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Technical Specifications (In-Cash Procurement)

Technical Summary of the Call for nomination - TAPB Architect and Engineering contract

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1 Purpose

This document is the technical summary of the Call for Nomination to seek companies interested in participating in the tender for the Tokamak Assembly Preparation Building (TAPB) Architect and Engineering (AE) Contract.

ITER is a first of a kind mega-project with a wide range of disparate leading edge/high-tech systems to be assembled and installed into buildings at its site in Saint Paul lez Durance, Cadarache, in the south of France.

The ITER Organization (IO) is the nuclear operator, complying with the relevant French Laws and regulations, authorization, codes and standards applied to Basic Nuclear Installation (INB). IO is responsible for integrating the activities from the early stage of design, to the procurement, the assembly, commissioning and operation.

The purpose of the Tokamak Assembly Preparation Building (TAPB) Architect and Engineering (AE) Contract is to elaborate an integrated design of the TAPB, based on the existing Conceptual Design Review (CDR), on safety and functional requirements, taking into account the constraints and interfaces coming from the processes. This activity is split into:

- **TAPB Facility and Building design,**
- **Construction permit and safety analyses,**
- **Support to tender and contract,**
- **Review of the constructor documents,**
- **Supervision of construction.**

The outcome shall be an integrated building design, providing evidence that safety and functional requirements have been met, while the overall cost of the facility has been reduced as much as reasonably possible.

All documentation and communication will be in English except the Construction Permit (In French) that shall be established by a French Architect.

Abbreviations are given in appendix 1.

Liability, insurance and conflict of interest items are developed in appendix 2.

Illustration of expected deliverables is given in appendix 3.

2 Requirements and main features of the TAPB

2.1 TAPB project lifecycle

The TAPB will have two functions corresponding to two phases of activity:

- Phase 1: Support to Tokamak Installation from 2020 to 2024,
- Phase 2: Support to perform the Beryllium First Wall (Be FW) trial fits and storage of the Be FWs, from 2025 to 2028,

This affords the opportunity to deliver the facility using a staged approach:

- Phase 1 works (pre-beryllium) are the building external envelope, lift, doors and building services limited to those needed for Phase1 warehouse function. During this period, the facility shall be flexible enough to house different types of needs, as for illustration:
    - Support Vacuum Laboratory,
    - Magnet Infrastructure Facilities for ITER (MIFI 2),
    - In-vessel Mock-ups and Trials Facility.

  The description of the Phase 1 activities and requirements are given in this section.
- Phase 2 works (beryllium) are the reception, the transfer, the storage and the trial fit of First Wall (FW) panels with Shield Blocks (SB).

  The description of the Phase 2 activities and requirements are given in this section.

The TAPB configuration during phase 1 works is called TAPB1.

The TAPB configuration during phase 2 works is called TAPB2.

The contractor shall demonstrate that at any time:

- The construction cost of the TAPB, in particular TAPB1, is minimized as much as possible,
- The TAPB design and construction is compliant with:
    - The functional requirements,
    - The safety requirements,
    - The constraints and the interfaces with other systems,
    - The overall integration within the ITER site,
- The configuration of TAPB1 (design and construction) has taken into account the requirements of TAPB2, in particular for the non-reversible aspect of the design and construction, as for example the Civil Work which shall be compliant with the safety requirements.

2.2 Main building features

The Tokamak Assembly Preparation Building (TAPB) shall be located within the ITER site boundary. It shall provide a suitable environment for the systems and workers inside.

The TAPB is a substantial stand-alone concrete building with one basement level, a ground level and a mezzanine (mezzanine only in phase 2).

The footprint is approximately 41 m x 17 m (without the steel frame import/export facility), i.e. approximately 700 m^2, the basement extends approximately 6.2 m below ground and the main floor of the building rises approximately 7 m above site ground.

TAPB1 shall house miscellaneous needs to support the Assembly of the Tokamak, with no nuclear safety requirement, except for the “non-reversible” parts (e.g. CW or lift).

TAPB2 shall house, support and provide space and systems to receive, transport, test, store, pre-assemble and export components consisting of Berylliated components during the Assembly phase of the Tokamak.

To be noted that in line with the ITER decree, Be is considered as a hazardous substance. Therefore, it shall be confined with two systems, based on two confinement methods: static and dynamic.

The structure of the TAPB shall provide space for the systems that they contain and enough strength to support itself, the components, all necessary assembly tooling and equipment and the building systems.

The TAPB is located within the INB Perimeter, on the North-East corner of Area 73. Site view is given in Figure 1.

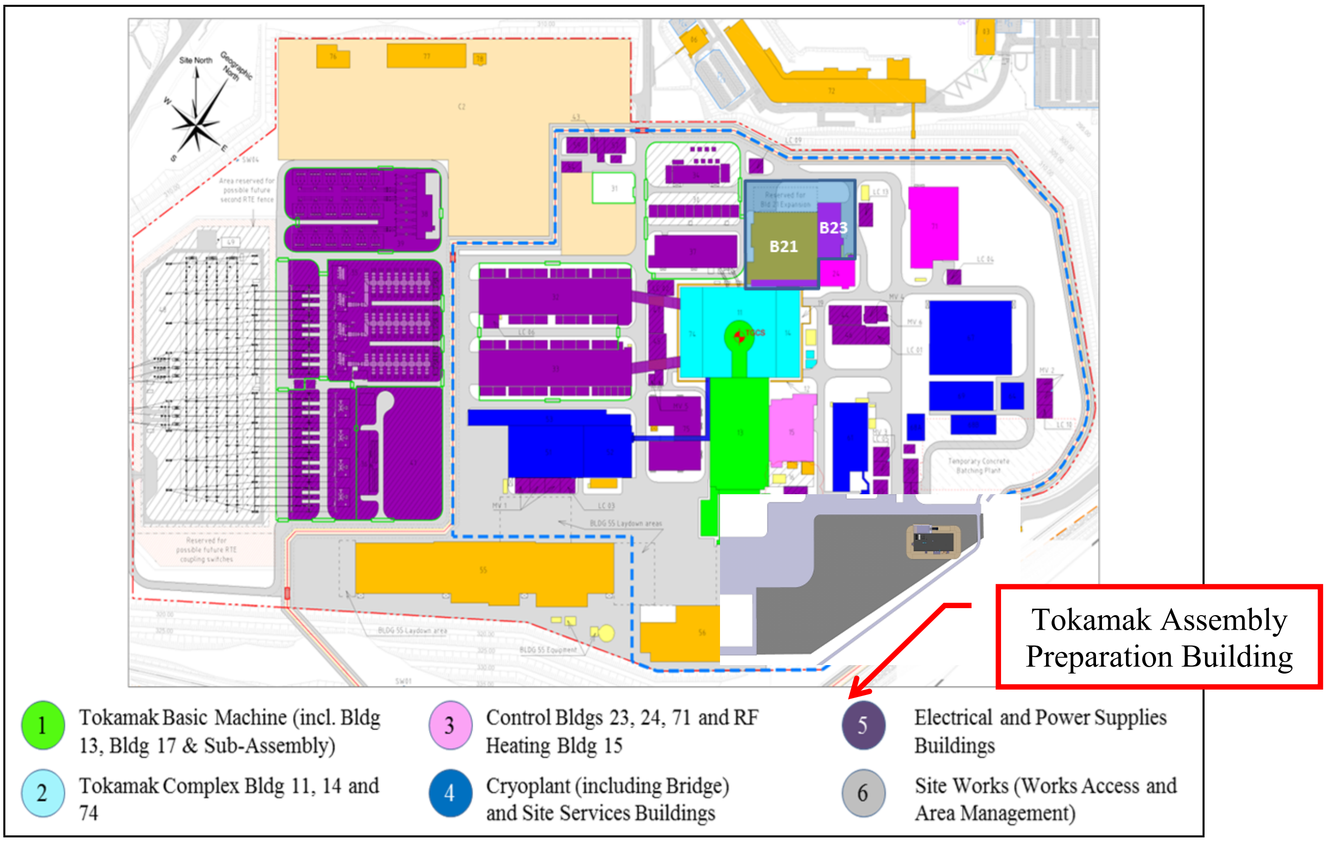

Figure 1 : Preliminary location of the TAPB on the site master plan

The 3D outline drawings below (Figure 2 and 3) are extracted from the conceptual design made end of 2017.

<u>Phase 1: TAP1 for Assembly needs</u>

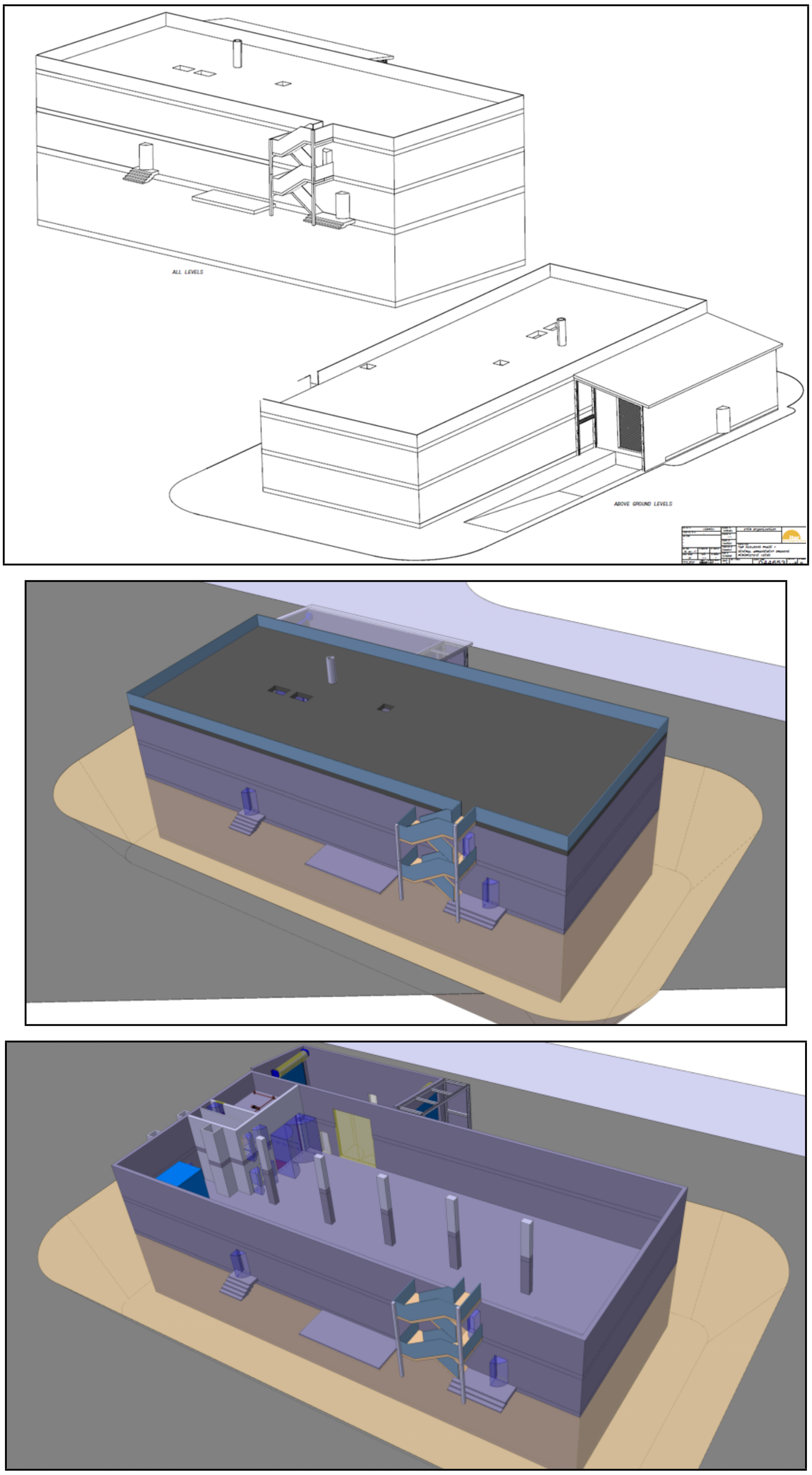

Figure 2 : **3D outline of TAPB1**

Phase 2: TAPB2 for Be FW storage/trial

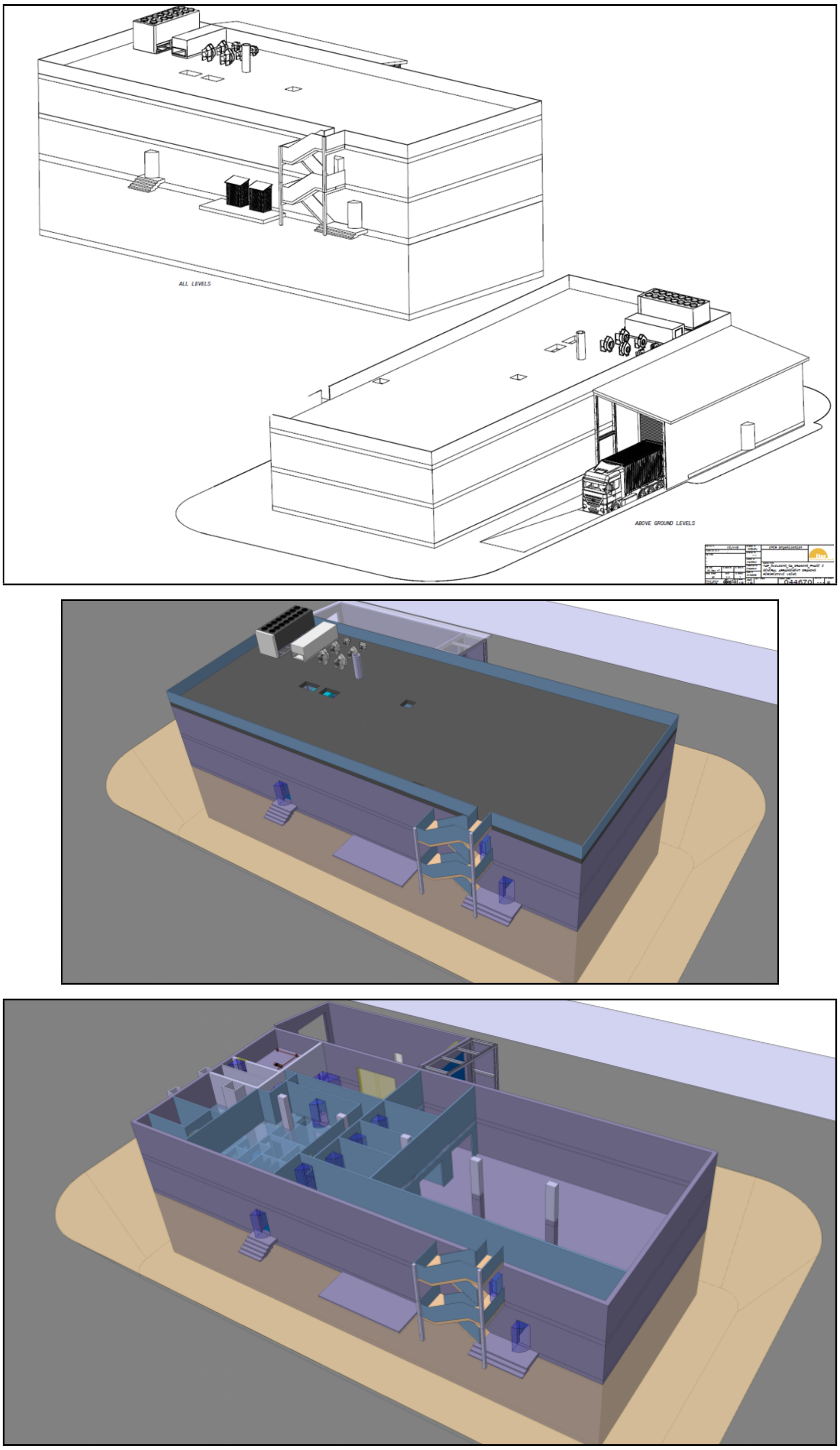

Figure 3 : **3D outline of TAPB2**

2.3 Phase 1 Main building requirements

As all of the activities desired to be undertaken in Phase 1 cannot be conducted in the TAPB simultaneously and the decision on which activities will be undertaken will be made after design of the TAPB has been started, this section is written to propose interfaces which could satisfy most of the individual needs.

Note that drawings included in this section are Conceptual Design drawings.

2.3.1 Assumptions

It is foreseen that there will be a horizontal access, i.e. an access without a step, to TAPB directly into the concrete re-inforced building.

Post drilling will be permitted for phase 1 and therefore no embedded plates will be required to support phase 1. However the building designer should note that embedded plates will be required for Phase 2.

Clean areas will be provided by local temporary facilities which will be designed, procured and imported into the building during the operational life of Phase 1 activities. They will not be part of the scope of the TAPB designer.

2.3.2 Safety and Security Considerations

2.3.2.1 Nuclear Safety

There are no nuclear safety requirements to be applied during phase 1 operation of TAPB. So, for phase 1 there are no equipment classified as PIC, except the building Civil Work.

2.3.2.2 Occupational and Industrial Safety

Full compliance with the relevant EU machinery and pressure regulations is expected.

2.3.2.3 Fire Safety

Fire analysis, including the design of fire extinguishing means and escape routes shall be defined for phase 1 operation, according the French law.

2.3.3 Functions and Operating Activities during Phase 1

Three main operating activities are likely foreseen possible in the TAP Building during phase 1:

- Support Vacuum Laboratory,
- Magnet Infrastructure Facilities for ITER (MIFI 2),
- In-vessel Mock-ups and Trials Facility.

No decision has been taken by IO yet regarding the space allocated in the TAP Building, for each of these activities. Therefore, the building design shall be flexible enough to be able to accommodate different types of needs during phase 1.

The potential operating activities are described below.

2.3.3.1 Support Vacuum Laboratory

The function of the Vacuum Laboratory is to support the site acceptance test of procured vacuum components, act as an equipment and vacuum support base during assembly, commissioning and operation of the ITER machine, and to maintain ITER non-activated vacuum components requiring planned maintenance.

The main functions of the Support Vacuum Laboratory are:

- In-coming inspection of ITER vacuum components,
- Vacuum qualification of the containment and confinement boundaries of ITER vacuum components,
- Provision, testing and qualification of leak testing equipment (vacuum boxes, pumping systems, leak detectors…) required for vacuum qualification of ITER vacuum components,
- Fabrication of vacuum boxes,
- Fabrication of representative mock-ups to test and qualify leak testing equipment,
- Provision of space allocated for external Contractors vacuum laboratory,
- Pre-assembly of some of ITER vacuum components,
- Short term storage of gaskets, vacuum fittings…,
- Trouble shooting of vacuum problems and repairing of ITER vacuum components during Commissioning of ITER Vacuum Systems,
- Trouble shooting of vacuum problems and repairing of ITER vacuum components during ITER Operation,
- Trouble shooting and repairing of leak testing equipment.

2.3.3.2 Magnet Infrastructure Facilities for ITER (MIFI 2)

The purpose of the facility is to host the installation of assembly mock-ups to permit the training and qualification of procedures, processes and operators. The facility also supports the magnet assembly by providing the suitable location to receive, inspect, test and, if necessary, repair large magnet components.

The main functions of the MIFI 2 are:

- Hosting of assembly of large mock ups (e.g. 40 m2) aimed to train workers and validate assembly procedures,
- Buffer storage of magnet components in case of storage shortage at IO site,
- Provision of fixtures and facilities for the following activities and processes: welding, drilling, cutting, handling and storing resins/resin cleaning chemicals, extracting fumes, cleaning vacuum equipment,
- Site Acceptance Testing and/or Simple Acceptance (e.g. unpacking and visual inspection) of large and small components. SAT will require an isolated ISO class 9 clean area of 250 m2.
- Trouble shooting and minor repairs of large magnets components and back-up workshop during machine assembly phase,

2.3.3.3 In Vessel Mock Ups

The purpose of the facility is to host the installation of assembly mock-ups to permit the training and qualification of procedures, processes and operators. The facility also supports the assembly of In-Vessel components by providing the suitable location to receive, inspect, test and, if necessary, repair the components.

The main functions of the In-vessel Mock-ups and Trials Facility are:

- Hosting of assembly of mock ups aimed to train workers and validate assembly procedures,
- Provision of fixtures and facilities for the following activities and processes: welding, drilling, cutting, handling and storing resins/chemicals, extracting fumes, cleaning vacuum equipment,
- Site Acceptance Testing and/or Simple Acceptance (e.g. unpacking and visual inspection) of In-vessel components (e.g. SB).
- Trouble shooting and minor repairs of In-vessel components and back-up workshop during machine assembly phase,

The list of mock-ups with dimensions and weight will be given to the Contractor. The biggest ones are 3 meters height, 10 tons temporary weight and need 45 square meters.

2.3.4 Requirements

Aspect	CRITERIA
Seismic Resistance	There are no specific ITER requirements, all permanently installed equipment and the building re-inforced concrete structure must withstand SL-2 seismic input.
Floor Loads	B1 slab 5 Te /m^2 (driven by phase 2 requirement) L1 slab 5 Te/m^2 (driven by phase 1 requirement MIFI) Roof 5 Te/m^2 (driven by HVAC requirements)
Wall Loads	Wall loads will be determined from HVAC duct and electrical cable trays loadings calculated by the AE, called the designer.
Slab underslide (Ceiling)	Slab underslide loads will be from suspended HVAC duct and electrical cable trays loadings calculated by the designer.
Handling means	<u>Vertical transfer:</u> A 20 tons capacity screw jacks lift is used to transfer equipment between L1 and B1. <u>Horizontal transfer:</u> Standard handling equipment (forklift, trolleys, pallet trucks…) are used to move equipment at L1 and B1. <u>Lifting:</u> Cranes of (type to be confirmed) up to 20 Te SWL may be used for lifting operations.
Dimensions and capacities of access	Building access doors for goods are 4m wide by 5m high An additional goods access door of 4m wide by 5m high is foreseen in the steel portal framed extension in order to allow access for goods which by passes the ramp and step arrangement. Height of L1 and B1 levels - More than 3m, nominally 6m height between floor and underside of slab at L1 and B1. Lift door clearance is 4m wide by 3.8m high. Lift platform is foreseen to be 5m long x 4.5m wide, capacity 20 Te.
Building Access for Equipment	A ramp to below grade and construction of a platform will facilitate delivery and export of equipment to be unloaded from lorries. An alternative access into the Goods Receipt / Dispatch area, without a step is planned for Phase 1 MIFI and Vacuum activities.
Floor Finishes	The designer shall specify a Resin Floor Finish which is compatible with the use requirements foreseen for phase 1.
Floor Wall Ceiling finishes	The designer shall investigate whether the same finishes can be applied for phase 1 and phase 2. The designer recommendation of what (if any) work on the finishes between phases 1 and 2 is required.

Aspect	CRITERIA
Fire Water Collection	The designer should make arrangements to ensure fire extinguishing water cannot run out of the building in compliance with French requirements.
Local Ventilation fume extraction penetrations between B1 and L1	Two penetrations between B1 and L1 air exhaust shall be available to use for passing local extract ventilation or for vacuum pump or cryopump exhausts. Two further penetrations will be required in the adjacent building external wall.
ISO 9 Clean Area	An ISO 9 clean area in accordance with **ISO 14644-1:2015** may be required in a part of one floor of the building depending which group occupy the building. Currently it is assumed that the local clean room walls and ceiling will be supplied as a modular construction enclosure by the operators as temporary fixtures.
HVAC	The Air Handling Unit (AHU) with cooler and chiller will be located on the roof and air supply and exhaust will be routed from the roof to L1 and B1 levels. The AHU will maintain temperature range suitable for human occupation in the building. The ventilation supply and extract fans will be provided by portable fans and local, temporary ventilation ductwork.
Compressed Air supply	CA outlets foreseen; • L1: - 1 outlet – bayonet connection on wall furthest from lift - • B1: - 1 outlet - bayonet connection on wall furthest from lift
Breathing Air	• Not required in phase 1
Gas compound for industrial gases	• Located outside building • Storage capacity about 10 standard industrial cylinders • Two penetrations for two gas lines, • Gas varieties foreseen are Helium (for leak testing) and Argon(for welding)
Building Isolation valves on all fluid and gas services which penetrate the external wall or roof	Building isolation valves located in easily accessible locations are required. For phase 1 these may be manual.
Electrical Power Distribution Rooms	One room to house load class IV electrical distribution boards and load class IV C&I cubicles to accommodate the provisional load. One electrical room to accommodate “Security and Access Control” equipment.

Aspect	CRITERIA
Electrical Power Supply Outlets	Illustration of Phase 1 power supplies – Voltage Class IV 400v socket outlets foreseen; • L1 – 4 outlets each in a different quarter of the floor plan with a diversity factor 0.5 • B1 – 4 outlets each in a different quarter of the floor plan with a diversity factor 0.5 230v socket outlets foreseen • L1 – 4 outlets each in a different quarter of the floor plan diversity factor 1 • B1 – 4 outlets each in a different quarter of the floor plan diversity factor 1 110v centre tapped socket outlets foreseen • L1 – 4 groups of 4 outlets each group in a different quarter of the floor plan diversity factor 0.5 • B1 – 4 groups of 4 outlets each group in a different quarter of the floor plan diversity factor 0.5 • L1 – 2 socket outlets one located on each of two of the central columns • B1 – 2 socket outlets one located on each of two of the central columns
Electrical C&I General	Illustration of phase 1 I&C for all PBS, are foreseen as Voltage Class IV ; Cubicle to house instrumentation for any phase 1 signals processing can be integrated in the Electrical Power Distribution room. The design, installation, testing and commissioning of the Low Voltage electrical systems shall be in accordance with NF C 15 100. The 110 volt system shall be a centre tapped to an earth supply system. It will be used exclusively for hand tools.
Lightning Protection	An analysis of the risk from lightning shall be undertaken by competent specialists as required in the Code of the Environment articles L. 211-1 et L. 511-1. The analysis shall be based on the approach presented in the norm NF EN 62305-2, version November 2006, and compliant with the relevant parts of NF C 17-100 (1997) and NF C 17-102 (2011) which remain in force.
Lighting	• L1 – ceiling grid with non-fluorescent lights to give 400 Lux (workshop) • B1– ceiling grid with non-fluorescent lights to give 400 Lux (workshop) Task lighting: no fixed installation required at either level. Task lighting will be provided by portable light sources provided by clients and connected to socket outlets. Emergency lighting – in accordance with EN 1838 Lighting Applications
Telephone and internet connection	Telephone - One outlet provided at L1 Internet connection – one outlet provided at L1
Potable water, Industrial water drainage and Sewage connection	Provided to building
Toilets	Will be provided in external cabins to meet French labour code requirements. A default number of 30 people will be assumed for the complete building.
Welfare (Changing / rest)	Will be provided in an external cabin to meet French labour code requirements. A default number of 30 people will be assumed for the complete building.
Office(s)	Not provided inside the building. It is anticipated that one or more external porta-cabins will be provided by others.

Aspect	CRITERIA
Safety Related	
Fire detection and alarms	A fire detection and alarm system which is compliant with current French Laws and Codes is to be considered for phase 1. At the location of the fire alarm panel, (located adjacent to the building entrance) an electrical isolation panel shall be provided to allow fire services to isolate building electrical supplies.
Fire Suppression Systems.	Fire extinguishing means will be provided in accordance with French laws and codes. The proposed system must be approved by ITER specialists.
Fire Water Retention	Any fire water discharged must be retained inside the building in accordance with French laws. The designer must provide measures to achieve this.
Fire Loads	Fire loads shall be calculated for each area (or room).
Fire Sectors	The designer shall consider designating fire sectors.
Fire Resistance	Fire sector boundaries shall be assigned fire resistance in accordance with French Laws. Fire sector boundaries are proposed to be EI 60 for all fire sector boundaries until a revised category is proposed by the building designer as part of his studies.
Emergency Exits	Must comply with French laws and codes. Due to the high value equipment that will be present in the building, emergency exit doors must be of a design where they cannot be opened from outside.
Emergency Exit Routes	Length, dimensions and location must comply with French law and codes. Lighting of the emergency exit routes must comply with French laws and codes. Stairways from above ground and below ground must not meet in a single vestibule area in compliance with French Laws and labour codes. Stairwell protection rooms should be included in the design if they are required in order to comply with French Laws and Codes.

Table 1: Preliminary TAPB1 requirements

2.3.5 Layout

The building is a reinforced concrete structure made of a basement level (B1) and a ground level (L1). There is no mezzanine in Phase 1.

The elevation view is given in Figure 4.

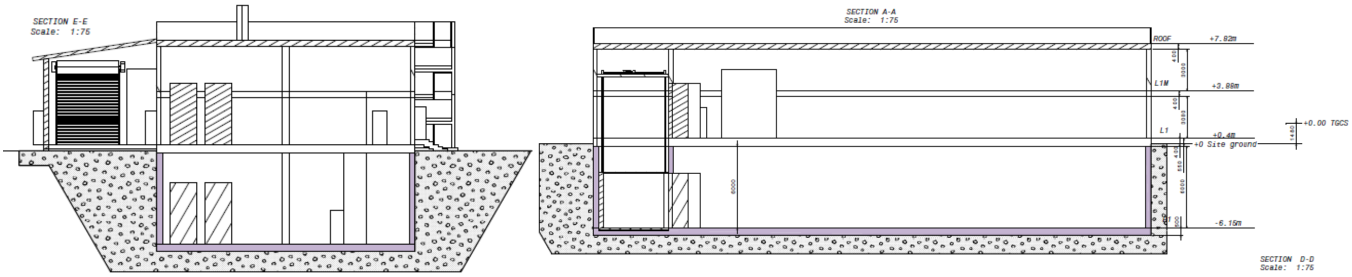

Figure 4 : TAPB1 elevation view

The Level B1 is separated into 4 distinct areas:

- B1 Workshop
- The tanks room
- The lift
- Staircases

The general arrangement of level B1 is given in Figure 5.

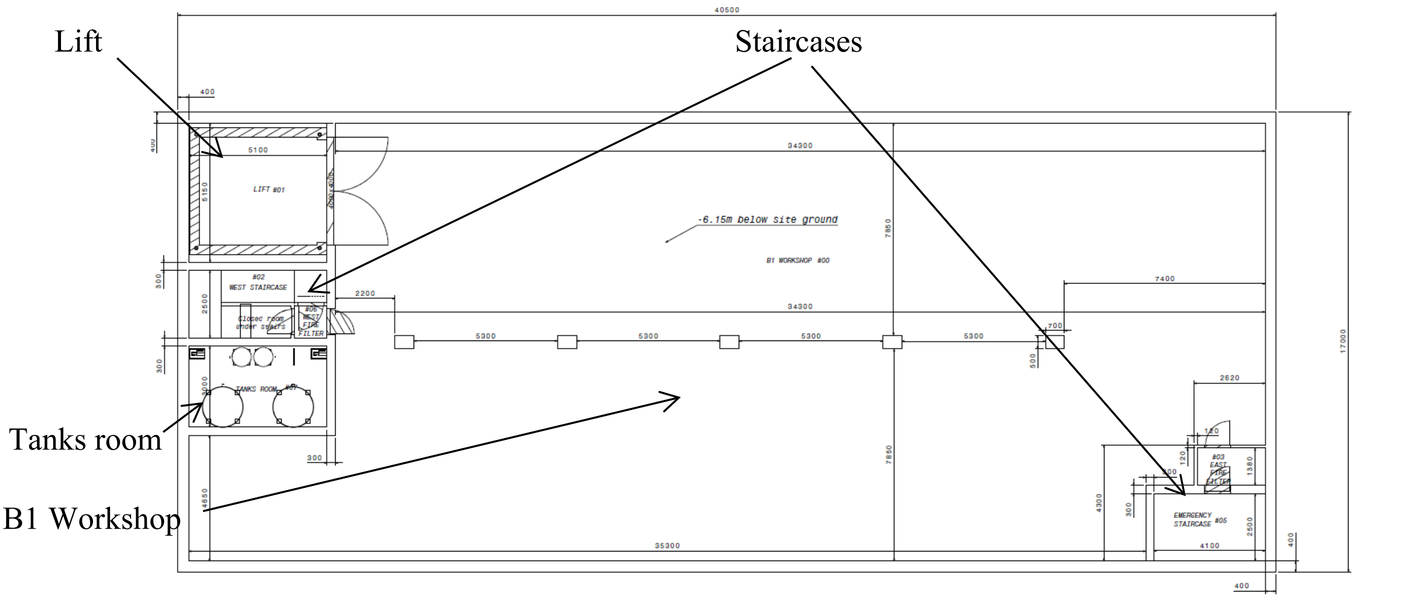

Figure 5 : TAPB1 General Arrangement B1

The Level L1 is separated into 5 distinct areas:

- L1 Workshop
- Electrical rooms
- The lift
- Staircases
- Import/Export facility

The general arrangement of level L1 is given in Figure 6.

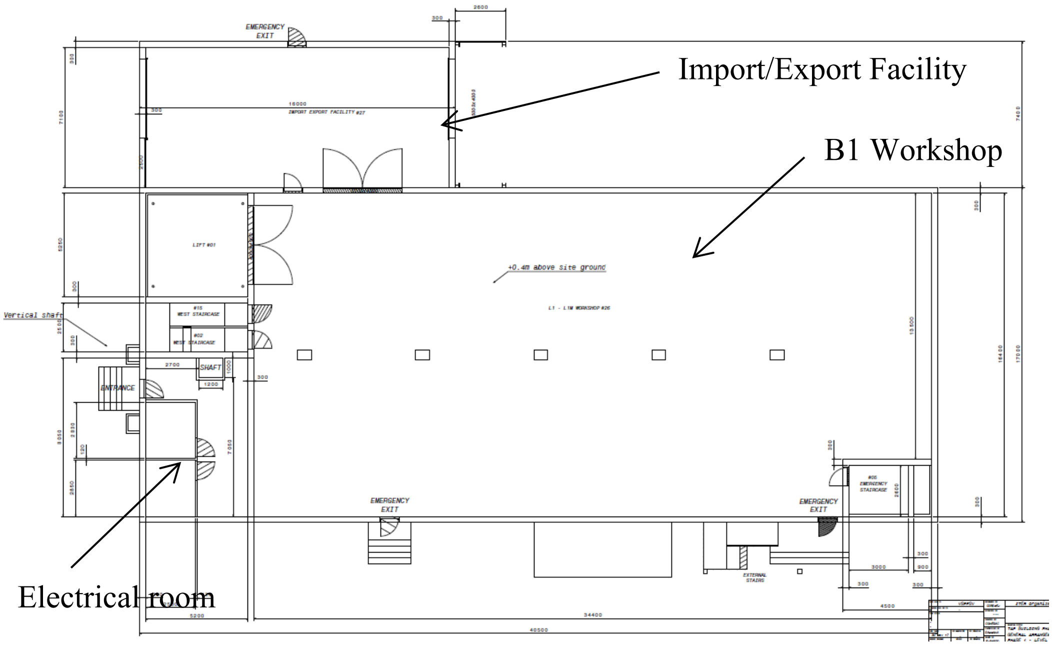

Figure 6 : TAPB1 General Arrangement L1

Although there is no mezzanine in Phase 1, the general arrangement of level L1M is given in Figure 7.

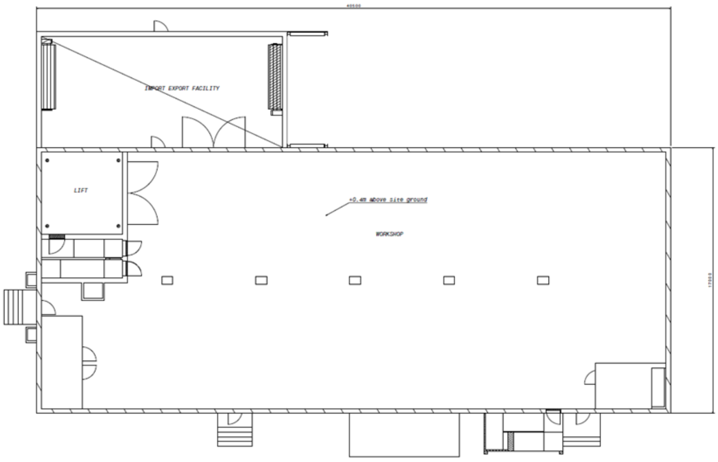

Figure 7 : TAPB1 General Arrangement L1M

The general arrangement of level R1 (Roof) is given in Figure 8.

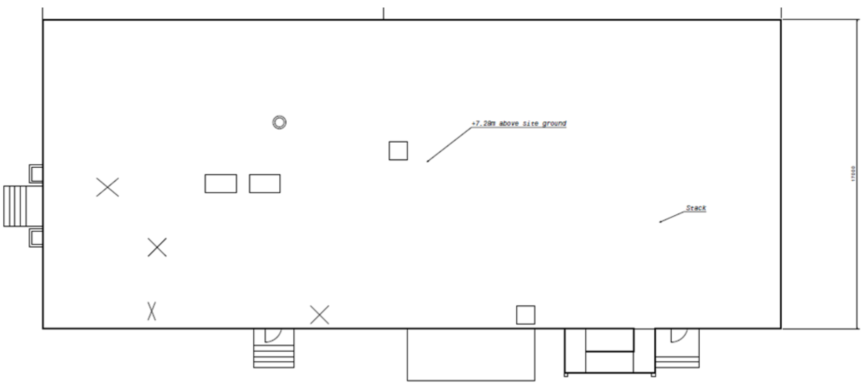

Figure 8 : TAPB1 General Arrangement R1

2.3.6 Foreseen Interfaces between Users and the Building and its Services

The preliminary interfaces with services are described in the figures below (to be reviewed by the designer):

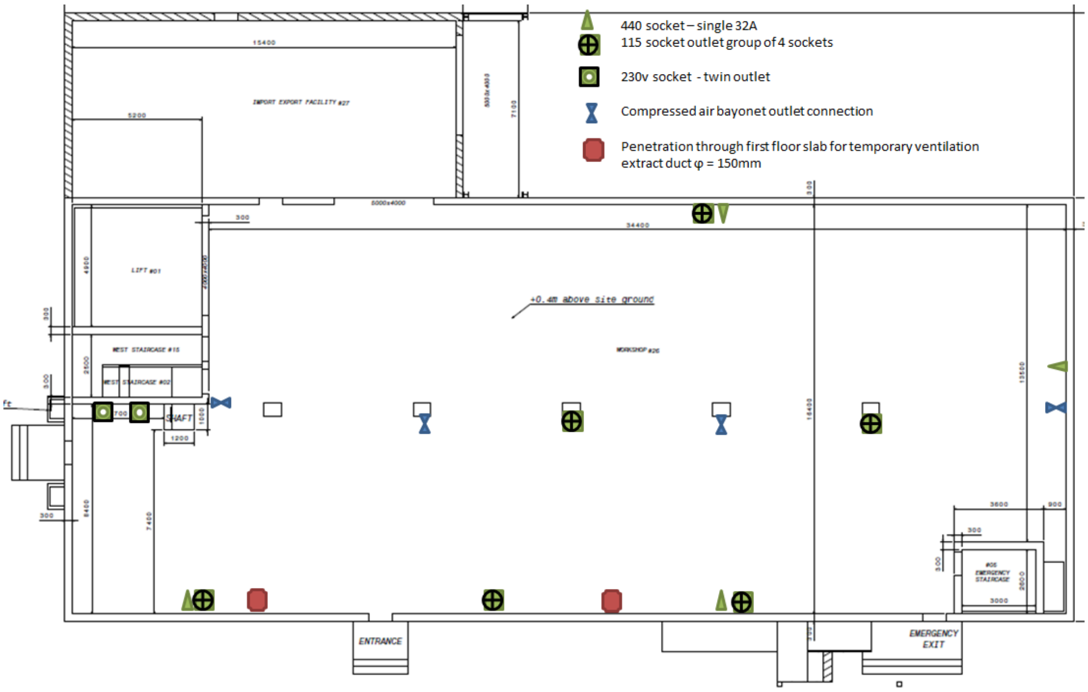

Figure 9 : Layout of Services Outlets in Phase 1: Ground Level L1

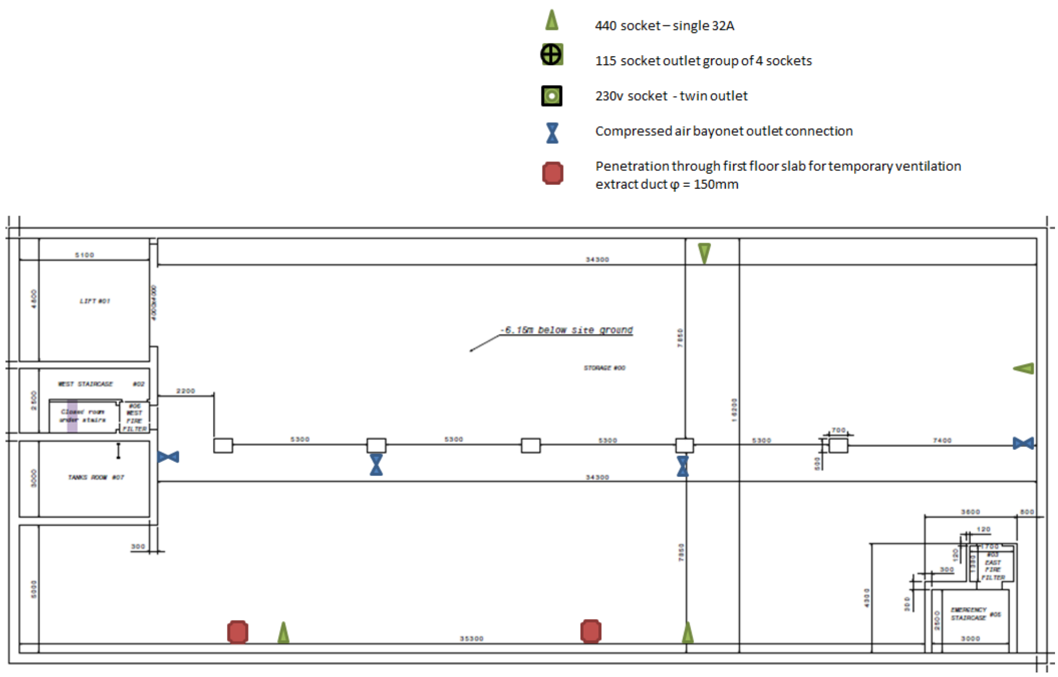

Figure 10 : Layout of Services Outlets in Phase 1: Basement Level B1

2.4 Phase 2 Main building requirements

Note that drawings included in this section are Conceptual Design drawings. They will have to be reviewed, updated and completed in the frame of the design activities requested to the contractor. Some of the features and requirements listed in this document may be impacted by the on-going review of the Conceptual design and the on-going safety analysis that is to be provided to the Regulator within the framework of the technical prescription.

2.4.1 Functions

The key safety function of the TAPB is the management of the chemical risk due to the beryllium, ensuring the minimization of beryllium exposure to workers and the environment.

The functional breakdown of the TAP Building is given below.

<u>Main functions:</u>

- To transfer containers for the storage of Beryllium First Wall (FW)
- To store the Beryllium FW in a secure manner
- To Perform the Trial Fit between the FW and the Shield Blocks (SB),

<u>Support functions:</u>

- To comply with the regulation / safety/ security
    - To provide static and dynamic confinement for the beryllium
    - To prevent, detect and mitigate internal and external risks
    - To minimize the impact to workers (ALARA) and the environment (release)
    - To protect against malevolence
- To operate the TAP facility
    - To have manned access, access control, change rooms, showers
    - To internally monitor the facility (e.g. with a control room)
    - To facility the Health-Physics affairs for the workers
    - The provide proper services (e.g. power supply, water, compressed air, helium, breathable air…)
- To characterize smear samples and wastes in the Be laboratory
- To buffer store berylliated waste (solid and liquid) before treatment
- To take into account the site constraints

2.4.2 Requirements

The TAPB obeys to INB regulation for design criteria. INB rules are applied because Beryllium is considered as a hazardous substance according to the ITER decree.

The following requirements are considered to be applicable for the facility:

- double confinement system for beryllium:
    - Beryllium Workshop – double static confinement (room and building)
    - Beryllium Storage – double static confinement (room and building) ; the FW is store in metallic box with a double plastic envelope,
- a dynamic confinement system is provided by the ventilation system dedicated to each confinement system with release at a single point, at the dedicated stack for the TAP building,
- a beryllium First-Wall storage area which is normally contamination free,
- a beryllium Workshop which can potentially have beryllium dust contamination,
- the relative humidity throughout the facility controlled below 65%,
- the comfort functions by maintaining ambient temperature,
- the double confinement is maintained in the case of an SL-2 seismic event,
- the TAP building is not used for the testing or storage of Blanket Shield Blocks, i.e. only a minimal number of Shield Blocks (approx. 6) are in the facility at any given time.
- 2 hours fire resistance for each confinement system of the building and rooms containing PIC/SIC equipment.

It should be noted that the TAPB is a High Security Zone (HSZ) from the physical protection perspective.

Other requirements for TAPB2 are given in next subsections.

2.4.3 Layout

The building is a reinforced concrete structure made of:

- a below-grade room for the storage,
- a ground level, a transfer area, a Be laboratory and a workshop for the trial-fitting between the First Wall panels (FW) and Shield Blocks (SB). The building services are housed in the service gallery along the workshop and on a mezzanine above the change facility,
- a mezzanine.

The First-Wall panel transport containers are introduced from a truck through an adjoining steel frame import/export facility, which serves also as buffer storage for the Shield Blocks before entering or leaving the TAP Building.

2.4.3.1 Layout of the Basement

The general arrangement of the basement level is presented in the figures below. The basement is separated into three distinct areas:

- The Beryllium FW storage,
- The tanks room (access from B1M),
- The lift,

The main features of the facility design and strategy are:

- The storage capacity is sufficient to store 440 FW plus 35 spares if needed,
- The elevator between floors is a “screw-lift” platform for vertical transfer of components and equipment,
- Two emergency exits are located in opposite corners of the basement,
- The containers are stored on movable racks, similar to what you would find for “bookshelves” in many libraries. The movable racks are stabilised against SL-2 seismic events by guides, both on the concrete floor and ceiling by:
    - securing the racks to the floor and ceiling and designing the guide system in order to resist to the tilting forces
    - securing the containers to the racks with the help of mechanicals locks
- The use of a side loader and movable racks is a proven solution commonly used in warehouse storage.

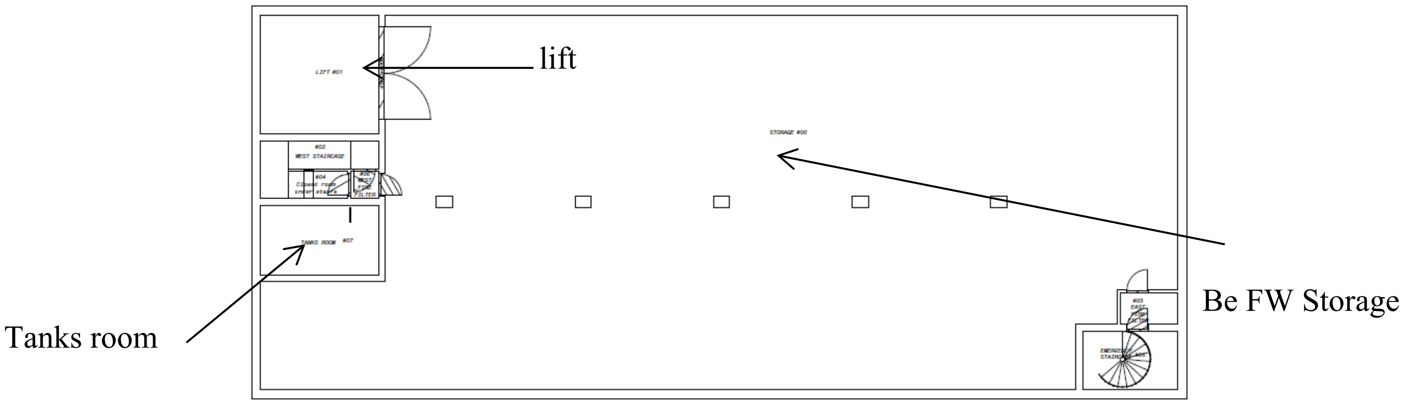

Figure 11 : TAPB2 Level B1 without equipment

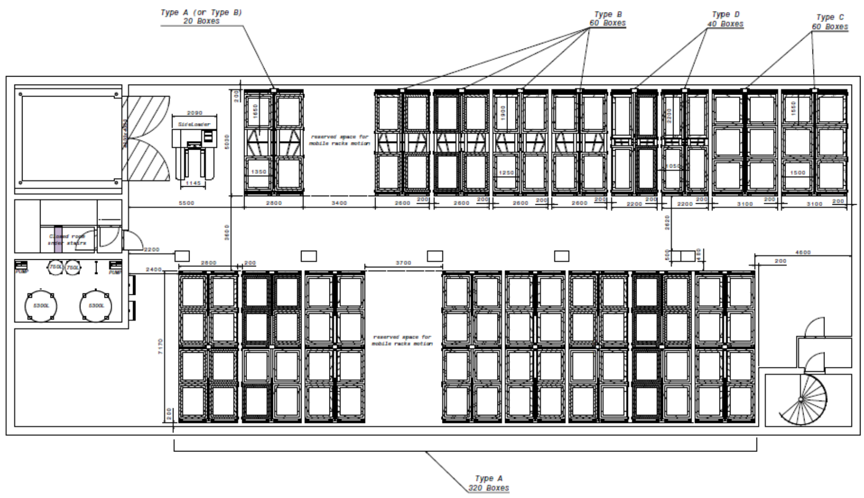

Figure 12 : TAPB2 Level B1 with equipment

2.4.3.2 Layout of the Ground Floor

There are four main areas at the ground floor level (L1):

- On one part of the building, there is the personnel access (man-trap with access control), change rooms, showers, personal access, logistic rooms, waste room, etc. This area includes a small control room/office, where monitoring of facility functions are displayed and where anomalies are reported.

- On the opposite side of the main floor of the building, there is the reception and transfer area for the containers of the FW panels and SBs, which includes the buffer storage of shield blocks, and the lift that moves the FW containers between the ground floor and the basement
- The workshop where unpacking/packing, measurement operation, leak test and trial- fits are performed
- The Be laboratory, located inside the building, in which tests will be performed on Be samplings (smear, Personal Air Sampler filters, etc.)

The external stairs gives access to the roof for maintenance of HVAC equipment.

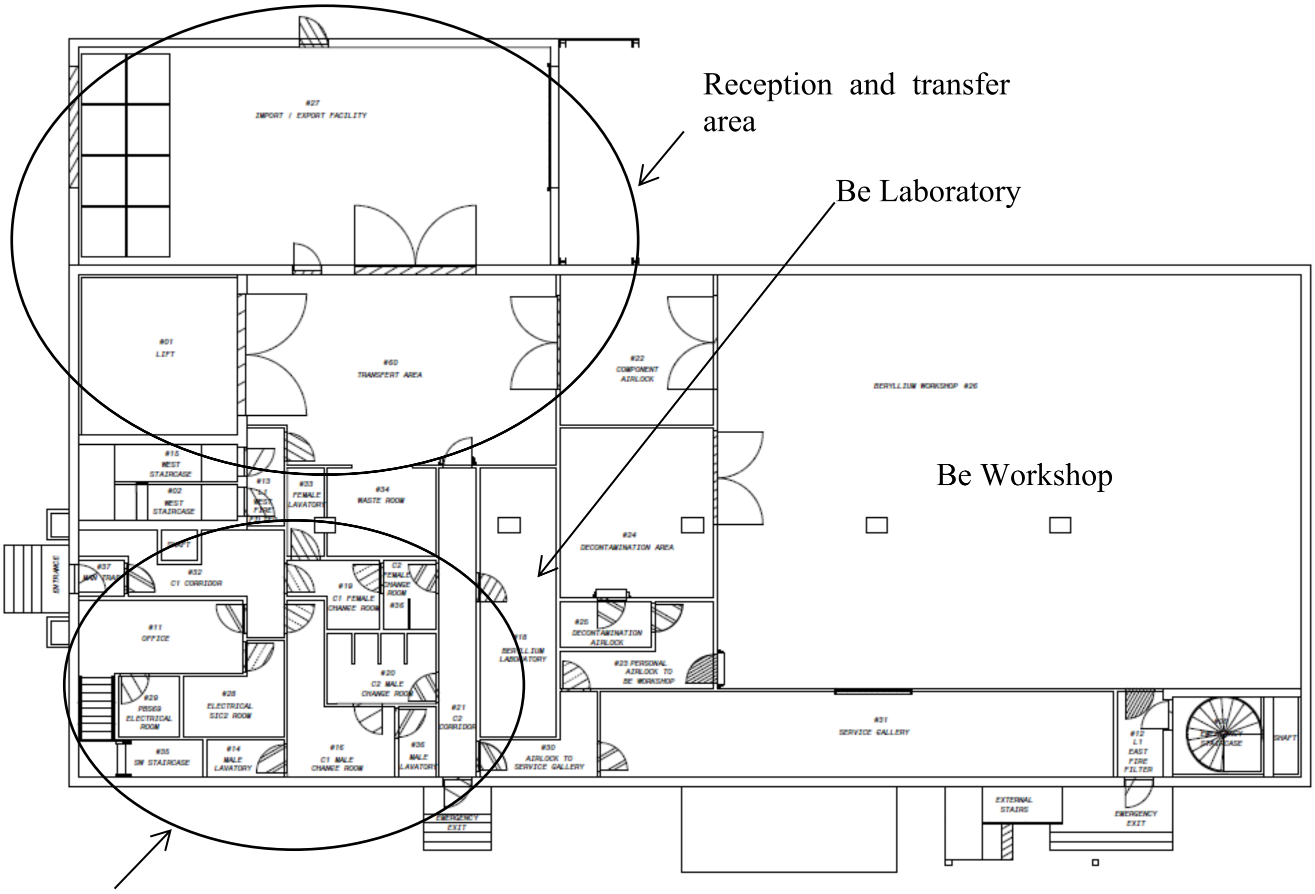

Figure 13 : TAPB2 Level L1 without equipment

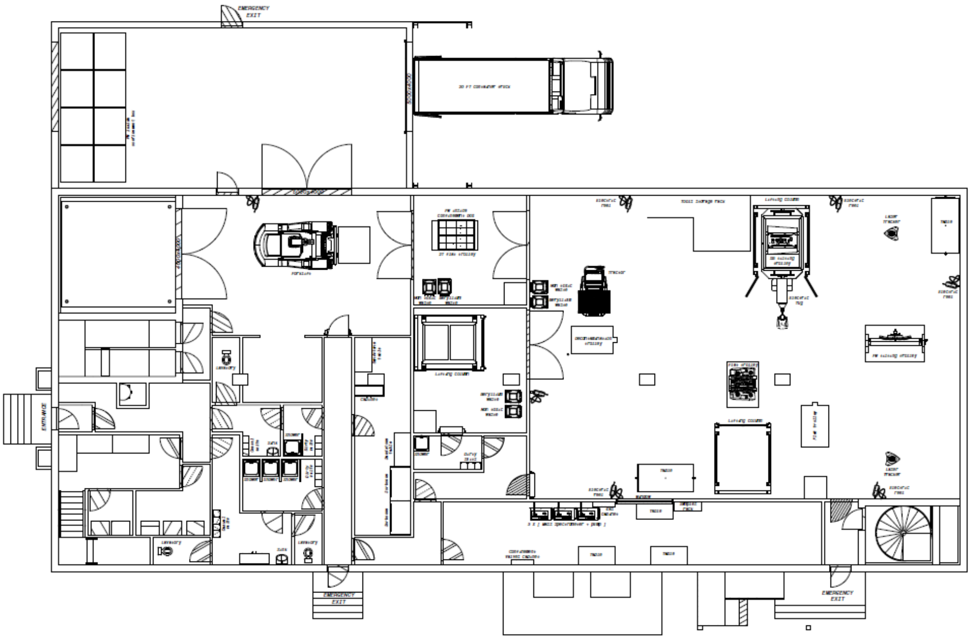

Figure 14 : TAPB2 Level L1 with equipment

2.4.3.3 Layout of the Mezzanine

The main floor of the facility has a mezzanine (secondary structure) which includes the service rooms for the facility as follows:

- HVAC technical rooms
- Electrical rooms
- Elevator Screw-Lift motors and gearing
- Corridor (to comply with the French regulation (Labour code) according to the rules applied to escape routes)

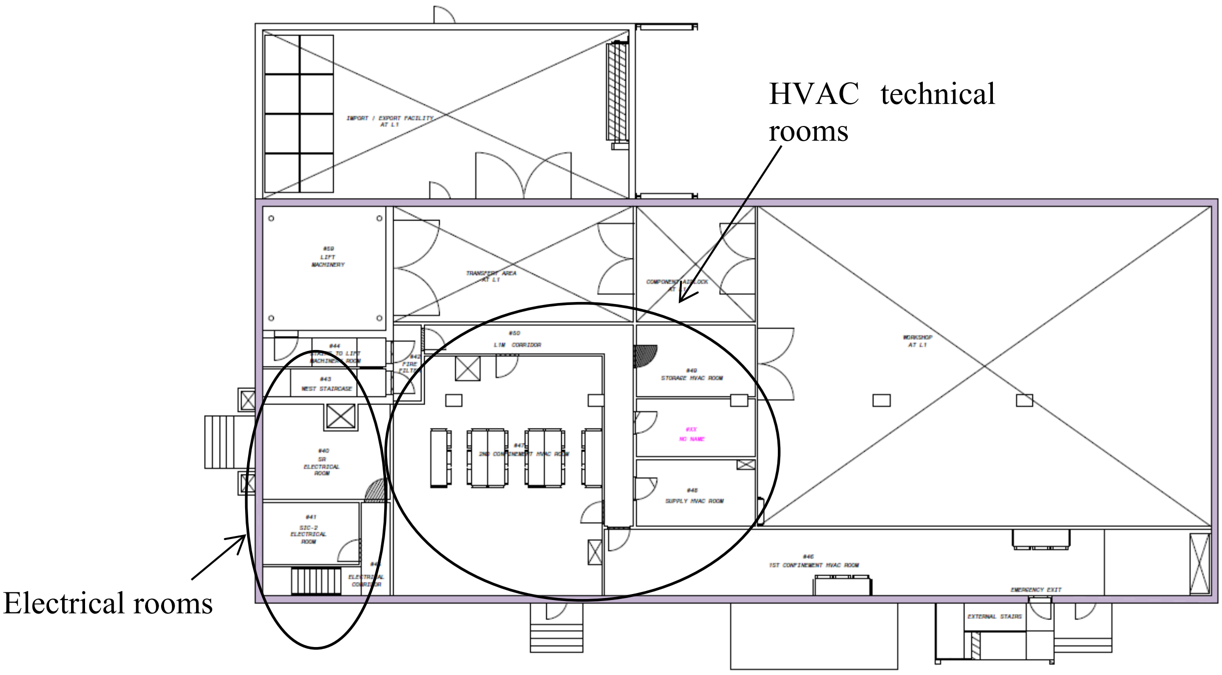

Figure 15 : TAPB2 Level L1M

2.4.3.4 Layout of the roof

On the roof, the following equipment is installed:

- The Air Handling Units for the ventilation
- The Chilled water system for the Local Air Coolers (LACs)
- The exhaust fans
- A stack to raise the release point of potential beryllium release to the environment

An external staircase in steel frame gives an access to the roof for the inspection and maintenance of this equipment.

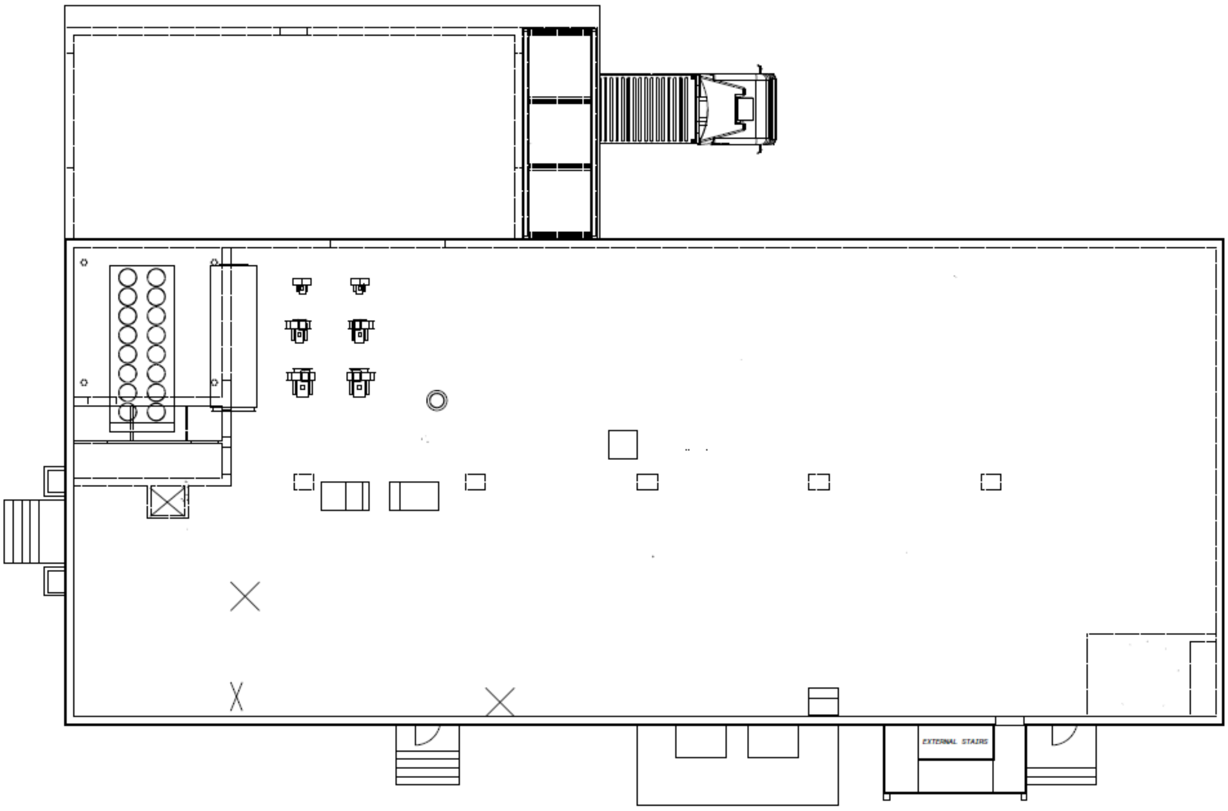

Figure 16 : TAPB2 Level R1

2.4.4 Transfer and Circulation

The horizontal transfer means of the different items are foreseen as follows:

- A manual pallet trolley of 3 tons capacity is used to transfer the FW from the shipping container into its storage container.
- A battery operated forklift of 7 tons capacity is used to transfer the Shield Blocks from the truck to the buffer storage in the building; the forklift is stored and recharged outside the concrete building, in the import/export facility.
- In the workshop, an electric tug is used to transfer the component from a workstation to another. When not in operation, the equipment is disconnected from the electrical network.
- In the basement, the FW storage containers are moved and placed on the shelves using a dedicated electric side loader (connected to its power supply via an umbilical). This equipment does not normally leave the basement.

The vertical transfer of the FW from the transfer area at L1 to the storage at B1 is ensured by a High Integrity Screw-Jack Lifting System with a capacity of 20t SWL for a travel height of 6m. The lift platform is guided during all movements & seismically restrained.

The TAP Building is equipped with an access control system to ensure security where restricted access conditions apply. The access control system includes door status indicators, badge readers and door lock actuators (as needed), audio-video surveillance equipment, and control logic to control worker access. For this need, there is a man trap at the entrance of the building, which leads into the office/control room and then the change-room.

All workers, whether working with the naked FW panels in the Workshop or the FW containers only, must pass through the change facility.

On leaving the facility, all workers must pass again through the change-room. Workers coming from the Beryllium Workshop may require a shower before exiting.

Evacuations routes are designed in accordance to French Labour Code.

2.4.5 Ventilation

The FW panel operations present a beryllium risk. Thus, the HVAC system has to comply with the ISO standard.

The HVAC system functions include:

- Providing a pressure cascade between inside and outside the facility, as well as, between different confinement zones,
- Cleaning of air prior to exhaust to the environment,
- Providing renewal of air according to ISO17873 and the French labour code,
- Providing clean fresh air and comfortable conditions for workers in the workshop and also in the locker rooms,
- Providing cooled air to ensure correct operation of equipment, such as electrical cubicles, etc,
- Providing devices to mitigate incidental/accidental situations, such as isolation dampers, fire dampers, etc,
- Providing the relevant devices to survey HVAC systems operation,

To perform the facility operations and the HVAC system operations, it is required to monitor HVAC system devices and operating parameters as flowrates (supply and exhaust), pressure cascade, air supply temperature, air ambient characteristics, filters monitoring, fan pressure, AHU monitoring and plenums pressure.

The TAP Building HVAC system is composed of:

- A general supply network feeding all the TAPB rooms
- The C1 exhaust network dedicated to C1 rooms
- The first confinement system exhaust network
- The second confinement system exhaust network

Exhaust networks will release air to the building stack.

To support the HVAC system for the conditioning function, Local Air Coolers (LAC) are implemented and supplied by chillers located on the roof.

In addition, 3 air extraction units independent from the main HVAC system support the process needs in the Workshop, air-lock and decontamination rooms.

In a fire situation within the building, the HVAC system shall ensure the following functions:

- To limit the spread of fire
- To avoid/limit Be emissions from the building
- To facilitate workers evacuation and firefighter intervention

To meet these functions, the following requirements must be met:

For C1 Fire sectors (FS):

- Ducts which ventilate (supply and exhaust) a fire sector (FS) is to be provided with a current fire damper complying with NF-S-61937-5.

For C2/C3 Fire Sectors (FS):

- HVAC equipment located at the exhaust have to be designed to withstand to a high temperature level.
- HVAC system design shall provide :
  - An airtight fire dampers,
  - A temperature sensor downstream of the fire damper,
  - A temperature sensor upstream from the last HEPA filter stage,
  - A spark protection upstream from the last HEPA filter stage, usually integrated within the last HEPA filter stage casing,
  - CTHEN filters and casing,
  - A smoke detector downstream of the last HEPA filter stage,

To facilitate evacuation and intervention:

- Air-locks are implemented in front of each stairwell access,
- Stairwells are maintained in overpressure compare to rooms around,

2.4.6 Utilities

The preliminary list of utilities identified at conceptual level is the following. It shall be reviewed, completed and updated by the designer:

SERVICES REQUIRED	COMMENTS
Site	
Industrial drainage	5m^3 per week
Sanitary drainage	5m^3 per week
Precipitation water drainage	Equivalent volume for building footprint
Liquid and Gas	
Domestic, potable water system	5m^3 per week
Breathing Air	220 Nm^3/h
Compressed Air	50 Nm^3/h
Fire protection water	120 m^3/h
Demineralised water	10 m^3 per week
Bottles used for Helium and Nitrogen if needed	
Signal Cables	
Report of alarm related to safety	To command post and safety desk
Access control monitoring	To command post and safety desk
Electrical Supplies	
Ordinary Load Class IV	600 kW
Local and mobile Diesel Generator	400 kW

Table 2: TAPB2's services

With regards to the electrical supply for the building, this can be interrupted temporarily by an external fault and Be confinement is ensured by the static confinement properties of the facility. It is not desirable, however, to rely on static confinement for long, and it is planned to restore electrical power for the HVAC system by use of a dedicated external diesel generator, noted in the table above.

2.4.7 Waste Management

The TAP Building shall accommodate appropriate space for:

- buffer storage of berylliated solid waste (gloves, suits, wipes, vinyl),
- buffer storage of berylliated liquid waste,

The preliminary estimate of the buffer requirements is the following:

- 4 pallets of size, 1.5 m x 1.5 m, each carrying four 200 l drums. This represents two months of buffer storage.

- 2 x 5 m3 suspect liquid buffer tanks to accommodate the washing of hands, for the personal showers, the HVAC condensation, the floor cleaning, the liquid waste coming from the Be laboratory, etc.
- 2 x 1 m3 buffer tanks for the decontamination shower emanating from the C3 rooms

The treatment of solid and liquid Beryllium waste is fully outsourced. However:

- the analysis of Be samplings, if needed, will be done in the Be laboratory inside the TAPB,
- solid waste is put into drums which are stored in the waste room,
- industrial liquid waste, including HVAC condensation, will be temporary stored in the tanks in the basement. Prior to transfer liquid waste in the CEA network, samplings will be performed in order to meet discharge criteria.
-

2.4.8 Design Features of the Building

2.4.8.1 Building Structure

Material grades and qualities used comply with the requirements of the Eurocodes (with relevant French National Annex), Euronorms and French national standards.

The TAPB and the systems it contains are designed to withstand the loads anticipated during normal, incident and accident conditions, including the process materials and tools and the total weight of stored materials and components.

Rooms and corridors have surfaces which are treated with de-contaminable epoxy paint.

The TAPB is designed to account for any structural interactions with its main interfaces. This includes seismic interactions, access routes and effects arising from adjacent structures, e.g. services trenches.

2.4.8.2 Seismic

The TAPB foundation is based on rock and the building is designed to resist the SL-2 seismic event. The PIC/SIC elements of the Building Systems for which there is a seismic requirement, are seismically qualified by demonstrating their performance under secondary response spectra generated from an analysis of the response of the building structure.

2.4.8.3 Fire Protection

Fire protection systems in the TAPB conform to the 7th of February 2012 French order.

TAPB integrates fire prevention, detection, alarms and extinguishing systems as described below:

- Walls, doors and partitions have appropriate fire rating, in conformity with the fire sectorisation,
- Fire barrier properties shall be maintained when crossing fire boundaries with all types of penetrations. The penetrations, ducts and electrical cables at boundaries of fire sectors shall withstand 2 hours (EI-120),
- Electrical materials shall be designed according to the IEC standards related to reduced flame propagation, flame retardant, low smoke and non-toxicity specifications,
- For all PIC/SIC components cables, fire resistant according to IEC 60331 or NF 32070 CR1,
- PIC/SIC cubicles are redundant in two segregated fire sectors,

- Ventilation systems are designed to prevent the spread of fire and smoke between sectors,
- The fresh air supply intakes to fire sectors are located, wherever possible, sufficiently far away from the exhaust air outlets and smoke vents of other fire sectors,
- Non-combustible or fire resistant filters are used,
- Heat and smoke detectors are provided and the fire detection systems are always available (uninterruptible power supplies),
- The location and detail of fire exits, personnel escape routes and facilities for the emergency services are in accordance with the applicable French regulations,
- Staircases which serve as access and escape routes are provided with overpressure ventilation relative to adjacent areas in order to keep the staircase free of smoke,
- The building has the capability to contain any fire-fighting water against spreading to the wider environment in a capacity underground. Note, however, that the use of water is forbidden in a room where beryllium is present,
- Fire extinguishers are provided in accordance with French codes and IO requirements. Dedicated fire extinguishers for fires involving beryllium are provided. Moreover, automatic fire extinguishing systems will be installed directly inside the engine compartment of the handling means (including the side loader)

2.4.8.4 Earthing and Insulation

The Building has an electrical earthing grid with connections to the plant-wide earthing grid network, and has earthing terminals at specified locations inside the Buildings. The earthing grid is designed according to the French regulation and electrical requirements.

2.4.9 Operation and control

There are two operation states of the TAP Building in the beryllium phase:

Operational State	Control philosophy
Operation in the workshop on FW panels	• Operator in the Be facility
No operation but FW panels in the workshop and in storage area	• No operator in the Be facility. • Safe state: workstations are shutdown, doors are closed and HVAC working. Alarms sent to the command post if fire alarm or HVAC failure

Table 3: TAPB2's operational states

It is expected to operate the facility based on one or two shifts during the day, depending on the inlet flow of First-Wall panels.

The facility is monitored remotely. When operators are in the Beryllium Workshop, the beryllium monitoring system is operational in order to check the beryllium airborne contamination. The facility is monitored from the office/control room at the entrance of the building where there is no risk of beryllium exposure.

The TAP Building shall comply with the Security Requirements, in particular with an intrusion detection and access control system, CCTV monitoring and series of barriers.

2.4.10 Confinement

The key safety function of the TAP Building is the confinement of the beryllium airborne contamination in order to protect the workers, the public and the environment, by providing static and dynamic confinements.

2.4.10.1 Beryllium source term

According to the EU CLP (Classification, Labelling and Packaging) Regulation, the Be classification for acute inhalation toxicity is category 2, acute oral toxicity is category 3, and carcinogenicity is category 1B (substances presumed to have carcinogenic potential for humans based largely on animal evidence).

Occupational contamination can occur due to:

- inhalation of beryllium aerosols,
- skin contamination.

In all operational states, it is considered that 440 FW are stored at the basement level + 35 spares within storage containers. This corresponds to around 14 tons of solid Be metal.

Depending on the operational state, there could be up to 6 FW in the workshop, i.e. 180 kg of solid beryllium.

In addition, transiently, there are six FW panels in their shipping containers present in the ISO container in the import/export facility during the time it takes to transfer them from to the basement. This time is estimated to be 2 hrs for a single truck load of FW panels.

The space in the basement required to store miscellaneous components is minor in comparison to the FW panel storage, but nevertheless, a region of the basement is reserved for these.

2.4.10.2 TAP Building Confinement System

The TAPB confinement system is based on the following confinement barriers:

First Confinement System

The first confinement system prevents the dispersion of hazardous material within the facility during normal facility conditions, e.g. operation, testing, and maintenance.

The first barrier of confinement of the FW panels, once they are unwrapped in the Be Workshop, is the workshop walls. The Workshop is served by a dedicated dynamic confinement system (HVAC).

In the storage all the source term is present therefore the room and the ventilation associated is considered as the first confinement system.

Second Confinement System

The second confinement system limits the spread of contamination outside the first confinement system and limits environmental releases in events during which the first confinement system fails to completely contain the inventory at risk. This system is distinct from the first confinement system and includes rooms with appropriate depressurization and filtration. These rooms are served by a segregated dynamic confinement.

The second confinement system of the storage containers includes mainly the lift, filters stage room at L1M and tanks room.

The second confinement system of the workshop includes mainly the services gallery, filters stage room at L1M, Be laboratory and transfer area.

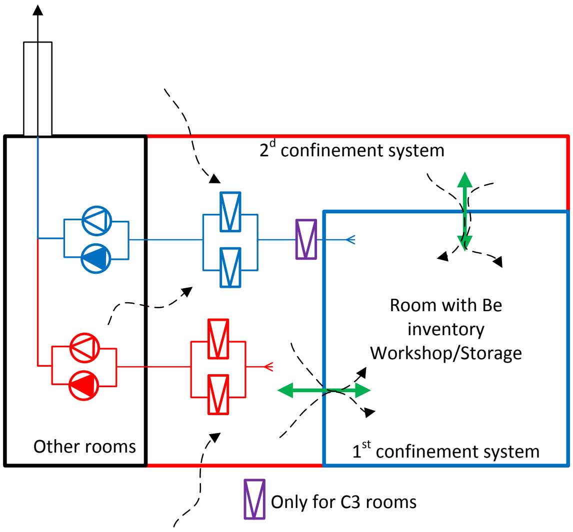

Figure 17 : TAPB2 confinement scheme

Dynamic Confinement

The dynamic confinement is implemented by the ventilation systems, which provide a pressure cascade with the higher contamination hazard areas at lower pressure than lower contamination hazard areas. Extracted air is discharged through series of filters before being released into environment through the exhaust point, i.e. the stack.

A minimum differential pressure of 40 Pa is maintained between 2 adjacent classification areas.

There is a personnel airlock between the beryllium decontamination area and the beryllium workshop with provision to add a decontamination shower for the worker plastic suit.

The following rules are applied for the penetrations:

- For C3 rooms, there is no penetration to external walls, penetrations are only with C2 or C1 rooms
- The only penetrations between the site and C2 areas are liquid drainage (going to the tanks at the basement). Note that these tanks are in a room completely isolated from the storage room, which has no penetrations to the site.
- All the other services (liquid & gas, cables power supply, etc.) are routed through C1 areas, either at L1 or L1M mezzanine
- Check valves are used for HVAC inlet and outlet services. These valves are closed after each transfer and are designed to fail closed.

The ventilation of the change room where the workers have their showers has a HEPA filter at the outlet.

2.4.11 Zoning drawing

2.4.11.1 Ventilation zoning

In the TAP Building, every room is allocated to a ventilation zone, depending on the (potential) contamination level inside the room (see table below).

Nature of room or area	Depression value [a]	Containment class
Non-controlled rooms or areas free from contamination	Atmospheric pressure or small overpressure	Unclassified
Supervised areas with low levels of surface or airborne contamination	Less than 60 Pa	C1
C1 should be uncontaminated in normal operations		
Controlled areas with moderate levels of surface or airborne contamination	80 to 100 Pa	C2
Controlled areas with high levels of surface or airborne contamination	120 to 140 Pa	C3
Controlled areas with very high levels of surface or airborne contamination	220 to 300 Pa	C4
Areas which are not accessible except under specific circumstances		
[a] Compared to the reference pressure.		

Table 4: Extract from ISO 17873 Standard

The preliminary ventilation zoning is defined here under.

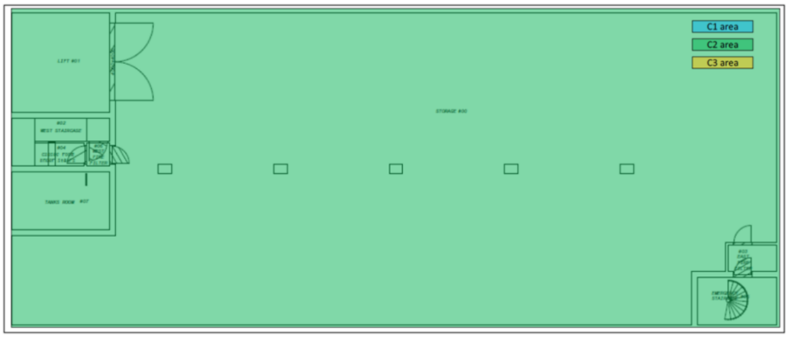

Figure 18 : TAPB2 - Preliminary ventilation zoning of the basement (B1)

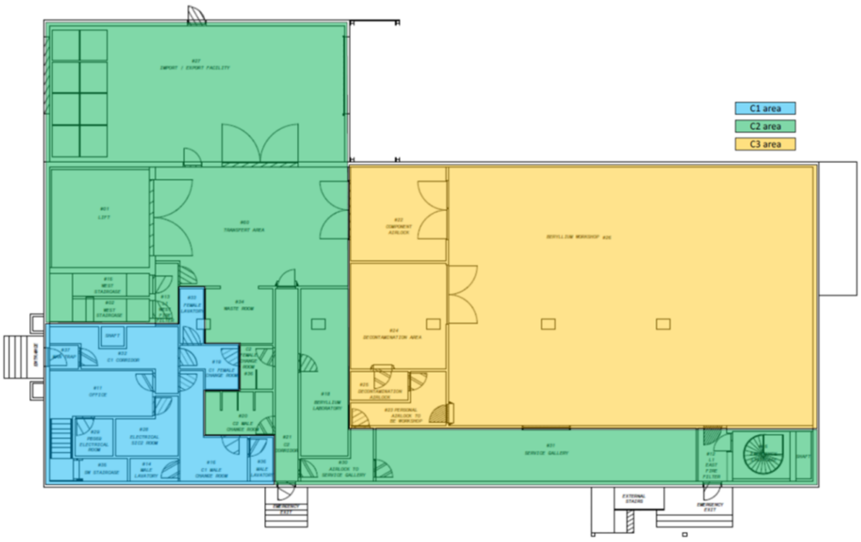

Figure 19 : TAPB2 - Preliminary ventilation zoning of the ground floor (L1)

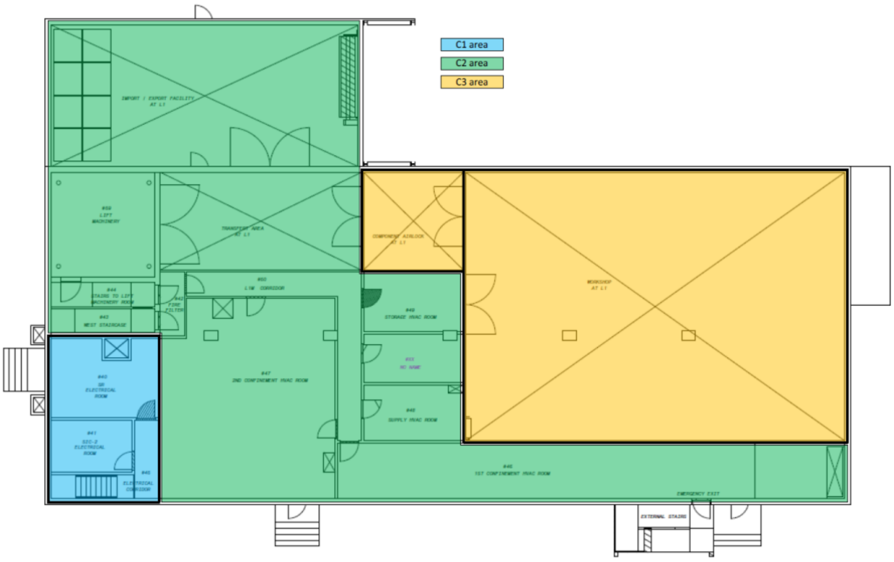

Figure 20 : TAPB2 - Preliminary ventilation zoning of the mezzanine (L1M)

2.4.11.2 Beryllium Zoning

2.4.11.2.1 Threshold Values

Threshold values for beryllium occupational exposures are recalled in Table 5*: Beryllium exposure criteria*

.

Beryllium zone	Beryllium exposure criteria		Access and control conditions
	Atmospheric concentration (µg/m^3)	Surface contamination (µg/m²)	
Beryllium non-controlled zone	< 0.01	< 0.1	• no plausible risk of presence of beryllium, • no access limitation.
Beryllium controlled zone	0.01 < [Be] < 0.2	0.1 < [Be] < 10	• no dispersion risk for beryllium aerosols, vapour and dusts, • possible presence of beryllium, in concentrations above the detection limits of monitoring equipment , • access limited to 'beryllium' qualified personnel, • stay times and possible safeguards adapted to the risk of exposure, depending on the operations to be performed.
Beryllium zone with respiratory protection	> 0.2	> 10	• presence of contamination and/or potential to exceed the limits for beryllium controlled zone. • Access limited to especially qualified 'beryllium' staff. • Confined and ventilated zone requiring use of respiratory protection gear.

Table 5: Beryllium exposure criteria

2.4.11.2.2 Identification of Beryllium Zones

The assumptions are the following:

- C1 ventilation zones correspond to “Beryllium Non-Controlled zone”.
- C2 ventilation zones correspond to “Beryllium Controlled zone”.
- C3 ventilation zone correspond to “Beryllium zone with respiratory protection”.

2.4.11.3 Fire sectorization

The preliminary fire sectorization has been performed according to ITER Fire Safety approach principles:

- The room contains combustible materials, potential ignition sources and potential sources of oxygen.
- The room contains one or more pieces of PIC/SIC equipment necessary to fulfil a safety function and which could potentially be damaged during a fire.
- The room contains a significant amount of toxic material mobilisable in case of a fire.

Based on the conceptual design analysis, the preliminary fire sectors in the TAPB2 is the following (to be reviewed, refined and update by the contractor):

Fire sectors	Room	Surface [m^2]	Level
FS1	Storage	556	B1
FS2	Workshop + decontamination	289.7	L1 + L1M
FS3	PIC/SIC electrical room	7.7	L1
FS4	PBS69 cabinet	3.9	L1
FS5	2nd confinement HVAC Room	88.5	L1M
FS6	1st confinement HVAC Room	71	L1M
FS7	SR electrical room	21.5	L1M
FS8	PIC/SIC electrical room	12.4	L1M
FS9	Lift machinery room	25.5	L1M
FS10	Be laboratory	22.2	L1

Table 6: Preliminary list of Fire sectors

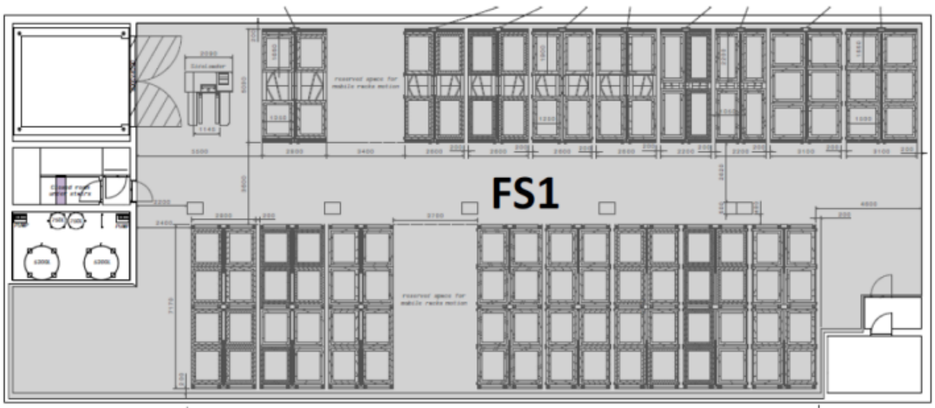

Figure 21 : TAPB2 - Preliminary Fire sectorization of the basement (B1)

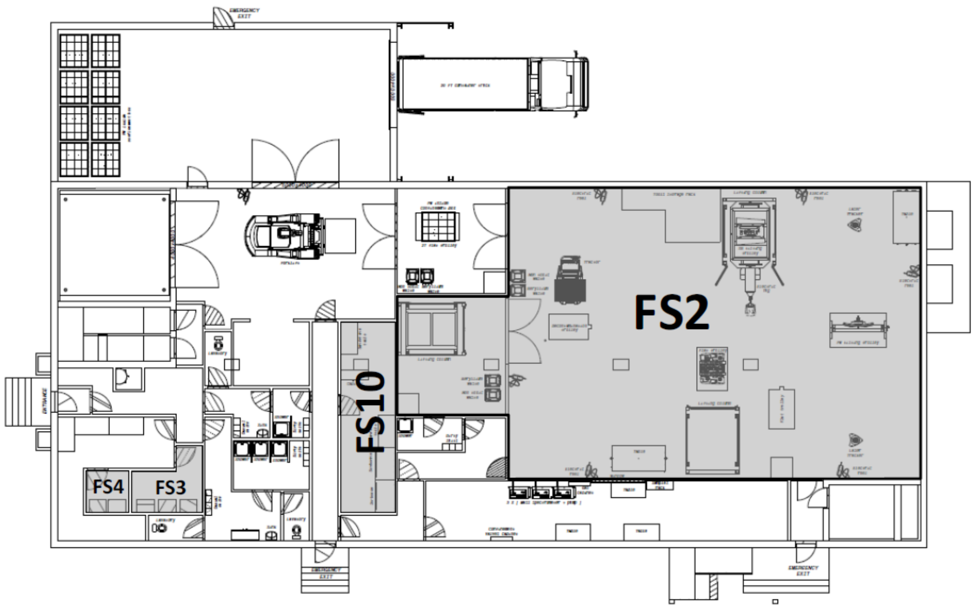

Figure 22 : TAPB2 - Preliminary Fire sectorization of the Ground floor (L1)

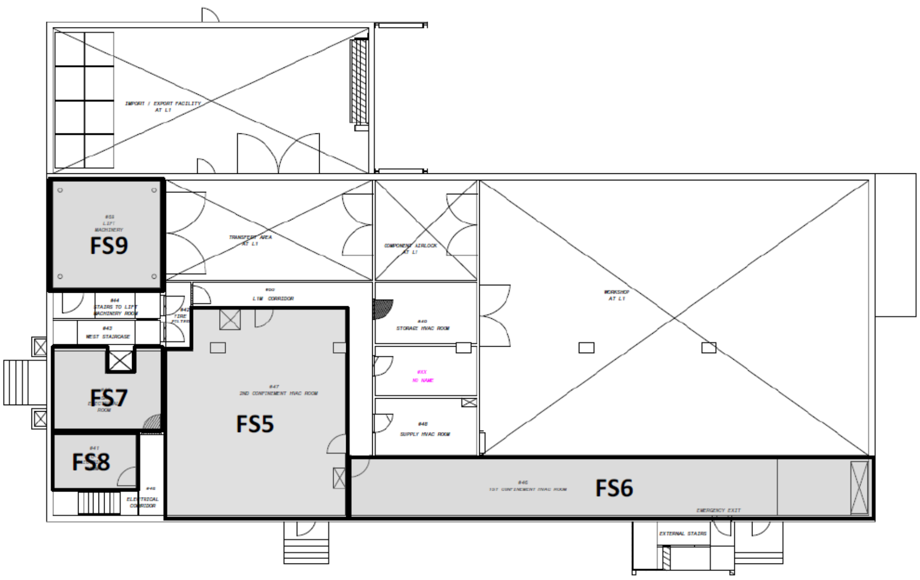

Figure 23 : TAPB2 – Preliminary Fire sectorization of the Mezzanine (L1M)

Note: the function of the airlocks is to collect a possible release of toxic material from fire sectors due to the loss of pressure cascade, reason why they are not part of the fire sector.

2.4.12 Risk Identification

In the TAP building, internal risks and external risk shall be assessed and the Contractor shall perform the safety support analyses, knowing that the licensing process is managed by the nuclear operator IO.

3 Scope

3.1 High-Level Requirements

The Contractor shall develop a design of the TAP Building in order to:

- Satisfy the IO system "user" requirements for the equipment and functionality of the building and systems,
- Comply with all necessary codes, standards, regulatory and safety requirements of the ITER project,

The resulting documentation shall be suitable/useable for:

- A safety demonstration versus safety defined requirements,
- Tendering the construction,
- Construction.

Within 1 month after the contract signature, the contractor shall review, update and if necessary, complete the input data:

- Conceptual Design Review (CDR), in particular the main feature of the Civil Work, the TAPB layout, the building loads and building interfaces, the precise location of the building in area 73,
- Interfaces requirements document,
- Changes to CDR document,
- Safety Analysis,
- Transverse and Project Requirements.

Based on this review, the Contractor will propose alternatives wherever cost or time benefits are considered substantial and achievable, in particular, the Contractor will evaluate which of the following option is the most optimized:

- Using specific components for phase 1 and change them for Phase 2
- Using components designed according to Phase 2 requirements since Phase 1

During the complete design phase, the Contractor shall develop designs which will optimize the cost and schedule constraints whilst simultaneously observing the key safety and quality criteria under which the ITER Project operates.

As such, a "Minimum Fit for Purpose" design philosophy, which in turn is consistent with the "As Low as is Reasonably Achievable" safety objectives is to be adopted and particular emphasis is to be placed on the optimization of space allocations within buildings at all times.

All designs shall be developed in accordance with the codes, standards and technical requirements given in this technical specification (including the reference documentation).

The IO shall provide the French Nuclear Regulator with a description and a safety analysis of the Tokamak Assembly Preparation Building (TAPB) as it is a "Protection Important Components" (PIC) and the design of such a facility is a "Protection Important Activity" (PIA) as defined in The Order 7th February 2012. As a consequence, the Contractor and Subcontractors must be informed that the compliance with the INB-order must be demonstrated in the chain of external contractors, if any, and contracted activities for supervision purposes are also subject to a supervision done by the Nuclear Operator.

For the Protection Important Components, such as the nuclear buildings, structures, systems of the nuclear facility, monitoring and emergency power supply 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.

To be noted that:

- part of the expected documentation will be used as support documentation to answer to the French nuclear regulator, as part of the licensing process.
- The document for the Construction Permit shall be established by an Architect (in French) according to the French Urbanism Law.

A preliminary list of deliverables is given in Appendix 3 in order to illustrate the expected outcome of the main missions in term of deliverables.

It is expected that:

- a significant part of the contractor team will be located on site in order to ensure efficient design which meets requirements.
- technical solutions shall be based on existing and proven solutions, aiming at reducing risks and minimizing cost.

3.2 Main missions

The contract scope is sub-divided into:

- TAPB Facility and Building design, construction permit,
- Support to tender and contract,
- Review of the constructor documents,
- Supervision of construction.

3.2.1 TAPB1&2 Facility and Building design

The Contractor will perform the architectural and structural design of the buildings, finishes, external service networks, Area 73 drainage and slab local to the TAP building and all interfaces between the building and the building services, including designs for temporary diversions of utilities and drains within Area 73 and all enabling works in order to facilitate the constructor's full and unimpeded use of the designated construction site, e.g. temporary backfill and protection of drains on site perimeter.

All of these designs will be sufficient such that the constructor has all information required to build from these design deliverables without further design activity (calculation or drawing).

Therefore the scope of design for these works includes:

- Preliminary Design TAPB1 and TAPB2, including safety demonstration at preliminary design maturity level,
- Construction Design TAPB1,
- Execution Design TAPB1,

The contract scope is the design of TAPB1 and TAPB2 works, however the design of the TAPB2 works is limited to preliminary design and all other design activities necessary to freeze all interfaces between TAPB1 and TAPB2 works. This is expected to be mostly, but not limited to, interfaces between TAPB2 works and the building.

Any design that may be necessary to performed for the Construction will be done by the Contractor.

In addition and following a system engineering approach, the contractor shall support IO to find a fair balance between the different sub-systems, minimizing the overall cost of the TAPB.

There should be enough survey information to perform a complete analysis of the soil. The Contractor will analyses the geological survey provided by IO and will perform any other survey that may have be necessary, according to its needs for the analysis of the foundations.

The Contractor will perform the design of the building services such that the constructor has all information to procure the building services, doors, lift, etc. and their installation without further design activity (calculation or drawing).

The design of the workstations, storage racks and process equipment will be carried out by IO, however the interface definition and the integration of these designs with the building and building services is part of this contract scope (including safety risks).

As part of the design activities, the contractor shall:

- provide a safety demonstration of TAPB2, based on the preliminary design level,
- provide a detailed design, a translation of defined requirements into technical requirements and then a refinement of the defined requirements
- demonstrate that the design is compliant with the safety requirement,
- follow up the safety requirement up to the commissioning phase of TAPB1,

In the frame of the design activities, the Contractor will prepare the Construction Permit for the building within the scope indicated in this specification. This includes the preparation of all architectural and engineering documents necessary for the Construction Permit according to the French Urbanism Law and which is detailed in the explicative note (cerfa 51434#07). This includes the requirement of the construction permit (CERFA n^{0}13409), all mandatory document included in the note and all other document corresponding to the nature of the building within the scope.

The Construction Permit shall be established by a French Architect in French language; it shall be reviewed by IO and delivered to the French Authority by the end of the Preliminary Design TAPB1 and TAPB2.

3.2.2 Support to Tender and Contract for TAPB1

The Contractor shall provide support to IO for tendering the construction of the Works including preparation of additional documentation required by the tender process, responding to tenderers queries, tender evaluation, etc.

As part of its obligation to provide a complete design, the Contractor will provide resolution of all tenderer and constructor queries on the design including clarification and elaboration will be performed by the Contractor.

3.2.3 Review of the Constructor Documents for TAPB1

The Contractor will review the constructor's implementation and manufacturing details and all design optimisations proposed by the constructor, in accordance with the design requirements.

3.2.4 Supervision of Construction of TAPB1 (Optional)

The Contractor may be required to provide technical follow up of the construction of the Works to ensure compliance with the design. This will be an option in the Contract exercised by instruction from IO during the Contract.

The Contractor may be required to provide support to the planning, monitoring, steering and coordination of the construction of the Works. This will be an option in the Contract exercised by instruction from IO during the Contract.

Legal Inspection and Statutory Inspections and Health and Safety Project Coordination will be assumed by IO.

Note that the construction contract will be for the Ph1 works. Separate contracts for the completion of the design of Ph2 works and construction of Ph2 works will be procured several years into the future.

The Construction Contract will be in accordance with FIDIC Red Book, being IO the employer and the Contractor will be the Engineer.

4 Schedule outline

The duration of the contract is expected to be 36 months.

Figure 24 is an illustration of the schedule for the TAPB design activities.

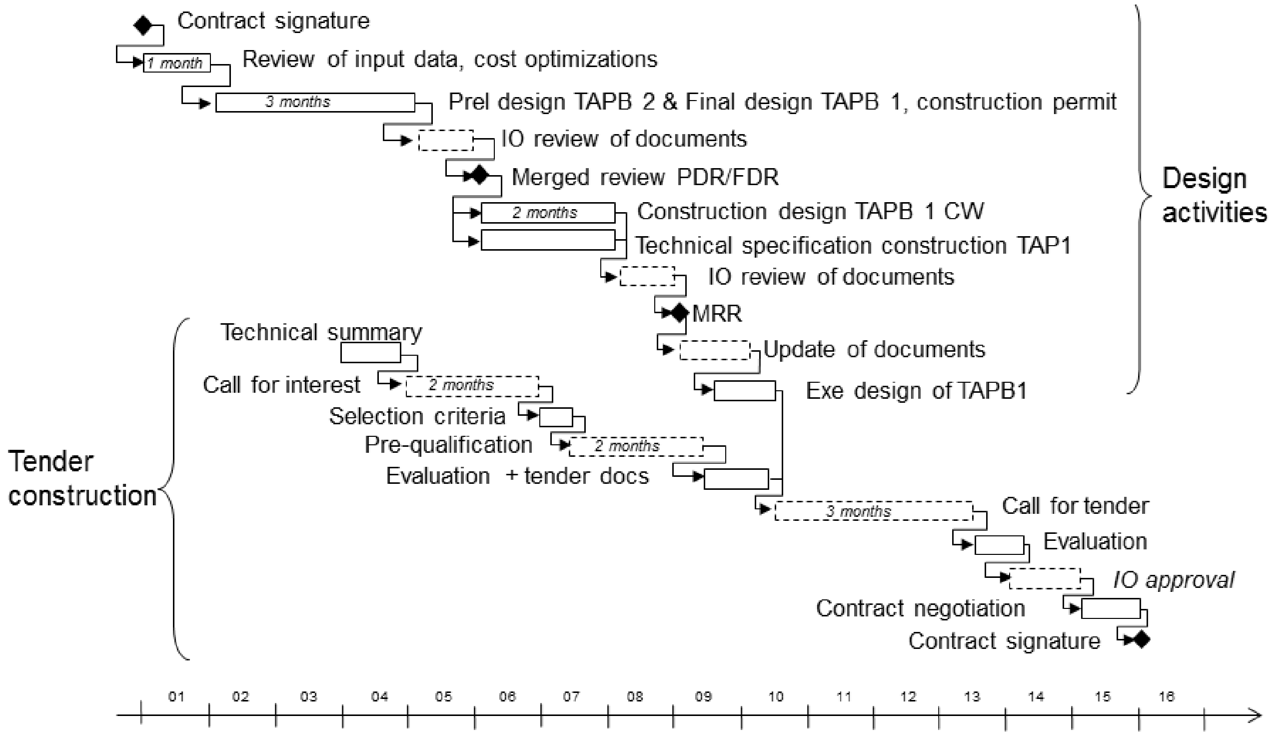

Figure 24 : Preliminary schedule of design activities TAPB

Figure 25 is an illustration of the overall schedule design / construction and operation.

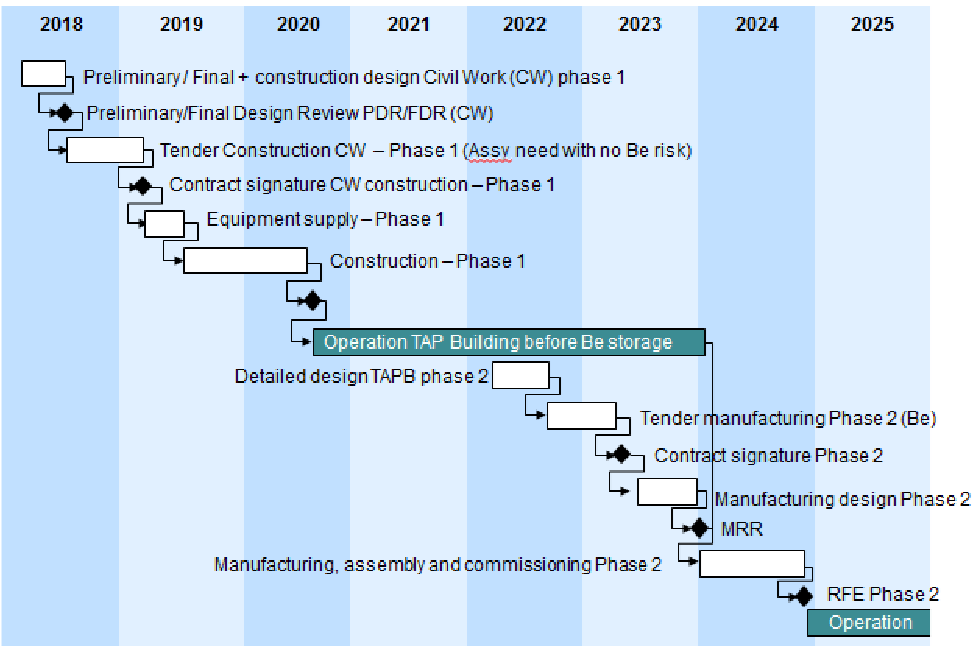

Figure 25 : Preliminary schedule of design, construction and operation

5 Contract tender

5.1 Skills and experience

The TAPB AE shall provide a well-organized, highly skilled and experienced for all the following topics:

	Demonstrable skills and experience of the core team	Main features of the TAP Building
Nuclear civil engineering of complex large scale project	High technology project	ITER stakeholders are China, the European Union, India, Japan, Korea, Russia and the United States. It corresponds to 35 different nations. The project language is English and documentation shall be elaborated in English except for the Construction Permit. A translation in French may be required for some safety support documents (Option).
	Engineering/design	Design and overall integration of : – Building structure. Volume TAPB 10,000 m3 nuclear reinforced concrete building with static and dynamic confinement, Approximately 50 rooms – Building systems, e.g. HVAC, fire protection, electrical distribution, I&C, liners, red zone cooling, piping, – Mechanical heavy handling, e.g. doors, trolleys, screw lifts. – Integrity maintained in case of SL-2 seismic event. – 2 hours fire resistance for confinement systems. – Management of Building services – Decontaminable epoxy painting
	HVAC and fire protection	Nuclear HVAC (safety functions) Management of heat loads, fire loads, air conditioning, fire protection and mitigation, pressure cascade and confinement zones, fire sectorization
	Network routing (e.g. cabling, piping, HVAC), management of penetrations and anchorage	PIC and SL-2 Control Cubicles, Electrical Distribution Boards. Routing of HVAC, cable trays, piping.. Segregation of routing for PIC functions (e.g. power supply, instrumentation)
	Seismic requirement	High seismic requirement (2 to 3 g acceleration in different dimensions) on building structure and part of the building system and process which is seismic classified according to the safety analysis
	Safety demonstration	Full traceability of safety requirement, from the “high level” safety requirement to the defined and detailed defined safety requirement and the related reference documentation Compliance matrix for the safety requirements Exhaustive list of prevention, detection and mitigation means for each internal and external safety hazard (deterministic approach).

	Demonstrable skills and experience of the core team	Main features of the TAP Building
	French Nuclear Regulator licencing process	Safety analysis in line with the French regulation, ASN recommendations, ASN Prescriptions and in line with the nuclear licensing process.
Security	Security	TAPB is a High Security Zone (HSZ) with Access Control requirements, monitoring, alarm devices.
H&S	Integrated H&S	TAPB is integrated in the IO construction site and follows IO and French law regulations related to H&S.

Table 7: Demonstrable skills and experience

The primary selection criteria for the TAPB AE contract will be demonstrated experience of the core team on site, knowledge and skills with criteria given in table above and ensuring safe, timely and cost efficient management of large scale first-of-a-kind and nuclear projects.

5.2 Procurement Schedule

A tentative timetable is outlined as follows:

Procurement Schedule	Tentative Schedule
Call for nominations	20th December 2017
Receipt of nominations	30th January 2018
(*) Issue pre-qualification and tender application	2nd February 2018
(*) Receipt of pre-qualification and tender application	15th March 2018
Estimated Contract award date	27th April 2018

Table 8: Timetable of the tender

The pre-qualification process shall ensure that the candidates have sufficient experience, resources and financial capacity to manage such a construction project to achieve the Owners requirements on safety, quality, cost and programme.

(*) Note that it is expected to merge the pre-qualification and tender steps.

Appendix 1: Abbreviations

ALARA	As Low As Reasonably Achievable
ASN	*« Autorité de Sûreté Nucléaire »* - French Safety Authority
Be	Beryllium
CDR	Conceptual Design Review
CEA	Commisariat à l'Energie Atomique
CW	Civil Work
CTHEN	« Caisson Filtre Haute Efficacité Nucléaire » - High Efficiency Filter Unit
DAC	Derived Atmospheric Contamination
F4E	Fusion For Energy, European Domestic Agency
FIDIC	International Federation of Consulting Engineers
FW	First Wall
HEPA	High Efficiency Particulate Air
HVAC	Heating, Ventilation, and Air Conditioning
I&C	Instrumentation & Control
INB	« *Installation Nucléaire de Base* » - Nuclear Facility
MIFI	Magnet Infrastructure Facilities for ITER
NSQ	« *Note de Synthèse de la Qualité* » - Quality Synthesis
PIC/SIC	Protection Important Component / Safety Important Component
PT	« *Prescription Technique* » - Technical Prescription
RPrS	« *Rapport Préliminaire de Sûreté* » - Preliminary Safety report
SAT	Site Acceptance Test
SB	Shield Block
TAPB	Tokamak Assembly Preparation Building
TAPB1	TAPB configuration during phase 1 works, with no Be hazard
TAPB2	TAPB configuration during phase 2 works, with Be hazard
TKM	Tokamak

Appendix 2: Liability, insurance and conflict of interest

1. Nuclear liability

The ITER Organization is the nuclear operator of the ITER nuclear fusion facility (INB 174) under French nuclear law. However, unlike other nuclear operators of nuclear fission installations in France, nuclear fusion installations are not covered by the Paris Convention on nuclear third party liability for the time being. Pending negotiations with the Contracting parties to the Paris Convention, the special nuclear liability regime (i.e. limited strict liability of the nuclear operator) implemented by the Paris Convention does not apply.

Therefore, the ITER Council, by a decision of 2009 endorsed that until a solution is found, the ITER Organization may assume this responsibility by providing a declaration and waiver of indemnity regarding nuclear liability to indemnify suppliers of the IO and their subcontractors in case they are held liable, based on the principles of the Paris convention, this in the understanding that if no regulatory solutions could be found before nuclear operations of the ITER facility started, a proper mechanism would be established by the ITER Members in accordance with Article 15 of the ITER Agreement.

This declaration and waiver of indemnity regarding nuclear liability shall be included in the contract signed by the contractor and the IO.

2. CEAR insurance

The ITER Organization and Fusion for Energy, the European Domestic Agency in charge of providing buildings to the ITER Organization, have taken out an insurance policy to cover:

- the risk of physical loss or material damage to the Project arising from whatsoever cause except if excluded,
- as well as to cover all sums which the Insured shall become legally liable to pay in respect of or arising from accidental bodily injury to or illness of third parties and accidental loss or damage or destruction to property belonging to third parties occurring during the construction/erection period on the construction site and arising from or in connection with the Insured Project unless excluded (CEAR Insurance Policy).

Contractors, Subcontractors of any tier and suppliers and/or consultants (in respect of their site activities) are also covered by this insurance policy and as such are only liable for the deductible, the exclusions or above the limit of coverage mentioned in the insurance policy in accordance with the insurance certificate that will be provided to you during the next phase of the tender process.

This insurance policy carries a global aggregate coverage limit of Euro 1,000,000 000 (one billion Euro).

The ITER Organization and Fusion for Energy will cover their own buildings used by the Contractors to perform their duty on Site, excluding the content being the contractor's property.

The CEAR insurance policy subscribed by the ITER Organization and Fusion for Energy shall not affect the contractor's liabilities or obligations.

3. Potential Conflict of Interest

The awarded company or consortium member or sub-contractor shall not participate in the related construction contracts.

This limitation does not apply to contracts already in place by the time of the signature of the TAPB AE contract, or to contracts placed or to be placed by the Domestic Agencies unless specifically mentioned before signature of the said contracts.

The same principles as above apply to parent companies or subsidiaries.

By "Parent Company" it is meant a firm that owns or controls other firms (called subsidiaries) which are legal entities in their own right. IO will consider as a "subsidiary" a company controlled by another (the parent) through the ownership of greater than 50 percent of its voting stock. This basically represents 50%+ 1 vote.

Voting Stocks (or voting shares) are the ordinary shares the ownership of which gives an entity the right to vote in the issuing firm's annual general meeting. The ultimate and exclusive right conferred by a lawful claim or title, and subject to certain restrictions to enjoy, occupy, possess, rent, sell, use, give away, or even destroy an item of property.

A parent company can be a Holding. ln that particular case, and in order to simplify the implementation of this principle for Holdings which definition can vary with the legal system, the IO will retain the same definition as for a Parent company(> 50% of voting shares).

In all cases, the I0 will strictly implement the principle of Article 2.2.3 of the Order dated 7 February 2012 relating to the general technical regulations applicable to INB (the independence of the supply chain stakeholders shall be demonstrated for protection-important activities). In addition, the I0 will require a commitment undertaking for ensuring this independence.

Appendix 3: Preliminary list of deliverables for guidance

Preliminary Design Phase 1 & 2
CONSTRUCTION PERMIT
Construction Permit including appendix.
INPUT DATA AND SAFETY
Review of QDs and Compliance Matrix
Review and completion of requirements and Technical assumption for missing data
Building external and internal interfaces
Quality plan update
TESTS AND COMMISSIONING
Testing and commissioning plan
SYSTEM ENGINEERING
Qualification Summary Report (NSQ) for SIC components (HVAC and building)
Definition of impact of TAPB2 preliminary design on TAPB1
Design Description Document
Nuclear Safety Control Plan
General arrangement drawings • Concrete outlines with access routes, • fire sectors and escape routes, • ventilation and pressure cascade,
Room book
UTILITIES
Utilities systems & network interface sheet with building structure and equipment
HVAC (including smoke exhaust) and Cooling network
Functional description and Basis of Design
Layout drawings of HVAC.
Ducts routing diagrams (single line)
HVAC supports and anchoring
FIRE DETECTION & PROTECTION & ALARM SYSTEM
Functional description and Basis of Design
Fire extinguishers specification and equipment layout
Fire water retention calculation
Fire detection and extinction system space reservation
Fire dampers & filters space reservation for first phase concrete interface
General arrangement
ELECTRICAL
Functional description and Basis of Design
Earthing and lightning functional description.
Single line diagrams of electrical power supply.
General arrangement
Electrical SSD diagram

Electrical drawings (cables routing & cable trays).
Electrical calculations (ETAP model),
Lighting calculations (Dialux mapping) & specification.
Electrical power supply wiring book.
OTHER SYSTEMS (potable water, sanitary / industrial /precipitation drainage)
Functional description and Basis of Design
General arrangement drawings
Detailed routing (layout) of other mechanical systems
Flow balance and sections, detailed calculations, overall capacities check of other mechanical systems
Equipment list of other mechanical systems
Storage tanks space reservation
Drainage of effluents from the shower and change rooms to the tanks
SCREW LIFT AND TRUCK BAY DOORS
Functional description and Basis of Design
Doors calculation taking into account pressure cascade, seismic event, fire rating requirements, access requirement
Lift mechanical calculation
General arrangement
STRUCTURAL
Site investigation report (geologic and geotechnical investigations)
General arrangement drawings with masses location
General arrangement drawings for steel works, racking, workshop, doors
Layout of loads (slab / walls / ceiling).
Functional description and Basis of Design
Review of civil structure thicknesses.
Floor Response Spectra.
Calculation report of special anchorage system and embedded plates for heavy or PIC equipments.
Structural calculation of typical secondary steelwork (access to the roof) and typical anchors for cladding.
Drawing of embedded plates
Site and systems Interfaces
Functional description and Basis of Design
Final Design Phase 1
PROJECT MANAGEMENT
Cost assessment
SYSTEM ENGINEERING
Qualification Summary Report (NSQ) for SIC components (HVAC and building)
Overview of the preliminary design – Update and completion
Nuclear Safety Control Plan
Design Justification Plan/Design Compliance Matrix
UTILITIES
General arrangement drawings

HVAC (including smoke exhaust)
Functional description and Basis of Design
Layout drawings HVAC.
PFD
PID
FIRE DETECTION & PROTECTION & ALARM SYSTEM
Functional description and Basis of Design
ELECTRICAL
Functional description and Basis of Design
STRUCTURAL
Finite Element Model with mass repartition to capture global and local effects, with the model of equipment when spectral mode is requesting integration (storage rack and boxes…).
Floor Response Spectra.
Calculation report of special anchorage system and embedded plates for heavy or PIC equipments.
Construction Design Phase 1
Basis of Design Report - update report
Excavation Report - update report (including karst contingency plan)
FE Model Description Report – detailed description of the model and it's verification - update report
Global Structural Analysis Report – detailed results of the FE model including validation of the individual load case results - update report
Floor Response Spectra, defining spectral accelerations to be considered in the design of all PIC (& therefore seismically qualified) equipment
Structural Calculation Report – detailed report considering the Primary Concrete structure
Structural Calculation Report – detailed report considering the Secondary Steel structures, including Truck Bay steelwork and access ladders, handrails etc.
Component Anchoring Calculation Report – detailed report considering the detailed requirements of all cast in anchorage systems and embedded plates
Construction method report (Works Program, including phase 2 preparation works)
Materials Specifications (Concrete, Steel Reinforcement, Structural Steel, Backfilling, Roads and Paving, Drainage)
Site Location Plan (local to B22, including Constructor and laydown areas, Site Office/Changing Facilities, etc.)
Architectural layout drawings (including façades)
Cladding drawings
Loads drawings
Foundations and buried drainage drawings/Excavation Drawing
Concrete Outline Drawings, including finishes: • Wall / Column • Floor / Beam • Basement Slab
Concrete Reinforcement Drawings • Wall / Column • Floor / Beam

• Basement Slab
Secondary Structures Drawings, including Truck Bay
Anchor Plates Drawings
Doors Lists
Openings and penetrations lists
Integrated 3D model (CMM) of the Building and its Systems
Site Services Drawing
Compliance Matrix and List of Defined Requirements
Execution Design Phase 1
Concrete Formwork drawings
Concrete Reinforcement detailed drawings
Concrete Reinforcement detailed schedules (bar bending schedules)
Steelwork fabrication drawings, cutting schedules
Cladding detailed erection sequence and fastening details
Construction sequence and falsework drawings
Earthing and lightning protection design report and details
Embedded Plates and Cast-in items drawings
Tender construction TAPB1
Final version of all layouts, drawings, designs, specifications, reports, calculations and other documentation which comprise the Design.
Geotechnical surveys
Topographical surveys
Construction and installation analysis and assumptions
Quality requirements
Environmental requirements
Management specifications
Technical specifications
A table defining the documents which will be provided to the tenderers/constructor
A table defining the documents which will be required from the constructor
Procedures, including supporting forms for:
Worksite management:
Security;
Worksite access rules (people, vehicle, equipment, etc.
Worksite boundary and restrictions on usage (storage areas, etc.
Waste management;
Document management:
Identification and coding of documents;
Submission and approval of documents;
Preparation of As Built documentation;
Technical management:
Submission and approval of products;
Testing and commissioning;

Organization of acceptance and taking over
Specification for the creation of additional topographical reference markers
Monitoring of construction;
Project Management:
Subcontracting rules
Change Management - update for construction phase
Management of Nonconformities - update for construction phase
Variations - update for construction phase
Project management documents - update for construction phase
Management of construction phase interfaces
Bill of Quantities prepared to the standard method of measurement CESMM3
Schedule of Rates
Other pricing documents
Contract schedule
Project Risk and Opportunity analysis
Tender queries and answers
Instructions to Tenderers, Tender Specification, pricing templates
All other documents which enable tenderers to assess the work to be carried out and the way in which it will be monitored and reported on
Report on proposed conditions of contract including special conditions to IO
Update of construction schedule and cost estimate to IO
Technical input to the Call for Interest, Call for Prequalification as well as the Call for Tender
Report proposing qualification and selection criteria for prequalification and tenders
Tender analysis report
Technical Monitoring of the Construction of the Works TAPB1
PIP including inspection and surveillance plans.
Change management procedure – update for construction phase
Interface control documents - update for construction phase
A detailed monthly report of the technical monitoring
Specification for topographical reference markers
Inspection and acceptance sheets for Inspection of manufacturing, product sheet and factory inspection, Verification sheets, factory inspection procedures, inspection plans and factory and on-site acceptance procedures and inspection reports;
Report on constructors proposed construction and assembly methods
Test and commissioning plans
Test and commissioning reports.
Construction Contract Execution Management TAPB1
Detailed record of progress
Photographic record of progress
Detailed record of the constructors resources
measurement report on the completed Works – based on bill of quantities
Detailed valuation report and forecast for future expenditure
Initial assessment of the price and schedule impact of variations to the contract
All instructions, Ordres de Service, deviations and other variations

Assessment reports on subcontractors
monthly report of the construction contract execution management
Planning, Steering and Coordination of Construction TAPB1
Written report including proposals on the constructors schedule
Written report including proposals on the constructors method
Written report including analysis of the root cause of delays on the construction progress compared to planned progress and forecast future progress, aimed at ensuring compliance with contractual milestones
Monthly report of Planning, steering and coordination
provide acceptance/taking over plans
provide acceptance/taking over reports
provide a monthly report of vehicles and personnel

Appendix 4: TAPB2 General Arrangement Sections