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VMFH93

VERSION CREATED ON / VERSION / STATUS
23 Oct 2017 / 1.1 / Approved

EXTERNAL REFERENCE / VERSION

Technical Specifications (In-Cash Procurement)

Technical Specification - Mechanical design Tokamak Assembly Preparation Building

This document aims at specifying four types of design activities to be performed for the Tokamak Assembly Preparation Building (TAPB):
1 – Interfaces between the process and the TAP Building,
2 – Preliminary design of the First Wall storage container, the storage rack and the mechanical workshop,
3 – Final design of the First Wall storage container, the storage rack and the mechanical workshop,
4 – Detailed mechanical sequence.

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1 Purpose

This document aims at specifying four types of design activities to be performed for the Tokamak Assembly Preparation Building (TAPB):

1 – Interfaces between the process and the TAP Building,

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4 – Detailed mechanical sequence.

2 Scope of work

2.1 Tokamak Assembly Preparation Building (TAPB)

The functions of the Tokamak Assembly Preparation Building are listed below:

1 - To transfer storage containers
To Import / Export beryllium storage containers
To transfer beryllium storage containers within the building

2 - To store containers of Beryllium First Wall (FW)

3 - To Perform the Trail Fit
To buffer store a few Shield Blocks (6)
To unwrap FW and SB from their storage containers
To perform smear tests of the Beryllium surface contamination
To tilt / upend the FW and to transfer it
To decontaminate if contamination is too high
To perform metrology tests
To assemble FW to SB

The layout of the building is the following:

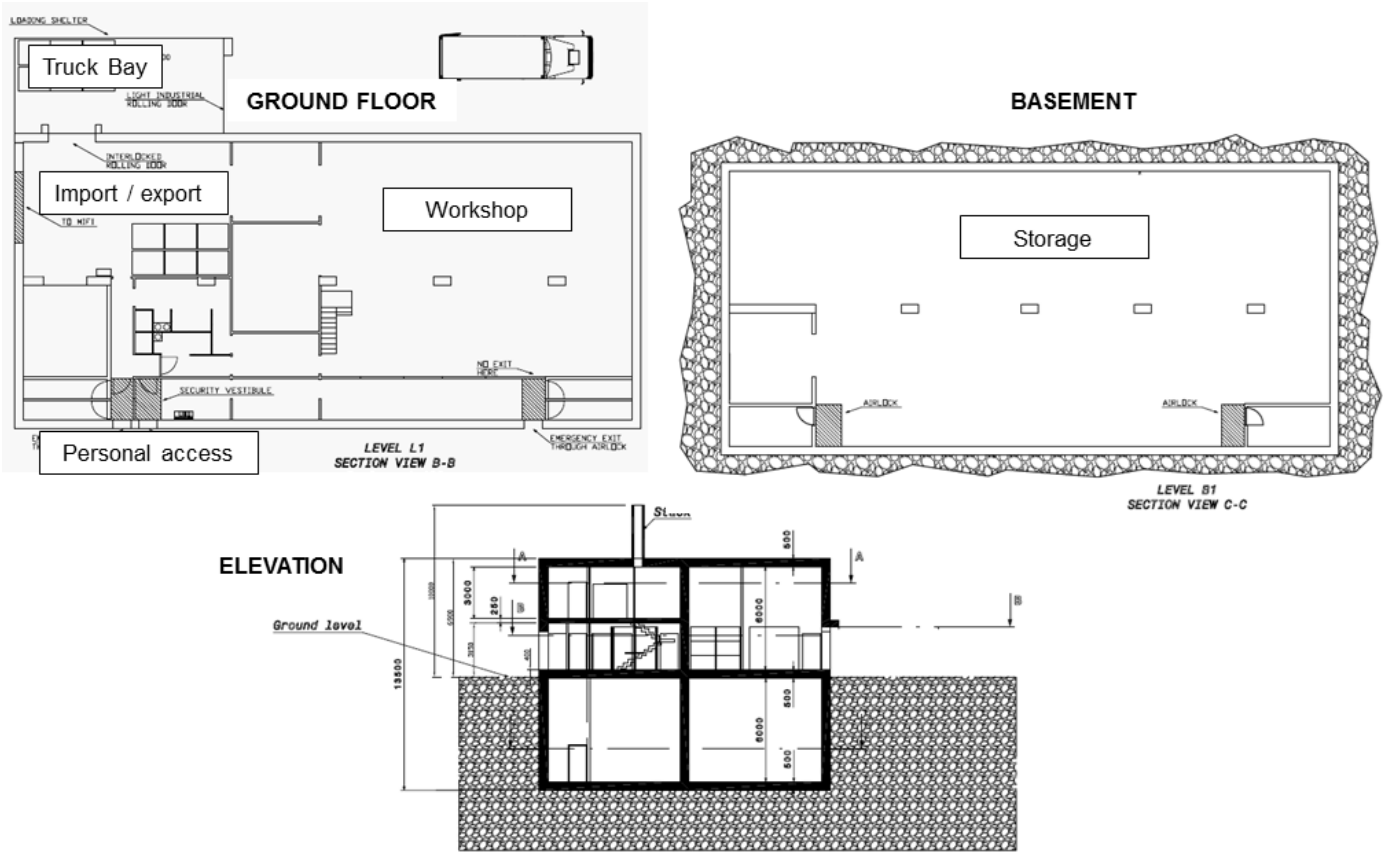


Figure 1 Plan view and elevation of the TAP Building

The overview of the conceptual design is given at the following link:
ITER_D_UZWSWY - 0 TAP Building - Overview of the conceptual design

Appendix 1 and 2 give illustration of the main feature at ground floor and basement level.

2.2 Scope of work

The scope of work corresponds to:

- The establishment of functional and physical interfaces between the mechanical systems and the building (e.g. mechanical loads, electrical loads, thermal and fire load),
- Mechanical design activities related to:
  - the storage containers of First Walls (FW) and Shield Blocks (SB),
  - the lifting platform, for equipment, to allow access from B1 to L1
  - the storage rack located at the basement of the TAPB,
  - the workstations locates at the ground floor in order:
    - to remove the FW and SB from their storage containers,
    - to tilt them if needed,
    - to perform the leak test,
    - to perform high precision measurements,
- Mechanical sequence and flow analysis of the operations to be performed on the FW and SB within the TAPB,

3 Definitions and acronyms

- BM: Blanket Module
- C-R: Contractor Responsible. See Contract specifications for definition of duty.
- C-TRO: Contractor Task Responsible Officer. See Contract specifications for definition of duty.
- EP: Embedment Plate
- FW: First Wall
- IO-RO: ITER Organization Responsible Officer. See Contract specifications for definition of duty
- IO-TRO: ITER Organization Task Responsible Officer. See Contract specifications for definition of duty
- ICS: Interface Control Document
- IS: Interface Sheet
- PBS: Project Breakdown Structure
- SB: Shield Block
- TAPB: Tokamak Assembly Preparation Building

For a complete list of ITER abbreviations see: ITER Abbreviations (ITER_D_2MU6W5).

4 Estimated Duration

The contract duration shall be one year and shall commence after the official start date and upon the mutual agreement of both parties.

The services shall be performed on-site at IO.

5 Work Description

5.1 Context

Conceptual design activities of the TAPB have been performed end of 2017.

2018 activities are the following:

- preliminary design of the TAPB building and elaboration of the tender documentation,
- detailed design of the TAPB process on:
    - the containers (storage and shipping), aiming to reduce as much as possible the cost of the shipping and/or storage containers, minimizing the overall cost and risks for the project,
    - the storage racks,
    - the lifting platform,
    - the mechanical workshop.

5.2 Objective of the contract

The objective of the contract is broken down into 6 deliverables which correspond to the activities listed in section 2.2.

5.2.1 Building interfaces

The aim is to freeze the building interfaces between the process and the Building, based on the conceptual design described at the following links:

- ITER_D_UZWSWY - 0 TAP Building - Overview of the conceptual design
- ITER_D_VJHRLM - Design Description Document TAPB for CDR
- ITER_D_VJHCNZ - TAP_Building_FW Storage Container Concept
- ITER_D_VJHLZE - TAP_Building_Basement_Storage System Concept
- ITER_D_VJHSYG - Assembly procedure and tool requirement of the TAPB workshop
- ITER_D_VLA32R - TAPB - Conceptual design - HVAC System design

When needed, the contractor shall refine the conceptual design in order to have sufficient maturity level to freeze the building interfaces.

This activity corresponds to the first deliverable D1.

5.2.2 Design of the FW containers and storage racks

Based on the conceptual design, the contractor shall update and refine the requirements, shall develop a preliminary design and Final design of the FW storage and shipping container / storage rack.

The preliminary maturity and final level corresponds to the maturity level described in ITER_D_4CK4MT - ITER System Design Process (SDP) Working Instruction, and in appendix 3, including structural calculations and cost estimates.

Specific attention shall be paid to safety and investment protection analysis, in particular aiming at reducing the risk of mechanical shock (e.g. collision, load drop) and reducing the fire risk (e.g. reduction of fire load, fire detection, local fire extinguishing mean).

This activity corresponds to the deliverable D2 (preliminary design) and D4 (final design).

5.2.3 Design of the mechanical workshop

Based on the conceptual design, the contractor shall update and refine the requirements, shall develop a preliminary design and Final design of the reception / trial fit workshop,

The preliminary maturity and final level corresponds to the maturity level described in ITER_D_4CK4MT - ITER System Design Process (SDP) Working Instruction, and in appendix 3, including structural calculations and cost estimates.

Specific attention shall be paid to safety and investment protection analysis, in particular aiming at reducing the risk of mechanical shock (e.g. collision, load drop) and reducing the fire risk (e.g. reduction of fire load, fire detection, local fire extinguishing mean).

This activity corresponds to the deliverable D3 (preliminary design) and D5 (final design).

5.2.4 Design of the Lifting Platform

Based on the conceptual design, the contractor shall update and refine the requirements, shall develop a preliminary design and Final design of the building lifting platform.

The preliminary maturity and final level corresponds to the maturity level described in ITER_D_4CK4MT - ITER System Design Process (SDP) Working Instruction, and in appendix 3, including structural calculations and cost estimates.

Specific attention shall be paid to safety and investment protection analysis, in particular aiming at reducing the risk of mechanical shock (e.g. collision, load drop) and reducing the fire risk (e.g. motorisation outside the lift shaft, reduction of fire load, fire detection, local fire extinguishing mean).

This activity corresponds to the deliverable D2 (preliminary design) and D4 (final design).

5.2.5 Mechanical sequence

This activity corresponds to the detailed analysis of the mechanical sequence of activities, in order to demonstrate that the inlet flow can be achieved as planned (see in particular section requirements given in section 12 of ITER_D_VJHSYG - Assembly procedure and tool requirement of the TAPB workshop

This activity corresponds to the deliverable D6.

6 Responsibilities

6.1 Contractor's Responsibilities

In order to successfully perform the tasks in these Technical Specifications, the Contractor shall:

• Strictly implement the IO procedures, instructions and use templates;

• Provide experienced and trained resources to perform the tasks;

•Contractor's personnel shall possess the qualifications, professional competence and experience to carry out services in accordance with IO rules and procedures;

• Contractor's personnel shall be bound by the rules and regulations governing the IO ethics, safety and security IO rules.

6.2 IO's Responsibilities

The IO shall:

• Nominate the Responsible Officer to manage the Contract;

• Organise weekly meetings on work performed;

• Provide offices at IO premises;

• Provide a standardized IT working environment (laptop, screen, keyboard, webcam and headset);

7 List of deliverables and due dates

D #	Description	Due Dates
D1	Building interfaces of mechanical systems, in particular storage racks, workshop, reception area: - Building loads (e.g. weight, heat, fire), - Physical interfaces (EPs if any), - Reaction forces, See section 5.2.1	T0 + 2 months
D2	Preliminary design of the storage container and the container racks – see section 5.2.2	T0 + 4 months
D3	Preliminary design of the mechanical workshop – see section 5.2.3 and the Lifting Platform – see section 5.2.4	T0 + 6 months
D4	Final design of the storage container and the container racks – see section 5.2.2	T0 + 8 months
D5	Final design of the mechanical workshop – see section 5.2.3 and the Lifting Platform – see section 5.2.4	T0 + 10 months
D6	Mechanical sequence – see section 5.2.5	T0 + 12 months

To be noted that:

- An important part of this activity relies on the ability to work in a close and collaborative way with other teams, such as the team in charge of the Blanket Modules (and likely with the DAs in charge of the BM procurement), the Assembly team, the building team and the safety team. The contractor shall prepare, as appropriate, support for technical meetings, aiming at finding technical agreements between all involved parties, keeping in mind the overall cost optimization of the systems being designed.
- The priorities between the different Deliverables to be issued could be changed at the KoM or during the duration of the contract, as per IO request and in agreement with the contractor.

- An non-exhaustive list of examples of deliverables contents can be found in Appendix-3

8 Acceptance Criteria

These criteria shall be the basis of acceptance by IO following the successful completion of the services. These will be in the form of monthly progress reports as indicated in section 8, table of deliverables and further detailed below:

- Report and Document Review criteria.
- Reports as deliverables shall be stored in the ITER Organization's document management system, IDM by the Contractor for acceptance.
- Technical Responsible Officer is the Approver of the delivered documents.
- The Approver can name one or more Reviewers(s) in the area of the report's expertise.
- The Reviewer(s) can ask modifications to the report in which case the Contractor must submit a new version.
- The acceptance of the document by the Approver is the acceptance criterion.
- The acceptance criteria of the document correspond to:
    - Justified and documented comments,
    - Lessons learned of existing nuclear facilities,
    - Reference to existing technologies and proven solutions used in nuclear field,
    - Reference to existing and applicable Norms and Standards,

9 Specific requirements and conditions

Significant experience in:

- Design of mechanical systems operating in irradiated and contaminated environment,
- Design of Radioactive Waste process,
- Design of doors, lifting platform, trolleys, cranes,
- Commissioning of heavy handling means in nuclear facilities,
- Commissioning of Radioactive Waste process.

At least 20 years' experience is required in these fields of expertise.

The contractor shall present in the offer:

- a resource loaded schedule, in line with the delivery dates given in section 7,
- a resource estimate for each of the Deliverables,

10 Work Monitoring / Meeting Schedule

The work will be managed by means of Progress Meetings and/or formal exchange of documents transmitted by emails which provide detailed progress. Progress Meetings will be called by the ITER Organization, to review the progress of the work, the technical problems and the planning. It is expected that Progress Meetings will be held weekly or biweekly. Progress meetings will involve C-R, CTROs, IO-RO and IO-TROs.

The main purpose of the Progress Meetings is to allow the ITER Organization/RHRM Division and the Contractor Technical Responsible Officers to:

a) Allow early detection and correction of issues that may cause delays;

b) Review the completed and planned activities and assess the progress made;
c) Permit fast and consensual resolution of unexpected problems;
d) Clarify doubts and prevent misinterpretations of the specifications.

In addition to the Progress Meetings, if necessary, additional meetings to address specific issues to be resolved may be requested by the ITER Organization.

For all Progress Meetings, a document (the Progress Meeting Report) describing tasks done, results obtained, blocking points and action items must be written by the Contractor. Each report will be stored in the ITER IDM in order to ensure traceability of the work performed.

11 Delivery time breakdown

See Section 8 – Deliverables and Due Date

12 Quality Assurance (QA) Requirements

The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.

The general requirements are detailed in ITER Procurement Quality Requirements (ITER_D_22MFG4).

Prior to commencement of the task, a Quality Plan must be submitted for IO approval giving evidence of the above and describing the organisation for this task; the skill of workers involved in the study; any anticipated sub-contractors; and giving details of who will be the independent checker of the activities (see Procurement Requirements for Producing a Quality Plan (ITER_D_22MFMW)).

Documentation developed as the result of this task shall be retained by the performer of the task or the DA organization for a minimum of 5 years and then may be discarded at the direction of the IO. The use of computer software to perform a safety basis task activity such as analysis and/or modelling, etc. shall be reviewed and approved by the IO prior to its use, in accordance with Quality Assurance for ITER Safety Codes (ITER_D_258LKL).

13 CAD Design Requirements (if applicable)

It is highlighted that the design activities can use CAD design tools, in 2D or 3D but 3D is not a mandatory requirement. If CAD design tasks are involved, the following shall apply:

The Supplier shall provide a Design Plan to be approved by the IO. Such plan shall identify all design activities and design deliverables to be provided by the Contractor as part of the contract.

The Supplier shall ensure that all designs, CAD data and drawings delivered to IO comply with the Procedure for the Usage of the ITER CAD Manual (2F6FTX), and with the Procedure for the Management of CAD Work & CAD Data (Models and Drawings 2DWU2M).

The reference scheme is for the Supplier to work in a fully synchronous manner on the ITER CAD platform (see detailed information about synchronous collaboration in the ITER GNJX6A - Specification for CAD data production in ITER Contracts.). This implies the usage

of the CAD software versions as indicated in CAD Manual 07 - CAD Fact Sheet (249WUL) and the connection to one of the ITER project CAD data-bases. Any deviation against this requirement shall be defined in a Design Collaboration Implementation Form (DCIF) prepared and approved by DO and included in the call-for-tender package. Any cost or labour resulting from a deviation or non-conformance of the Supplier with regards to the CAD collaboration requirement shall be incurred by the Supplier.

14 Safety requirements

ITER is a Nuclear Facility identified in France by the number-INB-174 ("Installation Nucléaire de Base").

For Protection Important Components and in particular Safety Important Class components (SIC), the French Nuclear Regulation must be observed, in application of the Article 14 of the ITER Agreement.

In such case the Suppliers and Subcontractors must be informed that:

- The Order 7th February 2012 applies to all the components important for the protection (PIC) and the activities important for the protection (PIA).
- The compliance with the INB-order must be demonstrated in the chain of external contractors.
- In application of article II.2.5.4 of the Order 7th February 2012, contracted activities for supervision purposes are also subject to a supervision done by the Nuclear Operator.

For the Protection Important Components, structures and systems of the nuclear facility, and Protection Important Activities the contractor shall ensure that a specific management system is implemented for his own activities and for the activities done by any Supplier and Subcontractor following the requirements of the Order 7th February 2012.

15 Appendix 1: Main features of the TAP Building and the TAPB workshop

Details are given in IDM links section 5.2.1 but the figures below are illustrations of the general arrangement and the current 3D model of the TAPB at ground floor, the mechanical workshop and the basement level.

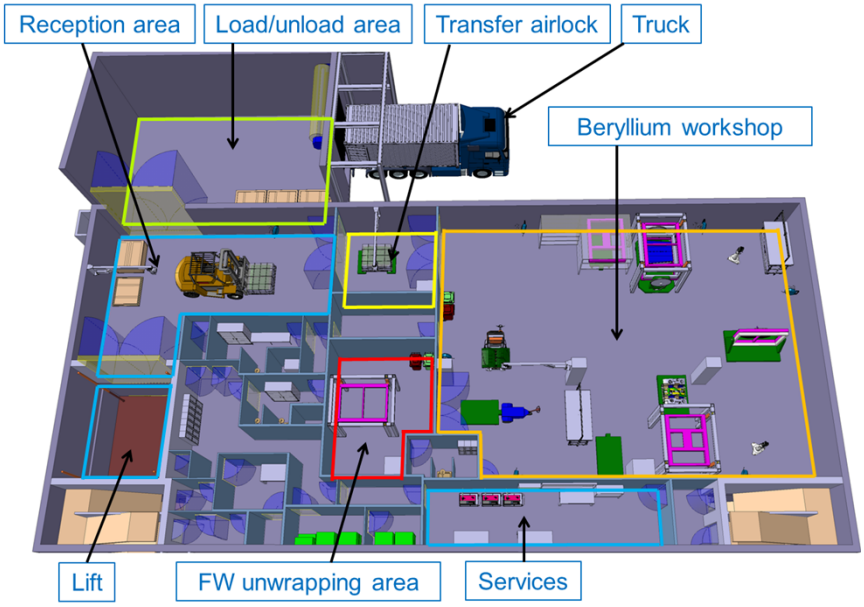


Figure 2: 3D view of the TAPB ground floor

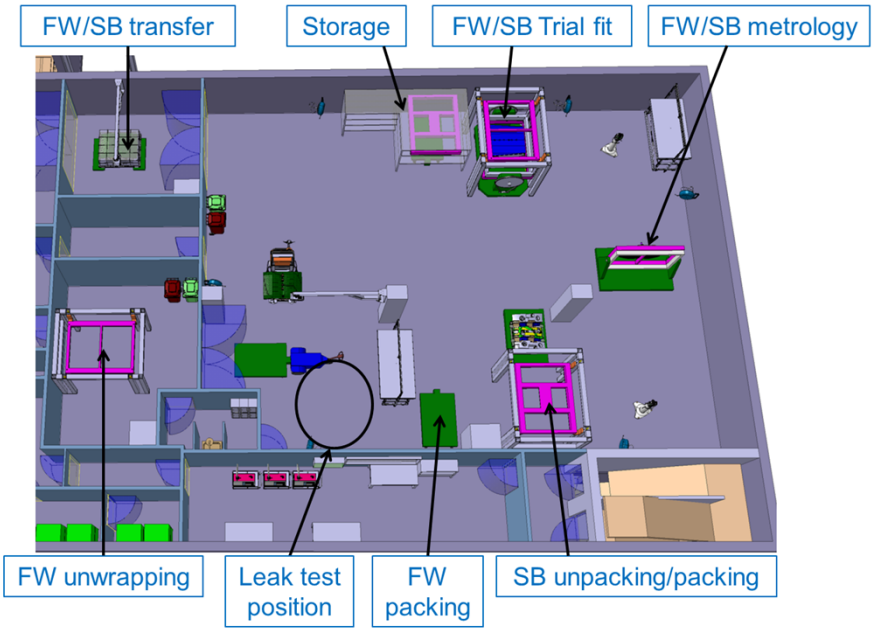


Figure 3: 3D view of the TAPB workshop

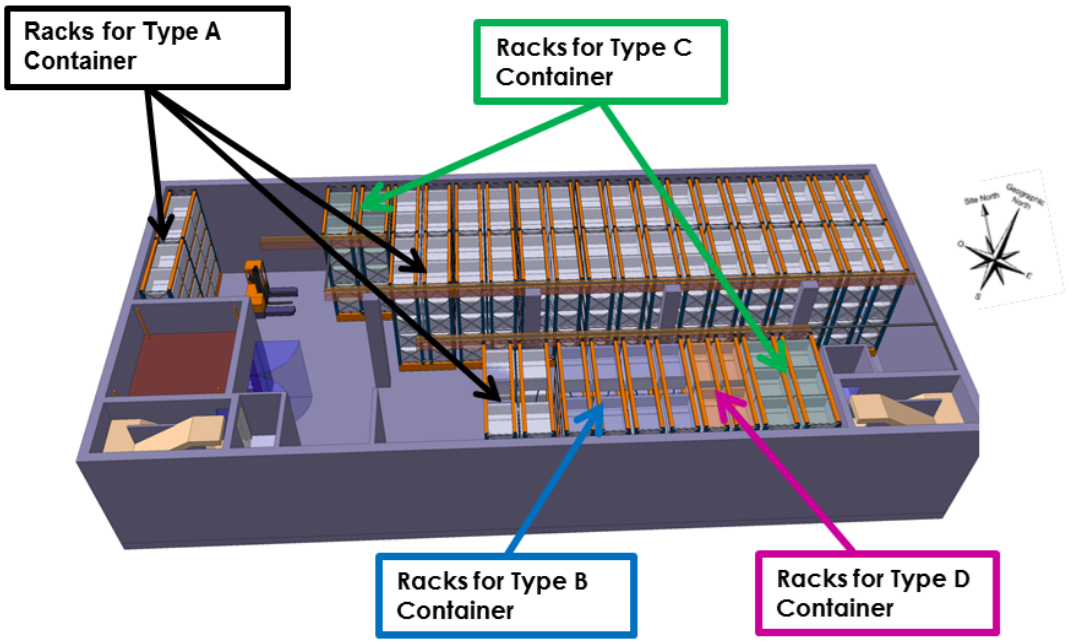


Figure 4: 3D view of the TAPB basement

16 Appendix 2: Main features of the storage container

At conceptual level, main features of the storage container corresponds to the 2D drawing illustrated below:

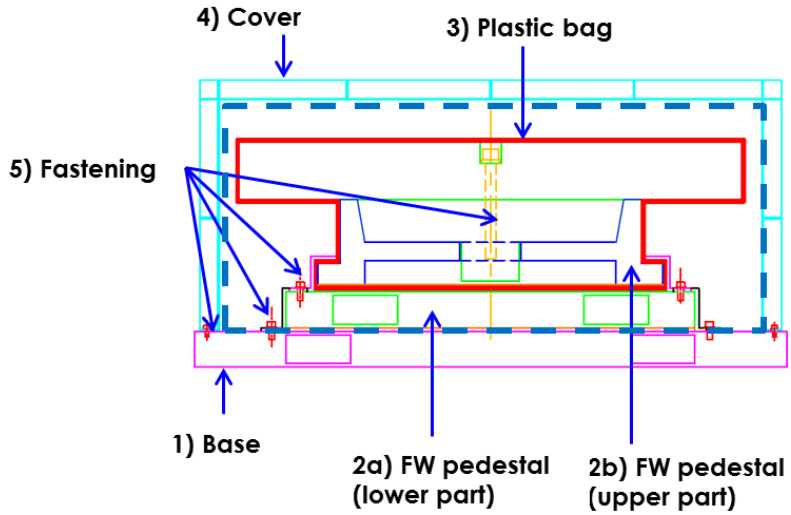


Figure 5: 2D view of the FW storage container

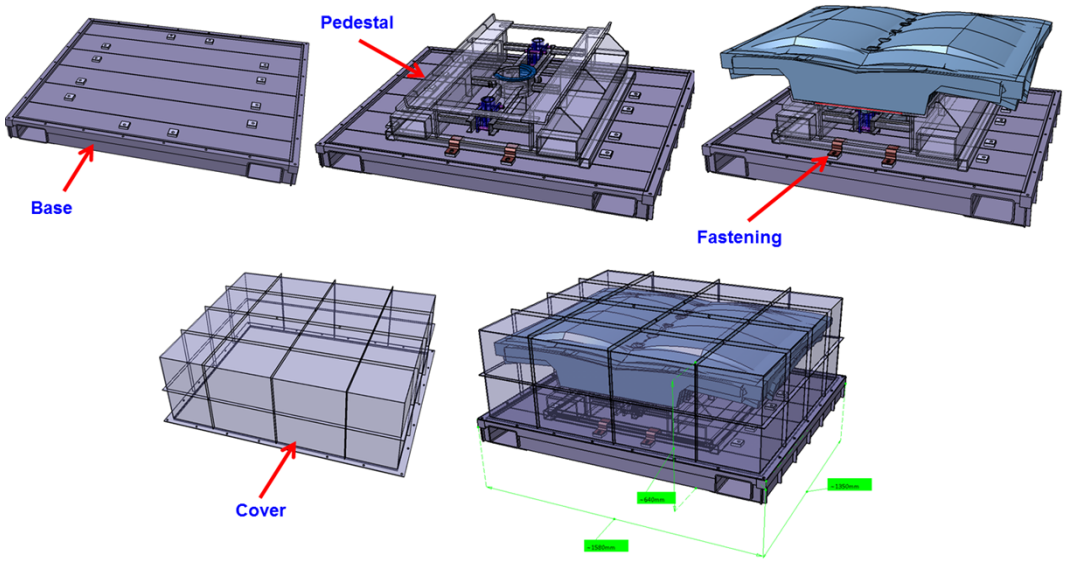


Figure 6: 3D view of the FW storage container

17 Appendix 3: Expected detail level of preliminary and final design

The following is a non-exhaustive list of Preliminary Design Deliverables that would be expected to be considered in the First Stages of this design.

They can be separate documents where deemed necessary, or accumulated into overall encompassing design deliverable documents.

- Identification of all technical risk items
- Identify fundamental safety requirements
- Develop a Mechanical Basis of Design
- Define containment requirements
- Outline fire resistance requirements
- Prepare preparatory Hazardous Area Classification layouts
- Identify general mechanical handling requirements
- Identify space volumes for building services
- Identify space volumes for mechanical systems
- Develop mechanical and process plant layout drawings
- Carry out layout design review
- Prepare / develop equipment specifications and mechanical information
- Prepare mechanical handling diagrams (MHD)
- Prepare mechanical flow diagrams (MFD)
- Consider / show compliance with Machinery Directive requirements
- Review EH&S statement against design information
- Prepare outline maintenance philosophy document
- Prepare outline de-commissioning philosophy document
- Prepare approximate order of cost estimate and programme
- Develop Structural Design Method Statement
- Develop 3D model for clash detection and layouts
- Develop Design Proposal Drawings (DPD's)
- Develop Initial Scoping Calculations
- Develop layout, space management / associated design activities
- Develop general mechanical handling requirements
- Carry out Machinery Risk Assessment
- Carry out Design Risk Assessment
- Develop Mechanical Flow Diagrams (MFD)
- Develop Mechanical Sequencing Diagrams (MSD) if required
- DESIGN REVIEW / HAZOP 1

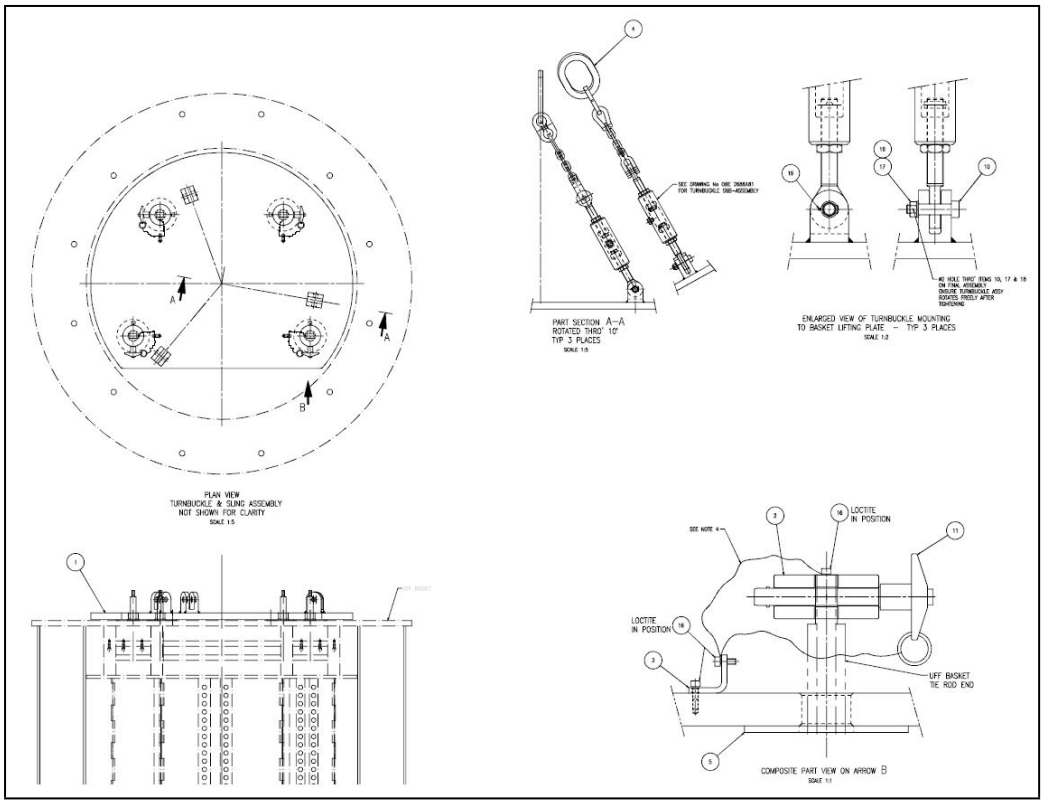
- Prepare preliminary safety report (PSR) and associated documentation
- Outline control system specification
- Complete functional equipment specifications
- Develop mechanical handling diagram (MHD) for control
- Complete design proposal drawing, (DPDs)
- Report - Identify items subject to Machinery Directive
- Prepare control philosophy document
- Prepare SIDD's philosophy document
- Complete final mechanical handling requirements & review against HAZOP 1
- Complete mechanical design review
- Commence 'W1' information (Loads)
- Compete Scoping Calculations
- DESIGN REVIEW / HAZOP 2

Additionally, the following is a non-exhaustive list of Final Design Deliverables that would be expected to be considered in the Second Stage of this design.

They too can be separate documents where deemed necessary, or accumulated into overall encompassing design deliverable documents.

- Prepare Design Readiness Review
- Authorise detailed design of mechanical equipment
- Continue to develop 3D model for clash detection and layouts
- Develop General Assembly Drawings
- Develop 2D Manufacturing Drawings
- Develop Parts lists / BoM’s
- Develop Final 'W2' Loading Drawings
- Complete Design Justification Report
- Complete Sequence and Interlock Definition Document (SIDD)
- Final Design Calculations Dossier
- Outline Installation Method Statements
- Finalise Control System Philosophy
- Finalise EC&I Design requirements
- Develop Technical File
- DOCUMENT REGISTER
- GENERAL EQUIPMENT DESCRIPTION
- DRAWINGS LIST
- DESIGN RISK ASSESSMENT
- DESIGN REQUIREMENTS AND STANDARDS
- MACHINERY GENERAL ESSENTIAL HEALTH AND SAFETY REQUIREMENTS CHECKLIST
- DECLARATION OF DESIGN CONFORMITY

Example of a Typical Preliminary Design Proposal Drawing



Example of a Typical Final Detail Design Drawing