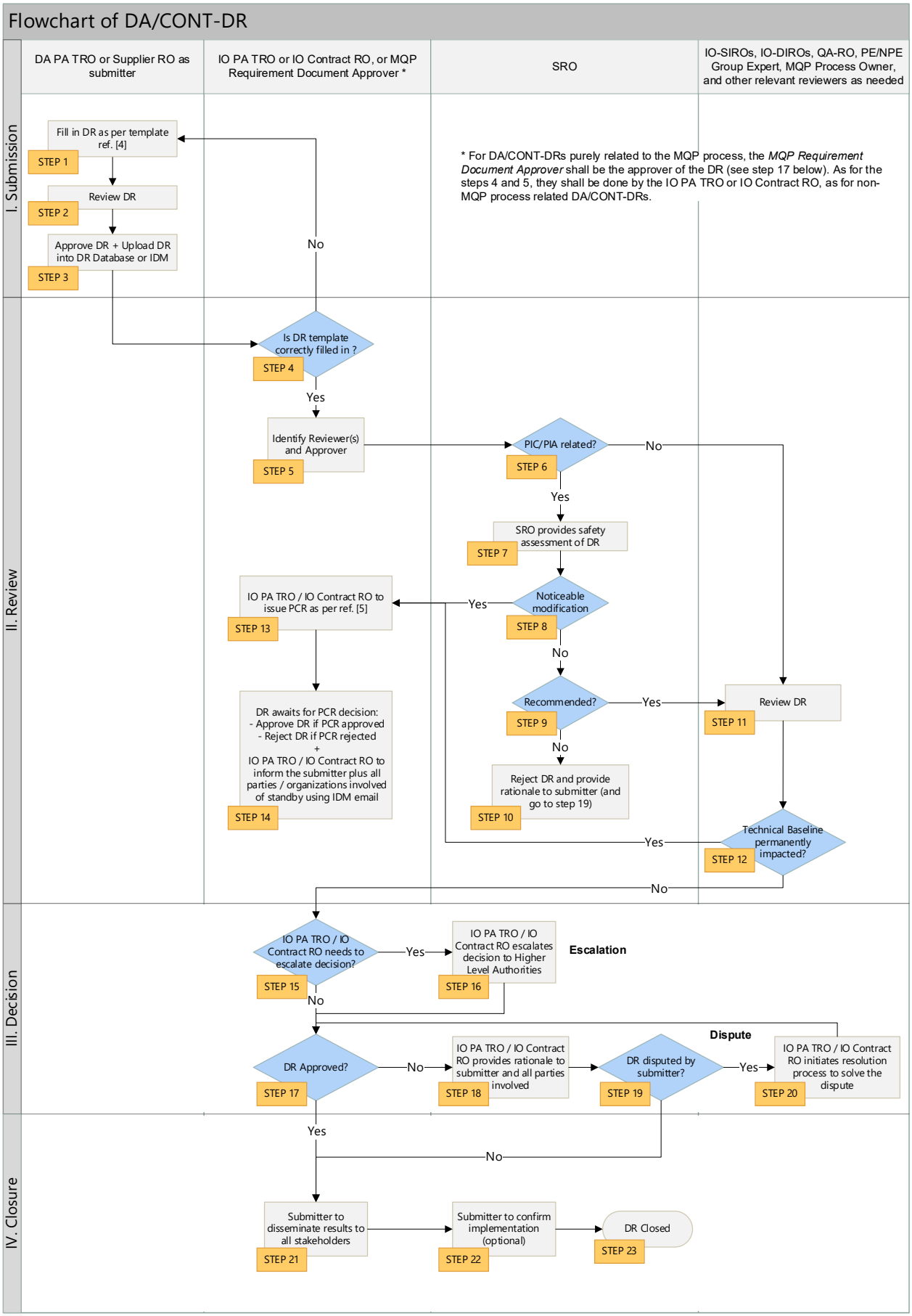


Figure 1 - Flowchart of DA/CONT-DR.

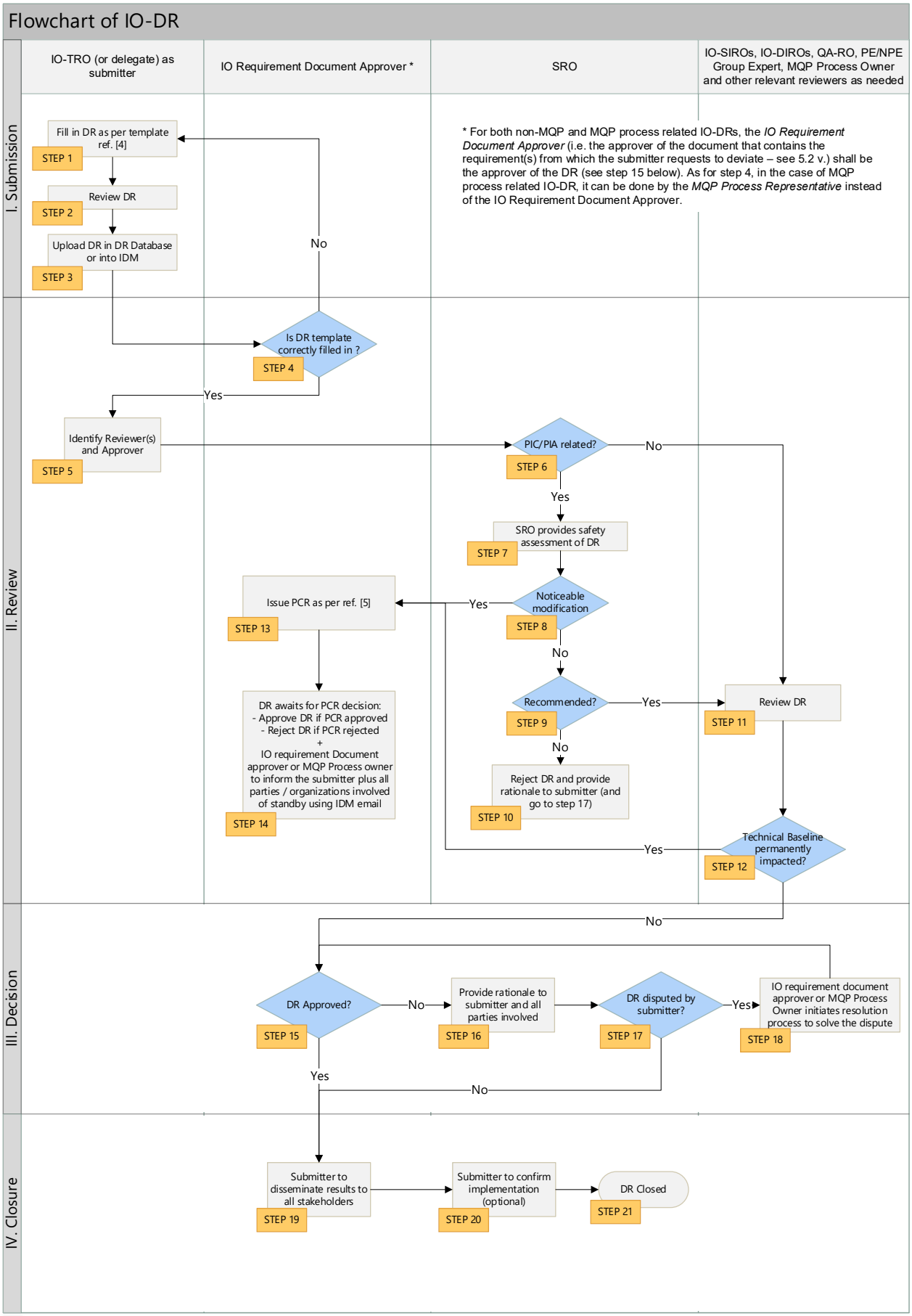


Figure 2 - Flowchart of IO-DR.

6.2 Responsibilities

The main responsibilities for the roles described in this procedure are described in sections 6.3.1 and 6.3.2.

The main roles covered in this procedure are:

- DA PA TRO, Supplier RO or IO TRO (as submitters)
- IO PA TRO or IO Contract RO
- DIRO, SIRO
- IO Expert, PE/NPE Group Expert, etc. as needed
- QARO
- SRO
- IO Requirement Document Approver
- MQP Process Owner, MQP Process Representative and other MQP stakeholders

6.3 Description of steps

6.3.1 DA/CONT-DR Process

Below we describe the tasks to be executed for each of the four main steps of the DA/CONT-DR (see Figure 1).

6.3.1.1 Submission

The DA PA TRO or the Supplier RO (submitters) shall:

- **Step 1:** Identify the necessity for a DR from a PA or contract baseline and initiate the request by using the DR Database or by following the DR template (ref. [4]).

  The DAs or suppliers can provide their DRs using their internal template, as described in sect. 5.2 Main Requirements (iv).
- **Step 2:** Review the DR for technical coherence, completeness and clarity, according to the relevant DA or Supplier internal procedures, prior to the submission to IO.
- **Step 3:** The DA PA TRO or Supplier RO line manager shall approve the DR before submission to IO and shall upload the DR template into the IT tool IDM (if the DR Database was not used).

6.3.1.2 Review

- **Steps 4 and 5: The IO PA TRO or IO Contract RO shall provide the first check by reviewing the DR submitted form for completeness and appropriateness, and verify that it is in agreement with the main requirements as per Sect. 5.2 of this procedure:**
  - If DR submitted form is correctly filled in, the IO PA TRO or Contract RO identifies the appropriate reviewers. The mandatory reviewers are:
    - SRO, if protection important components or activities are impacted (i.e. PIC/PIA ticked in the DR template ref. [4])
    - QARO
    - DIRO
    - SIRO
    - PE/NPE Group Expert (when ITER acts as manufacturer of PE/NPE equipment)

    - IO experts, if the field of concerned expertise is not covered by the mandatory reviewers and the approver
    - MQP process owner (or delegate), as well as the authors & reviewers of the MQP document from which the DR requests to deviate, if the DR is related to an MQP process.
  - Once reviewers are assigned, the IO PA TRO or IO Contract RO shall inform all reviewers that the review process has started using the IDM email function.
  - If the DR is not correctly filled-in, the IO PA TRO or IO Contract RO shall request further processing to the DA PA TRO or Supplier RO submitter.
  - The CMS-SL (or delegate) shall be added as observer.
- **Steps 6, 7, 8 and 9: If protection important components or activities are impacted, the SRO shall review as follows:**
  - Verify all impacts on regulatory, safety or environmental requirements, and provide the safety and environmental assessment in the DR template (ref. [4]). This assessment shall include the determination whether the proposed deviation constitutes a noticeable modification or, on the contrary, a non-noticeable modification, as defined in ref. [8];
  - Either:
    - Inform the IO PA TRO or Contract RO to trigger the PCR process, in case the deviation constitutes a noticeable modification, as follows:
      - Issue a PCR, as per ref. [5]. The PCR decision shall be registered in the DR template form (Step 13);
      - Maintain the DR is standby awaiting PCR decision and provide the rationale for the decision to issue the PCR to the submitter and all involved parties (Step 14);
    - Or recommend the DR;
    - Or reject (unless revised) the DR and provide rationale for the decision (see step 10).
  - If IO acts as a manufacturer of PE/NPE equipment, the PE/NPE Group Expert shall verify impacts on Essential Safety Requirements (ESR) (see ref. [9] and [10]) and quality requirements as defined in ref. [11], and assess if the DR shall be transmitted to the ANB.
- **Steps 11 and 12: The IO DIROs, SIROs and other technical reviewers as needed shall review the DR in order to:**
  - Ensure that the DR is technically justified and all requirements as per sect. 5.2 are respected;
  - Assess the technical aspects from system integration/configuration management point of view and provide the System/Design Integration assessment as needed, in the DR template.

    Note: The IO DIRO and SIRO shall ensure that the approved DRs are captured in the system configurations.
  - Verify if the DR impacts on ITER system level performance, reliability, operability, and interfaces, as needed;
  - Verify if the submitted DR impacts permanently any document from the ITER Technical Baseline.

- **If the IO DIRO or SIRO estimates that the requested deviation constitutes a permanent impact to the ITER Technical Baseline, he/she informs the IO PA TRO or Contract RO to trigger the PCR process, as follows:**
    - Issue a PCR, as per ref. [5]. The PCR decision shall be registered in the DR template form (Step 13);
    - Maintain the DR is standby awaiting PCR decision and provide the rationale for the decision to issue the PCR to the submitter and all involved parties (Step 14);

  Note: the DA is also entitled to trigger directly the PCR process.
- IO-QARO shall check the compliance of the submitted DR against the requirements in this procedure, the assignment of QC as per Quality Classification documentation, the assigned reviewers or approver according to this procedure, and the compliance against other concerned quality documents, e.g. Quality Plan, and other specific Sign-of-Authorities related to Project Teams (PT) and construction.
- Each reviewer shall have ten (10) business days to recommend / disapprove the DR, with a clear explanation. If after 10 days the reviewer has not signed the DR (either recommending or disapproving it) the IO PA TRO or Contract RO shall query as to its status and send an email reminding the reviewer(s) of the missing action.

6.3.1.3 Decision, Dispute and Resolution

- **If protection important components or activities are impacted, the SRO shall decide on the recommendation or rejection of the DR from the safety and environmental point of view:**
    - If recommended, the SRO shall notify the DR submitter of the decision and route it to review from the technical aspects system integration point of view (Step 11).
    - If rejected, the SRO shall provide rationale to submitter and all parties involved using the IT management tool IDM email function (Step 10).
- **Steps 15, 17, 18: For all DRs recommended by the SRO or not impacting protection important components or activities, the IO PA TRO or IO Contract RO (after the technical revision is terminated, Step 11), shall decide on the Approval or Rejection of the DR, and provide a rationale to the DR submitter and all involved parties.** DRs shall only be approved after establishing, through technical knowledge, expertise and experience, or by requesting the expertise of other experts, that approval of the request is acceptable with regards to the PA / CONT objectives and overall project needs;
- **For DA/CONT-DRs related to the MQP process, the approver shall be the IO approver of the MQP document from which the DR requests to deviate.**
- **Step 16:** If the decision related to the DR is above the authority of the IO PA TRO or IO Contract RO, the DR shall be escalated to a higher level authority. Higher level Authorities consist of:
    - Impacted Section Leader, or delegate;
    - Impacted Head of Division/Department or delegate, as appropriate;
- If the DR is rejected, the DA PA TRO or Supplier RO:
    - Shall try to develop an alternative plan that does not require deviation in order to fulfil requirements. If the DA PA TRO or Supplier RO devises and alternative solution that (still) involves a departure from the requirement(s), the IO PA TRO or IO Contract RO shall analyse the request and inform the submitter if this alternative solution can be considered for acceptance.

- If an alternative solution is not suggested, the DA PA TRO or Contractor RO can dispute the decision and liaises with the involved parties for solution seeking.

- **Step 20:** If the DR is rejected, or a reviewer disapproval rationale is disputed by the initiator and cannot be resolved at the IO PA TRO or IO Contract RO level, they shall initiate a resolution process to solve the dispute, as follows:
  - Appeal to the higher level management for a solution;
  - If not settled, the DR shall be listed in the Project Issue Management (PIM) list: https://jira.iter.org/secure/RapidBoard.jspa?rapidView=45&projectKey=PIM.
- The decision to approve a DR from a DA/Supplier A impacting the scope of a DA/supplier B, with no impacts to the ITER baseline, shall be taken by a higher level authority that has the full overview to make the decision of approving the DR from the DA/Supplier A and trigger a PA Change Notice (see ref. [3]) for the DA/Supplier B without changing the ITER baseline.

  Upon decision, the DA PA TRO or Supplier RO shall inform the submitter of the DR decision taken by using the IDM email function (as long as IDM is the available tool) and distribute the link to higher-level management (e.g. Section Leader, Head of Division), as necessary.
- Estimated time for decision on a DR is 2 weeks. One additional week to be considered if the decision needs to be escalated.

6.3.1.4 Closure

The DA PA TRO or Supplier RO (as submitters) shall:

- **Step 21:** Ensure that the DR decision was disseminated to all stakeholders and provide corrective action as needed.
- Ensure that all impacted documentation (including, document UID) is registered in the DR submitting form (as per sect. 5.2).
- **Step 22:** Confirm the DR implementation (optional), for cases when further critical actions are triggered by DR approval and/or related documentation needs to be revised to reflect the implementation of the deviation. For cases when DR implementation confirmation is required, the DR submitter shall attach all the necessary evidences to demonstrate the implementation.

6.3.2 IO-DR Process

As shown in Figure 2, the IO-DR process is similar to the DA/CONT-DR process except for a few steps as shown below.

6.3.2.1 Submission

Steps 1 to 3: The IO-DR submission process shall be performed similarly to the one described in sect. 6.3.1.1, with a few exceptions:

- The IO TRO (or a delegate) is the submitter of the IO-DRs.
- The IO-DR shall be reviewed internally by the IO-TRO (or a delegate) line manager, e.g. Section Leader or Head of Division/Department, using the IT tool.

6.3.2.2 Review

- **Steps 4 and 5: The IO requirement document approver (i.e. the document that contains the requirement(s) from which the submitter requests to deviate – see 5.2 v.) shall provide the first check by reviewing the DR submitted form for completeness and appropriateness, and verify that it is in agreement with the main requirements as per sect. 5.2 of this**

procedure. For IO-DR related to the MQP process, this check can instead be done by the MQP Process Representative.

- If DR submitted form is correctly filled in, the IO TRO identifies the appropriate reviewers. The mandatory reviewers are:
  - SRO, if protection important components or activities are impacted (i.e. PIC/PIA ticked in the DR template ref. [4])
  - QARO, DIRO, SIRO
  - PE/NPE Group Expert (when ITER acts as manufacturer of PE/NPE equipment)
  - IO experts, if the field of concerned expertise is not covered by the mandatory reviewers and the approver
  - MQP process owner (or delegate), as well as the authors & reviewers of the MQP document from which the DR requests to deviate, if the DR is related to an MQP process.
- Once reviewers are assigned, the IO TRO shall inform all reviewers that the review process has started using the IDM email function.
- If the DR is not correctly filled-in, the IO requirement document approver shall request further processing to the IO TRO submitter.
- The CMS-SL (or delegate) shall be added as observer.

- **Steps 6 to 14:** the other reviewers as necessary, shall execute the same steps as described in sect. 6.3.1.2.

6.3.2.3 Decision, Dispute and Resolution

Steps 15 to 18: For the IO-DR, decision, dispute and resolution follow the same steps as given in sect. 6.3.1.3, with the exception that:

- For the IO-DR, a decision shall be taken by the IO Requirement Document Approver (i.e. the document that contains the requirement(s) from which the submitter requests to deviate – see 5.2 v.), both for non-MQP and MQP process related DRs. No escalation is possible.
- If the IO-DR decision is disputed, the IO Document Approver shall initiate a resolution process by following the same steps as given in sect. 6.3.1.3.

6.3.2.4 Closure

Steps 19 to 21: For the IO-DR closure, the submitter shall follow the same steps as for the DA/CONT DR described in sect. 6.3.1.4.

7 Records

The expected records from the DR process are provided below.

Record	Template	Place to store	Doc type	Naming convention	Retention period
Deviation Request	Template in ref. [4], or DA/CONT template	DR Database (*) or IDM	DA QA Deviation Request Contractor QA Deviation Request ITER QA Deviation Request	IDM procedures or DR Database	ITER lifetime

(*) https://user.iter.org/default.aspx?uid=FA2VRS

8 Interactions with other processes

8.1 Interactions with the Design Control Process

This procedure belongs to the process of Configuration Management (QAP, sec. 3.1, see ref. [1]]) and interacts with the process of Design Control (QAP, sect. 3.3, see ref. [1]). The Design Control process provides guidance to the IO PA TRO, IO Contract RO or IO Requirement Document approver for the review of design integration aspects of DRs using the MQP procedures for Design Planning, ref. [12], and Design Change Control, ref. [13], among others.

8.2 Interactions with the Supply Process

This procedure interacts with the Supply process (QAP, sect. 3.4, ref. [1]). IO changes to PAs or IO direct contracts (e.g. In-Cash contracts) shall be managed using the Procedure for the Preparation, Review, Approval, Award and Amendment of Procurement Arrangements (PA), see ref. [3] and the In-Cash Procurement Procedure, see ref. [15].

8.3 Interactions with Nuclear Safety Processes

This process interacts with the Nuclear Safety processes. The Safety RO reviews the DR according to the Procedure for the Management of Safety Modifications (ref. [8]) and to ensure that it complies with the ITER Integrated Safety, Environment and Security Management System (ISMS) Manual (ref. [14]), including the MQP L2 and lower level procedures.

8.4 Interactions with MQP Process Management Process

This process interacts with the MQP Process Management process. As indicated in ref. [16], deviations from MQP should be permissions and not requirements or recommendations. Deviations from MQP shall be reviewed and approved by impacted original document's stakeholders and recorded in IDM.

It is recommended to use the current DR Procedure to track any Deviation to MQP requirement.

IDM UID
22F53X
VERSION CREATED ON / VERSION / STATUS
19 Mar 2021 / 9.1 / Approved
EXTERNAL REFERENCE / VERSION

MQP Level 2

Procedure for Management of Nonconformities

The purpose of this document is to specify the Nonconformity Management process, hereinafter NC from the Initiation to the Closure in the IO NC system. The Workflow as well as the Roles and Responsibilities of each stakeholder are specified in a generic way.

Approval Process			
	Name	*Action*	*Affiliation*
Author	**Neagu S.**	**19 Mar 2021:signed**	**IO/DG/SQD/QMD**
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Document Security: Internal Use *RO: Khomutnikov Aleksei*			
Read Access	**LG: SQD Managers, GG: MAC Members and Experts, LG: Quality Control Group, AD: ITER, AD: External Collaborators, AD: IO_Director-General, AD: External Management Advisory Board, AD: OBS - Quality Management Division (QMD) - EXT, AD: OBS - Quality Management Division (QMD), AD: Auditors, AD: ITER Mana...**		

Change Log			
Procedure for Management of Nonconformities (22F53X)			
Version	***Latest Status***	***Issue Date***	***Description of Change***
v1.0	In Work	25 Feb 2005	
v2.0	In Work	14 Sep 2005	
v3.0	In Work	14 Dec 2005	
v4.0	In Work	28 Feb 2006	
v4.1	Signed	10 Apr 2008	
v4.2	Signed	10 Apr 2008	
v4.3	Signed	11 Apr 2008	
v4.4	Approved	11 Apr 2008	
v5.0	In Work	18 Jun 2012	Definitions of Deviation and Specified Requirement clarified and immediate notification and agreement of classification of non-conformances introduced
v5.1	Approved	18 Jun 2012	Minor editorial change to contents
v6.0	Approved	02 Apr 2013	- modification of the title - add the following steps in the process for non-conformities: - root causse analysis - corrective action (if needed) - closure of NCR
v6.1	Approved	25 Jun 2013	Modifications according to approved MQP Doc Request G23MB4: - Changes to allow verbal agreement on remedial actions when the non-conformance does not impact on an external system - Minor NCR: the section 1, 2.1 and 2.2 need to be filled and sent to IO
v6.2	Approved	13 Mar 2015	Changes according to MQP doc Request - QWRRS2: - Addition of an explanatory footnote for PIC and PIA - Addition of PIA with PIC - Addition of list of internal NCRs to be sent to IO upon request of QARO
v7.0	Approved	18 Aug 2017	Update according to MQP doc request VBFECU (the summary of pre-reviews: MQPWG, SQAWG, SD, Construction Teams... can be found in the MQP doc request VBFECU). The changes consists in clarification, simplification by making the document generic (thus applicable to all phases; not only to Manufacturing but also to Construction), and rework of the document according to the MQP template 438T76: - Process NC introduced (not product NC as previously understood); - Simplification of number of documents (starting situation was 6 documents level2): 22F53X is now the Level 2 MQP for Nonconformity management, e.g. merging RGF2R7 (PT), dealing with both external IO NC and internal IO NC. - The workflow and roles rendered generic (e.g. notion of DIRO now extended to 'interaction RO', so that it can encompass Construction Teams). - Clarified list of criteria (Baseline, Performance,...) to guide in the categorization of NC (major / minor), still keeping the same criteria regarding Regulatory Requirements, Safety, Environmental impact. - The requirement of paragraph 2.9 of revised QAP version 8.5, and GIN007 (General Instruction Note from DG), are propagated: tracking of NC closure; re-enforcement of tracking mechanism of actions until implementation. - KPI of the process and escalation process (in case of dispute) are introduced.
v7.1	Approved	11 May 2018	As per MQP doc Request - WK69F2 Includes Module H needs
v8.0	Revision Required	10 May 2019	as per approved MQP doc Request - XYLYX5: - requirements regarding Counterfeit, Fraudulent, and Suspect Items (CFSI)

			as per Safety Division Action plan (definition CFSI included, clear requirement for SD involvement and responsibilities). - clarify the IO NC approval level (process owner / DH) as per NCR database application - reference of JIRA CAT system to be applied for action follow-up - clarification related to minimum time - frame from NCR detection until NCR recording (maximum two weeks is allowed). - clarifications regarding intermediate / conditional release of NCR that requires further long term actions (further actions and instruction to be recorded in release note).
v8.1	Signed	14 Jun 2019	Revision to implement reviewer comments from previous version. List of changes: - add reference - XKUKAX - add DAs responsibilities (as per NCR database application) - add clarifications regarding baseline levels (see chapter 5.1 and annex 2) - add further clarifications for NCR conditional release. - add annex 2 - Baseline level map as per [11] - add clarifications on appendix 1 - NC form
v8.2	Approved	17 Jun 2019	Revision - Technical IDM issue. Revision as per MQP doc Request - XYLYX5 & to implement reviewer comments from previous version. List of changes: - add reference - XKUKAX - add DAs responsibilities (as per NCR database application) - add clarifications regarding baseline levels (see chapter 5.1 and annex 2) - add further clarifications for NCR conditional release. - add annex 2 - Baseline level map as per [11] - add clarifications on appendix 1 - NC form
v9.0	In Work	19 Mar 2021	- Chapter 3.1 – arrange definition – alphabetic order - Chapter 3.1 – add the following definitions: o Causal Analysis Tree o Contractor o Inter-Organization Non-Conformity (I-NC): o IO NC system (add note for clarification NC database scope) o PE Group o Scrap (remedial action) o Root Cause Analysis (RCA) o Service o Service provider - Chapter 3.2 add the following abbreviations: o CAT; I-NC, PBS, PROR, SCG - Chapter 4.1 add the following references o [31] How to – Long Aging NCRs management 3CZWDX o [32] Risk and Opportunity Management Procedure 22F4LE o [33] Management review procedure 3L7SWX o [34] Lessons Learned meeting Procedure DV4UUH o Add note “The procedures are applicable to the DAs, only if they are listed in the Multi Party Amendment (MPA).” - Chapter 5.1, 5.2, 5.3 and 5.4 o Change the structure of procedure to reflect the NCR stages o For NCR categorization ITER_D_4HCC3W - HOW TO - NCR Categorization was added o Add RCA categories and Causal Analysis Tree (CAT) o Add mandatory requirements to defined expected due dates for decided remedial actions o Add mandatory requirements to defined expected due dates for NCR closure

			o Add specific section for Inter-Organizational Non-Conformity (I-NC) o Add requirements for application of fast NCR closure – applicable only for minor NCR o Add specific section for Conditional Release of NC. o Add clarification for RCA methodology - ITER_D_2X4E9A - Root Cause Analysis Leaflet o Add clarification for NCR closure o Add interaction with the risk and opportunity process. - Chapter 5.5 – changes to introduce specific requirements for Module H and H1. - Add chapter 5.7 – Internal NC of Performers - Chapter 7 – change the responsibilities for process owner and DH – for IO NCRs - Chapter 9.3 – add requirements for "Nonconformities survey process for PIC and PIA"
v9.1	Approved	19 Mar 2021	Technical issue

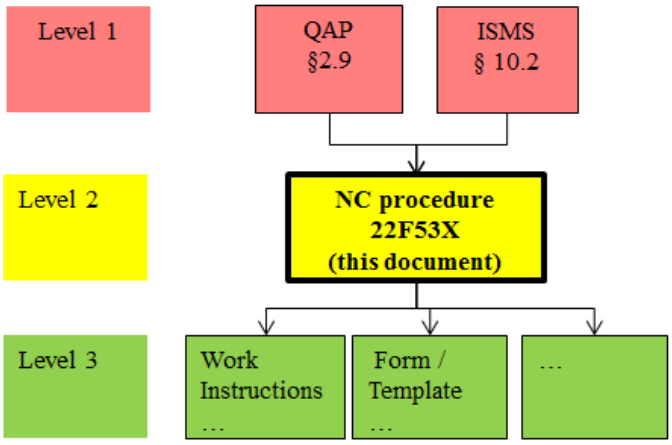
Table of Contents

1 Purpose

The purpose of this document is to specify the Nonconformity Management process, hereinafter NC from the Initiation to the Closure in the IO NC system. The Workflow as well as the Roles and Responsibilities of each stakeholder are specified in a generic way.

2 Scope

This MQP Level 2 Procedure belongs to the Process 'Quality Assurance' and propagates the requirements of the chapter 2.9 of the Quality Assurance Program (QAP) [5], and of the chapter 10.2 of the Integrated Safety Management System Manual (ISMS) [6]. Hierarchy of MQP documentation is illustrated below:



This procedure shall be followed for the management of Nonconformities detected during the all ITER project phases (from the design until operation/maintenance).
- for both types of NCs: Product NC and Process NC,
- by both internal and external performers (IO/ DAs/ suppliers / contractors).

2.1 Out of Scope

- Management of Deviation Request.
- Cost and schedule issues. To be treated as per contractual requirements.
- The management of Internal Nonconformities [1] of external Performers is not covered by this procedure.
    - However, external Performers shall make lists of their Internal Nonconformities available to IO for information, on request of IO.
- NC of Quality Audit (see link with others processes in **section 9**)

3 Definitions and acronyms

3.1 Definitions

Action assignee: An all-inclusive term to designate any person assigned to perform an action in the course of the NC treatment. This person can be from any organization.

Authorized Body/Authorized Notified Body: Organisation authorized by a member state to carry out conformity assessment of pressure equipment and /or nuclear pressure equipment.

Baseline documents (level 0, 1, 2 and 3) – to be used for NC categorization – definition as per [11].

[1] Nonconformities according to the QMS of the external Performers

The ITER baseline is the set of all configuration items with all of its applicable documents approved at one of the project's key milestones that serve as a reference for activities throughout the lifecycle of a product. The scope of a baseline shall be unique and not overlapping with any other.

Causal Analysis Tree: The Causal Analysis Tree is shown in Appendix 3 ("B"-Level) of the procedure. The Causal Analysis Tree is a result of a benchmarking study of industry causal analysis systems. The lowest level of the Causal Analysis Tree is typically referred to as the "B" Level. The Causal Analysis Tree allows for a tailored approach to developing corrective actions

Corrective vs preventive/risk-based actions [2]

- **Corrective action:** action to eliminate the cause of Nonconformity.
- **Preventive/risk-based action:** an all-inclusive term to refer to an action to eliminate the cause of a potential nonconformity

Contractor: legal entity/ organization who has entered into a contract with the IO.

Counterfeit, Fraudulent, and Suspect Items (CFSI)

A counterfeit item is a copy or substitute without legal right or authority to do so or one whose material, performance, or characteristics are knowingly misrepresented by the vendor, supplier, distributor, or manufacturer.

A fraudulent item that items which is intentionally misrepresented to be something they are not.

A suspect item is one in which there is an indication by visual inspection, testing, or other information that it may not conform to established industry-accepted specifications or national/international standards.

Deviation Request, DR (out of Scope)

Request for deviation from a specified requirement in a formal agreement (e.g. signed contract, signed Procurement Arrangements…).

DA RO

- DA staff member nominated as responsible for the coordination of NC process within DA and ensuring continuous interfaces with IO and performers (initiation and closure of the NC).
- For the NCR related to PA implementation, the IO NC system (NCR database) shall be used. For NCRs where the NC ownership will be under DA responsibility, the DA RO will apply DA specific NCR procedure.

Inter-Organization Non-Conformity (I-NC):

[2] Clarification on the term 'preventive' in this document: depending on Standards, various terminologies exist:

Definitions ISO 9000 v2015 (QMS - Fundamentals & vocabulary)	Concept of preventive action in ISO9001 v2015 (QMS - Requirements):	Terminology INB order [1]	Terminology IAEA GSR part 2 / 2016
3.12.1 preventive action action to eliminate the cause of a potential nonconformity or other potential undesirable situation … Note: **Preventive action** is taken to prevent occurrence whereas *corrective* action is taken to prevent recurrence.	**0.3.3 Risk-based thinking** The concept of risk-based thinking has been implicit in previous editions of ISO 9001, including for example carrying out preventive action to eliminate potential nonconformities … One of the key purposes of a quality management system is to act as a **preventive** tool. Consequently, ISO 9001 v2015 does not have a separate clause or sub clause on preventive action.	**Art. 2.6.3. − I.** – The operator ensures discrepancies are managed within a time-frame adapted to the issues concerned, in particular by … defining the appropriate remedial, **preventive** and corrective actions	**6.3.** The causes of non-conformances of processes … shall be evaluated and any consequences shall be managed and shall be mitigated … The status and effectiveness of all corrective actions and **preventive** actions taken shall be monitored and shall be reported to the management at an appropriate level in the organization.

Nonconformity with multiple interfaces between different entities DAs / IO and suppliers. A non-conformity that may be resolved more efficiently or in the best interests of the ITER Project by a party (DA or IO) other than by the Sending DA or its contractors. It applies in situations when a quality issue is identified late in the item's manufacturing process when there is a time criticality associated with the onward availability of this item, causing consequential impacts on later work.

Initiator of a NC:

- Entity or person who detect the Nonconformity and triggers its' registration. Mainly the performer but can be any stakeholder of the ITER project (e.g. IO-CT, IO-PT, DA, ASN, (A)NB staff members, etc.).

IO/ DA Specified Requirement:

- Specified requirements by IO/ DA including:
  - Technical and Quality requirements
  - Regulatory requirements.

IO NC Owner, hereafter IO-RO:

- IO staff member nominated as responsible for the coordination and closure of the NC, in the IO NC system (NCR database). Depending on NC scope the IO-RO is :
  - for Product NC, TRO (manufacturing phase) or CRO (construction phase).
  - for Process NC, the IO DH of affected entity.

IO-Interactions RO

- An all-inclusive term to designate a RO who is managing the project / contract affected by the original NC and related interactions with other systems (e.g. DIRO or RO in Construction Teams…).

IO NC system:

- An all-inclusive term used to refer to the agreed system for tracking and recording NCs until closure in IO. Either IO NCR Database (DB) or through IDM system (for specific cases – see the **note**).

Note: IDM maybe used only for specific cases when NC database does not provide necessary configurations, ensuring flexibility for recording of such specific NCR (e.g. cases when performers refuse or are not available to apply NCR DB, etc.). The use of IDM instead of NCR database shall be agreed with IO QARO in advance (by email). After NCR approval in IDM, QMD shall ensure the transfer (link) of such NCR from IDM to NCR database (NCR legacy) considering the graded approach established by QMD.

Long-term actions – Actions (remedial/ corrective actions) that requires more than one month for implementation and strict follow-up of responsible and due dates.

Manufacturer Means any organization or legal person who manufactures a product or has a product designed or manufactured, and markets that product under his name or trademark.

Nonconformity, herein NC

- Non-fulfilment of a requirement.
- Product or Process, which does not fulfil or fail in meeting IO */ DA,* specified requirements.

NC report

- Nonconformity Report, i.e. the record of each Nonconformity (NC); sometimes referred as NCR.

Performer

- An all-inclusive term used to cover both IO internal and external organizations, such as IO-CT, IO-PT, Domestic Agencies, Suppliers, Manufacturers and Contractors… who provide products (SSC…), works or services to ITER project.

PE Group

The PE Group is responsible for all matters related to the proper and efficient implementation of Pressure Equipment and Nuclear Pressure Equipment regulations within the whole ITER Project – part of EPNS.

Product NC: When the requirement related to the characteristic of an item, component or work is not fulfilled. As an example, failure in meeting a specified tolerance of a component.

Process NC: When the MQP procedural requirement are not fulfilled is relative to the specified way of working. As examples, failure in the propagation of requirements in the Supply Chain; failure in the execution of Design process, failure in the notification of a contractual hold point.

The Process NC related to IO processes, will be treated by IO as internal NC in accordance with detailed IO internal working instructions.

The Process NC related to performers processes, will be treated as Internal NC of performers in accordance their internal procedures – **see chapter 5.7 conditions**

Remedial action

- Action to eliminate a detected Nonconformity
    - **Use as-is:** the item deviates from requirements but is declared fit for the intended use.
    - **Rework**: compliance with the original requirements can be restored.
    - **Repair**: fitness for the intended use can be restored although the repaired item may not conform to the original requirements.
    - **Reject**: the item is not fit for the intended use.
    - **Scrap**: the item is not fit for the intended use (cannot be restored) and it cannot be used for different other scope.
    - **Other**

For process NC, the remedial actions will be specifically defined as per NC evaluation and RCA.

Root Cause Analysis (RCA)

Set of problem solving techniques targeted at identifying the actual root cause or the reason that caused the problem. The need for RCA stems from the fact that the elimination of the symptoms of the problems is not alone sufficient to address the problem, it has to be addressed at the cause level.

Service - output of an organization (service provider) with at least one activity necessarily performed between the organization and the IO. The dominant elements of a service are generally intangible.

Service often involves activities at the interface between IO (responsible for establishing the requirements) and service provider, as well as upon delivery of the service and can involve a continuing relationship.

Service provider – organization that provides a service. In a contractual situation, a service provider is sometimes called contractor.

3.2 Acronyms

Complementary or as quoted in [23] ITER abbreviations:

ASN	French Nuclear Safety Authority (from French: Autorité de Sûreté Nucléaire)
(A)NB	(Authorized) Notified Body
CAR	Corrective Action Request
CAT	Causal Analysis Tree – see annex 3
CCB	Configuration Control Board
CFSI	Counterfeit, Fraudulent, and Suspect Items
CRO	Contract Responsible Officer

DA	Domestic Agency
DH	Division Head
DR	Deviation Request
EPNS	Environmental Protection & Nuclear Safety Division
FR	Functional Reference
I-NC	Inter-Organization Non-Conformity
IO	ITER Organization (sometimes referred to as ITER)
IO-RO	IO Responsible Officer of the work package affected by the NC
IO-DIRO	IO Design Integration Responsible Officer
IO-QARO	IO Quality Assurance RO
IO-SRO	IO Safety Responsible officer
IO-CT	ITER Organization Central Team
IO-PT	Project Team established in accordance with 4.ii of [QYTZEP]
IDM	ITER Document Management(System)
ISMS	Integrated Safety Management System Manual
KPI	Key Performance Indicator
MQP	Management Quality Program
MIP/ITP	Manufacturing Inspection Plan / Inspection and Testing Plan
NC	Nonconformity
NCR	Nonconformity Report
NSI	Nuclear Safety Inspection
PA	Procurement Arrangement
PBS	Plant Breakdown Structure
PCR	Project Change Request
PIC	Protection Important Component, as defined in [24] 0
PIA	Protection Important Activities, as defined in [24]
PIM	Project Issue Management
PE/NPE	Pressure Equipment (PE) in the scope of [2] Nuclear Pressure Equipment (NPE) in the scope of [4]
PE Group	Pressurized Equipments Group – part of EPNS
PNI	Part Number of ITER
PROR	Project Risk and Opportunity Register
QAP	Quality Assurance Program
QMD	Quality Management Division
QMS	Quality Management System
RCA	Root Cause Analysis
RRF	Review of Regulatory Files
RO	Responsible Officer
SSC	System, Structure and Component
SCG	Safety Control Group
SOA	Sign-Off Authority
SR	Safety Related
SQD	Safety and Quality Department
TRO	Technical Responsible Officer

4 Applicable and Reference Documents

4.1 Applicable documents

Regulations	[1]	Order dated 7 February 2012 relating to the general technical regulations applicable to INB - EN	7M2YKF
	[2]	Pressure Equipment directive 2014/68/UE [French version]	RZ6PAK [RZ5PGG]
	[3]	Environmental code mainly art L557 and art R557 – Décret n° 2015-799 du 1er juillet 2015 relatif aux produits et équipements à risques - EN	U5TKD4
	[4]	ESPN Order dated 30 December 2015 modified – Arrêté du 30 décembre 2015 relatif aux équipements sous pression nucléaires - [EN]	SMP384
MQP Level 1	[5]	Level 1 MQP – ITER Quality Assurance Program (QAP)	22K4QX
	[6]	Level 1 MQP - ITER Integrated Safety, Environment and Security Management System Manual (ISMS)	4HCWJU
	[7]	ITER Policy on Safety, Security and Environment Protection Management	43UJN7
Interacting processes – MQP	[8]	Level 2 MQP - Document & Records process - Sign-Off Authority for Project Documents	2EXFXU
	[9]	Level 2 MQP – Nuclear Safety process - Procedure for the Safety Review of Regulatory Files	48VD6T
	[10]	Level 2 MQP – Nuclear Safety process - Organization of nuclear safety inspections in ITER Organization and its supplier chain	CW8EL3
	[11]	ITER Baseline diagram	2XWZEK
	[12]	Nonconformity and corrective actions Survey Process for PIC and PIA in Application of Articles 2.6.3, 2.7.1 and 2.7.3 of the INB Order	HDAWCU
	[13]	Level 3 MQP – Configuration Management process – Project Issue Management	SSU96T
	[14]	Level 2 MQP – Inspection and Testing process – Requirements for Producing an Inspection Plan	22MDZD
	[15]	ITER Procurement Quality Requirements	22MFG4
	[16]	Requirements for Producing a Contractors Release Note	22F52F
	[17]	Release Note Template	QVEKNQ
	[18]	Working Instruction for Mechanical Completion Dossier Preparation	UYUSEE
GIN	[19]	GIN 007 - Closure of Non-Conformance Reports	UKG3W8
Note: The procedures are applicable to the DAs, only if they are listed in the Multi Party Amendment (MPA).			

4.2 Reference documents

[20]	Quality Management System Audits	2DQTA8
[21]	ITER Corrective Action Procedure (CAR)	9QELY2
[22]	DA / Supplier / Sub-contractor QA Non-conformance Report Template	A6HRLB
[23]	ITER abbreviations	2MU6W5
[24]	Nuclear safety common definitions	RLZXMV
[25]	IO QA Non-conformance Report Template	2MVY2Z
[26]	Project Change Procedure	22F4E5
[27]	Guideline for identification (Symptoms) of Counterfeit,	

Fraudulent and Suspect Items (CFSI) XKUKAX

[28] Procedure for Implementation of the Inter-Organizational Non-Conformity Resolution Process YVPWYR
[29] ITER Project Management Plan (PMP) 2NCR3F
[30] Procedure for management of Deviation Request 2LZJHB
[31] How to – Long Aging NCRs management 3CZWDX
[32] Risk and Opportunity Management Procedure 22F4LE
[33] Management review procedure 3L7SWX
[34] Lessons Learned meeting Procedure DV4UUH

5 Basic principles

5.1 General principles for NC management

- The main steps for the methodology for NC management, are as follows:
  - The organisation, where the NC is detected, shall immediately stop works related to the nonconforming product /service and to inform IO.
  - Immediate actions to segregate *(*labelling and/or physical separation of NC shall be applied) the nonconforming item / work and to ensure safety.
  - Description of the nonconformity - NC report shall be immediately registered in NC system.
  - Agreement and implementation of remedial actions to eliminate the Nonconformity. The remedial action can be implemented only after IO formal agreement.
  - Root cause determination through RCA (Root Cause Analysis) using Causal Analysis Tree and decision on corrective & preventive/risk-based actions
  - Follow-up of actions from their initiation until their implementation
  - Verification of the effectiveness of actions.
  - NCR closure - NCR shall be handled and closed with the priority.

5.2 NCR initiation – 1a

During NC initiation stage – 1a, the following points need to be addressed (but not limited):

- Recording the NCR (Description of the problem)
- NCR categorization (major / minor)
- Preliminary proposal of remedial actions need to be established (if the initiator can provide this information at this stage).

Recording of NCR

Once NCR is detected, the initiator is recording the NC in the IO NCR database (status “Submit”) or equivalent electronic system (e.g. IDM for internal IO NCRs (status “Sign”) recognised by IO.

NC report shall be submitted within maxim 5 working days in the NC system to initiate the NC process (trigger the NCR review / approval cycle). In case of dispute between stakeholders, maximum two weeks from the NC detection time may be allowed with IO agreement only.

For management / use of IO NCR database, stakeholders shall apply detailed instructions:

- ITER_D_SM2JWP - NCR Database - Introduction & How to for IO-DA personnel
- ITER_D_SY6RQ5 - NCR Database - Introduction & How to for Suppliers and Contractors

Immediate actions shall be taken to segregate (*labelling and/ or physical separation of NC shall be applied*) the nonconforming item / work and to ensure safety.

After the NCR is submitted in the NC system, the review and approval cycle will be launched and will allow to the performer and all effected stakeholders to provide their feedback.

In case during the review / approval the NCR is rejected, then the NC owner (approver) is immediately informed and will have the responsibility to restart / re-submit the NCR only after all the conditions are agreed and applied. In case of disputes, the NC owner shall ensure further escalation as per - **section 10** of present procedure.

NCR categorization

The preliminary categorisation of NCR shall be done at the initiation stage with the involvement IO RO (confirm) and IO QARO in accordance with the following criteria:

- In ITER project, the way to implement this graded approach for NC management is to categorize NCs either as 'Major' NC or as 'Minor' NC depending on the impact of the NC to the safety, quality or performance.

- The following table provides guidelines to establish the category of the NCR. The final categorization shall be agreed between:

    - NC initiator (propose the NC categorization),
    - Performer (propose the NC categorization if initiator),
    - DAs TRO (provide support and agreement for NC categorization) in case of PAs implementation and
    - IO-RO with support of IO QARO (final confirmation of NC categorization).

Major NC	Safety / Regulation	- Nonconformity with a IO specified requirement affecting Regulatory Requirements, Safety, Environmental impact
	Baseline*	- Nonconformity with an impact on a Baseline document Level 0 / 1 / 2
	Interactions	- Nonconformity with interaction with other PBS, Construction and/or other Process
	Impact on Performance	- Implication on Functional performance
	Repetitive NC	- More than 2 similar NCRs can trigger one major NC to investigate root cause of recurrence.
Minor NC	Safety / Regulation	- Nonconformity with a specified IO requirement not affecting Regulatory Requirements, Safety, Environmental impact
	Baseline*	- Nonconformity with an impact on a Baseline document Level 3
	Interaction	- Nonconformity with no interaction with other PBS, Construction and/or other Process
	Impact on Performance	- Implication on layout (within the same space reservation of concerned system/ PBS)
	Nonconformity not falling under definition of Major NC.	

*Baseline document levels are defined as per IO procedures [11] and [29].

The detailed requirements /clarifications regarding NCR categorization are described in the ITER_D_4HCC3W - HOW TO - NCR Categorization.

During the NC initiation stage, performer shall propose preliminary remedial actions (if the initiator can provide this information at this stage) and need to be recorded in NC system for IO acceptance.

5.3 Assessment of Nonconformity – Stage 1b

During NC evaluation stage – 1b, the following points need to be addressed (but not limited):

- Final remedial actions need to be recorded in NC system and agreed with NC owner.
- Preliminary Root Cause Analysis (RCA) need to be applied and propose corrective actions / RCA category need to be established and recorded in NC System (when required)

During the NCR assessment stage, the remedial actions shall be clearly defined and agree by IO-RO.

For all the decided remedial actions the expected due dates and responsible for closure need to be established and recorded in NC system – Sage 1b.

RCA categorization with Causal Analysis Tree (CAT) evaluation shall be applied for all NCRs.

For Minor NCR, the application of RCA remains under performer internal responsibility and does not require IO acceptance. This approach regarding minor NCR evaluation does not release the performer from his responsibility to ensure correct evaluation of NCR, establishing the NCR Causes and corrective actions application.

The root-causes of nonconformities are categorized based on Causal Analysis Tree by the type of failure/ problems as following:

RCA category/ level	Description of RCA category by type of failure
A1	Design/ Engineering problem
A2	Equipment/ Material problem
A3	Human Performance problem
A4	Management (procedure/ process/ method) problem
A5	Communications problem
A6	Training Deficiency
A7	Other Problem

Each RCA categories/ levels (A) are also divided in sub-categories/ levels (B) as described in Annex 3 of present procedure. The sub-categories/ levels (B) – see annex 3, need to be recorded in the RCA report only.

The RCA category – level A, shall be recorded by performer in the NC system in the "Preliminary Analysis of Causes" section and confirmed by IO-RO (NC owner).

In IO and DA, the NC owner is primarily the RO of the item or work being affected by the NC.

- In case of NC involving several Performers, an owner in IO (or DA – for the cases when the NC does not have impact on IO requirements) shall be established with the responsibility to coordinate all actions between parties and supervise the overall action plan.

Two options are possible for NC treatment:

- A unique NC is opened covering all aspects and Performers;
- Several NCs are opened for each Performer.

If the NC owner face issues in finding agreement between parties, or if there is no agreement to find an NC owner, issue will be escalated according to **section 10** of present procedure.

For the cases when the DA is NC owner (NC with no impact on IO requirements), the DA shall apply their own specific NCR procedure accepted by IO.

For most of the cases the performer is also assigned for NCR closure. For specific cases when responsible for NC closure is other entity than performer, during the NC evaluation stage the NC owner (IO-RO / DA- RO), shall confirm (indicate) who is responsible entity for NCR closure.

Also, during the NC evaluation stage, after identification of NCR impact analyse, the NCR has to be linked (IDM, PLM etc.) to the applicable document (drawings, specification, procedure, etc.) that are affected by the NCR and requires future update. This task is under NC owner responsibility.

For specific situations, stage 1a (NC initiation) and stage 1b (NC evaluation) can be merged into one stage (1b) - if the NC initiator have all the necessary information: description of NC, Categorization, establish remedial actions, NC evaluation, Preliminary RCA, Corrective actions and categories.

Inter-Organizational Non-Conformity (I-NC)

The I-NC is a non-conformity applied in situations when a quality issue is identified late in the items manufacturing process when there is a time criticality associated with the onward availability of this item, causing consequential impacts on later work.

The NC identification is the trigger event of the I-NC but the close out of each process does not depend on the same elements.

The NCR should be kept open for technical corrective and remedial actions whereas the I-NC is kept open for financial actions as per applicable procedure [28]. The NCR can be closed even if the I-NC is not closed and vice versa.

When an I-NC is detected, the NCR title should indicate the mark “I-NC” to raise the attention of stakeholders and initiate application of I-NC mechanism. The mechanism and details for treatment of I-NC is described in the [28].

5.4 NCR closure – stage 2

When required (see note 1), a detailed RCA shall be performed with conclusions whether or not launching corrective actions, and should consider as appropriate any preventive/risk-based actions.

Note 1: The RCA is required to be applied for all NCs in accordance with the following criteria:

- For major NCR’s, the RCA need to be accepted by IO and shall be mandatory recorded in NC system.
- For minor NCR’s, the RCA does not require IO acceptance and shall be under performer responsibility only. For specific cases decided between performer and NC owner (IO-RO), the RCA may be submitted to IO for acceptance and recorded in NC system.

For all the corrective actions indicated in the RCA, the expected due dates and responsible for closure need to be established and recorded in the NC system (when Preliminary RCA is finalized -1b stage).

For complex RCA, the performer (responsible for NC closure) shall arrange specific RCA meetings and perform a detailed RCA. The RCA results and conclusions, together with the decided corrective actions shall be recorded in RCA report with the following information: RCA team members, RCA method, chronology of the events, causes of NC, corrective actions and risks required to eliminate and prevent the NC, etc.

For Root Cause Analysis (RCA) application the following guidance may be used ITER_D_2X4E9A - Root Cause Analysis Leaflet by the stakeholders.

The NCRs can be closed only after the following conditions are meet:

- **For minor NCRs:**
  - all remedial actions are closed (respecting the expected due dates – as recorded in the NCR stage 1) and evidences for remedial actions closure are recorded (attached to NCR for closure stage) in IO NC system.
  - For minor NCRs, the RCA application together with corrective actions implementation are under performer responsibility only and does not required IO acceptance.
  - in case the decided remedial actions (ex: "reject", "scrap") will not remain part of (will not affect) the final product or activity that will be delivered to IO and the related corrective actions (if necessary) will be implemented internally by performers without affecting IO products and activities, the NC can be closed immediately – fast NCR closure**. For such cases, the NC owner shall agree on fast NCR closure mode.

**note: Fast NCR closure is applicable for minor NCRs where the remedial actions ("reject" or "scrap") will not affect the final products / activities that will be delivered to IO. Fast NCR closure means, immediate NCR closure after initial stage of NCR is reviewed and approved – does not require a new review / approval cycle for NCR closure by all stakeholders.

- **For Major NCRs:**
  - all remedial actions are closed (respecting the expected due dates – as recorded in the NCR stage 1) and the evidences for remedial actions closure are recorded (attached to NCR for closure stage) in IO NCR database (or IDM).
  - all corrective actions (CA) decided as per RCA are closed (respecting the expected due dates – as recorded in RCA) and the evidences for CA closure are recorded in IO NC System (attached to NCR for closure stage).

The final closure of NC is confirmed if all related actions are implemented to guarantee the IO requirements of the item or work at the handover to IO.

For NCR closure, the performer (responsible for NCR closure) issues the update of NCR (NC report) in the IO NC system, to ensure NCR is reviewed & accepted /approved by all relevant stakeholders.

As a basic principle, the delivery of the items shall be released only if all the related NCR's are closed.

The IO NC system record the actions (remedial/corrective actions) agreed with Performers and also the internal actions in IO. If it is decided to follow some long-term actions (remedial/ corrective actions) in a separate system (JIRA CAT system or equivalent electronic system), traceability of the actions and tracking system shall be demonstrated to monitor the progress. The NCR shall not be closed if the related remedial actions / corrective actions are still open (see previous paragraphs for NC closure conditions.)

If during the NCR treatment, the risk and opportunities are identified then the IO-RO shall record the risk and opportunity in IO register (PROR) as per procedure [32].

Conditional Release of NC.

For exceptional cases, intermediate/ conditional release of the NCRs can be accepted only after agreement between IO (NC owner) and DA's / performers.

For such cases when conditional release of the NC is agreed to allow the shipment of components, tracking and checking of remaining points/ actions is required, until the final closure of the NC and handover.

To ensure proper follow-up of conditional release of NCRs, the performer shall maintain the NCR open until all the decided remaining conditions / actions are closed. The continuous follow-up of NCRs status will ensure on the same time the follow-up of such conditionally released NCRs.

For such cases when conditional release of NC is applied, clear further instructions/ actions shall be also indicated in the NCR and in the final delivery documentation (section 6 of [17] - Release Note template – QVEKNQ or section 12 – Punch list of Mechanical Completion Dossier prepared as per [18] - UYUSEE) to be taken into account on the next phases of the project.

The performer shall record the NC conditional release in NC system and NC owner will communicate this information to the corresponding IO team (IO construction team, PT, PBS team etc.) if any impact on the next phases of the project.

5.5 PE/NPE Assessment

This section is useable only when IO is acting as PE/NPE manufacturer. This section explains the process to sort out the nonconformity detected during design and manufacture of pressure equipment or nuclear pressure equipment.

Nonconformity shall be close out following relevant paragraph 5.3.

A nonconformity concerning a PE/NPE or Implementation plan for design & manufacture of PE/NPE (VE2DSP) is considered as properly closed by IO if the impact on the other past, current and future productions is performed.

5.5.1 Nonconformity related to Equipment manufactured by IO in the scope of Module H/H1

5.5.1.1 Process Nonconformity

IO describes and presents to ANB[3] the solutions it intends to adopt to remedy the process nonconformity related to the application of Implementation plan for design & manufacture of PE/NPE – VE2DSP and shall obtain ANB validation[4] before they are implemented.

5.5.1.2 Product NCR

Product Non-Conformances are classified as Major or Minor according to the criteria defined in chapter 5.2 above.

IO will describe the solutions it intends to adopt to remedy the non-conformances and will keep the related records available for ANB consultation.

5.5.2 Nonconformity related to Equipment manufactured by IO out of the scope of Module H/H1

5.5.2.1 Major Product Nonconformity

Only major product NCR affecting regulations [1], [2], [3] & [4] shall be sent to ANB.

IO describes and presents to ANB[3] the solutions it intends to adopt to remedy the major product NCR and shall obtain ANB validation[4] before they are implemented.

As soon as the NCR is uploaded in NCR database, PE/NPE expert shall send to ANB:

- the NC and all necessary information (report, drawing, picture…),
- remedial actions proposal : Whenever the supplier or subcontractor is able to repair in accordance with the PA documentation and/or selected code, this will be the preferred remedial action,
- Root-cause-Analysis.

If the repair is not following the PA/ contract documentation, contract and/or selected code, IO needs to evaluate if this repair has an impact on an essential safety requirement of [1], [2], [3] or [4] and if the hazards and risks analysis should be updated and submitted to ANB for approval.

To implement the remedial action(s), a revision of original MIP /ITP or new MIP/ITP will be prepared to include the new operations and the needed intervention points from all the parties. IO/ANB could add new control points (Hold points, witness points, reports and notification points).

5.5.2.2 Minor Product Nonconformity

The supplier or subcontractor is able to repair in accordance with the PA/ Contract documentation or existing repair procedure(s) approved by IO and accepted by ANB.

Minor NC and all evidences or reports are kept by IO in NCR database and are available to ANB on their demand (periodic meeting, ANB visit or audit).

When possible, IO shall accept the action plan without impact on the workshop schedule.

After implementation of the action plan, remedial action(s), corrective action(s) and evidence(s) are approved by IO (if required).

5.6 Case of NC related to CFSI

In case the Non-Conformity deals with a Counterfeit, Fraudulent and Suspect Item (CFSI), the Head of the EPNS Division informs the ASN using the template Déclaration d'évènement significatif à l'ASN (SKKSP3), after validation by the Director General. Such cases will be treated and reported as significant event following the regulatory requirements.

The template ITER_D_SRVZKZ - Compte-rendu d'évènement significatif is used for this analysis. After validation by the Director General, the analysis report is sent by the Head of the EPNS Division to the ASN within 2 months after the detection of the CFSI.

For identification (symptoms) of CFSI items the following guideline need to be followed and consulted by the stakeholders: [27] - XKUKAX - Guideline for identification (Symptoms) of Counterfeit, Fraudulent and Suspect Items (CFSI).

All the non-conformities dealing with a CFSI shall be evaluated by IO QARO and IO SRO to:

- ensure confirmation of CFSI case,
- initiate and perform RCA and
- ensure further escalation to EPNS Head.

5.7 Internal NC of performers.

During contracts / PAs implementation, the performers (DAs, Suppliers, contractors, sub-contractors) may identify internal NC that need to be managed internally within the performers organization without involving IO and other external entities.

Such internal nonconformities (NC) has the following characteristics:

- NC will not affect the final products and activities delivered to IO or different other entities (other DAs, supplier, contractor) in the scope of ITER project,

- NC will not have impact on contractual/ PAs requirements
- NC will not have impact on cost and schedule related to ITER project and
- NC will not have impact on regulatory requirements applicable for ITER project.

The performer internal NCRs, shall be managed by external performers in accordance with their internal NCR procedures.

The performers shall maintain fully traceability and evidences for internal NCR closure, to be available during the IO/ DAs audits and inspections.

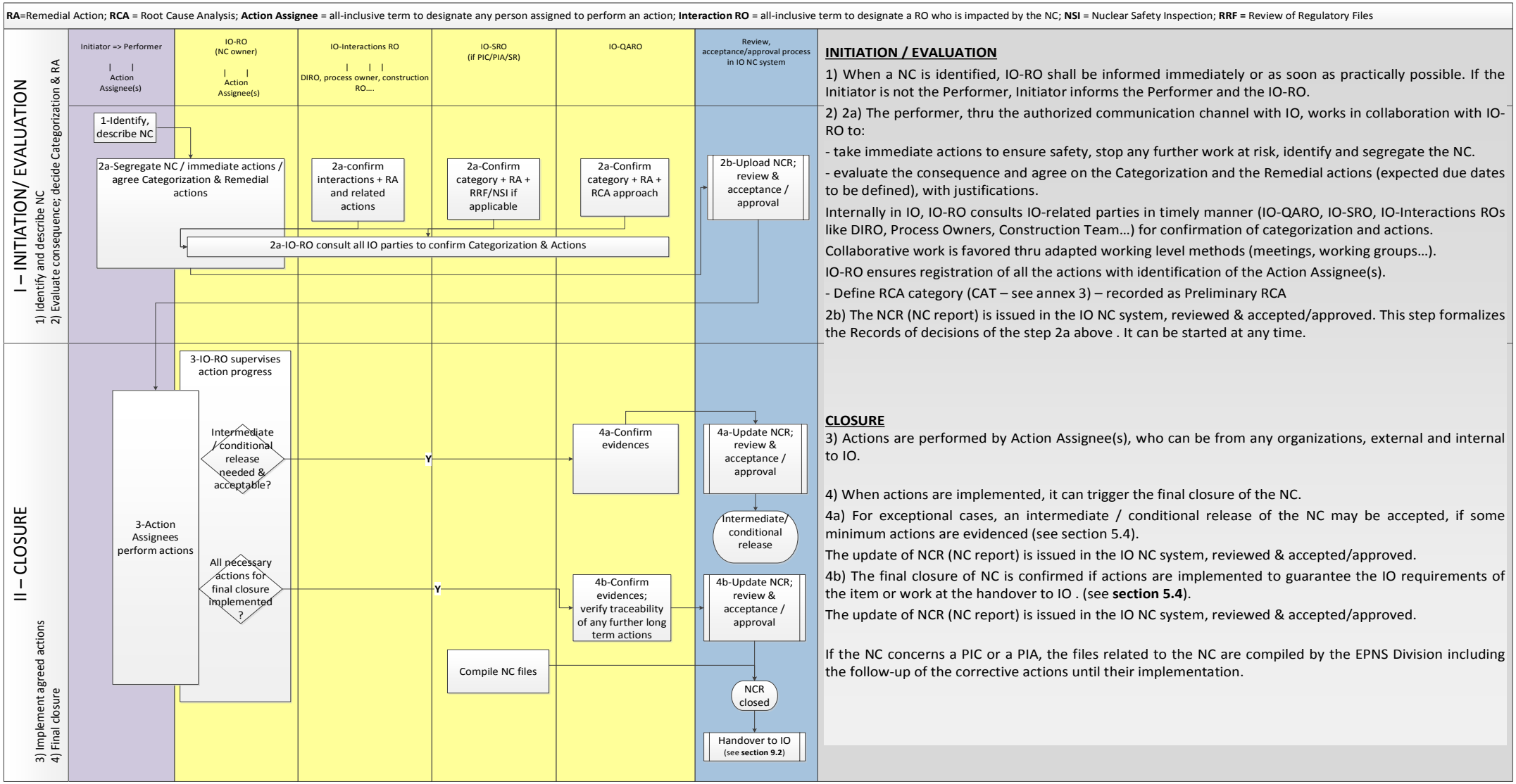
Internal NC of performers shall be recorded using performer's NCR templates and internal database (if applicable). A list (log/ register) of internal NCRs need to be maintained by the performer to allow strict control of NCR stages, trend reports and analyses. This internal NCR log shall be available at IO/ DAs request during the audits and inspections.

IO internal NCRs: For such NC (with no impact on other organizations), the involved stakeholders will be IO staff only and review / approval cycle will respect present procedure requirements. A dedicated working instruction – MQP level 3 (with no impact on DAs) will be prepared for detailing the instructions for treatment of IO internal NCRs.

6. Workflow

The work flow focuses on Roles and Responsibilities in a generic way. Two main stages of the process are defined, for both Product NC and Process NC:

I. **Initiation / evaluation:** This stage consists in taking immediate actions, describing the NC, evaluating the impact and agreeing on categorization and remedial actions.
II. **Closure:** This stage consists in implementing the actions agreed and in closing the NC with the required evidences.



INITIATION / EVALUATION

1) When a NC is identified, IO-RO shall be informed immediately or as soon as practically possible. If the Initiator is not the Performer, Initiator informs the Performer and the IO-RO.

2) 2a) The performer, thru the authorized communication channel with IO, works in collaboration with IO-RO to:

- take immediate actions to ensure safety, stop any further work at risk, identify and segregate the NC.
- evaluate the consequence and agree on the Categorization and the Remedial actions (expected due dates to be defined), with justifications.

Internally in IO, IO-RO consults IO-related parties in timely manner (IO-QARO, IO-SRO, IO-Interactions ROs like DIRO, Process Owners, Construction Team…) for confirmation of categorization and actions.

Collaborative work is favored thru adapted working level methods (meetings, working groups…).

IO-RO ensures registration of all the actions with identification of the Action Assignee(s).

- Define RCA category (CAT – see annex 3) – recorded as Preliminary RCA

2b) The NCR (NC report) is issued in the IO NC system, reviewed & accepted/approved. This step formalizes the Records of decisions of the step 2a above . It can be started at any time.

CLOSURE

3) Actions are performed by Action Assignee(s), who can be from any organizations, external and internal to IO.

4) When actions are implemented, it can trigger the final closure of the NC.

4a) For exceptional cases, an intermediate / conditional release of the NC may be accepted, if some minimum actions are evidenced (see section 5.4).

The update of NCR (NC report) is issued in the IO NC system, reviewed & accepted/approved.

4b) The final closure of NC is confirmed if actions are implemented to guarantee the IO requirements of the item or work at the handover to IO . (see **section 5.4**).

The update of NCR (NC report) is issued in the IO NC system, reviewed & accepted/approved.

If the NC concerns a PIC or a PIA, the files related to the NC are compiled by the EPNS Division including the follow-up of the corrective actions until their implementation.

7. Responsibilities

- The Performers shall ensure the implementation of the requirements of this document to control nonconformities.
- For NC under performers responsibility, the final acceptance by IO of Nonconformity Reports:
  a) Is limited to the particular contract and item referred in the report;
  b) Does not relieve the performer of any contractual obligations and responsibilities.
- Detailed stakeholders and their roles and responsibilities are listed in the following table.

#	Stakeholder	Responsibilities
1	Initiator	• Detect and identifies NC and notifies IO; • Alerts the involved parties, primarily the affected IO-RO as soon as practically possible (within one week) and with necessary details; The IO-RO may decide that the NC is actually an "Internal Non-conformity" and stop the initiation of the NC in IO NC system. • Notify the Performer, if different from the Initiator; • Responsible for registering or triggering the registration of the NC into the IO NC system; Sometimes, it can be directly the IO-RO who detects and identifies NC.
2	Performer	When Performer is the person detecting the NC, executes actions of Initiator as above; • Segregates NC, take immediate remedial actions. Stop (as per IO agreement) any further related work on the item until a decision on the NC is taken; • Make initial written proposal of the RCA categorization, using CAT and remedial actions. Initiates problem-solving technique to treat the NC, including as appropriate RCA and preliminary analysis of causes as soon as practically possible (typically within a couple of weeks). Performer can seek assistance from IO-QARO in the methodology of NC problem solving techniques. • Through the authorized communication channel with IO and DA' (in case of PA implementation), collaborates with IO-RO/ DA-RO to achieve the appropriate conclusion on NC categorization and actions (remedial actions and corrective actions). • Provides evidence of progress of the NC treatment to the IO-RO in a pro-active and timely manner. • Complementary to the required information by IO, manage comprehensively the NC in NC system. • The performer is the designated entity for NCR closure, responsible for implementation of remedial/corrective actions and trigger the NCR closure stage in NC System.
3	IO-RO NC-Owner	• IO Person assigned responsible : o For the coordination and control of the activities in the NC treatment; o Ensuring that the NC is documented and recorded in the IO NC system correctly. o Triggering and guarantying the closure of the NC. For that , the IO-RO shall: • Consult all related-parties, including IO-Interactions RO, IO-SRO (for NC concerning PIC and/or PIA), PE/NPE expert (as required) and IO-QARO to confirm categorization and actions decided. • Agree with the Performer and DA-RO (in case of PA implementation) on the apparent cause analysis tree and remedial actions; Participate and conclude on the impact assessment, including impact on IO Baseline documentation. • In case there is any change action(s) on IO Baseline documentation, manage the implementation according to [11], manage the initiation of a Project Change Request (PCR), if so requested by the DIRO. • Shall ensure that the NC is issued and registered in the IO NC system correctly. • Track the NC and related actions until the final closure of the NC in IO NC system.

#	Stakeholder	Responsibilities
		• In the review and approval cycle of the NC reports, is either the person **Approving**[3] or is **Reviewer** (if acceptance/approval is done by higher level of organisation). • IO-RO can seek assistance from IO-QARO in the methodology of NC problem solving and RCA techniques. In case of dispute to find and designate an IO-RO, see **section 10**
4	IO-SRO	• Checks if PIC, PIA, Safety Related (SR), are properly designated. • Agrees on the NC categorization (for NC concerning PIC and/or PIA). • Assess Safety impact and validates action proposal. • Reviews with respect to Regulations [1], [2], [3] & [4] • Is part of the review process of the NC reports, as appropriate for NC concerning PIC and/or PIA. • Confirms if there is a need for Safety Review of Regulatory Files [9]0 and / or Nuclear Safety Inspection [10]0 , and call for those processes as necessary.
5	PE Group	• Checks if PE/ NPE are properly designated. • Agrees on the NC categorization (if the NC is PE/NPE relevant). • Consult (A)NB for major product NCR and process NCR • Assess statutory & regulatory impact and validates action proposal • Review with respect to Regulations [1], [2], [3] & [4]. • Is part of the review process of the NC reports, as appropriate.
6	IO-Interactions RO (DIRO) <u>For Major NC only</u>	• Checks the NC potential impact on other areas than the original scope of the NC, review and confirm apparent cause analysis using CAT and remedial action proposal. • For NC at manufacturing stage, it includes the assessment of impact on Assembly, Installation and Operations. • Is part of the review process of the NC reports, as appropriate. • In case there is any change action(s) on IO Baseline documentation, ensure it is implemented according to [11]. • Analyse the NCR considering the design impact and if PCR is required to trigger further upper level project changes as per [26].
7	IO-QARO	• Checks the compliance of the NC process • Checks if proper RCA is undertaken, commensurate to the impact and risk of the NC, along with the necessary action(s). • Can provide a support to the stakeholders, as necessary, in the methodology of NC problem solving techniques. • Is part of the review process of the NC reports, as appropriate. • Checks the evidences required to grant the closure of NC. It involves traceability of the actions until implementation. • Confirms if any long-term corrective actions can be tracked in a separate system, to allow final closure of the NC on the individual item or work, and verifies the traceability of those actions. • In IO, provide assistance to sort what are internal IO actions and what are external IO actions. Indeed, an NC by an external performer may reveal the need for actions within IO. In that case IO-QARO ensures opening of the relevant NC/CAR in the appropriate IO system. • Facilitate the coordination between the stakeholders, and may become the IO NC

[3] The <u>approval level of NC can be delegated to a different IO stakeholder</u> (upper level or similar level) if agreed with Department Head of requester and approved by process owner. Such delegation regarding approval level of NC shall be documented with clear justifications using <u>deviation request</u> applied as per [30].

#	Stakeholder	Responsibilities
		owner, in case of complex NC, involving different processes.
8	QMD	• In application of GIN007 [19], QMD ensures that NCs are closed in due time. • Provide NC statistics and KPIs to monitor the effectiveness of the NC process.
9	IO-Tech Staff	• Person is designated by IO-RO as appropriate. • Review the NC regarding the technical aspects - added as additional reviewers of NC.
10	IO Process owner	• For IO internal NC, related IO processes and procedures deficiencies (need for improvements), the process owner is responsible for NCR review for confirmation of RCA and remedial and corrective actions implementation. • Ensure the process improvement (if needed) revising the affected procedures and working instruction as per decided actions triggered by NC evaluation.
11	IO DH or upper level	• For IO internal NCs, the approval shall be under DH of affected entity (or appointed representative) responsibility.
12	DA-RO	• DA Person assigned responsible : o For the coordination and control of the activities in the NC treatment within DA; o Ensuring that the NC is documented and recorded in the IO NC system correctly. o Triggering and guarantying the closure of the NC ensuring continuously interface/ communication with performer. Ensure continuous communication / interface with IO-RO to achieve the appropriate conclusion on NCR categorization, agree on related actions, remedial, and corrective actions (as required) and NCR closure.

8. Records/Outputs

- The form in Appendix 1 lists the minimum information required for managing a NC report.
  - The template [22] or template [25] is proposed to address this minimum information. Alternative formats (including in electronic form – NCR database) which include the essential metadata may be acceptable. They shall be subject to IO Quality Management Division acceptance in advance of their intended use.
- NCs are an integral part of a contract and PAs. Upon completion of the work, NC reports shall be included in the data package handed over to IO (**see chapter 9.2**).
- In IO, a NC register shall be maintained including all relevant metadata. The IO-RO is the Responsible person to ensure record of NC reports in the IO NC system, for the whole lifetime of the ITER project.

9. Link with other processes

9.1. Link with other 'Quality Assurance' processes (QA audit, CAR)

- The 3 following procedures have the same goal of addressing nonconformities and having proper corrective actions implemented. These procedures are governed by the same principles based on standard quality practices: problem description, Root Cause Analysis (RCA), corrective actions implementation and verification of effectiveness. They are complementary to address all types of inputs.
  - Nonconformities resulting from QA audits are managed through detailed steps described in [20]0
  - The CAR procedure [21]0 describes the process to manage Corrective Actions Requests as a result of other sources (for example DG decision, ASN request, a management review…).
    What is important is that actions are implemented by one of the above process, and that there is no duplication. This verification is done by Quality Management Division QMD.

9.2. Link with 'Procurement'

As elements governing ITER Procurement Quality Requirements0:

- NCs are an integral part of a contract. Upon completion of the work, NC reports together with relevant documentary evidence shall be included in the data package handed over to IO.
    - For Manufacturing, it is governed by the process for Producing a Contractors Release Note 0 and Manufacturing Dossier.
    - For Assembly&Installation, it is is governed by the process for Mechanical Completion Dossier 0.
- During execution of Inspection Plans governed by [14], if modifications appears to be necessary due to Nonconformity (such as repair…), the NC report should be referred in the Inspection Plan.
- The products / activities shall be released for delivery only if all the related NCR's are closed.
  The release of the PAs credits / contracts termination shall be applied if all the related NCRs are closed.
  For exceptional cases, please see conditional release - chapter 5.4.

9.3. Link with 'Nuclear safety'

- In the treatment of NC, SRO may trigger the need for the Review of Regulatory File (RRF) [9]0 or / and for a Nuclear Safety Inspection (NSI) [10]0. See **chapter 7** (role of IO-SRO).

- Nonconformities survey process for PIC and PIA shall be performed by SCG in accordance with Articles 2.6.3, 2.7.1 and 2.7.3 of the INB Order.

- An biannual assessment report shall be prepared by SCG and approved by SQD Head, for global review of non-conformities on the cumulated effect of uncorrected discrepancies on the installation, and identify and analyse the recurrence propensity for similar types of NC as requested by the article 2.7.1 of the INB Order [1]. The SCG is responsible for the annual assessment of trends and the cumulated effect of NCRs and analyse the recurrence propensity for similar types of nonconformities.

- Input data for such report could also come from the lessons-learned feedback as per [34].

9.4. Link with 'Configuration Management' process

- In the NC categorization, one of the criteria is the level of control (level 1/2/3/4/5) of the IO Baseline Documentation impacted. Those levels are governed by IO procedure [11].
- If the treatment of NC implies the modification of IO Baseline Documentation, the proper Change Action(s), under the relevant Level of CCB shall be managed according to [11] (**chapter 7)** and PCR [26].
- In **chapter 10** (Dispute and Resolution), the PIM process [13] can be called (Project Issue Management).

9.5. Link with 'Documents and Records'

- In **section 0**, the present procedure 22F53X describes the roles of IO Stakeholders as reviewers of the NC reports, as an input to SOA (Sign-Off Authority) [8]0. It can be summarized in following table:

<table>
<tr><th></th><th>IO-RO</th><th>IO-Interactions RO</th><th>IO-QARO</th><th>IO-SRO</th><th>PE Group</th></tr>
<tr><td rowspan="2">Minor NC</td><td rowspan="2">Approve[4] or Review</td><td>-</td><td rowspan="2">Review</td><td rowspan="2">Review
(if PIC/PIA/SR)</td><td rowspan="2">Review
(if PE/NPE)</td></tr>
<tr><td>Major</td><td>At minimum IO-DIRO Review Stage I [5]</td></tr>
</table>

NC					

SOA 0 being document-based does not give indication of the status of a document within a workflow. The present procedure 22F53X develops the stages of NC treatment, each of them grading the required minimum list of reviewers. Therefore, in case of contradiction, this MQP procedure 22F53X, and its derived MQP Level 3 documents, take(s) precedence.

9.6. Link with "PE/NPE conformity assessment"

In the treatment of NC, PE Group may trigger the need to update a procedure or any document used as support of the Quality System accepted by ANB.

If during the resolution of an existing nonconformity, a visual examination required for the final assessment of the PE/NPE is impacted, IO will allow ANB to perform a new visual examination.

The pressure test could be performed even if all the nonconformities are not closed if IO provides evidences to ANB that these opened non-conformities will not have an impact on the pressure test.

9.7. Link with Finance & budget process

Management of I-NC is part of finance & budget process and shall be applied in accordance with [28].

10. Dispute and resolution

Criteria for triggering escalation includes, but is not limited to:

- dispute on the way to close a NC;
- long aging NC - opened for a long time (typically more than 12 months) without any justification;
- dispute on ownership of NC; as an example, when there is multiple interfaces involved (e.g. different systems, multiple Performers and organisations …).

In IO, the mechanism how to escalate is as follows:

- Submission first to Division Head (DH) level;
- If resolution within IO is not gained at the Division Head (DH) level, it will be submitted to the QMD Head and technical Department Head level;
- If still no resolution is made, then the NC will be submitted to ''PIM" (project issue management; issue at PIM [13]).

11. KPI

IO has established 2 KPI indicators to assess the efficiency of the process:
1. The time between the detection of the NC and submission of NC (5 working days).
2. The time between the detection date of the NCR and the closure of NCR. – LL NCR

The internal specific KPIs for monitoring of NCR management performance may be established by IO process owner and shall be monitored/reported as per Management Review procedure [33].

In application of QAP [5] section 2.9,

'' The Non-conformities shall be resolved with high priority and this resolution shall not exceed 9 months in average and 12 months individually, except initial agreement from the IO DG or the QMD Head.''

---

[4] IO-RO is either the person Accepting/Approving (as per contract definition), or is Reviewer (if acceptance/approval by higher level of organisation).
For IO NC the approval shall be obtained from process owner or DH (see chapter 7). The approval level on DAs site shall be applied as per DA NCR procedures

[5] Stage I is the Initiation stage as per **section 0**, with one objective being agreement on remedial actions.

If long time (Long Aging - LL) is necessary to close the NC, justification shall be provided by NCR owner (with performer support) and recorded. The detailed requirements regarding long aging NCRs management are described in the [31].

Appendix 1: List of related information / data to be provided in NC system template

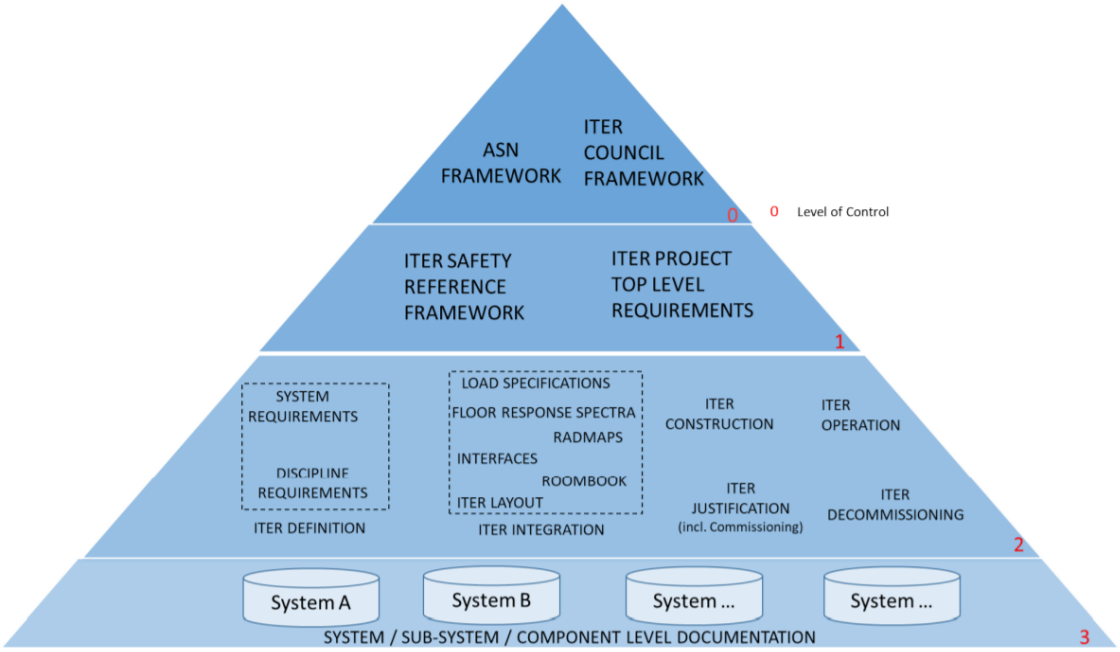
	Field	M = Mandatory O = Optional
NC Initiation Stage **I**	Title of Nonconformity	M
	External Performer(s) NC Reference(s)	M (if applicable)
	ITER Contract reference (PA/Task Agreement / Direct contract as applicable)	M (if applicable)
	DA	M (if applicable)
	Supplier / Contractor	M (if applicable)
	Affected DA (other than related contact)	M
	Plant Breakdown Structure (PBS)	M
	Item / Work identification and localization (objective is to keep traceability)	M
	FR / PNI/ SN (for product NC only) – see note **	*M*
	CWP	O
	NC Category (Major or Minor)	M
	Quality Class	O
	Is PIC? PIA? SR?	M
	Date of NC detection	M
	Requirements	M
	Description of the Nonconformity vs. Requirement	M
	Proposed preliminary Remedial Action(s) and description	M
	Initiator and organization (with signature *)	M
NC evaluation Stage **I**	Confirmation of final Remedial Action(s) (*expected completion date for closure)*	M
	Justification of Remedial Action (s)	M
	Preliminary Root Causes Analysis RCA (following CAT – annex 3)	M
	Impacted Documents, including Baseline Documents	M
	Target date for NC closure	M
	Supporting Documents	O
	Is a PCR/CCB Required? (if Y, reference #)	M (MAJOR)
	Is an RRF/NSI Required? (if Y, reference #)	M (if PIC/PIA/SR)
	Performer(s) RO (with signature*)	M
	IO ROs (with signature*)	M
	IO Reviewers (with signature*)	M
	IO Acceptance/Approval (with signature *)	M

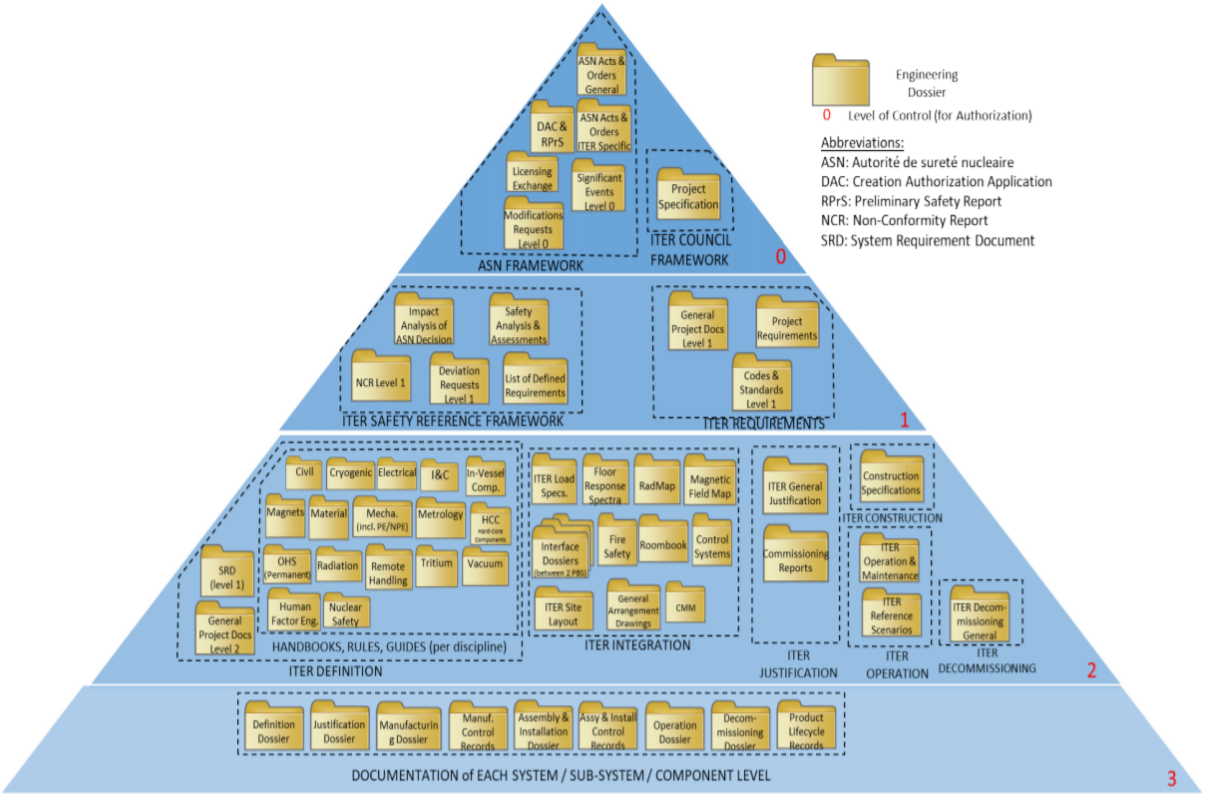
NC Closure Stage **II**	Follow-up on remedial action(s): when implemented + evidences	M
	Root Cause Analysis	M (Major)
	Are Corrective (and Preventive/risk-based) Actions Required? Y/N If Y, description of actions and due date.	M (Major)
	Follow-up on Corrective actions required for final NC closure: when implemented + evidences	M (Major)
	Performer(s) RO (with signature *)	M
	IO ROs (with signature *)	M
	IO Reviewers (with signature *)	M
	IO Acceptance/Approval (with signature *)	M

(*) 'with signature' means that there shall be a formal trace (electronic signature –*NCR database*) of the signature of the person.

(**) When the NC affect a single item, the item SN (serial Number), FR (functional reference) and PNI identifier shall be used. When the NC affect an entire batch, the PNI shall be used to identify all concerned items

Appendix 2 – TECHNICAL BASELINES overview levels as per [11] – see ITER baseline diagram



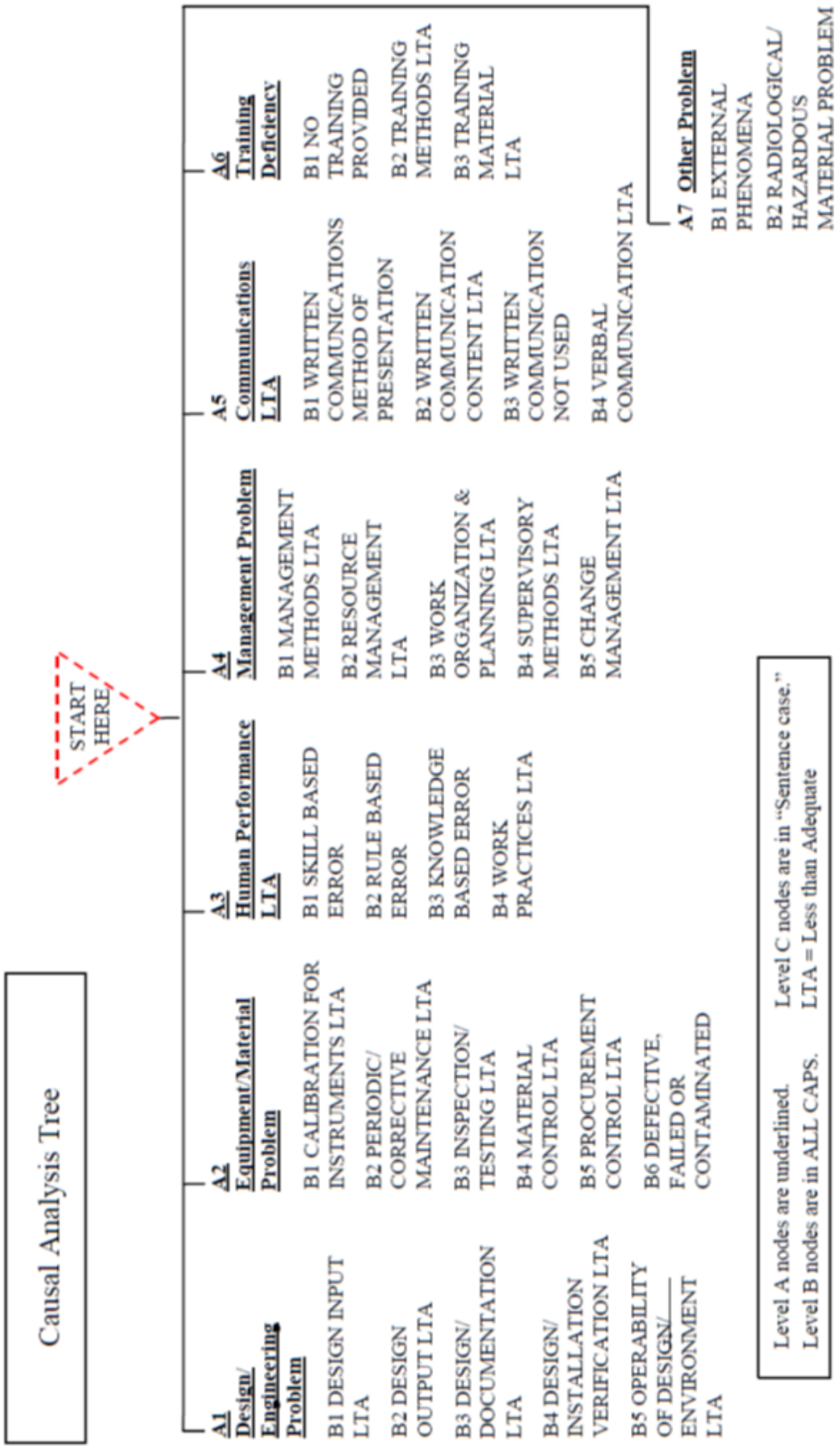


Details of ITER baselines with Engineering dossiers type and baseline levels as per [11].

MANAGEMENT BASELINES.

The management baseline requirements are indicated in chapter 9.5 of ITER_D_2NCR3F - ITER Project Management Plan (PMP).

Appendix 3 – Causal Analysis Tree for Root Cause Analysis (RCA)



Deviation Request (DR)

1. General

Type of DR	**IO / DA / CON**	Issue Date	
DA/ CON / ref. num.			
DR Title			
Item/ Component identification			
Work Activity:			
	PBS description		PBS number
Main PBS			
Quality class (QC)	QC 1: ☐ QC 2: ☐ QC 3: ☐ QC 4: ☐		
Safety self - assessment by RO	PIC/SIC-1	PIC/SIC-2	Non-SIC	PIA
	☐	☐	☐	☐
IO Manufacturer of the Pressure Equipment or Nuclear pressure Equipment	Yes ☐ No ☐	PE ☐ NPE ☐	Pressure Category: ☐ 0 ☐ I ☐ II ☐ III ☐ IV	Radioactive level: ☐ Level N2 ☐ Level N3

2. Description of Deviation

Introduction	
Description of the original requirements (Before)	
Description of the proposed alternative (After)	
Justification (for PIC and PIA, include safety justification)	

Deviation Request (DR)

3. Impact assessment (to be filled by initiator)

Other technical impact	☐	
Cost impact	☐	
Schedule impact	☐	
Impact on interface, other impacted PBS, PA, etc.	☐	
Impacted documents	☐ *List impacted document title and Uid + Rev. Num.*	
Other impacts	☐	
Follow-up of DR implementation (see note 4*)	Required ☐	Not required ☐

4. Safety and Environmental (Assessment by EPNS-DH – see note 2*)

Assessment result and comments	☐ Escalation required to a EPNS meeting required / ☐ Accepted (No escalation) ☐ Rejection unless revised

5. System / Design Integration (Assessment by IO-DIRO – see note 3*)

Assessment result and comments	☐ Escalation to a PCR required ☐ Accepted (No escalation to PCR required)

6. Decisions

	Name	Signature*	Date	Decision
Initiator				
CON RO				
DA RO				
IO-Approver				☐ Approve * ☐ Reject *

7. Confirmation of Implementation (if required – see section 3 – impact assessment)

	Name	Signature*	Date
CON-RO			
DA RO			
IO-Approver			

8. List of Attachment

Note *:

1- Signature of DR and confirmation of IO decision (reject/ accepted) are mandatory required. IDM system may be used for DR review and approval signatures (DR shall indicate the reviewers / approver names and date).
2- EPNS-DH (delegated SRO) assessment will be recorded in IDM system – with a clear resolution if DR is rejected/escalated.
3- DIRO assessment will be recorded in IDM system. If escalation to PCR is required then the section 5 of DR shall be mandatory filled.
4- The DR implementation confirmation "is required" typically for the cases when further critical actions are triggered by DR approval and/ or related documentation need to be revised to reflect the deviation implementation.

Warning: These guidelines in blue text to be removed prior to IDM upload

Note: This template should be filled out in its entirety. Incomplete information or inconsistencies with reference documents could lead to this report not being approved by IO and not releasing the components for transportation.

Upon upload to IDM; use doc-type [HS]-Delivery Report with the respective Controller as a mandatory reviewer and the IO-ILM Representative as the Approver. (See 2ZA626 for names).
Also the IDM UID of this document needs to be sent to logistics.data@iter.org per the DRR requirements.

Delivery Report for:

Please state Shipment Description here

Procurement Arrangement:

and/or

Contract/PO Number:

Please state PA, Contract, and/or PO # here

Table of Contents

1 Purpose

*This section outlines the **reason the Delivery Report is provided***

[Your text such as: The purpose of this Delivery Report is to provide IO-ILM (Integrated Materials & Logistics Management Group), the ALT (Advanced Logistics Team (logistics.data@iter.org)) and the Logistics contractors the information needed to adequately manage the planning, reception, and Materials Management of these ITER component(s).

Furthermore, this Delivery Report is a contract deliverable and is consistent with IO Management Requirements defined in ITER_D_X3NEGB - Working Instruction for the Delivery Readiness Review (DRR).

2 Scope

This Delivery Report applies to the delivery of (state shipment description/summary here) to the IO to the location and consignee stated in Section 5.

***IMPORTANT NOTES**:*

- ***The IO-TRO or delegate shall raise a Jira ticket to the IO cataloguing team to create PNIs per ITER_D_UYGU3S - WI for Creation of Part Number of ITER, PNI and Cataloguing.***
- ***There shall be a unique identifier/code/PNI for each item-type. These PNIs and other identifiers (Tag, heat, and/or serial numbers) shall be specified on the Packing List and Release Note, as well as those items' classifications.***
- *If needed, a Package & Packing List Template is available here:* ***XBZLNG***
- ***This packing list should be in the native file format (i.e. MS Excel), attached to the "Attachments" section of the IDM metadata of this Delivery Report, or if the PL has its own UID in IDM, please reference it in Section 4 of this Delivery Report.***
- ***The components shall be physically labelled in accordance with ITER_D_VYJ7U2 - Procedure for Labelling on Physical Items***

3 Important Dates

3.1 Packaging Date:

Please state the date(s) the shipment is expected to be packaged or was packaged at the supplier or manufacturer's facility.

3.2 Estimated Shipping Date:

Please state the date(s) the shipment is estimated to be shipped from the supplier, DA, or manufacturer to the IO.

3.3 Estimated Delivery Date:

Please state the date(s) the shipment is expected to deliver to the IO Site or designated storage IO storage facility. IO fully understands that this date is subject to change, but please provide the estimated IO delivery date to the best of your knowledge.

4 Applicable & Relevant Documents

***At a minimum, this section shall reference the Release Note**, corresponding **Equipment Storage & Preservation Requirements Form** (even if "In-Work"), and **Packing List** (if uploaded separately)*

Other possible references include: Lifting and Handling instructions, Packing Reports, Operations or Maintenance Manuals, BOMs, Drawings, Deviation Notices, Non-conformance reports, Material Safety Data Sheets, TI Number (if Daher is Transporter) etc.)

[1]	Release Note
[2]	Packing List
[3]	Equipment Storage & Preservation Requirements Form
[4]	

5 Consignee Details

This section states the full address of the place of delivery and the point-of-contact responsible to receive the package

[Your text such as:
ITER Organization, Building 89/ Warehouse Zone 2
Route de Vinon-sur-Verdon
CS 90 046
13067 St Paul Lez Durance Cedex -
Attention: Yanchun Qiao
+33 4 42 17 62 57

6 Shipper/Exporter Details

Please state the Sender's full address and name (point of contact) with contact information.

IMPORTANT NOTE:

If this delivery comes from a country outside of the EU (European Union), the rules and steps as defined in ITER_D_LF4QST - Procedure for the Import and Export of Goods shall be followed to ensure import customs clearance into France.

7 Additional Relevant Information

If not already referenced elsewhere or provided in Section 4, please provide as applicable:

- *Statement of Enclosed Documentation (to **physically accompany the component(s))** if any.*
- *Reference to TI/SPL/or TO Number (if DAHER International will be the Logistics Service Provider (LSP))*
- *Identification & Marking details (Part Number of ITER– PNI / Serial Number - SN)*
- *Specific Lifting & Handling Instructions*
- *Drawings showing Center of Gravity (COG), lifting points, etc.*
- *Dangerous or Hazardous goods Information (i.e. Material Safety Data Sheets (MSDS))*
- *Special transportation, storage and/or preservation plans during transit.*

8 Storage and Preservation Recommendations:

*This section states the sending entity's **recommendations** for storage and preservation (if periodic preservation activities are required). This should align with the Vendor operations or maintenance manuals.*

IMPORTANT NOTE:
The official Storage & Preservation Requirements shall be a separate document using ITER_D_WU9636 - Template - Equipment Storage & Preservation Requirements Form *and uploaded in IDM folder* Preservation Requirements

SUPPLIER STORAGE & PRESERVATION RECOMMENDATIONS
Recommended Storage Level: *(Should align with suppliers' documents (i.e. vendor manual))* ☐ A {Temperature & Humidity Control *(between 5°C and 28°C and 10% - 70% Relative Humidity at all times)*} ☐ B {Temperature Control (*between 5°C and 60°C at all times*)} ☐ C {Indoors or Equivalent, no temperature control} ☐ D {Outside storage}
Additional Storage or Preservation Information: Please provide any additional or specific storage or preservation recommendations for the items in this delivery.

9 Receipt Inspection Level (RIL) Preference

This is for the inspection to be done upon delivery to the IO. For full details of the process and RILs please reference ITER_D_RXCTBZ - Procedure for Reception of Components at the ITER Site

(Can be decided here by DA-TRO, IO-TRO, or IO-QARO only)

Receipt Inspection Level (RIL) Preference: ☐ Unknown (decide at IO) or:	☐ RIL-1 (Open package, 100% component inspection with IO-TRO, IO-QARO, and QCC) ☐ RIL-2 (Open package, component-level inspection by OLC with IO-TRO and/or IO-QARO and/or QCC) ☐ RIL-3 (Same as RIL-2, but no IO presence mandatory) ☐ RIL-4 (Package-level inspection only, Do Not Open packages) ☐ RIL-Data (i.e. for direct deliveries. No Inspection or Storage by OLC, SMat data only)

9.1 Receiving Inspections and Tests Required on IO site:

***Note**: **This applies only to RIL-1 or RIL-2 inspections**. Specific receiving inspections and tests on IO site are defined by IO-TRO (such as SAT- (Site Acceptance Testing) procedures).*

If no specific requirements for inspection or testing exist, this can be "N/A"

No.	Description of receiving inspections and tests required	Applicable procedures/ documentation for this inspection and/or testing
[1]		
[2]		

10 Declaration of Integrity

Supplier or DA Section:

Please provide a declaration of integrity of the packages and the components. This can be attached as an appendix, separate page, or to remain in this section, but it shall be signed and included in this Delivery Report.

This may be an electronic (IDM) signature to maintain Delivery Report legibility.

[Your text such as: The undersigned hereby certifies that the components and package(s) described in this Delivery Report and corresponding Packing List(s) meet the contractual requirements with the exception of any deviation notices and non-conformance reports specified and referenced within this Delivery Report.

Name and Title:

Signature:

Date:

JADA-55332TS0021-3
ITER_D_RBZBEQ

Bill of Material and Component Classifications of PoPola

ITER Project Japan Domestic Agency

	Name	Affiliation	Date
Author	IMAZAWA Ryota (TRO) 今澤 良太	Plasma Diagnostics Group	25-Apr-2022
Reviewers	TAKAMIZAWA Jun 高見澤 潤	Plasma Diagnostics Group	25-Apr-2022
Approver	HATAE Takaki (RPGL) 波多江 仰紀	Plasma Diagnostics Group	26-Apr-2022

Change log

Brunch no. (date) (IDM no.)	Change description
- (17 Aug 2015) (RBZBEQ v1.0)	First version
1 (1 Oct 2015) (RBZBEQ v1.1)	— Enovia trees in sections below were updated; Section 5.7, 5.8, 5.9, 5.10, 5.16, 5.17, 5.20, 6, 7.2, 7.5, 7.6 and 7.8 — Diagnostic room layout in Section 5.20, 6 and 7.8 were updated. — In Section 2, “Retroreflector” and “In-PP components” were merged into “in-VV components because they are the same classification. TC of ex-vessel components was amended (TC-1A -> TC-4B).
2 (21 Dec 2015) (RBZBEQ v1.2)	— Information of 2D diagram was added to Section 2 “PBS Structure” — Section 3 “ENOVIA Tree” was updated — Section 4 “Classification Table” was updated — New section, “PED and ESPN Classification”, was added. — Information about size/weight and ID in 2D diagrams were added to Section 6-8.
3 (21 Apr 2015) (RBZBEQ v2.0)	Texts and document structure are completely changed.

Table of Contents

Abbreviations:

— CB: Cassette Body (divertor)
— CBD: Cabling Diagram
— EMM: EPP Mirror Module
— EP: Equatorial port
— EPP: Equatorial Port Plug
— FD: Final Design
— FR: Functional Reference (number)
— FW: First Wall
— GBS: Geographical Breakdown Structure
— IS: Inter space
— ISMB: Inter space mirror box
— PC: Port cell
— PCMB: Port cell mirror box
— PD: Preliminary Design
— PFD: Process Flow Diagram
— PID: Piping and Instrumentation Diagram
— PNI: Part Number of ITER
— QC: Quality Class
— RH: Remote Handling
— RR: Retroreflector
— SC: Seismic Class
— SIC: Safety Important Class
— SLD: Single Line Diagram
— TC: Tritium Class
— UMM: UPP Mirror Module
— UP: Upper port
— UPP: Upper Port Plug
— VC: Vacuum Class

1 Introduction

The primary aim of the PoPola is to measure the change of polarization of injected far-infrared (FIR) laser light in order to identify the profile of plasma current, or equivalently safety factor. There are thirteen PoPola measurement channels to accomplish this measurement task. Each channel is comprised of a set of optical components that launch a laser beam from Equatorial Port Plug 10 (EPP10) or Upper Port Plug 10 (UPP10) across the plasma to a retroreflector. Figure 1 shows the overview of PoPola optical transmission line. Diagnostic room is at L2 of Building 74. The laser beam passes through the optical transmission line in a port cell and a gallery.

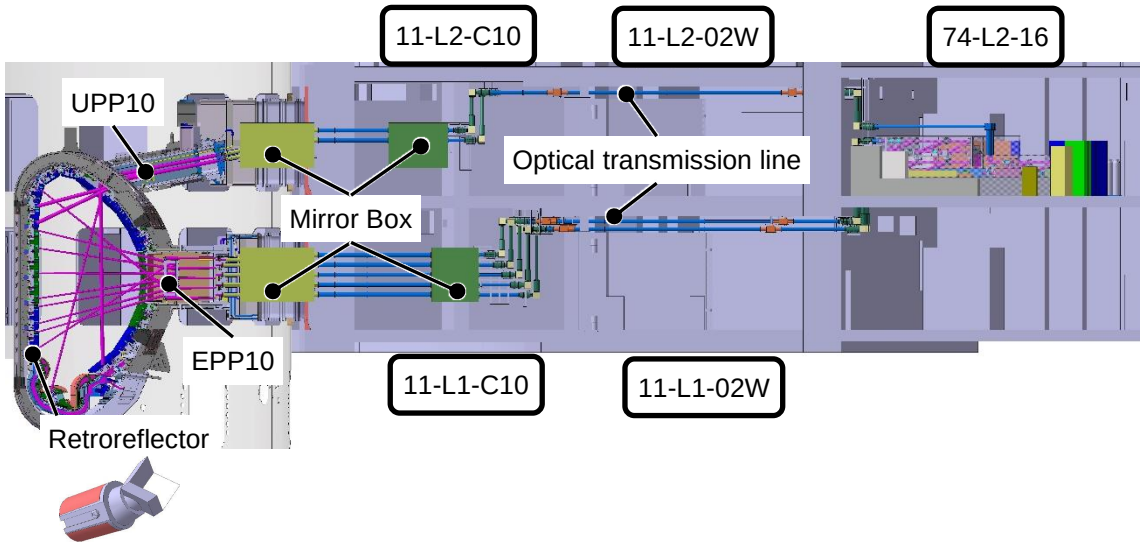


Figure 1 Overview of PoPola Optical Transmission Line

Figure 2 show the PoPola viewing chord layout (in other words, the layout of the laser paths) in the vacuum vessel. The ID of the viewing chord consists of alphabet and number. Alphabet “E” and “U” stands for EPP10 and UPP10, respectively, that the laser beam comes from. The number is just defined as sequential.

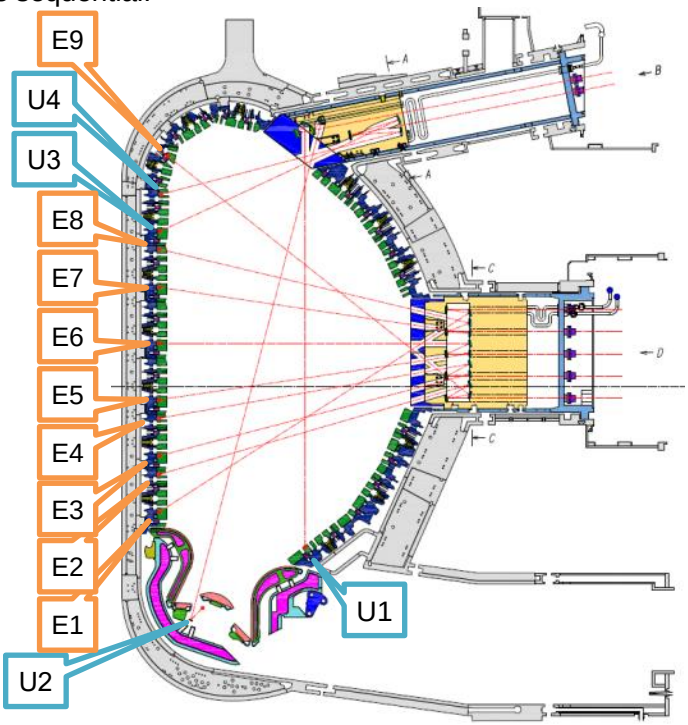


Figure 2 Overview of PoPola viewing chords

Figure 3 show an overview the PoPola in-vessel components. There are two kinds of retroreflectors; one in the blanket and the other on the divertor. In the diagnostic port plug, the

authors call a set of mirrors and supports as “mirror module”. The mirror modules in EPP10 and UPP10 are called EMM (EPP Mirror Module) and UMM (UPP Mirror Module), respectively. Moreover, both EMM and UMM consist two parts. As shown in Figure 3, EMM consists of the upper part called UEMM (Upper EMM) and the lower part called LEMM (Lower EMM). Similarly, UPP consists of the front part called FUMM (Front UMM) and the rear part called RUMM (Rear UMM).

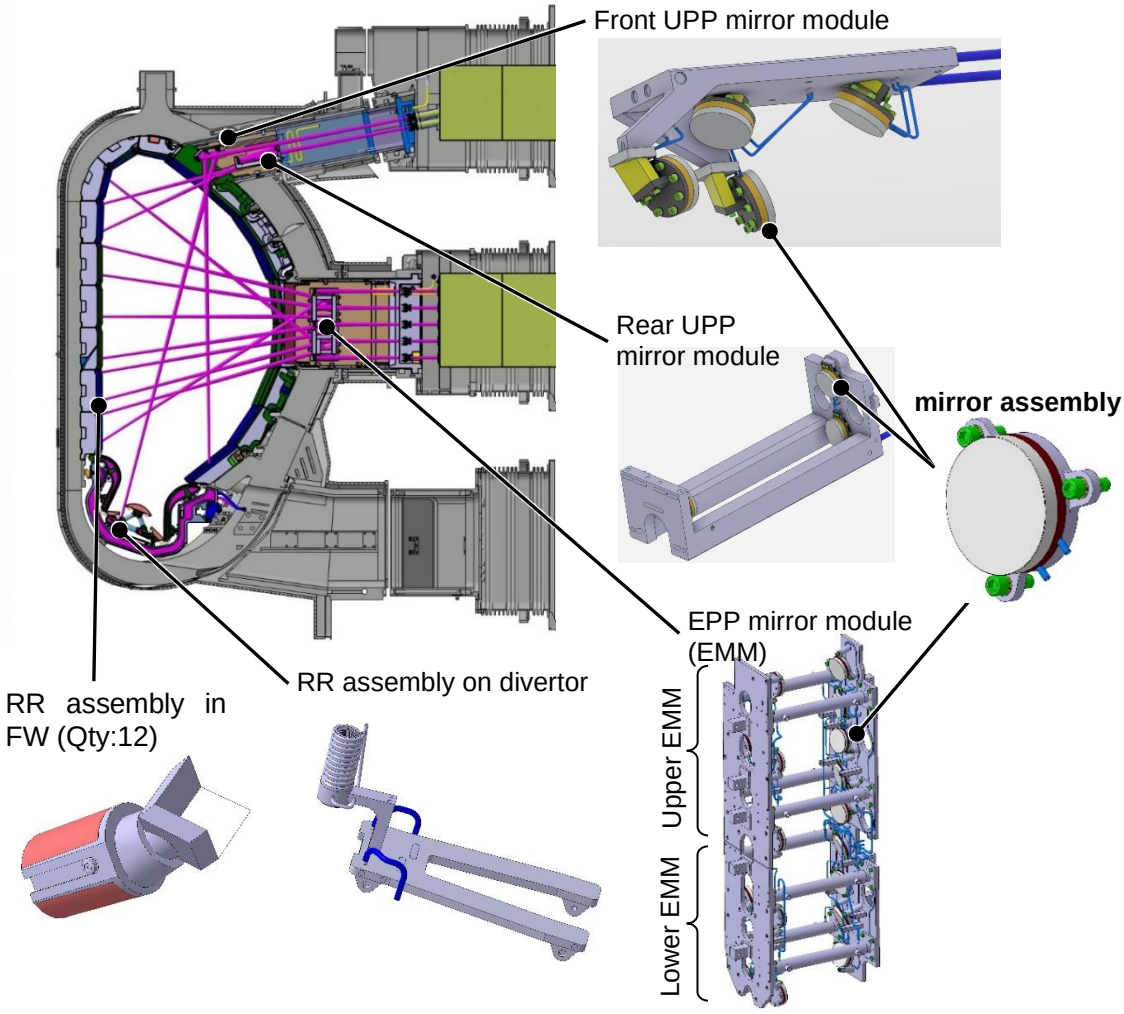


Figure 3 PoPola in-vessel components

Figure 4 shows an overview of the PoPola ex-vessel components in the port cell. At the closure pate of the diagnostic port plug, retroreflectors dedicated for laser beam alignment are attached to vacuum windows. In the port interspace, the optical components are placed in a large box called ISMB (interspace mirror box). Similarly, in the port cell, the optical components are placed in PCMB (port cell mirror box). Except for ISMB and PCMB, the ex-vessel transmission lines consist of pipes. In the gallery, the pipes are fixed to the ceiling. The support structures of the pipes at the ceiling are also in the scope of PoPola system.

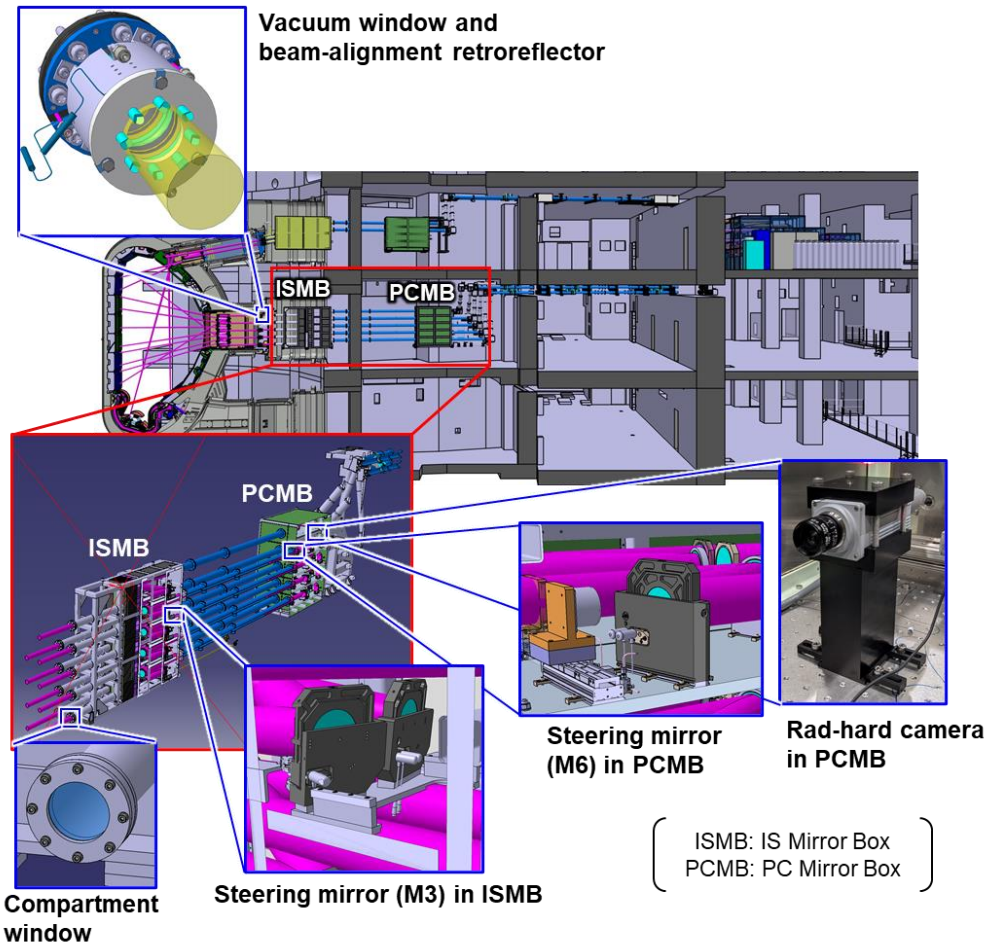


Figure 4 PoPola ex-vessel components interfacing directly with the port integrator of Equatorial Port 10.

2 Scope

This document identifies the PoPola components by using the ITER numbering system (i.e. FR and PNI) and clarifies the classification of each components such as quality class, safety class and vacuum class. Besides, the useful information such as a viewing chord ID, GB and the component drawing are also provided.

Design maturity of the PoPola components are not uniform because some components need to be manufactured earlier than others depending on their delivery dates. For instance, the final design of the retroreflector was completed, and the manufacturing study of the retroreflector just started in 2022. In contrast, the design of the components in the upper port 10 has been scarcely updated after the closure of the preliminary design review in 2016. Thus, this version is not the final version, and this document will be updated in accordance with the progress of the design maturity.

3 PBS Structure

55.C6 PoPola consists of eleven subsystems at PBS level 3. Brief explanation can be found in the table below. PBS of each PoPola component can be found “FR” column of tables in Section 5.

PBS	Title	Description
55.C6.00	PoPola Common	Common components in diagnostic building (e.g. clean booth, air-conditioner, safety switches)
55.C6.EA	PoPola Eq system A	Equatorial port system A
55.C6.EB	PoPola Eq system B	Equatorial port system B (Ex-vessel components of E2, E4, E8) (upgradability)
55.C6.UP	PoPola Up system	Upper port system
55.C6.FA	PoPola FIR laser EA	FIR laser system for 55.C6.EA (600 mW)
55.C6.FB	PoPola FIR laser EB	FIR laser system for 55.C6.EB (upgradability)
55.C6.FU	PoPola FIR laser UP	FIR laser system for 55.C6.UP (400 mW)
55.C6.DA	PoPola Detector EA	PoPola detector for 55.C6.EA
55.C6.DB	PoPola Detector EB	PoPola detector for 55.C6.EB (upgradability)
55.C6.DU	PoPola Detector UP	PoPola detector for 55.C6.UP
55.C6.IC	PoPola I&C	I&C, Cubicles

2D diagrams of each PBS are as follows.

PBS	Title	PFD	PID	SLC	Cabling
55.C6.00	PoPola Common	9XK2LM	PHY5ZR	RUXPR5	9ZJQW3
55.C6.EA	PoPola Eq system A	NA	S93GA7	NA	S99BXY
55.C6.EB	PoPola Eq system B	NA	S99KLH	NA	S97AUF
55.C6.UP	PoPola Up system	NA	S97YJX	NA	S9CEK6
55.C6.FA	PoPola FIR laser for EA	NA	S96ZUN	NA	S7VU9S
55.C6.FB	PoPola FIR laser for EB	NA	S99NY2	NA	S97VWL
55.C6.FU	PoPola FIR laser for UP	NA	S7UC3V	NA	S98DB2
55.C6.DA	PoPola Detector for EA	NA	S7FYRD	NA	S42CAC
55.C6.DB	PoPola Detector for EB	NA	S967FT	NA	S7SHEE
55.C6.DU	PoPola Detector for UP	NA	S97GCN	NA	S96U32
55.C6.IC	PoPola I&C	NA	NA	NA	S948PP

4 Evaluation of Quality Classification

Quality classification was evaluated by following “Quality Classification Determination” (24VQES v5.2). The evaluation results are the tables below. It should be noted that the components in the scope of IO-CT such as a vacuum window and a safety cubicle are excluded from this evaluation.

Components in the vacuum vessel

	Inputs for QC evaluation					Results of QC evaluation								
	SIC	SC	VQC	TC	ESPN	F1 QC	F2 QC	F3 QC	F4 QC	F5 QC	F6 QC	F7 QC	FQC	QC
Retroreflectors in blankets	non	SC2	VQC1	TC-1A	NA	1	3	1	3	3	2	1	1.93	**1**
Retroreflectors on divertor	non	SC2	VQC1	TC-1A	N3 Cat. 0	1	3	1	1	3	2	1	1.71	**1**
in-port-plug mirror module	non	NSC	VQC1	TC-1A	N3 Cat. 0	1	3	3	1	3	2	1	2.14	**2**

It should be noted that the ESPN categorization is explained in the following documents.

- “55.C6 - Components Classification BOM for CCR”, ITER_D_3DX9R9 v1.1
- “55.C6 PoPola – Summary report justifying ESPN classification of in-Equatorial-Port-Plug-10 component”, ITER_D_696J63 v1.1

Components on the closure plate of the diagnostic port plug

	Inputs for QC evaluation					Results of QC evaluation								
	SIC	SC	VQC	TC	ESPN	F1 QC	F2 QC	F3 QC	F4 QC	F5 QC	F6 QC	F7 QC	FQC	QC
Beam-alignment retro-reflectors	SR	SC2	NA	TC-4B	NA	3	3	3	3	2	3	3	2.89	**3**

Ex-vessel components in Building 11

	Inputs for QC evaluation					Results of QC evaluation								
	SIC	SC	VQC	TC	ESPN	F1 QC	F2 QC	F3 QC	F4 QC	F5 QC	F6 QC	F7 QC	FQC	QC
Laser injection optics in IS/PC	non	NSC	NA	TC-4B	NA	3	3	3	3	3	2	2	2.86	**3**
Optical transmission line (pipes for laser enclosure)	non	SC2	NA	TC-4B	NA	3	3	3	3	3	3	3	3.00	**3**
Secondary confinement equipment (including supports and fire protection box)	SIC-2	SC1 (SF)	NA	TC-4B	NA	1	3	2	1	1	2	2	1.79	**1**

Components in Building 74

	Inputs for QC evaluation					Results of QC evaluation								
	SIC	SC	VQC	TC	ESPN	F1 QC	F2 QC	F3 QC	F4 QC	F5 QC	F6 QC	F7 QC	FQC	QC
Components in Building. 74	non	NSC	NA	NA	NA	3	3	3	3	3	1	1	2.71	**3**

5 Component lists

The authors provide component lists by the area. As explained in Section 2, the design maturity depends on the PoPola components. When “Maturity” is “FD” (final design) in the tables below, you see that all information is provided. On the other hand, when “Maturity” is “PD” (Preliminary Design), components may lack some information indicated by “TBD”. The information will be provided by FDR associated with the component.

5.1 Retroreflectors

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Component drawing	Maturity
CST-S03-IN_VV	Retroreflector in blanket	—	—	—	non	SC2	QC1	VQC-1B	TC-1A	non	non	https://user.iter.org/?uid=3G8YFB_v2	FD
(ditto)	*for E1*	toroidal section #10, FW #1 Lower	55C6EA-RR-1000	I00RFYNB9	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	toroidal section #10, FW #01 Upper	55C6EB-RR-2000	I00RFYNCQ	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	toroidal section #10, FW #02 Lower	55C6EA-RR-3000	I00RFYND8	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	toroidal section #10, FW #02 Upper	55C6EB-RR-4000	I00RFYNEP	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	toroidal section #10, FW #03 Lower	55C6EA-RR-5000	I00RFYNF7	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	toroidal section #10, FW #04 Lower	55C6EA-RR-6000	I00RFYNGN	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	toroidal section #10, FW #05 Lower	55C6EA-RR-7000	I00RFYNH6	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	toroidal section #10, FW #05 Upper	55C6EB-RR-8000	I00RFYNJV	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	toroidal section #10, FW #07	55C6EA-RR-9000	I00RFYNKD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U1*	toroidal section #10, FW #18	55C6UP-RR-1000	I00RFYT9D	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	toroidal section #10, FW #06 Lower	55C6UP-RR-3000	I00RFYTBE	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	toroidal section #10, FW #06 Upper	55C6UP-RR-4000	I00RFYTCX	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
CST-S03-IN_VV	Retroreflector on divertor (U2)	toroidal section #10, CA #28	55C6UP-RR-2000	I00RFYTAW	non	SC2	QC1	VQC-1A	TC-1A	non	N3 Cat. 0	https://user.iter.org/?uid=3G8YFB_v2	FD

5.2 Components attached to EPP10

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Component drawing	Maturity
CST-S05-EQ_10	EPP Mirror Module (EMM)	EP10, DSM#2	—	—	non	NSC	QC2	VQC-1A	TC-1A	RHC3	N3 Cat. 0	https://user.iter.org/?uid=5R3R6W_v1	FD
(ditto)	*Upper EMM*	*(ditto)*	55C6EA-WMM-0100	I00SYPF6U	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*Lower EMM*	*(ditto)*	55C6EA-WMM-0101	I00RFYNLU	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-C10	Vacuum Window	EP10, closure plate	—	I00VY78TZ	SIC1/2	SC1(S)	QC1	VQC1-A/3-A	TC-1A	non	non	Classification: S3U8FQ v2.3	FD
(ditto)	*for E1*	*(ditto)*	55C6EA-WA-1100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	55C6EA-WB-2100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	55C6EA-WA-3100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	55C6EA-WB-4100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	55C6EA-WA-5100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	55C6EA-WA-6100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	55C6EA-WA-7100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	55C6EA-WB-8100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	55C6EA-WA-9100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-C10	Beam-alignment retroreflector	EP10, closure plate	—	I00RFYNMC	SR	SC2	QC3	non	TC-4B	non	non	https://user.iter.org/?uid=68ZK5H_v2	FD
(ditto)	*for E1*	*(ditto)*	55C6EA-RR-1100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	55C6EB-RR-2100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	55C6EA-RR-3100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	55C6EB-RR-4100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	55C6EA-RR-5100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	55C6EA-RR-6100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	55C6EA-RR-7100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	55C6EB-RR-8100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	55C6EA-RR-9100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*

5.3 Components attached to UPP10

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Component drawing	Maturity
CST-S05-UPR_10	UPP Mirror Module (UMM)	UP10	—	—	non	NSC	QC2	VQC-1A	TC-1A	RHC3	N3 Cat. 0	TBD	PD
(ditto)	*Front UMM*		55C6UP-WMM-0100	I00RFYTDF	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*Rear UMM*		55C6UP-WMM-0101	I00RFYTEY	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-C10	Vacuum Window	UP10, closure plate	—	I00VY78TZ	SIC1/2	SC1(S)	QC1	VQC1-A/3	TC-1A	non	non	Classification: S3U8FQ v2.3	PD
(ditto)	*for U1*	*(ditto)*	55C6UP-WA-1100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	55C6UP-WA-2100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	55C6UP-WA-3100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	55C6UP-WA-4100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-C10	Beam-alignment retroreflector	UP10, closure plate	—	I00RFYNMC	SR	SC2	QC3	non	TC-4B	non	non	https://user.iter.org/?uid=68ZK5H_v2	FD
(ditto)	*for U1*	*(ditto)*	55C6UP-RR-1100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	55C6UP-RR-2100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	55C6UP-RR-3100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	55C6UP-RR-4100	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*

5.4 Components in EP10 interspace

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Component drawing	Maturity
11-L1-C10	EP10 Interspace Mirror Box (ISMB)	EP10, ISS	55C6EA-WMA-0200	I00RTPQC4	non	NSC	QC3	non	TC-4B	non	non	https://user.iter.org/?uid=5KNZXS_v3	FD
11-L1-C10	Transmission line penetrating BS in EP10	EP10, BS	—	—	non	SC2	QC3	non	TC-4B	non	non	https://user.iter.org/?uid=6AJ9RT_v2	FD
(ditto)	*for E1*	*(ditto)*	55C6EA-PI-1200	I00S8H9JS	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	55C6EB-PI-2200	I00S8H9KA	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	55C6EA-PI-3200	I00S8H9LT	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	55C6EB-PI-4200	I00S8H9MB	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	55C6EA-PI-5200	I00S8H9NU	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	55C6EA-PI-6200	I00S8H9PC	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	55C6EA-PI-7200	I00S8H9QV	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	55C6EB-PI-8200	I00S8H9RD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	55C6EA-PI-9200	I00S8H9SW	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
					(ditto)	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-C10	**<Component of ISMB>**	EP10 ISMB	—	—	non	NSC	QC3	non	TC-4B	non	non	https://user.iter.org/?uid=5KNZXS_v3	FD
(ditto)	Compartment window	*(ditto)*	—	I005KK3ZQ	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E1*	*(ditto)*	55C6EA-WA-1200	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	55C6EB-WA-2200	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	55C6EA-WA-3200	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	55C6EB-WA-4200	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	55C6EA-WA-5200	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	55C6EA-WA-6200	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	55C6EA-WA-7200	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	55C6EB-WA-8200	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	55C6EA-WA-9200	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	Exhaust gas line	*(ditto)*	55C6EA-PI-0200	I004VSHZR	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	Exhaust valve #1	*(ditto)*	55C6EA-VR-0300	I004VSJ77	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	Exhaust valve #1	*(ditto)*	55C6EA-VG-0301	I004VSJBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*

5.5 Components in UP10 interspace

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Component drawing	Maturity
11-L2-C10	UP10 Interspace Mirror Box (ISMB)	UP10, ISS	55C6UP-WMA-0200	I00RTPQNF	non	NSC	QC3	non	TC-4B	non	non	TBD	PD
11-L2-C10	Transmission line penetrating BS in UP10	UP10, BS	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for U1*	*(ditto)*	55C6UP-PI-1200	I00S8H8GZ	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	55C6UP-PI-2200	I00S8H8HH	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	55C6UP-PI-3200	I00S8H8JJ	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	55C6UP-PI-4200	I00S8H8K2	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-C10	**<Component of ISMB>**	UP10 ISMB	—	—	non	NSC	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	Compartment window	*(ditto)*	—	—	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U1*	*(ditto)*	55C6UP-WA-1200	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	55C6UP-WA-2200	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	55C6UP-WA-3200	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	55C6UP-WA-4200	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	Exhaust gas line	*(ditto)*	55C6UP-PI-0200	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	Exhaust valve #1	*(ditto)*	55C6UP-VR-0300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	Exhaust valve #1	*(ditto)*	55C6UP-VG-0301	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*

5.6Components in EP10 port cell

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Component drawing	Maturity
11-L1-C10	Duct	EP10 PC, PCSS	—	—	non	SC2	QC3	non	TC-4B	non	non	https://user.iter.org/?uid=6CNJHQ_v2	FD
(ditto)	*for E1*	*(ditto)*	55C6EA-PI-1306	I00S8H8YR	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	55C6EB-PI-2306	I00S8H974	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	55C6EA-PI-3306	I00S8H96L	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	55C6EB-PI-4306	I00S8H953	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	55C6EA-PI-5306	I00S8H94K	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	55C6EA-PI-6306	I00S8H932	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	55C6EA-PI-7306	I00S8H92J	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	55C6EB-PI-8306	I00S8H8Z9	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	55C6EA-PI-9306	I00S8H98M	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-C10	Duct Support in EP10	EP10 PC, PCSS	55C6EA-ZJ-0301	I005KK3W7	non	SC2	QC3	non	TC-4B	non	non	https://user.iter.org/?uid=6NDEX4_v3	FD
11-L1-C10	EP10 Port Cell Mirror Box (PCMB)	EP10 PC, PCSS	55C6EA-WMA-0300	I00RTPQDL	non	NSC	QC3	non	TC-4B	non	non	https://user.iter.org/?uid=5UAAH9_v2	FD
11-L1-C10	EP10 transmission line support	EP10 PC, PCSS	55C6EA-ZJ-0300	I00RTPQFK	non	SC2	QC3	non	TC-4B	non	non	https://user.iter.org/?uid=6CZZLY_v1	FD
11-L1-C10	Transmission line	EP10 PC. On "EP10 transmission line support"	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for E1*	*(ditto)*	55C6EA-PI-1302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	55C6EB-PI-2302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	55C6EA-PI-3302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	55C6EB-PI-4302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	55C6EA-PI-5302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	55C6EA-PI-6302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	55C6EA-PI-7302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	55C6EB-PI-8302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	55C6EA-PI-9302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-C10	Flexible Light Guide	EP10 PC, outside PCSS	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for E1*	*(ditto)*	55C6EA-WMA-1300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	55C6EA-WMB-2300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	55C6EA-WMA-3300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	55C6EA-WMB-4300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	55C6EA-WMA-5300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	55C6EA-WMA-6300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	55C6EA-WMA-7300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	55C6EA-WMB-8300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	55C6EA-WMA-9300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-C10	Transmission line	EP10 PC. At ceiling	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for E1*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-C10	Ceiling support	EP10 PC. At ceiling	TBD	I00S34G7M	non	SC2	QC3	non	TC-4B	non	non	TBD	PD

5.7 Components in UP10 port cell

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Component drawing	Maturity
11-L2-C10	Duct	UP10, PCSS	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for U1*	*(ditto)*	55C6UP-PI-1306	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	55C6UP-PI-2306	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	55C6UP-PI-3306	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	55C6UP-PI-4306	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-C10	Duct Support in UP10	UP10, PCSS		TBD	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
11-L2-C10	UP10 Port Cell Mirror Box (PCMB)	UP10, PCSS	55C6UP-WMA-0300	I00RTPQPX	non	NSC	QC3	non	TC-4B	non	non	TBD	PD
11-L2-C10	UP10 transmission line support	UP10, PCSS		I00RTPQRW	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
11-L2-C10	Transmission line	UP10 PC. On "UP10 transmission line support"	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for U1*	*(ditto)*	55C6UP-PI-1302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	55C6UP-PI-2302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	55C6UP-PI-3302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	55C6UP-PI-4302	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-C10	Flexible light guide	UP10, outside PCSS	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for U1*	*(ditto)*	55C6UP-WMA-1300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	55C6UP-WMA-2300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	55C6UP-WMA-3300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	55C6UP-WMA-4300	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-C10	Transmission line	UP10 PC. At ceiling	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for U1*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-C10	Ceiling support	UP10 PC. At ceiling	TBD	TBD	non	SC2	QC3	non	TC-4B	non	non	TBD	PD

5.8 Components in L1 gallery

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Component drawing	Maturity
11-L1-02W	Fire protection box at PC side	L1 Gallery. Close to PC lintel	TBD	I00589G9S	SIC2	SC1(SF)	QC1	non	TC-4B	non	non	TBD	PD
11-L1-02W	2nd window at PC side	L1 Gallery. Close to PC lintel	—	—	SIC2	SC1(SF)	QC1	non	TC-4B	non	non	TBD	PD
(ditto)	*for E1*	*(ditto)*	55C6EA-WA-1400	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	55C6EB-WA-2400	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	55C6EA-WA-3400	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	55C6EB-WA-4400	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	55C6EA-WA-5400	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	55C6EA-WA-6400	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	55C6EA-WA-7400	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	55C6EB-WA-8400	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	55C6EA-WA-9400	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-02W	Fire protection box at Bld.74 side	L1 Gallery. Close to Bld. 74	TBD	I0059FBL2	SIC2	SC1(SF)	QC1	non	TC-4B	non	non	TBD	PD
11-L1-02W	2nd window at Bld.74 side	L1 Gallery. Close to Bld. 74	—	—	SIC2	SC1(SF)	QC1	non	TC-4B	non	non	TBD	PD
(ditto)	*for E1*	*(ditto)*	55C6EA-WA-1401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	55C6EB-WA-2401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	55C6EA-WA-3401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	55C6EB-WA-4401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	55C6EA-WA-5401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	55C6EA-WA-6401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	55C6EA-WA-7401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	55C6EB-WA-8401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	55C6EA-WA-9401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-02W	Transmission line	L1 Gallery. At ceiling	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for E1*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E2*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E3*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E4*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E5*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E6*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E7*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E8*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for E9*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L1-02W	***<Ceiling Support>***	L1 Gallery. At ceiling										https://user.iter.org/?uid=2KLNLC_v3	FD
(ditto)	C6_L1_CEILING_SUPPORT_01_ASSY	*(ditto)*	55C6EA-ZJ-0001	YMUUKW	SIC2	SC1(S)	QC1	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L1_CEILING_SUPPORT_02_ASSY	*(ditto)*	55C6EA-ZJ-0002	YMUULF	SIC2	SC1(S)	QC1	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L1_CEILING_SUPPORT_03_ASSY	*(ditto)*	55C6EA-ZJ-0003	YMUUMX	SR	SC2	QC2	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L1_CEILING_SUPPORT_04_ASSY	*(ditto)*	55C6EA-ZJ-0004	YMUUNG	SR	SC2	QC2	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L1_CEILING_SUPPORT_05_ASSY	*(ditto)*	55C6EA-ZJ-0005	YMUUPY	SIC2	SC1(S)	QC1	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L1_CEILING_SUPPORT_06_ASSY	*(ditto)*	55C6EA-ZJ-0006	YMUUVT	SIC2	SC1(S)	QC1	non	TC-4B	non	non	*(ditto)*	*(ditto)*

5.9 Components in L2 gallery

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Component drawing	Maturity
11-L2-02W	Fire protection box at PC side	L2 Gallery. Close to PC lintel	TBD	I005LM5BB	SIC2	SC1(SF)	QC1	non	TC-4B	non	non	TBD	PD
11-L2-02W	2nd window at PC side	L2 Gallery. Close to PC lintel	—	—	SIC2	SC1(SF)	QC1	non	TC-4B	non	non	TBD	PD
(ditto)	*for U1*	*(ditto)*	55C6UP-WA-1400		*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	55C6UP-WA-2400		*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	55C6UP-WA-3400		*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	55C6UP-WA-4400		*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-02W	Fire protection box at Bld.74 side	L2 Gallery. Close to Bld. 74	TBD	I005FWJW7	SIC2	SC1(SF)	QC1	non	TC-4B	non	non	TBD	PD
11-L2-02W	2nd window at Bld.74 side	L2 Gallery. Close to Bld. 74	—	—	SIC2	SC1(SF)	QC1	non	TC-4B	non	non	TBD	PD
(ditto)	*for U1*	*(ditto)*	55C6UP-WA-1401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	55C6UP-WA-2401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	55C6UP-WA-3401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	55C6UP-WA-4401	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-02W	Transmission line	L2 Gallery. At ceiling	—	—	non	SC2	QC3	non	TC-4B	non	non	TBD	PD
(ditto)	*for U1*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U2*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U3*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
(ditto)	*for U4*	*(ditto)*	TBD	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
11-L2-02W	***<Ceiling Support>***	L2 Gallery. At ceiling										https://user.iter.org/?uid=5FUDB3_v3	PD
(ditto)	C6_L2_CEILING_SUPPORT_01_ASSY	*(ditto)*	55C6UP-ZJ-0001	I005FULQL	SIC2	SC1(S)	QC1	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L2_CEILING_SUPPORT_02_ASSY	*(ditto)*	55C6UP-ZJ-0002	I002QT9LZ	SR	SC2	QC2	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L2_CEILING_SUPPORT_03_ASSY	*(ditto)*	55C6UP-ZJ-0003	I002QT9MH	SR	SC2	QC2	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L2_CEILING_SUPPORT_04_ASSY	*(ditto)*	55C6UP-ZJ-0004	I005FULYG	SR	SC2	QC2	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L2_CEILING_SUPPORT_05_ASSY	*(ditto)*	55C6UP-ZJ-0005	I005FUM8L	SIC2	SC1(S)	QC1	non	TC-4B	non	non	*(ditto)*	*(ditto)*
(ditto)	C6_L2_CEILING_SUPPORT_06_ASSY	*(ditto)*	55C6UP-ZJ-0006	I005FUMGG	SIC2	SC1(S)	QC1	non	TC-4B	non	non	*(ditto)*	*(ditto)*

5.10Components in Building 74

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Supplier, Model no.	Maturity
	<LASER AND OPTICS>												
—	FIR Laser system (55.C6.FA)	—	—	—	non	NSC	QC3	non	non	non	non	TOYAMA	PD
74-L2-17	*Main unit*	PoPola diagnostic room	55C6FA-LAA-0001	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	*Controller*	PoPola diagnostic room	55C6FA-POC-0001	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	*Power Supply*	PoPola diagnostic room	55C6FA-PSU-0001	I00VNAGPU	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
—	FIR Laser system (55.C6.FA)	—	—	—	non	NSC	QC3	non	non	non	non	TOYAMA	PD
74-L2-17	*Main unit*	PoPola diagnostic room	55C6FB-LAA-0001	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	*Controller*	PoPola diagnostic room	55C6FB-POC-0001	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	*Power Supply*	PoPola diagnostic room	55C6FB-PSU-0001	I00VNAGPU	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
—	FIR Laser system (55.C6.FA)	—	—	—	non	NSC	QC3	non	non	non	non	TOYAMA	PD
74-L2-17	*Main unit*	PoPola diagnostic room	55C6FU-LAA-0001	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	*Controller*	PoPola diagnostic room	55C6FU-POC-0001	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	*Power Supply*	PoPola diagnostic room	55C6FU-PSU-0001	I00VNAGPU	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	Chiller (55.C6.FA)	PoPola diagnostic room	55C6FA-HX-0002	I00SYNW4K	non	NSC	QC3	non	non	non	non	Thermoflex TF10000	PD
74-L2-18	Chiller (55.C6.FU)	PoPola diagnostic room	55C6FU-HX-0002	I00SYNWEQ	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	Chiller (55.C6.FB)	PoPola diagnostic room	55C6FB-HX-0002	I00SYNWAN	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	H.V supply of FA	PoPola diagnostic room	55C6FA-PSU-0002	I00SYNW2J	non	NSC	QC3	non	non	non	non	IDX, IPN-20K200-M (customized)	PD
74-L2-18	H.V supply of FB	PoPola diagnostic room	55C6FB-PSU-0002	I00RUVFYB	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	H.V supply of FU	PoPola diagnostic room	55C6FU-PSU-0002	I00SYNWCP	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	Vacuum Pump #1 of FA	PoPola diagnostic room	55C6FA-PV-0004	I00SYNYHR	non	NSC	QC3	non	non	non	non	Edwards, nXR90i	PD
74-L2-18	Vacuum Pump #2 of FA	PoPola diagnostic room	55C6FA-PV-0005	I00S65PER	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	Vacuum Pump #1 of FB	PoPola diagnostic room	55C6FB-PV-0004	I00SYNYHR	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	Vacuum Pump #2 of FB	PoPola diagnostic room	55C6FB-PV-0005	I00S65PER	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	Vacuum Pump #1 of FU	PoPola diagnostic room	55C6FU-PV-0004	I00SYNYHR	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	Vacuum Pump #2 of FU	PoPola diagnostic room	55C6FU-PV-0005	I00S65PER	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-18	Alcohol supply unit	PoPola diagnostic room	55C600DIA-0001	TBD	non	NSC	QC3	non	non	non	non	HORIBA STEC, LSC-7900-0004 (customized)	PD

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Supplier, Model no.	Maturity
	<DETECTION SYSTEM>												
74-L2-16	Detection system (55.C6.DA)	PoPola diagnostic room	55C6DA-DIA-0001	TBD	non	NSC	QC3	non	non	non	non	TBD	PD
74-L2-16	Detection system (55.C6.DB)	PoPola diagnostic room	55C6DB-DIA-0001	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	TBD	*(ditto)*
74-L2-16	Detection system (55.C6.DU)	PoPola diagnostic room	55C6DU-DIU-0001	TBD	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	TBD	*(ditto)*
74-L2-16	Cryo-cooler #1 (55.C6.DA)	PoPola diagnostic room	55C6DA-PC-0001	I00VN9UNL	non	NSC	QC3	non	non	non	non	CRYOMECH, PT405RM-CPA2850	PD
74-L2-16	Cryo-cooler #2 (55.C6.DA)	PoPola diagnostic room	55C6DA-PC-0002	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	CRYOMECH, PT405RM-CPA2850	*(ditto)*
74-L2-16	Cryo-cooler (55.C6.DB)	PoPola diagnostic room	55C6DB-PC-0002	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	CRYOMECH, PT405RM-CPA2850	*(ditto)*
74-L2-16	Cryo-cooler (55.C6.DU)	PoPola diagnostic room	55C6DU-PC-0002	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	CRYOMECH, PT405RM-CPA2850	*(ditto)*

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Supplier, Model no.	Maturity
	<CUBICLES>												
74-L2-16	PSH cubicle	PoPola diagnostic room	55C6IC-CU-7201	I00VN9USN	non	NSC	QC3	non	non	non	non	—	PD
74-L2-16	EA control cubicle	PoPola diagnostic room	55C6IC-CU-8002	I00RUVCJR	non	NSC	QC3	non	non	non	non	—	PD
74-L2-16	UP control cubicle	PoPola diagnostic room	55C6IC-CU-8003	I00RUVFHK	non	NSC	QC3	non	non	non	non	—	PD
74-L2-16	EB control cubicle	PoPola diagnostic room	55C6IC-CU-8004	I00VNAGXY	non	NSC	QC3	non	non	non	non	—	PD
74-L2-16	EA alignment cubicle	PoPola diagnostic room	55C6IC-CU-8011	I004VSQ87	non	NSC	QC3	non	non	non	non	—	PD
74-L2-16	DA cubicle	PoPola diagnostic room	55C6IC-CU-8012	I004VSQAE	non	NSC	QC3	non	non	non	non	—	PD
74-L2-16	UP&EB alignment cubicle	PoPola diagnostic room	55C6IC-CU-8014	I00RUVCLQ	non	NSC	QC3	non	non	non	non	—	PD
74-L2-16	DU&DB cubicle	PoPola diagnostic room	55C6IC-CU-8015	I00RUVCET	non	NSC	QC3	non	non	non	non	—	PD

GBS	Component name	Location	FR No.	PNI	SIC	SC	QC	VC	TC	RHC	ESP/ESPN	Supplier, Model no.	Maturity
	<UTILITIES>												
74-L2-16	Water feedthrough #1	PoPola diagnostic room	55C600-DF-0002	TBD	non	NSC	QC3	non	non	non	non	—	PD
74-L2-16	Water feedthrough #2	PoPola diagnostic room	55C600-DF-0009	TBD	non	NSC	QC3	non	non	non	non	—	PD
74-L2-16	Air Conditioner (55.C6.FA)	PoPola diagnostic room	55C6FA-CL-0002	I00RUVF7N	non	NSC	QC3	non	non	non	non	SMC, IDHA-23B-E	PD
74-L2-16	Air Conditioner (55.C6.FU)	PoPola diagnostic room	55C6FU-CL-0003	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*	*(ditto)*
74-L2-16	Compressed Air Manifold	PoPola diagnostic room	55C600-DF-0001	I005KDERU	non	NSC	QC3	non	non	non	non	—	PD