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MQP Procedure

Procedure for the design office activities related to CAD Data Exchange Task

The purpose of this procedure is:- to define the requirements for the exchanges of CAD Data in the ITER collaborative activities between IO Central Team, IO Domestic Agencies, Project Teams and/or external contributors.- to describe the Data Exchange Task (DET) process ensuring the compliance of the exchanges with these requirements- to specify the transmission and storage rules for CAD data in the ITER collaborative design activitiesThe CAD data addressed by the DET procedure are Diagrams, 3D models, drawings, each of this type of data being mastered through dedicated authoring and management software and repositories in the ITER project.

| <i>Approval Process</i> | | | |
|---|--|--------------------------------|------------------------------|
| | <i>Name</i> | <i>Action</i> | <i>Affiliation</i> |
| <i>Author</i> | Thomas E. | 25 Nov 2015:signed | IO/DG/COO/CIO/DO/MDC |
| <i>Co-Authors</i> | Le M.- P. | 25 Nov 2015:signed | IO/DG/COO/CIO/DO/MDC |
| <i>Reviewers</i> | Choi C.- H. | 07 Dec 2015:recommended | IO/DG/COO/TED/VV/VVTS |
| | Elbez-Uzan J. * | 28 Nov 2015:recommended | IO/DG/RCO/SD/EPNS |
| | Martin E. | 26 Nov 2015:recommended | IO/DG/COO/CIO/DO |
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| <i>Approver</i> | Onozuka M. | 07 Dec 2015:approved | IO/DG/COO/CIO |
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Change Log

Procedure for the design office activities related to CAD Data Exchange Task (2NCULZ)

| <i>Version</i> | <i>Latest Status</i> | <i>Issue Date</i> | <i>Description of Change</i> |
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| v1.0 | In Work | 21 Aug 2009 | |
| v1.1 | In Work | 21 Aug 2009 | ref doc |
| v2.0 | Signed | 18 Mar 2011 | Transfer ownership to E. Thomas as requested by JGM on 18/03/2011. Co-author modified |
| v3.0 | In Work | 23 Nov 2015 | Two documents have been merged: Procedure for the Exchange of ITER CAD data and data derived from CAD data (34YAT2) and Procedure for the design office activities related to CAD Data Exchange Task (2NCULZ). The technical actions supporting this process in the system administration of the CAD repositories will be defined outside this document. Document has been integrated into MQP via MQP doc Request - RZFFTC |
| v3.1 | Approved | 25 Nov 2015 | - Content practically unchanged. - Some typos corrected and definitions completed. - Few sentences re-ordering allowing a better reading. |

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1 Purpose

The purpose of this document is to define the requirements for the exchanges of CAD Data in the ITER collaborative activities between IO Central Team, IO Domestic Agencies, Project Teams and/or external contributors.

The Data Exchange Task (DET) process, established to fix the mechanisms and principles for the exchanges of CAD Data in the frame of the ITER project, ensures the compliance of the exchanges with these requirements

2 Scope

This procedure specifies the transmission and storage rules for CAD data in the ITER collaborative design activities, which can be, but are not limited to: Procurement Arrangements, Task Agreements, IO direct contracts with the industry, DA direct contracts with the industry, Project Teams, Voluntary basis contributions to the ITER project, etc...

The CAD data addressed by the DET procedure are Diagrams, 3D models, drawings, each of this type of data being mastered through dedicated authoring and management software and repositories in the ITER project.

The use of the DET procedure is mandatory for:

- The transfer of CAD data from/to a design contributor, supplier or other collaborator, for purposes of CAD design work or any contractual work related to the development of ITER components
- The transfer to IO of CAD data for integration into the CAD data repositories.

Data derived from IO models dedicated to visualisation (for example 3Dpdf, 3dxml, smg, etc.) must be used for communication purposes only, and so shall not be used as input for CAD work or any contractual work. This data is outside the scope of the DET process. When exchanging these formats, it is the responsibility of the sender to inform all recipients and any downstream users of the permitted scope of use and the consequences of misuse.

3 Definitions and acronyms

| Abbreviation | Real name |
|---------------------|--|
| BOM | Bill Of Material |
| CAD | Computer Aided Design CAD Data: All data generated through the CAD systems, e.g. Diagrams, 3D Models, 2D Drawings, Meshing, etc. |
| CAD Exchanger | Name of the Role given in the frame of the DET process to the persons in charge of coordinating and performing the DET steps. Distinction should be made with the IO-CT CAD exchange team, or IO-DA CAD Exchange teams. In the frame of a specific DET, the CAD Exchanger role is assigned to one member of those teams. |
| CAD repository(ies) | System supporting the Management and Storage of the CAD data. In this procedure, "CAD repositories" refers to all the IT systems used by the ITER project to control the CAD data. These systems offer the functionalities: versioning, lifecycle, workflows, etc... |
| DA DO | IO-DA Design Office |

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|----------------------|---|
| DECO | Design Coordinator: |
| DET | Data Exchange Task |
| DMU | Digital Mock-up |
| DOs | In this document, understood as Design Office of both IO and the External contributor |
| EP | External Partner, understood as External contributor |
| External contributor | In this document, understood as Organization out of the IO being involved in the ITER design. |
| IO | ITER Organization |
| IO-CT | ITER Organization Central Team, sometimes appear in its ancient and shorter form “IO” |
| IO DO | IO-CT Design Office |
| IO-DA | ITER Organization Domestic Agency(ies),, sometimes appear in its ancient and shorter form “DA” |
| PA | Procurement Arrangement |
| PDM | Product Data Management (Database for CAD data) |
| PLM | Product Lifecycle Management |
| PT | Project Team |
| RO | Responsible Officer |
| SSD | See System Design, IGE XAO software for diagram production. |
| TA | Task Agreement: Equal footing agreement with DA that outsources Design work and /or R&D work to DA. DO technical enablers: All tools used and mastered by the DO |
| TRO | Technical Responsible Officer: Nominated for a specific PA, responsible for the quality and fitness of components to be procured under the PA and for their successful delivery to the ITER Site. |

4 References

- [1] [Order dated 7 February 2012 relating to the general technical regulations applicable to INB - FR \(7GJHSE\)](#)
- [2] [ITER System Design Process \(SDP\) Working Instruction \(4CK4MT\)](#)
- [3] [Procedure for the Usage of the ITER CAD Manual \(2F6FTX\)](#)
- [4] [CAD Manual 08 - Collaboration Processes \(249WV4\)](#)
- [5] [Working Instruction for Usage of SMDD \(LYEH46 v1.1\)](#)
- [6] [How to use the SMDD Application \(System for the Management of Diagrams and Drawings\) \(JKT5KN v3.2\)](#)

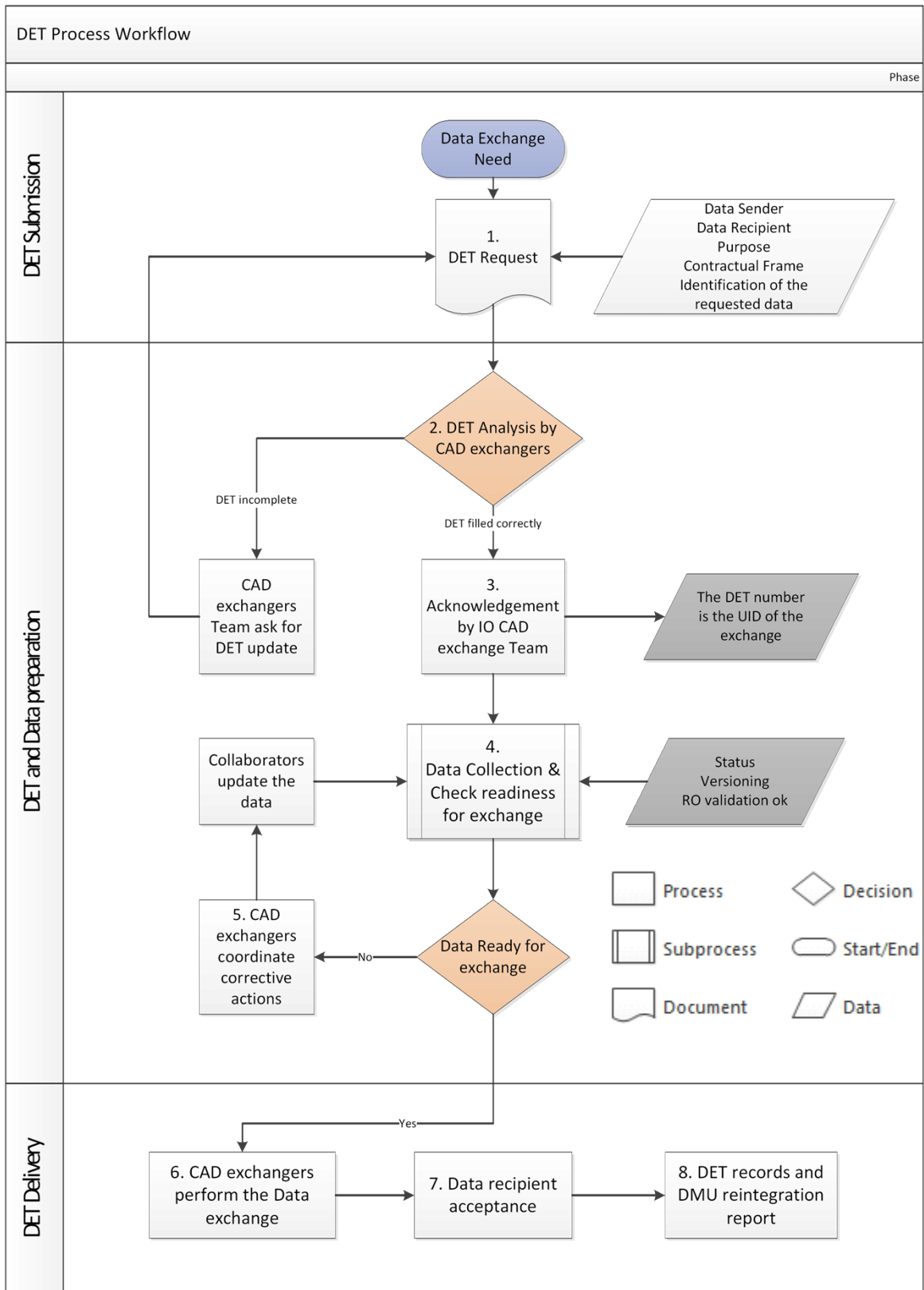
5 Responsibilities

The responsibilities expressed hereafter are to be understood in the frame of the process better explained through the flowchart in chapter 6. Therefore, we advise a parallel reading of the responsibilities and the flowchart.

- DET Requester: is responsible for the accuracy of the information provided at the time of the DET request.
- Data Sender: is responsible for providing a data compliant with the ITER CAD Quality: (See the [Procedure for the Usage of the ITER CAD Manual \(2F6FTX\)](#))
- The Data Recipient: is responsible for checking the transferred data before use and to notify to all parties that the data has been correctly received.
- The CAD Exchangers: Are responsible for:
 - Ensuring that the CAD data transferred through the DET process complies with the general rules for CAD exchanges expressed within this procedure.
 - Monitoring that the DET process is applied by all involved parties so the requirements expressed in chapter “2.Aims and Scope of the DET procedure” are fulfilled, and the general rules for CADEXchange identified in the chapter 3.1 are respected.
 - To request corrective action, and/or to report to the relevant management instances when the transmitted data and the operations performed in the frame of the DET process do not match the 2 previous items
- The IO CAD exchange Team: endorses the CAD exchangers responsibilities identified above in the frame of a DET assigned to them. On the top of these duties, they are also responsible for:
 - Supporting all CAD Exchangers teams in the ITER project about the relevant techniques and tools used to export/import data from and to the ITER central repositories (Enovia/ SSD / SMDD, etc...)
 - Performing or coordinating the CAD Management System administration tasks required in the frame of the DET process, and that cannot be performed from remote places: A typical example is the administration of the replication packages allowing the synchronization of ITER CAD databases geographically dispersed. The IO-CT ROs are responsible of the engineering needs of their system: data purpose request.
- The Design Coordinators:
 - In case of DMU-reintegration: are responsible for the CAD quality check of the incoming data, and the associated CAD data promotion
 - In case of export DETs: Are responsible for providing data compliant with CAD quality rules, and to support the CAD Exchangers in the identification and selection of the data to be exported.

6 Flow chart

The Data Exchanges Tasks (DET) shall follow the same general workflow hereafter:



7 Process Description

7.1 Aims of the DET procedure

This DET process is designed to fulfil the following requirements:

- To ensure the control, the traceability and the quality of the exchanged data, as part of the design inputs and ITER design activities, in compliance with the [Order dated 7 February 2012 relating to the general technical regulations applicable to INB - FR \(7GJHSE\)](#)
- To maintain consistency between exported Design and Reference data stored in ITER CAD databases
- To trigger and coordinate the CAD data Management sub-processes operated on the exchanged data (e.g. Transfers of ownership, data checking and Validation, tagging data for traceability, etc)
- To ensure the reusability of the data: to make possible the re-integration of the exported and modified design through preparatory actions at the export phase, as well as later ensuring the usage of the reintegrated data within the downstream processes (Further phases of design, CAD drawings, validation calculations, etc)
- To collect and spread any information related to CAD exchanges through effective communication, allowing all parties involved in the design or design verification, or having an interface with it to make the proper comments and provisions to the data recipients

7.2 Data Exchange Task (DET) Process

The requirements expressed in the chapters above are translated into the general rules for CAD data exchanges, a process to ensure their application, the so-called Data Exchange Task (DET) process, and a classification of 4 DET types to cover all CAD data exchanges cases performed in ITER.

7.2.1 *General rules for the CAD Data exchanges*

- **Respect of the contractual structure:** The DET process respects the contractual structure for which the data is transmitted: As associated to a particular framework (PA, TA, PT or contract), the DET process ensures that the data senders, data recipients and intermediate organizations are identified and given the proper roles in the DET process. This implies, for instance, that the DA DO and DA RO are always involved in the exchanges performed in the frame of a Procurement Arrangement, even if the DET final recipient can be, for CAD technical reasons, the DA industrial partner.

- **Data at Frozen Status, and compliant with applicable standards and CAD Manual rules:**
To cope with the requirement for traceability of the exchanges, the CAD data transmitted through the DET process shall have reached a frozen Status in the CAD data lifecycle: The transmitted data has mandatorily gone through a successful checking and validation process leading to its promotion.

Frozen status means that the current version of the exchanged object cannot be modified in its repository, and therefore is retrievable information for the project life. This rule explicitly excludes the transmission of “In-work” data.

- **Data Maturity and status matching the purpose of the DET:**

The data transferred through the DET process is selected and collected to match the usage of the foreseen data usage indicated in the request for data exchange. The data selection is based on the following criteria:

- Maturity of the exchanged CAD data is consistent with the foreseen data usage. Find more information about Documents Maturity in relation to the Design Phases in the ITER System Design Process (SDP) Working Instruction (4CK4MT) [2]
- CAD Data having reached a “draft status” is validated within a fast design evolution cycle, and so is reserved for the concurrent engineering.
- CAD Data having reached an “Approved status” has been checked through an exhaustive verification process. Only Approved CAD data can be used as initial input of contracts and PAs, or for manufacturing purposes.
- Exported Data Origin: The characteristics of the data as identified in the bullets above obliges for the sending of CAD data which have been registered and controlled through the dedicated ITER CAD management systems, and excludes their modification after extraction of these systems.
- Data Exchange Consistency checking: After the collection of the data to be transmitted, the consistence of data itself and its pertinence with regards to the purpose of the exchange is assessed by the CAD Exchangers Interfacing responsible officers and Design Integration Officer are also invited to evaluate the suitability of the data with regards to the DET purpose.

7.2.2 *Types of DET*

4 different DET types exist to cover the different purposes of a CAD data exchange:

- For information only (FIO): This data is provided to the external partner to enable him to check the ITER reference data, but must not be considered as input for a CAD design task. No particular internal process is launched by the CAD Exchangers beyond the collection of the data.
- Contextual data (CD): This data is provided to the external contributor to enable him to build his context of work, and then to identify interfaces, allowable space for his system, neighboring objects, etc. This data is never returned to the central CAD repositories after the design task completion, but the CAD exchangers enable after export the identification of the major changes of objects exported with that status.
- Design data (DD): This data is provided for modification by the external partner and further on to be re-integrated within the ITER central repositories. This data is locked in the ITER Databases for its exclusive usage by the external contributor during the external design task so there is no conflict at the reconciliation phase. To ease the export /import operation, some CAD data re-structuring may be performed prior to the sending operation. This data being un-modifiable in the central repositories during the exported design task, this export status cannot be applied without being duly justified by a contractual frame.
- DMU re-integration (DMU): This data is received from the external contributors for its reintegration into ITER central repositories, thus allowing its further usage by all project contributors. The re-integration implies either a reconciliation for the data coming from contributors working file-based or Promotion/Publication process if the contributor worked directly connected to the ITER CAD repository. This type of DET may imply a transfer of ownership depending on whether or not this exchange corresponds to a final delivery or not.

7.3 Process steps description

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| Step 1 | <p>The DET request is submitted to CAD Exchangers:</p> <ul style="list-style-type: none"> • The requester can be any person contributing to the ITER engineering/design and having interest in this exchange. However, this statement shall not contradict the agreements between the DA and its suppliers: Some DA DO request to be the exclusive focal point of CAD data exchange in the ITER party. • The data sender is the organization/person owning the CAD data at the time of the request. The data sender can be, depending on the direction of the data exchange, from IO, DA, PT or directly the supplier when agreed by the contracting organization (IO/DA/PT). • The data recipient is the organization/person who will receive the data through the DET process. The recipient can be, depending on the direction of the data exchange, IO, DA, PT or directly the supplier when agreed by the contracting organization (IO/DA) • The CAD Exchangers can be either the IO CAD Exchange team or DA CAD Exchange Team, depending of the origin of the requester, and as defined in the Design Collaboration Implementation Form (DCIF) specifically agreed for the collaborative design activity. <p>The request is performed by filling a DET template as identified in chapter 7 below and sending it to the CAD exchangers</p> |
| Step 2 | <p>The CAD exchangers check that the proper DET inputs are provided:</p> <ul style="list-style-type: none"> • Identification of the Data Recipient, Data sender, Contractual framework in which the exchange is performed. • Purpose of the exchange: Describes what usage will be made of the data by the Data recipient. This information is of prime importance to define the type of DET (For Information, Contextual data, Design data, DMU reintegration, see chapter 3.3 Types of DET) • Identification of the data Requested to be exchanged: When known, the unique identification of the data is provided to CAD Exchangers through Bill of Materials (BOM). When unknown, as precise as possible description of the data. • All other relevant information helping to understand the background of the CAD data exchange |
| Step 3 | <p>IO DET Acknowledgement: This step corresponds to the registration of the DET into the logs of the CAD Exchangers:</p> <ul style="list-style-type: none"> • A unique DET number is provided to identify this exchange • The DET type (see chapter 3.3 Types of DET) is defined at this stage, if not already done by the requester during the DET submission in step 1. • All persons who could be concerned by the CAD data exchange are informed about the request: Data Sender, Data recipient, CAD exchange team of the concerned DA, Responsible officers and Design coordinators of the system, on IO and DA side, and the Design Integration officer. They are, from this point of the process onwards, welcome to provide comments |

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| | or additional information helping the exchange. |
| Step 4 | <p>a)CAD Exchangers collect the data.</p> <ul style="list-style-type: none"> • When for export purposes, from the ITER central repositories. The CAD Exchangers can be supported in this task by the Data owners, the Design Coordinator and Responsible officer of the concerned PBS, or the Design Integration officer. • When for DMU re-integration, from the network place dedicated to DET exchange. This place is secured and backed-up, so the traceability of the data cannot be put at risk by possible modifications. <p>b)CAD Exchangers check the CAD data set to be exchanged:</p> <ul style="list-style-type: none"> • The CAD Exchangers perform a random verification of the CAD Quality aspects: When transmitted, the CAD data is supposed to have been already checked by the data sender. • The data suitability for the DET purpose is verified, as well as the compliance of the data set with the topics expressed in the chapter 3.1 General rules for the CAD Data exchanges <p>The CAD exchangers can request support for verification of these points to all members consulted at data collection step (see above in this cell)</p> |
| Step 5 | <p>Coordination of the corrective actions driven by CAD Exchangers.</p> <p>Depending on the checks performed in step4, corrections to the data may be performed before export. This might imply data re-structuring to ease the exchange, correction of the ownership, promotion to frozen status, production of additional documentation to support the understanding of the design changes, etc.</p> |
| Step 6 | <p>CAD exchangers perform the exchange: This step comprises:</p> <ul style="list-style-type: none"> - Only In case of DET for DMU reintegration: <ul style="list-style-type: none"> o The incoming data is registered within the ITER central repositories. Versioning mechanisms are used to keep the history of the design, version after version. o When the data was delivered file-based, it is then stored with an “In-work” status. When the data was worked-on by the external contributor directly in the central repositories, the delivery is represented by a dedicated frozen status, allowing the traceability of the delivered data. - For all cases, the CAD Exchangers produce the documentation allowing the identification of the transmitted data - For all cases, the CAD Exchangers complete the DET form, gathering all relevant information to support a consistent exchange: Bill of materials, identification of the data ownership, identification of the design changes since last exchange, etc. <p>CAD exchangers then inform all parties about the completion of the exchange, appending the DET form to the completion mail. This information is disseminated to the same recipients as for the acknowledgement.</p> |
| Step 7 | <p>Acceptance of the DET by the data recipient:</p> <p>The data recipient checks the re-integrated data, and signifies his acceptance, or requests rejection of the data. This choice is documented, and communicated to the CAD exchangers, who append this information to the traces of the exchange.</p> <p>For the DETs of type “DMU-reintegration”, this choice is reflected through the</p> |

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| | lifecycle status given to the reintegrated version of the data. (Draft or rejected) |
| Step 8 | <p>The DET is concluded by the verification and storage of all traces of the exchanges: All documentation and written communications are gathered into one place identifiable by the DET number. The DET then reaches the status “Completed” in the DET management system (DET logs)</p> <p>Optional step in case of DMU re-integration only: IO CAD Exchange Team Communicates the results of the DMU re-integration and in case of asynchronous collaboration, informs the external contributor that he can proceed with the design on the basis of the newly reintegrated set of data (new versions or new references for first shot).</p> |

7.4 Specific DET cases

7.4.1 *DET and Multi-CAD approach:*

A Multi-CAD approach is the CAD working frame where the 2 collaborating organizations keep on performing design tasks with different CAD systems, and integrating their design into a common platform, through the conversion of a neutral CAD format.

The strategy made by the ITER project is to reserve this approach to the late stages of designs (Manufacturing design, mostly), when the advantages and security for the manufacturer to keep its own processes and tools outweigh the drawbacks associated to the Multi-CAD approach: Partial loss of CAD information, impossibility to perform some downstream applications on the sole basis of the converted models, loss of associativity between the resulting models and drawings, additional risks of configuration management issues, additional workload necessary to work around these drawbacks.

When the use of Multi-CAD has been agreed this shall be shown on the DCIF appropriate to the specific design task. The DET process shall then include additional tasks to secure the Multi-CAD approach and to ensure the compliance of the results with the rules enounced in the chapter 8.1.5 of the [CAD Manual 08 - Collaboration Processes \(249VV4\)](#)

In particular, the DET process will then:

- Include the verification that the converted models transferred through the DET are suitable for control of design and associated interfaces, and that the models provide sufficient information for the expected downstream applications. This verification task is the duty of the data recipient.
- Include the verification of the persistence of the identifications of models and drawings through the successive exchanges, and of the correspondence of the models versions in the original models and converted models. This verification task is the duty of the originator of the converted CAD Models.
- Include the checking of the congruence of the original models with the converted models (geometry and attributes). This verification task is the duty of the originator of the converted CAD Models.
- The checking reports issued by the originator of the converted CAD Models shall be appended to the set of Data and information carried through the DET.

Drawings issued from a Multi-CAD approach and in pdf format will be stored under SMDD.

[5] [Working Instruction for Usage of SMDD \(LYEH46 v1.1\)](#)

[6] [How to use the SMDD Application \(System for the Management of Diagrams and Drawings\) \(JKT5KN v3.2\)](#)

The bill of materials of the SMDD records submitted by the DA/Supplier is appended to a DMU-reintegration DET, which will be used to trigger the DA and IO checking and validation (Acceptance/Approval as adequate)

7.4.2 *DET and CAD Data protection*

If some data are linked to export control, the MQP procedure [Export Control Procedure \(JE3N8C\)](#), shall be implemented.

When a CAD data is subject to CAD Data protection,

- A so-called CAD data protection notice is established and approved, identifying the individuals having a granted access to the protected data, as stated in the [Procedure for the protection of CAD data. \(RX6FZA\)](#).
- The following specific rules apply to the DETs transferring this protected data:
 - o One IO CAD Exchanger at least is nominated in the CAD data protection notice
 - o This CAD Exchanger is responsible for making the DET compliant with the following items:
 - The DET identifies that the transmitted data is subject to CAD data protection, and the DET refers to the related CAD data protection notice.
 - The data recipient of the DET is identified within the related CAD data protection notice. Should this point not be satisfied at the time of the DET request, The CAD exchanger is responsible for triggering the required update of CAD data protection notice, or, if appropriate, to report about the impossibility to perform the exchange because of its contradiction with the agreed protection.
 - The recipient list of the communications made in the frame of this DET is limited to the persons identified in the CAD data protection notice.
 - The data recipients and all individuals involved in the DET are informed about their duties with regards to the protection of the transmitted CAD data, in particular the non-disclosure of the transmitted CAD data without prior consent of the data originator..
 - o The IO CAD Exchange team is responsible for the coordination of the system administration tasks to be operated on the CAD repositories. They follow-up the adequacy of the granting of accesses to the CAD repositories with the CAD Data protection notice.

7.4.3 *DET and Project Team :*

Project Teams (PT) are established in the ITER project to streamline existing work delivery and decision related procedures and processes such that IO and DA staff within the teams' operate effectively as if they were working in a single organization (accepting the responsibilities of IO as a nuclear operator and DA as contracting agents).

Assuming this main goal, when a DET is issued from a supplier to a project team, The PT and all its members are recognized as a unique recipient of the DET:

- Consequently, and without affecting the general DET process workflow, the DET is no longer a process of delivery performed between the IO-DA and the IO-CT, but between the External supplier and the Project Team.
- The unification of the team is reflected in the organization of the CAD repositories, so all PT members are granted to the same level of access as if they were working in a single organization. The required system administration actions on CAD repositories

are coordinated by the IO CAD exchange team, as result of the requests of the PT leaders.

- The checking tasks of the incoming data and the CAD promotion operations triggered by the DET process are run simultaneously by the PT members from both IO and DA, contrarily to the sequential operations run out of the Project teams frame. The PT leaders shall agree and inform the CAD exchangers about which PT members are assigned with the duties of CAD Quality checking and CAD data promotion
- The IO CAD Exchangers team and DA CAD Exchangers team shall agree on the assignment of individual DET process steps among their joint team members.

8 Forms and templates

DET template forms are available per organization:

- [7] [Data Exchange Task \(DET\) Template for CNDA \(QCJJC3\)](#)
- [8] [Data Exchange Task \(DET\) Template for EUDA \(QEEYFY\)](#)
- [9] [Data Exchange Task \(DET\) Template for INDA \(QB542S\)](#)
- [10] [Data Exchange Task \(DET\) Template for IO \(QPY8YS\)](#)
- [11] [Data Exchange Task \(DET\) Template for JADA \(QCLB83\)](#)
- [12] [Data Exchange Task \(DET\) Template for KODA \(QD3URB\)](#)
- [13] [Data Exchange Task \(DET\) Template for RFDA \(QE6CMP\)](#)
- [14] [Data Exchange Task \(DET\) Template for USDA \(QEFEUP\)](#)

A how-to describes how to fill the form: [12] [How to fill a DER - plus the DET process \(25MAL5\)](#)

Please send all requests for information regarding DET procedure application, to: cadexchange@iter.org

9 Records

- DET process ensures that the exchange data is retrievable for the life of the project, either by means of backed-up and archived local storage , or by means of records (Bill of Materials) of the frozen version numbers of the exchanged references of CAD data, as stored in the CAD data repositories (Enovia, SSD, etc...)
- The traceability of the DET exchanges themselves is organized by the IO CADEXchange team. To this end:
 - o A unique number is assigned to each of the DET. This identifier follows the format: DET-XXXXX, where XXXXX is a sequential number.
 - o A versioning mechanism of the DETs is put in place to easily identify the successive DETs having the same data sender, the same data recipient, the same purpose.
 - o The Main characteristics of the DETs are stored and can be used as filter criteria for the retrieval of any DET : by sender, by recipient, by PBS, by type of DET, etc...