

## Technical Specifications (In-Cash Procurement)

# Technical Specification for the A3 In Pit Access Platforms (IPAP)

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## SUPPLY

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### 1 Preamble

This specification covers the engineering design and Manufacture of the A3 In pit Access Platforms for the ITER Organisation.

This Technical Specification is to be read in combination with the General Management Specification for Service and Supply (GM3S) – Ref [1] that constitutes a full part of the technical requirements.

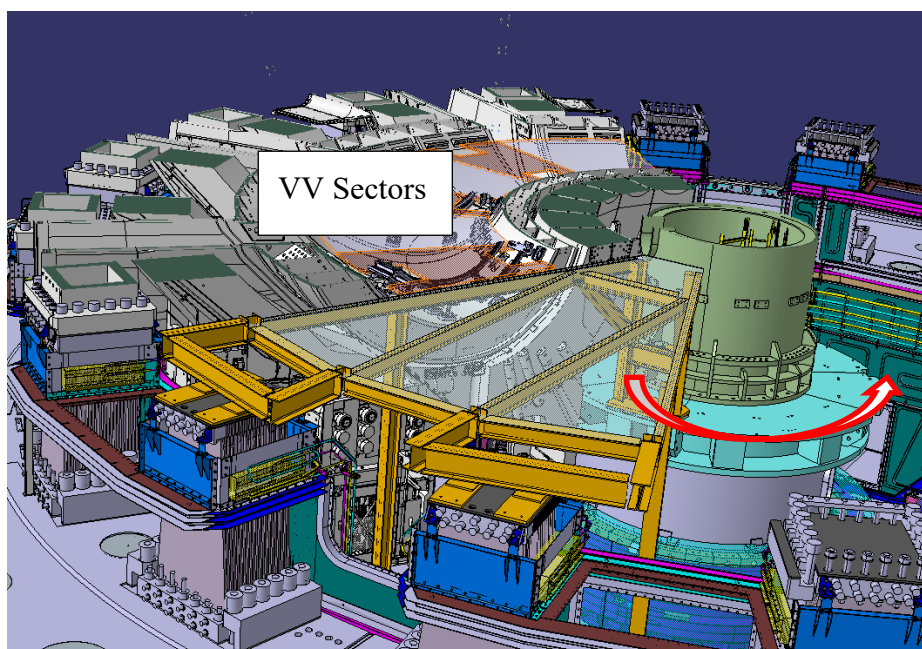
In case of conflict, the content of the Technical Specification supersedes the content of Ref [1].

### 2 Purpose

The A3 In Pit Access Platforms (A3 IPAP) shall be used in the Tokamak Pit for access to the VV (via the in Vessel Staging) and to the lower outer edge of the VV.

The VV Sector will be installed in 9 segments in pit and welded together.

The platform is intended to be installed and removed to the next empty segment to provide access to the newly installed VV Sector. The platform will therefore need to be installed and removed a minimum of 9 times.



### 3 Acronyms & Definitions

#### 3.1 Acronyms

The following acronyms are the main one relevant to this document.

Abbreviation	Description
MTO	Material Take Off
CRO	Contract Responsible Officer
GM3S	General Management Specification for Service and Supply

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IO	ITER Organization
NCR	Non-Conformance Report
PRO	Procurement Responsible Officer
QA	Quality Assurance
TFGS	Toroidal Field coil Gravity Support
VV	Vacuum Vessel
VQC	Vacuum Quality Class
WPQR	Welding Procedure Qualification
WPS	Welding Procedure Specification

**3.2 Definitions**

Abbreviation	Description
FDR	Final design review: At FDR phase all issues raised during the previous steps of design have been addressed. The design is complete, properly documented and interfaces are all defined and agreed.
IDM	ITER Document Management system used for exchange and storage of deliverables refer to section 6.2 of the GM3S Ref [1]
MIP	<p>Manufacturing and Inspection Plan: This is a document that lists the main steps of the manufacturing and test process that could affect the quality. For each particular operation, in the MIP, the following is identified:</p> <ul style="list-style-type: none"> <li>- Requirements and instructions applicable to those operations,</li> <li>- Operations to be inspected or witnessed by DA, IO, PT and (Agreed) Notify Body ((A)NB), etc.</li> </ul> <p>Reference documents providing traceability and recording of the verification and completion of these operations.</p>
MRR	Manufacturing Readiness Review: At this stage the contractor has developed all the applicable documents for manufacturing and is ready to start manufacturing.
PDR	Preliminary design review: Meeting where the Design Developer (The Contractor) presents the design developed and seeks for IO approval. On the basis of the technical documents submitted the IO authorize or not the Contractor to proceed with the next phase of design.
SMDD	System for the Management of Diagrams and Drawings: System where the drawings and single line diagrams are uploaded. A dedicated tool exist to upload large amount of drawings (when applicable).

**4 Applicable Documents & Codes and standards****4.1 Applicable Documents**

It is the responsibility of the Contractor to identify and request for any documents that would not have been transmitted by IO, including the below list of reference documents.

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This Technical Specification takes precedence over the referenced documents. In case of conflicting information, this is the responsibility of the Contractor to seek clarification from IO.

Upon notification of any revision of the applicable document transmitted officially to the Contractor, the Contractor shall advise within 4 weeks of any impact on the execution of the contract. Without any response after this period, no impact will be considered.

Ref	Title	IDM Doc ID	Version
[1]	General Management Specification for Service and Supply (GM3S)	<a href="#">82MXQK</a>	1.4
[2]	Presentation of A3 In Pit Platform Concept Design	<a href="#">B2CXRT</a>	1.0
[3]	CAD Data Requirements Summary for Contractor Supplied Data	<a href="#">HPQ64Y</a>	5.0
[4]	ITER Vacuum Handbook	<a href="#">2EZ9UM</a>	2.5
[5]	Appendix 3 Materials	<a href="#">27Y4QC</a>	1.20
[6]	Design Review Procedure	<a href="#">2832CF</a>	6.4
[7]	Working Instruction for Manufacturing Readiness Review	<a href="#">44SZYP</a>	5.0
[8]	Instructions for Seismic Analyses	<a href="#">VT29D6</a>	2.0
[9]	Instructions for Structural Analyses	<a href="#">35BVV3</a>	4.0
[10]	Floor Response Spectra for Tokamak Sector Assembly Tool	<a href="#">SPPXJ4</a>	1.3
[11]	Requirements for Producing an Inspection Plan	<a href="#">22MDZD</a>	3.7
[12]	Procedure for Management of Nonconformities	<a href="#">22F53X</a>	9.1
[13]	Working Instruction for Manufacturing Readiness Review	<a href="#">44SZYP</a>	5.0
[14]	015138 - As Built Drawing for Central Column	<a href="#">2JK7VS</a>	---
[15]	1101GS_005382--R: Gravity Support Assembly	<a href="#">2MSWC8</a>	5.10
[16]	NU_22137A_20_BS_101 - CR_BS_GENERAL-ASSEMBLY	<a href="#">EHX6KW</a>	39
[17]	015135 - As Built Drawing for TF Inner Support	<a href="#">2KN8R2</a>	3
[18]	A3 In Pit Platform Requirement Drawing - Elevation Requirement	<a href="#">B87C5R</a>	1.0

## 4.2 Applicable Codes and Standards

This is the responsibility of the Contractor to procure the relevant Codes and Standards applicable to that scope of work.

**Specific requirement 1:** The execution class selected for the platforms is EXC2 as per NF EN 1090.

**Specific requirement 2:** Construction products used shall be provided with CE Marking certificates in accordance with the requirements set in the European Regulation No 305/2011.

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**Specific requirement 3:** The Contractor shall provide the list of the applied codes and standards used and demonstrate the compliance of the platforms against the applicable requirements.

## 5 Scope of Work

### 5.1 Design and Manufacture of A3 IPAP

#### 5.1.1 *Description*

The current concept of the platforms called “A3 In-Pit Access Platform” has been developed to fit into the space on either side or between VV sectors during the assembly processes, see [2] for info. The platform at this stage has not gone through any structural analysis calculation. This will be the role of the Contractor.

The Contractor is responsible to perform the detailed design, manufacturing design and manufacture of the platform which includes analysis work and check of compliance to the EN norms as such, production of manufacturing and assembly drawing, MIPs and quality processes and manufacture and delivery.

The following list shall not relieve The Contractor from his obligations.

This comprises, but is not limited to:

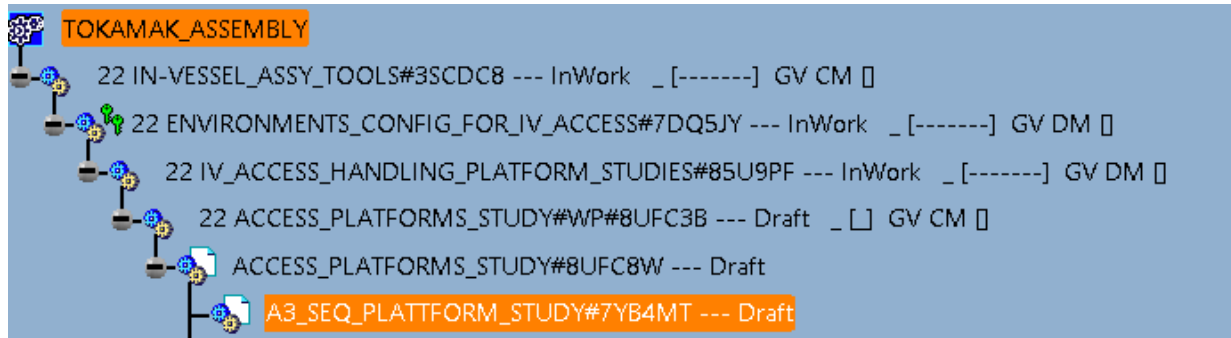
1. Structural analysis of the platform to validate the design and size the beams (selection of material can be made at this stage (between Steel or Aluminium));
2. Check and analysis of interfaces with proposed details of connections;
3. Study of installation process and adjustment of design to aid installation;
4. Detailed Design Review meeting (3h meeting);
5. Update of design following the detailed design review;
6. Production of manufacturing and assembly drawings;
7. User manual;
8. Supply of manufacturing dossier;
9. Delivery of all equipment to the IO site in France;
10. Weekly technical meetings (conference call);
11. Information transfer: CAD exchange, document exchange ;
12. Approved analysis report;
13. Approved installation process (Preliminary);
14. Approved Interface analysis;
15. 3D model in CATIA.

#### 5.1.2 *Design requirements*

##### 5.1.2.1 *CAD Model*

The concept design of the platform can be found in the ENOVIA system as below. The dimensions of the platform in the CAD mode must be followed. Enlarging of the beams will need to be approved following structural analysis.

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### 5.1.2.2 General Requirements

**Specific requirement 4:** The platforms material shall be agreed with the IO and shall comply with the material requirements in; [5]. Anticipated to be of Steel or Aluminium.

**Specific requirement 5:** The choice of material will depend on potential installation possibilities (i.e. a lighter material shall be considered in case of manual installation).

Frame Classifications	Class
Safety Classification	Non-Safety Importance Class
Protection Classification	Non-Protection Importance Class
Vacuum Classification	Interfaces to the environment: Vacuum Quality Class 1B All other parts; Vacuum Quality Class N/A
Quality Classification	Quality Class-3
Seismic Classification	Non Seismic Category*

Table 1 – A3 IPAP Classifications

\*(Eurocode 8 will be applied for investment protection)

**Specific requirement 6:** The design of all platforms and processes in this contract shall consider the assembly workers' safety as the first priority.

**Specific requirement 7:** The platforms are designed to receive load as defined in 5.1.6.1 at height while ensuring the access of people. The contractor shall ensure that all equipment and tools manufactured and tested as part of this contract, meet or exceed all the French regulatory requirements for health and safety and access at height.

**Specific requirement 8:** These platforms are going to be used in pit in a clean environment (VQC2B classed), so no forbidden material shall be used and the design shall ease the cleaning and avoid trapping the dust e.g. to avoid crevices, blind holes, trapped volumes etc, such as using no-tapped through holes instead of tapped blind holes.

**Specific requirement 9:** The platform will require some in pit assembly due to the space constraints, as far as practically achievable, the design shall consider using captive bolts in order to avoid the fall of object at height and to lose parts inside the Pit.

**Specific requirement 10:** At the end of the contract, The Contractor shall submit the completed compliance matrix giving the final status of compliance to the specification

**Specific requirement 11:** Based on the applicable codes and standards, The contractor shall establish the design criteria applicable to each part of the platform, this will be recorded in the structural calculation note.



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**Specific requirement 12:** The platform shall be rotatable to fit into the locations of the 9 sectors (when the sectors are not installed)

**Specific requirement 13:** For contact surface interfaces between the platform and ITER components, the use of allowed material such as nylon shim shall be considered to avoid damaging the interfaces during installation and use of the platform.

### 5.1.3 *Operating requirements*

**Specific requirement 14:** The handrails shall be removable.

**Specific requirement 15:** The Contractor shall study and propose simple assembly methods to ease installation and assembly.

**Specific requirement 16:** An access shall be designed onto the platform (not shown in the 3D model). The access is anticipated between the TFGS from the Cryostat Base.

### 5.1.4 *Performance requirements*

#### 5.1.4.1 *Assembly requirements*

**Specific requirement 17:** The Contractor shall study the assembly sequence of the platform within the environment given in 3D.

**Specific requirement 18:** The assembly and removal duration shall be reduced as far as possible.

**Specific requirement 19:** Handrails must be easily installed and removed with no risk of dropped objects.

**Specific requirement 20:** Harness points shall be provided on the platform to allow for assembly and installation

**Specific requirement 21:** The central panels (main body of the platform) shall be designed to be lifted in and out of the pit in one piece. Lifting points shall be provided and a quick connection with the interfacing structures shall be designed.

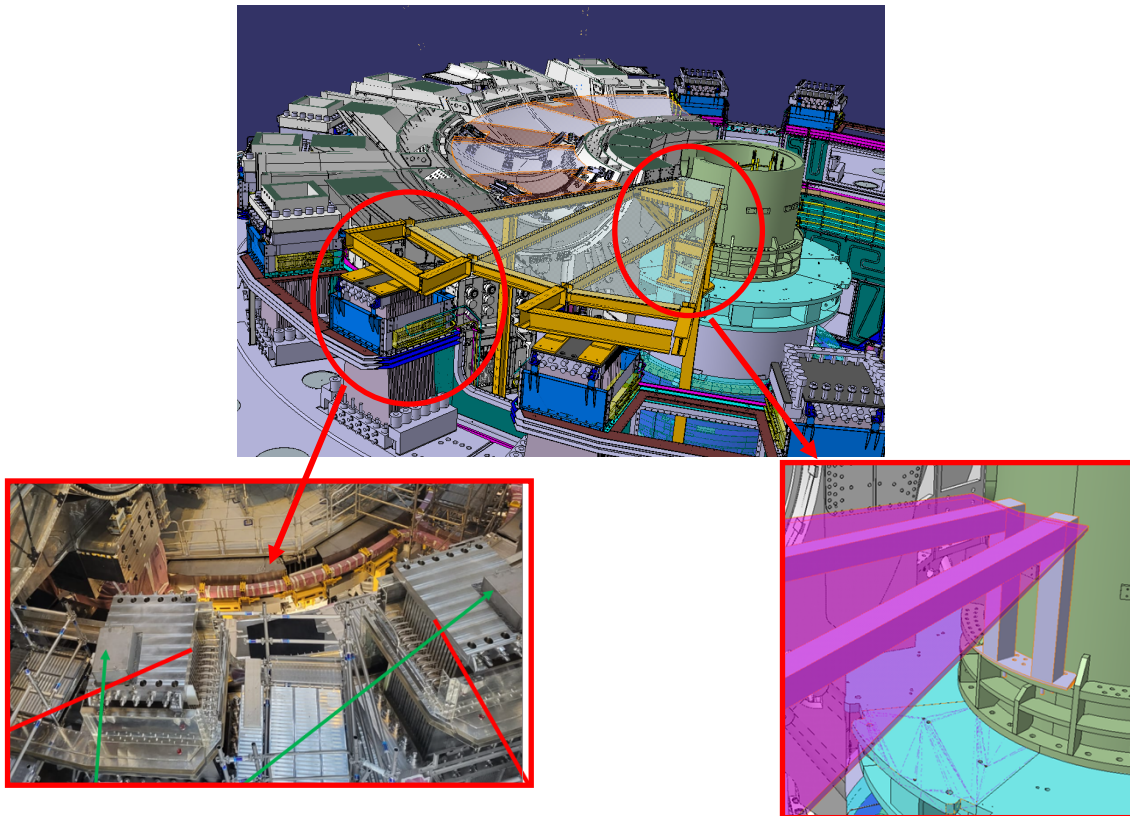
**Specific requirement 22:** The lifting shall not risk damage to any of the interfaces

**Specific requirement 23:** Lifting points shall be sunk to avoid any tripping hazard on the platform.

### 5.1.5 *Interface requirements*

**Specific requirement 24:** The platform shall have interfaces with the the Toroidal Field Coil Gravity Support (TFGS) and the In Pit Central Column (as show in the views below);

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Drawings of the interface can be found at [14], [17] & [15].

**Specific requirement 25:** The interfaces have not yet been designed or checked, the contractor shall propose an interface design and shall supply the reactions at these interfaces at detailed design phase. The IO will then have 4 weeks to check and confirm these interfaces.

**Specific requirement 26:** Interfaces and their requirements shall then be recorded in the user manual.

**Specific requirement 27:** All interfaces with in-Pit and in-Cryostat components shall be of stainless steel.

#### 5.1.5.1 Tolerance requirements

**Specific requirement 28:** The Contractor shall consider a capacity of adjustment of the platform interface, the range shall be  $\pm 20\text{mm}$  at each location in X,Y and Z ( see [18]).

**Specific requirement 29:** Should bracings be necessary to be compatible with the seismic solicitation, a tolerance of  $\pm 20\text{mm}$  shall be considered at the bracing interfaces in X,Y and Z.

**Specific requirement 30:** The elevation requirements are shown in [18]. The main goal of the platform is to access in-Vessel via the in vessel staging. For this purpose an additional vertical adjustability of  $\pm 200\text{mm}$  is required.

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## 5.1.6 Mechanical Requirements

## 5.1.6.1 Main loads

Load case	Case
<u>Dead Weight (DW)</u>	To be calculated using model
<u>Dead Weight (DW)</u>	Permanent loads; <ul style="list-style-type: none"> <li>- Floor covering</li> <li>- Handrails</li> <li>- Fences</li> </ul>
Dynamic Loading (DL)	<u>Personnel + Portable Tools</u> ; <ul style="list-style-type: none"> <li>- 4 x persons per floor (80kg x 12)</li> <li>- Portable tools 100kg</li> </ul>
Dynamic Loading (DL)	<u>Specific Loads</u> ; 6 tonnes on a 1m <sup>2</sup> area (most unfavourable location)
Dynamic Loading (DL)	<u>Uniform Load</u> ; 5kN/m <sup>2</sup>
Seismic (SL)	As per Eurocode 8 – with; <ul style="list-style-type: none"> <li>- 4 x persons per floor (80kg x 12)</li> <li>- Portable tools 100kg</li> </ul>

## 5.1.6.2 Load combinations

Combination definition	Load Combination	Design Criteria
Standard use	$1.35 \cdot DW + 1.5 \cdot (DL)$	NF EN 1990
Seismic unloaded	$1.35 \cdot DW + SL$	NF EN 1998

## 5.1.6.3 Fatigue cycles

According to the standard 1993-1-9, minimum number of cycles for which a fatigue study has to be carried out is to 10000 cycles, we assume less than this value. For that reason, no fatigue calculation has to be done in this project.

Maximum lifetime: 10 years

**Specific requirement 31:** The platforms shall be designed as a minimum for the loads and load combinations specified in 5.1.6.1.

**Specific requirement 32:** Under seismic solicitation, the platforms shall not collapse and damage nearby IO components, nor be able to detach from their attachments.

## 5.1.6.4 The structural analysis report

**Specific requirement 33:** The contractor shall perform the structural analysis or hand calculations of the platforms to validate the design assessing the structural integrity, the stresses,

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the maximum deformations, the stability and all aspects needed to assure the correct functionality of the platforms in the worst configurations.

**Specific requirement 34:** The analysis shall be performed according to the methods described in chapter 7.2 of [9].

**Specific requirement 35:** After full internal review, The contractor shall upload to IDM the results of the finite element analysis of the platforms, this will clearly indicate if the platforms pass all the applicable criteria under the most unfavourable loading conditions.

**Specific requirement 36:** The contractor's 3D models and FE models shall also be shared in an exportable format.

### 5.1.7 *Electrical Requirements*

Not applicable

### 5.1.8 *Software requirements*

Not applicable

### 5.1.9 *Material, welding and fabrication requirements*

#### 5.1.9.1 *Materials*

**Specific requirement 37:** Structural steel shall be considered for the structure of the platforms.

**Specific requirement 38:** Any parts of the platform that contact a vacuum classed component such as the cryostat base (VQC2A) or lower cylinder (VQC2A) shall be made from vacuum compatible material (for example, SS 304). The list of acceptable material is listed in [5].

**Specific requirement 39:** The top of the platform shall be equipped of non slippery **stainless steel** floor plates this is to avoid any rust creation on surfaces where constant friction will be created.

**Specific requirement 40:** Generally while working in pit, the equipment used should not cause transfer of the following materials:

- a) Sulphur and sulphur compounds
- b) Pb, Hg, P, Zn, Cd, Sn, Sb, Bi, As, Cu, rare earth elements.

#### 5.1.9.2 *Tolerances*

**Specific requirement 41:** Fabrication and assembly tolerances shall comply with EN 1090.

#### 5.1.9.3 *Finishing*

Coatings of the Platform shall be compatible with cleaning with isopropyl alcohol and be robust and not flake or chip. No specific surface roughness is required. The painted surfaces are not to contact directly any IO Vacuum classed components.

However care must be taken to ensure that paint thickness does not prevent assembly of items, and ensure the marking is preserved for traceability.

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**Specific requirement 42:** The platforms shall be designed for use (indoors) and storage (outdoors) for up to 5 years at the IO site and therefore have appropriate corrosion protection for all components.

**Specific requirement 43:** Carbon steel fasteners are required to have a corrosion protection coating.

**Specific requirement 44:** A Surface Treatment Procedure shall be submitted for IO approval, to detail control of ambient conditions, method of application, quality control, repair processes, etc. Preference is for corrosion protection of carbon steel by painting, according to EN ISO 12944-3.

**Specific requirement 45:** For stainless steel parts methods to prevent surface contamination shall be taken.

**Specific requirement 46:** The coating chosen where there is a friction contact shall be carefully examined to avoid any peeling of material.

**Specific requirement 47:** Painting colour is Grey (RAL 7035 / Pantone 421) and to be in compliance with Table 2.

Surface preparation	Painting system	NDFT (µm)
All surface with scale, rust or other debris should be removed and washed with an alkaline detergent.	Epoxy Shop Primer	>40
	Epoxy Intermediate	>80
	Acrylic Urethane	>40
	Total Minimum Dry Film Thickness	>160

**Table 2 – Paint System**

### 5.1.10 Quality Control Provisions

**Specific requirement 48:** The contractor shall ensure that the design is safe for man access and heavy loading at height and propose the associated necessary controls.

### 5.1.11 Spare Parts

**Specific requirement 49:** The platforms will be assembled at the FAT, subsequent to that the Contractor shall supply the necessary set of new bolts for the final assembly on the IO site.

**Specific requirement 50:** The Contractor shall propose the applicable list of spare parts allowing the IO to replace some damaged parts in a quick manner.

### 5.1.12 Packing, preservation & shipping

The platforms shall be designed or packed to allow transportation from supplier manufacturing facilities to IO site via standard road transport, therefore meeting requirements for road transportation for each of the countries it will pass through to arrive at IO site.

**Specific requirement 51:** The platforms shall be designed and packed to be transported to IO site via standard road/sea transport.

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**Specific requirement 52:** All components and assemblies packed for shipping shall have a unique identification that allows traceability.

**Specific requirement 53:** All components requiring re-assembly at the ITER Site shall be clearly labelled and tagged. Minimum pre-assembly shall be foreseen.

**Specific requirement 54:** The supplier shall design and supply appropriate packaging, adequate to prevent damage during shipping. Where necessary, shock absorbing material shall be used. Measures shall be taken by the contractor to prevent corrosion of components when in storage prior to delivery, and during transportation.

**Specific requirement 55:** Packaging should allow for lashing and lifting.

**Specific requirement 56:** Packaging should be designed for all planned modes of transportation and for storage outside up to one month.

**Specific requirement 57:** All components and assemblies shall have a unique identification that allows traceability, format to be accepted by IO see [1]. All components and the main subcomponents shall be clearly marked in a permanent way and in a visible place.

### 5.1.13 Delivery Time

The maximum expected duration from the contract signature to the supply of the scope of work is 8 months for design + manufacture and delivery.

## 6 Location for Scope of Work Execution

The Contractor can perform the work at their own location

## 7 IO Documents & IO Free issue items

No free issue item is expected from IO

## 8 List of deliverables

The Supplier shall provide IO with the documents and data required in the application of this technical specification, the GM3S Ref [1] and any other requirement derived from the application of the contract.

You can find here below a minimum list of documents, but not limited to, that are required within the expected timing:

Technical Design Family (TDF)	Generic Document Title (GTD)	Expected Timing (T0+X) *
Contract Start	Quality Plan	2
Contract Start	Detailed Schedule	2
Design	Structural Analysis Repot (DRAFT)	10
Design	Health and Safety Risk Assessment (DRAFT)	10
Design	Interface Definition Document including loading (DRAFT)	10
Design	Updated 3D model	10
Manufacturing Design	Structural Analysis Repot (APPROVED)	18

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Manufacturing Design	Health and Safety Risk Assessment (APPROVED)	18
Manufacturing Design	Interface Definition Document including loading (APPROVED)	18
Manufacturing Design	Updated 3D model (APPROVED)	18
Manufacturing Design	Manufacturing Drawings	18
Manufacturing Design	General assembly drawings	18
Manufacturing Design	User Manual (DRAFT)	18
Manufacturing Design	Manufacturing and Inspection Plans (MIP) including hold and witness points	18
Pre-Delivery	User Manual (APPROVED)	30
Pre-Delivery	Factory Acceptance Test Report (if necessary)	30
Pre-Delivery	Inspection Reports (material certifications according to EN10204, NDT tests, completed MIP, visual inspection, dimensional inspection)	30
Pre-Delivery	Release Note	30
Pre-Delivery	Packing List	30
Pre-Delivery	Bill of Materials (BOM)	30
Pre-Delivery	Declarations of conformance	30

(\*) T0 = Commencement Date of the contract ; X in weeks.

Supplier shall prepare their document schedule based on the above and using the template available in the GM3S Ref [1] appendix II.

## 8.1 Contract Milestones

Ref. Milestone	Deliverable	Due date
M1	Kick off meeting	T0
M2	Detailed Design Review	T0 + 10 weeks
M3	Manufacturing Readiness Review	T0 + 18 weeks
M4	FAT Report	T0 + 25 weeks
M5	Delivery to Site	T0 + 30 weeks

## 9 Quality Assurance requirements

**Specific requirement 58:** The main equipment (except off the shelf items classified QC4) provided under this contract is QC3. Ref [1] GM3S section 8 applies in line with the defined Quality Class.

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**10 Safety requirements**

No specific safety requirement related to PIC and/or PIA and/or PE/NPE components.

**10.1 Nuclear class Safety**

Not applicable

**10.2 Seismic class**

No specific safety requirement related to PIC and/or PIA and/or PE/NPE components apply  
Eurocode 8 will be applied for investment protection.

**11 Specific General Management requirements**

Requirement for [1] GM3S section 6 applies in full

**11.1 Contract Gates**

The Contract Gates shall be as follows;

*11.1.1 KOM*

The Kick-Off Meeting (KOM) is the first contract gate. The CRO organises the meeting with support of PRO no later than one (1) month after the Contract enters into force, unless agreed differently between the parties. The Contractor representatives, IO CRO and IO PRO shall prepare the KOM using the KOM template as available in Appendix III. This document will be signed by the attendees and capture the KOM review discussions and decisions if any. The Contractor Representatives, including Sales representative who participated to the Contract negotiations, IO CRO, IO PRO constitute the minimum attendees to the KOM and shall be completed with (partial) attendance of relevant personnel from both Parties, like but not limited to technical specialist, QA, OHS, SRO, Safety, Logistics, Document Control representatives.

For any contract above 1M euros, the KOM has to take place face to face at ITER premises unless agreed differently by the parties. For any contract below 1 M euros, the KOM can take place remotely. The Contractor shall submit at minimum one week before the KOM the following document in advanced draft (when applicable but not limited to) : Contract Management plan, Contract implementation Schedule, Documentation Schedule, QA plan, safety risk assessment documents.

*11.1.2 Detailed Design Review*

The design review at IO is a meeting where a panel of selected people with different expertise will assess if the design developed by The Contractor is meeting the criteria established in the specification. A list of actions will be raised during the meeting will be included in the panel report after the review and communicated to The Contractor for consideration.

**Specific requirement 59:** The Design reviews should last maximum 3 hours. All requirements shall be reviewed in sufficient detail to show how they are met.



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**Specific requirement 60:** The Supplier shall provide the design documentation 1 week prior the design review.

### *11.1.3 Manufacturing Readiness Review*

The manufacturing readiness review is key to ensure that all requirements are met prior to start the manufacturing.

The MRR shall review that all documentation has been prepared to commence manufacture and that all comments/actions from the Detailed Design Review have been addressed.

It shall verify that all manufacturing activities have been planned and prepared to ensure that the work can be accomplished as specified.

Following the approval of MRR, the Contractor will manufacture, test, and trial assemble the platforms.

### *11.1.4 FAT*

**Specific requirement 61:** The Contractor shall develop the FAT procedure at the MRR stage for IO approval. This shall list the tests with criteria for acceptance.

**Specific requirement 62:** The Contractor shall perform the assembly of the platform and any applicable inspection and test.

**Specific requirement 63:** The Contractor shall test the on-site assembly strategy (for the position where no direct overhead crane access is available) during the FAT and upload the FAT report to IDM on completion of the tests.

## **11.2 Work Monitoring**

**Specific requirement 64:** The Contractor shall schedule and run a weekly meeting detailing the status of progress on the overall plan, share difficulties and updates.

**Specific requirement 65:** The Contractor shall upload to IDM the revised schedule on a monthly basis should there be variations. The variations shall be explained at the progress meeting.

## **11.3 CAD design requirements**

This contract requires for CAD activities, [1] GM3S section 6.2.2.2 applies