

Interface Sheet-IS

IS-41-62.13-001 Interface sheet between PBS41.EL, PBS41.V3 and PBS62.13

Interface sheet between PBS41.EL, PBS41.V3 and PBS62.13

Approval Process			
	Name	Action	Job Title / Affiliation
Author	Ahossy A.	12 May 2025:signed	Mechanical Engineer
Co-Authors	Pince L.	04 Jun 2025:signed	Nuclear System Integration Engineer
	Sheng Z.	16 May 2025:signed	Power Electronics Engineer
Reviewers	Lagier T.	16 Jun 2025:recommended	Electrical Engineer, Power Conversi...
	Shen H.	06 Jun 2025:recommended	Project Leader
	Stewart P.	06 Jun 2025:recommended	Civil/Structural Nuclear Engineer
	Van kessel R.	16 Jun 2025:recommended	Electrical Engineer
Approver	Vanpoperynghe Y.	16 Jun 2025:approved	Section Leader
Information Protection Level: Non-Public - Unclassified			
RO: Tsedri Thibault			
Read Access	LG: DA RO to sign off ICDs, GG: AIF- CEA SSA Liaison Committee Members &experts, LG: F4E-Architect/Engineering company, GG: MAC Members and Experts, GG: STAC Members & Experts, GG: CEA Decommissioning Experts, LG: CEA view, GG: DA Heads, Co-ordinators and Management, AD: ITER, AD: External Collabor...		

#drn#

Change Log			
IS-41-62.13-001 Interface sheet between PBS41.EL, PBS41.V3 and PBS62.13 (9RCYJ5)			
Version	Latest Status	Issue Date	Description of Change
v0.0	In Work	20 Oct 2023	
v1.0	Signed	03 Jun 2024	First issue
v1.1	Revision Required	28 Jun 2024	Mass table modified Earthing chapter modified Typo in references corrected
v1.2	In Work	12 Feb 2025	1- Masses increased by 50% on request of @Zhicai SHENG 2- Fixation solution updated following IS 22 41 ITER_D_5XL6W4 2- Definition of reaction forces updated 3- Text of environment temperature modified 4- Update of the chapter on loss of HVAC 5- Update of fire protection conditions 6- Update of earthing definition
v1.3	In Work	21 Feb 2025	1- Masses increased by 50% due to the updates of ELM PS electrical loads 2- Fixation solution updated following IS 22 41 ITER_D_5XL6W4 2- Definition of reaction forces updated 3- Text of environment temperature modified 4- Update of the chapter on heat loads 5- Update of fire protection conditions 6- Update of earthing definition 7- Update of the chapter on fire load
v1.4	In Work	26 Feb 2025	Update following comments: - Fire loads - Title of tables
v1.5	Revision Required	26 Feb 2025	format
v1.6	In Work	24 Apr 2025	Update following answered comments
v1.7	Signed	07 May 2025	Update following comments
v1.8	Approved	12 May 2025	Update following comments of @Van Kessel Rick

Table of Contents

1	PURPOSE	3
2	SCOPE	3
2.1	INTERFACING PARTS OR COMPONENTS	3
3	DEFINITIONS	4
4	REFERENCES.....	4
4.1.1	<i>Reference documents.....</i>	<i>4</i>
4.1.2	<i>Applicable documents</i>	<i>5</i>
4.1.3	<i>Standards</i>	<i>5</i>
5	INTERFACE REQUIREMENT DATA	6
5.1	TECHNICAL DESCRIPTION OF THE INTERFACE POINTS.....	6
5.2	LOCATION/FOOTPRINT / PHYSICAL DIMENSIONS	6
5.3	MASSSES.....	7
5.4	HOLDING DOWN ARRANGEMENT.....	7
5.5	REACTIONS FORCES ON ANCHORS	8
5.6	MAINTENANCE REQUIREMENTS	8
5.7	HEAT LOAD	8
5.8	FIRE LOAD	10
5.9	GENERATED VIBRATIONS	12
5.10	OTHER SERVICES	12
5.11	INSTALLATION REQUIREMENTS	12
5.12	EXCLUSION ZONES.....	13
5.13	OTHER SPECIAL PROVISIONS	13
5.14	ENVIRONMENTAL PARAMETERS	13
5.14.1	<i>Temperature during assembly in B13</i>	<i>14</i>
5.14.2	<i>Ambient temperature during operation in B13</i>	<i>14</i>
5.14.3	<i>Temperature during loss of HVAC accident in B13</i>	<i>14</i>
5.15	TESTING AND COMMISSIONING REQUIREMENTS	14
5.16	RFE REQUIREMENT (BUILDING CONDITIONS REQUIRED AT TIME OF EQUIPMENT INSTALLATION)	14
5.17	FIRE PROTECTION AND FIRE PROTECTION MATERIAL	14
5.18	EARTHING POINTS.....	14
5.19	STAGED APPROACH	15
6	INTERFACE STEP STATUS (ACHIEVED MATURITY LEVEL)	16

List of tables

Table 1: Components PBS41	3
Table 2: Components PBS62	3
Table 3: Definitions	4
Table 4: Reference documents	4
Table 5: Applicable documents.....	5
Table 6: Standards.....	5
Table 7: Nominal mass estimation.....	7
Table 8: Heat loads	9
Table 9: Fire loads.....	11
Table 10: Temperature in B13	14
Table 11: Staged approach.....	15
Table 12: Interface step status.....	16

List of Figures

Figure 1: 3D data for ELM components in B13	6
Figure 2: 3D data for VS3 components in B13.....	6
Figure 3: Exclusion zones in B13	13

1 Purpose

This document is to define the interfaces data which will be used for the design of both interfacing PBS 62.13 and PBS 41.EL, 41.V3.

2 Scope

The scope of this document is the interface points identified in the concerned Interface Control Document (ICD) between Assembly Building (PBS 62.13) and Coil Power Supply and Distribution (PBS 41). This Interface sheet (IS-62.13-41) between Building 13 and CPSD comprises the IS (IS-41-62.13-001) detailed within the ICD [09]. All recommendations and updates about IS are listed in the schedule of the ICD.

2.1 Interfacing parts or components

Components (PBS 41)	
Description	PBS
ELM Coil Circuits	41.EL
In-Vessel VS3 Circuits	41.V3

Table 1: Components PBS41

Components (PBS 62)	
Description	PBS
Assembly Building	62.13

Table 2: Components PBS62

3 Definitions

CMAF	CAD Model Approval Form
CMM	Configuration Management Model
ELM	Edge Localized Mode
ICD	Interface Control Document
IS	Interface Sheet
IVC	In-Vessel Coil
PBS	Plant Breakdown Structure
PS	Power Supply
RFE	Ready for Equipment
SRD	System Requirements Document
VS3	Vertical Stabilization (In-Vessel)

Table 3: Definitions

4 References

4.1.1 Reference documents

[REF] Document Titles	IDM Links	Version
[01] Load Specifications (LS) v6.2	ITER_D_222QGL	6.2
[02] Load Specifications for Buildings with Safety Requirements	ITER_D_2ERTXQ	3.6
[03] Application of the FRS Simplified Methodology to Building 13 - PBS 63.13 Assembly Building	ITER_D_RW33SG	1.1
[04] IO cable catalogue	ITER_D_355QX2	6.13
[05] ELM PS Fire Load Assessment	ITER_D_8TNAEA	2.0
[06] ELM-PS conceptual integration in B13	ITER_D_7G6KWJ	1.7
[07] IS-22-41-003 Interface Sheet between Machine Assembly & Tooling (PBS 22) and In-Vessel Coil Power Supplies (PBS 41) in B13	ITER_D_5XL6W4	1.3 (in review)
[08] Preliminary concept of the grounding of PBS41 ELM and VS3 components in B13 for CDR design purposes	ITER_D_92PFYU	1.2

Table 4: Reference documents

4.1.2 Applicable documents

[REF] Document Titles	IDM Links	Version
[09] ICD-62.13-41 Interface Control Document (ICD)	ITER_D_9MPWW6	2.6
[10] Staged Approach Configuration - PBS Level 3	ITER_D_SNE6G8	4.0
[11] SRD-41 (Coil Power Supply and Distribution) from DOORS	ITER_D_28B6XQ	5.0
[12] ELM-PS Load specification for B13	ITER_D_CAWUM D	1.6
[13] VS3-PS Load Specification for B13	ITER_D_DF8LDF	0.0
[14] System Requirements Document SRD 62-13 Lay-down and Assembly Hall	ITER_D_2F7RGN	3.7

Table 5: Applicable documents

4.1.3 Standards

[REF] Document Titles	IDM Links	Version
[15] Part 1-2: General actions — Actions on structures exposed to fire	NF EN 1991-1-2	2002

Table 6: Standards

5 Interface Requirement Data

5.1 Technical Description of the Interface Points

The Interface Control Document [09] identifies the interfaces between the PBS 41 and PBS 62.13 and it provides technical description of the interfaces.

This IS contains either the detailed Interface Requirements (interface data) or, where more practical, provides references to documentation where the Interface Requirements are available. Where data are not currently available, bounding data and scheduled availability dates are to be provided.

Note: the Building interface topics listed below (chapters letter) refers for historical consistency purposes to the columns of the former [ITER_D_493BC9 - Data collection table for PBS62 Tokamak Complex Buildings - Interface Requirements](#) used during the TKC Buildings design. However, the data from this Data Collection Table are now superseded by the Interface Requirements below.

5.2 Location/Footprint / Physical Dimensions

Location and dimensions of PBS 41 equipment and components are defined in the applicable CMM.

At current design phase, the 3D data for ELM and VS3 systems in B13 are provided in the links below.

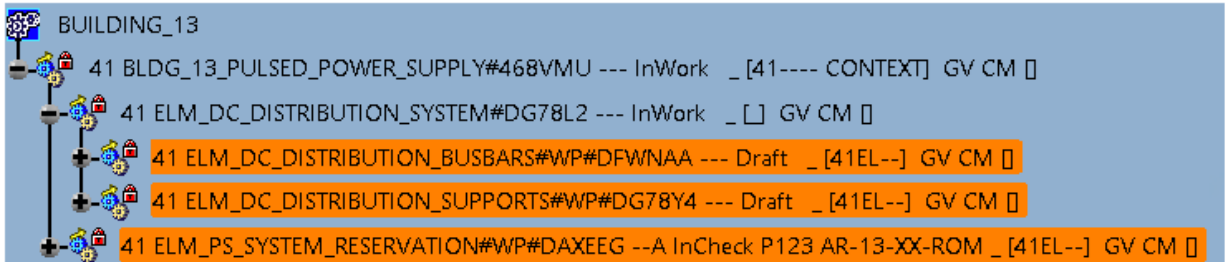


Figure 1: 3D data for ELM components in B13

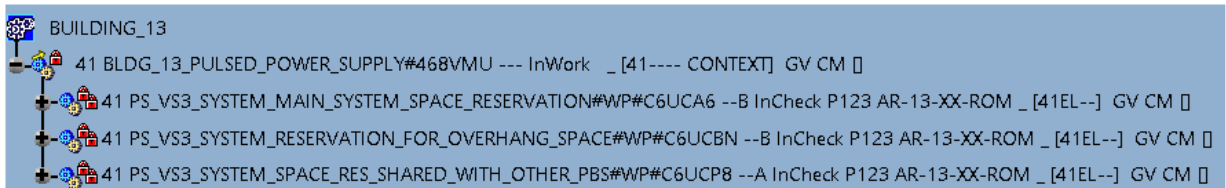


Figure 2: 3D data for VS3 components in B13

5.3 Masses

Total as-installed mass of item - where applicable.

[62.1341-001i001 R] PBS 62 shall consider the preliminary estimations of masses of PBS 41 ELM and VS3 equipment for evaluation of the resistance of the B13 slab and structures.

N°	Components		Current estimation of nominal mass of the component [Tons]	
	System	sub-system	Value	Unit
1	ELM	ELM installation	469	[Tons]
2		Fire protection material for ELM installation	14	[Tons]
3	VS3	VS3 installation	516	[Tons]
4		Fire protection material for VS3 installation	26	[Tons]
5	ELM/VS3 Substation	ELM/VS3 Substation installation	30	[Tons]
6		Fire protection material for substation	9	[Tons]
		Total mass ELM installation	483	[Tons]
		Total mass VS3 installation	541	[Tons]
		Total mass ELM/VS3 substation installation	39	[Tons]
		Total nominal mass of ELM & VS3 installation in B13	1064	[Tons]

Table 7: Nominal mass estimation

Note: The data provided in the table above are conceptual data from CDR design phase. When the final configuration of ELM and VS3 systems will be approved, PBS41 will provide PBS62 with the final masses for the verification of the loading capacity of the B13 slab and the B13 structure with consideration of the locations and position provided in the CMM.

5.4 Holding Down Arrangement

Indicate the reference of drawing or other documents wherein the anchorage details are defined. This will, typically, define anchor bolt arrangement (or interface plate or similar) and specific data, and determine supply source. Any tolerances needed, such as geometrical or positioning tolerances, must also be indicated here.

The base supports for the PBS41 ELM/VS3 components in B13 are the B13 floor concrete slab, the B13 bedplate and the B13 building structure.

[62.1341-001i002 R] For the fixation of components on the slab, PBS41 shall use post-drill anchors and may use the existing anchors and the Rail Base Plates of the SSAT tools as described in [07].

[62.1341-001i003 R] For the fixation of components on the bedplate, PBS41 shall use welding or drilling and the T-slots in the bedplate. The conditions of the use of the bedplate is given in [07].

[62.1341-001i004 R] For the fixation of components on the B13 main building structure or other existing steel structures in B13, PBS41 shall attach additional supports to the existing columns of the B13 main building structure by welding or clamping.

5.5 Reactions forces on anchors

Reactions forces on anchors given after calculation (including seismic reaction forces with the Floor Response Spectra)

[62.1341-001i005 R] Following the integrity analyses, PBS41 (ELM-PS and VS3-PS) shall collect from the Contractor and provide to PBS62 the final loads set at the interface with PBS62. These loads are the loads sets at the attachment points with the existing beams or columns of the B13 structure, the loads at the fixation points on the bedplate, the load at the post drill plates.

[62.1341-001i006 R] PBS62 to use these data for the verification the resistance of the B13 structure, the bedplate and the B13 slab when the final design of the systems will be performed.

5.6 Maintenance Requirements

Refer to details of any specific access platforms or other facilities for inspection and maintenance, space provisions for mobile plant in CMM, equipment removal and the like.

The maintenance scenarios and requirement shall be specified later.

5.7 Heat Load

Definition of the thermal load generated by the plant/equipment and to be handled by the Building HVAC system.

[62.1341-001i003-R] PBS 62 HVAC shall consider the PBS 41 heat loads specified below:

PBS_L 1	PBS_L 2	PBS_L3	PBS_Title	Building _ID	Floor _code	Room_ code	Room_ name	Heat Load (kW) *
41	41.EL	41.EL.00	MV cables	13	L1	13-L1-01	Main Assembly area	0.2
41	41.EL	41.EL.00	Power transformer	13	L1	13-L1-01	Main Assembly area	12.3
41	41.EL	41.EL.00	Front end rectifier	13	L1	13-L1-01	Main Assembly area	56.4
41	41.EL	41.EL.00	Control system and Auxiliaries	13	L1	13-L1-01	Main Assembly area	9.3
41	41.EL	41.EL.00	Distribution busbar	13	L1	13-L1-01	Main Assembly area	6.5
41	41.EL	41.EL.00	MV&LV& Control cubicles	13	L1	13-L1-01	Main Assembly area	24.0
41	41.V3	41.V3.BB	Extension busbars	13	L1	13-L1-01	Main Assembly area	1.0

PBS_L 1	PBS_L 2	PBS_L3	PBS_Title	Building _ID	Floor _code	Room_ code	Room_ name	Heat Load (kW) *
41	41.V3	41.V3.CH 41.V3.CP 41.V3.IV	Charger, capacitor bank & inverter	13	L1	13-L1-01	Main Assembly area	30.9
41	41.V3	41.V3.00	LV, I&C cubicles	13	L1	13-L1-01	Main Assembly area	13.0
41	41.V3		Dummy load	13	L1	13-L1-01	Main Assembly area	8.0
41	41.EL		Dummy load for rectifier	13	L1	13-L1-01	Main Assembly area	20.0

Table 8: Heat loads

*Note:

1. The heat loads are given in average values in consideration of plasma operation duty cycle of 25%.
2. The dummy loads will only operate during commissioning, thus will not increase the total heat loads to be handled by the building HVAC system.

5.8 Fire Load

The list of the fire load in PBS41 installation in B13 is given in the table below.

[62.1341-001i007 R] PBS 62 shall consider the PBS 41 Fire Load Inventories specified below:

Fire Sector	Fire Part	CV reference	Calorific Value [MJ/Unit]	Unit	Quantity	Fire Loads [MJ]	Fire Insulation	Modes	Operating Modes
13-FA-01 {B13 Fire Area 01}	PBS41 – VS3 extension busbar	QQYCVH v3.0	73.56	MJ/(m)	200.00	16,919	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 MV cables	355QX2 V6.13	44.13	MJ/(m)	120.00	6,090	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 LV & Control cubicles	RT9U7W V1.3	800	MJ/(m ³)	8.45	7,772	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 MV cabinet	RT9U7W V1.3	800	MJ/(m ³)	10.37	9,539	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 Rectifier container and dummy load	RT9U7W V1.3	800	MJ/(m ³)	86.21	79,313	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 Discharge and connection container	RT9U7W V1.3	800	MJ/(m ³)	172.42	158,626	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 Inverter container	RT9U7W V1.3	800	MJ/(m ³)	172.42	158,626	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 Transformer container	RT9U7W V1.3	800	MJ/(m ³)	33.14	30,489	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 Output container	RT9U7W V1.3	800	MJ/(m ³)	86.21	79,313	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 Energy storage capacitor	8D4TN3 v1.0	4930	MJ/unit	648.00	3,673,836	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - VS3 Cable trays	RT9U7W V1.3	440	MJ/m	300.00	151,800	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - ELM LV & control cable tray	RT9U7W V1.3	440	MJ/m	90.00	45,540	NO	0+1+2	All modes

Fire Sector	Fire Part	CV reference	Calorific Value [MJ/Unit]	Unit	Quantity	Fire Loads [MJ]	Fire Insulation	Modes	Operating Modes
13-FA-01 {B13 Fire Area 01}	PBS41 - ELM LV cables	355QX2 V6.13	49.91	MJ/m	1620.00	92,982	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - ELM DC busbar	QQYCVH v3.0	58.88	MJ/m	30.00	2,031	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - ELM MV cables	355QX2 V6.13	44.13	MJ/m	675.00	34,256	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - ELM Dummy load	8TNAEA v2.0	17600	MJ/unit	1.00	20,240	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - ELM Transformer cabinet	RT9U7W V1.3	800	MJ/(m ³)	256.50	235,980	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - ELM MV cubicles	RT9U7W V1.3	800	MJ/(m ³)	191.70	176,364	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41 - ELM LV & control cubicles	RT9U7W V1.3	800	MJ/(m ³)	12.60	11,592	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41-ELM Distribution busbars	QQYCVH v3.0	78.24	MJ/m	240.00	21,595	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41-ELM Input stage	RT9U7W V1.3	800	MJ/unit	109.62	100,850	NO	0+1+2	All modes
13-FA-01 {B13 Fire Area 01}	PBS41-IVCPS MV Substation	RT9U7W V1.3	800	MJ/unit	44.90	41,308	NO	0+1+2	All modes

Table 9: Fire loads

Note:

- The cables are selected referring to [04], the fire load values given in this document are more accurate. Anyway, this will be confirmed with PBS44
- Cubicles: the loads are calculated according to the referenced fire load value, and the number and dimensions of the cubicles. Detailed information can be found in [05] and [06].
- For impact on the building, the summary of fire loads, together with the concept layout has been sent for assessment. Initial structural analysis has been performed, further evaluation is needed to validate the existing report, thus the layout can be updated accordingly.

5.9 Generated Vibrations

Definition of the vibrations generated by the plant equipment in terms of frequencies and amplitudes.

Not applicable at current design stage.

5.10 Other Services

Description of all services serving the plant directly and for which pipe and/or tray routes are required to be routed internally within the building.

[62.1341-001i008 R] PBS 62.13 shall consider the routing of the following services for PBS 41 within the building:

- *Component Cooling Water (26.CC)*
- *PPEN*
- *SSEN*

5.11 Installation Requirements

Data to inform the detailed designer of special installation requirements, if any, such as: a) Item to be built-in (captive item), b) special openings to be designed for installation and subsequent closure, c) specific temporary equipment to be used for installation.

Not applicable at current design stage.

5.12 Exclusion Zones

The exclusion zones for ELM-PS are defined in the image below.

The exclusion zones for VS3-PS are yet to be defined.

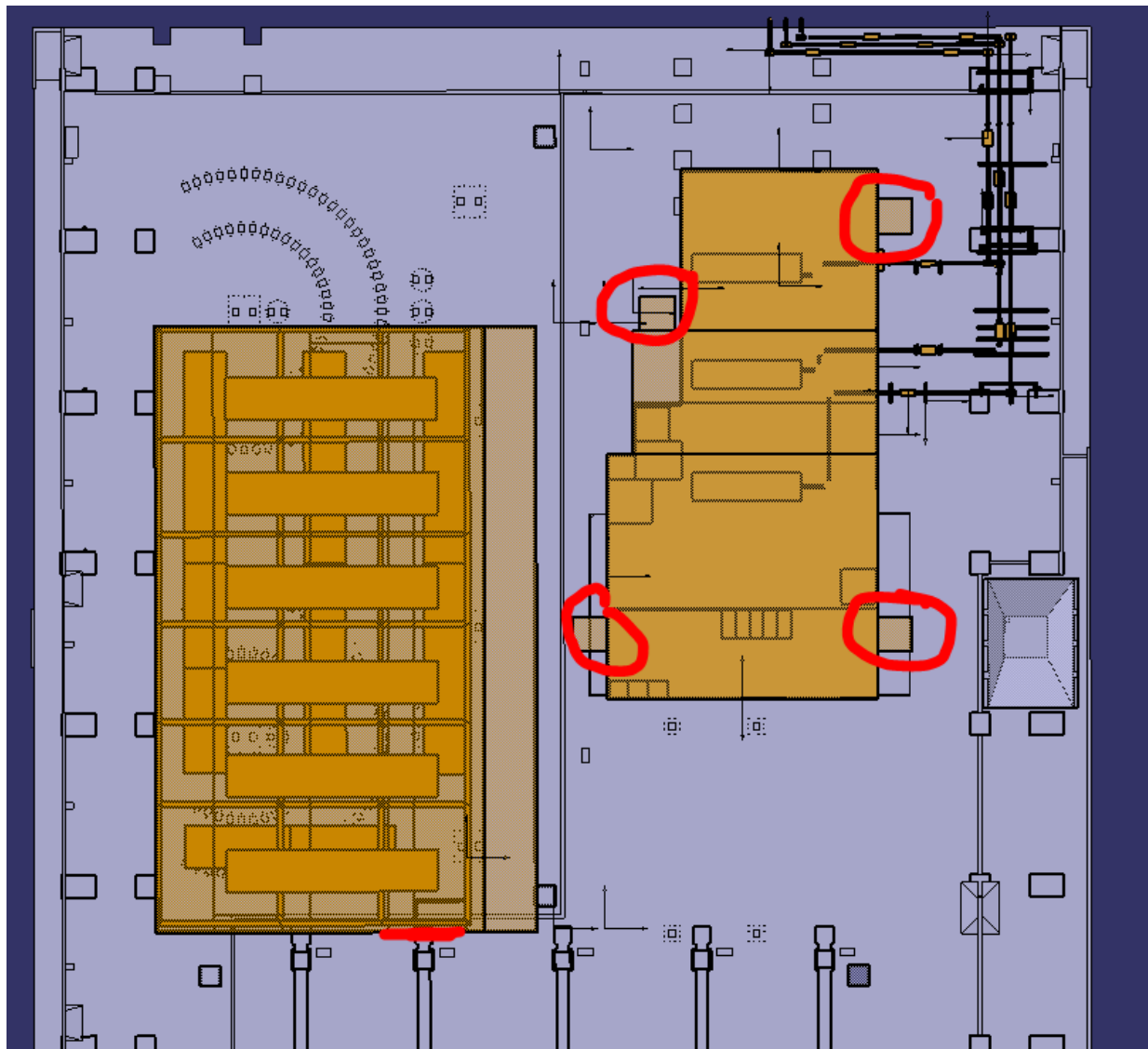


Figure 3: Exclusion zones in B13

[62.1341-001i009 R] PBS62 shall keep free spaces indicated in the CMM model for the opening of the doors.

5.13 Other Special Provisions

Any particular requirements not covered elsewhere, to be considered by the detailed designer of the building. These might include notes on acoustics, special ventilation needs, waste issues, space required for temporary dummy load banks and the like.

Not applicable at current design stage.

5.14 Environmental Parameters

Definition of the temperature (maximum and minimum), relative humidity (RH), air quality (dust limitations) to be considered in the detailed design of the Building HVAC systems.

5.14.1 Temperature during assembly in B13

The temperature variation in buildings in general is given in document in reference [02] §5.1.6. table 5-3.

Period of the year	Temperature [°C]		
	Minimal	maximal	Average
Summer	25	28	26.5
Winter	12	18	15
Average	18.5	23	21

Table 10: Temperature in B13

The installation of equipment in B13 is realized within ambient temperature specified above $\Theta_{mINST} = 21^{\circ}$

5.14.2 Ambient temperature during operation in B13

The ambient temperature in B13 during the operation of the ELM-PS is 35°C.

5.14.3 Temperature during loss of HVAC accident in B13

The loss of HVAC is an accident situation. The PBS41 ELM-PS and VS3-PS will be stopped in case of loss of HVAC.

5.15 Testing and Commissioning Requirements

Definition of any special facilities or space requirements to be considered by the detailed designer to support testing and commissioning needs, e.g. space for temporary power or load units, major temporary service supply routes, radiography exclusion areas, or other.

Not applicable at current design stage.

5.16 RFE Requirement (Building conditions required at time of equipment installation)

Not applicable at current design stage.

5.17 Fire protection and fire protection material

The Fire Risk Assessment study is currently ongoing from IO side. This report will specify the fire protection measures and consequently the fire temperature reached at the fire source in B13 after two hours.

[62.1341-001i0010 R] Once the fire analysis will be available, PBS41, depending of the results of this fire analysis, shall add or not a suitable fire protection material to the components subjected to the load combinations 12 and 13 in of the Load Specification documents in reference [12] and [13] to make sure the requested behaviour of the components is maintained after the fire event.

5.18 Earthing Points

This section contains the requirements for specific earthing arrangements.

The preliminary concept analysis of the earthing system corresponding to the Concept Design Review phase is provided in document in reference [08].

5.19 Staged Approach

PBS 41 IVC systems are installed through several assembly phases as defined in the Staged Approach Configuration in reference [10].

Items description	SRO	DT-1	DT-2
PBS 62.13 systems	X	X	X
PBS 41. EL – ELM Coil Circuit	X	X	X
PBS 41.V3 – In-Vessel VS3 Circuits	X	X	X

Table 11: Staged approach

X = Functional

6 Interface Step Status (Achieved Maturity Level)

Interface Points	Initial Allocation	Refined Allocation	Final Allocation
All interface points	X		

Table 12: Interface step status