

Technical Specifications (In-Cash Procurement)

Technical Specifications - Design & Built of the new MFC and ECPS building

This document provides the technical requirements for the design and construction of a laboratory building for Magnetic Field Compatibility (MFC) and Ex-Vessel Coil Power Supplies Project (ECPS).

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1 Purpose

1.1 Purpose

The purpose of this Technical Specification is:

- To provide the technical requirements for the design and the construction of a new industrial workshop building to be erected at the ITER Site;
- To specify applicable norms and regulations that the Contractor shall respect to meet the project performance requirements of the ITER Organization.

2 Scope

The scope includes all activities necessary to complete the Works in accordance with this specification including but not necessarily limited to:

- Management of all the Contractors activities;
- Geotechnical mission(s) to justify the hypothesis taken by the Contractor during the design phase.
- Design and construction of early preparatory works including several type of networks rerouting.
- Design and construction of a industrial workshop with all building services required for its safe operation;
- Design and construction of indoor overhead cranes including its associated foundations;
- Design and construction of necessary foundations for the building on the existing platform including its levelling and the internal concrete slab creation;
- Design and construction of lightning protection and connecting to the existing (if any) earthing systems;
- Design, construction or connection of all the associated networks: potable water, raw water electrical networks, rainwater, low current, sanitary drainage and industrial drainage;
- Testing and commissioning of all the Works;
- Provision of a complete set of As-built files.

3 Time for completion

The Time for Completion of the Works is specified in the Contract.

4 Acronyms and Definitions

The following acronyms may be found in this document:

A.E.V. -	French: <i>Le classement Air - Eau - Vent</i> / Air - Water - Wind classification
AIPR -	French: <i>Autorisation d'intervention à proximité des réseaux</i> / English: Certification to work in the vicinity of networks.
ARF -	Lightning Risk Analysis (ARF): Assessment of the elements to be protected.
B56 -	Existing Building 56 (Cryostat Sub-assembly Building).
BAES -	French: <i>Bloc Autonome Eclairage de Sécurité</i> / English: Block Autonomous Security Lighting.
BMS -	Building Management System
CODAC -	Control, Data Access and Communication
CRO -	Contract Responsible Officer

CPRHS -	Cask and Plug Remote handling system
CSTB -	French: <i>Centre Scientifique et Technique du Bâtiment</i>
DESP -	French: <i>Directive Equipments Sous Pression</i> / English: Pressure Equipment Directive.
DICT -	French: <i>Déclaration d'Intention de Commencement de Travaux</i>
DN -	French: <i>Diamètre nominal (intérieur)</i> / Nominal diameter (always interior).
EIC -	Environmental Important Component
EOTA -	French: <i>L'Organisation Européenne pour l'Agrément Technique</i>
FEM -	French: <i>Federation Européenne de la Manutention</i> / English: European Materials Handling Federation.
FDS -	Fire Detection System
FFL -	Finished Floor Level
FW -	Fire Water
GNT -	Gravel Non-Treated
HSPC -	Health & Safety Protection Coordinator
HP -	Hold Point
ID -	Industrial water Drainage
IDM -	ITER Document Management System
IMTF -	ITER Maintenance Test Facility
IPEG -	ITER Platform Earthing Gird Protection coordinator
HVAC -	Heating, Ventilation and Air Conditioning
HV -	High Voltage
IO -	The ITER Organization
LC -	Low Current
LV -	Low Voltage (power lines of 400V and below).
LOTO -	Lock-Out Tag-Out permit
MoM -	Minutes of Meeting
MV -	Medium Voltage ($\geq 15\text{kV}$)
NCR -	Non-Conformance Report
(NF) DTU -	(French Norm) Unified Technical Documents
NP -	Notification Point
PAS -	Public Address System
PDWS -	Precipitation Drainage Water System
PEHD -	High-density polyethylene.
PF/EP -	French: <i>Permis de Fouille</i> / English : Excavation Permit.
PIA -	Protection Important Activity
PIC -	Protection Important Class
PLC -	Programmable Logic Controller
PPE -	Personal Protective Equipment
PPSPS -	French: <i>Plan Particular de Sécurité et de Protection de la Santé</i> / English : Individual Health Protection and Safety Plan.
PRE -	Environmental Respect Plan
PTW -	Permit to Work
PW -	Potable Water
PWD -	Precipitation Water Drainage
QA -	Quality Assurance
RFI -	Request For Information
RH -	Remote Handling
RW -	Raw Water
SAF -	Subcontractor Acceptance Form
SCP	French: <i>Société du Canal de Provence</i>
Site -	Places provided by the ITER Organization where the Works are to be executed, and any other places specified in the contract as forming part of the Site.
SLAT -	Regulated power supply.

SSI -	French: <i>Système de sécurité incendie</i> / English: Fire safety system.
SWL -	Safe Working Load Fire security system
TE -	French: <i>Température Electrique</i> / English : Electrical temperature.
TF -	French: <i>Température Fuel</i> / English :Diesel temperature.
TGBT -	French: <i>Tableau General Basse Tension</i> / English: Main Low Voltage Distribution Board
TNS -	Terra Neutral Separate
TPC -	French: <i>Tube de Protection des Cables</i> / English: Duct to protect cable.
UPS -	An Uninterruptible Power Supply (a battery back-up).
Works –	The work and design to be executed by the Contractor, including temporary work and any variation(s), under the Contract.
MFC	Magnetic Field Compatibility
ECPS	Ex-Vessel Coil Power Supplies
SMDD	System for the Management of Diagrams and Drawings
ACS	Access Control system

5 Reference documents

- [1] Conceptual design drawing of IO CA5 SMF laboratory building (ITER_D_ DJMQKG)
- [2] Chemical Safety Management Tool - User Manual (ITER_D_W6EREY)
- [3] CAD instructions for companies (ITER_D_9PNNM4)
- [4] Permit to Work Procedure (ITER_D_UBET39)
- [5] Access procedure (ITER_D_S3893D)
- [6] ITER Internal Regulations (ITER_D_27WDZW)
- [7] PGCSPS Volume 1 – Health and Safety General Coordination Plan for the construction of ITER Project (ITER_D_T6V4RP);
- [8] Alert procedure (ITER_D_7LB8NY)
- [9] Environmental Management Plan (ITER_D_97W4PN)
- [10] Environmental requirements (ITER_D_97WRFP)
- [11] Global ITER Worksite Synthesis Drawing (ITER_D_2UFTW7)
- [12] In-Cash Procurement Technical and Management Documentation Exchange and Storage Procedure (ITER_D_G8UMB3)
- [13] ITER Policy on Safety, Security and Environment Protection Management (ITER_D_43UJN7)
- [14] Housekeeping instruction (ITER_D_XJKR3R)
- [15] General Management Specification for Service and Supply (GM3S) (ITER_D_82MXQK)
- [16] ITER Smoking policy (ITER_D_B7QCU8)
- [17] Lifting Instruction (ITER_D_YJ9MBD)
- [18] Work at Height Instruction (ITER_D_Y5X8R7)
- [19] ITER site meteorology (ITER_D_2UT36S)
- [20] ITER Procurement Quality Requirements (ITER_D_22MFG4)
- [21] Requirements for Producing a Quality Plan (ITER_D_22MFMW)
- [22] Procedure for management of Nonconformity (ITER_D_22F53X)
- [23] Procedure for the management of Deviation Request (ITER_D_2LZJHB)
- [24] Quality Classification Determination (ITER D 24VQES)
- [25] A8 - Appropriation phase - Equipment information required (ITER_D_25T7KP)
- [26] Subcontractor Acceptance Form (SAF) - template (ITER_D_4LXSY)
- [27] IO Chiller equipment as built folder
- [28] IO Electrical equipment as built folder
- [29] As built folder of the Technical buried gallery in the area
- [30] Preliminary geotechnical information folder of the area
- [31] COORDINATION DRAWING –Temporary Networks Approximate Layout
- [32] OHS events follow-up procedure – (ITER_D_2CTZTP)

6 Work Description

6.1 Location

The building is located on the Southeast side of the ITER site on the new Contractor's area called CA5 on an existing platform in rough soil.

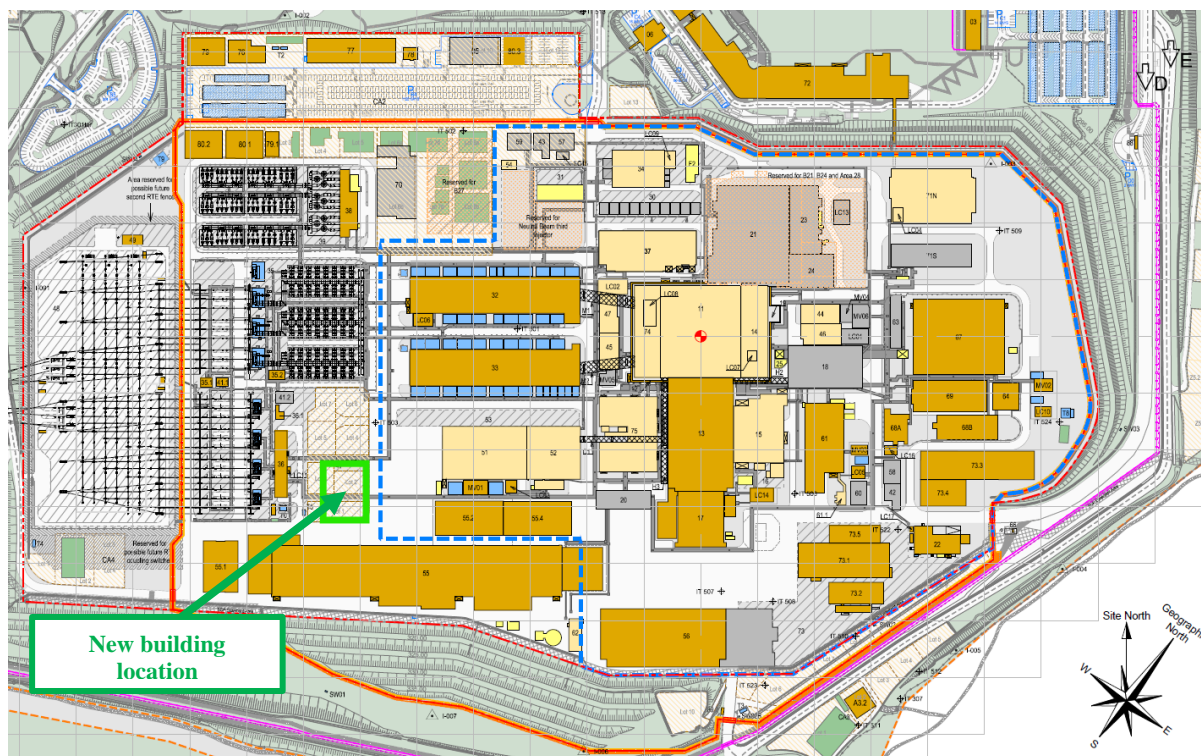


Figure 1 – location of the works

The footprint of the building shall be such that it allows emergency vehicles to drive all around. There shall be no obstructions placed in this area.

6.2 General requirements for all Works

The Contractor shall design and construct the Works to comply with the Eurocodes, the applicable norms & standards, French Labour Codes and applicable DTU as well as follow the best industry practice to ensure their safe operation. The Works shall be compliant with the relevant health and safety regulations applicable in France and Europe.

The Contractor shall undertake his activities in accordance with good industry practice relevant the technical nature of the Works and to the location of the Site. His performance shall include all supplies and services necessary for the Works (including specialized plant, tools, qualified labour, power supply, transportation and handling mean, temporary works, etc.).

All installations delivered under this Contract shall be undertaken in accordance with the manufacturers' recommendations and shall comply with the applicable norms & standards.

The design life of the buildings delivered under the Works shall be 25 years.

The buildings shall be designed to withstand the local climatic conditions e.g. earthquake, snow and wind according to the Eurocodes (mainly 0, 1, 2, 3, 7 and 8).

The new building foundation shall be designed to be structurally independent and to transfer no forces to the underground technical galleries .

The Contractor shall obtain IO's approval of their design before commencing the Works on the ITER Site.

The construction of the new building shall be organized to minimize the impact on the surrounding areas which are under operation.

The Site Supervisor(s) and the excavator driver(s) shall be AIPR certified to be able to work in the vicinity of the existing networks.

The Contractor shall be responsible for cleaning the Site access roads in case the Works make them dirty or soiled with regard to the weather conditions and the frequency of use. During the dry periods, the Contractor shall implement measures to limit the spreading of dust.

The Contractor shall aim to re-use the removed/recovered materials on the project as much as possible. The crushing of the rocky material coming from foundation excavation is encouraged. The Contractor is responsible for an appropriate sorting and evacuation of all old, unused and temporary materials generated during the Works and their disposal from the Site to an authorize landfill.

The Site shall be appropriately cleaned by the Contractor on completion of the Works on the ITER site.

In due course, the Contractor shall provide the IO with the control tests reports and results for the deliverables under the Works as required by the law and as detailed in this document. All statutory initial inspections shall be performed by a 3rd party (independent checker) validated in advance by the IO. These records shall also form a part of the as-built documentation submitted on completion of the Works.

6.3 Regulatory aspect

The new building is considered as a temporary facility directly necessary for the construction of ITER. Therefore, in accordance with R421-5 of French Urban Planning Code, it will be exempt from building permit.

6.4 Functional requirements

The MFC laboratory is to be used as a temporary laboratory and shall provide a facility suitable for the tests and measurements on electrical, mechanical, electronic components under a Static Magnetic Field (0 Hertz) used for the ITER project prior to their transfer to their final location at the ITER Site.

The ECPS laboratory is to be used as a temporary laboratory and shall provide a facility suitable for the tests and measurements on power converters to diagnose and troubleshoot existing power electronic components, and design new models.

Each volume (MFC & ECPS areas) will accommodate up to 20 workers performing laboratory activities on a daily basis without particular air pollution expected.

The building shall provide them with a safe place to work. The building structure shall function as a protection envelope from the external environment allowing the works continuity during all weather conditions including thunderstorm and its characteristics in terms of climate conditions inside are a prerequisite for the COFRAC accreditation of the laboratory (only for MFC laboratory). In addition, the building shall be appropriately insulated to provide a comfortable environment to work in by optimizing as much as possible the energy used.

The ground floor access to the building shall be stepless. The surrounding platform shall be arranged to prevent any water ingress inside the building or water stagnation in front of the door.

6.5 Main Characteristics of the building

The following size of laboratory is expected to be constructed at the ITER Site:

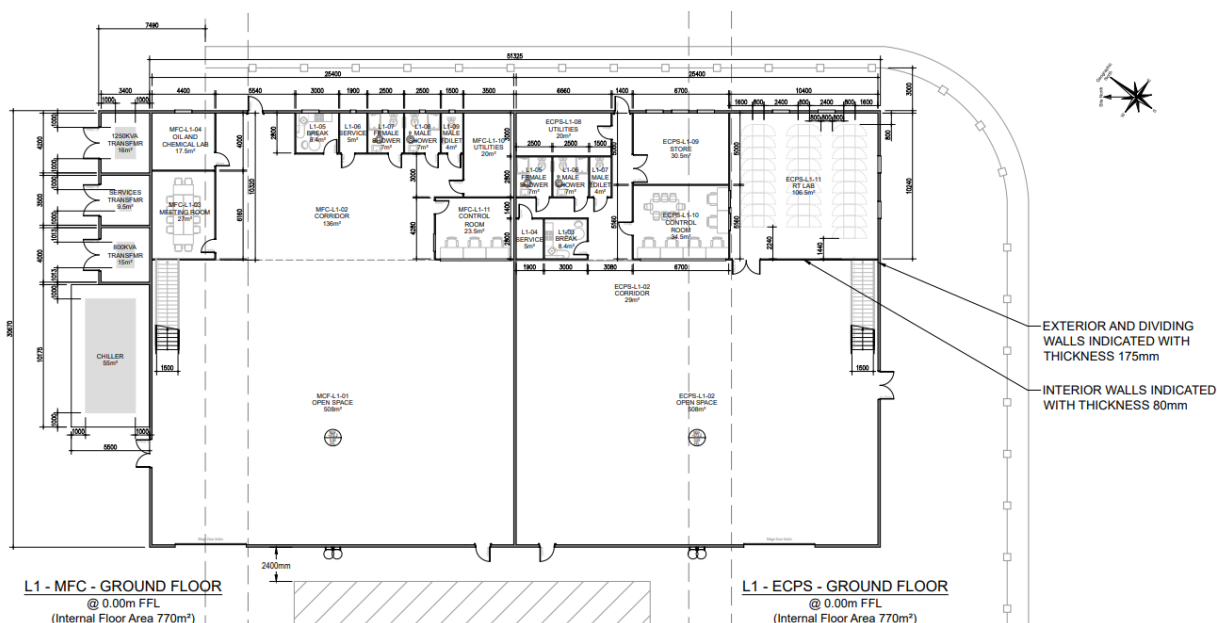
Laboratory	MFC/ECPS laboratory
Minimum usable height (m)	Total height of the building to be defined by the Contractor ensuring a 6m clear space underneath the overhead crane lowest part;
Width (m)	50 m
Length	35 m

Each laboratory shall have free spans, i.e. without intermediate columns inside the building. It shall be a steel structure building (metal cladding wall and roof) with a reinforced concrete floor and foundations.

The proposed arrangement inside the building is given in reference [1]. It includes a mezzanine area on one side of the building to maximize the usable space.

The building is composed of two different independent volume which are composing the two different laboratories.

The general utilities (as FDS, BMS, ACS...) will be shared, but, the two volumes will have their own overhead cranes, main HVAC systems and entrances without internal common doors. In conclusion, the volume of each laboratory shall be treated as independent area.



6.6 Preparatory Works prior to the construction of the building

The building will be built on an existing contractor's area (CA5) composed of a technical backfilling with some underground networks. Prior to start the building construction, the Contractor shall undertake several preparatory works to reroute the existing networks and to prepare the platform subgrade within the footprint of the new building, as follows:

1. Modification to the existing potable water network including:
 - a) Reposition of the potable water branch of the area outside the building footprint,
 - b) Creation of connection points for the building.
2. Modification to the existing low voltage and low current network including:
 - a) Reposition of the main pulling chambers and the associated ducts outside the building footprint,
 - b) Reposition and reconnection of the electrical cabinets of three lots.
3. Implementation of an earthing (copper) cable loop around the new building including several connection to the existing ITER IPEG network available in the area.
4. Modification and extension of the existing precipitation water drainage network for the new building including the removal of PDWS located within new building footprint; and, the modification of some connection points and the existing branch.
5. Creation of the high voltage (HV), low voltage (LV) and low current (LC) underground networks serving the building including interconnection with existing buried concrete gallery.
6. Installation of a new sanitary drainage network with its dedicated buried storage tank to collect the sanitary effluents of the building.
7. Removal of all the abandoned networks within building's footprint.
8. Cleaning and arrangement of the working area in the Site.

In addition, as early as possible, the Contractor shall performed a complementary geotechnical investigation(s) on the Site to confirm their design hypothesis and the geotechnical information provided by the IO – refer to [27].

6.6.1 General requirements for underground Works & buried networks

The Contractor shall perform a full topographic survey of the Site to base their design and drawing(s) on the in-situ topographic coordinates.

Before the beginning of the above mentioned preparatory works, the Contractor shall properly identify the existing networks located in the Site based on [11], [31] and [28]. Then, after a site detection campaign, the Contractor shall mark on Site all the existing buried networks positions (X, Y, Z coordinates) prior to start any excavation. The Site Supervisor (s) and the excavator driver(s) shall be AIPR certified to be able to work in the vicinity of the existing buried networks. The rule of prudent approach shall be followed at any time. The Contractor shall obtain an approval from the IO through the Permit To Work (PTW) process before commencing any excavation for the networks modifications and construction in the vicinity of existing ITER Organization facilities.

The earthworks shall be designed and carried out in such a way that they do not affect or cause any damages to the existing facilities (by landslide, vibrations, etc.) on the Site and in the areas surrounding it. Any ground movement linked with the excavations and modelling of the existing platform and its embankments shall remain within the Site provided to the Contractor. The surplus material shall be evacuated from the Site and off the ITER site.

The manholes shall be implemented in at least 50m intervals along all pipelines or ducts and at each change of direction (vertically or horizontally).

All implemented manholes shall be EN124/D400 class minimum.

Any intermediate manholes to house the PW pipelines shall have a minimum internal dimension: 1m wide and 1m long. Manholes shall be clearly identified by screwed on aluminium engraved plates showing: identification number (provided by the IO); valve rotation sense and operating pressure.

To avoid rain water stagnation inside the manholes, those located outside of the road areas shall be placed with open bottom (without bottom slab) on a 200 mm layer of gravel. The manholes located underneath the existing road shall be installed with the concrete bottom slab drilled in several points (drilling diameter: 25 mm) to allow the stagnated water drainage to be released.

Triangle-shape manhole covers shall be avoided. All covers shall be in one piece only (rectangular or square) to avoid the cover falling inside the manholes. For the LC standard chamber, the two triangular covers shall be permanently fixed together to create one cover.

The new gravity network shall be water-tight (including its connections to the existing network).

Ducts shall be high-density polyethylene (PEHD), outer corrugated profile, smooth inner, cuff link in end, TPC-type.

Duct size shall be of internal diameter 63 mm for the low current (LC) and 200 mm diameter for low voltage (LV) and medium voltage (MV) networks, unless otherwise specified.

The ducts and pipelines are to be installed and left clean with no remaining debris or being blocked inside. All ducts or pipeline ends shall be kept closed / protected against any contamination by water, debris or dust.

In general, potable water shall be designed and laid in the freeze-free depth necessary to protect them from the frost (e.g. deeper than 0.8m from the ground surface level in any place). The pipelines

shall be designed and laid down with some slope in accordance to the applicable norms and standards.

All control valves shall be water type (sizing to be defined by the Contractor). Control valve equipment shall meet the NF EN 12845 + A2 Standard requirements and shall include the installation of a by-pass for each control valve.

Rules for distance between buried (utilities) networks and rules for proximity between networks and plants shall be respected (refer to NF P98-332).

The Contractor is responsible for updating the reference documentation related to the modifications of the existing networks in accordance to the Works performed – mainly [11] and [31].

6.6.2 Potable Water (PW) - network modifications and requirements

All Works for the potable water (PW) network must be carried-out taking into account the applicable laws, standards and codes, in particular the French standard NF S 62200 regarding the installation rules.

The disturbance to the existing PW network shall be limited to a day only (maximum 8hrs duration). For that purpose, to minimize the impact, the Contractor shall first install the new west branch and perform the two connections on the existing main pipe once the new network is ready to be put directly in service.

PW system requirements:

- i. Installation a new PEHD DN110 branch running west of the future building façade sufficiently away from the future foundation.
- ii. Once the new branch is ready, interconnection works shall be done on the existing network by installing the appropriate elbows to supply the water on the area using the new network.
- iii. Removal of the existing manhole PW26.
- iv. Creation of a connection in DN50 (diameter to be confirmed by the Contractor during the design phase) on the new PEHD DN110 branch to resupply the PW28 chamber which will be used as connection point for the project. A buried valve (fr *bouche à clé*) shall be installed at the connection on the main network.
- v. Moving outside new building footprint the manhole PW28 and reinstallation of meter and the valve inside the chamber with downstream: a pressure reducer, strainer, anti-pollution check valve and isolation valve.
- vi. Creation on a new main supply branch for the new building with a PEHD pipe DN50 minimum (diameter to be confirmed by the Contractor during the design phase) from the moved PW28 manhole to the service room L1-04 of the ECPS laboratory.
- vii. Tightness tests of new network shall be performed in accordance with Fascicule 71 preconisation with a tolerance loss of maximum 0.2 bar for test compliancy.
- viii. Drinkability tests (D1 and D2 types) shall be performed at the completion of the Works.

6.6.3 Earthing & lightning networks - modifications and requirements

The ITER Site (including CA5) is fitted with an earthing grid – Integrated Plant Earthing Grid (IPEG) - in order to reduce potential difference between the structures to values to which the equipment can withstand. IPEG is being sized according to IEEE80.

As per section below about the lightning protection and the final design of the earthing network, the Contractor shall keep the existing earthing network as it is and extend the earthing loop all around the new building.

The Contractor shall design and install an earthing protection for the structures of the new building

and its equipment (e.g. crane). The design of the earthing protection systems shall provide a safe environment for the personnel and the functional purpose for the equipment in the building to avoid any electrical hazards. The use of double or multiple earthing points shall be avoided, as this can create some loops for eddy currents and produces electromagnetic noise. The earthing protection shall be interconnected with the existing IPEG surrounding Area CA5 in several points (8 minimum).

Earthing and lightning systems requirements:

- i. All operators or subcontractors performing the lightning works shall be qualified for this scope (QUALIFOUDRE certification).
- ii. The network shall be constructed of the copper cables buried at 1m depth. The cables diameters shall be confirmed during the design phase by an appropriately qualified designer.
- iii. All the connections and interconnections of this network shall be done by aluminothermy welding.
- iv. The existing earthing loop and connection points shall be kept in place, and, if necessary, adapted to fit for the purpose for the future building and its foundations footprint.

6.6.4 Low Voltage (LV) - network modifications and requirements

The Contractor will have to relocate the main electrical distribution network of the CA5 outside the new building footprint, located in Area CA5 and connected to T5 substation.

Note: The Lot's electrical panels can be used by the Contractor during the Works.

LV system requirements:

- i. After the lock-out of the LV electrical network, the Contractor shall disconnect the electrical cabinets of the lots 4, 5, 6 and 7 and pull back all the cable to be able to modify the routing of the main networks.
- ii. Creation a new buried network, composed 8TPC200 + 4PE 25mm², on the west side of the new building footprint with the moving of the two main existing pulling chambers (7000ES-RQ-0395 and 7000ES-RQ-0396). Once it is done the contractors shall pull again the cables to reconnect the electrical cabinets previously disconnected.
- iii. The electrical cabinets of the lots 4 & 5 shall be reinstalled outside the new building footprint on the lot 5 at a location which is not affecting truck and pedestrian access to the new building. It includes for each: the reinstallation of 2TPC200 + 1 PE25mm², the creation of a new concrete base, the refixation of the cabinet and its electrical reconnection.
- iv. This electrical modification shall be justified by an electrical calculation note provided by the Contractor (if necessary).
- v. At the end of the Works, a legal initial inspection shall be performed by an independent checker (Viel) to prove the good execution of the Works.

6.6.5 Sanitary water Drainage (SD) – network requirements

To manage the sanitary water produced by the new building utilities, one (1) collection tanks of 10m³ capacity shall be implemented underground at the south side of the new building.

The exact locations of both tanks shall be defined by the Contractor during the design stage and shall be validated by the IO prior to the on-site Works commencement.

Associated to ITV report, a tightness test of the SD network shall be carried out by the Contractor according to method L (testing by the air). The method W (testing in the water) shall be limited to a control of all manholes not equipped with waterproof buffer and the pipelines, in case of their failures in testing with the method L. The control of the water fall shall be carried out throughout the

whole course of the implemented SD network. In case of any obstructions and/or solid materials presence, it will be the duty of the Contractor to clean the network and test it again.

SD system requirements:

- i. The SD collection tanks shall be adapted to sanitary water with a robust skin.
- ii. PVC CR8 pipes Ø to be defined in accordance the standards and the needs.
- iii. The system shall be a gravity SD network with a minimum gradient of 2%.
- iv. Pipes type(s) and diameter(s) shall be defined in accordance to the applicable norms and standards.
- v. For any aerial pipes (only when impossible to have them buried), an appropriated mechanical protection from the weather conditions shall be implemented (including the solar).
- vi. The applicable loads shall be considered in the design of the SD network (selection of the elements sizing) including the traffic circulation above the buried SD tanks and pipes.
- vii. All manholes shall have a minimum class of D400.
- viii. The manholes shall be accessible by the trucks for the purpose of pumping and maintenance of the tanks.
- ix. The tank shall be equipped with a filling-up level sensor connected to the BMS system of the new building. The ducts to pull the associated cables shall be in the scope of the Contractor.
- x. On the outlet pipe of the tank, a double check valve shall be installed to avoid backflow.
- xi. On completion of the SD network Works / section of the Works (as appropriate), the above requested tests shall be performed. For the network laid below the future concrete slab “sous dallage”) , the test shall be done before the realization of the slab.

6.6.6 Precipitation Water Drainage (PWD) – network modifications and requirements

The Contractor shall modify the existing precipitation water drainage (PWD) system located in the Site.

The modification works to the existing network shall ensure the evacuation of rain water coming from at all times. The Contractor shall propose a plan for the duration of the Works with temporary means, if necessary, to establish it.

The Contractor shall manage the rain water by installing buried gravitational network connected to existing PWD system. No aerial and visible network will be allowed. The downpipes to serve new building shall be located inside the building envelope and shall be connected underground to the existing PWD networks in the area.

This global management of the rain water shall be designed and performed to avoid any water ingress inside the new building. Grating gutters shall be installed in front of all trucks doors and the pedestrian accesses. Surrounding slope directed toward the roads shall be done to protect the building.

The final design shall be defined at the design stage by the Contractor and shall be validated by the IO. A proper calculation note shall be submitted justifying the conception by taking into account the same hypothesis than the existing network (decennial - Region 3 Montana to be considered).

On completion of the Works, the modified and new precipitation water drainage networks shall be checked to prove its perfect functionality. The PWD concerned shall be all the network located in the footprint of the building project including surroundings infrastructures with the existing network modified. The Contractor shall performed a video inspection (ITV) and a tightness test of the network according to the method L (testing by the air). Network testing with the method W (testing in the water) shall be limited to control the manholes and pipelines in case of reported failures following the method L testing. These controls of the flow of water shall be carried out throughout

the whole course of the PWD network. The ITV shall be performed up to the main collectors of the area. In case of any obstructions and/or solid materials presence, it will be the duty of the Contractor to clean the network and test it again.

The Contractor shall avoid to pollute the existing PWD.

PWD system requirements – refer to [11] and [28]:

- i. Temporary management of the rain water during the preparation and/or construction Works shall be included in the Contractor's scope.
- ii. The existing grating located in the area shall be kept intact as much as possible.
- iii. On the north, The DN500 branch located between the manholes nos. 7000PD-RG-1038 and 7000PD-RG-1039 shall be shorten to move a out of the new building footprint. The manholes 7000PD-RG-1039 and 7000PD-RG-1040 shall be reinstalled. The manhole 7000PD-RG-1040 shall be used to connect the main pipes collecting a part of the rain water of the roof.
- iv. On the same principle, the South collection branch shall be relocated outside building footprint. The DN400 branch located between the manholes nos. 7000PD-RG-1035 and 7000PD-RG-1037 shall be shorten. The manhole 7000PD-RG-1037 shall be reinstalled. The manhole 7000PD-RG-1037 shall be used to connect the main pipes collecting a part of the rain water of the roof.
- v. To be developed during the design phase by the Contractor, it is expected to create a Building's PWD collection network to release the water in the existing network as described above.
- vi. On completion of the PWD network Works / section of the Works (as appropriate), the above requested tests shall be performed. For the network laid below the future concrete slab "sous dallage"), the test shall be done before the realization of the slab.

6.6.7 High Voltage (HV) and Low Current (LC) – networks requirements

The Contractor shall create a connection between the existing HV (HT) buried gallery passing below the building on the North side of the building and the transformer areas on North-East corner of the building – refer to *Figure 3* below. In addition, connection will be done in between the same gallery and the utilities rooms of the building.

This underground connection will be used to pull high voltage cable and low current wires to connect the building to the new definitive HV substations to be installed (by others / out of the scope of Works).

The associated signalization, fencing, marking and management of this activity is in the Contractor's scope.

A particular attention is required during the Works and their preparation due to the high number of existing networks to be crossed in that area.

HV & LC systems requirements – refer to [11], [28] and *Figure 3* below:

- i. After a proper identification of the existing networks in the area and marking of their locations (in X,Y,Z coordinates), the Contractor shall neatly cut the road surface and start the excavation.
- ii. Refer to the definition of the electrical room as well, from the reinforced concrete manhole of the buried gallery to the future location of the HV substation/ transformer on the CA5, 3 times (3x) two (2) 200 mm PEHD/TPC-type ducts shall be installed, the depth will be defined at the execution stage by the Contractor taking into account the depth of all the existing networks. For each, these group of two ducts + its associated copper cable will arrive at the

concrete slab final level through slab penetration. So, in total, Six (6) penetrations sleeves shall be done to properly connect the electrical rooms, at the angle not exceeding the allowed cable banding radius for a copper cables 240mm².

Nota: For the penetrations in the gallery manhole, the contractor shall propose a technical solution not downgrading the structure resistance. The design of the penetration shall be dully justify with a calculation note taking into account the as built information of the gallery provided in the reference documentation [29]. For that purpose, execution drawings are expected as well. The penetrations done shall be properly backfilled to grant their total watertightness.

- iii. In the same trench, 3 time (3x) PE 70mm² copper wire shall be laid all along the HV ducts with at each ends a spare length of 5m.
- iv. In addition, from the same reinforced concrete manhole of the buried gallery to the utilities room MFC-L1-10, (2x) two (2) 100 mm PEHD/TPC-type ducts shall be installed, the depth will be defined at the execution stage by the Contractor taking into account the depth of all the existing networks. So, in total, two (2) penetrations sleeves shall be done to properly through the concrete slab to connect the utilities room, at the angle not exceeding the allowed cable banding radius for several monomode fiber 48FO.
- v. From the 1250kVA Transformer room in the annex to the future location of the main MFC distribution board located in the utilities room MFC-L1-10, two (2) 200 mm PEHD/TPC-type ducts + PE 70mm² copper wire + two (2) 63 mm PEHD/TPC-type ducts shall be installed, the depth will be defined at the execution stage by the Contractor taking into account the depth of all the existing networks. For each, these group of two ducts + its associated copper cable will arrive at the concrete slab final level through slab penetration. Penetrations sleeves shall be done to properly connect the electrical rooms, at the angle not exceeding the allowed cable banding radius for a copper cables 240mm².
- vi. From the 250kVA Service Transformer room in the annex to the future location of the main distribution board for building services located in the utilities room ECPS-L1-08, two (2) 200 mm PEHD/TPC-type ducts + PE 70mm² copper wire + two (2) 63 mm PEHD/TPC-type ducts shall be installed, the depth will be defined at the execution stage by the Contractor taking into account the depth of all the existing networks. For each, these group of two ducts + its associated copper cable will arrive at the concrete slab final level through slab penetration. Penetrations sleeves shall be done to properly connect the electrical rooms, at the angle not exceeding the allowed cable banding radius for a copper cables 240mm².
- vii. From the 800kVA Transformer room in the annex to the future location of the main distribution board for building services located in the utilities room ECPS-L1-08, two (2) 200 mm PEHD/TPC-type ducts + PE 70mm² copper wire + two (2) 63 mm PEHD/TPC-type ducts shall be installed, the depth will be defined at the execution stage by the Contractor taking into account the depth of all the existing networks. For each, these group of two ducts + its associated copper cable will arrive at the concrete slab final level through slab penetration. Penetrations sleeves shall be done to properly connect the electrical rooms, at the angle not exceeding the allowed cable banding radius for a copper cables 240mm².
- viii. From the future location of the main MFC distribution board located in the utilities room MFC-L1-10 to the external chiller area, two (2) 200 mm PEHD/TPC-type ducts + PE 25mm² copper wire + two (2) 63 mm PEHD/TPC-type ducts shall be installed, the depth will be defined at the execution stage by the Contractor taking into account the depth of all the existing networks. For each, these group of two ducts + its associated copper cable will arrive at the concrete slab final level through slab penetration. Penetrations sleeves shall be done to properly connect the electrical rooms, at the angle not exceeding the allowed cable banding radius for a copper cables 240mm².

- ix. From the existing pulling chamber 7000ES-RQ-0395 (after its relocation) to the nearest wall of the building, two (2) 160 mm PEHD/TPC-type ducts shall be installed on the same principle than described above.
- x. On completion of the Works, the trench shall be appropriately backfilled and the soil reconstituted to its original conditions.
- xi. Associated bearing and penetrometer tests shall be performed by the Contractor prior to the application of the final layers (asphalt and/or concrete slab) to prove a proper reconstruction of the subgrade [30].



Figure 3 - Simplified plan of HV and LC ducts installation

6.6.8 CA5 Area – modifications and requirements

The Contractor shall remove the existing buried and superficial temporary installation/ networks prior to start the foundation works of the building and its indoor floor slab.

CA5 requirements:

- i. The demolishing / removal methodology chosen by the Contractor shall limit the production of dust and prevent any damage to the existing surrounding structures.
- ii. The removed material shall be reused in the Works on the project as much as possible, or, appropriately sorted and evacuated from the Site to an authorize landfill.
- iii. Temporary management of the rain water on Site during the demolition/removal Works shall be included in the methodology of the Works.

6.6.9 Technical trenches for chilled water

The Contractor shall install two technical trench to supply the chilled water to the building from the external chiller area to the west side of the ECPS open space – refer to the figure 4 below:

Technical trenches requirements:

- i. The two concrete technical trenches shall be straight and run parallel to each other, the usable internal section of the trench shall be: width 400mm by 350mm height, 2 lines of length 27ml (54ml in total),
- ii. The cover of the trenches shall be in iron cast with a class D400 to grant the passage of trucks on the top. In addition for the external part of the trench, the covers shall be properly sealed to avoid water infiltration and a drain shall be performed to avoid water stagnation inside,
- iii. The technical trenches shall be laid respecting the manufacturer recommendation for a road (group 4),
- iv. The technical trenches shall be properly integrated to building foundations design and to the reinforced concrete slabs of the building. A perfect continuity of the floor shall be respected between the technical trenches and the surrounding concrete floor; no level discrepancy will be accepted. If needed, an appropriate dilatation joint shall be implemented and its formation shall not create any level discrepancy.

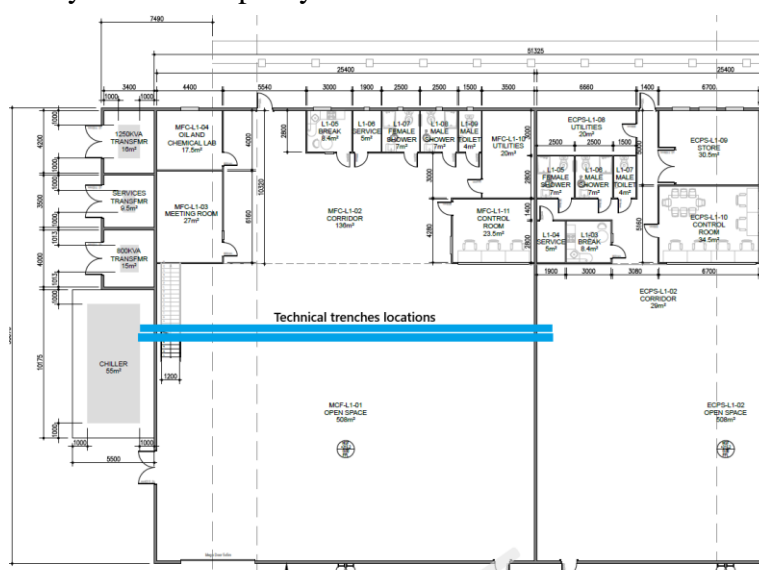


Figure 4 - Simplified plan of chilled water technical trenches

6.7 Building Foundations

The Contractor is fully responsible for the design of the foundations. The Contractor shall design building's foundations taking into account the two existing buried technical galleries and the networks described in the chapter 6.6 above.

The foundation design shall be duly justified based on the geotechnical and physical characteristics of the area. The Contractor shall perform the appropriate geotechnical mission(s) to validate its hypothesis and justify its calculation. Preliminary geotechnical information of the area are provided in [30]. The geotechnical mission(s) shall give a recommendation about the methodology to perform the Works e.g. the type of the earthworks permitted in the vicinity of the existing structures to prevent any damages to them by the Works.

The building foundations shall be designed to be structurally independent from the existing buried galleries and shall not transfer any load to them. At the design stage, the Contractor shall submit a hypothesis note which shall be validated by the IO prior to the construction works commencement.

Taking into account the preparatory (early) Works described in Section 6.6 above, the design of foundations of the building shall take into account the presence of the existing networks to protect them from any damages by the Works – refer to [11] and [28].

On the same basis, the Contractor shall choose the appropriate design for the foundation of the annex electrical rooms, the HVAC slabs and the chiller slab.

The crane loads shall be taken into consideration in the design of building' structures and the foundations.

The foundations shall be constructed at the free frost level following the applicable norms and standards.

In case the foundations surface could generate any dust, its surface shall be appropriately treated (e.g. application of an anti-dust coating system).

During the execution of the foundations, the Contractor shall be responsible for implementation of all the necessary measures to:

- a) Ensure the stability of the embankments.
- b) Prevent any settlement or collapse on the existing structures and utilities.
- c) Reinforce the existing structures if and where necessary (including during the temporary works stage).
- d) Manage the evacuation of rain water using a dedicated temporary network - it shall composed of a pump and settlement tank.
- e) Keep a safe access for pedestrian and vehicles at all times.
- f) Implement a proper fencing off for the working area / excavation zone in accordance to the progress and the risk related to the Works.

Any ground movement linked with the excavations and modelling of the existing platform shall remain within the Site boundaries. The surplus materials shall be evacuated by the Contractor from the ITER site to a dedicated deposit area.

The cleaning of roads around the Site shall be at the expense of the Contractor based on the weather conditions, the roads cleanliness and the frequency of their use. During dry periods, the Contractor shall implement the measures to limit the spreading of dust from the Site.

6.8 Internal concrete floor slab

The concrete floor slab of building shall be designed according to the applicable Eurocodes and the DTU 13.3 taking into account the geotechnical parameters. At the design stage, the Contractor shall submit a hypothesis note which shall be validated by the IO prior to the construction works commencement.

Building floor slab (in the main workshop hall) shall have a bearing capacity of 5 tonnes/m² distributed load with a flat surface (0% gradient).

The building indoor floor slab shall maintain the existing bearing capacity of 5 tons/m². The finishing of the floor shall be in accordance with civil construction Standard DIN 18202 related to the flatness, group 4 classification of table 3. The indoor floor slab shall be designed to prevent the production of any dust and to protect it against mechanical aggression (e.g. be coated with anti-dust paint with hardener or be constructed from a concrete reinforced with quartz, all applied following the manufacturers' recommendations). Note: Depend on the building foundation chosen, it could be necessary to treat also the foundation surface against dust production.

A perfect continuity of the floor shall be respected between the volumes of the building (MCF and ECPS laboratories floor); no level discrepancy will be accepted. An appropriate dilatation joint shall be implemented and its formation shall not create any level discrepancy.

The Contractor shall confirm the external platform levels and slopes on site by performing a full topographic survey of the concerned area. The final level(s) of the surrounding platform shall be re-defined by the Contractor to provide a correct rain water management of the external platform around building to stop any water ingress into the buildings.

In addition, the Contractor shall install appropriate grating gutters connected to the PD network in front of each main door (for the trucks) and the pedestrian doors.

There could be ramps introduced at the doors (both, the pedestrian and truck types) to accommodate any difference in levels between the newly constructed indoor floor and the existing platform in Area of CA5. If any implemented, the access ramps in front of the main access doors shall not exceed 4% gradient. The access ramps in front of the pedestrian doors shall minimize the tripping hazard. In any case, they shall be designed to avoid any rain water floods and stagnation on the existing slab and road.

The ground floor slab for the annex electrical building shall have a bearing capacity of 3 tonnes/m² distributed load with a flat surface (0% gradient). The surface shall be treated against dust production and shall be at the same level as building workshop hall concrete slab.

If judicious, the floor slab of the below listed rooms could have a reduced bearing capacity of 350 kg/m² distributed load with a flat surface (0% gradient) and also shall be treated against dust production:

- MFC and ECPS control rooms,
- MFC and ECPS utilities rooms,
- MFC and ECPS shower/ service/ toilets/ break rooms,
- MFC meeting room,

- MFC chemical lab,
- ECPS L1-09 store room,
- ECPS corridor at ground floor,
- MFC L1-02 corridor at ground floor,
- ECPS L1-11 RT lab.

In addition, sleeves listed in the section 6.6 shall be properly integrated to the slab to interconnect the different rooms of the building as described.

The two manholes of the existing buried galleries, one in the main MFC L1-01 open space lab and one in the ECPS 11-11 RT lab, shall be properly integrated to the slab design to keep their functionality.

6.9 Building external envelope

Building external envelope structure shall be designed and constructed such that full functionality is maintained under all climatic conditions that could reasonably be expected during the design life of the building. Eurocodes shall be applied accordingly.

The Contractor shall consider in the design the local weather conditions given in [19].

Building's steel structures shall be painted with an anti-corrosive protection coating system, RAL 7015 (slate grey), AFNOR classification: family I Class 4a, no particular fire resistance is requested.

The Contractor shall choose the type of doors, smoke exhaust and windows in order to provide sufficient thermal insulation and to avoid condensation inside the building. The choice shall follow the A.E.V. classification in accordance to the region, the site and the exposition.

During the design phase, the Contractor shall provide the IO with the thermal calculation notes to support its design of the building with the controlled indoor temperature as specified in this technical specification – refer to Section 6.25 below. The energy consumption shall be optimized and reduced as much as possible.

The color for the building external envelope shall be the standard white (RAL to be proposed by the Contractor for IO approval).

In any case, the insulation material selected for the building shall be rockwool with a fire classification A1 following the Eurocodes, and the entire insulation complex shall justify EI30 minimum. The minimum insulation thickness for the walls shall be 150mm.

For the roofs, differently fixed in accordance to the support, a 200 mm Rockwool insulation with a fire classification A1 following the Eurocodes shall be implemented below the waterproofing layer.

The annex building envelope to house the three transformer rooms shall be constructed as a reinforced concrete wall (or equivalent) justifying a fire resistance EI 120. The same insulation principle shall be applied than for the main building. The fixation of the insulation and final layer

shall be adapted to the support.

The building roofs shall be design with an acroterion sufficiently height to grant a proper waterproofing as per the standards. Collective protection type guardrails shall be forecasted to visit all the roofs. The guardrails shall be compliant with standard and adapted to external usage.

The access to the workshop roofs shall be designed via a CAT ladder located on the west side of the building. Depend on the roof concept design of the contractor, the number of access points will be defined. In principle, all the roof surface shall be visitable.

The CAT ladder shall be fixed directly to the main steel structure of the building, no fixation to the cladding will be allowed.

The CAT ladders structure shall be made of a galvanized steel or aluminum. It shall meet the applicable norms and standards, in particular NF E85-01, NF E85-015 and the French Labour Code. The bottom access shall be protected and restricted by a full access hinged panel, locked with a padlock with a key hole for European cylinder. The locks shall be provided by the Contractor after validation of the organigram by the IO.

On completion of the Works, the Contractor shall justify the conformity of the equipment with an inspection report done by an independent checker.

In addition, there is an internal common wall making the separation between the two laboratories. This wall shall grant, in any case, EI30 minimum resistance. Its characteristics shall be defined by the contractor based on their conceptual design for this particular inner wall.

6.10 Doors and Windows

The laboratory shall be equipped with the different door types and windows as specified below.

6.10.1 External pedestrian doors

The buildings shall be equipped with the insulated doors to allow the ingress and exit of the pedestrians, they shall also function as the emergency exits. The quantity and locations of the pedestrian doors (emergency exits) shall be designed by the Contractor to be compliant with the applicable norms and regulations as well as the French Labour Code.

The required minimum number of the pedestrian doors and their positions are given in [1]:

- I. Six (6) doors to be implemented in building peripheral external walls:
 - a) one (1) double leafs door in the North façade and one (1) double leafs door in the South façade;
 - b) two (2) in the East wall; and, two (2) in the East wall;
- II. One (1) double leafs door for each transformer room in the annex building (fire classification required);

The pedestrian doors shall meet the requirements listed below:

- i. Two leaves (double-leaf door) with the clear opening dimensions: W=1940 mm x H=2400 mm. The other shall be single-leaf door with clear dimensions: W=1000 mm x H=2400 mm.
- ii. The color shall be chosen by the IO at later stage;
- iii. Each door shall be equipped with a door closer and door stopper (located as far as possible from the hinge side to avoid an arm lever effect);

- iv. Anti-panic push bar shall be installed inside, with a door handle and a key hole for European cylinder. The locks to be provided by the Contractor after validation of the organigram by the IO (Bricard brand);
- v. Thermal insulation shall be designed in line with the defined indoor conditions;
- vi. For the doors eligible, the European fire classification shall be at least EI 120 with fire resistance during 120 minutes;
- vii. Fixing devices shall be in steel and base plates in galvanized steel;
- viii. Doors shall be equipped with a strip seal to prevent the ingress of water except for the indoor doors. The strip seal shall be compatible with / allow the disable person access;
- ix. An autonomous emergency-lighting unit shall be installed minimum 10cm above each door frame;
- x. The system must avoid tripping hazard or provide appropriate warning-safety signage.

6.10.2 Large motorized door

The building shall be equipped with two (2) large motorised doors providing an access for the vehicles delivering large components to the new laboratories. It shall be installed in the North-West corner and South west corner of the building - as indicated in [1].

The large motorised door shall meet the following requirements listed below:

- i. The clear opening dimensions shall be: W=5m x H=5m.
- ii. Thermal insulation shall be designed in line with the defined indoor conditions to maintain.
- iii. The color shall be chosen by the IO at later stage;
- iv. The structure shall be CE marked.
- v. Motorization shall be 400V, 50Hz and 3 phases.
- vi. Protection level shall be IP 55.
- vii. Door shall be equipped with adequate strip seal/gaskets to prevent the ingress of water.
- viii. No floor rail type door will be acceptable.
- ix. The door frames shall not extend into the internal building space and shall not clash with the overhead crane and any other equipment.
- x. Operating mode shall be by a sustained pressure button for the descent/closing and a single push for the rise/opening of the door.
- xi. The door shall be monitored (open/closed) and controlled via BMS.
- xii. An orange flash light (LED type) shall be installed on both sides (external and internal) of the door to indicate when the door is in operation. It shall turn on few seconds before the door's movements commence.
- xiii. A safety edge shall be installed.
- xiv. A floor marking at the door way shall be painted with yellow & black strips with a required width in accordance to the applicable regulations.
- xv. A spot lights (LED type, + 50 lux light) shall be installed outside the door to light the doorway area when the door is in operation, it shall turn on few seconds before the door movement commencement. There shall be possibility to turn this light on/off manually.

The Contractor shall make sure the doors are conformed with applicable norms and provide the suitable documentation & certificates in order to facilitate the statutory inspection, which is part of the Contractor's scope before taking over of the workshop (the report shall be free from comments from the third party) and according to all regulatory applicable standards (in particular NF EN 13241-1 and ART R4224-13 of the *Arrête 21/12/1993*). Start in service report without observation has to be provided by the Contractor. The statutory initial inspection shall be performed by a third party validated by the IO.

6.10.3 Windows in the building

The building shall be equipped with windows as indicated in [1].

No windows are expected at the ground floor for the electrical and cubicles rooms in the building.

The thermal insulation shall be designed in line with the defined indoor conditions and shall maximize as much as possible the energy saving. The windows selection shall follow the A.E.V. classification in accordance to the region, the site and the exposition.

The windows shall meet the below requirements – refer to [1].:

- i. Sun protection of the Southern and Western facades obtained by implementation of glass with a solar gain inferior to 25% (in the mass); The windows shall have the glass laminated SP10 and a solar protecting in their mass.
- ii. Windows PVC or Aluminium, double glazed insulation compliant with RT2012;
- iii. Tilt window.
- iv. Rolling shutters PVC or Aluminium blade, isolated, with manual command. The trunk shall be insulated and invisible from outside.
- v. Number and Windows dimensions – refer to [1];
- vi. The height window sill shall respect the standard and shall be at least at 1m from the final level of the floor;
- vii. Ventilation rulers built-in.
- viii. Windows selection shall follow the A.E.V. classification in accordance to the region, the site and the exposition.
- ix. All windows shall be equipped with a device to block them in open position.

6.11 Smoke exhaust system

The building shall be equipped with an adequate smoke exhaust system, its final design and the number of hatches shall be defined by the Contractor at the design stage. The systems shall be compliant with all statutory requirements and the French Labour Code, in particular the Decree No. 92-332 of the 31st of March 1992.

The smoke exhaust system shall follow the below requirements:

- i. Smoke exhaust hatches shall:
 - a) Be properly thermally insulated to avoid any condensation on their surfaces;
 - b) Be installed with a fixed steel grating (1200 Joules resistant);
 - c) Be equipped with individual sensors indicating their position (Open/Closed);
 - d) Have the opening panel made of translucent polycarbonate of 30 mm minimum thickness;
 - e) Open automatically in the situation when the indoor temperature reaches 140°C at the roof level.
- ii. Smoke exhaust control panel shall:
 - a) be equipped with a pneumatic system with gas;
 - b) be equipped with a visual device to signal the gas cartridge infill level;
 - c) allow to carry out two (2) openings and one (1) closure per cartridge.
- iii. Smoke exhaust cables network shall be made of copper.

The location of the smoke exhaust panel in the building shall be at the main entrance next to the intervention plan, its exact location shall be agreed with the IO during the design stage.

The final site acceptance test for the smoke exhaust system shall be performed with the IO and the concerned authority to ensure that the system works properly and meets the above requirements.

6.12 Rain water evacuation from the roof

The building shall be equipped with the rain gutters with hidden (not visible from outside) downpipes to effectively evacuate the rain water from the building roofs. For that purpose, the downpipes shall pass inside the building envelope. The dimension, number and location of the gutters and the downpipes shall be designed taking into account the local weather conditions and the applicable norms and standards, in particular the NF DTU 43.3.

At the roof level, at the top end of the downpipes, the Contractor shall install galvanized metallic sieves to prevent small parts collected with the water (e.g. leaves) to run down the pipes and potentially obstruct or block them with time.

The rainwater downpipes shall be directly connected to the main precipitation drainage networks using buried pipes - refer to Section [1] above for further requirements.

If the direct connection seems not feasible, the Contractor shall direct the rainwater towards the nearest existing precipitation drainage in the platform.

The management of the rainwater shall not compromise the water tightness of the building.

The creation of water puddles and retention on the floor slabs around the building shall not be accepted.

6.13 External MFC Chiller area

The Contractor shall design and build an external concrete slab to install the existing Carrier chiller. This external storage shall meet the following requirements:

- The support shall be reinforced concrete slab capable to withstand the loads transfer by the chiller and the external climatic condition . As built information of the chiller to design slab is provided in reference documentation
- The slab shall be design to respect the free frost level following the applicable norms and standards.
- The expected Size: 10x5.5 m.
- The slab surface will be brushed finish type with a slope of 0.5% direct to the north (away from the building).
- The slab shall properly integrated in its design the ducts penetration described in section 6.6.7 and the technical trenches described in section 6.6.9.
- The storage shall be closed on two sides (one gable and one long size) by simple torsion metallic fence of 2m height, dark grey color. A gate of 2000mm height x 900mm shall be installed on the west side of the area. The gate shall be the same color than the fence and design to withstand external weather conditions.

6.14 Electrical rooms in the annex building

There shall be three independent electrical rooms created in the North west side of the building, at the ground floor L1 level – refer to [1].

The electrical rooms shall meet the following requirements:

- i. The expected internal size of the rooms shall be:
 - a. For the MFC TR room: L=4.7m x W=3.4 m → approximate room surface usable = 16 m². This room will house the Dry Type 22/0.4 kV 1250 kVA Transformer (procurement, delivery and installation out of the contractor scope).
 - b. For the ECPS TR room: L=4.4m x W=3.4 m → approximate room surface usable = 15 m². This room will house the ECPS Dry Type 22/0.4 kV 800 kVA Transformer (procurement, delivery and installation out of the contractor scope).
 - c. For the Services TR room: L=3m x W=3.4 m → approximate room surface usable = 10 m². This room will house the ECPS Dry Type 22/0.4 kV 250 kVA Transformer (procurement, delivery and installation out of the contractor scope).
- ii. The usable ceiling height of the rooms shall be minimum 3m (no false ceiling is expected).
- iii. Following the structural specifications given in Sections 6.7 and 6.8 above, all concrete surfaces in the rooms (the walls and the ceiling) shall be protected with an adequate anti-dust coating system to protect the raw surfaces and to avoid the dust generation.
- iv. All used service penetrations (e.g. sleeves, cable trays, trenches) in the room shall be backfilled and provide the fireproof during minimum 120 minutes. Not used service penetrations (e.g. for future services or spare ones) shall be temporarily closed/covered for an adequately protection before their intended use.
- v. The floor in the rooms shall be adequately marked to indicate the space reservations for:
 - a) Pedestrian path,
 - b) Space required to open fully the pedestrian door,
 - c) Space required to open fully the different electrical cabinets' doors,
 - d) Fire extinguishers positions,
 - e) HT & BT equipment areas identification.
- vi. The rooms shall be equipped with a sufficient ventilation system and a suitable HVAC to ensure an acceptable ambiance temperature and conditions for the intended / installed equipment and the personnel working there.
- vii. All installed equipment shall be accessible for maintenance without MV LOTO (e.g. lights, HVAC, etc.). Sufficient Equipotential bonding bars connected to the earthing network shall be installed in the electrical room in order to allow connecting transformer parts, and metallic frames.
- viii. A pedestrian door shall provide the access in each room – refer to Section 6.10.1.
- ix. The entire structure shall be connected to the earth and a grounding bare shall be provided for each room.
- x. These rooms will accommodate the ducts described in the section 6.6.7. Their final position will be defined at the construction design stage.
- xi. The floor shall be in concrete as described in section 6.8. The slab shall properly integrate in its design the ducts penetration described in section 6.6.7.

6.15 Mezzanine area

On the East side of the building, in each laboratory, above the ground floor rooms, a mezzanine area shall be created with a minimum of usable surface of 260m² – refer to the conceptual drawing [1].

The floor of the mezzanine shall be solid and shall have a capacity of 250kg/m². The concrete floor, made as a composite slab, shall be treated as described in section 6.8 to avoid the dust production.

The thickness of the floor shall be optimized to maximize the usable height and keeping minimum: 3m height usable at the ground floor and 2.5m height usable on the top of the mezzanine. The overhead crane shall be able to lift equipment in this area.

To maximize the usable surface at the ground floor level, the number of columns to support the structure shall be minimized as much as possible, keeping minimum 5m between them.

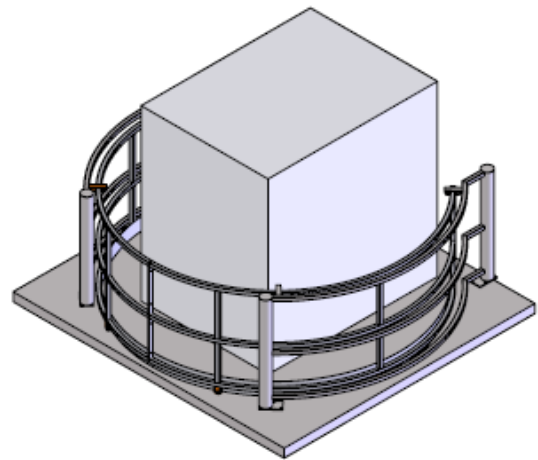
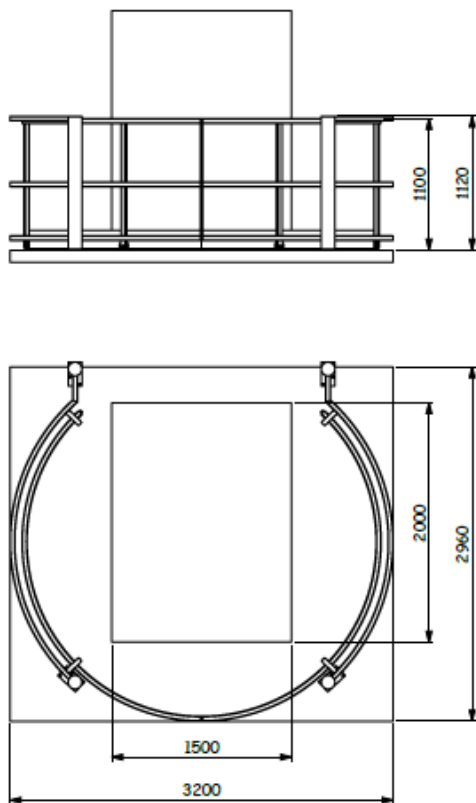
Two straight stairs shall be installed to access to the mezzanine areas – refer to [1]. The staircases shall meet the applicable norms and standards, in particular NF E85-015 and EN ISO 14122-3. The Blondel's formula shall be used for the calculation of the stairs dimensions considering that the step tread shall be between 280 mm – 320 mm and the step riser/height shall not exceed 160mm. The usable width of the stairs shall be minimum 1500 mm. The service loads to be considered in the staircase design is minimum 250 kg/m².

Handrails shall be installed on the both side of the stairs flight(s).

The steps shall have an anti-slip mat surface and the steps' nosing shall be highlighted in yellow and have the anti-slip finishes. One stairway with associated continuous collective protection have to install at one extremity to ease the access/ evacuation.

To prevent any risk of fall, metal guardrails shall be installed on the edge of the mezzanine with solid plinth, and it shall be in accordance with French Labor code (minimum height 1.1m). Refer to [1], incorporated to the guardrails of the mezzanine, two (2) safety SAS for delivery shall be design, procure and install respecting the below requirements – refer to figure 5:

- Conform to the standards,
- Usable delivery SAS for goods size of maximum: 2000x1500mm,
- Height of the guard rails: identical to the one of the mezzanine without any discontinuity,
- No rails at the goods passage,
- Metallic type with a circular shape.



Position ouverte à l'avant


 TAC Plaine de Clairac 100 Rue Marvis Bastié	BE 55 - 3200 x 3000 DESCRIPTION :
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Figure 5 – Expected layout of the delivery SAS

The lighting of the mezzanine shall be compliant with the requirement of the dedicated section later in the document and shall be controlled separately than the main work hall by switches located at stairway.

6.16 Internal structure

The Contractor shall create internal partitioning to create several rooms as per the drawing in reference [1].

6.16.1 Floors

Please refer to the above section 6.8.

6.16.2 Ceilings

The Contractor shall implement a false ceiling made of acoustic tiles in all rooms as follow:

- Ceiling tile: 600 mm x 600 mm, colour white (RAL to be defined by the IO at later stage), Rockwool type, with fire reaction A1 minimum;
- Service space void above the false ceiling sufficient to pass all the services;
- Acoustic reduction shall be 21dB (class A as per ISO 354);
- Easy removable false ceiling system.

The usable height of the ceilings with regards to the finished floor shall not be less than:

- 2.75m for the level 1;
- 2.5m for the mezzanine level L2.

6.16.3 Interior walls

The interior walls shall follow the below requirements:

- The interior partitions shall be designed to provide a minimum of 44 dB (A), and, all the partitions shall go up to the structural ceiling, above the level of the false ceiling;
- The insulation thickness of the internal partitioning walls shall be 48mm Rockwool with fire reaction A1;
- Cladding on the both side can be pasteboard or steel type with a smooth painted finishing with colour white (RAL to be defined by the IO at later stage) granting a good acoustic insulation;
- The wall's claddings shall be fully watertight, shock resistant and easily cleanable for the following specific rooms: Toilets and showers rooms, cafeteria areas around the wet points and service rooms;
- In the rooms, the covering of the vertical visible steel elements (as post, beam...) shall be done with plasterboard.

6.16.4 Internal pedestrian doors

The buildings shall be equipped with the internal pedestrian doors as per the drawing in reference [1].

The quantity and locations of the pedestrian doors shall be designed by the Contractor to be compliant with the applicable norms and regulations as well as the French Labour Code. The size of the doors shall comply with the safety requirements in terms of the number of occupants of the room.

The double leafs pedestrian doors shall meet the requirements listed below:

- i. Single leaf door with the clear opening dimensions: W=930 mm x H=2040 mm. The access doors to the utilities rooms and MFC L1-04 chemical lab room shall be single leaf door with the clear opening dimensions: W=930 mm x H=2500 m.
- ii. The door shall be isoplane acoustic type 44dB, full core with shop-painted metallic joinery. The colour shall be chosen by the IO at later stage;
- iii. Each door shall be equipped with door stopper, in addition, for the sanitary rooms (toilets) a door closer shall be installed too;
- iv. Interior and exterior stainless steel baton door handle and a key hole for European cylinder; except the toilets doors with shall be equipped with actuator lock from inside with visual colour indicator outside see detailed after. The locks to be provided by the Contractor after validation of the organigram by the IO (Bricard brand);
- v. In addition, the doors of the meeting rooms shall be equipped with internal deadbolt lock;
- vi. Doors shall not be equipped with a strip seal;
- vii. Doors of toilets and showers cabins fitted with:
 - Safety locks which can be easily operated by the user and easily released from outside for access in case of emergency (turn and release);
 - Roller latch lock;
 - Occupied indicator;
 - Pull handle.

- viii. For the ECPS L1-09 store room and ECPS L1-11 RT Lab room: Double leafs door with the clear opening dimensions: W=1940 mm x H=2500 mm equipped with:
 - 2 oculus D400mm,
 - The frame colour shall be chosen by the IO at later stage;
 - Interior and exterior stainless steel baton door handle and a key hole for European cylinder. The locks to be provided by the Contractor after validation of the organigram by the IO (Bricard brand);
 - Fixing devices shall be in steel and base plates in galvanised steel;
 - An autonomous emergency-lighting unit shall be installed minimum 10cm above each door frame;
- ix. For the ECPS L2-06 Power Electronics Lab room : Double leafs door with the clear opening dimensions: W=1940 mm x H=2200 mm equipped following the same requirement than above.

6.16.5 **Sanitary rooms, WC rooms, Cafeteria room and Service rooms**

The building shall be equipped with two twin main sanitary rooms, 2.5x2.8m minimum each, one for male, and one for female and two male WC 2.5x1.5 m. Both rooms shall be designed in accordance with the French labor code, codes & standards, and shall allow the access of disabled person. Each room will be equipped with:

- One hand washing point (sink and tap) – supplied by potable water system,
- Full equipped shower with curtain,
- Toilet,
- Coat rack (4 racks minimum),
- Walls shall be tiled and waterproof.
-

Service rooms of 2.8x1.9 m minimum shall be created and equipped with service sink + tap hot & cold water to be used by the cleaning service in each laboratory.

Break rooms of 3.0x2.8 m minimum shall be created and equipped with sink + tap hot & cold water to be used for people eating inside.

For all rooms the sewage water will be directed to the sanitary drainage system.

6.16.6 **Utilities rooms**

The building shall be equipped with two utilities rooms with a sufficient surface to install, operate and maintain all the system and utilities of the building. The proposed surface is 20m² minimum for each which could be optimized and justified at the design stage. The room shall be designed in accordance with the French labor code, codes & standards.

The utilities rooms doors shall be one leaves door, EI30 fire resistant, and, follow the requirements given in section 6.16.4.

The surrounding internal walls shall have a fire resistance class EI30 and shall be made in non- flammable material.

The utilities room MFC -L1-10 will house in particular for MFC:

- A general HTA 22kV cabinet (approx. dimension 3,5x1.5m) only MFC (out of contractor scope),
- A General electrical cabinet LV to supply the HVAC systems of the building (two

main volumes) – general cabinet provided by IO (already existing in B32),
Contractors to provide the necessary information to install the new main breakers
for HVAC – refer to reference documentation,

The utilities room ECPS -L1-08 will house:

- A general HTA 22kV cabinet (approx. dimension 3,5x1.5m) only ECPS (out of contractor scope),
- A general electrical cabinet LV to supply the different services of the building (two main volumes)→ The contractor shall design, procure and install this main distribution board connected to 250kVA service transformer,
- IT, BMS, FDS, ACS and PAS cubicles and cabinets (Contractor's scope),

6.16.7 Oil and Chemicals lab room

The MFC building shall be equipped with an oil and chemical analysis lab located on the ground floor connected to the sanitary drainage system. This area shall follow the below specification:

- A self-supporting inox industrial sink for syringes and glass bottles cleaning connected to sanitary drainage network. This industrial sink shall be full equipped with a mixing valve for potable hot/cold water supply, and, its associated evacuation panoply,
- The wall against the sink shall be protected from water projection with tiles on 60cm height minimum.

6.16.8 Control rooms

The building shall be delivered with two control rooms where MFC and ECPS will pilot their main installation. These rooms will be equipped with large internal fix windows to be able to have a direct view on the piloted installation.

The windows in the control rooms of the building shall meet the below requirements – refer to [1]:

- i. For the ECPS control room: One (1) fixed window: W=6.0 m x H=1.2 m. For the MFC control room: One (1) fixed window: W=4.8 m x H=1.2 m; and, One (1) fixed window: W=1.2 m x H=1.2 m
- ii. The height of window's sill shall be 1.2 m.
- iii. Exact position to be defined at later stage by the IO, centred on the north wall.
- iv. The window shall have a laminated glass with a mirror finish (in the mass) on the workshop hall/ open space side.
- v. The frames of the windows and the partitioning walls systems shall be reinforced to properly withstand the loads of the windows.

6.16.9 Surface markings and signs

The Contractor shall mark the surface of step ways, pedestrian path and door way of the emergency exits & all the internal doors with yellow & black strips. Moreover, the Contractor shall paint the floor where extinguishers are located to avoid any storage in front of them.

The recommendations of the paint manufacturer shall be followed. The Works shall be

performed when the forecasted meteorological conditions and the state of the surface are appropriate.

The Contractor shall provide and install necessary safety awareness signs related to the Works in accordance with French Regulations and standards. The signs shall be in both versions, French and English.

The installation height shall be adapted to the location, considering site constraints, visibility and safety.

The Contractor shall confirm with the IO RO the type and location of the signs prior to order from the supplier. An extinguisher ID plate shall be installed for each of them.

6.17 Door keys of the building

The Contractor shall deliver all necessary keys and accessories for normal usage of the joinery.

The locks of all doors shall be integrated to the BRICARD SERIAL XP organization chart already implemented on Site. The Building keys organization chart shall be submitted for approval by the ITER Organization. It shall include a building master key, an offices sub-master key and a technical room sub-master key.

The lockable padlocks of the roof accesses and the chiller areas external gate will also be integrated in the key chart.

The Contractor shall supply:

- 3 keys for each single lock;
- 3 keys of the building master key;
- 3 keys of the offices sub-master key;
- 3 keys of the technical room sub-master key.

The Contractor will remain responsible for all keys until the Taking-Over of the Works.

6.18 Fire protection and safety equipment

The Contractor shall define the type, number and location of the fire extinguishers according to APSAD R4 regulations. A dedicated fire protection mission shall be performed by the Contractor at the design stage to confirm the building design and to position the devices appropriately. The Contractor shall take into account the investment protection aspect in the definition of extinguishing agent (i.e. CO₂ preferred to the powder ABC where possible according to the risks). Provision and distribution of the fire extinguishers shall be in the scope of the Contractor.

The signalization panel of each fire extinguisher shall be fluorescent. All fire extinguishers shall be equipped with the identification plates providing the key details (unique ID number, type, size and date of fabrication as a minimum).

The emergency exits shall be illuminated with autonomous emergency light spots. The emergency ways shall be illuminated with autonomous emergency light spots.

The building shall be furnished with the intervention and evacuation plans. In general, one evacuation plan shall be installed at each pedestrian door.

The safety register shall be provided and installed by the Contractor (the location to be confirmed by the IO at the design phase).

An emergency stop button to switch off the electricity inside each laboratory (so two in total for the building) shall be available next to the intervention plan. One (1) emergency stop button to

switch off the HVAC of the building (only ventilation and main roof top bringing fresh air inside the building) shall be installed too to be able to confine each laboratory (so two in total for the building) - the location to be confirmed by the IO at the design phase.

6.19 Lightning protection

The Contractor shall provide an adequate lightning protection to the building, crane and the electrical supply and controls. The design of the lightning protection systems shall provide a safe environment for personnel and avoid electrical hazards. The building shall be fitted with necessary protection against lightning hazards in order to allow work continuity during thunderstorm. The design Tool SESshield/CDGES for Lightning Protection studies is mandatory.

All operators or subcontractors performing the lightning works shall be qualified for this job (QUALIFOUDRE certification).

The Contractor shall provide all supportive calculation notes for their lightning protection design with a final conformity report performed by an independent checker.

6.20 Overhead Crane

The Contractor shall design, supply, installation, test and commissioning of **two overhead cranes**, one for each laboratory (MFC and ECPS) with appropriated foundations and main structure such that they meet the requirements defined in this technical specification. The crane shall comply with all applicable legislation and shall be CE marked.

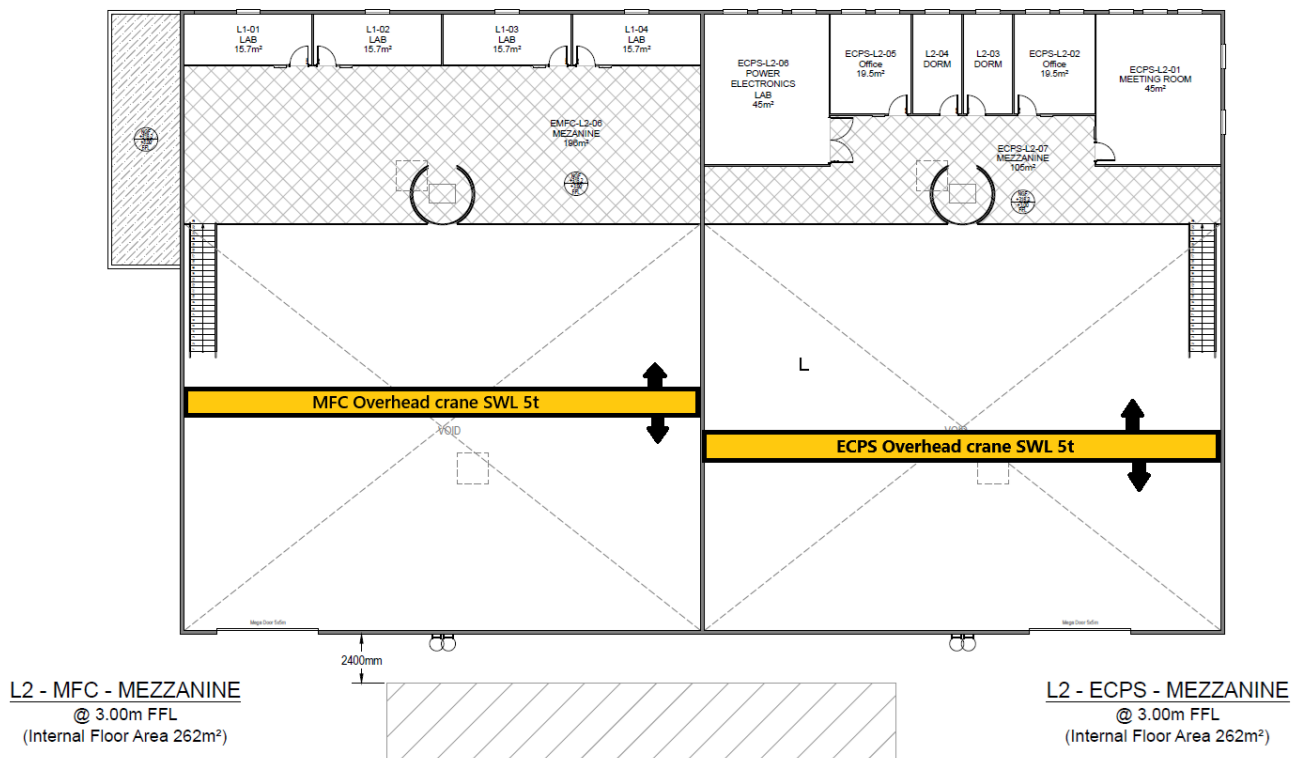


Figure 6 - Simplified plan of the overhead crane in the building

6.20.1 **Cranes parameters**

- i. Span: To be defined by the Contractor. It shall ensure that the crane is capable of operating along the full length of the building. It shall be optimized to fit within the building including a provision of a minimum space for a person between any moving parts of the crane and the building walls / structures (refer to NF EN 349 Safety of machinery - Minimum gaps to avoid crushing of parts of the human body and French Labor Code Art. R4323-12);
- ii. The crane shall be overhead type running the East-West direction in the two open spaces of the laboratories with the capacity to lift equipment on the mezzanine areas.
- iii. Height under hook (or under the crane bridge structure, whatever is lower): minimum 6.00m;
- iv. Lifting capacity of a hoist - Safe Working Load (SWL): 5 tons
- v. Hoist (high-low) speeds: 5-0.3m/min 2-speed;
- vi. Cross-travel (high-low) speeds: 20-2m/min stepless.
- vii. Long-travel (high-low) speeds: 40-5m/min stepless.
- viii. Duty group:
 - a) Steel structure: FEM A5;
 - b) Hoist: FEM M5;
 - c) Cross travel: FEM M5;
 - d) Long travel: FEM M5.
- ix. Motor duty (duty cycle):
 - a) Hoist motor: 60% ED;
 - b) Trolley travel: 40% ED;
 - c) Gantry travel: 40% ED.
- x. IP protection: IP 54.
- xi. Structure:
 - a) A) Welded box type. Tests in accordance to the norms and standards, in particular NF EN 5817, minimum required: 100% visual done by a third party at the expense of the Contractor. In case of defect detected, a new program of tests shall be agreed with the IO to proof the resistance of the structure.
 - b) Overhead type: single or double span.
- xii. Gearing:
 - a) Total enclosed design for the lifetime of the crane (25 years);
 - b) Helical type hardened and ground.
- xiii. Steel rope and drums:
 - a) High tensile, galvanized steel rope;
 - b) Large diameter rope drums to extend the steel rope's lifetime;
 - c) Wear resistant cast iron steel rope guide.
- xiv. Surface:
 - a) Preparation of SA 2.5;
 - b) Painting thickness for structure: E 60µm;
 - c) Painting thickness for trolleys: E 80µm;
 - d) Color to follow the Manufacturer's standards.
- xv. Limit switch and buffers:
 - a) 2-step limit switch or speed adjustment device for hoisting, cross

- and long travels to avoid the sudden stop shock;
 - b) Energy-absorbing buffer for cross and long travels together with fixed end stops.
- xvi. Hook blocks:
 - a) Rotate freely 360 degrees;
 - b) Supported on anti-friction lifetime lubricated bearings;
 - c) Simple Hook with safety latches.
- xvii. Power supply by a C-track and flat cable festoon system;
- xviii. Control, operating and monitoring:
 - a) Can bus technology;
 - b) Two (2) Radio remote control operation, frequency range to be approved by IO,
 - c) Display of the lifted loads on the remote controls,
 - d) Spare emergency radio remote control to be provided.
- xix. Other standard features:
 - a) Overload limiting device;
 - b) disk braking for all motors;
 - c) Thermal protection for hoist motors;
 - d) All initial lubrications;
 - e) All the warning signs for crane and components;
 - f) Emergency stop;
 - g) Alerting horn
 - h) Obstacle detector on each end of gantry;
 - i) Swing attenuation system for the loads;
 - j) Anti-derailment device.

6.20.2 **Cranes requirements**

The crane may be an overhead-type.

Settlement of the crane rails shall not result in any loss of function or operability of the crane.

In this regard, the Contractor shall seek guidance from the crane manufacturer and shall design the crane rail and foundations / supports accordingly.

The design and construction of the foundations and the structure supporting the crane shall be compatible with and take account the geotechnical parameter of the area.

The Contractor shall propose a solution to allow an easy access to crane on-board devices as electrical cabinet and trolley to ease the operation and maintenance checks.

The Contractor shall ensure that the crane is compatible with these constraints and that there will be no clashes between the building (including its mechanical and electrical fit-out elements) and the crane structures. The laboratory clearance envelope shall not be protruded by any element of the Works.

The travel of the crane within the laboratory shall be optimized to ensure maximum coverage of the available area.

The Contractor shall install an electrical cabinet from which the crane will be powered. The crane structure and its rails shall be designed for the TNS earthing system.

In case there is a period of time when the crane is exposed to external weather conditions the

Contractor shall provide an adequate weather protection to the crane and the electrical supply and controls. This shall include lightning protection.

If necessary, the Contractor shall provide a temporary source of power to undertake required tests and to commission the crane.

If requested by the ITER Organization, the Contractor shall arrange a visit to the crane manufacturing facility.

The installation tolerances shall not exceed the values shown in D.2.19 and D.2.21 of EN 1090- 2; the crane structure shall be classified as Class 2.

The Contractor is responsible to perform the initial load test with Legal body inspection and to provide an inspection report with no observations.

6.20.3 Requirements for the cranes rails

The rails shall be of non-alloy structural steel grade 275JR to EN 10025-2 and manufactured in accordance with applicable European Standards.

Length of each portion shall be optimized in order to minimize the number of junctions in the rails. The rails and their fixing/supporting elements shall not protrude the laboratory clearance envelop.

Once installed, the rails shall be earthed.

The rails supporting structure shall be designed to allow a precise alignment of the rails and its necessary recovery linked with the structure deformations that might occur during the building's design lifetime.

6.20.4 Warranty requirements

The Contractor shall provide a 2-year warranty for the crane and crane rails. The warranty shall cover the cost of all labor and parts necessary to repair the crane regardless of the cause of failure (other than misuse by third parties).

Warranty interventions shall be carried out by the Contractor within 24 hours of notification by ITER Organization. It is expected that the crane will perform about 200 lifting operations per year.

6.20.5 Training

The Contractor shall provide to the ITER Organization an appropriate and comprehensive training in the use of the crane and all mechanical and electrical installations delivered under the Works.

6.21 Electrical supply of the laboratory

During the design phase, the Contractor shall provide the ITER Organization with the total power balance and calculation notes (in Caneco and pdf versions) of all electrical equipment to be installed in the building.

The current power available on the lot is 3300A (3P+N+T) in the Low Voltage Main Switchboard coming from the existing 1250 kVA MFC Transformer, the new 800 kVA ECPS Transformer, the new 250 kVA Building Transformer. If during the design phase, the power is not sufficient, the Contractor shall have to pull new backup cable between the building 36/LC11 inside existing ducts and install a new breaker in the local substation to

complete the power necessary; the distance is less than 100m. In any case, the new electrical power capacity of shall not exceed 250Ampere (A).

The building insulation shall be sufficient to allow this requirement to be fulfilled.

All electrical installations shall meet the statutory requirements. The Contractor shall make sure the electrical installations are compliant with applicable norms (NF C15-100 in particular).

Where applicable, the installation shall be CE marked.

6.21.1 **Design hypothesis and constraints**

The Main Electrical Source is coming from the B36/22kV cubicle, to be selected after dedicated study. The 22kV cable line (100m) shall feed the new High Voltage Main Switchboard (HVMS) 24 kV rated voltage, compact dimension and composed by incoming line, measurements, 3 transformers departs. The HVMS will feed the MFC Transformer, the ECPS Transformer, the Building Transformer.

- i. The output of MFC Transformers 1250kVA will feed the MFC LVMS located in the MFC Utility room – out of Contractors scope (only ducts to be provided and input for new breakers for HVAC of the building) -refer to [28];
- ii. The output of ECPS Transformer 800kVA will feed the ECPS LVMS located in the ECPS Utility room – out of Contractors scope (only ducts to be provided);
- iii. The output of Building Service Transformer 250kVA will feed the LVMS located in the ECPS Utility room – Design, procurement & installation in Contractors scope (full scope);
- iv. Final power shall be confirmed by the Contractor based on its power balance, and, if necessary, the installation of a new breaker, shall be part of the Contractor scope based on the building conception.
- v. TNS is the nominal electrical system to be applied.
- vi. All Works related to the high voltage (HV) are outside the Contractor's scope. These are as listed below:
 - a) Transformer design, procurement and installation,
 - b) HV cable trays design, procurement and installation,
 - c) LV cable to interconnect the transformer and the main electrical switchboards,
- vii. The Contractor shall allow an early access for HT contractor and shall work in coactivity in the room. The organisation will be defined at later stage with the IO and the HSPC.
- viii. The Contractor shall design, supply, install and connect the installations and equipment listed in the following chapters of this Section.
- ix. Auxiliary Parts for I&C inside switchboard shall be power supplied by UPS system or DC Charger.
- x. During the design phase, the Contractor shall provide the IO with the total power balance and the calculation notes (in CANECO and pdf versions) of the electrical equipment to be installed in the building.
- xi. The Contractor shall make sure the electrical installations are compliant with applicable norms (e.g. NF C15-100 in particular). All electrical installations shall meet the statutory requirements.
- xii. If the building is a metallic structure, an equipotential belt (with copper braids or cables) shall be implemented between all the metallic columns.

- xiii. All LV/LC electrical cabinets installed in the building under the Works shall be appropriately earthed.
- xiv. The design and the data sheets of the products used for the earthing protection shall be approved by the IO at the design stage prior to their installation.
- xv. All installations and equipment shall be CE marked.
- xvi. Incomer & Tie breakers shall have the necessary reserve to accommodate mechanical interlock by keys. IO will provide to the Contractor the RONIS keys numbers at later stage. The supply and installation of this interlock system is at the expense of the Contractor.
- xvii. Each equipment shall be tagged with an ITER numbering provided by the IO.

For all the necessary input data related to the existing electrical networks – refer to reference documents [28].

In addition, at the later stage of the project, the IO will confirm to the Contractor several input data coming from the HV installation for the design of the LV installation. When necessary, at the time the design is planned to commence, the Contractor shall request the confirmation of the above requirements using the Request For Information (RFI) process.

6.21.2 Main electrical switchboard and distribution cabinets

The Contractor shall supply and install the main electrical switchboard in the low voltage room and all necessary distribution cabinets.

The ratings and time current tripping curves will be defined based on the appliances to be protected. The installation will be calculated so as to guarantee total selectivity. An insulation fault on an electrical circuit should not cause isolation of more than a ¼ of the facilities per sector.

The switchboard, the boxes and the cabinets shall be designed to receive at least 30% of additional equipment.

The main electrical switchboard shall be equipped with a lightning protection in accordance to the ARF recommendation; and, energy meters on all main feeders (HVAC/lighting/electrical outlets...).

The Contractor shall design, supply and install main switchboard supplied by the 250kVA Service transformer to supply the building utilities following the below arrangement (which can be optimized by the Contractor with an approval of the IO):

1. **Main switchboard to supply the main utilities of the two buildings in the room ECPS L1-08** with a number of columns to be defined by the contractor:

Main breaker 400 A type *masterpact* for whole LV switchboard installed with a counting meter (type D50) and all necessary small breakers, related to:

- i. Standard electrical fit-out breakers of the electrical rooms in the annex,
- ii. Standard electrical fit-out breakers of the two utilities rooms,
- iii. Surge arrestor type 1+2,
- iv. Standard electrical fit-out breakers for outside electrical lights and sockets,
- v. Emergency lights in the building,
- vi. Lights in the building ,
- vii. Breaker for the two external motorised door (5 m x 5 m),
- viii. Transformer Temperature surveillance unit (NT935 Type in Modbus),
- ix. Measuring Unit in Modbus,

- x. Gateway modbus to 61850 Unit for interface with PBS43,
- xi. Intertrip and interlocking electrical signals between HV and LV,
- xii. TNS electric system with the nominal voltage 230 / 400 VAC,
- xiii. With remote signalling contact wired on cage clamps,
- xiv. Protected by fuse according to the manufacturer's recommendations
(*Note: If integrated fuse, attention must be paid to short circuit current value*),
- xv. Short-circuit current (50Hz): to be adapted to the installation point (depending of the electrical calculation note),
- xvi. Breaker for the MFC overhead crane,
- xvii. Breaker for the ECPS overhead crane,
- xviii. Breakers for the sockets/ electrical distribution described in 6.23 section below,

NOTA for all the above points:

Respect $L1+L2+L3 \leq 500$ mm thus consider having a surge arrester including its protection.

All the breakers shall be monitored: SD/OF information.

The Contractor shall forecast the connecting switchboard columns in between columns to connect the breakers passing by electrical terminals until a wire section of 25 mm².

The Contractor shall update all relevant calculation notes on CANECO (back-up mode) and drawings concerned by the Works. The native files shall be provided together with Adobe PDF version.

For the Works requiring lock-out (LOTO) which impact other ITER site user, the Works shall be performed in such a way to minimize the impact on surrounding activities by working on Saturday or staggered/night shift hours.

As explained, the Contractor shall forecast to connect the following utilities on the existing main MFC switchboard powered by the 1250kVA transformer in the room MFC L1-10:

- i. Breakers for the two main building HVAC system: one main HVAC to control the MFC space volume; and, one main HVAC to control the ECPS space volumes - capacity to be determined by the Contractor and provided to the IO for breaker installation,
- ii. Breakers for HVAC supply in the two utilities rooms (section 6.25.4) - capacity to be determined by the Contractor and provided to the IO for breaker installation,
- iii. Breakers for HVAC supply in the electrical rooms (section 6.25.3) - capacity to be determined by the Contractor and provided to the IO for breaker installation,
- iv. Breakers for HVAC supply in the other rooms (section 6.25.2) - capacity to be determined by the Contractor and provided to the IO for breaker installation,
- v. Breakers for ventilation of the building (section 6.25.5) - capacity to be determined by the Contractor and provided to the IO for breaker installation,

→ Out of contractor scope: procurement & installation of the main electrical distribution board with the new breakers to be installed.

→ In Contractor scope: design and update of the calculation note & associated drawings/ synoptics (to be provide to the IO), cable design, procurement, pulling, installation, connection from the breaker to the equipment (downstream breakers)

6.21.3 Cabling and marking

All the LV links will be carried out in copper U100R2V wiring.

All the switchgear (protective devices, relaying, terminal boards, cables etc.) will be tagged.

6.22 Electrical distribution

The Contractor is responsible for the design, procurement and installation of all necessary LV and LC cables and cable trays related to the distribution of the electricity of the project.

The cable trays shall have the following specifications:

- i. Made of steel – type CABLOFIL;
- ii. Connected to the earthing system;
- iii. Minimum height of the trays: 50 mm;
- iv. Width of the trays: 500 mm,
- v. In general, installed between 2.5 m and 3 m in workshop – main volumes, inside the false ceiling for the concerned rooms and below the mezzanine area always above 2.5m as well ;
- vi. Supports made of hot deep galvanized steel and adapted to the locations and surface the trays are to be fixed to.

In addition, the Contractor shall install the following empty cable trays (as reserved spare ones) for the future building development:

- i. One (1) LC empty tray between the ECPS L1-08 utilities and the ECPS L1-10 Control room,
- ii. Two (2) LV empty tray between the ECPS L1-08 utilities and the ECPS L1-11 ECPS RT LAB.

The Contractor shall adapt the design of the cable trays taking into account the building constraints (other networks e.g. ducts, trays, pipes and the cranes). There shall be no clashes with any fixed or mobile equipment.

6.23 Electricity inside the building

The following specifications shall be followed:

- Electrical protection level IP 55 for outdoor electric devices and IP 44 for indoor electric devices;
- Each 10 meters – 5 in total per L1 open space for each laboratory + 1 at L2 mezzanine level for each laboratory (12 in total for the whole building), fixed on building poles, a 3P+N+E wall distribution board IP 5X typically composed by:
 - MCB and RCD (if prescribed)
 - N. 1 63 A CEE socket 3P+N+E
 - N. 2 32 A CEE socket 3P+N+E
 - N. 3 16 A CEE socket 3P+N+E
 - N. 4 16A CEE socket 2P+E

Such boards position will be confirmed at design phase by the IO;

- Five (5) electrical sockets 2P+E 16A shall be installed at the mezzanine

- level for each laboratory (position to be decided at design phase by the IO);
- Terra Neutral Separate (TN-S) type of electrical earthing system shall be implemented on each structure of the laboratory. An equipotential bonding will be made available to the Contractor;
- Electrical boards or cabinets shall be designed with additional, 30% extra power capacity (design and supply) to cater for the future power supply expansion. The total electrical power of the building shall not exceed 3300A.

During the laboratory design phase, the Contractor shall provide the IO with the power balance and calculation note (in Caneco and pdf versions) of the electrical equipment in the laboratory. The IO shall give the Contractor the electrical requirements according to upstream power supply which will allow the Contractor to design the laboratory main power distribution panel.

For the calculation of the power balance and the design of the installation, please consider:

- For 2P+E 16A sockets duty factor (Ks) of 10%, use factor (Ku) of 0.8%,
- For 3P+N+E 63/32/16A sockets: duty factor (Ks) of 30%, use factor (Ku) of 1,

The Contractor shall be responsible for the design and installation of the power distribution system outside and inside the laboratory. The power connection between the power distribution panel of the laboratory building and the existing power panel of the IO shall be the scope of the Contractor.

The Contractor shall make sure the electrical installations are compliant with applicable norms (NF C15-100 in particular) in order to facilitate the statutory inspection, which is part of the Contractor's scope before commissioning of the laboratory (the report shall be free from comments from the third party).

If the building is a metallic structure, an equipotential belt (with copper braids or cables) shall be made between all the metallic columns.

All LV/LC electrical cabinets installed in the building and/or under this Contract shall be appropriately earthed.

The crane shall also be equipped with an equipotential bonding. The rails and rails sections shall be earthed with appropriate copper braids and with earth brushes between the rails and the crane structure (as recommended by the manufacturer).

6.23.1 **Equipment and electrical plugs**

The Contractor shall supply, install and connect all the plugs 16A 2P+pin earth. The fittings shall be of standard brand Legrand Mosaic 45 with screws or equivalent.

The plugs shall be embedded in white conduits and/or integrated at posts (meeting rooms). They shall be positioned depending on the chosen location of equipment and furniture for ease of access, and against risk of trips and falls.

The Contractor shall plan for a departure of 16A from the cupboards with a differential of 30mA, for 8 socket-outlets maximum.

The distribution of low current and low voltage networks shall be uncoupled. The interference problems shall be taken into account in the routing of cables. The dimension of the conduits shall allow a space reserve of 30%.

This feeding system shall be easily adaptable for new connections.

The estimated numbers of normal outlets are the following:

Location	Number of normal outlets	Number of uninterruptible outlets
Offices, Closed Lab rooms, Dorm rooms	3 / desk	Ø
Meeting rooms	2 on sockets tower each supplied by a specific feeder 1/participant on meeting table with the power supply lines from the socket tower 1 in ceiling for screen 1 in ceiling for beamer 4 in ceiling for video 1 / entrance	Ø
Printer areas (L1, below the mezzanine to be defined at later stage), one in each laboratory	4	Ø
Cafeterias	4 2 for vending (0.5KW) and coffee (2KW) machines supplied by a specific feeder (16A) 1 for water fountain (0.2KW)	Ø
Corridors (below and above the mezzanine)	1 / 10m	Ø
Sanitary facilities	2 + 1 power supply for hand dryer	Ø
Utilities room of MCF	5	2
Utilities room of ECPS	5	2 8 / rack 1 power supply for FDS 1 power supply for PAS
Service rooms	2	Ø
Building Entrances / exits – below the mezzanine	2	Ø
MFC L1-04 Oil and Chemical lab	8	Ø
ECPS L1-11 RT Lab	8	Ø
ECPS L1-09 RT store	8	Ø
ECPS L2-06 RT Power electronics lab	8	Ø

The setting out of the plugs shall be submitted to ITER Organization approval by the Contractor on the basis of the final furniture arrangements.

6.23.2 Distributions and cable trays

The distribution is laid out on cable trays of type:

- Cable basket or under tubes IRO in common areas;
- Ventilated/perforated in the technical rooms and the workshops.

When more than 2 cables follow the same path, they shall be laid out on cable trays, at a rate of 2 maximum layers of cables placed side by side. They shall be fixed by collars of the Rilsan type or equivalent.

The cable trays are of a certain dimension so as to leave a reserve of 30% of the width and have a wing of 5cm.

Each element of the cable shelf is supported by at least two cantilevers, with a deflection of less than 2cm per meter.

In the zones at risk of shock, the mechanical protection of the cables - by cover or tube - is maintained until 2.00 m above floor level.

6.24 Lighting

The lighting shall be compliant with the French Labour Code, be designed in accordance to NF EN 12464-1 and meet the below listed requirements:

- The installation shall be CE marked.
- LED Colour shall be of natural tone: 4000.
- LED lifetime shall be minimum 50,000 hours.
- The protection level in accordance to the areas (wet or dry).

Lighting levels will respect the recommendations from the standard NF EN 12464-1 and will be calculated according to the NFC 71.121:

Room type	Minimum lighting level (lux)
Corridor	100
Staircase	100
Office / meeting room / storage/ workshop/ laboratory/ open space	500
Utilities and service rooms	500
Sanitary facilities	200

Table of minimum lighting levels

The Contractor shall include in the Works:

- Calculation of the number of lights;
- Supply and installation of economic lighting of LED type;
- Implementation of dimmable LED lighting in the offices / meeting rooms / control room and laboratory rooms;
- Supply and installation of small equipment / fittings, of MOSAÏC type from Legrand or equivalent;
- Controls of simple switch type in the technical / showers/ meeting rooms / laboratories/ workshop and offices;
- Control by presence detectors in the corridors, toilets and cafeterias;
- PVC conduits fixed against the walls for apparent routes. The routes shall be covered as soon as possible.
- For the wet areas the electrical regulations shall be respected.

During the test and commissioning period, the illuminances of the different areas shall be checked with a calibrated luxmeter. For the Taking-Over by the IO, a global report shall be submitted to the IO to confirm that the requirements are met without observation.

The lights shall be positioned to grant an immediate and easy access for maintenance works.

6.24.1 **External lighting**

The contractor shall install the necessary lights to ensure a lighting level of at least 100lux all around the building, at 5m distance, illuminance level taken at any point 1m above the FFL,

The lighting shall be compliant with the French Labour Code, be designed in accordance to NF EN 12464-1 and meet the below listed requirements:

- i. The installation shall be CE marked,
- ii. LED Colour shall be of natural tone: 4,000,
- iii. LED lifetime shall be minimum 50,000 hours,
- iv. The protection level shall be minimum IP 68,
- v. Wall-mounted,
- vi. Controlled by the BMS monitoring system to be set in accordance to time and the period of the year.

During the test and commissioning period, the illuminances of the different areas shall be checked with a calibrated luxmeter. For the Taking-Over by the IO, a global report shall be submitted to the IO to confirm that the requirements are met without observation.

The lights shall be positioned to grant an immediate and easy access for maintenance works.

6.24.2 **Emergency lighting**

The buildings shall be equipped with a fixed installation of emergency lighting (autonomous emergency lighting) in main volumes, corridors and staircases, in accordance with the decree of 26 February 2003 relating to the circuits and installations of safety and circular DRT n° 2003_07 of 2 April 2003 concerning the application of the decree of 26 February 2003.

The Contractor shall supply, install and connect safety lighting, as follows:

- Autonomous blocks of emergency lighting “Emergency exit” 60 lumens;
- Operate by remote control blocks “Emergency exit”;
- Displayed in conformity with the NFC 71800;
- 2 blocks separated by a maximum of 15m shall be used to mark out the direction to the outside exit (written in English);
- 1 block above each fire exit;
- 1 block spaced every 15m in corridors and main open space volumes;
- 1 block at mezzanine level to indicate the staircase;
- 1 block above each utilities and laboratory rooms in the level 1.

6.25 Heating, Ventilation, Air Conditioning systems (HVAC)

The heating, ventilation and air conditioning systems (HVAC) implemented under the Works shall be electrical (no gas or fuel sources allowed), and, they shall be designed according to the total electrical power capacity of the building.

The systems shall be compliant with all statutory requirements, the applicable norms and standards and the French Labour Code. The equipment shall be CE marked.

All the external HVAC units shall be installed on a ground floor, aside of the building, on a dedicated laydown area defined by the Contractor following the chosen concept. The big external units cannot be installed on the East side to keep the patrol track as free as possible between the building and the existing fence. An access to the different parts of the systems shall be ensured to allow a safe and appropriate maintenance.

The design shall mitigate as much as possible the noise and vibration disturbance generated by the HVAC systems. The duct lagging shall be implemented accordingly.

The ventilation system shall be designed to prevent any dust ingress. A filter shall be positioned at the entrance to avoid dust entry (filter type G4).

The HVAC systems shall be supervised and controlled by the BMS system of the building..

All new HVAC units shall be supplied with a cooling gaz with GWP lower than 675 (GWP of R32).

The evacuation of condensate of the indoor units water shall be via a connection to the sanitary drainage tank (included in Contractor's scope) - refer to Section 6.6.5.

6.25.1 HVAC system for the Main halls of the two laboratories

The two main open space hall in the building shall be equipped with two HVAC systems (one dedicated to each laboratory) capable of ensuring the following internal conditions:

- a) Indoor temperatures remain between +18°C and +28°C measured at +2m from the FFL with the outside temperatures vary between -5°C to +35°C;
- b) Temperatures fluctuation inside the building shall not exceed $\Delta=2^{\circ}\text{C}$;
- c) Relative humidity control: $H<80\%$.

The ventilation system shall be sized to have 20 people working at the same time in each laboratory open space hall with a flow of 60m³/hour/person considered.

No specific heat loads shall be considered for the main volume.

The HVAC shall be equipped with a heat exchanger system and allow to recycle the air at 90% (intake 10% of fresh air).

In addition to the above specifications, the HVAC systems for the building shall meet the following requirements:

- i. All system supports shall be removable and their spacing shall be designed to avoid any deformation of the supported equipment. The supports shall not be fixed directly to the cladding. The Contractor shall justify the fixing solution to ensure the absence of damage to the existing structure where the supports are to be fixed.
- ii. Any alterations to the cladding (service openings, sleeves, backfilling, etc.) shall be refurbished with the same as existing finishes in terms of the visual aspect, fire resistance and water-tightness levels.

- iii. The main elements of the system shall be appropriately tagged (with unalterable plates properly fixed).
- iv. All ducts supplying the air (cold and hot) and returning the air shall be appropriately insulated with minimum 50 mm of glass wool layer ($R_{\min}=1.4 \text{ m}^2\cdot(\text{K}/\text{w}) - \text{A2-s1-d0}$). The insulation shall be composed of an aluminium sheet (creating a vapour barrier), kraft sheet and reinforcing mat.
- v. The ducts shall be made of galvanized steel sheets (thickness in accordance to the applicable norms & standards) with a smooth inside surface finishing (no textile ducts allowed). The ducts shall be fully airtight and incombustible - A1.
- vi. The networks shall be designed to mitigate as much as possible the friction loss by avoiding the singular points.
- vii. Some technical holes to the access for measurements shall be forecasted in the upstream and downstream elements of all HVAC system.
- viii. The air blown or extracted shall pass through an anti-rain gird made of a galvanized steel.
- ix. The return gird shall be made of stainless steel / inox.
- x. The heat exchangers shall be undercurrent exchanger type made of aluminium. The additional pressure loss added to the network shall be compatible with the rooftop design. The energy efficiency shall be high to be able to heat the fresh air from -5°C to $+19^{\circ}\text{C}$ by simple heat exchange with the return air at $+20^{\circ}\text{C}$ with the designed air flow. The exchanger shall be equipped with several regulation dampers on the fresh air, the rejected air and the free cooling.

6.25.2 **Offices, cafeterias, meeting rooms, control rooms, closed Lab rooms and storage rooms**

The systems shall be air-conditioning heat pump inverter type (preferred multi splits).

The interior units shall be wall-mounted type or ceiling-mounted type with one remote control or control panel for independent heating and air-conditioning in each room.

Each local unit shall also be connected to a central control panel, located in the LV room allowing a rapid regulation setting of the whole building.

The installations shall be designed for the following target temperatures, for outside temperature of $+35^{\circ}\text{C}$ in summer and -10°C out in winter and a relative humidity of 80% :

- In the offices, the cafeteria, the storage, the toilets, the control rooms, the closed lab rooms and the meeting rooms: winter, $21\pm 2^{\circ}\text{C}$, summer, $26\pm 2^{\circ}\text{C}$;

6.25.3 **HVAC system for the electrical rooms in the annex building**

The electrical room shall be served by a dedicated HVAC system sized to ensure the temperatures in the room remain between $+15^{\circ}\text{C}$ and $+35^{\circ}\text{C}$ with the outside temperatures vary from -5°C to $+35^{\circ}\text{C}$. The heat loads of the dry transformers shall be considered in the design.

The ventilation system shall be designed following the standard NF C13-200. The ventilation shall be forced by a mechanical extraction located on the top of the room.

The natural fresh air entrance shall be implemented in the low part of the room with a sufficient inlet section to allow appropriate fresh air flow.

6.25.4 HVAC system for the Utilities rooms

The interior units shall be wall-mounted type or ceiling-mounted type with one remote control or control panel for independent heating and air-conditioning in each room.

Each local unit shall also be connected to a central control panel, located in the LV room allowing a rapid regulation setting of the whole building.

The installations shall be designed for the following target temperatures, for outside temperature of + 35°C in summer and - 10°C out in winter and a relative humidity of 80% .

For the utilities rooms, the Contractor shall design, supply, install, connect and perform the commissioning of the HVAC system with the following characteristics:

- Independent HVAC system;
- Reliable and continuous operation 24/7;
- Cooling power equal or higher than 5kw (heat loads generated by the equipment listed above to be considered if needed);
- Temperature set point is 20 °C +/-1°C all year round;
- COP equal or higher than 3.5;
- The noise level of the interior HVAC units shall not exceed 70dB;
- Suitable local control panel with a future implementation of a remote control and/or monitoring system (Modbus RTU interface);

6.25.5 HVAC system for the ECPS L1-11 RT Lab room

The interior units shall be wall-mounted type or ceiling-mounted type with one remote control or control panel for independent heating and air-conditioning in each room.

Each local unit shall also be connected to a central control panel, located in the LV room allowing a rapid regulation setting of the whole building.

The installations shall be designed for the following target temperatures, for outside temperature of + 35°C in summer and - 10°C out in winter and a relative humidity of 80% .

For this room, the Contractor shall design, supply, install, connect and perform the commissioning of the HVAC system with the following characteristics:

- Independent HVAC system;
- Reliable and continuous operation 24/7;
- Cooling power shall integrate the heat load that will be generated by the equipment in this room which is **16.5kW.**
- Temperature set point is 24 °C +/-1°C all year round;
- COP equal or higher than 3.5;
- The noise level of the interior HVAC units shall not exceed 70dB;
- Suitable local control panel with a future implementation of a remote control and/or monitoring system (Modbus RTU interface);

6.25.6 Ventilation

The Contractor shall design according to the French labour Code, supply and install simple flow ventilation systems ensuring optimum indoor air quality and energy savings in the control rooms, the meeting rooms, the toilets, the showers, the MFC-L1-04 lab room and the cafeteria/ break rooms, as follows:

- The boxes of air extraction shall be located in the false ceiling or at the ground floor outside in a dedicated area;
- The ducts shall not be apparent in the building and shall be thermal insulated;
- The PVC grids of air intake and exhaust installed in the false ceilings;
- The air intake shall be of an adjustable humidity control type;
- Control by programming clock;
- The Ventilation units shall be supervised by the BMS system of the building
- The air flows to be taken into account are those of the relevant standard/code (refer to table below):

	Meeting/ Control room	Isolated Toilet	Grouped Toilets
Ventilation flow	30m ³ /h/pers	30m ³ /h/room	30 + 15 N m ³ /h

N: number of sanitary units (toilet) in the room.

An emergency stop button shall be installed in the entrance hall to stop all mechanical ventilations in order to allow the confinement of the building.

6.26 Plumbing

6.26.1 Water distribution inside the building

The Contractor has to design and installed the following water distribution inside the building:

- For the potable cold and hot potable water, an accessible distribution clarinet per room shall be installed with a valve per circuit and its identification,
- The distribution networks shall be in multicouche with adapted welded junction and supports according to the manufacturers;
- The design and the diameter of the pipes shall be defined in accordance to the standards and the use;
- For toilets areas, all the taps shall be time-controlled, push button of the Presto type or similar and equipped with water-saving aerators;
- All maintenance plumbing devices (water heater, sanitary drainage collector and inspection hatches, isolation valves...) shall be regrouped in technical ducts hidden (Non-visible piping) but easily accessible (lock integrated in the keys organization chart) for maintenance purposes;
- The potable water circuits shall supply the following points:
 - All the Sinks of the building,
 - All the showers,
 - Laboratory sinks of room MFC-L1-04,
 - All the toilets,

6.26.2 **Water evacuation inside the building**

The Contractor has to design and installed the following water evacuation inside the building.

- The sanitary network shall collect the sewage water coming from the all the toilets rooms, shower rooms, laboratory rooms, utilities rooms, service rooms and cafeteria/break rooms. The Contractor has to design and installed the internal associated gravity network to collect this water. The design and the diameter shall be defined in accordance to the standards and the use;
- The networks shall be designed to avoid any bad smell inside the building. Primary and secondary blowhole network shall be installed with material conform to the DTU.
- The networks shall be in PVC with adapted glued junction and supports according to the manufacturers;
- All maintenance sanitary pipes shall be regrouped in technical ducts hidden (Non-visible piping) but easily accessible (lock (if necessary) integrated in the keys organization chart) for maintenance purposes;

6.26.3 **Production of hot potable water**

The Contractor shall enable the production of warm water for all the toilets, shower rooms, service rooms and cafeterias, by electric warm water boilers, including:

- Supply, installation and electrical connection of boilers, capacity depending on the distribution in the building to be designed by the contractor;
- The temperature of warm water in the tanks shall be at least 55°C in order to avoid any risk of development of legionella.

6.26.4 **Sanitary equipment**

The Contractor shall supply and install all the equipment and connections to the evacuation and feeder systems (dual-flush toilets supplied by the raw water network and the rest of the equipment by the potable water network) including:

- Dual-flush toilets with white glazed ceramic bowls supplied by the raw water network;
- All equipment for disabled persons;
- White glazed ceramic lavatories with mirrors above;
- Cold/warm water mechanic mixer taps and slop sink for maintenance in all services rooms;
- Cold/warm water thermostatic mixer taps for hand washers sinks in all toilets and shower rooms;
- For the shower, the cabin shall be waterproof with a minimum receiver size of 90x90cm. The cabins shall be closed by single leaf transparent security glass door. The taps shall be thermostatic mixer type. Each single shower room shall be equipped with: one towel handle, soap handle, four patters fixed on the door.
- Kitchenette set in each cafeteria, equipped with single sink & plate rack, cold/warm water thermostatic mixer taps, microwave oven and built-in refrigerator;
- In each cafeteria, pending connection points from the potable water network for the following equipment that IO will install :
 - 1 vending machine (500W / Ø) (dim : W0.8xD0.9xH1.8m)
 - 1 coffee machine (2000W / valve 3/8 gaz) (dim : W0.6xD0.9xH1.8m)
 - 1 water fountain (200W / valve 3/8 gaz) (dim : W0.4xD0.4xH1 m)

- For the laboratory room MFC-L1-04 shall be equipped with a self-supporting Inox industrial sink of a minimum size of: 1.2m long, 0.6m width, working height of 0.85m, sink depth: 0.3m. This laboratory sink shall be full equipped with a mixing valve for potable hot/cold water supply, and, its associated evacuation panoply. The wall against the sink shall be protected from water projection,
- Accessories (mirrors, flaps, padder, electric hand dryers, ...);
- Autonomous water heater located in hidden but easily accessible areas for maintenance purposes;
- Centralized mechanical ventilation;
- Connecting the equipment to the supply points with isolation valve in hidden but easily accessible areas for maintenance purposes.

6.27 Low Current networks

The building shall be connected to the Low Current (LC) network and, equipped as described in here. For the external / underground LC network connections and routing refer to Section 6.6 .

The LC network shall be connected and distributed for provision of the following systems in the building:

- IT network,
- Wi-Fi antenna,
- Fire Detection System (FDS),
- Building Monitoring System (BMS),
- CODAC system,
- Public Address system (PAS),
- Access Control system (ACS),
- Security Camera system (in option).

6.27.1 IT network

The Contractor shall carry out the following Works:

- Design of the installation which will be validated by IO IT and IO BFO,
- Pull 2x single mode fibers 48 threads from the existing external IT cabinet in B36 to the MFC substation by using designed ducts and galleries (routing provided in IO design phase) – approx. length of each fiber 200ml,
- Install a main IT rack inside the ECPS-L1-08 Utility room. For this purpose, the “server type “ rack(s) (19” GIGARACK Serie 250 42U type A 2000x800x1000 or equivalent) of the low current room of each floor shall be sized with a spare capacity of 30% to house the following components,
- Install an IT switch (new patch panel) into a new IT rack (switch will be provided by IO IT services). The manageable IT switch(es), Cisco 2960-X type, equipped with SFP and PoE stackable modules including links if several switches are needed in the LC room. These manageable IT switches will be provided and install by the ITER Organization;
- Connection of the fibers using LC connectors in each substation existing IT patch panel and in new patch panel. All the connections between IT equipment are in the scope of the Contractor,

- Reflectometry tests shall be provided at the end.
- The LC network shall be connected and distributed for provision of the following systems: PAS, FDS, BMS, IT networks , CODAC, ACS and Wi-Fi antenna – (security camera in option). All these systems shall be installed in the same IT cabinet, and it will include 30% spare space for future development if necessary.
- The Contractor shall design, supply and install a grid inverter to assist all the LC systems in case of electrical switch off. It should be an UPS with a minimum capacity of 3kVA (APC SMX750I type) in the rack feeding important system as: BMS (WAGO), PAS (TSIP), IT switch with an autonomy of 2h mini at 300W (x1 SMX48RMBP2U).
- All plugs and cables shall be numbered in the substation and on the patch panels on the existing IT patch panel for identification. All cable shall be properly sorted using specific rack in the cubicle.

The Contractor shall supply, install and connect the totality of the installations for data processing and the telephone with RJ45 plugs category 6, for the following requirements:

Location	Number of RJ45 plugs	Other IT link
Offices	2 / desk	Ø
Storage room	1/entrance (from the CSD LC cabinet)	Ø
Meeting room	1(chairman /VC monitor) 3 (chairman) 1 in ceiling for beamer 2 in ceiling for VC	(chairman /VC monitor) 1 x HDMI 1x RJ45
Printer areas	2	Ø
Cafeterias/ Break room	2	Ø
Corridors	1 / staircase access (wall mounted) 1 / in the middle of each corridor (Emergency phones) 4/ floor in ceiling for wireless access points	Ø
Utilities room	2	Ø
Control room	2 / desk	Ø
Building Main Entrances (2 in total)	1 / access	Ø
ECPS-L1-09 Store room	4	Ø
ECPS-L1-11 RT Lab room	6	Ø
MFC L1-04 Oil and Chemical lab Room	4	Ø
L2 MFC Lab room & L2 ECPS dorm room	2	Ø
ECPS-L2-06 Power electronics Lab room	5	Ø

6.27.2 **Wi-Fi networks**

The Contractor shall implement a wireless network distribution in the building by installing a Wi-Fi system with necessary cables as follows:

- 4 x Cat.6 RJ Copper cables from IT Switch in utility room to Wi-Fi bornes locations inside the utilities room of the laboratory – exact location to be defined during the design phase,
- 2 x Wi-Fi access point, located inside each laboratory (4 in total), to be supplied by IO-IT and installed and fixed by the Contractor inside laboratory (The Contractor shall perform cable connection between access points and antennas and fixation);
- 2 x Wi-Fi antennas (1x outdoor antenna and 1x indoor antenna) by laboratory (4 in total), to be supplied by IO-IT and installed, fixed and connected to the access point by the Contractor, (The Contractor shall perform partition opening, cable connection and fixation).

6.27.3 **Fire Detection System**

The Contractor shall involve and integrate a SSI design mission during the design phase to propose a fire detection system (FDS) for building (the two laboratories and the annex). It shall be efficiently adapted to the building's configuration and its particular points of concern.

Based on the results of the above detailed study, the Contractor shall design, supply and install the FDS addressing the below listed requirements:

- i. Add a fire Detection Panel in the ECPS L1-08 utilities room,
- ii. Add a new fire detection station (ECS forte DEF) in the cabinet connected to VisioDEF system via Moxa using available connection on IT switch in the ECPS L1-08 utilities room ,
- iii. Connect this new FDS station to the FDS network inside the building (FDS loop of interconnection between sensors and triggers),
- iv. Manually triggered alarm points shall be located at each pedestrian door of the building (in the laboratories and the annex building
- v. The smoke sensors shall be installed:
 - a. inside the electrical room in the annex building (at least one detector above the transformer),
 - b. inside the utility rooms (at least one above main switchboard),
 - c. inside the control rooms,
 - d. inside the: MFC-I1-04 lab, ECPS L1-09 store, ECPS-L1-11 RT Lab, ECPS-L2-06 Power electronics lab,
 - e. at the air outlet points of the HVAC systems,
 - f. in the two main volumes of the laboratories including below the mezzanine (open spaces).
- vi. All devices shall be connected to the IO Fire Detection System (DEF system).
- vii. The FDS shall be connected to the existing ITER site network.
- viii. A sound alarm has to be installed in the two main open spaces of the laboratories to notify the personnel / workers about any need for the evacuation.

- ix. All devices shall be DEF brand and shall be interconnected physically by using appropriate wire (CR1-C1 9/10e) to perform appropriate FDS loops inside the building.
- x. Perform necessary test and commissioning to proof to the IO that the system is working.

Note: The Contractor shall provide all the technical documents and drawings concerned by this network.

6.27.4 **Building Monitoring System (BMS)**

The Contractor shall implement a monitoring system composed of the following elements meeting the following requirements listed below:

- i. Two (2) new independent PLCs, in a dedicated electrical box, near the main electrical switchboard ECPS L1-08 utilities room of the building, by installing:
 - a) PLC-input power: PLC Power supply made by independent breakers, with 2x Micro-UPS DC – SDC-M 24V / 55 W DIN2 PACK 3G), each one to power one PLC independently;
 - b) PLC input connection: 2 x Network Cat.6 cables, one from each PLC to IT Switch of the building,
- ii. 2 x temperature/Hygrometry Modbus sensors to monitor the indoor environment of each main open space of laboratories (4 in total) (type BLET Song1-XTRS485 with cover, min 0.1deg precision). One additional sensor shall be forecasted to monitor the Utilities room, same type,
- iii. 3 x network Cat.6 cables, one from each sensor to above listed PLC;
- iv. Modbus protocol to monitor all HVAC units installed (including ventilation) in the building by the Contractor (for all points of monitoring available on the BMS are required, in particular Fault synthesis);
- v. Install the sensors to monitor all electrical breakers of the main LV switchboards (independent SD/OF information), the electrical consumption from a multifunction power meter (e.g. DIRIS),
- vi. Monitoring of the sanitary drainage buried tank outside of the building by installing for each tank a sensor to monitor the filling level connected to the BMS system above and sending two alarms: filling at 80% and filling 100%,
- vii. Monitoring of systems status requested in option for each option exercised,
- viii. For each trucks doors, monitoring the following points:
 - Door opened,
 - Door closed,
 - Default on the door,
 - Override the control (open/close) of the doors.
- ix. Monitoring of the cranes to report default,
- x. Monitor the positions of the smokes exhaust hatches,
- xi. The external lights shall be piloted from the BMS.

All necessary monitoring system shall be available on the existing BMS-PCVue system.

The Contractor shall be responsible for the BMS software update, hardware and cabling implementation and installation.

6.27.5 Public Address System (PAS)

The entire building shall be equipped with a Public Address (PA) system. The PA speakers shall be implemented to allow the broadcast of site PA system message inside the building.

The following specifications shall be followed:

- i. TSIP device shall be installed in an IT rack and connected to power and IT port plug in ECPS L1-08 utilities room;
- ii. For the PA system indoor coverage (inside the laboratory):

Inside each laboratory main volume, install 2x2 compression chambers, power 30W each, as follows:

- 2 speakers in the middle of the North Wall, fixed together, as high as possible on the wall;
- 2 speakers in the middle of the South Wall, fixed together, as high as possible on the wall.

The PA lines, running indoor shall be appropriately protected and secured as per EN 54-16 requirements (e.g. using the indoor cable).

The noise level of the PA system shall be adapted regarding the expected ambient noise.

The Contractor shall be responsible for programming the existing Vox@net system to incorporate the above PA installation and commission the system (including the well function check). It includes as well Configuration of the IDA8 matrix, local calls, outside calls, monitoring of the lines and amplifiers.

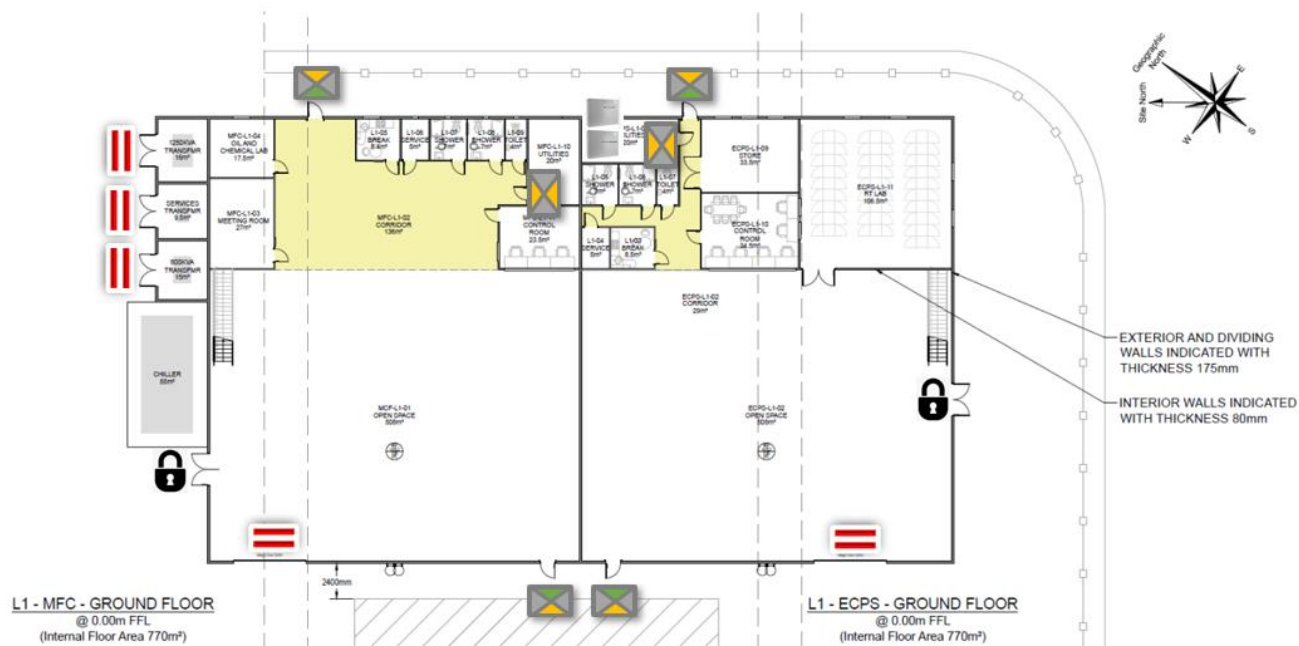
Note: The installation, programming and commissioning activities will require an access to some existing buildings on the Iter Site, e.g. B03 where the PA server is situated. These activities will require additional administrative tasks to be carried out by the Contractor prior to access being granted by the ITER Organization to B03 (e.g. Prevention Plan, PTW, LOTO, PRE etc. – refer to ITER templates).

6.27.6 Access control system

The Contractor shall design and implement an access control system in the building, as follows:

- i. Furniture of a new dedicated access cubicle Wall mounted box ACM5/6 self-protected against opening with: Two (2) PSXU-TS and with indicator lights and One (1) PSX680LEDFC in the ECPS L1-08 utilities room;
- ii. This box shall be equipped with:
 - a) Four (4) AP7803 AEOS Blue Door Controller – *Nedap* + height (8) licenses for access and two (2) SAM-Cards with licence transparent mode + Users licenses;
 - b) Two (2) AP7831 AEOS Blue Door Controller – *Nedap* + 20 intrusion licenses;
- iii. Furniture of a new dedicated power supply box ACM2-1210 self-protected against opening in the ground floor low current room;
- iv. This power supply box shall be equipped with:
 - a) Two (2) PSXU-TS

- b) Two (2) PSXU-ARM
 - c) Two (2) PDB801
 - d) One (1) PSXM-1210 and/or One (1) PSXM-2410
 - e) Two (2) FX1218 or 1x FX1218+2x FX1212
- v. Four (4) building main accesses (two (2) double leafs doors and two (2) one leaf doors) shall be equipped with complete access control system, as follow:
 - a) One (1) outdoor badge reader *NEDAP*: CVX190;
 - b) One (1) electromagnetic lock (type: SewosyEF550 CTC + ZL);
 - c) One (1) push button (type: BOPOIS);
 - d) One (1) BBG (type: BBMV2C);
 - e) Two (2) opening detectors (type: IM1640PAG) + junction box BRA7X2VVS (only one of opening sensor for the one leaf door).
- vi. Two (2) internal doors (the two utilities rooms) shall be equipped with complete access control system, as follows:
 - a) Two (2) indoor badge reader *NEDAP*: MD80;
 - b) One (1) electromagnetic lock (type: SewosyEF550 CTC + ZL);
 - c) Two (2) BBG (type: BBMV2C);
 - d) One (1) opening detector (type: IM1640PAG).
- vii. Three (3) doors of the annex building shall be equipped with the opening detectors (type: IM1640PAG) + junction box BRA3X2VVS.
- viii. Two (2) emergency doors shall be equipped with:
 - a) One (1) BBG (type: BBMV2C);
 - b) One (1) electromagnetic lock (type: SewosyEF550 CTC + ZL);
 - c) the opening detectors (type: IM1640PAG) + junction box BRA3X2VVS.
- ix. In addition, the two (2) motorized doors shall be equipped with anti intrusion contacts;
- x. For double leaf doors equipped with an intrusion sensor, each leaf shall be equipped with an opening sensor;
- xi. Design, procurement and installation of the necessary *SYTI* wires to interconnect all access control system;
- xii. All junction boxes shall be auto protected (in series with the door opening sensor auto protection);
- xiii. Furniture of 2000 badges licences;
- xiv. Test and commissioning of the global system with the support of the IO;
- xv. Update of all the documentations related to this system.



LEGEND






-  Security Door, badge-in-out (with break-glass, electromagnetic lock-door sensors)
-  Security Door, badge-in free exit (with break-glass, electromagnetic lock-door sensors, exit push button)
-  Acs Cubicle and power supplies
-  Opening sensor, electromagnetic lock, break-glass
-  Opening sensor

Figure 7 - Access control system in the building.

6.28 Spare parts

The Contractor shall ensure the availability of operating spares and consumables for a minimum of 3 years after taking over of the building to the IO. The Contractor shall provide a prevision of spare parts list (product reference / manufacturer number / equipment allocation) for the main equipment to be maintained as: crane / motorized doors.

In addition, the Contractor has to provide the Equipment Information table completed.

6.29 Warranty

The warranty of the structure & fabric of the laboratory and the anchoring & sealing shall be for 5 years and the warranty of the other mechanical and electrical components shall be for 2 years from the date of Taking Over of the laboratory building to the IO.

6.30 Road works – final arrangement

At end of the works, the Contractor shall arrange the platform around the new building, approx.. 1,000m², as follow :

- i. Platform arrangement shall be done around the building with a range of 5m strip except on the east side closed by heavy security fences. In addition, from the two truck doors to the asphalted road of the west, a strip/ delivery track shall be performed of 7m wide shall be created.
- ii. The external surface slopes shall have a minimum gradient of >2% to ensure a good rain water evacuation and to avoid creation of any stagnant water / puddles. The slopes will be always directed away from the building façade.
- iii. The connection with the platform/roads and the surrounding areas shall be made without any level differences / steps.
- iv. The platform structures shall be composed of:
 - a) A geotextile of 400g/m²,
 - b) Subgrade of 20cm of technical backfilling (GNT), type 0/40,
 - c) Top layer of 10cm of technical backfilling (GNT), type 0/20,
- v. The acceptance criteria for the platform arrangement is a PF2 with $E_{v2} > 50 \text{ MPa}$ $E_{v2}/E_{v1} < 2$. Bearing tests plates shall be done on site, rate: one test

6.31 Supply and installation of office furniture of the building

The Contractor shall supply and install the furniture items of entire in accordance to the described below and the floor plan given in appendix [1].

6.31.1 Codes and Standards

All furniture and associated equipment must conform to the minimum requirements as prescribed in the relevant European and French design codes and standards (or similarly approved international design codes and standards) for such items, including but not limited to:

- ISO 14001 – Environmental Management Systems
- EN 120 – Wood-based Panels. Determination of formaldehyde content. Extraction method called the perforator method
- EN 438 – High-Pressure Decorative Laminates (HPL), Parts 1 – 4
- EN 527 – Office Furniture – Work tables and desks, Parts 1 – 3
- EN 717 – Wood-based Panels. Determination of formaldehyde release
- EN 1335 – Office Furniture – Office work chair, Parts 1 – 3
- EN 14073 – Office Furniture – Storage furniture, Parts 1 – 3
- EN 15372 – Furniture – Strength, durability and safety – Requirements non-domestic tables
- EN 15373 – Furniture – Strength, durability and safety – Requirements non-domestic seating

It is also preferable for environmentally-friendly products to be used where applicable, with certification provided by international organisations, for example, the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC).

6.31.2 Definitions

The following terminology is applied in this section, in accordance with European Standards CEN/TR 14699 and EN 438-1:

- *High-pressure decorative laminate(s) (HPL)*: sheet(s) consisting of layers of cellulosic fibrous material (normally paper) impregnated with thermosetting resins and bonded together by a high pressure process;
- *Levelling device*: Device for making minor alterations to the height of a supporting element in order to achieve stable contact between the furniture and the floor;
- *Office desk*: Unit predominantly designed for office tasks to be undertaken in a seated position;
- *Office work chair*: Piece of seating furniture for one person with a back rest and armrests;
- *Meeting chair*: Piece of seating furniture for one person with a back rest and without armrests;
- *Workstation*: Assembly comprising display screen equipment, which may be provided with a keyboard or input device and/or software determining the operator/machine interface, optional accessories, peripherals including telephone, modem, printer, document holder, work chair and work desk or work surface, and the immediate work environment;
- *Work surface*: Upper surface of a work top;
- *Work top*: Part of a piece of furniture which provides for a work surface.

6.31.3 Future purchasing

All schemes that are presented to IO, and as such the final chosen scheme, shall have a manufacturer's catalogue life of at least 10 years minimum so that any future purchasing by IO, as necessary, will be of the same type as the furniture delivered in the initial installation phase.

6.31.4 Guarantee

All selected furniture items/equipment shall come with a sufficient guarantee concerning performance, durability etc. that is suitable for the environment in which they are to be used.

6.31.5 Operation and maintenance manuals

For each furniture item, operation and maintenance manuals shall be provided.

6.31.6 Scope of Work

The Contractor shall supply and install the furniture similar or equivalent to the ones equipping the existing buildings. The services shall include:

- The provision of furniture installation drawings showing the exact location of the furniture in the different rooms (to be agreed at design stage with IO);
- Transport and the delivery to the site, unpacking and the assembly of furniture;
- Intermediate storage of furniture if required to meet the delivery schedule;
- The provision of adequate protection of the rooms during delivery and installation activities, where necessary. This concerns in particular floors, walls, ceilings, stairs, doors and windows;
- The removal and disposal of packing and protection materials.

6.31.7 **Office / Control rooms furniture**

a) Office desks

Office desks shall have the following minimum features:

- Conformance with EN 527-1/2/3, or similar internationally approved standards;
- Adjustable height of office desks, in an approximate range of 650 mm to 850 mm;
- White legs;
- Work tops:
 - Minimum plan dimensions: 1600 mm (L) x 800 mm (D) ;
 - A minimum thickness of 20 mm;
 - A minimum panel density of 650 kg/m³;
 - Conformance with EN 120 and EN 717, or similar internationally approved standards, with regards to formaldehyde content and release;
 - Good level of abrasion and scratch resistance in accordance with EN 438, or similar internationally approved standards;
 - Birch HPL work surface.
- Levelling devices;
- Cable management features;
- Modular capability to connect adjoining pieces;
- Modesty panels.

Additional side desks to constitute an L shape are required, with the following minimum features:

- Connectable to the main office desk;
- Minimum plan dimensions: 800 mm (L) x 600 mm (D).

b) Office work chairs

Office work chairs (1 per desk) shall have the following minimum features:

- Grey fabric finishing of the seat and back rest;
- Arm rests adjustable in height;
- Dimensions in conformance with EN 1335-1 – Office work chair Type A;
- Safety requirements, adjusting devices, information for use etc. in conformance with EN 1335-2;
- Soft wheel casters for hard surfaces such as linoleum;
- Marking of the chair with the following information:
 - Name or label of manufacturer;
 - Type designation;
 - Year of construction.

The chairs shall be tested in accordance with EN 1335-3 or similar internationally recognised standards.

c) Drawer units

Drawer units (1 per desk) shall have the following minimum features:

- Under desk : ~600 mm (H);
- Rectangular shape, plan dimensions: 600 mm (L) x 400 mm (W);
- Monochrome white laminate finishing;
- Wheeled units;

- Equipped with removable security locking features;
- 3 drawers per unit.

d) Cupboards

Storage cupboards shall have the following minimum features:

- Conformance with EN 14073, or similar internationally approved standards;
- Approximate dimensions :
 - 2000 mm (H) x 1200 mm (W) x 430 mm (D) for full-height cupboards (1 per 2 desks);
 - 1000 mm (H) x 1200 mm (W) x 430 mm (D) for half-height cupboards (1 to be installed in the offices with an odd number of persons).
- Shutter style doors (i.e. non-outwardly opening doors);
- Moveable shelving:
 - Minimum 5 shelves for full-height cupboards;
 - Minimum 3 shelves for half-height cupboards.
- Levelling devices;
- Equipped with removable security locking features;
- Monochrome white finishing.

e) Whiteboards

Whiteboards (1 per office and 1 in the meeting rooms) shall have the following minimum features:

- Approximate dimensions: 900 mm (H) x 1200 mm (W);
- Magnetic surfaces;
- Supports for pens;

Whiteboards are to be delivered by the Contractor but not mounted on the walls.

f) Coat hooks

Coat hooks (1 per desk in offices, 4 in meeting rooms, 1 per toilet) shall be wall mounted and provide the possibility of hanging at least 2 coats.

They are to be delivered by the Contractor but not mounted on the walls.

6.31.8 Meeting room furniture

a) Modular meeting room tables

Modular meeting tables + 1 table in each printer area having the following minimum features:

- Dark grey desk top;
- Rectangular shape, plan dimensions: 1400 mm (L) x 700 mm (W);
- Modularity such that tables can be connected to one another to form an appropriate layout;
- Participant's tables equipped with connection box including 2 No. 220V power sockets to allow use of computers during meeting sessions;
- Chairman's table equipped with a connection box including:
 - 3 No. 220V power sockets
 - 3 No. RJ45 network sockets
 - 1 No. HDMI connection point (point to point cable mentioned in Appendix A25)
 - 1 No. RJ45 connection point (point to point cable mentioned in Appendix A25)
 - 3.5mm Jack connection point (point to point cable mentioned in Appendix A25)

b) Meeting chairs

Meeting chairs having the following minimum features:

- Padded seat and backrest;
- Black fabric finishing;
- Stackable.

6.31.9 Cafeteria furniture

All cafeteria furniture shall be designed for heavy duty use and easy to clean.

c) Poser tables

The poser tables (1 per cafeteria) allow a small number of people to congregate within the cafeteria spaces. These tables shall have the following minimum features:

- Conformance with EN 15372, or similar internationally approved standards;
- Birch HPL circular table top;
- White foot;
- Approximate dimensions: 1000 mm (H) x 600 mm (ø).

d) Bar stools

2 bar stools per poser table

The minimum requirements are given below:

- Conformance with EN 15373, or similar internationally approved Standards;
- White legs;
- Approximate seat height: 700 mm.

6.32 Option 1 – Security camera control system

The Contractor shall design and implement a security camera control system in the building, as follows:

- i. Security cameras shall control the main building accesses and surrounding, as follow:
 - a. One (1) AXIS Q3536-LVE camera to control the MFS Lab main entrance;
 - b. One (1) AXIS Q3536-LVE camera to control ECPS lab main entrance;
 - c. Three (3) AXIS P1465-LE camera installed outside on the south west corner of the building to control the external surrounding areas;
 - d. Three (3) AXIS P1465-LE camera installed outside on the north west corner of the building to control the external surrounding areas;
 - e. Three (3) AXIS P1465-LE camera installed inside on the south middle wall of the MFC laboratory to control the main open space and top of mezzanine;
 - f. Three (3) AXIS P1465-LE camera installed inside on the north middle wall of the ECPS laboratory to control the main open space and top of mezzanine;
- ii. Design, procurement and installation of the necessary wires to interconnect all security camera control system. Cameras shall be connect in the LC room;
- iii. Installation and connections of all the cameras with the necessary supports and memory cards,
- iv. Setting and configuration of all the cameras with the IO support,
- v. Furniture of the necessary Licences XProtect Corporate Device License (DL);
- vi. Furniture of the Contrat Cares Plus 3 years;
- vii. Test and commissioning of the global system with the support of the IO;
- viii. Provide of all the documentations related to this system.

7 Site constraints

7.1 Site data

7.1.1 Geotechnical data

The soil characteristics of the Site can be found in the reference documentations – refer to [27].

The Contractor shall perform a geotechnical mission during the design phase at its expense to justify its design hypothesis and to ensure the stability of the building's structure with the overhead crane.

The geotechnical follow-up verifications and controls shall be performed during the Works execution by the Contractor.

A complete mission G3 is expected to be performed to support the design in its phases accordingly.

7.1.2 Existing buried networks

The existing buried networks in the Site of the Works are illustrated in [1], [11], [29] and [31].

The Contractor shall ensure that the existing buried networks are not altered or damaged by the Works.

As described in Section 6.6, prior to the commencement of any Works in the vicinity of the existing buried networks, the Contractor shall first properly identify the existing networks located in the area using the drawings, then, after the Site investigation(s) and detection campaign, the Contractor shall mark on site all the existing networks positions (X, Y, Z) prior to start any excavation.

7.1.3 Forest and protected trees

Some storage areas are located in the vicinity of a forest. Smoking is strictly prohibited in this area.

During dry periods, the Contractor shall implement measures to limit the spreading of dust as well as reduce the fire risk.

The working area is not subject to the Prefectural Order regarding access to the forest. In case of works within area subject to the order, the works shall respect the access conditions associated to the daily fire risk level communicated during the summer months by the Prefecture, every evening for the next day, as follows:

- **Green**: works allowed with caution during all the day;
- **Yellow**: works allowed from 05:30hrs to 13:00hrs only with particular cautions;
- **Orange**: access allowed but works forbidden;
- **Red**: access forbidden – fire risk too high.

The Contractor shall take into account this risk and adapt its working hours and/or methodology accordingly, as necessary.

7.2 Interfaces and Site constraints

The Contractor will face the interfaces with other contractors and users during the Works on the ITER site.

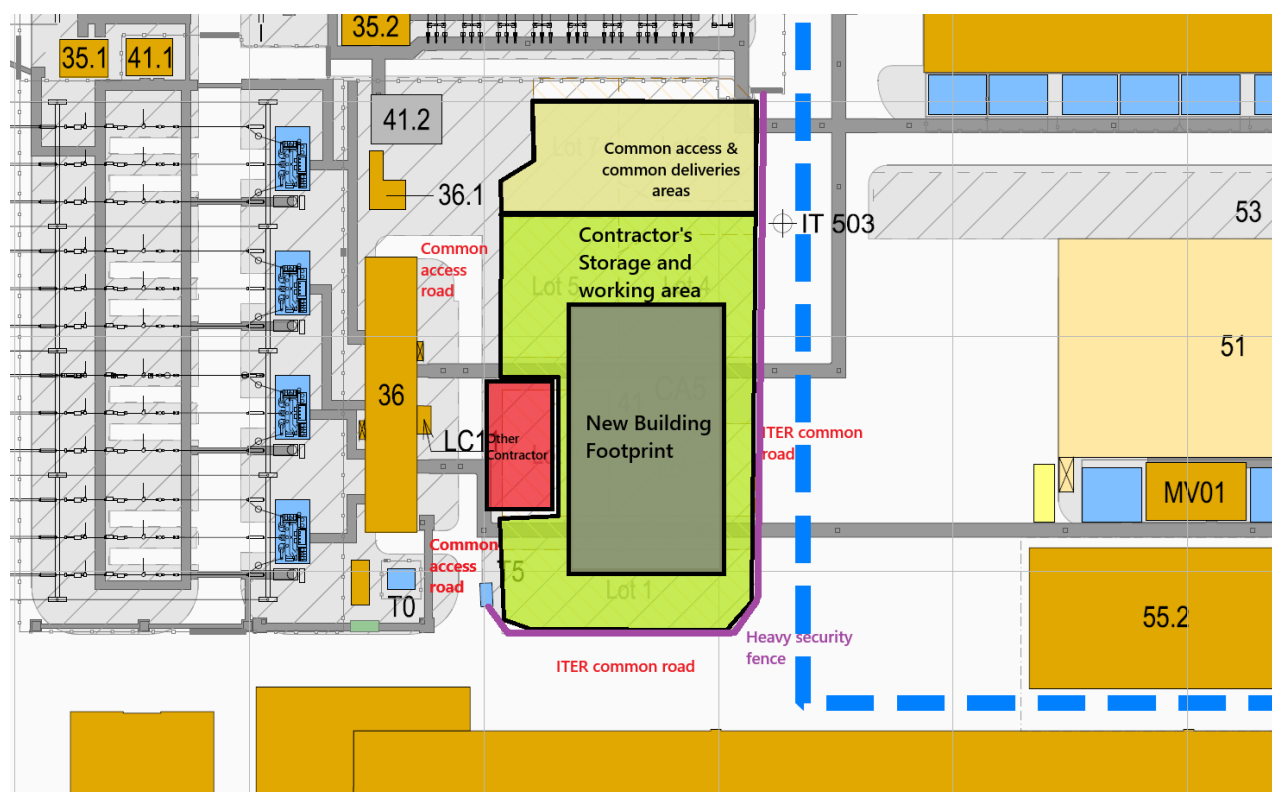


Figure 8 - Main interfaces to be considered in the Site.

The Site of the project is surrounded by different areas with high constraints – refer to *Figures 8* above:

- i. On the west side, there is the main access road to the area and some other contractor activity. No impact is allowed on it or its accesses.
- ii. On the North side, it is the main working and storage area allocated to the Contractor to erect the new building.
- iii. The South side and the East side of the Site are surrounded by an heavy security fences (where damaged are not allowed) which is delimitating the end of the CA5 area and the beginning of common ITER asphalted roads. These roads are used by several contractors on site, so, no impact is allowed there.

Due to the constraints listed above, the Contractor shall forecast as much as possible to erect building within the Site with a methodology minimizing the impacts on surrounding areas. All these points shall be considered in the design proposal of the Contractor. Particular conditions could be requested, such as working outside of normal working hours or during the weekends. The additional cost shall be borne by the Contractor.

All the temporary means to mitigate the impacts on the other entities shall be forecasted by the Contractor.

The Contractor is expected to have a very proactive approach to ease the coordination of this busy

area crossing by lot of pedestrian and personal cars. A particular attention is necessary on the signalization and the closure of the worksite.

Any impact on a surrounding area or the existing IO's assets shall be notified to the IO and Health & Safety Coordinator as soon as possible.

7.3 Installation on the Site

7.3.1 Facilities provided by the IO

a) *The areas and access*

The below listed areas and accesses will be provided by the IO to the Contractor during the Works:

- I. Access to the ITER construction platform and the Site will be possible by entering the ITER site via the entrance B from the North and /or the entrance D from the East;
- II. **The Site is formed of the planned new building footprint and the working/ storage area around it** - refer to the purple area in *Figure 8* above → approximate surface is 4,000 m² (including the footprint of the new building to be built).
- III. A pedestrian path is available in between the CA2 and the CA5, 5min walk.

Note: The IO shall not provide waste and wastewater connections to the Site.

The Site and all working / storage areas shall be closed/fenced-off by the fences (type HERAS / 2m high panels) properly secured and maintained to resist the wind forces by the Contractor. If necessary, for specific activities (e.g. excavation works), the fences and their protection could be requested to be reinforced by the HSPC and the IO.

b) *Electricity provision*

The Contractor will be authorised to use the LV electrical network available on the ITER Site required for the Works at ITER's expense under condition that its consumption is considered as normal (no abusive use by the Contractor).

Electricity provision to the Site can available after an electrical connection to CA5 lots electrical cabinets. Any temporary electrical worksite installation (the connection works and provision of any required equipment) shall be foreseen in the scope of the Contractor.

However, in the case it is not feasible for the IO to provide the electrical power supply to the Site, the Contractor shall provide its own power generator at his own expense.

c) *Water provision*

Potable and Raw water required for the Works, Site facilities, tests and commissioning can be provided by the ITER Organization under condition that its consumption is considered as normal (no water networks leakage or abusive use by the Contractor). The connection points are located in CA5.

d) *ITER site welfare facilities*

The IO will provide to the Contractor an access to the existing welfare facilities on the ITER site. This includes the sanitary buildings with showers and toilets facilities (but no lockers) and the worksite canteen, all located at CA2 which is next to the worksite.

7.3.2 Facilities provided by the Contractor

The Contractor shall provide and manage the following facilities during the Works on the Site:

- i. Temporary fences (type HERAS / 2m high panels) to fence off the Site perimeters.
- ii. All temporary Works measures required for the delivery of the project including but not limited to:
 - a) any mitigation measures to reduce the impact of the Works on the Site surroundings (e.g. solid fence panels / tarpaulin to reduce a dust spread during the excavation activities / earthworks).
 - b) mobile traffic lights, road signs, GBA concrete block, etc., to ensure the safety and security of the Site and its surroundings.
- iii. Any temporary office / gathering facilities and portable chemical toilets for the Contractor's team on the Site.
- iv. Provision of the potable / drinkable water for the Contractor's team on the Site.

7.4 Applicable codes and standards

The Contractor shall comply with French design and construction standards or with European design and construction standards if such European standards exist and they are broadly equivalent to the French standards.

Unified Technical Documents (DTUs) and NF DTU specifications and calculation rules shall be considered as good industry practice and be applied to the Contract.

In case the Contractor's manufacturing process is not compliant with the DTU specifications, it shall provide a European (or French) technical assessment from EOTA (or CSTB) it complies to.

The Contractor shall comply with the machinery directive 2006/42/CE. The equipment, when required, shall be CE marked.

For all products and materials subject to quality standards, the Contractor must use only the products and materials that comply with said standards and be able to present evidence of compliance on the IO's request.

This building will be considered as temporary for the duration of the ITER Worksite. Therefore and according to R421-5 of the French Town Planning Code, it will be exempt from administrative formalities linked to this code (especially building permit).

In performing the contract the Contractor shall comply with applicable laws and standards, in particular those listed below.

Applicable French regulations:

- French decrees, laws and circulars;
- French Labour Code;
- The Construction Code ("Code de la construction") ;
- The Town and Planning Code ("Code de l'urbanisme");
- The Public Health Code ("Code de la santé publique") ;
- Regulations applicable to the building accessibility for disabled persons (applicable only to the ground floor);
- The Highway and Roads Code ("Code de la route");
- The Environmental Code ("Code de l'environnement");
- The decree of 8 January 1965, relating to the protection measures applicable to the organisations whose personnel carries out building work;
- The Water Law ("Loi sur l'eau");

- Prefectural orders 15-2007 and 45-2009;
- EU regulation 305/2011 concerning construction products and the CE requirements;
- And any other applicable laws.

7.5 Coordination of the Works

The Works shall be coordinated to ensure that they do affect or could be affected by other contractors' activities in the surroundings of the working area.

The relevant coordination meetings are held by IO CRO at the ITER site on a weekly basis, at which the Contractor shall be present.

7.6 Site facilities, cleaning and maintenance of the Site

The Contractor shall provide its own temporary Site facilities in conformity with the decree of January 8th, 1965, modified by the decree n°95608 of May 6th, 1995. The Contractor shall secure the Site with a perimeter fence.

The temporary Site facilities shall be located in the area close to the working area. In the case where the Contractor plans to connect its facilities to the existing networks, it shall seek the IO's agreement first. The Contractor shall be responsible for all necessary studies and works to implement these connections. The Contractor shall install relevant meters to ensure accurate monitoring of the consumptions.

The ITER Organization shall not provide waste and wastewater connections to the Site.

The Contractor shall be able to present the regulatory control reports of its premises without observations.

The roads and the areas around the Site footprint shall be maintained in a good condition and a constant state of cleanliness. The Contractor shall take all necessary measures (e.g. using a scrubber, scraper, sweeper, karcher...) to mitigate them appropriately clean. Should any said cleaning fail to be performed, it will be performed by a third party on the IO's request but at the expense of the Contractor.

The Contractor shall manage and be in charge of the necessary actions to ensure:

- I. An appropriate housekeeping on the Site and the areas provided to the Contractor by the IO for the Works duration including keeping clean and tidy the pavements and access paths leading to those areas used by the Contractor.
- II. Systematic removal, as and when they are produced, of any waste (e.g. improper cuttings, rubble, demolition products, packaging, etc.) from the Site and any working area, produced by itself or by its subcontractor(s).
- III. Performing of the Works in a clean manners.
- IV. Reinstatement of the Site after the Works completion.
- V. Removal of the Contractor's plant and equipment as well as dismantling of any temporary facilities implemented on the Site and in the areas provided to the Contractor by the IO.
- VI. Thorough general cleaning of the areas affected by the Works prior to the Taking-Over.

7.7 Protection of existing facilities

The Contractor shall ensure that existing facilities are not damaged by the Contractor while executing the Works and that suitable protection is put in place when working in the vicinity of the existing facilities.

In case of any damages to the existing facilities and/or third party assets caused by the Works execution, the Contractor shall reinstate them to their original condition (using the same materials as

much as possible) or cover the cost of the remedial works performed by others.

7.8 Security of the Site

The Contractor shall be responsible for the security of the Site and his belongings on the ITER site. The Contractor shall secure the Site with a perimeter fence.

The Contractor shall establish a point of contact within his organisation that shall be available 24/7 (including weekends, bank holidays and site closure days) to deal with any incidents concerning the Contractor's Site in a fast and effective manner. The Contractor shall provide the IO with the direct contact details of this person and/or an on-call duty telephone number.

7.9 Health and safety requirements

The Contractor shall respect the French Labour Code and apply the nine general safety principles listed in article L4121-2 thereof.

The Contractor shall also comply with the following documents and all proceedings arising therefrom:

- a) ITER Internal Regulations – refer to [6];
- b) General health and safety coordination plan (PGC SPS) Vol. 1 - IO&F4E – refer to [7];
- c) Housekeeping Instruction – refer to [14];
- d) Lifting Instruction – refer to [17];
- e) Work at Height Instruction – refer to [18];
- f) Chemical product management procedure – refer to [2];
- g) Alert procedure – refer to [8];
- h) Smoking policy – refer to [16].

The IO has placed a contract to provide the services of a Health and Safety Protection Coordinator (HSPC) during the ITER construction works. This contract has been established with APAVE under the authority of the IO Safety Department. The HSPC is mandatory for construction projects performed under the French Decree 94-1159. The HSPC defines the health & safety rules applicable on the ITER site, reviews the specific health and safety plans (PPSPS), perform the common inspections and co-ordinates activities from a health & safety perspective.

The Contractor's Work will be subject to regular inspections by the HSPC (APAVE) and/or the IO Safety Representative(s) to ensure compliance with the health & safety practices, including but not limited to working at heights, housekeeping and storage of hazardous materials.

In case the Works involve the use / and or storage of chemical products on the ITER Site, the Contractor shall comply with the chemical product management procedure [2] and fill in a designated chemical product acceptance form minimum ten (10) working days in advance of planned used/delivery on the Site.

The Contractor and its subcontractor(s) shall establish a specific health and safety plan (PPSPS) using the ITER template (in French) and transmit it to the HSPC at least 15 working days (8 working days for subcontractor) prior to the planned commencement of the Works on the Site.

The on-Site Works cannot start before a Common Inspection is carried out by the HSPC with the Contractor (and its subcontractor, when applicable), and the inspection report is issued by the HSPC, in accordance with R4532-13 and R4532-14 of the French Labour Code.

All Contractor and subcontractor' staff must follow a newcomer's safety training course within six (6) working days after their permanent access badges to the ITER site are issued. The newcomer's safety training course is held by HSPC (APAVE) on the ITER site at least once a week. Failure to

attend to this course within the required period of six (6) days by the Contractor's staff granted the permanent badges will result in an automatic blocking of their access to the ITER site until the course is taken.

This training course does not relieve the Contractor of his responsibilities with regards to the training of its own staff for their work stations and the general safety rules in accordance with articles L.4141-1 and following of French Labour Code.

The Contractor shall pay specific attention to the safe and respectful behaviour of its on-Site personnel. This includes supplying and wearing of appropriate personal protective equipment (PPE). The IO draws the Contractor's attention to the fact that sanctions may be applied to the Contractor's staff contravening the safety rules.

All the required equipment to create a safe environment for the Works shall be provided by the Contractor.

7.10 Nuclear Safety - Environmental protection

ITER is a basic nuclear facility (in French: "*Installation Nucléaire de Base*") identified in France by the number INB-174 and subject to the French Order of 7th February 2012, relating to the general technical regulations applicable to basic nuclear facilities.

In the performance of the Contract, it is anticipated that the Contractor will perform or participate in the following so-called: "Protection-Important Activities" (PIA), as defined by the above mentioned Order:

- Activities for the protection of the environment;
- Waste management.

For these activities, the Contractor shall comply with environmental protection requirements and procedures applicable at the ITER Site, as described in [9] and [10].

The Contractor shall ensure that these activities are carried out by Suitably Qualified and Experienced Persons. For this purpose, the Contractor shall make the necessary provisions for training course(s) in order to maintain the required skills and qualifications for its staff and, whenever necessary, to develop them. In case these activities are carried out by the sub-contractor(s), the Contractor shall ensure that its sub-contractor(s) make analogue provisions for their own staff.

Furthermore, the ITER Policy on Safety, Security and Environment Protection Management – refer to [13] - presents the strategical objectives of the IO for protecting the interests mentioned under Article L593-1 of the French Environmental Code, must be circulated, known, understood and applied by all staff of the Contractor and cascaded down in the managerial lines of the Contractor's organisation and its sub-contractor(s)'.

An Environmental Respect Plan (PRE) shall be produced using the ITER template in [10] and provided by the Contractor at a minimum of ten (10) working days prior to the start of the on-site Work.

The Contractor shall issue a monthly environmental report, by the 5th day of each month, forming part of a monthly report, containing the information for the previous month – refer to Section 9.4.2. This report shall be submitted to the IO and HSPC representatives.

7.11 Access to the Site

The Contractor shall follow the procedures and any administrative formality to enter the ITER site and to carry out the Work on the Site.

Access to the ITER Site is subject to the entrance and exit control measures, as defined in the ITER site access procedure – refer to [5]. The Contractor shall manage his accesses using HELIOS system in a timely manner.

Specific controls are applied to personnel entering the site. For security purposes, access may be

refused or withdrawn for any Contractor's representative without justification.

Regular access hours for the ITER construction site are from 05:30hrs to 22:30hrs (Mondays to Saturdays).

Access to the ITER site outside regular access hours could be possible but only for specific activities – subject to the IO's discretion.

7.12 Permit To Work

Prior to commence any Works on the ITER site, some Permit To Works (PTWs) will be required to be raised by the Contractor for the IO's representatives validation in accordance with the Permit To Work Procedure - refer to [4] and [15].

7.13 Language

All communication with the IO shall be in the English language, unless otherwise stated.

The Contractor shall ensure that his management team is represented by at least one (1) person who can effectively communicate in English (orally and in writing).

Also, there shall be at least one person (1) capable to communicate in English present on the Site at all times.

7.14 Quality Assurance

The Contractor shall have an ITER approved Quality Assurance (QA) Program or an ISO 9001 accredited quality system.

The general requirements are detailed in [ITER Procurement Quality Requirements](#) - refer to [20].

The Contractor shall obtain written agreement from the IO to any modifications to the design, scope and/or the requirements described in this specification. Deviations and non-conformities shall be processed in accordance with [Procedure for management of Nonconformities](#) – refer to [22] and [Procedure for the management of Deviation Request](#) – refer to [23]. The Contractor shall commit to process non-conformities reports (NCR) and associated remedial and corrective actions expeditiously. The list of the NCRs and the deviation requests (DRs) shall be included in the monthly report issued by the Contractor – refer to Section 8.4.2.

The project will be realised under Quality Class 4 as described in [Quality Classification Determination](#) - refer to [24].

8 Meetings

A kick-off meeting shall be convened at the IO site within five (5) days following the Contract signature.

The Contractor shall delegate a representative to be present on the Site during the Works, particularly when the on-Site activities are to commence and are ongoing.

The Contractor shall participate in weekly and monthly meetings with the IO and the HSPC representative (when deemed required), to discuss the Works progress and any project related matters. During the design phase these meeting may be held remotely (via Microsoft Teams) but during the construction site, they will be held on the Site. The IO will establish such sequence of meetings and issue the invitation(s) to the Contractor in due course. At these meetings, the Contractor shall present a report/schedule detailing its current and foreseen activities (with 2-week look-ahead) versus the current (approved) Schedule of Works. For each meeting, the Contractor shall record the minutes of the meeting (MoM) and distribute them to all Parties who attended the meeting

via ITER Document Management system (IDM) – refer to Section 9.2 - for the IO’s approval within two (2) working days following the meeting.

With regard to the monthly meetings, the Contractor shall provide to the IO such information and documentation as the IO deems necessary to determine the progress, quality and status of the Works. As a minimum, a current monthly report shall be provided by the Contractor to the IO in advance (at least 2 working days before) to each meeting – refer to Section 9.4.2.

The Contractor shall be available to participate in any ad-hoc meetings on the IO request. The Contractor might be asked to issue a formal record of the as-hoc meetings.

9 Contractor Deliverables

9.1 List of planned document deliverables

At the beginning of the Works under the contract, a list of planned document deliverables shall be established between the IO and the Contractor. For this purpose, the Contractor shall submit a drafted list of deliverables and their planned issue dates within one (1) week after the signature of the contract, using the ITER template (Excel table) – to be provided by the IO in due course.

The list shall be updated by the Contractor during the course of the Contract.

The Supplier shall provide IO with the documents and data required in the application of this technical specification, the GM3S Ref [15] and any other requirement derived from the application of the contract.

Supplier is requested to prepare their document schedule based on the above and using the template available in the GM3S Ref [15] appendix II ([click here to download](#)).

9.2 Documents formats and data exchange

All documentation delivered to the IO shall be in English (unless requested otherwise, as stated in this specification) using Microsoft Office standards or Adobe PDF. For any specific software used (e.g. CANECO, AutoCAD, etc.), the deliverables shall be provided in their native and pdf versions.

Adobe PDF documents shall have the texts recognition and include bookmarks.

The electrical diagrams shall be delivered in See Electrical Expert format.

The Contractor shall ensure that all documents deliverables are uniquely identified and traceable (provided with the project unique reference numbering system including their revision and the issue dates, were applicable).

All deliverables (except the drawings and diagrams in Adobe PDF format) shall be transmitted through ITER Document Management System (IDM) / Contractor’s Document Exchange Area, as detailed in the [In-Cash Procurement Technical and Management Documentation Exchange and Storage Procedure](#) – refer to [12].

Drawings and diagrams in Adobe PDF format shall be exchanged in the System for the Management of Diagrams and Drawings (SMDD), a “sister” to IDM.

9.3 Documents review and approval

The Contractor shall allow ten (10) working days for a review period by the IO.

In case the IO disapproves a document or has comments and requests its new revision, the Contractor shall update and resubmit the deliverable within five (5) working days, taking into account the IO’s comments. For each following-up review period by the IO, the Contractor shall allow five (5)

working days.

The review period shall start the following day after the uploaded deliverables have been signed in by the Contractor in IDM and/or SMDD.

The Works performance without the IO's approval or in the absence of approved relevant documents shall be sanctioned by a stop of the Work order until the situation has been rectified. All consequences of the Work stoppage shall be borne by the Contractor.

9.4 Contractor's deliverables

9.4.1 Early Deliverables

Contractor's Quality Plan

Before submitting any other deliverable, the Contractor shall submit and have approved by the IO, the Contractors Quality Plan - refer to Section 7.14 and [21]. It is therefore important that the Contractor submits his Quality Plan as soon as possible after the Contract Commencement Date.

Schedule of Works

The Contractor shall submit a Schedule of Works (Programme) which shall show as a minimum the main activities to be carried out for the design, procurement, mobilization, preliminary design, construction design, on-Site construction, commissioning, preparation of as-the built documentation and the Taking-Over.

The time required by ITER Organization to review the deliverables shall be taken into account by the Contractor when preparing the Schedule of Works. The Schedule of Works shall be compatible with the Time for Completion of the Works.

The Schedule of Works and its updates (if required) shall be provided to the IO's approval.

Performance Security

The Contractor is to provide the Performance Security to the IO within two (2) weeks since the Commencement Date, as specified in the Contract.

9.4.2 Monthly Reports

A Monthly Report shall be submitted by the Contractor for acceptance by the IO five (5) working days after the end of each calendar month.

The Monthly Report shall contain:

- a) A narrative description of activities that have taken place over the period including photographic evidence of the progress of the Works.
- b) An update of the Schedule of Works (if required) showing the actual progress against the planned progress.
- c) In the case the Works are not progressing in accordance with the Schedule of Work, the report shall contain a detailed explanation of how the Contractor intends to recover the Schedule.
- d) A list and status of all RFI's submitted by the Contractor.
- e) A list and status of all DRs submitted by the Contractor.

- f) A list and status of all NCRs (raised by the Contractors or others) affecting the Works.
- g) A list and status of all IO requested Variations to the Works.
- h) A list of health and safety statistics including:
 - i. number of worked hours on the Site;
 - ii. total number of workers curves as well as the number of hours worked per week;
 - iii. all accidents (including environmental issues / observation sheets) occurring on the Site (or elsewhere if connected to the Works);
 - iv. the number of accidents with lost working days;
 - v. the number of lost working days per accident;
 - vi. a brief report of the causes of accidents or incidents as well as the corrective measures implemented following the accidents or incidents;
 - vii. an assessment of the training and safety awareness courses carried out during the month.

Nota: It is linked to application of PGC Annex 38: Reporting OHS events follow-up procedure [32].

- i) A list of environmental statistics - refer to [9] - including:
 - i. electricity consumption;
 - ii. potable water consumption;
 - iii. raw water consumption;
 - iv. fuel consumption;
 - v. quantities of waste generated, distinguishing between hazardous waste, non-hazardous waste, inert waste, concrete laitance and the overall percentage of recycled waste.

9.4.3 Deliverables required prior to Commencement of Works at the Site

The documents listed below shall be submitted by the Contractor (and where appropriate each sub-contractor) for approval by the IO no later than ten (10) working days prior to the Commencement of Works at the Site (unless stated otherwise):

- a. Environmental Respect Plan (PRE) – in the ITER template – refer to [10].
- b. The documentation list including their deliverables schedule (1st draft, to be updated during the course of the Contract) .
- c. List of subcontractor(s);
- d. Third party control entity selected for the independent self-control and acceptance tests performance (for approval by the IO).
- e. General layouts of building: the facades and top plan views of the building including their expected foundations system, the networks routings and the main equipment.
- f. Permit to Work (PTW) request(s) – refer to [4].
- g. Access requests for personnel to the ITER Site – refer to [5].
- h. The Contractor Site installation plan (French: *Plan d'Installation de Chantier*).
- i. List of subcontractors and relevant Subcontractor Acceptance Form (SAF) – using ITER template – refer to [26].
- j. List of suppliers.
- k. PPSPS for the Works performed by the Contractor and each sub-Contractor(s) – in the ITER template (bilingual – English & French) – refer to [7].

Note: The submission shall be minimum 15 (8 for the subcontractors) working days prior to the planned Works on the Site.

9.4.4 Preliminary design deliverables

The ITER Organization requires the Contractor to submit the preliminary deliverables in order to ensure that the Contractor has understood the scope of Works and for the IO to assess whether the Contractor's proposed solutions meet the ITER Organization's requirements.

The Contractor shall submit the following documents for the IO's acceptance (non-exhaustive list):

- a. A list of all controls, checks and testing that the Contractor intends to carry out in order to satisfy the requirements;
- b. Contractor's Quality Control Plan detailing the list of controls, checks and testing which shall be marked-up by the IO to indicate those where the IO intervention points (Hold Points – HPs / Notification Points – NPs) are required.
- c. Preliminary Design Report describing all Works to be undertaken (e.g. civil, structural, mechanical and electrical). This report shall include confirmations of the total electrical power capacity/consumption required.
- d. Preliminary Design drawings illustrating:
 - i. General arrangement drawing(s) for all the Works.
 - ii. Plan(s) and views of the building's structure and its foundations.
 - iii. Sufficient cross-sections through the building in order to demonstrate that the requirements defined in this technical specification have been met (e.g. for the FFL surface, workshop clearance envelope, insulation of the walls and roofs, etc.).
 - iv. External buried networks (HV/ PW / LV / LC/ PWD/ SD/ buried gallery) and the platform preparation drawings with useful cross-sections and details for the singular points.
 - v. Layout(s) of the electrical and mechanical buildings fit-out including the electrical networks (LV and LC) distribution inside the building.
 - vi. PWD network including the locations of the roof gullies, downpipes, any horizontal drains and the connections to the existing precipitation drainage network.
 - vii. Layout(s) of the lightning and earthing protection system with defined number, location and details of the connection points.
 - viii. Drawing of the trucks (large) doors and their supporting secondary structure details as well as the auxiliary equipment.
 - ix. Indoor crane and its rails showing sufficient details to demonstrate that it fits within the clearance envelope and meet all other requirements defined in this specification.
 - x. Technical data sheet of the trucks (large) doors and their equipment.

9.4.5 Construction design deliverables

The IO requires the Contractor to submit the construction design deliverables in order to ensure that the accepted preliminary design has been developed accordingly and that the as-built records of the Works will meet the IO's requirements.

The Contractor shall submit the following documents for acceptance by the IO (non-exhaustive list):

- a. All construction design drawings suitable for the execution of the Works on the Site.
- b. Final Design Report - updated with the calculation notes and material definitions for the structural, insulation and fit-out elements of the Works. The report shall include all electrical

calculations (in both, CANECO and pdf formats), load lists and one-line diagrams and other information necessary for the future statutory inspections prior to the commissioning.

- c. Updated Contractor's Quality Control Plan (if necessary).
- d. Evacuation Plans and an Intervention Plans of the building.

The construction design deliverables can be submitted to the IO in phase manner to suit the planned construction schedule. However, no construction activity shall start before the relevant construction design deliverable has been approved by the IO.

Below a non-exhaustive list of expected documents to be provided by the contractor:

- **For civil works:**
 - Layout plan;
 - Plan of spoil/fill and assessment of quantities;
 - Geotechnical study reports (G2PRO/G3);
 - Calculation of the building design loads (exploitation, climatic and of seism) and load take down, for design of foundations and checking of structures;
 - Detailed design of the foundations, setting out and reinforcement plan;
 - Design and plans of the metallic structures: offices, roof-covered areas, staircases;
 - Checking of the arrows and the Eigen frequencies under working loads of the floors of the offices;
- **For buried services:**
 - Layout of installations;
 - Plans of earthworks;
 - Design note for the wet networks (estimate of the loads, diameters, slopes);
 - Construction plans of the ducts networks (electrical power, low current, optical fiber), of the hydraulic networks (drinking water, raw water, waste water, rain water) with connections to the existing, underground drainage;
 - Construction plan for earthing.
- **For the HVAC:**
 - Note for heat balances according to the Thermal Regulation 2012 (RT2012);
 - Dimensioning of the equipment and technical documentation;
 - Execution drawings of the networks and terminals;
 - Power loads estimates and plans for electric connections.
- **For the electrical power:**
 - Notes for the assessments of power requirements;
 - Notes of calculations using the software Caneco BT;
 - Setting out plans of electrical sockets;
 - Calculation note of the cables and the electrical control panels and technical documentation;
 - Line diagrams.
- **For plumbing:**
 - Note for the balance of fluids;
 - Plans of construction of the networks for each fluid;
 - Dimensioning and technical documentation of each product;
 - Power loads estimates and plans for the necessary electrical connections.

- **For low current:**
 - Setting out plans for RJ 45 sockets;
 - Line diagrams;
 - Diagrams of connection.
- **For all disciplines:**
 - Nomenclature of the Works;
 - Execution drawings or detailed workshop drawings of the Works;
 - Reports of tests and approvals;
 - Samples of materials at the request of the ITER Organization;
 - All required documents for the execution of the work.

9.4.6 Deliverables required during the execution of the Works

The Contractor shall provide the following documents during the execution of the Works:

- a. Results of all control tests performed by the Contractor during the execution of the Work.
- b. Reports of tests and their results approvals (performed by the external body / independent checker).

Note: In the case of negative results, the Contractor shall provide a written explanation of the corrective actions the Contractor intends to undertake to the IO's satisfaction.

- c. Contractor's Quality Plan status statements relating to the controls by the IO (HPs/NPs).
- d. Monthly progress reports – refer to Section 9.4.2 above.
- e. All required documents regarding with the Contractor Safety Plan or the environmental specifications of the IO or necessary to the traceability of the Work.

9.4.7 As-built documentation

Upon completion of the Works, and prior to Taking-Over, a complete as-built files shall be provided by the Contractor, including (non-exhaustive list):

- a. Detailed as-built drawings for all Works executed taking into account any changes implemented during the construction Works. The drawings shall be revised as a final "as-built" version.
- b. Final design report including all calculations notes.
- c. Registers of all NCRs, RFIs, DRs and Variations raised during the execution of the Contract (including the reports).
- d. Results and statements of all controls, checks and tests executed during the Works including the commissioning legal inspection reports issued by the independent checkers for the followings:
 - Electrical installations,
 - Lightning protection,
 - Illuminance levels check,
 - DESP (HVAC system),
 - Motorized doors,
 - Overhead cranes,

- e. Technical notes and materials technical data sheets with precise references of all equipment installed under the Works (e.g. manufacturer, types, and precise references) – filled in the Excel table, refer to [25] above.
- f. Material & equipment guarantees, compliance certificates attesting that the installations are in conformity with the provisions of the safety regulations.
- g. All necessary documents for the *operational and maintenance folder* defining the activities that are required to comply with manufacturers' recommendations, including the user manuals and operation instructions, the general schedule of maintenance inspections, the list of spare parts, etc. for all equipment.
- h. As-built update of existing installation documents,
- i. Worksite pictures folder documenting the as-built status of the Contractor deliverables.

All as-built deliverables shall be provided by the Contractor in an electronic format (Adobe PDF and native file) through IDM and SMDD – refer to Section 9.2 and [12]- as well as on an external hard drive / USB key.

The Contractor shall endeavour to provide all required as-built documentation prior to an issue by the IO the Taking-Over Certificate.

The Contractor shall allow for a review period by the IO of twenty (20) working days.

10 Taking-Over by the IO

The Works shall be taken-over by the IO when they have been completed in accordance with the Contract. Except for any minor outstanding works and defects, that will not substantially affect the use of the Works for their intended purpose.

The Works shall not be considered as completed for the purposes of Taking-Over until the required as-built documents have been submitted (via IDM / SMDD) by the Contractor to the IO.