

MQP Level 3

Diagrams and Drawings Management System Working Instruction

The purpose of this document within CAD process is to formalize the way the Diagrams & Drawings, D&Ds management shall be executed.

Approval Process			
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v1.1	Signed	18 Nov 2013	Procedure revised to incorporate comments received on: Export Control. Clarification of roles and responsibilities. Clarification of process.
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v2.0	Signed	23 Mar 2021	As per approved MQP doc request https://user.iter.org/default.aspx?uid=429HX2 : The document change: - Applies MQP Template - Turns the document into management requirements - Streamlines the flowchart - Delegates responsibilities on DAs and Suppliers - Addresses the links with other processes - Addresses the requirements for Technical Document Management/workflow (to be further aligned if needed with the coming MQP documentation)
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1 Purpose

The purpose of this document within CAD process is to formalize the way the Diagrams & Drawings, D&Ds management shall be executed.

This MQP Level 3 document meets the requirements from the MQP Level 2 documents CAD Management Plan [1] and Procedure for CAD verification and publication [2].

It complies with the Document Management procedure [3] rules, taking into account, when required, the specificities of the D&D singular CAD data management.

The present document instructs the responsibilities of the CAD users (and CAD Data publication stakeholders), as D&D management system users, to ensure and maintain CAD Data quality in the D&Ds management system and enabling its Configuration Management within the PLM.

It also provides some relevant functions of the ITER D&Ds management system: the System for Management of Diagrams and Drawings, SMDD.

2 Scope

This document shall be used by all the ITER design contributors who are producing Diagrams and Drawings, D&Ds CAD Data within IO Organization (IO staff, PT members, IPAs, interims, contractors supporting IO activities), DAs and contractors when promoting the D&D at the work stage to publish their diagram or drawing in the ITER D&Ds management system. 3D modelling publication is excluded from the scope of this document.

Authorization of use and applicability are outside the scope of this procedure: the usage of documents approved through this procedure is regulated by [4] [5] and [6] below.

3 Definitions and acronyms

Term	Acronym	Definition
Bill Of Material	BOM	
Computer Aided Design	CAD	
CAD Data		Computer Aided Design data produced by CAD Applications: Diagram, 3D Model, 2D Drawing. Refer to [1].
Configuration Management	CM	
Component List		List of functional references with relevant technical properties
Component Management DB	CMDB	
Diagrams and Drawings	D&D	Understood in the frame of this document as the set of documents corresponding to all doc types related to Schematics and Drawings, originated from any CAD Authoring tools or even on the drawing board. The commonality of all docs in D&D lies on the usage of a title-block, specific properties and attributes, and they undergo a data and process management slightly differing the standard Document Management process. Note: By extension and as used for years in the SMDD implementation in ICP, we use the expression “SMDD Drawing record”, reduced to “SMDD drawing record” to refer to the unitary object managed in SMDD, regardless of the fact it is a Diagram or Drawing.
D&D management system		Generic term for the application which provides the overall functions answering the requirements for publication, review, acceptance and

		approval of any ITER diagram or drawing.
Domestic Agency	DA	
Database	DB	
DEsign COordinator	DECO	
Design Office	DO	
Drawing Record		Record in the D&D Management System corresponding to one drawing identified by a Drawing Number. Drawing record has as many revision as required to manage changes.
External Partner	EP	
Generic Document Title	GDT	Technical Documents classification. Technical Document Families includes a list of Generic Document Titles Example: TDF “Process Diagrams” is composed of the GDTs “Process Flow Diagrams” and “Piping & Instrumentation Diagrams) In some cases, the GDT equals the TDF, and then the TDF includes only one GDT which uses the same name.
ITER Collaborative Platform	ICP	
ITER Data Loading	IDL	
ITER Document Management (system)	IDM	
Iter IDentifier	IID	The ITER Identifier is the 6 digits alphanumeric code assigned to an object through an automatic ID generator, and used to identify the objects and documents in the ITER CAD authoring tools and ICP
Item Management DB	IMDB	
ITER Organization	IO	
Lifecycle 1	LC1	Refer to [7]. Documents produced by IO or a PT in IO Document, Data or CAD Management System, following IO MQP processes.
Lifecycle 2	LC2	Refer to [7]. Documents produced by an external entity following its own MQP process, in its own Document, Data or CAD Management System and delivered to IO.
Lifecycle 3	LC3	Refer to [7]. Documents produced by an external entity using IO Document, Data or CAD Management System Tools.
List of Deliverables	LoD	
Original data		The original data means here the original CAD File of the drawing in the native format.
Portable Document Format	PDF	Publishing Adobe Suite format, using ISO 2000-1 standard.
Product Lifecycle Management	PLM	
Piping and	P&ID	

Instrumentation Diagram		
Process Flow Diagram	PFD	
Part Number of ITER	PNI	
RACI Table	RACI	Workflow responsibilities distribution representation as a table, using following caption: R: Responsible A: Accountable C: Consulted I: Informed
System for the Management of Diagrams and Drawings	SMDD	D&D management system application. This is the web interface developed by IO DO and IT aiming to publish diagrams and drawings, implementing validation workflow and providing as outputs the inputs for PLM application, following Document Management and Configuration Management needs and requirements.
System Design Process	SDP	
System Sequence Diagram	SSD	Plant design diagram authoring tool.
Technical Document Family	TDF	
Technical Document Family Card	TDFC	Identity card of the TDF and included GDTs.
Technical Document Management	TDM	

4 Reference Documents

[1]	Procedure for the CAD Management Plan (2DWU2M v2.2)
[2]	Procedure for Verification and Publication of CAD Data (U348ND v1.4)
[3]	Document Management Procedure (22K5JQ v7.0)
[4]	Procedure for Configuration Identification (TZV743 v2.1)
[5]	Procedure for Configuration Control, Review and Audit (TZY7YV v1.2)
[6]	Procedure for Configuration Management Planning (TZY8BS v1.4)
[7]	Technical Document Management procedure (Reference procedure under preparation)
[8]	Sign-Off Authority (SOA) for Project Documents (2EXFXU v5.2)
[9]	Expected content of System Design deliverables (43S7GL v1.2)
[10]	CAD Execution procedure (U348G8 v1.1)
[11]	How to use the SMDD Application (System for the Management of Diagrams and Drawings) (JKT5KN v4.4)
[12]	Work Instruction for Generation of ITER Bill of Materials (BOM) (VXMR6K v1.4)
[13]	BOM Mechanical Discipline (YH3HJR v1.5)
[14]	BOM Template-piping discipline (WKRHM5 v1.2)
[15]	TDFC Process Diagram T5.5_S3 (WM7YBE v3.1)

[16]	TDFC Electrical Diagram T5.5 S3 (WNNCEM v3.2)
[17]	TDFC Part Drawing T5.5 S3 (WAD9FG v3.3)
[18]	TDFC Arrangement or Layout Drawing T5.5 S3 (WA9HY6 v3.2)
[19]	TDFC Area Classification Drawing T5.5 S3 (YVQ4DQ v1.1)
[20]	TDFC Assembly or Installation Drawing T5.5 S3 (WA9VN6 v3.4)
[21]	TDFC Building Drawing T5.7 S3 (W9ZKZY v3.2)
[22]	TDFC Bill of Material-BOM T5.5 S3 (W9ZCNP v3.5)
[23]	TDFC Equipment or Component List T5.5 S3 (WBXM7R v3.2)
[24]	Design Development Procedure (U34DDZ v1.1)

5 General principles

D&Ds are the printable part (2D information) of the CAD data generated through, and controlled by CAD process, as resulting from the Design Control process.

D&Ds also belong to the technical documents governed by the Technical Documents Management procedure [7], and so they shall comply, as far as possible and unless prevented by specificities related to their CAD nature, to the rules and methods set in [7].

Among other common characteristics of the 2 categories ‘CAD’ and ‘Technical Document’, the following might be importantly mentioned here after:

- All D&Ds can be generated by any ITER design’s contributor (IO, DA or external ITER design contributor) and then registered, traced, verified, within the IO’s D&D management system until their Acceptance or Approval or Rejection in this system. The D&Ds are then the inputs for the remaining steps of document control steps given within the Technical Documents Management procedure [7], implemented through the PLM functionalities and system.
- All D&Ds in the scope of this procedure are subject to the assignment of a unique ITER Identifier (UID) and to a versioning mechanism for a single UID, allowing their traceability at the level of their version. Please note the specificities given to this requirement when applied to CAD data (section 5.1)
- All D&Ds verification and publication shall apply and comply with:
 - o Sign-Off Authority (SOA) for Project Documents [8], particularly at DA/IO reviewers/approvers nomination stage, and Document Management Procedure [3],
 - o Expected content of System Design deliverables [9],
 - o Principles for verification set by the Technical Documents Management procedure [7].
- As other Technical Documents, D&Ds submitted by external contributors using their own title-block are assumed as validated through the drawing submitter’s quality program, and shall display unambiguously this information in their title-block.
- As any ITER document, D&Ds are subject to generic ITER Documents access rules for the D&Ds. Like for any other ITER document, some D&Ds can be subject to export control, Intellectual property or any other protection matter. The D&Ds management system secures the access, view and download to identified individuals for these D&Ds.

5.1 Principles applied specifically to Diagrams and Drawings

On the top of the general principles applied commonly to all Technical Documents and D&Ds, the CAD nature of the D&D makes that they undergo the specific requirements set here after:

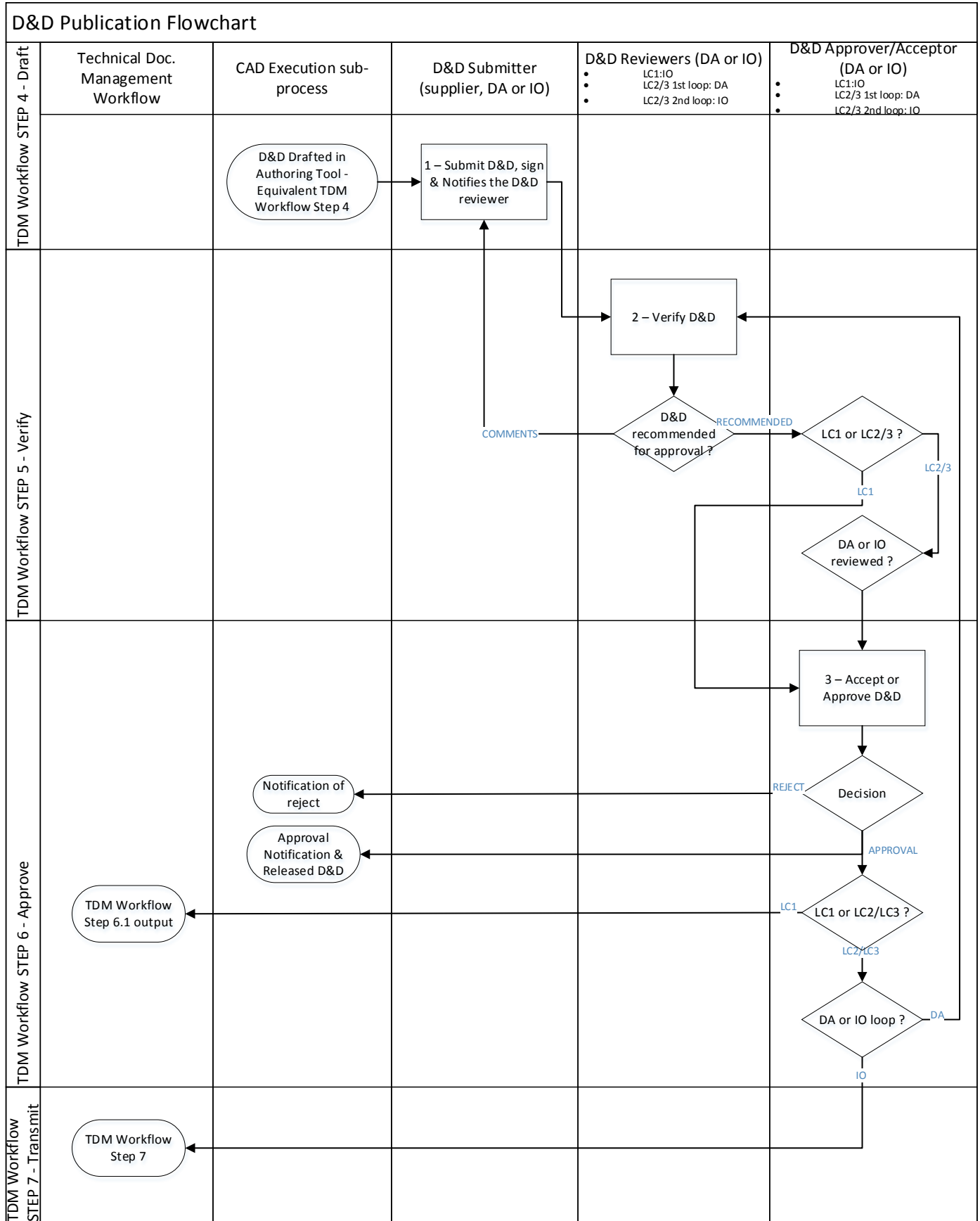
- D&D registration within IO D&D Management system shall be enabled regardless of its original CAD format
 - o Thanks to the usage of a PDF snapshot of the D&D. The minimum representation required from the author is its PDF version.

- This minimum PDF representation should be complemented by the original data recorded as associated to the SMDD drawing record. The rationale is to get better than a simple PDF file in case revision or integration in IO CAD Tool is needed.
- Their verification and publication shall comply with Procedure for the CAD Management Plan [1] and Procedure for Verification and Publication of CAD Data [2] for CAD process. This includes:
 - Application at the authoring stage of the CAD Manual, as stipulated by the CAD Execution procedure [10]
 - Precedence rules that apply between the diagrams, 3D models (loaded in the DMU), and the 2D drawings: Approval of 2D drawing is subsequent to the approval of the linked 3D model, itself subsequent to the approval of the linked diagram. (Functional design first, then Physical design as readable in the SDP)
 - Note that at the time of drafting this procedure and its implementation through the usage of SMDD in ICP, the lifecycle applied to the D&Ds may slightly defer from the lifecycles set in the Technical Documents Management Procedure, while the general approach is respected. A complete alignment will be sought for during the integration of IDM and SMDD within the PLM platform. For details of the current lifecycle and status currently applied, please refer to the section 6.
- Important information from the D&D shall be collated, exposed in the IO D&Ds management system and made available for retrieval of the D&D, filtering, sorting, etc...:
 - The original D&D Title-block information as it exists prior its submission in SMDD: drawing number, drawing revision, drawing Status, Drawing producer (Organization, Designer), etc...
 - Additional SMDD drawing properties are filled at SMDD submission step: Contractual context (PA, TA, Contract), Alternative D&D references in external Data management systems used to control the D&D at prior their submission in IO's system, Exchange number, etc...
 - Attributes inherited by the D&D when it is used in subsequent PLM processes (e.g. applicability or other document management attributes not conflicting with D&D attributes)
- An "Identification and Status Banner" shall be appended to the Drawing Record. Automatically generated when using the SMDD tool, the banner shall respect following rules:
 - The drawing record shall graphically display on all drawing Sheets the crucial information about SMDD record (e.g. ID, Version, Status), enriched with PLM attributes when assigned to the drawing Record,
 - 2 banners are required to reflect the respective verification process of DA and/or IO,
 - Those banners are required not to affect the internal area of the ISO drawing frames, so they are located in the D&D margins,
 - Banners are updated by the system on any change of the drawing record.
- D&D is the graphical representation of a set of components (diagram) or parts (drawing) that, depending on the D&D type, should or shall be published in SMDD together with a component List or BOM at the record stage. The ITER System for Management of Diagrams and Drawings provides the information of the mandatory Component List or BOM in function of the D&D type. This information is also available in the How to use the SMDD Application (System for the Management of Diagrams and Drawings) [11]. Consequently:
 - The D&D Submitter loads the associated Component List to any Diagram object in the D&Ds management system. This enables the identification of the Diagram content.
 - The D&D Submitter loads the associated BOM to any Drawing object in the D&Ds management system. This enables the identification of the drawing content to functional Diagrams components.
 - The D&D Submitter should use the same source data set to generate the Drawing object and the associated loaded Component List/BOM.
 - The use of ITER CAD platforms helps to generate directly from the CAD data source the corresponding BOM in the ITER CAD template with correct settings.

- When using an external CAD system, the D&D Submitter should use the ITER BOM template and load it associated to the loaded Drawing, in compliance with the Work Instruction for Generation of ITER Bill of Materials (BOM) [12].
 - Some helping template document are:
 - BOM Mechanical Discipline [13]
 - BOM Template-piping discipline [14]
 - The D&Ds management system SMDD builds links between one diagram record and components objects in the CMDB once a Functional Reference is identified in any Component List which is loaded at diagram record stage. Components objects are automatically created in CMDB including its Functional Reference if not identified yet in the CMDB.
 - The D&Ds management system builds links between one drawing record and components objects or part object in the IMDB once a PNI is identified in any BOM which is loaded at drawing record stage.
 - This requirement excludes the case of a single part drawing.
 - All D&Ds are, as CAD data, subject to identification and subject to versioning, following the maturity statuses defined in the CAD Management Plan [1].
- For D&Ds produced in ITER CAD platforms (under IO control),
- The reference D&Ds management system, SMDD, conserves CAD Data identification items (drawing number, ENOVIA ID, ...) previously generated in the CAD authoring tool. This, thanks to developed interface between CAD System and D&D Management System.
 - The D&Ds management system linkage to CAD authoring tools synchronizes the D&D versioning with CAD authoring tools as follows:
 - SMDD synchronizes drawings versioning with CATIA
 - IDM Technical Baseline hosts diagrams versioning made with SSD. Versions update is automated.
 - Drawings, due to their particular “frozen-like” publication type, are often updated for dedicated design milestones like Design Reviews on the basis of design evolutions batches on 3D models. The amount of drawings to be updated for a dedicated batch invokes bulk functions of the D&D management system to properly update a set of drawings using dedicated loading parameters. The SMDD tool provides bulk functions for which the use is detailed in the How to use the SMDD Application (System for the Management of Diagrams and Drawings) [11].

6 Workflow

6.1 D&D Publication Management Flowchart



6.2 Description of steps

The present workflow runs D&D management as CAD data and as Technical Document, complying with requirements and workflow described in Technical Document Management procedure [7], which categorizes Technical Documents lifecycles in LC1, LC2 and LC3 as follows and reminded in the section 3 of the present document. The present workflow implements these lifecycles and their associated review and approval loops in an integrated flow, in contrary to TDM workflow.

Example:

The workflow will use twice the Step 2 – Verify D&D if it is applied to a drawing produced by a DA, because this step shall be performed at DA level and then also at IO level.

Running in parallel with the TDM workflow, the following steps descriptions identifies the corresponding TDM associated steps, merging TDM Steps 4.1/4.2/4.3 as Step 4, merging TDM Steps 5.1/5.2/5.3 as Step 5, merging TDM Steps 6.1/6.2/6.3 as Step 6, merging TDM Steps 8 and 8.1 as Step 8.

Step 1 of this workflow follows the step 3 of the Technical Document Management workflow [7]. It starts when the diagram or drawing is drafted and ready for submission in the D&D management system (SMDD).

The following tasks (steps)

6.2.1 Step 1. Submit D&D, sign & Notify the D&D reviewer

This step runs in parallel to the step 4 of the TDM workflow [7], focusing on D&D management. At this step, the D&D shall be frozen in the CAD authoring tool.

As required in step 4 of the TDM workflow [7], this step aims to submit the diagram or drawing in the D&D management system in pdf format, following the instructions given in the [11] and complying the requirements defined in [7]. Component List or BOM is to be loaded with the D&D.

Signature of the D&D and notification of submission activates the next step of the present workflow,

6.2.2 Step 2. Verify D&D

This step starts following the previous Step 1 above.

This step runs in parallel to the step 5 of the TDM workflow [7], focusing on D&D management.

This step aims to operate the review of the diagram or drawing in the D&D management system following the instructions given in the [11] and complying the requirements defined in [7].

Reviewed/recommended D&D and notification of verification activates the next step of the present workflow.

6.2.3 Step 3. Accept/Approve D&D

This step starts following the previous Step 2 above.

LC1:

This step runs in parallel to the step 6 of the TDM workflow [7], focusing on D&D management.

This step aims to operate the approval of the diagram or drawing in the D&D management system following the instructions given in the [11] and complying the requirements defined in [7].

Approved or rejected D&D and notification of approval/rejection is output of the present workflow and input for Step 7 of the TDM workflow.

LC2/3:

This step deviates from the TDM workflow [7] and does not run in parallel to its equivalent Step 8.

It deviates in its tool implementation, although the spirit of approval and acceptance is respected. In the current implementation through the D&D management system (SMDD, in ICP, previously to its integration within the PLM frame), the approval is represented by only one operation named ‘Approve’, combining both the acceptance sub-step and the approval sub-step.” To be noted that with the migration of SMDD within the PLM, this aspect will tentatively be fully aligned with TDM procedure.

In accordance with the applicable work agreements, like the PAs and Annex B, between IO, DA, and suppliers, the D&D can be accepted or approved by the DA and the IO. The approach of the D&D technical content responsibility is illustrated in the following cases, taking into account the different steps of the present workflow:

- The D&D is submitted by a supplier, DA reviews and accepts, IO reviews and approves.
- The D&D is submitted by a supplier, DA reviews and accepts, IO reviews and accepts.
- The D&D is submitted by a supplier, DA reviews and approves, IO reviews and accepts.
- The D&D is submitted by a supplier, DA reviews and approves, IO reviews and approves.

Notes:

- *A supplier submitting a D&D should ensure the presence of the supplier internal approval in the D&D title-block. This instruction becomes a strict requirement (shall) when the D&D is only for acceptance at DA and IO levels.*
- *In the SMDD tool, until an “ACCEPT” button is available, the acceptance made by DA shall be operated by a review commented with a comment declaring the acceptance of the D&D.*

This step aims to operate either the acceptance or the approval of the diagram or drawing in the D&D management system following the instructions given in the [11] and complying the requirements defined in [7].

Accepted, approved or rejected D&D and notification of acceptance/rejection ends the present workflow.

7 Responsibilities

7.1 RACI Table

RACI Table	D&D Submitter	D&D Reviewer	D&D Approver/Acceptor	D&D TRO
Step 1 - Submit D&D	R	I	I	A
Step 2 - Verify D&D	I	R	I	A
Step 3 – Accept or Approve D&D	I	C	R	A

7.2 D&D Submitter

The D&D submitter is responsible for the registration of the diagrams/drawings in the D&Ds management system.

- For a PA case, the D&D Submitter should be a DA supplier member, with the purpose that the submitter is as close and as knowledgeable about the produced drawing. However, per DA discretion and with respect of the DA/supplier contractual agreements, this role can be held by a DA member.
- For an IO supplier case, the D&D Submitter should be the IO supplier member, and this role can be held by an IO member, such as the IO TRO. The D&D Submitter is responsible to set-up in D&Ds management system the persons to review and the person to release the diagrams/drawings, in the strict respect of the Sign-Off Authority (SOA) for Project Documents [8].

7.3 D&D Reviewer

If reviewer(s) is from DA, he/she is responsible for the review of the Supplier's diagrams/drawings. Reviewers' nomination at the DA place should reflect the DA internal Sign-off authority.

If reviewer(s) is from IO, he/she is responsible for the review of the diagrams/drawings received from IO, the DA or from the IO/DA Supplier. When the entity producing the drawing organizes the review of the D&D in SMDD, the reviewers list should contain at least the reviewers identified in the title-block. IO Reviewers' list is defined by the Sign-Off Authority (SOA) for Project Documents [8].

7.4 D&D Approver / D&D Acceptor

For LC1 lifecycle, approver is from IO, he/she is responsible for the approval of the diagrams/drawings received from IO.

IO Approver/Acceptor is defined by the Sign-Off Authority (SOA) for Project Documents [8].

For LC2/3 Technical Documents, the work agreements, like PAs an Annex B, and applicable documents related to the agreed signature workflow, defines the acceptance and approval responsibilities at supplier, DA and IO level.

IO Approver/Acceptor is defined by the Sign-Off Authority (SOA) for Project Documents [8].

DA Approver/Acceptor nomination at the DA place should reflect the DA internal Sign-off authority.

7.5 D&D TRO

He/she is from IO and responsible for the overall maintenance of the diagrams/drawings for a PA/Contract within this procedure, i.e.:

- Uploading the diagrams/drawings for the IO to Supplier Contract.
- Setting the PA sub-folder tree structure for the IO to Supplier Contract.
- Setting the PA sub-folder tree structure for the IO to DA PA.

8 Links with other processes

8.1 Interactions with Configuration Management process

- D&D Approval is the output of this document for execution of the Configuration Management process by the use of approved D&D in [4] [5] and [6] procedures.

8.2 Interactions with Design Control process

- Expected content of System Design deliverables [9] is input for execution of this procedure, through the use of following TDFCs by the D&D Submitter to identify the D&Ds:
 - Diagrams, as technical document, are identified within the Technical Document Families as process diagrams and Electrical Diagrams, referring to:
 - TDFC_Process_Diagram_T5.5_S3 [15], composed of Process Flow Diagram, PFD and Piping and Instrumentation Diagram, P&ID GDTs,
 - TDFC_Electrical_Diagram_T5.5_S3 [16], composed of its associated GDTs.
 - Drawings, as technical document, are identified within the Technical document Families as Drawings, referring to:
 - TDFC_Part_Drawing_T5.5_S3 [17],
 - TDFC_Arrangement_or_Layout_Drawing_T5.5_S3 [18],
 - TDFC_Area_Classification_Drawing_T5.5_S3 [19],
 - TDFC_Assembly_or_Installation_Drawing_T5.5_S3 [20],
 - TDFC_Building_Drawing_T5.7_S3 [21],
 , composed of their respective associated GDTs.
 - Component List and BOM, are identified within the following TDFs:
 - TDFC_Bill_of_Material-BOM_T5.5_S3 [22]
 - TDFC_Equipment_or_Component_List_T5.5_S3.
- D&D Approval is output for execution of the Design Control process by contributing to the Design Development Procedure [24] workflow at step 1 and 3.

8.3 Interactions with Identification & Control of Items process

- Working Instruction for Generation of ITER Bill of Materials [12] is input for execution of this procedure

8.4 Interactions with Document & Records process

- Sign-Off Authority (SOA) for Project Documents [8] is input for execution of this procedure
- Document Management Procedure [3] is input for execution of this procedure.
- Technical Document Management procedure [7] is input for execution of this procedure.

- All the outputs of the present procedure are output for execution of the Document & Records process to serve Technical Document Management procedure [7] workflow implementation.

8.5 Internal Interactions

- Procedure for the CAD Management Plan [1] is input for execution of this procedure.
- Procedure for Verification and Publication of CAD Data [2] is input for execution of this procedure.
- CAD Execution procedure [10] is input for execution of this procedure.

9 Outputs

Output	Template	Storage	Doc type	Naming convention	Retention period ¹ , years
Signed D&D	N/A	SMDD repository	N/A	Signed	Project overall lifecycle
D&D Rejection	N/A	SMDD repository	N/A	Rejected	Project overall lifecycle
D&D Verification	N/A	SMDD repository	N/A	Reviewed / Recommended	Project overall lifecycle
D&D Acceptance	N/A	SMDD repository	N/A	DA Accepted / IO Accepted	Project overall lifecycle
D&D Approval	N/A	SMDD repository	N/A	DA Approved / IO Approved	Project overall lifecycle

Note:

D&D management system proceed to publication (submission, verification, approval) of CAD data which is output of design workflows. Outputs of the present workflow are publication ones.

¹ The retention period may be governed by external standards and regulations.