

Technical Specifications (In-Cash Procurement)

Technical Specification for Installation Tooling Under PF5 Coil

This is the Technical Specification for Lifting Tooling for lighter parts and components under PF5 Coil, lifted from floor to ceiling. The concept presented assumes it is on access scaffolding shared with workers. The contractor is free to propose other options. The scope of supply includes one set of tools for test and in pit use, with additional sets optional, plus one set of scaffolding (if the final concept includes scaffolding) for test only. No in-pit scaffolding is included in this ...

SUPPLY

Table of Contents

1	PREAMBLE	3
2	PURPOSE.....	3
2.1	Lifting Environment and Usage	6
2.2	Loads and Load Rating	12
3	ACRONYMS & DEFINITIONS	12
3.1	Acronyms	12
3.2	Definitions.....	13
4	APPLICABLE DOCUMENTS & CODES AND STANDARDS.....	13
4.1	Applicable Documents	13
4.2	Applicable Codes and Standards.....	14
5	SCOPE OF WORK.....	15
5.1	Scope of Supply	15
5.1.1	Description	15
5.1.1.1	Out of the scope of supply	16
5.1.2	Planning, Processes and Management	16
5.1.3	Loads and Test Requirements	17
5.1.4	Manufacturing Requirements.....	17
5.1.5	Quality Assurance Requirements.....	19
6	LOCATION FOR SCOPE OF WORK EXECUTION	19
7	IO DOCUMENTS & IO FREE ISSUE ITEMS.....	19
8	DELIVERABLES AND SCHEDULE MILESTONES	19
8.1	Schedule: Firm and Optional Scope.....	19
8.2	List of Deliverables and Due Dates	19
8.3	List of deliverable documentation.....	20
8.3.1	Kick off Meeting	20
8.3.2	Conceptual Design Review (CDR)	21
8.3.3	Final Design Review (FDR)	21
8.3.4	Manufacturing Readiness Review (MRR)	22
8.3.5	Deliverables Required for Shipment.....	22
9	QUALITY ASSURANCE REQUIREMENTS.....	23
10	SAFETY REQUIREMENTS.....	23
11	SPECIAL MANAGEMENT REQUIREMENTS	24
11.1	Work Monitoring	24

SUPPLY

11.2 Meeting Schedule.....25

11.3 CAD design requirements25

SUPPLY

1 Preamble

This Technical Specification is to be read in combination with the General Management Specification for Service and Supply (GM3S) – [R1] that constitutes a full part of the technical requirements.

In case of conflict, the content of the Technical Specification supersedes the content of [R1].

2 Purpose

Images in this section are intended to show functionality. The proposed solutions will not necessarily look similar.

This document is a Technical Specification for the design and procurement, plus any customization / manufacturing required, of lifting equipment for handling of parts up to 150kg, between floor and “ceiling” at up to 5m. This equipment is used around the full circumference of tokamak pit, under the PF5 Coil*, centred on each of the PF5 Coil Clamps. There are 18 PF5 Coil Clamps. The zone of work and equipment used in the zone is referred to here as a “segment”.

*PF is the abbreviation for Poloidal Field. For this Technical Specification it is not necessary to understand the nature or purpose of the magnetic coils; PF5 serves as the ceiling, with some irregularities such as threaded studs protruding from it.

Due to space constraints, it is assumed that lifting equipment will be on scaffolding, with installation technicians, at a height suitable for installation on the ceiling. This technical specification defines the requirements for lifting means to get parts from floor to working scaffold platform, and lifting means to get from platform to ceiling.

One segment of scaffolding is included in the scope. Scaffolding shall respect the requirements of the French arrete 21 December 2004 and recommendation R408. It is to be justified by a detailed calculation note or by the manufacturer manual.

Tooling and scaffolding shown in this tech spec are for illustration only. Other equipment and proposals for getting parts and workers to the required height can be proposed.

Figure 1 shows examples of tooling parts to be handled with this lifting equipment. Installation of the Rail System (green ring, in 18 segments, 3 shown) is one of the main uses. The heaviest part to be handled weighs about 140kg.

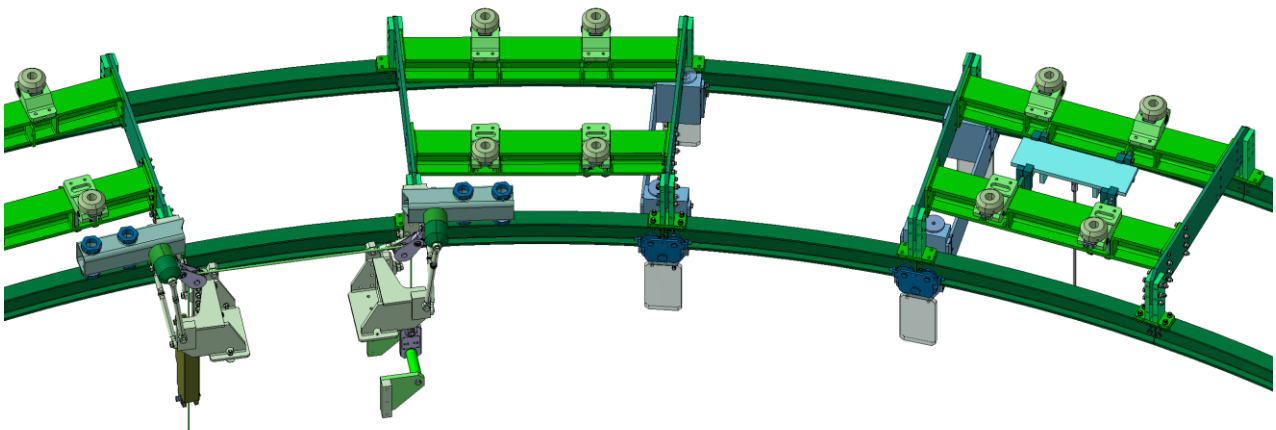


Figure 1: Installed Tooling, Examples

SUPPLY

Figure 2 shows the Rail System attached under the PF5 Coil (light brown, this is the “ceiling” referred to in this doc), with a simplified environment.

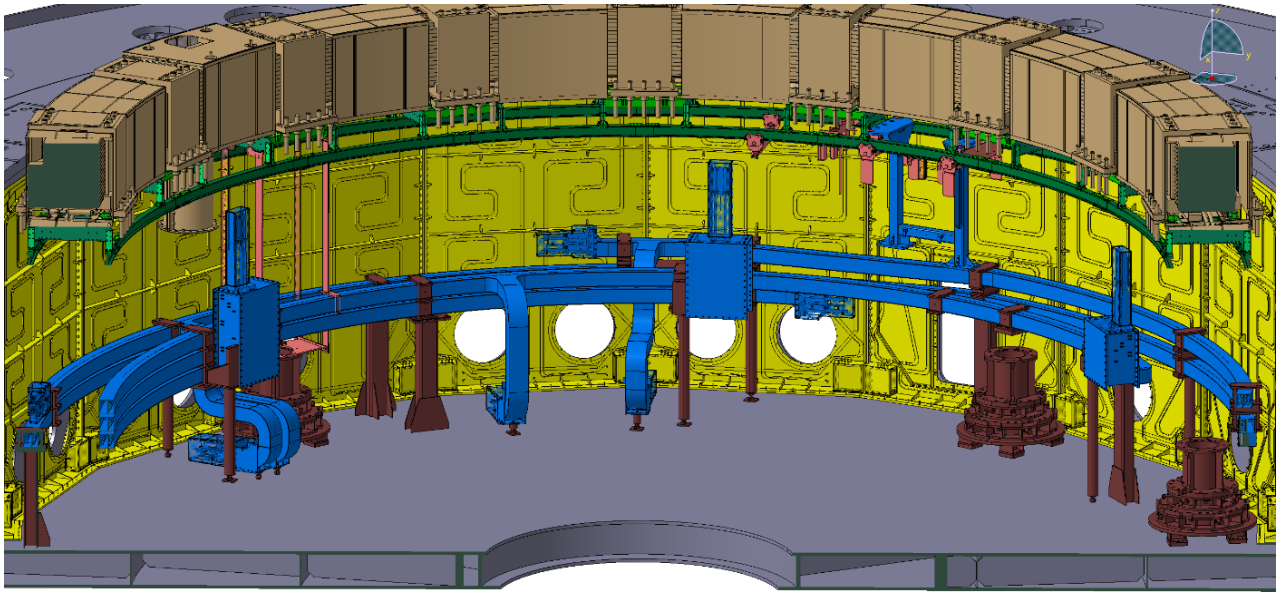


Figure 2: Rail System to be Installed, in Simplified Environment

Scaffolding is assumed at all 18 positions / segments around the pit. Generally, an independent scaffolding will cover each 20° segment, and these segments will be erected between the Feeder Rings (shown in blue below PF5 and Rail System in Figure 2). The scaffolding can be 0.7m wide to fit between Feeder Rings, and 2.0m or 2.5m long depending on the local environment at each location. Scaffolding sections may be “bridged” to allow workers to remain at the top level, rather than climb up and down every time. One scaffolding segment for use in test environment, 0.7m wide x 2.0m long, is included in the scope of supply. All other scaffolding sections used in the pit are out of scope.

Lifting equipment shall be usable at all positions, and moved between segments as necessary. No overhead crane access is available for movement of lifting equipment. Process for disassembly, reassembly and movement of this equipment is included in the scope of supply, including any additional equipment required for these operations.

Solutions proposed are expected to be stable with support from the floor, however alternative solutions can be proposed with attachment to PF5 ceiling studs for stability or bracing.

Figure 3 shows a worker on a scaffolding platform under the PF5 Coil ceiling. This image gives a better idea of the working space available in this area.

SUPPLY

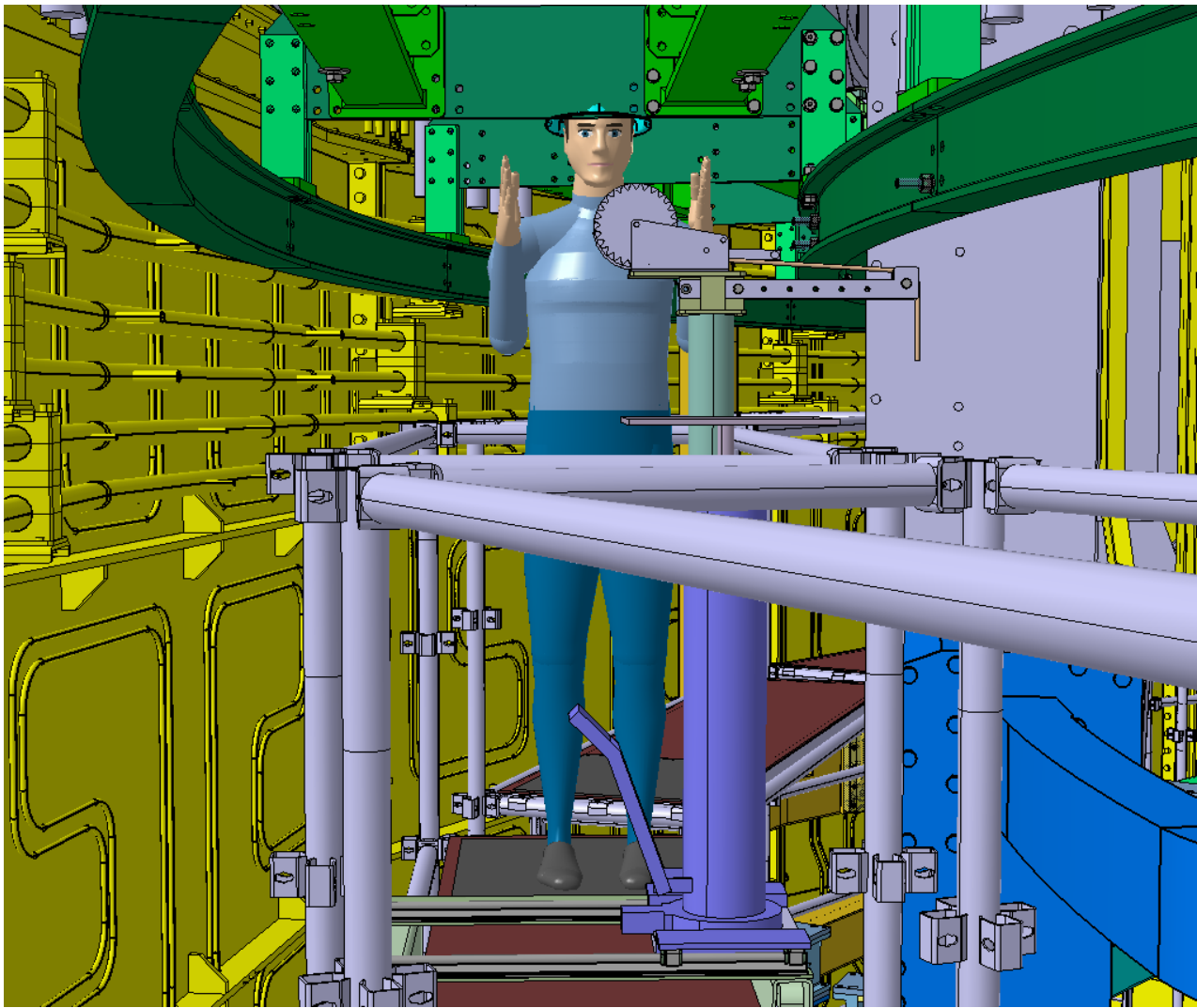


Figure 3: Working Space Available under PF5 Coil

Note that in Figure 3 and model provided, the scaffolding is modelled with some simplifications; for example, toe-boards are not shown, nor are cross braces. The scaffolding and tooling provided shall be usable with standard PPE (Personal Protection Equipment) and fully compliant with applicable regulations.

Several variations of scaffolding will be required. In addition to the length difference above, Figure 4 shows an example of a variant rotated 90° with upper and lower levels staggered. Platforms in these segments are 0.7m wide and 1.5m long. The lifting equipment defined in the scope of this technical specification shall be compatible with all foreseen scaffolding variants.

SUPPLY

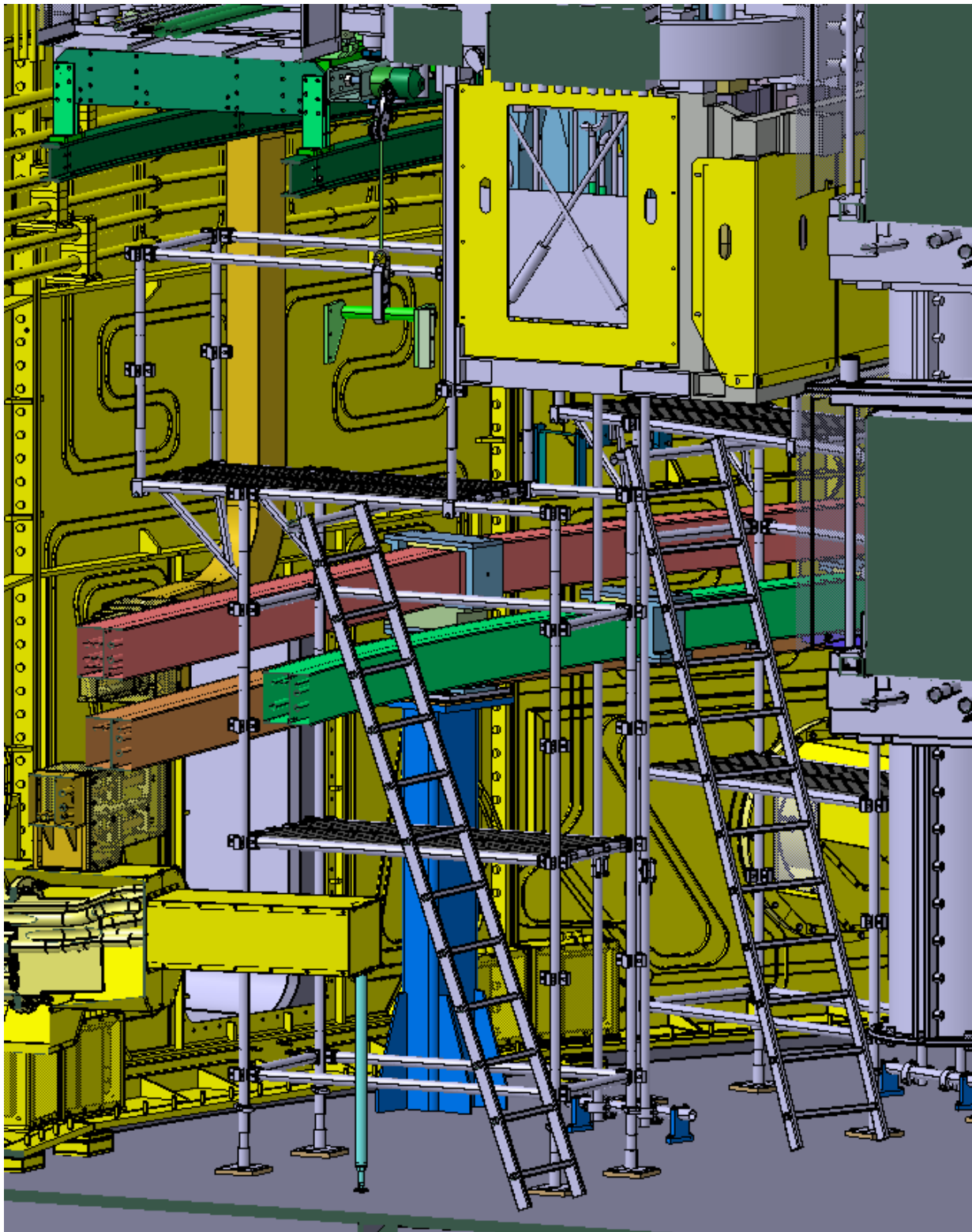


Figure 4: Scaffolding Variations, Rotated Example (simplified, for illustration)

2.1 Lifting Environment and Usage

This tooling is for use in the lower tokamak pit, under the main tokamak machine, referred to as B2 (Second Basement Level) level in pit. Parts – components, tooling and scaffolding pieces – will be lifted to this area using the main cranes through the central machine bore, or through access doors at the same level from outside the tokamak pit. The central machine bore is 4m in diameter; parts

SUPPLY

involved in this technical specification are generally much smaller so bore size is not expected to be a limiting factor. Pallet jacks or other means will be used to move parts from here to the location required for lift to ceiling.

The lift from floor to ceiling is illustrated in two steps; first crane hoist attached on scaffolding platform to lift from floor lifting table, and then telescoping lifting table up to ceiling. The crane hoist is assumed to rotate on its axis to bring parts from outside of the scaffolding structure to the lifting table on the inside. The tooling allows the lifting table to be translated horizontally in both directions (X and Y) in order to bring the parts to their final location.

See Figure 5 for the typical environment at lifting location. Note that the Toroidal Field (TF) Terminal Boxes are about 3.5m above the floor and the Feeder Rings about 1.5m above the floor. In general, parts will be lifted from the area indicated. In some locations, the lift area may be to the side, or behind also. In this configuration, the lift area is mainly between 300mm and 500mm inside the access scaffolding. For lifts from sides or behind scaffolding, the lift range shall start near the edge of the scaffolding.

The scope of tooling in this contract starts with lifting the part off the floor or off the transport tool in the lift area.

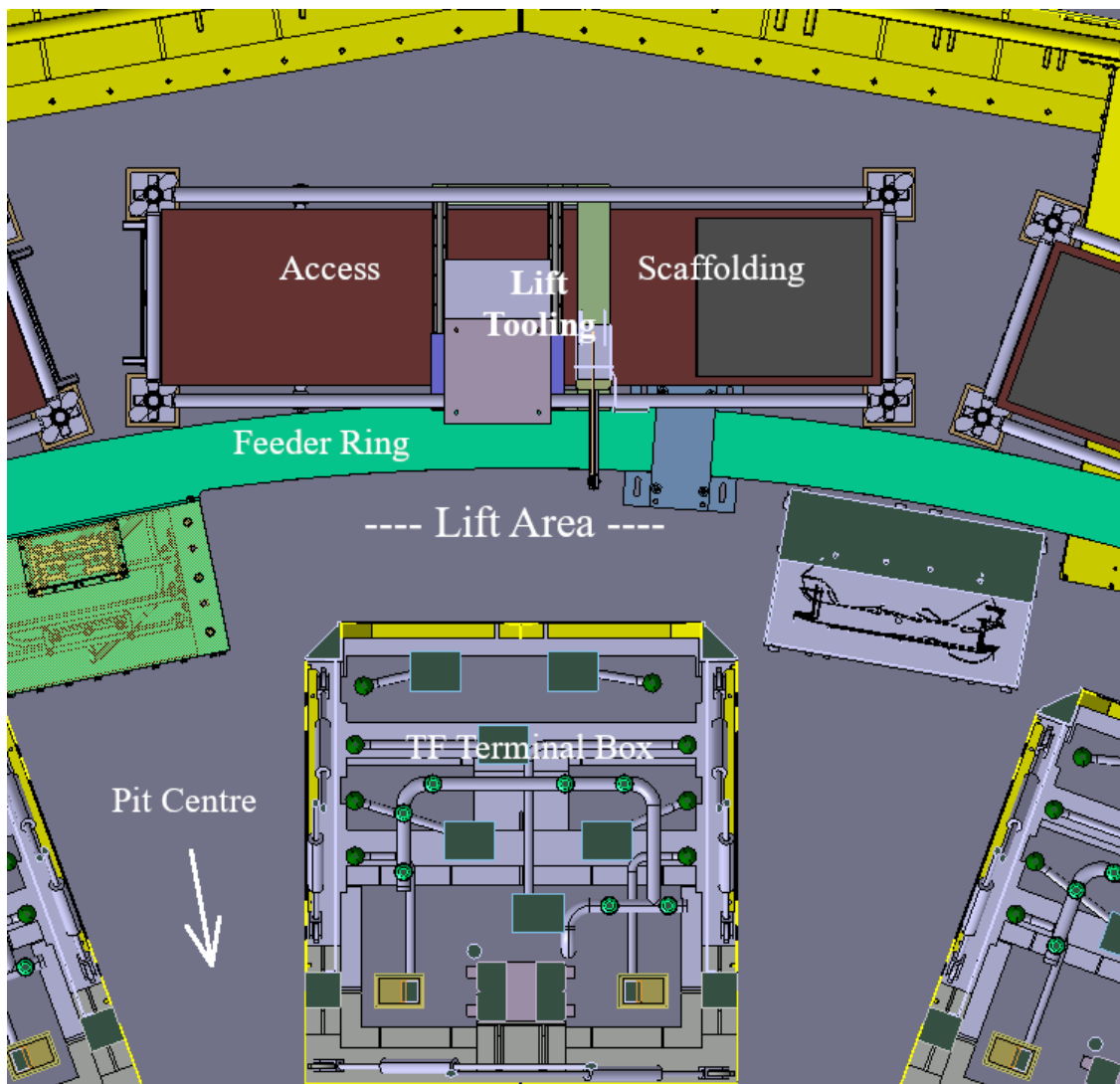


Figure 5: Lift Environment

SUPPLY

Figure 6, left, shows a part lifted up to the table and rotated around to land on the table (both positions shown superimposed). The part shown is the largest and heaviest part (~140kg) that will be lifted with this tooling. Figure 6, right, shows this part lifted up to the ceiling height (ceiling not shown), for assembly to parts previously installed. The maximum load on scaffolding ledgers needs to be carefully evaluated for this load case.

Note that the part is shown rotated 90° from crane hoist to lifting table, and needs to be rotated an additional 90° into final position. This illustration assumes that the table can also pivot as needed.

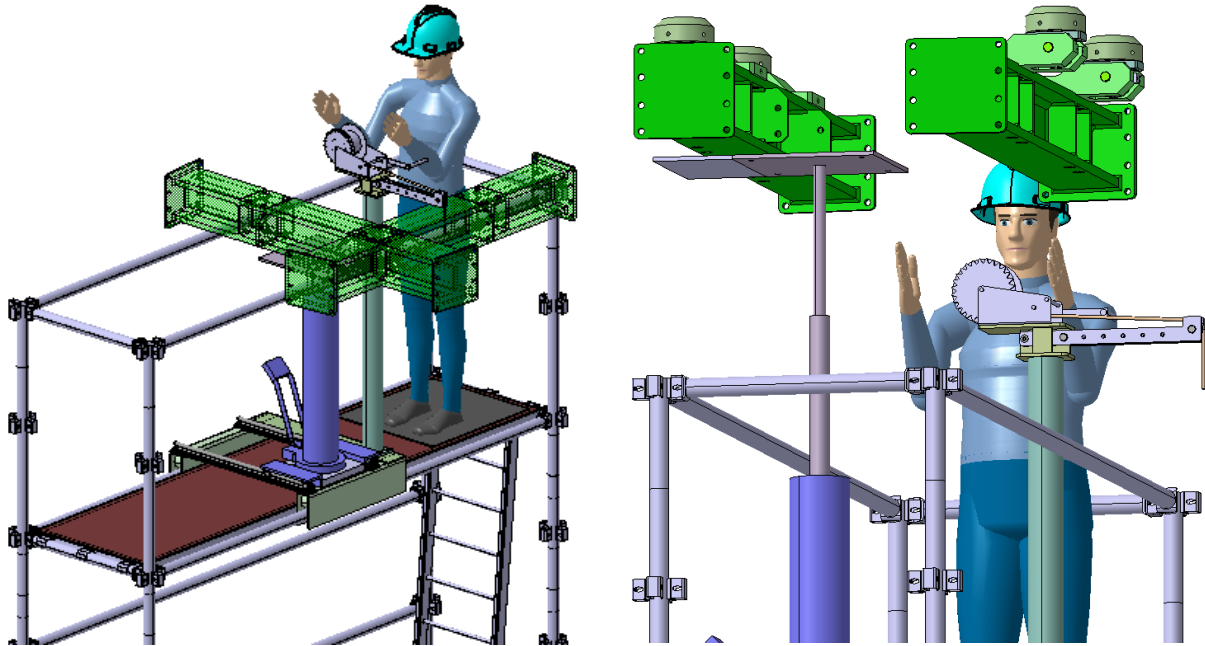


Figure 6: Part Lift Example, Large Beam

The lift table is shown with an extension on one side to get the part to its final position, which could be outside of scaffolding footprint, depending on the local environment at each position. Approximate distances to part centre lines to scaffolding ledger bars for a typical segment as shown in Figure 7. The rails (curved parts at top and bottom of Figure 7) will also be installed with this tooling, however, these are light (<25kg) and can be lifted by hand from crane hoist, with safety steps attached as required. Note that in certain locations – where scaffolding is rotated, for example – it may be necessary to move the scaffolding to install parts on the ends.

Two workers are expected to be on the scaffolding platform in addition to this tooling where possible. Workers may need to cross from one side to the other of the lift tooling.

SUPPLY

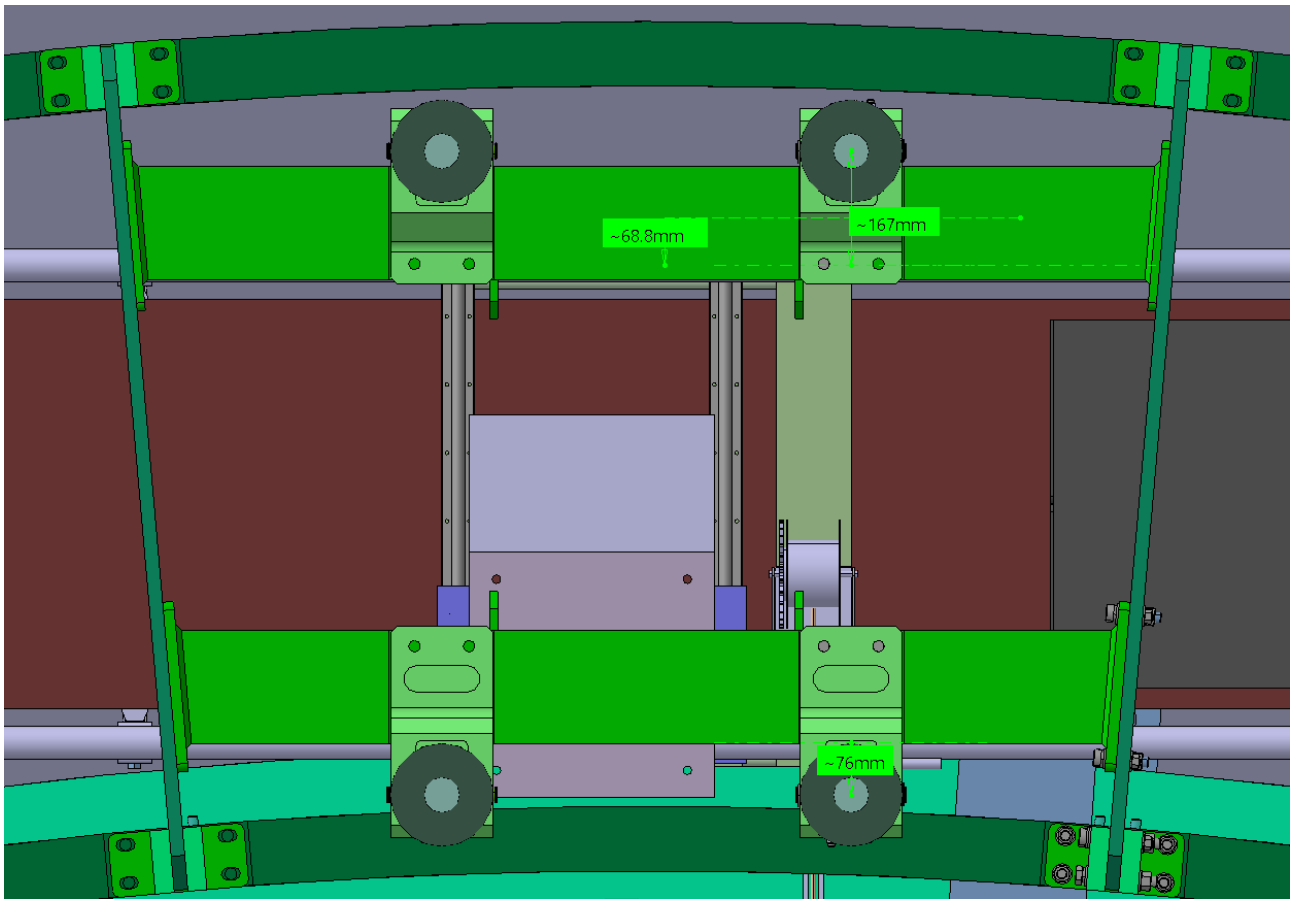


Figure 7: Parts Overhanging Scaffolding, Distance to Bar Centre Line

Note that Figure 7 shows the nominal overhang distance. Some margin for scaffolding placement and tolerance has been added to this in section 2.2.

Figure 8 shows another example of smaller parts lifted into place on lifting table. Lifting table needs adequate precision to be able to align parts and attach. This also assumes the lift table is extended in one direction to reach the installation position.

SUPPLY

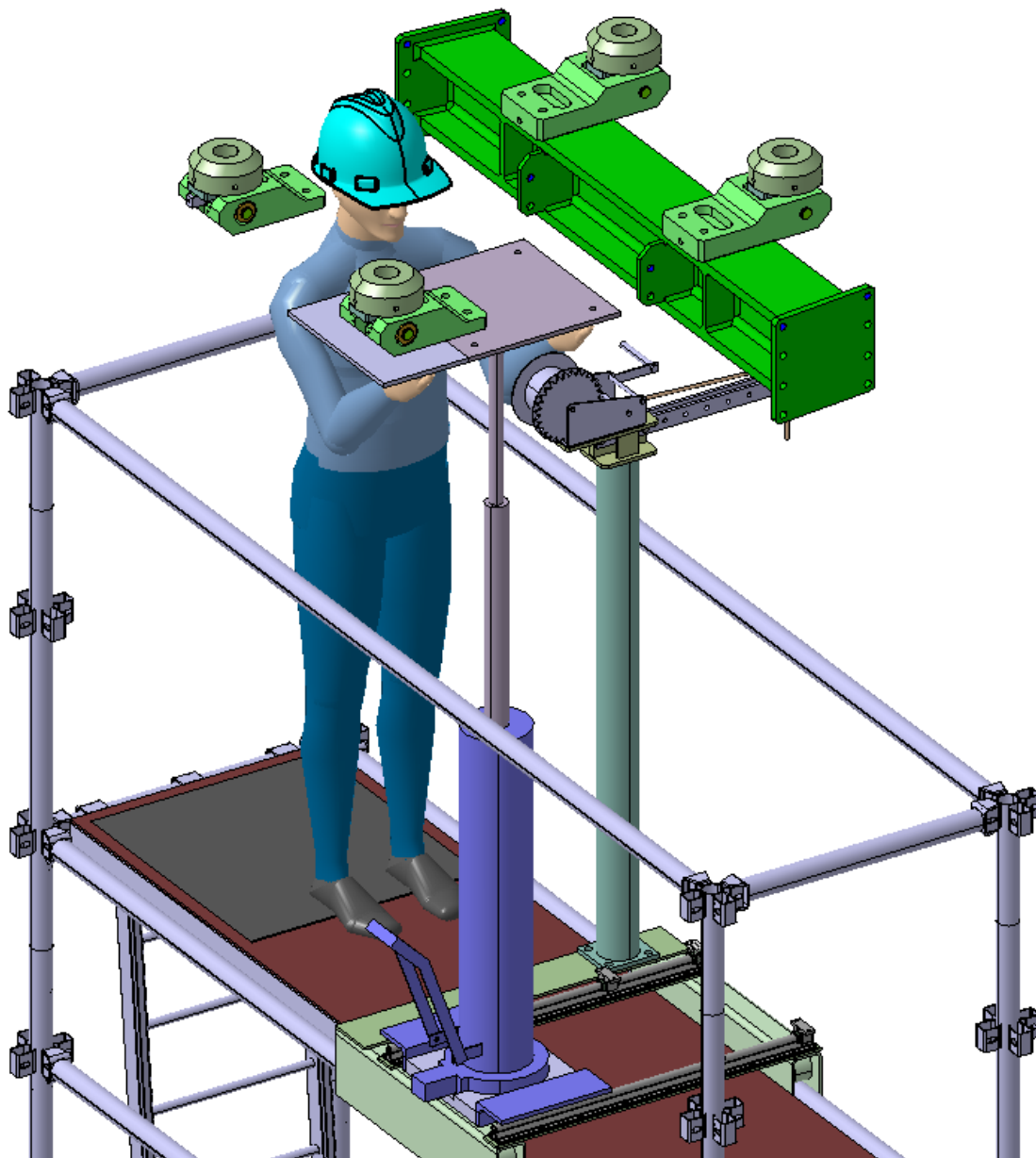


Figure 8: Part Lift Example, Small Parts

The equipment defined in this Technical Specification will be used to install a tool inboard of the main rail tooling. This is shown in Figure 9. Its centre of mass is located approximately 0.3m out of the scaffolding footprint on the inside. The largest part to handle in this location weighs a bit less than 100kg and is attached close to the ceiling – there could be some space to grip the part from the top, but not enough to hoist from above.

For illustration, this tooling is shown assembled from an extension on the scaffolding, and the lifting table moved onto this extension. Other options can be proposed such as balance beam, 0g arm, etc.

If the solution provided uses the scaffolding extension, the extension is in the scope of scaffolding supply for one test scaffolding segment.

SUPPLY

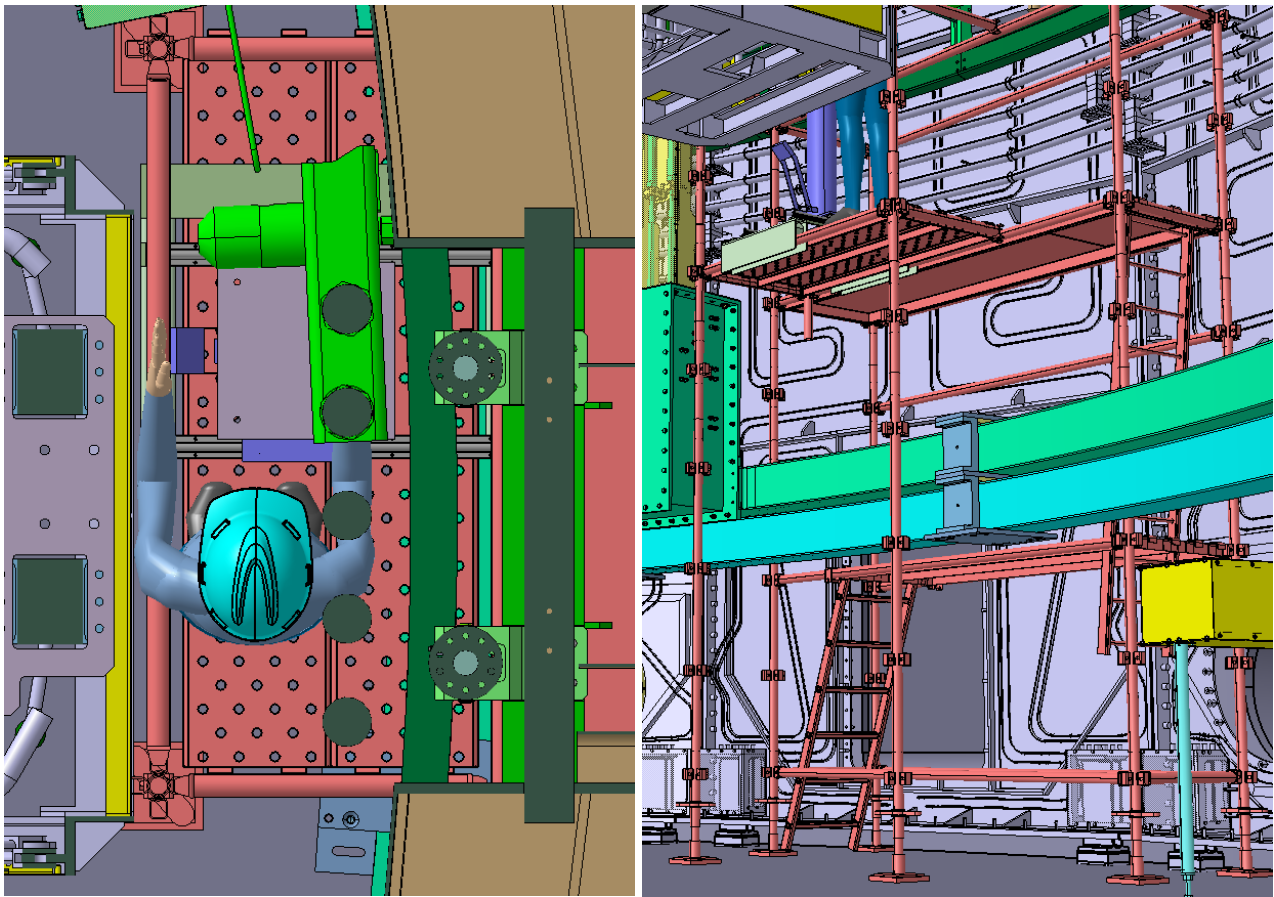


Figure 9: Additional Parts Installed Inboard

Figure 10 shows the main parts to be installed using this equipment, in green.

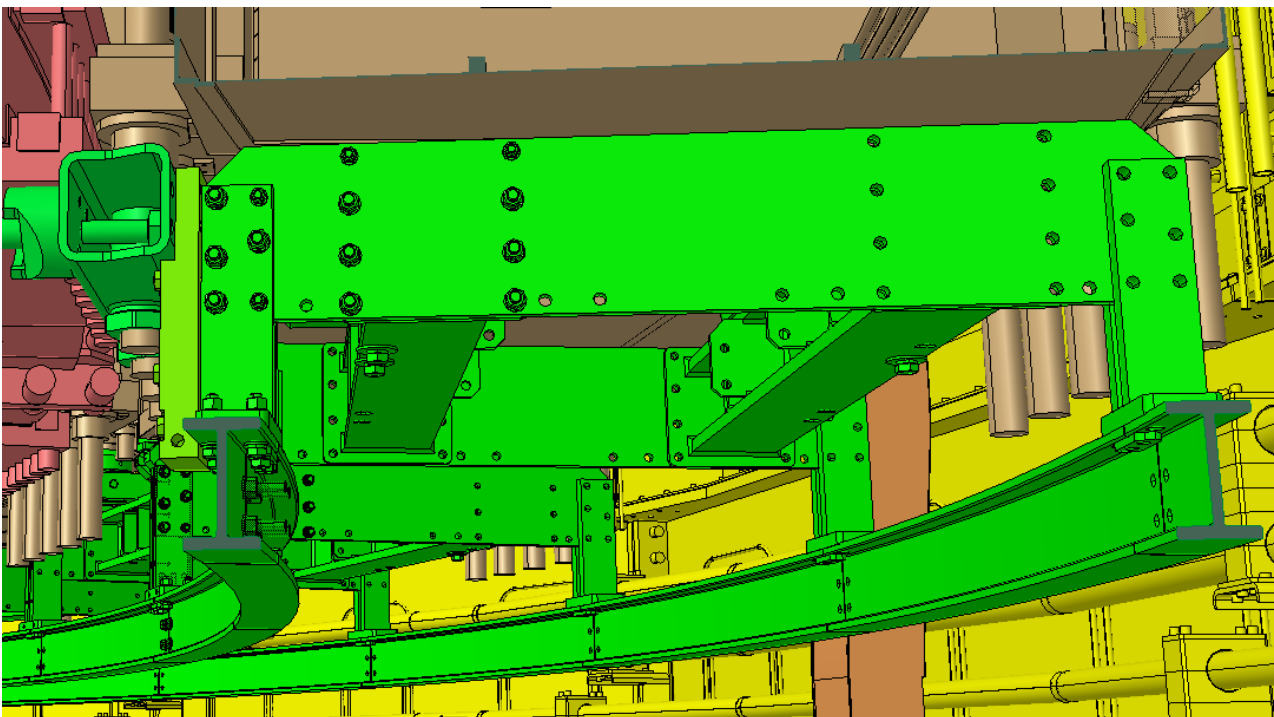


Figure 10: Main Components Installed with Environment

SUPPLY

2.2 Loads and Load Rating

Anticipated maximum mass of parts to be handled by lifting equipment and scaffolding are as follows;

- 150kg up to 100mm outside of scaffolding footprint, based on concept presented for illustration.
- 100kg up to 400mm outside of scaffolding footprint, based on concept presented for illustration.

Maximum masses include 10kg for lifting lugs, slings, etc.

The requested load rating for this equipment is as follows;

- 250kg up to 100mm outside of scaffolding footprint, based on concept presented for illustration.
- 150kg up to 400mm outside of scaffolding footprint, based on concept presented for illustration.

Some compromise load rating between maximum anticipated loads and requested load rating is permitted, and shall be clearly stated in offer.

3 Acronyms & Definitions

3.1 Acronyms

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

Abbreviation	Definition
CDR	Concept Design Review
CE	Conformité Européene
FAT	Factory Acceptance Test
FDR	Final Design Review
GM3S	General Management Specification for Service and Supply
IO	ITER Organization
MD	Manufacturing Dossier
MIP	Manufacturing and Inspection Plan
NDT	Non-Destructive Testing
PNI	ITER Part Number
QC	Quality Class (1, 2, 3, or 4)
SAT	Site Acceptance Test
WLL	Working Load Limit
WPS	Welding Procedure Specification

SUPPLY

3.2 Definitions

Contractor: shall mean an economic operator who have signed the Contract in which this document is referenced.

Throughout this document, the following terminology shall apply:

- “shall” is used wherever a provision is mandatory (it is a requirement). The IO RO shall be informed of any deviation.
- “should” is used wherever it is necessary to express recommended or preferred provisions, deviations are allowed but they shall be justified to the IO RO.
- “may” is used to expressed allowed provisions or potentialities.

Tooling Classifications	Class
Safety Classification	Non-SIC (Safety Important Component)
Protection Classification	Non-PIC (Protection Important Component)
Vacuum Classification	N/A (no vacuum equipment)
Quality Classification	QC-1
Seismic Classification	NSC (Non Seismic)

4 Applicable Documents & Codes and Standards

4.1 Applicable Documents

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

This Technical Specification takes precedence over the referenced documents. In case of conflicting information, it 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
[R1]	General Management Specification for Service and Supply (GM3S)	82MXQK	1.4
[R2]	3D model reference (enovia ID; SCAFFOLDING_LIFTING_TOOL_CC_FEEDER-RINGS_B2#WP#AE6KND)		---
[R3]	ITER Procurement Quality Requirements	22MFG4	
[R4]	Design Review Procedure	2832CF	
[R5]	Applicable Codes, Standards and Regulations for the Design of the Machine Assembly Tools	D3Q5XP	2.1
[R6]	Release Note Template	QVEKNQ	
[R7]	Package & Packing List Template	XBZLNG	

SUPPLY

[R8]	Requirements for Producing a Quality Plan	22MFMW	
[R9]	Inspection Plan (IP) Template	QV7GQF	
[R10]	Deviation Request Template	2LRNQP	
[R11]	NCR Database - Introduction & How to	SM2JWP	
[R12]	Inspection Plan (IP) Template	QV7GQF	

4.2 Applicable Codes and Standards

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

The equipment designed, manufactured and tested shall be in accordance with the latest applicable codes and standards and regulations. The applicable version of the codes and standards and regulations shall be defined at the start of the contract.

As part of the CE marking process, the Supplier shall provide the list of the applied codes and standards used in the design.

Examples of standards that may be applicable to the equipment to be procured within the scope of this Technical Specification are:

Ref	Title
CS1	Eurocode 0 - Basis of Design: NF EN 1990
CS2	Eurocode 3 - Design of Steel Structures: NF EN 1993
CS3	Supporting Structure – EN 1090-3 (Execution of steel structures and aluminium structures - Part 3: technical requirements for aluminium structures), which in turn applies the Eurocode 9: design of aluminium structures (EN 1999-1-1 General structural rules).
CS4	Safety of machinery - General principles for design - Risk assessment and risk reduction: NF EN ISO 12100
CS5	NF A50-630-2, NF EN 755-2 of 2016-04-23 Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties
CS6	Lifting accessories standard EN 13155
CS7	Lifting table standard EN 1570-1

For welds, NDT and qualification of welders the following shall be applied:

CS8	EN 15614 - Specification and qualification of welding procedures for metallic materials, welding procedure test, arc and gas welding of steels and arc welding of nickel and nickel alloys
CS9	EN 287 - Qualification test of welders. Fusion welding. Steels
CS10	EN ISO 9712 - Non-destructive testing - Qualification and certification of NDT personnel General principles

SUPPLY

CS11	EN ISO 5817 - Level of imperfections in welded joints (equal or superior to level C)
------	--

5 Scope of Work

This section defines the specific scope of work, in addition to the contract execution requirement as defined in Ref [1].

5.1 Scope of Supply

5.1.1 Description

The contractor is responsible for;

- The selection of lifting equipment to meet height, position and weight requirements. All equipment shall be CE Certified. Conceptual designs for various solutions shall be provided.
- Safety assessment of tooling and usage cases, meeting all applicable French and European safety requirements.
- The design of custom and/or customized equipment.
- Structural analysis of Custom / Customized equipment on scaffolding used.
- The manufacture, testing and CE certification of custom and/or customized tooling. Raw material procurement as required with material certificates.
- Design and supply of one scaffolding segment variation 0.7m wide x 2.0m long, with working platform height as required for compatibility with lifting equipment and work height. The scaffolding segment in the scope of supply is for use in test environment; no special material requirements. The segment shall respect the applicable regulations; for example, it must be fixed scaffolding to be used for lifting.
- The supply of one set of equipment above, including scaffolding (firm scope).
- The supply of additional sets of equipment above (optional scope, excluding scaffolding). IO reserves the right to purchase this equipment independently from manufacturers and machine custom parts as required.
- The configuration, supply and setup on site in test environment of one set of scaffolding and lifting equipment. (Setup may be with IO technicians working under contractor supervision, depending on permit to work.)
- Submitting and respecting the Schedule, Manufacturing plan, inspection / quality plan. These shall be updated as required during contract execution.
- Providing Maintenance / Test / Inspection procedure for tooling as required. Any testing and inspection required before delivery is in scope of supply. Any maintenance, testing or inspection included in the procedure to be performed after delivery is out of scope.
- Providing as built data for final acceptance.
- Identification of parts with PNI and Serial Number. Bill of Materials (BoM) contractor's identification shall be provided.

SUPPLY

- Part finishing as required; galvanization or painting with anti-rust primer and colour for steel parts, and anodizing of aluminium parts (if any). Lubrication as required with Molykote D-321 R lubricant.
- Packaging and protection for shipping and storage, and any preservation requirements. Packaging design is in the supplier's scope. For purchased parts, manufacturers' packaging shall be provided unless agreed otherwise.
- Shipment of hardware to the IO site.

The equipment provided – as well as its design, documentation and custom tooling / fixtures used to manufacture it – will become the property of the IO upon delivery. Tooling and fixtures shall be stored and maintained by the contractor.

Solutions provided in offers will be evaluated based on their cost as well as cost of usage; time required to install / move / change the solutions and time savings during their use.

5.1.1.1 Out of the scope of supply

The contractor is not responsible for:

- Performing integrated structural analysis, considering the tool + the environment,
- The maintenance of the equipment on IO site,
- Any on site works other than the ones necessary as part of the delivery and warranty,
- SAT: Site Acceptance Test.

5.1.2 Planning, Processes and Management

[Req.1] Project planning, milestones and hold points shall be defined and agreed at the start of the contract, based on the preliminary plan below and planning provided in the offer. A summary of steps and milestones is listed below;

- Tender,
- Contract signature,
- Kick off Meeting – held at IO or remotely to launch work on contract,
- Weekly written reporting, highlighting progress and difficulties encountered,
- Technical and managerial progress meetings, generally by video conference,
- Conceptual Design Review – formal review of the proposed design options. CDR to be held remotely or at IO site.
- Final Design Review – formal review of the final design, ready for manufacturing. FDR to be held remotely or at IO site,
- Manufacturing Readiness Review,
- Manufacture,
- Factory Acceptance Testing,
- Delivery to IO,
- Warranty.

SUPPLY

5.1.3 *Loads and Test Requirements*

- [Req.2]** The manufacturer shall confirm that tooling design and manufacturing are adequate to meet load requirements defined in section 2.2, and adequate for conformance to French and European norms and CE certification as support structure. An Engineering Analysis Report confirming suitability of design to be submitted for FDR.
- [Req.3]** The manufacturer shall ensure that tooling can be safely assembled and moved between locations. Instructions for assembly, disassembly and movement shall be provided.
- [Req.4]** Design of equipment, and procedure for disassembly, reassembly and movement shall be such that minimum retesting is required after such changes.
- [Req.5]** Load testing, of parts and/or assemblies, shall be defined and conducted by the contractor in agreement with IO. The safety factor shall be determined by the code applied for the design; applying EN 1991-3, all pieces shall be tested to 125% WLL without permanent deformation and after removal of the force there shall be no visible defects.
- [Req.6]** Load testing shall be in compliance with all applicable French and European regulations, ensure fit for function, and be performed to ensure complete assembly will pass site acceptance testing (SAT). This includes at least; sample testing of any load bearing welds, and sample testing of threaded parts. Part deflection under load should be included as necessary. Preliminary Test Plan shall be submitted for FDR, and complete plan by MRR.
- [Req.7]** IO Representatives shall witness all testing performed, unless explicitly agreed otherwise.

5.1.4 *Manufacturing Requirements*

- [Req.8]** Prior to the start of manufacturing activities, all design issues shall be resolved, and it shall be verified that the equipment can be manufactured based on the final version of design approved by the IO.
- [Req.9]** Tooling in use shall be capable of achieving a final part positioning precision of $\pm 3\text{mm}$ in all directions.
- [Req.10]** Material compatibility is required based on usage of part and contact with machine components. In particular, the tool shall not cause transfer of the following materials;
1. Sulphur and sulphur compounds
 2. Pb, Hg, P, Zn, Cd, Sn, Sb, Bi, As, Cu, rare earth elements
 3. Halides

This requirement is primarily applicable to the lifting table, which could be used with tokamak machine components. Zinc plating is accepted for bolts and nuts to avoid galling. Flat washers and lock washers, shall be Stainless Steel. The scaffolding supplied in this contract is for use in a test environment only; this material compatibility requirement does not apply to it.

- [Req.11]** The tool material shall be certified according to EN 10204 type 3.1 (paragraph 4.1). Fasteners shall be certified according to EN 10204 type 2.1 (paragraph 3.1).

SUPPLY

[Req.12] The design of the machine assembly tools shall comply with the applicable Codes, Standards and Regulations which are defined in Ref. [R5].

[Req.13] The following welding documentation shall be retained by the Contractor and available for IO review;

- Procedures for the control of the welding program, which includes qualification of Welding Procedure Specifications, qualification and assignment of welders, filler metal control, control of welding work, specification of workmanship requirements, and other information related to the administrative control of welding.
- NDT procedures and inspector qualifications (can be subcontracted).
- Records of Welder Performance Qualification and updates/renewal of qualification for the welders who will be assigned to the work.
- Forms to document the production welding activities.
- Drawing(s) depicting examination surface configuration and the surface finish for pressure retaining and integrally attached welds and adjacent base material subject to volumetric examination shall be provided by the Contractor.

[Req.14] Manufacturing of first tool set and optional sets shall be considered. Any manufacturing tooling required in full for test segments shall be itemized in offer. Such tooling and/or material shall be considered IO property in the event that it needs to be transferred to another supplier after manufacturing of first set.

[Req.15] Parts from each set of tooling should generally be interchangeable. Parts may be matched if necessary to meet assembly tolerances, with serial numbers and tag numbers applied to individual parts according to matched assembly requirements.

[Req.16] Threads shall be formed / rolled, not cut, unless otherwise agreed for specific threads.

[Req.17] Extra pieces shall be supplied to ensure minimal risk of downtime. This applies primarily to, but is not limited to, fastening hardware. Spare quantities shall be agreed by FDR.

[Req.18] Painting, galvanizing or other protective coating will be required. Specifications and/or colour to be agreed with IO to meet tool schedule needs. Break sharp edges and corners, burrs, etc. before painting. Painting shall be according to C3 system of ACQPA (association pour la certification et la qualification des peintures anticorrosives) or similar.

[Req.19] Parts shall be delivered free of any dirt, oil, cutting fluids, etc. Excessive weld spatter shall be removed before painting. Supplier shall provide cleaning procedure, ensuring no transfer of material listed in [Req.10] to the ITER machine. Cleaning based on EN 12300 standard is recommended.

[Req.20] Parts shall be identified with the following information;

1. ITER part number (PNI), as specified in BoM.
2. Tag number, as specified on drawing.
3. Serial number.
4. Parts may include a manufacturer part number also.

SUPPLY

Identification shall be engraved preferentially, when possible, or using a label otherwise, particularly for painted parts. Identification shall be visible after assembly. Letters shall be 1cm tall.

[Req.21] The Manufacturing Dossier, defined in section 8.3.5, shall be submitted before shipment.

[Req.22] Packaging shall be appropriate for storage outdoors subject to all weather conditions at ITER site throughout the year. Any storage limits shall be noted in Preservation Plan.

[Req.23] Packaging size, weight and handling shall be defined and agreed with IO by FDR. Time required to unpack and setup from storage and disassemble and repack for storage shall be considered in packaging design.

[Req.24] All shipments shall be accompanied by Bill of Materials, Packing List, and any other documentation necessary for delivery to IO Site.

5.1.5 *Quality Assurance Requirements*

6 Location for Scope of Work Execution

The Contractor can perform the work at their own location.

Scaffolding shall be set up at IO site by contractor, or subcontracted to IO scaffolding contractor.

7 IO Documents & IO Free issue items

See applicable documents section 4.1, to be delivered at start of contract execution.

No free issue item is expected from IO.

8 Deliverables and Schedule Milestones

8.1 Schedule: Firm and Optional Scope

The Supplier shall produce a detailed Schedule showing all phases of the Contract and showing how the overall IO Schedule will be complied with. This detailed Schedule shall be submitted to the IO for approval/acceptance, before starting any work in relation to the Contract. The schedule shall cover the following;

- 1) Firm Scope. Supply of one set of tooling and scaffolding. This will be used primarily for testing and process development.
- 2) Optional Scope. Supply of additional sets of tooling (without scaffolding). The lead time and cost of additional sets of tooling to be included in quote.

8.2 List of Deliverables and Due Dates

The maximum expected duration from the contract signature to the supply of the scope of work is 6 months. The expected schedule is as shown in Table 1 below:

SUPPLY

Schedule Milestones	Description	Contract Gate	Expected Timing (T0+x)
D1	Kick Off Meeting 1 (T0)	Y	
D2	Conceptual Design Review	Y	T0 + 4 weeks
D3	Final Design Review	Y	T0 + 8 weeks
D4	Manufacturing Readiness Review	Y	T0 + 12 weeks
D5	Shipment Documentation Delivery	Y	T0 + 22 weeks
D6	Delivery	Y	T0 + 24 weeks

Table 1 List of Deliverables and Due Dates

T0 = Date of Kick off Meeting

8.3 List of deliverable documentation

The Supplier shall provide IO with the documents and data required in the application of this technical specification, the GM3S Ref [R1] and any other requirement derived from the application of the contract.

The contract is divided into three phases; preliminary design, final design and manufacturing.

- Conceptual design phase: The contract starts with a Kick off Meeting shortly after contract signature, with preliminary documentation presented, to start the Conceptual Design phase. The contractor will evaluate the IO requirements and identify solutions to meet these requirements. The contractor shall provide preliminary designs of at least two fundamentally different solutions. Solutions shall cover a range of manual vs. automatic (for example 0g arm) tooling. IO and contractor will review the solutions and choose the option to develop in Final Design phase.
- Final design phase: The contractor will develop the design solution chosen at CDR. The final design phase will terminate with a successful Final Design Review, presenting the completed design and supporting documentation, after which manufacturing phase will begin.
- Manufacturing phase: The contractor shall finalize manufacturing documentation, order material, and produce hardware. The manufacturing of parts will start only after a successful Manufacturing Readiness Review. Some material purchasing and manufacturing activities may be advanced based on schedule requirements and with prior IO agreement.

During the design review “chits” may be issued: A chit is a description of an issue found in the design that must be resolved. Chits are divided into two categories. For a Category 1 chit, the issue needs to be resolved immediately before that phase of the design can be accepted. A Category 2 chit can be resolved during the next phase.

8.3.1 Kick off Meeting

The required documentation for the Kick off Meeting:

- | | |
|--|------------------------------|
| - Kick off Meeting Required Documentation | Maturity |
| - Quality Plan | Preliminary |
| - Compliance Matrix | Preliminary |
| - Work Plan and Schedule | Complete (subject to change) |

SUPPLY

- To be updated as required during contact.

8.3.2 *Conceptual Design Review (CDR)*

At the end of the conceptual design phase, the tool design shall have been developed to demonstrate;

- that solutions are identified to meet the requirements for safety and CE certification,
- that identified solutions meet technical and schedule requirements or any deviations identified,
- solutions are achievable at an acceptable risk and cost.

Sufficient information shall be provided in order for the IO to make a full assessment of the Supplier's proposals in terms of safety, functionality, and operability.

The minimum required documentation for the Final Design Review:

CDR Required Documentation	Maturity
- Compliance Matrix	Complete
- Functional analysis	Preliminary
- Hazard analysis and mitigation plan	Preliminary
○ Contractor shall provide a hazard analysis. Mitigation plan will be addressed by IO unless specifically in contractor's scope.	
- Engineering Analysis Report for CE Certification	Preliminary
- User Manual	Preliminary
○ Process for disassembly, reassembly and movement of this equipment.	
- 3D models and 2D drawing updates (as required)	Preliminary
- Quality Plan	Preliminary

8.3.3 *Final Design Review (FDR)*

At the end of the final design phase, the tool design shall have been developed to demonstrate;

- that it meets the requirements for safety and CE certification,
- that any deviations from the requirements or schedule have been identified,
- it is achievable at an acceptable risk and cost, with any design changes proposed.

Sufficient information shall be provided in order for the IO to make a full assessment of the Supplier's proposals in terms of safety, functionality, and operability.

The minimum required documentation for the Final Design Review:

FDR Required Documentation	Maturity
- Functional Analysis	Complete
- Hazard analysis and mitigation plan	Complete
- Engineering Analysis Report for CE Certification	Complete
- User Manual	Complete
- 3D models and 2D drawing updates (as required)	Complete

SUPPLY

- Quality Plan	Complete
- Bill of Materials	Preliminary
- Welding Procedure Specification (WPS)	Preliminary
- Manufacturing and Inspection Plan	Preliminary
- Test Plan and Report Template	Preliminary

8.3.4 *Manufacturing Readiness Review (MRR)*

The required documentation for the Manufacturing Readiness Review:

MRR Required Documentation	Maturity
- 3D models and 2D drawings updated (if necessary)	Complete
- Bill of Materials (including serial numbers)	Complete
- Welding Procedure Specification (WPS)	Complete
- Manufacturing and Inspection Plan	Complete
- Test Plan and Report Template	Complete
- Maintenance and Periodic Inspection Plan	Complete
- Cleaning and Packaging Procedure	Complete
- Manufacturing Dossier	Preliminary
<ul style="list-style-type: none"> ○ Including Material Certificates and/or Declarations of conformity for raw materials and hardware, welder and NDT inspection personnel qualification / certification. 	

8.3.5 *Deliverables Required for Shipment*

The contractor shall submit the following documentation prior to shipping:

- Packing List
- Contractor Release Note
- Preservation Plan (any humidity or temperature limits during shipping and storage, rust prevention measures, periodic inspection requirements, etc.)
- Manufacturing Dossier (MD)

The MD shall have a table of contents listing all sections and attachments. The MD shall be organized in the following manner:

Section 1 – Fabrication Documents, including:

- Material and Inspection Certificates, Type 3.1 in accordance with EN 10204
- NDT Examination Reports
- Dimensional Inspection Reports, As-built Drawings, Documents, and Data as necessary
- CE Certificate

Section 2 – Qualifications and Procedures

- Manufacturing and Inspection Plan (MIP)
- Welding Procedure and Operator Qualification Records
- Welding Procedure Specifications
- NDT/Inspection Personnel Certifications

SUPPLY

- Packing and Shipping Procedures
- Records of approved Non-Conformances (NCR) and Deviation Requests (DR)
- Codes and Standards conformity certificates

Release Note;

The Release Note shall be submitted along with the MD prior to shipment. The above test reports shall show that the structural and non-structural material satisfies the intent of this specification and shall be submitted with a Release Note according to [R6]. The Release Note shall attest to completeness, accuracy and compliance with this specification.

IO reserves the right to verify the validity of the Certificate of Compliance during the performance of audits of the Contractor or by independent inspection of the item(s).

9 Quality Assurance Requirements

The Quality class under this contract is QC1 (lifting equipment), [R1] GM3S section 8 applies in line with the defined Quality Class.

[Req.25] The Supplier shall make sure that suitably qualified and experienced people are working on the design, manufacture and test of the equipment supplied under this technical specification.

[Req.26] A Quality Plan shall be produced by the contractor, including subcontractors' Quality Plans, at the start of the contract, and submitted to the IO for approval before FDR. Refer to reference [R8] for further details.

[Req.27] Prior to the start of manufacturing, a Manufacturing and Inspection Plan (MIP) shall be produced by the contractor, including subcontractors' scope, and approved by IO, who will mark up any intended intervention point. The level of detail in the MIP shall be such as to prevent the possibility of bypassing any quality activity and to enable adequate planning, monitoring and verification of operations.

The right of IO to intervene or witness any point in the MIP shall apply in relation to any subcontractor via the main contractor. The oversight of any quality control operation by the IO shall not release the supplier of their responsibility in meeting any and all aspects of this technical specification.

See reference [R9] for an example template for the MIP.

[Req.28] The supplier shall warranty all hardware supplied in the scope of this technical specification for all defined load cases for five years from the date of delivery to the IO site.

[Req.29] The equipment shall be handed over to the IO only after the supplier has demonstrated its full compliance with the requirements included in this Technical Specification and other contractual requirements: all the related documentation has been accepted by IO, the equipment has satisfactorily passed all tests and commissioning. A Certificate of Acceptance shall be signed by both IO and the Contractor formalizing acceptance of the above.

10 Safety Requirements

The scope of this technical specification covers non-PIC, non-PIA and non-PE/NPE equipment.

SUPPLY

[Req.30] Safety of workers on scaffolding and workers and equipment below, as well as protection of parts handled shall be fully addressed by equipment provided within the scope of this technical specification. Safety features include, but are not limited to;

- Lashing points provided on lifting table for larger parts
- Net deployable around lifting table and/or scaffolding platform to catch smaller parts, including nuts and bolts.
- Soft covers on corners of equipment subject to contact with parts or workers during handling, including anticipated mishandling.

11 Special Management requirements

Requirement for [R1] GM3S section 6 applies completed/amended with the below specific requirements:

11.1 Work Monitoring

[Req.31] Data generated during execution of the contract for submission to IO shall be uploaded electronically into the ITER IDM system, following a structure to be defined by or agreed with IO.

[Req.32] All documentation shall be in English, unless explicitly agreed otherwise.

[Req.33] The Contractor shall establish the list of code and standards applicable to the supply and submit it for approval by IO, taking into account sections 4.2 in particular.

[Req.34] The Documentation produced in the scope of work on this technical specification shall be retained by the Supplier for a minimum of 5 years after contract close-out.

[Req.35] All documentation listed in section 8.3 above shall be completed according to the design phase and approved by IO in IDM.

[Req.36] All requirements of this Technical Specification and subsequent changes proposed by the Contractor during the course of execution of this contract shall be recorded using the Deviation Request process [R10] and Non-Conformity Report [R11].

Other information needed shall be through official Request for Information (RFI), via email or verbally with email confirmation. The contractor shall maintain RFI exchanges, DRs and NCRs to be included in final Manufacturing Dossier.

[Req.37] The Supplier shall ensure that access rights are granted to IO personnel at all locations where ITER work is being performed. The IO reserves the right to perform unscheduled inspections. Planned and documented audits may be performed by the IO and regulatory body representatives in France, to verify compliance with the technical and quality requirements contained in this Technical Specification. Moreover the IO reserves the right to obtain or take photographs of the ITER equipment during the different phases of its preparation.

SUPPLY

11.2 Meeting Schedule

[Req.38] Design reviews, organized and led by contractor, will generally be held over a period of 1 day at the IO site. Design reviews shall be held in English. All requirements shall be reviewed in sufficient detail to show how they are met.

[Req.39] The Supplier shall provide the design documentation at least 1 week prior the design review.

[Req.40] The contractor shall coordinate regular technical and management meetings (combined or separate as required) with IO, generally via video conference. Frequency shall be weekly if not otherwise agreed between the parties. The meetings shall include project planning and progress updates, documenting progress and achievements, any problems or unforeseen events, and demonstrating fulfilment of project scope, constraints, and on time delivery including corrective actions if necessary.

11.3 CAD design requirements

[Req.41] CAD data shall be provided for all models developed and/or modified by the contractor. IO uses CATIA V5 R31, and native data is preferable. However, the contractor is not required to work in the same system, but only required to provide accurate data that can be read into IO systems.