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BEER - Interface Description

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CONTENT

LIST OF TABLES

1. SCOPE

The scope of this document is to create a uniform list of technical interfaces, which are to be taken into account in the project, in terms of relations between individual subsystems within the internal coordination of BEER Instrument, and also within the whole European Spallation Source (ESS) project.

This document introduces project-specific marking of individual interfaces throughout all the parts of the project, in order to identify them from the perspective of the whole ESS project. The interfaces are divided into individual areas, parts and listed in tables, together with their descriptions, references and statuses.

2. ISSUING ORGANISATION

Nuclear Physics Institute (NPI), NUVIA, and Mirrotron.

3. CONTEXT

The document will describe the interface for the whole instrument and main subsystems for the top level of the instrument listed below:

- 13.6.6.1 Beam Transport and Conditioning System
- 13.6.6.2 Sample Exposure System
- 13.6.6.3 Scattering Characterization System
- 13.6.6.5 Experimental Cave
- 13.6.6.6 Control Hutch
- 13.6.6.7 Sample Preparation Area
- 13.6.6.8 Utilities Distribution (Infrastructure)
- 13.6.6.9 Support Infrastructure
- 13.6.6.10 Control Racks
- 13.6.6.11 Integrated Control and Monitoring

4. INTERFACE TYPE DEFINITION

4.1. Boundary Interface (Bi)

This is an interface where the BEER Instrument interfaces with a neighbouring system without any impact (no contact, no transfer of force, signal, power, goods or fluids).

4.2. Contact Interface (Ci)

This is an interface where the BEER instrument interfaces with a neighbouring system and imparts/transfer a force to the neighbouring system.

4.3. Service Interface (Si)

This is an interface where the BEER Instrument interfaces with a neighbouring system with an area/volume defined for transfer of goods or services (this encompasses access points, supplies like: electrical, pneumatic, hydraulic, gases, vacuum).

4.4. Hardware Interface (Hi)

This is an interface where the BEER instrument interfaces with a neighbouring system providing a defined volume/surface reserved for passage of the neighbouring system (e.g. Forklift access, maintenance access for racks, envelope spaces for local cranes, etc.).

5. INTERFACE BREAKDOWN

The Bifrost instrument has been split in to;

- Area 01 – BEER top assembly
- Area 02 – In-bunker
- Area 03 – Bunker Wall
- Area 04 – D03
- Area 05 – E02
- Area 06 – Experimental Cave
- Area 07 – Control Hutch & Sample Preparation Area

Example:

The description of the interface No.1 for the Safety Shutter located in the hall D03will be

Instrument: BEER

Area: D03

Assembly: Safety Shutter

Interface number: 01

Interface notation:BEER.04-D03.01

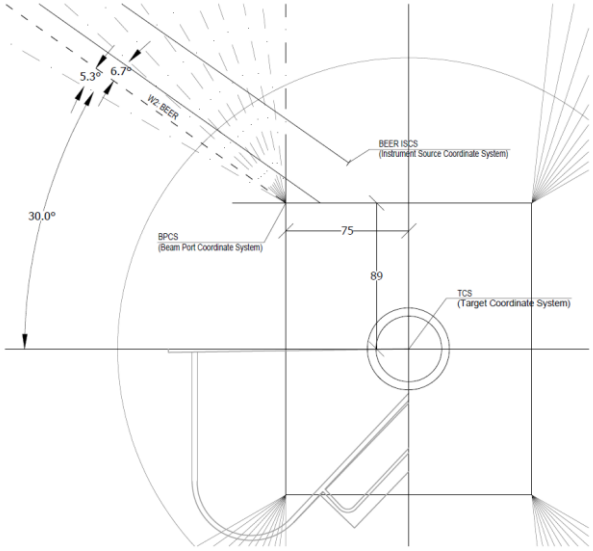
6. SYSTEM INTERFACES FOR BEER

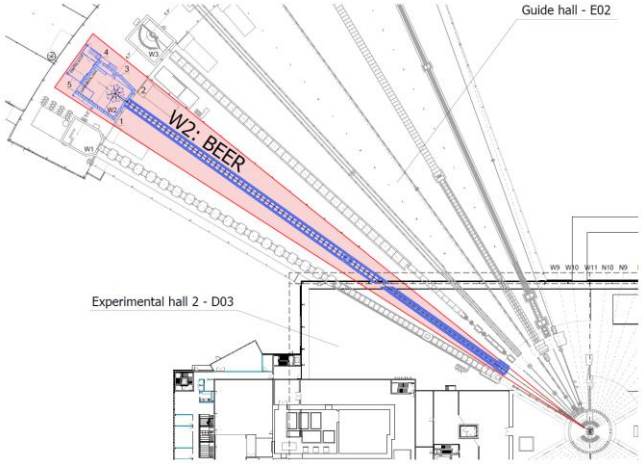
6.1. BEER Interfaces – BEER top assembly

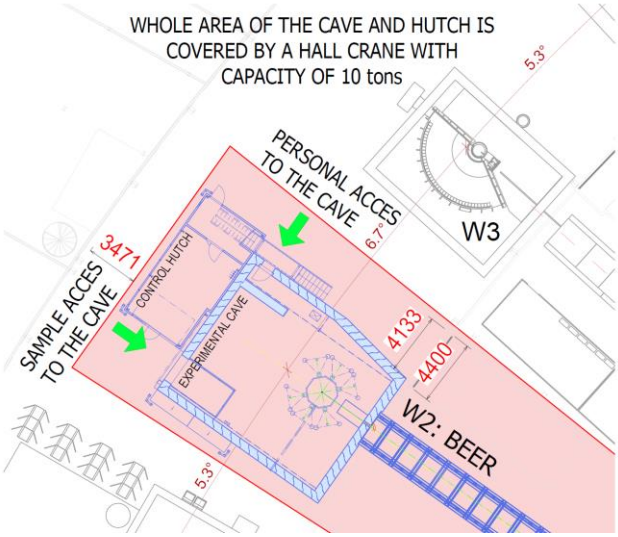
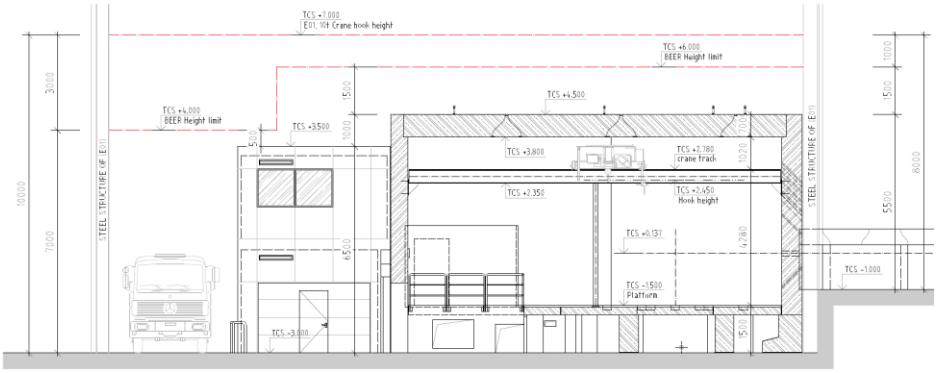
The BEER instrument is located in neutron port beam W02. The in bunker components will be installed in hall D02, while the rest of the components outside bunker wall, cave and hutch areas will be installed in hall D03, E02 and E01.

Table 1 describes the location within the ESS facilities.

Table 1 - BEER top assembly interfaces

#	ID	Interface
BEER top assembly	BEER.01-TOP.01	*Type:* **Boundary** *Description:* **BEER instrument and the main coordinate system** Each instrument has been allocated a beam port position in the instrument suite, which is position W02 for BEER. A set of references are provided for coordinate systems like TCS, focal points, ISCS and angles for the beam ports to facilitate the proper integration of the 3D models. These will be needed as references for the future installation and alignment of the instrument. The relation between the main coordinat systems is shown in Figure below - TCS, FP, ISCS (BEER).  *Reference:* • ESS – 0035090, Main coordinate systems at the ESS.

#	ID	Interface
BEER top assembly	BEER.01-TOP.02	*Type*: **Boundary** *Description:* **Neighbouring instruments** The structure part of the BEER instrument was designed inside the out-of-bunker envelope intended for the instrument. The area of the BEER envelope was defined by ESS in the file layout.dwg (provided by ESS on 3/7/2017). During the design phase, one collision with neighbouring instruments was detected. It was a collision of the adjacent shutter pit walls of the BEER and NMX instruments. The collision was removed by changing the composition of the adjacent wall on the BEER side. Since the beamline shielding was moved to the ESS common shielding solving a future possible collision is up to the ESS common shielding. Outline of the BEER envelope is shown in the figure below.  *Reference:* • ESS – 0083838, BEER Instrument 3D model.

#	ID	Interface
BEER top assembly	BEER.01-TOP.03	*Type:* **Hardware** *Description:* **Logistics in E01** The basic parameters for logistics near the cave and hutch in E01 are shown in the figures below.  LONGITUDAL SECTION SCALE 1:100  *Reference:* • ESS-0403282, ESS - Instrument Technical Interfaces. • ESS-0462073, drawing No. EGP5043-D-181858, General technical report - Annex 1: GENERAL LAYOUT.

6.2. BEER Interfaces – In-bunker

Table 2 - BEER In-bunker interfaces

#	ID	Interface

6.3. BEER Interfaces – Bunker Wall

Table 3 - BEER Bunker Wall interfaces

#	ID	Interface

6.4. BEER Interfaces – D03

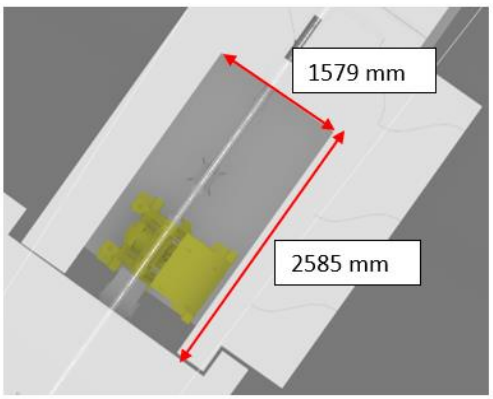
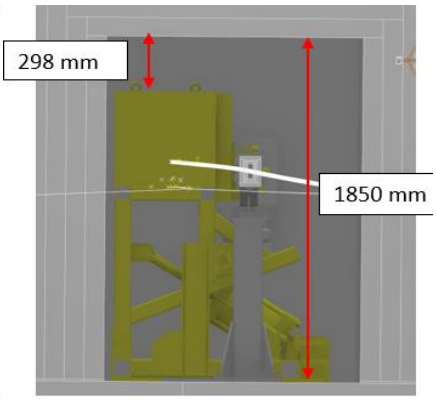
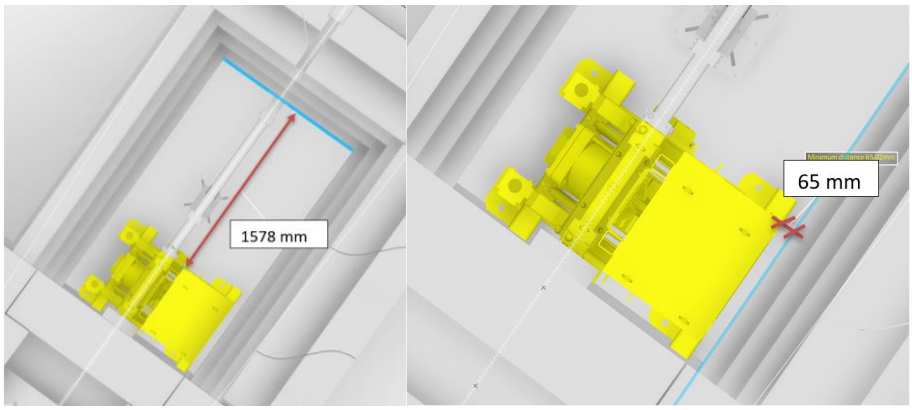
In D03, just after the bunker wall and the bunker wall feedthrough, there is the safety shutter mounted upon base shielding blocks and placed inside a pit shielding assembly. Just after the safety shutter, there is the guide within its vacuum housing that runs until the E02 wall. The guide is also mounted upon base shielding blocks. There is a shielding structure along and around the guide in the whole length of the hall. The base blocks as well as other shielding structures will be designed and provided by ESS Common Shielding Project.

BEER parts situated inside the D03 – PBS identification

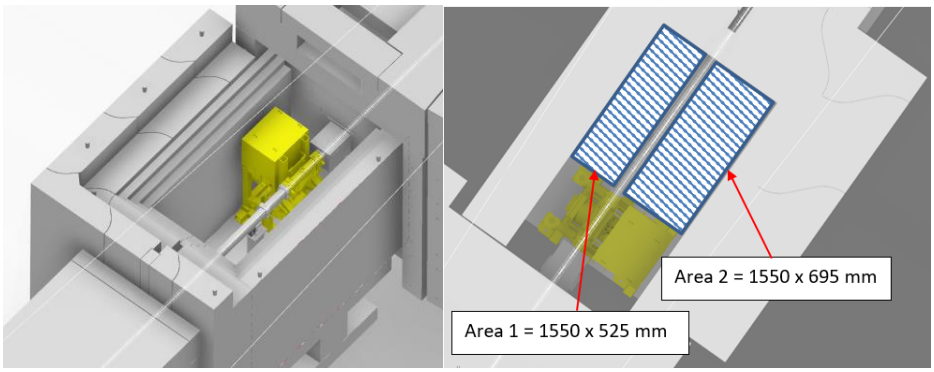
- 13.6.6.1.8.3 – Safety Shutter,
- 13.6.6.1.2.1.4 – Transport Guide,
- 13.6.6.1.2.2 – Guide hosuing (vacuum) – out of the bunker part,
- 13.6.6.1.2.3 – Guide support system – out of the bunker part.

Table 4 describes the interfaces with the different systems in D03. It shall be updated as further sub-systems are developed.

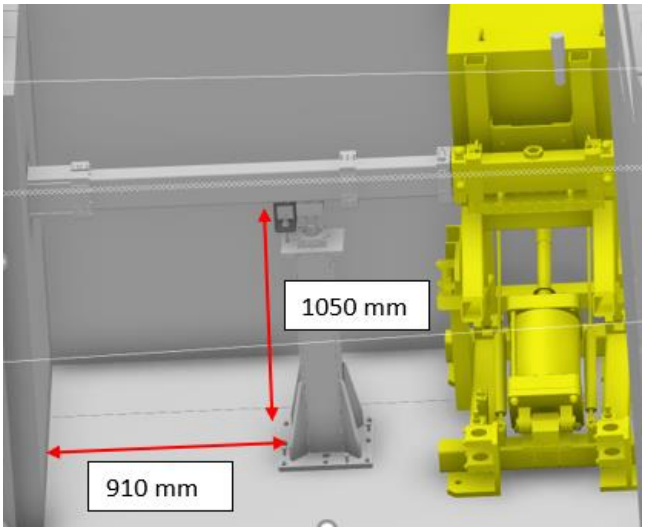
Table 4 - Interfaces within D03

#	ID	Interface
Safety Shutter	BEER.04-D03.01	*Type:* **Boundary** *Description:* **Inner dimensions of the shutter pit. Spatial coordination.** Inner dimensions of the shutter pit are shown in pictures 1 and 2. The location of the shutter inside the shutter pit is shown in pictures 2 to 4. The shutter is directly placed on the shutter pit floor consisting of concrete base blocks (base blocks are part of common shielding).   Picture 1, 2 – Inner width, length and height of the shutter pit.  Picture 3, 4 – Distance between the shutter shielding block and the back wall of the shutter pit, and between shutter shielding block and the side wall of the shutter pit (shutter in opened position). *Reference:* • ESS – 0083838, BEER Instrument 3D model (ESS-0431220 EGP assembly in the ESS CATIA).

#	ID	Interface
Safety Shutter	BEER.04-D03.02	*Type:* **Hardware** *Description:* **Access for maintenance** Access for maintenance of the shutter in the shutter pit is done from the top of the shutter pit after removal of the shutter pit ceiling (see Picture 1). Main lifting operations are performed by crane hook that can reach space above the shutter. Maintenance of the shutter requires operator actions inside the shutter pit. Available space for operator in the shutter pit is shown in Picture 2 and 3.



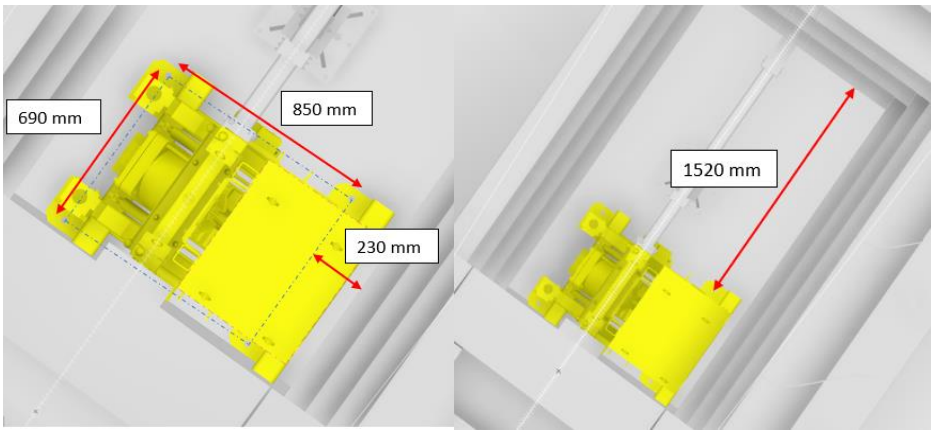
Picture 1, 2 – shutter pit with removed ceiling, space for operator inside the shutter pit.

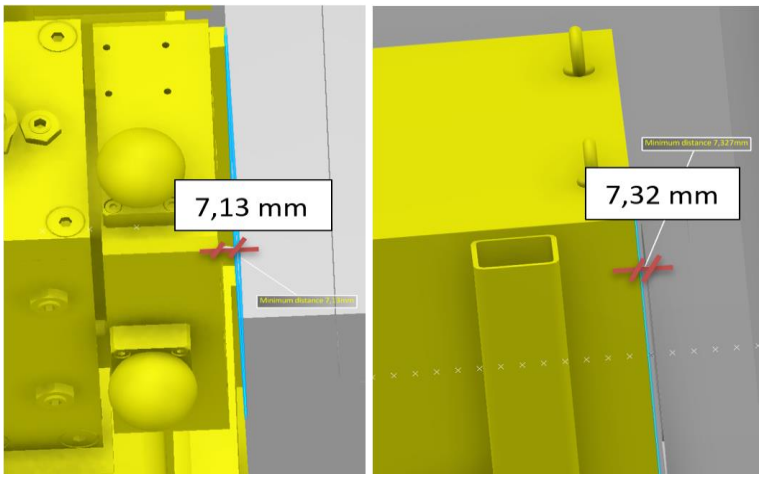


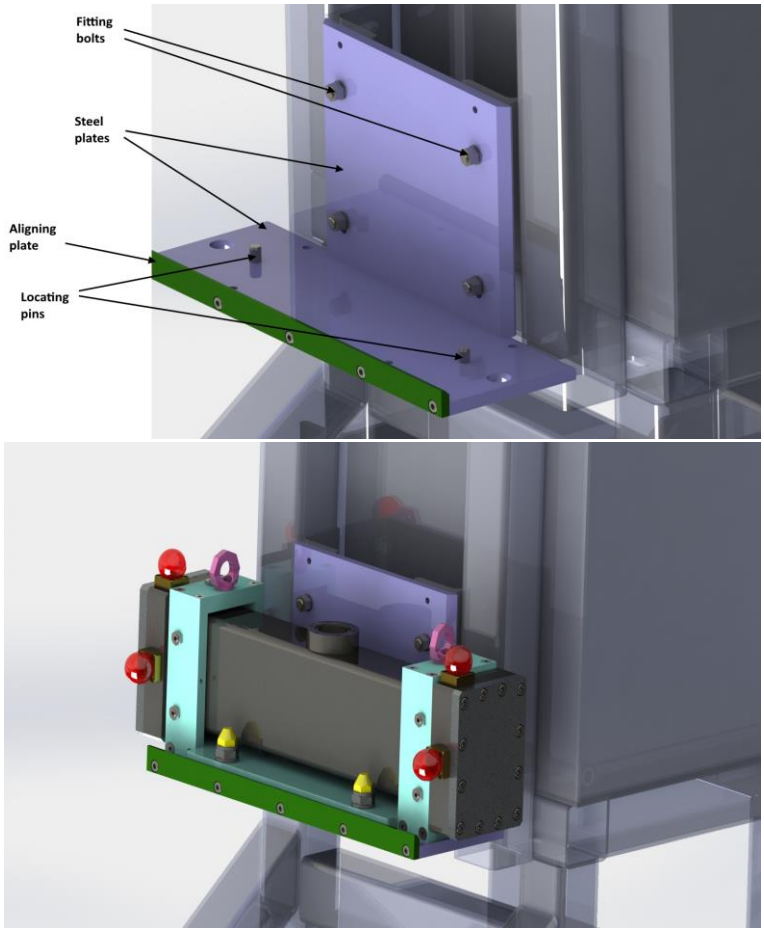
Picture 3 – Space under the neutron guide.

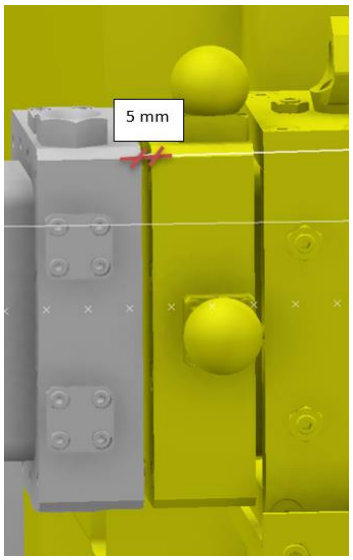
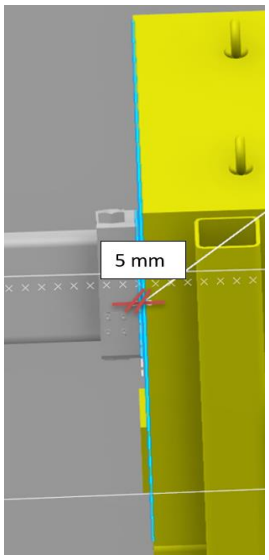
Reference:

- ESS – 0083838, BEER Instrument 3D model.
- ESS-1407431, document No. BEER-CV-900014-T, Technical report.

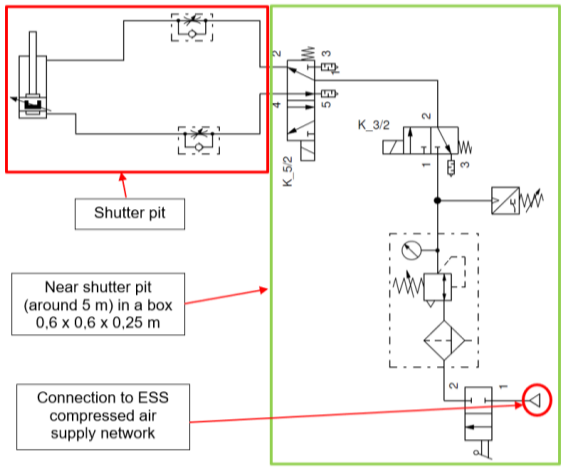
#	ID	Interface
Safety Shutter	BEER.04-D03.03	*Type:* **Contact** *Description:* **Fixing to the floor (to the concrete base blocks)** The shutter is directly placed on the shutter pit floor (support blocks) and is anchored by four M20 screws in chemical anchorages. The location of the anchoring screws are shown in Picture 1 and 2. Total number of anchoring screws: 4  Picture 1, 2 – Distance between the four shutter anchoring screws and distance between anchoring screws and side and back wall of the shutter pit. *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-1407431, document No. BEER-CV-900014-T, Technical report. • ESS-1417768, drawing No. BEER-CV-900036d, DPS01.06 -Shutter - Interface with shutter pit.

#	ID	Interface
Safety Shutter	BEER.04-D03.04	*Type:* **Boundary** *Description:* **Bunker wall insert** The distance between the shutter neutron guide and the bunker wall insert (shutter opened) is shown in picture 1 on the left. The distance between the shutter shielding and the bunker wall insert (shutter closed) is shown in picture 1 on the right.  Picture 1 – Distance between shutter neutron guide and bunker wall insert (on the left) and distance between the shutter shielding and the bunker wall insert (on the right) *Reference:* • ESS – 0083838, BEER Instrument 3D model.

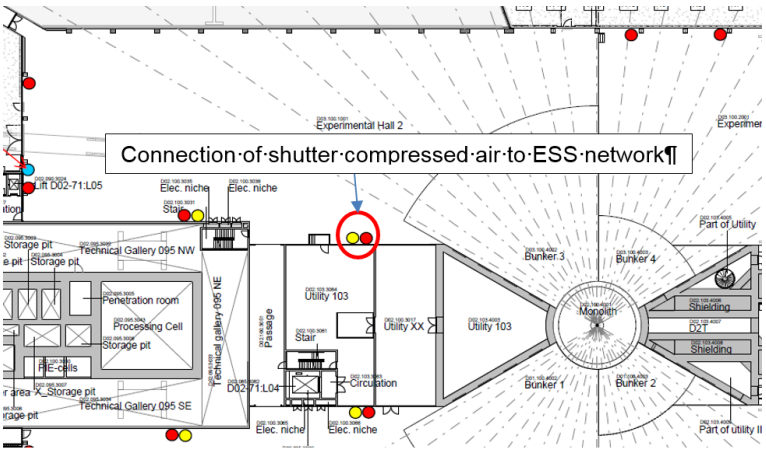
#	ID	Interface
Safety Shutter	BEER.04-D03.05	*Type:* **Contact** *Description:* **Interface between the shutter insert (GSH2) and the safety shutter** The vacuum housing of the shutter insert is fixed through a mounting unit to the structure of the safety shutter. The mounting unit consists of two perpendicularly welded steel plates, fitting bolts, aligning plate and locating pins for positioning the vacuum housing.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS–1812156, drawing No. MR439-1000-00 (MR439-1000-00.pdf), MR439-1100-00 (MR439-1100-00.pdf), MR439-1110-00 (MR439-1110-00.pdf).

#	ID	Interface
Safety shutter	BEER.04-D03.06	*Type:* **Boundary Interface** *Description:* **Shutter pit insert** The distance between the shutter neutron guide and the shutter pit insert (shutter opened) is shown in picture 1. The distance between the shutter shielding block and the shutter pit insert (shutter closed) is shown in picture 2.   *Reference:* • ESS – 0083838, BEER Instrument 3D model.
Safety shutter	BEER.04-D03.07	*item unoccupied*

Safety shutter	BEER.04-D03.08	*Type:* **Service** *Description:* **Connection to compressed air** The preliminary scheme of compressed air distribution to shutter pneumatic cylinder is shown in picture 1. The interface shall be the connection to shutter pneumatic cylinder (welding or connector) to the ESS compressed air system in picture 1. The location of the possible outlet between the shutter and the compressed air supply is shown in picture 2. Requirement pressure of the compressed air is 6 bars.



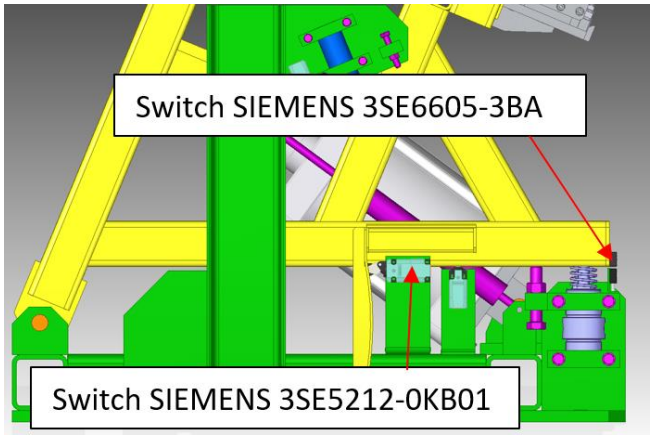
Picture 1 – Preliminary scheme of compressed air distribution to pneumatic cylinder.

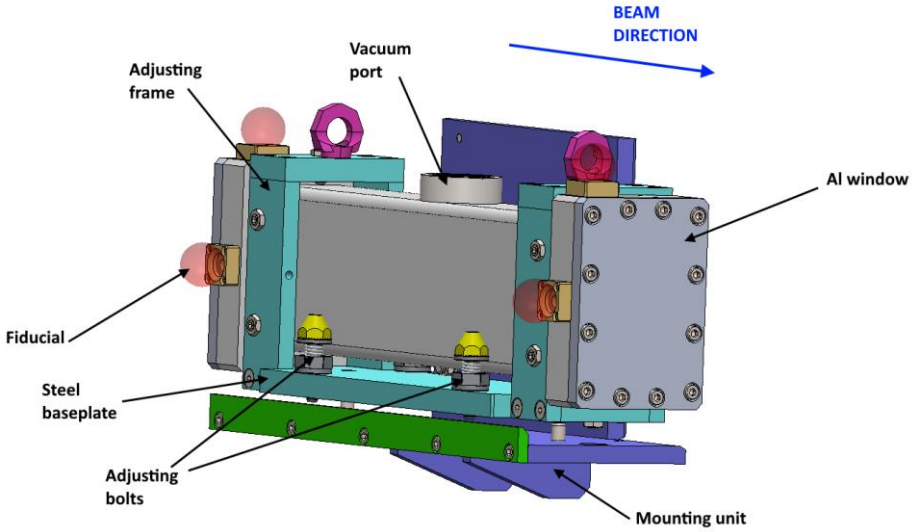
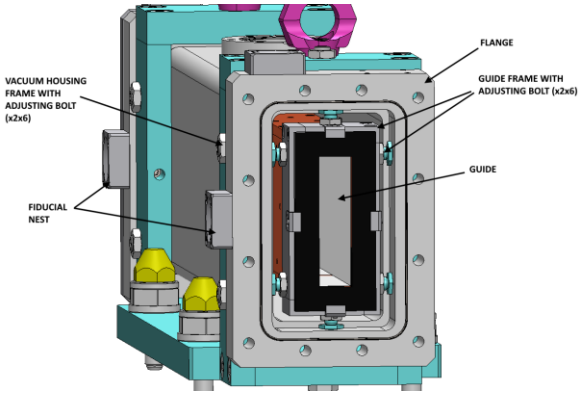
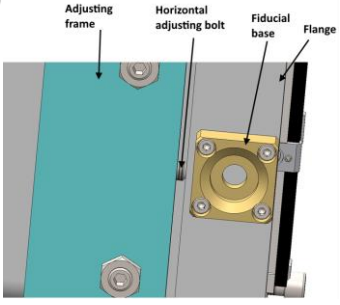


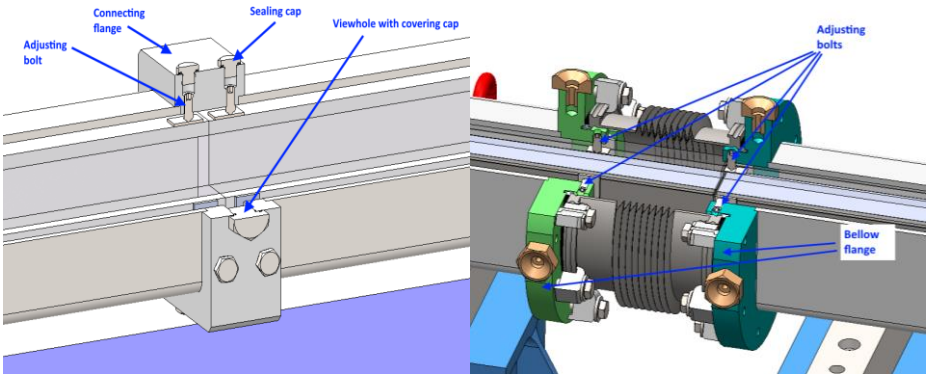
Picture 2 – Location of possible outlet of the ESS compressed air system to connect the safety shutter.

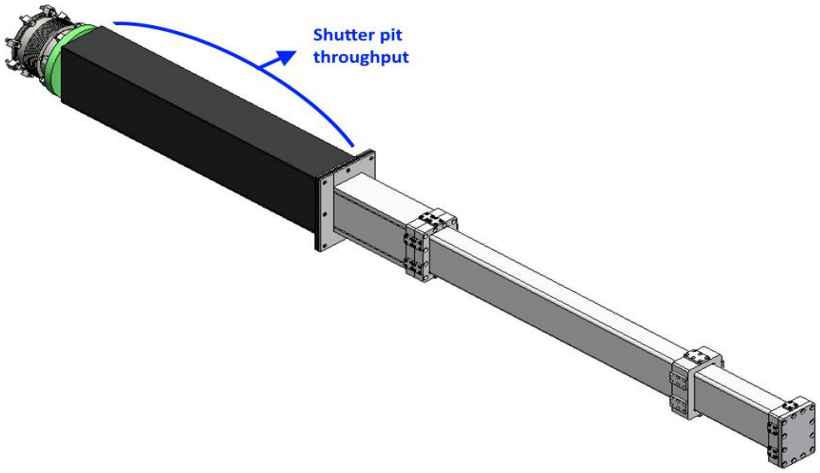
Reference:

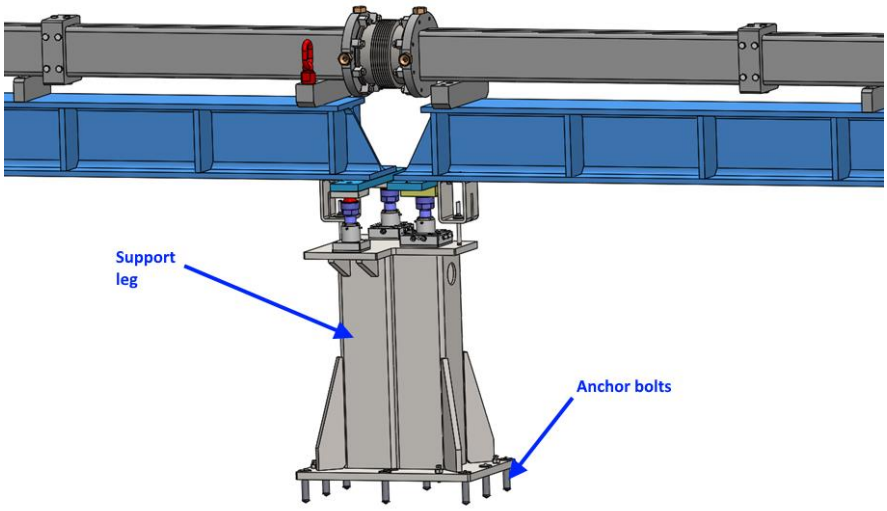
- ESS-0046984, drawing DM--ID-TBSIDD----Outlets in D E Experimental halls.
- ESS-1407431, document No. BEER-CV-900014-T, Technical report.

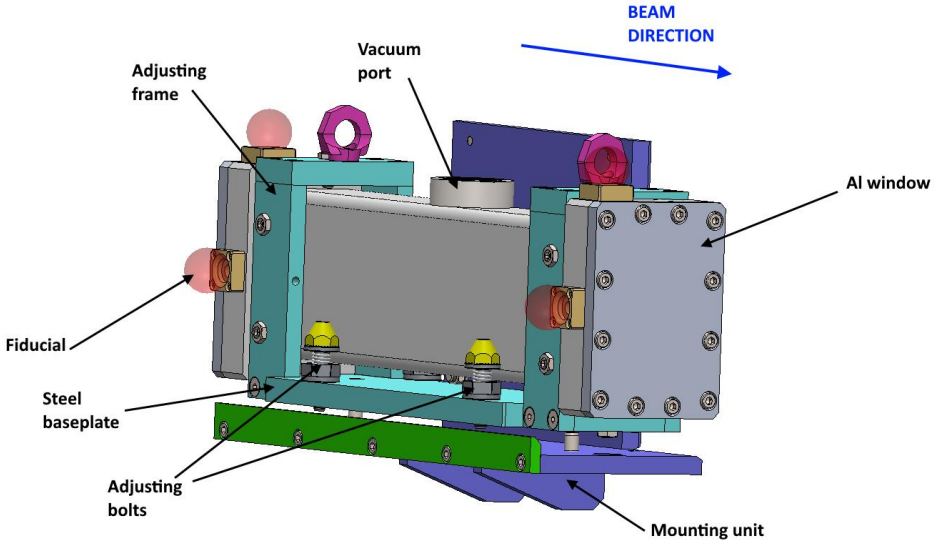
#	ID	Interface
Safety shutter	BEER.04-D03.09	*Type:* **Service Interface** *Description:* **Connection to Personal Safety System** The interface are the two PSS switches used to detect the shutter closed position (see picture 1).  Picture 1 – View of PSS switch to detect the shutter closed position. *Reference:* • ESS-1407431, document No. BEER-CV-900014-T, Technical report.

#	ID	Interface
Neutron guides system	BEER.04-D03.10	*Type:* **Hardware** *Description:* **Access for maintenance and alignment** Alignment of the neutron guide in the safety shutter system (guide section ID W02-13) is done by moving the whole vacuum housing by inbuilt bolts in the adjusting frame. Vertical alignment of the housing is done by a spring bolt mechanism which is accessible from above from long distance. Adjusting bolts with straining screws are attached around the guide for vertical and horizontal positioning inside the vacuum housing.  For the alignment and common maintenance of the neutron guide in the safety shutter system, a personal access through the pit wall and pit ceiling is necessary. For the adjustment of the vacuum housing by the alignment frames at both ends of the guide, the whole space around the guide has to be accessible.  

#	ID	Interface
Neutron guides system	BEER.04-D03.10	Alignment of the rest of the guides in D03 are done by adjusting screws through different types of flanges. The connecting flange has sealing caps which covers the adjusting screws. For accessing the bellow flange's adjusting bolts the bellow must be disassembled. Adjusting must be done with a pressurized system. The single connecting flanges have viewholes at their side, these have sealed covering caps. For the alignment and the common maintenance of the rest of the neutron guides, a personal access directly to the area of each bellow and alingment frames (at least 250 mm long section for bellows and 200 mm for alignment frames, approx 42 positions) through the ceiling and wall of the beamline shielding is necessary.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS - 1812156, drawing No. MR439-1100-00 (MR439-1100-00.pdf). • ESS-0432372 BEER – Systems Oprations & Maintenance Manual.

#	ID	Interface
Neutron guides system	BEER.04-D03.11	*Type:* **Hardware** *Description:* **Shutter pit wall** A wall insert is used where the guide passes the shutter pit wall. The wall insert (section ID W02-14) is provided with a steel casing and Mirrobor shielding. Outer dimensions of the wall insert: 206 (width) x 260 (height) x 1000 mm (length).  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS - 1812156, drawing No. MR439-2000-00 (*MR439-2000-00.pdf*).

#	ID	Interface
Neutron guides system	BEER.04-D03.12	*Type:* **Contact** *Description:* **Fixing the support structure to the floor (to the base concrete blocks) in D03** The neutron guides and their beams with the kinematic stands are sitting on support legs which are fixed to the floor by Hilti HSC-I M10x50 anchor bolts, DIN 912 M10x60 hex head bolts and M10 washers. Total number of the bolts per one leg: 8 pieces of anchors, 8 pieces of wachers and 8 pieces of bolts.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS - 1812156, drawing No. MR439-2040-00 (*MR439-2040-00.pdf*), drawing No. MR439-3030-00 (*MR439-3030-00.pdf*), drawing No. MR439-3040-00 (*MR439-3040-00.pdf*), drawing No. MR439-4312-00 (*MR439-4312-00.pdf*), drawing No. MR439-4322-00 (*MR439-4322-00.pdf*).

#	ID	Interface
Neutron guides system	BEER.04-D03.13	*Type:* **Services** *Description:* **Connection to vacuum** To connect the vacuum to the safety shutter insert (section ID W02-13), an ISO-CF 40 vacuum port is designed at the top of the shutter insert.  The vacuum ports are designed on the vacuum houses in hall D03 at the following ISCS coordinates: • 28307 mm (vacuum port CF 40), • 32515 mm (vacuum port KF 40), • 52515 mm (vacuum port KF 40). The height of the CF 40 vacuum port is 22mm, the height of the other vacuum ports (KF 40) is 25mm. *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS - 1812156, drawing No. MR439-0000-00 (*MR439-0000-00.pdf*).

6.5. BEER Interfaces – E02

The transport guide continues in E02. There is also a chopper at 80 meters and the first slit in hall E02. The beamline shielding structure incl. chopper pit will be designed and provided by ESS Common Shielding Project.

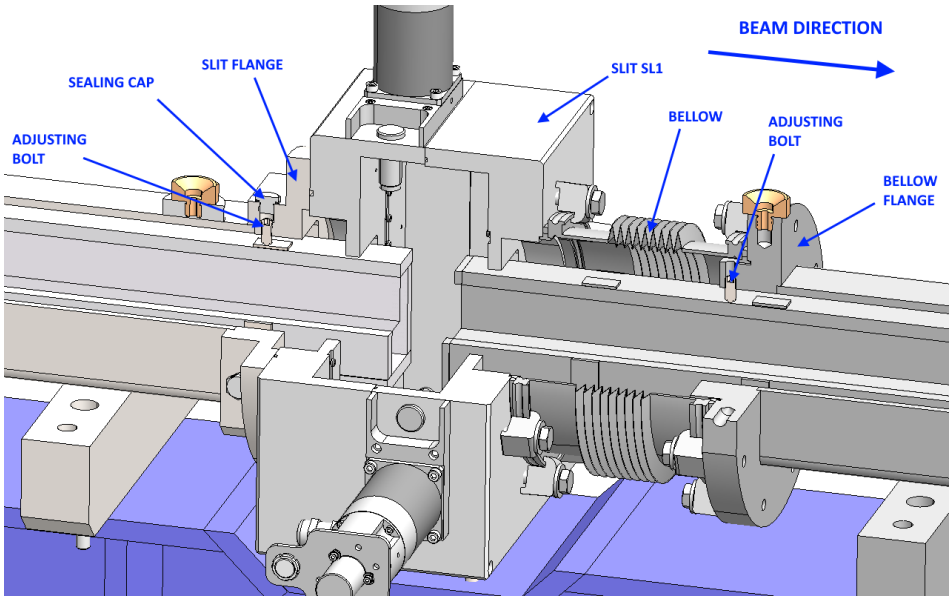
BEER parts situated inside the E02 – PBS identification

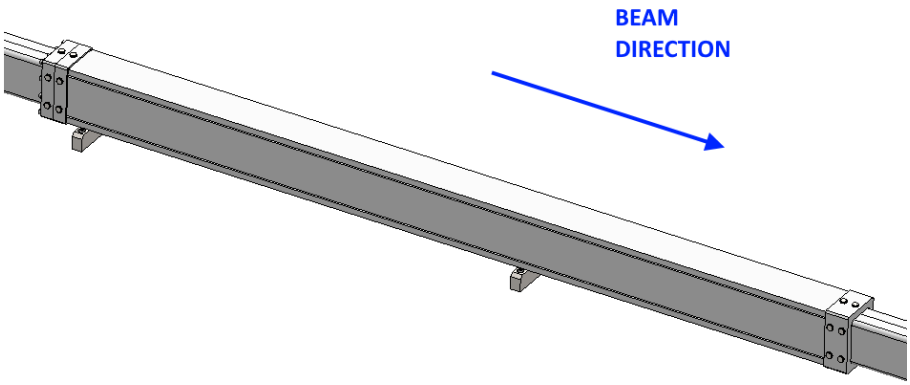
- 13.6.6.1.2.1.4 – Transport guide,
- 13.6.6.1.2.1.5 – Focussing guide,

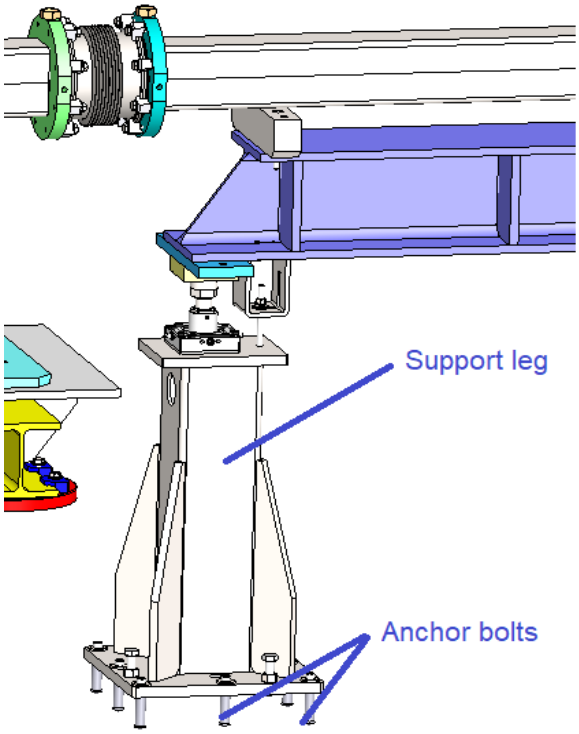
- 13.6.6.1.2.2 – Guide hosuing (vacuum) – out of the bunker part,
- 13.6.6.1.2.3 – Guide support system – out of the bunker part,
- 13.6.6.1.4.5 – Beam shaping slit system.

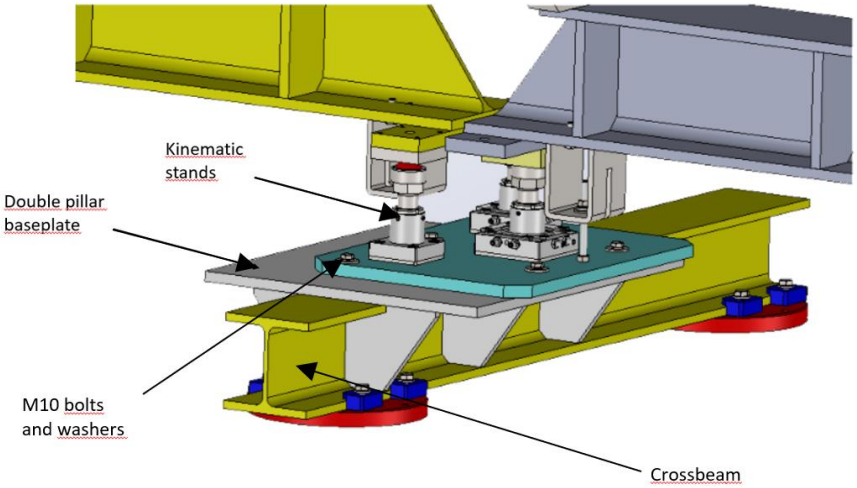
Table 5 describes the interfaces with the different systems in E02. It shall be updated as further sub-systems are developed.

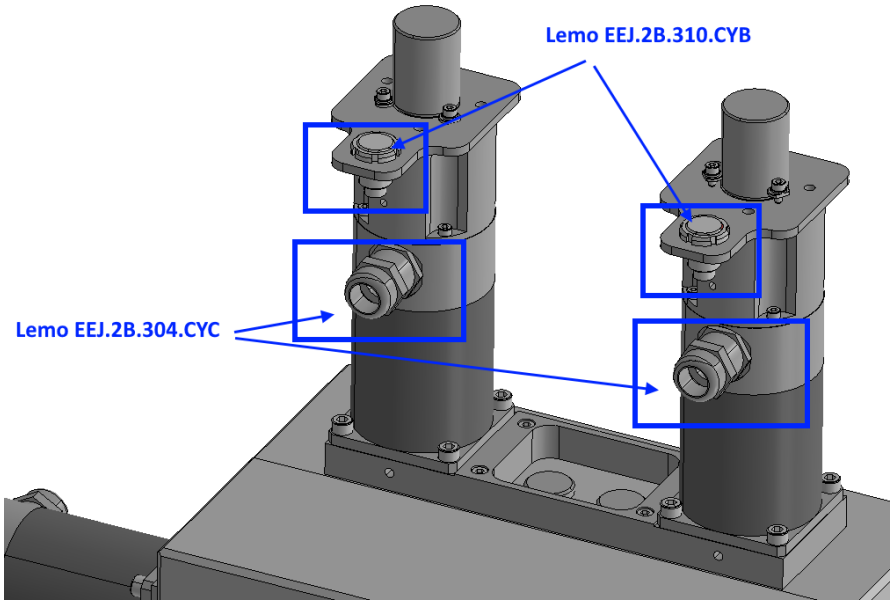
Table 5 - Interfaces within E02

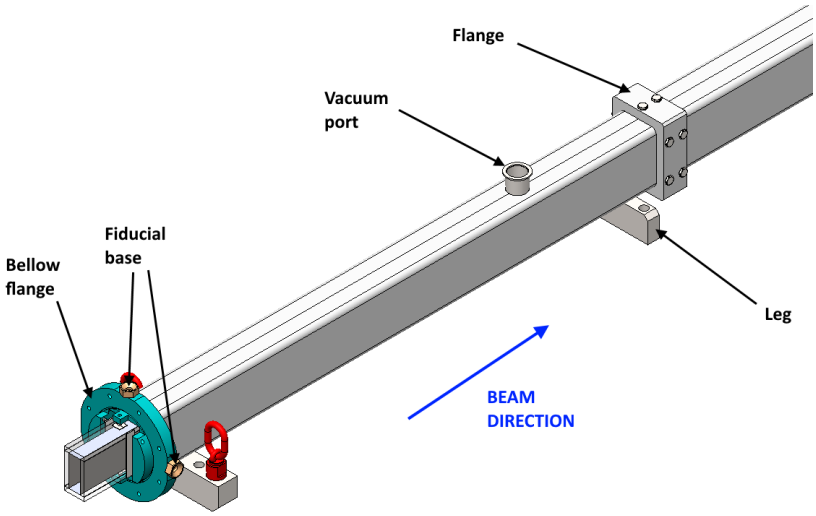
#	ID	Interface
Neutron guides system	BEER.05-E02.01	*Type:* **Hardware** *Description:* **Access for maintenance and alignment.** The neutron guides have access for alignment at various types of flanges. The aligment is done with adjusting screws. The connecting flange and the slit flange has sealing caps which covers the adjusting screws. For accessing the bellow flange's adjusting bolts the bellow must be disassembled. Adjusting must be done with a pressurized system. The single connecting flanges have viewholes at their side, these have sealed covering caps. For the alignment and the common maintenance of the rest of the neutron guides, a personal access directly to the area of each bellow and alingment frames (at least 250 mm long section for bellows and 200 mm for alignment frames, approx 60 positions) through the ceiling and wall of the beamline shielding is necessary.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS - 1812156, drawing No. MR439-7000-00 (*MR439-7000-00.pdf*). • ESS-0432372 BEER – Systems Oprations & Maintenance Manual.

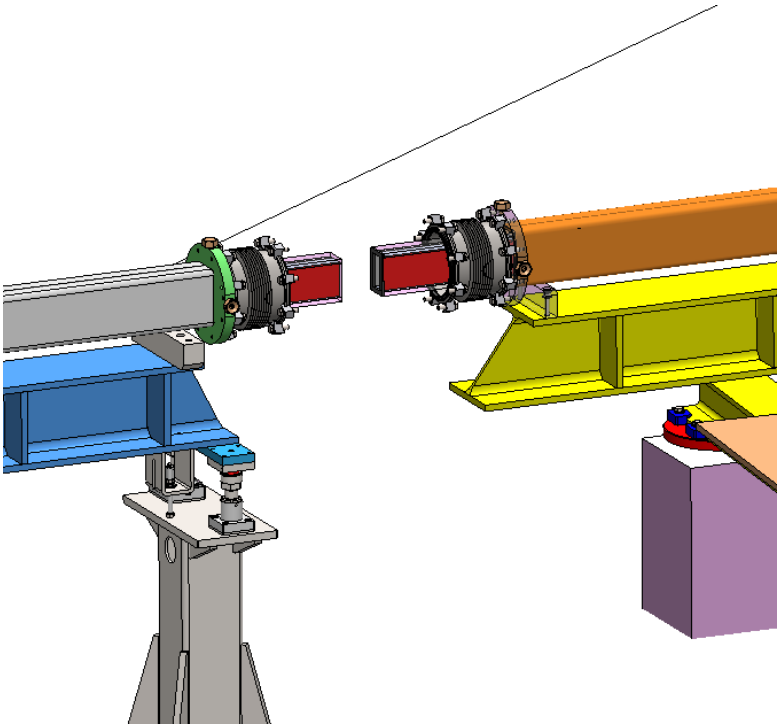
#	ID	Interface
Neutron guides system	BEER.05-E02.02	*Type:* **Hardware** *Description:* **Wall between D03/E02 - opening. Spatial coordination.** The segment where the vacuum housing passes through the wall between D03 and E02 halls, the guides are running in steel casing. Outer dimensions of the wall insert: 134 (width) x 174 (height) x 2473 mm (length).  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-4340-00 (*MR439-4340-00.pdf*).

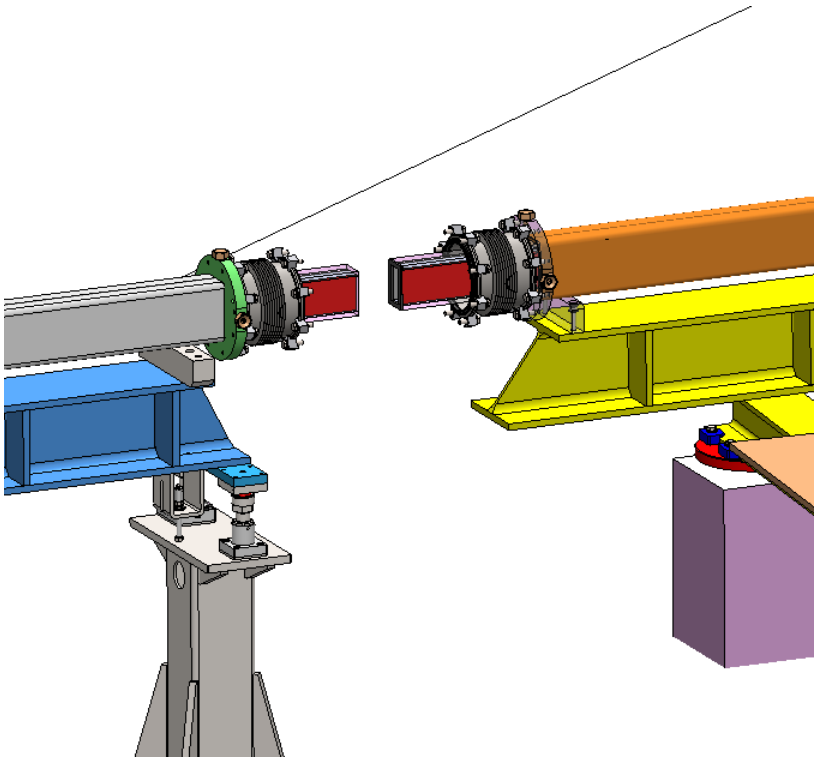
#	ID	Interface
Neutron guides system	BEER.05-E02.03	*Type:* **Contact** *Description:* **Fixing the support structure to the floor in E02.** The neutron guides and their beams with the kinematic stands are sitting on support legs which are fixed to the floor by Hilti HSC-I M10x50 anchor bolts, DIN 912 M10x60 hex head bolts and M10 washers. Total number of the bolts per one leg: 8 pieces of anchors, 8 pieces of wachers and 8 pieces of bolts.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS - 1812156, drawing No. MR439-4312-00 (*MR439-4312-00.pdf*), drawing No. MR439-4322-00 (*MR439-4322-00.pdf*).

#	ID	Interface
Neutron guides system	BEER.05-E02.04	*Type:* **Contact** *Description:* **Fixing the support structure to the piles in E02** The neutron guides and their beams with the kinematic stands are fixed to the crossbeam, through baseplates which are connected with M10 bolts (4 pieces) and M10 washers (4 pieces).  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-4370-00 (*MR439-4370-00.pdf*), drawing No. MR439-4380-00 (MR439-4380-00.*pdf*), drawing No. MR439-4390 (*MR439-4390.pdf*), drawing No. MR439-5010-00 (*MR439-5010-00.pdf*), drawing No. MR439-5010-00 (*MR439-5020-00.pdf*).

#	ID	Interface
Neutron guides system	BEER.05-E02.05	*Type:* **Services** *Description:* **Connection of the slit SL1 and its limit switches to power** The SL1 slit has 4 pieces of stepper motors, each of them have Lemo EEJ.2B.304.CYC type connectors. The motors have in-built AMCI R11X-J10/N resolvers which can be controlled through Lemo EEJ.2B.310.CYB connectors. Required parameters of the electrical connection: 60 V (DC) operating voltage. Each slit blade will be sensed by a Burgess F4T7YCGP limit switch at the fully opened position, the slit blade pairs will be sensed by Cinel UHC Microswitch Tipi3 switches at the fully closed position (where the gap is zero between the slit blades). Each slit blade has individual vacuum feedthrough (Lemo SJG.2B.306.CLAPV). All of the switches are operated by 24 V (DC) voltage.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-7000-00 (*MR439-7000-00.pdf*).

#	ID	Interface
Neutron guides system	BEER.05-E02.06	*Type:* **Services** *Description:* **Connection to vacuum** KF 40 vacuum ports are designed on the vacuum houses in hall E02 at the following ISCS coordinates: • 72415 mm • 92515 mm • 112515 mm • 132515 mm • 152515 mm  Required parameters of the vacuum connection: ISO KF40 The height of the KF 40 vacuum ports is 25mm. *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-0000-00 (*MR439-0000-00.pdf*).

#	ID	Interface
Neutron guides system	BEER.05-E02.07	*Type:* **Hardware** *Description:* **Chopper pit front wall** No direct contact of guide and chopper pit shielding is expected. The detail technical solution must be discussed after radiation calculations are performed and the shielding structure of the pit is designed by ESS common shielding.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-4000-00 (*MR439-4000-00.pdf*).
Neutron guides system	BEER.05-E02.08	*Type:* **Hardware** *Description:* **Chopper pit back wall** No direct contact of guide and chopper pit shielding is expected. The detail technical solution has to be discussed after radiation calculations are performed and the shielding structure of the pit is designed by ESS common shielding. *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-0000-00 (*MR439-0000-00.pdf*).

#	ID	Interface
Neutron guides system	BEER.05-E02.09	*Type:* **Contact** *Description:* **Connection to the chopper at 80 m - upstream** The technical solution on the interface needs to be solved in cooperation with the designer of the chopper. At the time of sub TG3.2 there are only preliminary assumptions. Edge welded DN 160 ISO bellow coupling: • axial stroke: 51.0 mm, • squeezed length: 11.3 mm, • free length: 39.0 mm, • stretched length: 62.3 mm, • end piece 2xISO-K 160, length: 44.0 mm, • whole length: 99.3 mm – 150.3 mm.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-4000-00 (*MR439-4000-00.pdf*).

#	ID	Interface
Neutron guides system	BEER.05-E02.10	*Type:* **Contact** *Description:* **Connection to the chopper at 80 m - downstream** The technical solution on the interface needs to be solved in cooperation with the designer of the chopper. At the time of sub TG3.2 there are only preliminary assumptions. Edge welded DN 160 ISO bellow couplings: • axial stroke: 51.0 mm • squeezed length: 11.3 mm • free length: 39.0 mm • stretched length: 62.3 mm • end piece 2xISO-K 160, length: 44.0 mm • whole length: 99.3 mm – 150.3 mm Reference: • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-4000-00 (*MR439-4000-00.pdf*).

6.6. BEER Interfaces – Experimental Cave

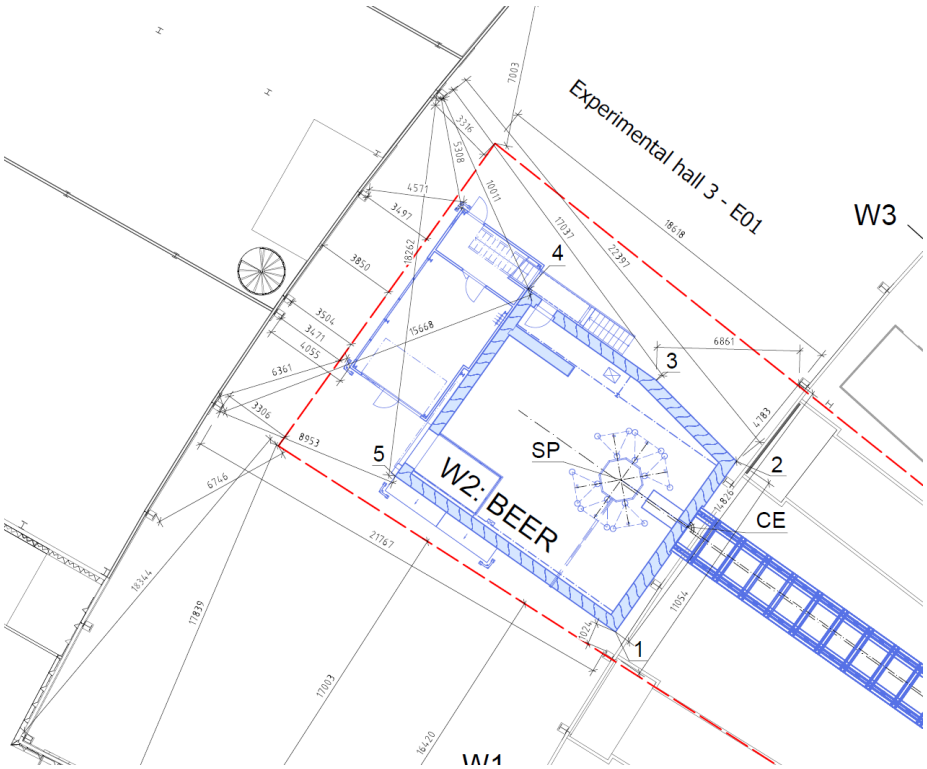
The cave is situated in hall E01. The structure of the cave consists of pre-cast concrete blocks. The cave is equipped with several technical utilities. On the platform inside the cave, there are detectors, exchanger, slits and other equipment needed to operate instrument. Heavy sliding doors and door for persons are designed to enter the cave.

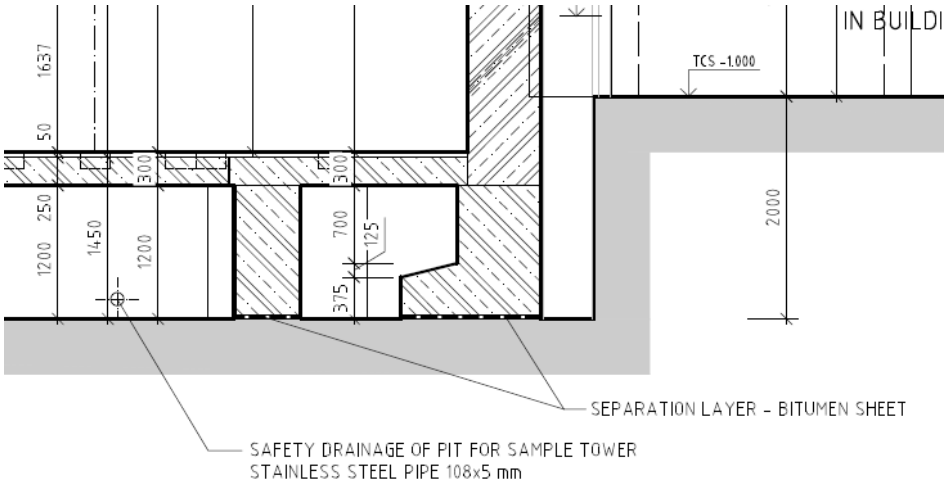
BEER parts situated inside the cave – PBS identification

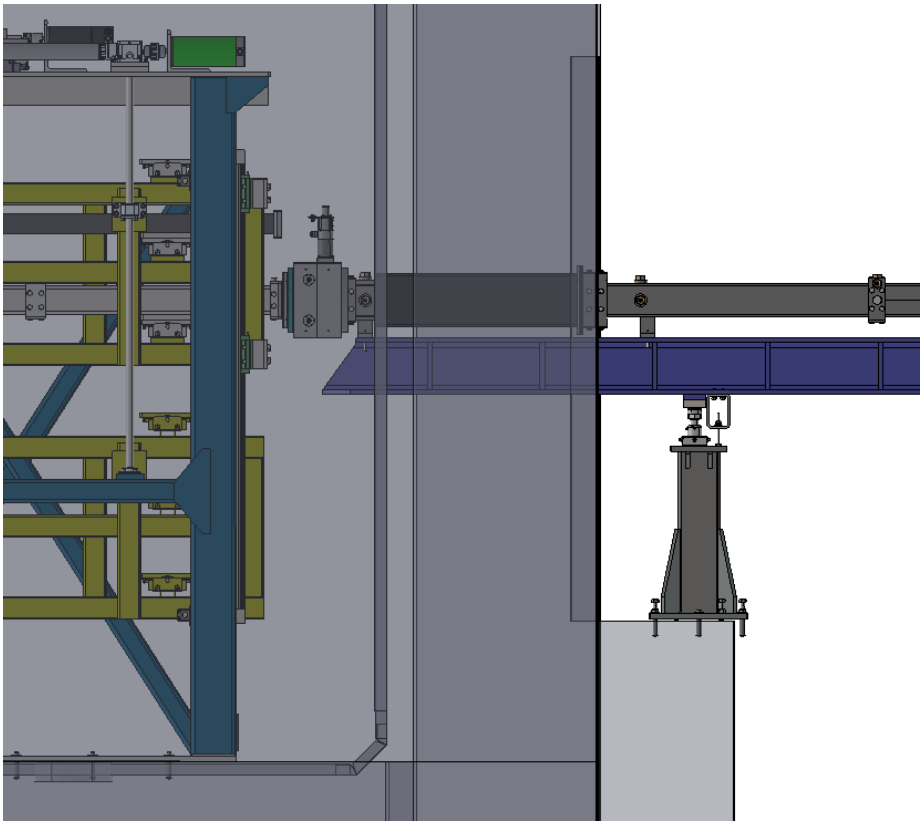
- 13.6.6.1.2.1.5 – Focussing guide,
- 13.6.6.1.2.2 – Guide hosuing (vacuum) – out of the bunker part,
- 13.6.6.1.2.3 – Guide support system – out of the bunker part,
- 13.6.6.1.4.5 – Beam shaping slit system,
- 13.6.6.1.8.6 – Beam Stop,
- 13.6.6.5.2 – Experimental cave Utilities distribution,
- 13.6.6.5.3 – Experimental cave Support Infrastructure,
- 13.6.6.5.4 – Experimental cave Shielding,
- 13.6.6.5.5 – Experimental cave Structure,
- 13.6.6.5.6 – Experimental cave Sample environment utilities supply.

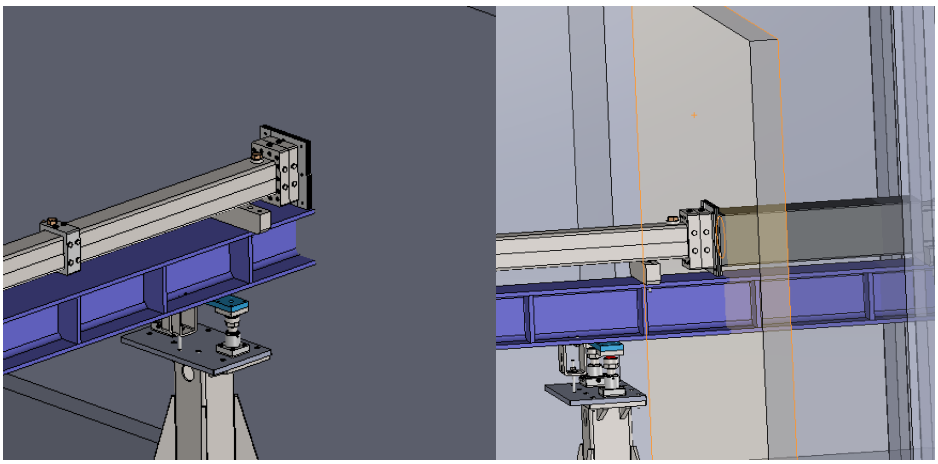
Table 6 describes the interfaces with the different systems in the experimental cave. It shall be updated as further sub-systems are developed.

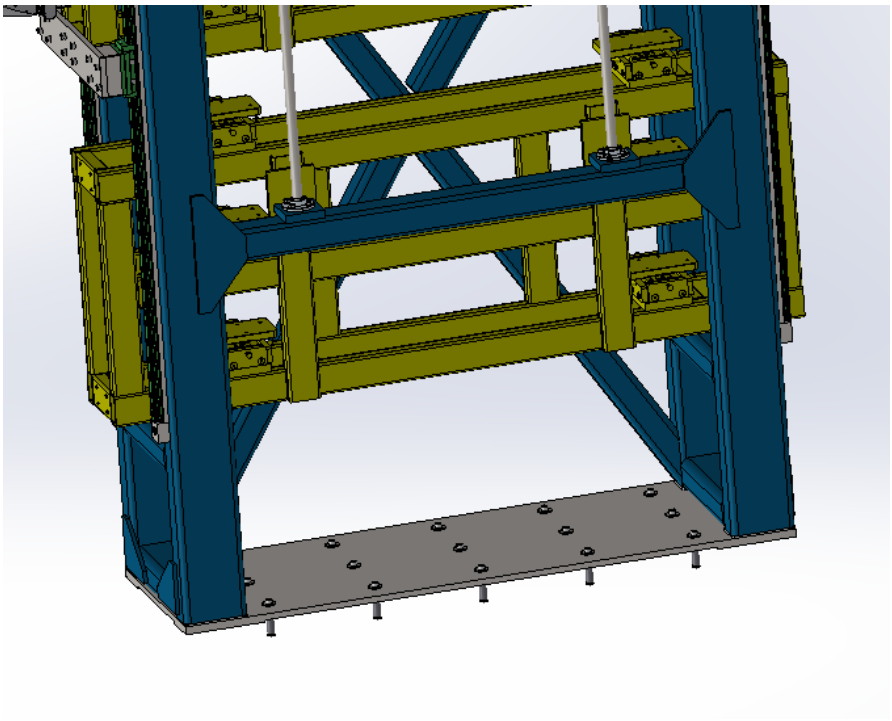
Table 6 - Interfaces in the experimental cave

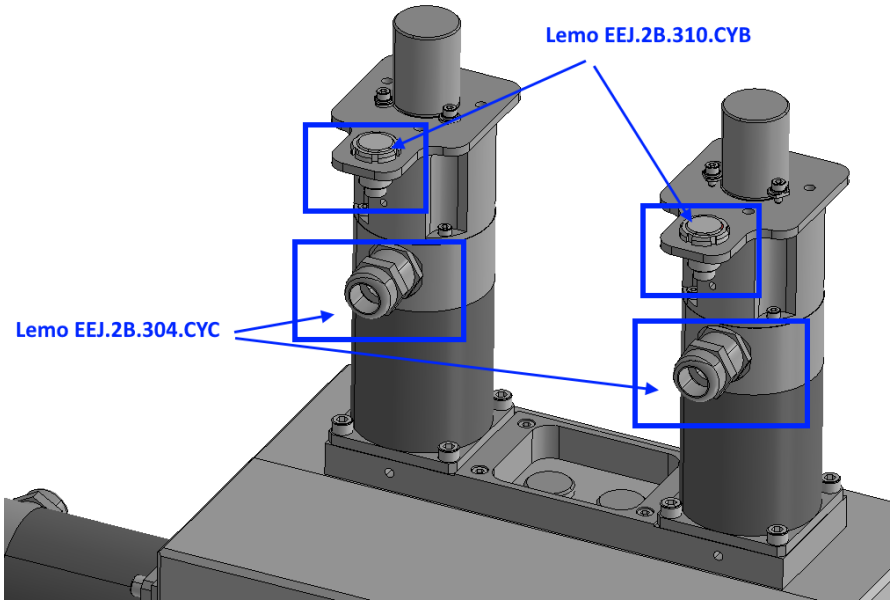
#	ID	Interface
Cave	BEER.06-Cave.01	*Type:* **Boundary** *Description:* **Position inside the hall E01. Spatial coordination.** The position of the cave to the related structures inside the E01 is shown in the figure below.  *Reference:* • ESS – 0083838, BEER Instrument 3D model.

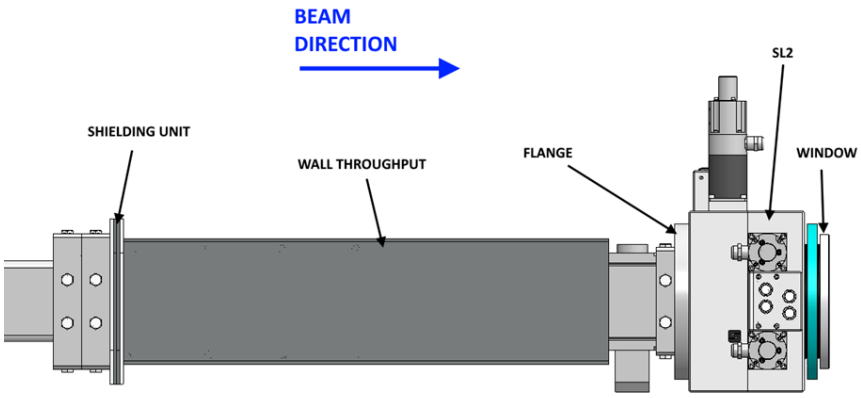
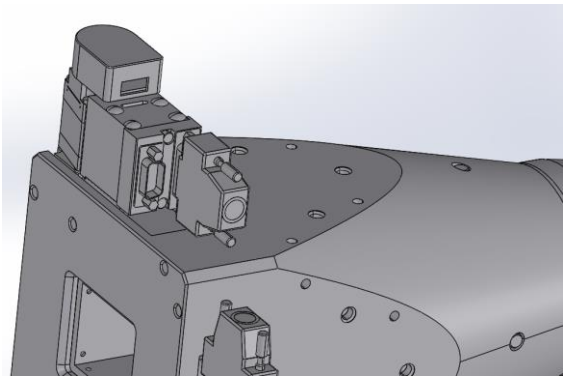
#	ID	Interface
Cave	BEER.06-Cave.02	*Type:* **Contact** *Description:* **Floor in the hall E01 (load and separation).** The load capacity of the floor in the hall E01 is 20 t/m^2 (according to the document ESS 0403282 Instrument Technical Interfaces) The resulting - maximum floor load from the structure of the cave is 22.34 t/m. It means, that the load is locally exceeded by 12% This exceedance has been verified by Tyréns in its assessment from 05/2019 and approved by ESS. Foundation blocks of the cave are separated from E01 floor slab by a strip of heavy bitumen sheet (SBS modified bitumen sheet with a fiberglass support insert) th=3.5 mm.  *Reference:* • ESS-0461627, document No. EGP5043-F-180584,Technical report. • ESS-0461614, drawing No. EGP5043-D-181789, Sections 1-1', 2-2', 6-6'. • ESS-0461615, drawing No. EGP5043-D-181790, Sections 3-3', 4-4', 5-5'. • ESS-0461611, document No. EGP5043-L-171492, Static analysis and technical report. • Static analysis of Experimental hall 3 (E01) floor slab, Tyréns (05/2019).

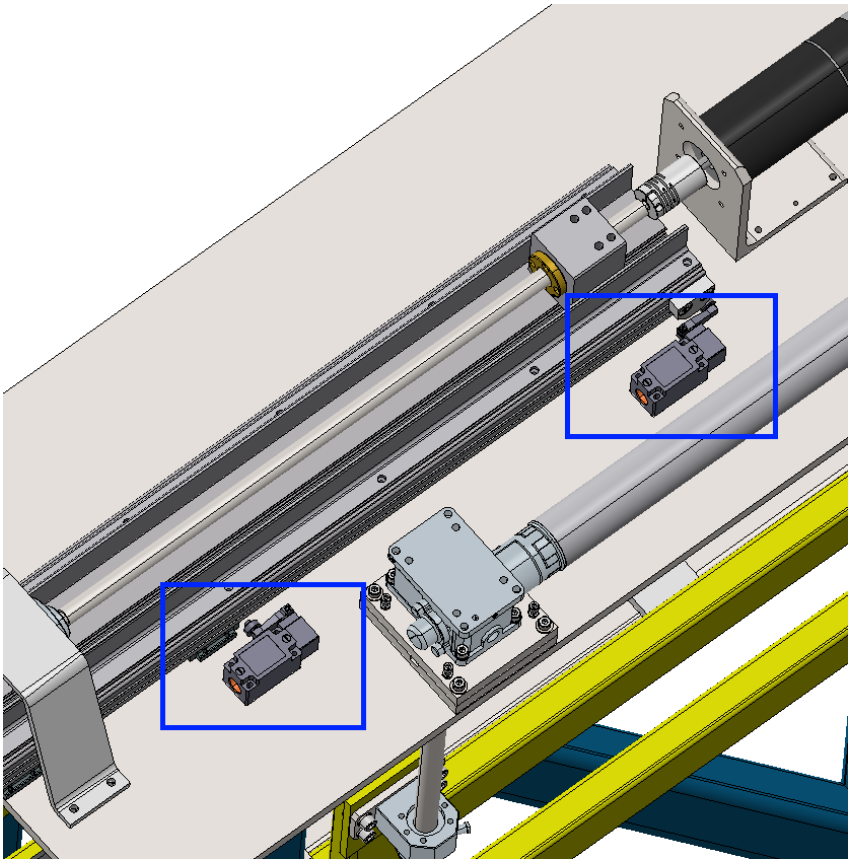
#	ID	Interface
Neutron guides system	BEER.06-Cave.03	*Type:* **Contact** *Description:* **Fixing the support structure to the concrete block in front of the cave** The neutron guides and their beams with the kinematic stands are sitting on support legs which are fixed to the floor with Hilti HSC-I M10x50 anchor bolts, DIN 912 M10x60 hex head bolts and M10 washers. Total number of the bolts per one leg: 8 pieces of anchors, 8 pieces of wachers and 8 pieces of bolts.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-7310-00 (*MR439-7310-00.pdf*); drawing No. MR439-7320-00 (*MR439-7320-00.pdf*).

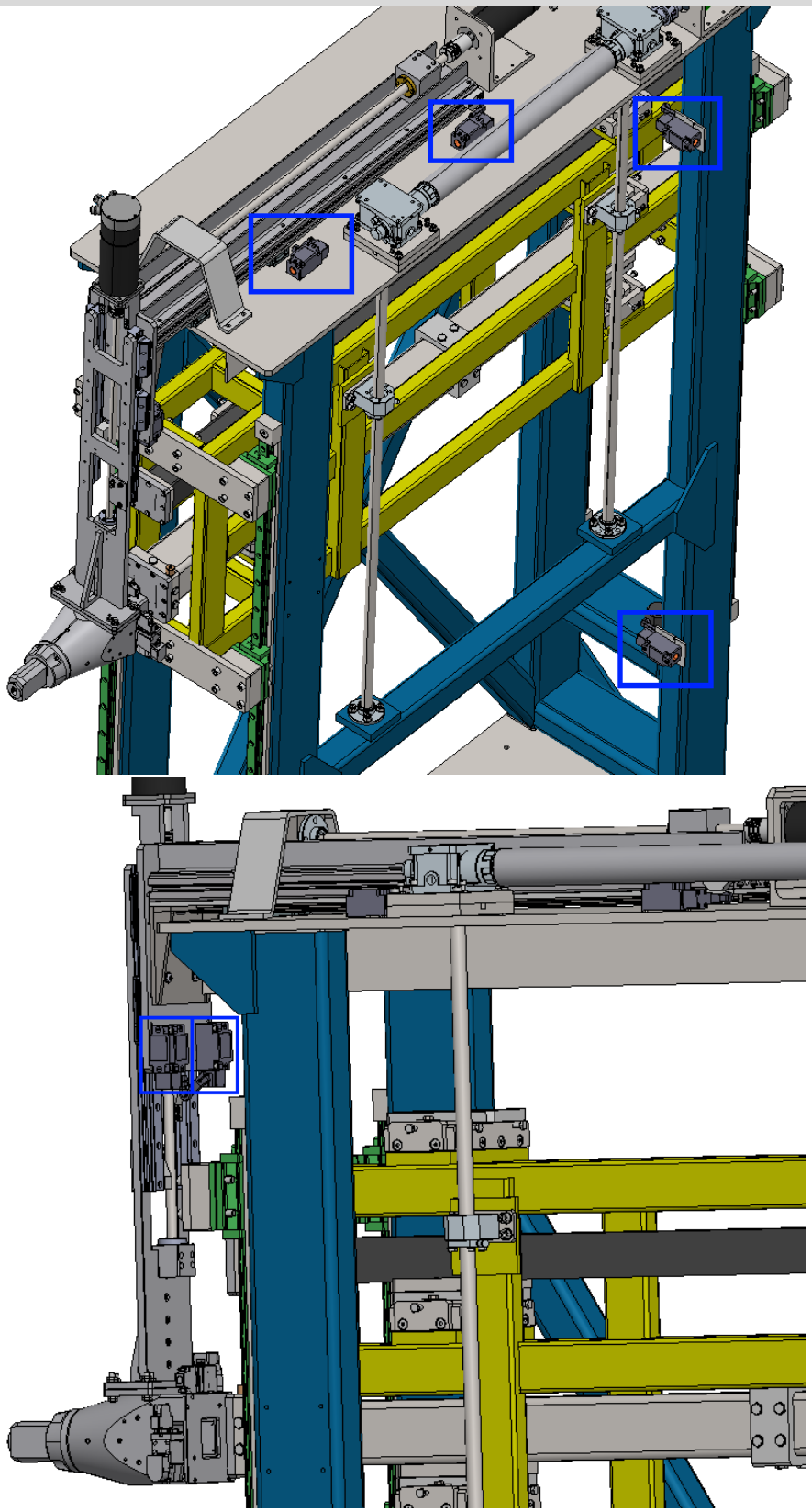
#	ID	Interface
Neutron guides system	BEER.06-Cave.04	*Type:* **Hardware** *Description:* **Cave front wall - throughput** A wall insert is used where the guide passes the cave front wall. The wall insert (section ID W02-19) is provided with a steel casing and Mirrobor shielding. Dimensions of the wall insert: 224 (width) x 244 (height) x 718 (length) mm. **Note:** Since the design of pre-cast concrete parts of the cave was made before the design of the neutron guides system, the opening in pre-cast concrete parts needs to be refined and adapted to the guide throughput before the pre-cast concrete parts are manufactured!  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-7000-00 (*MR439-7000-00-D.pdf*).

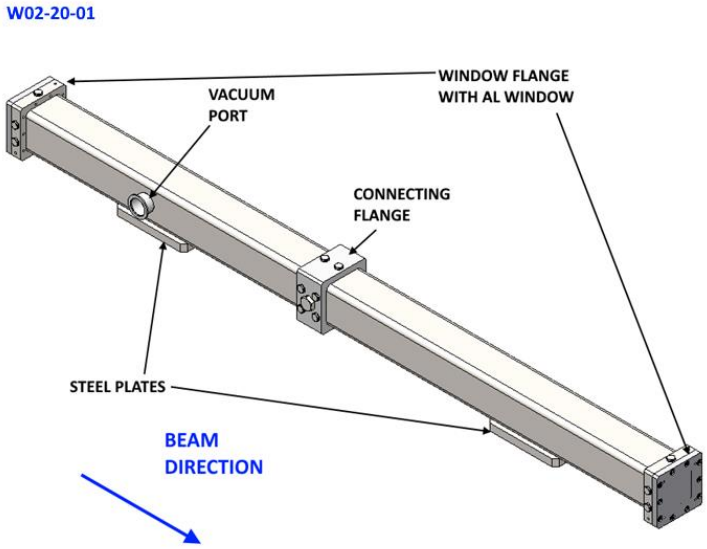
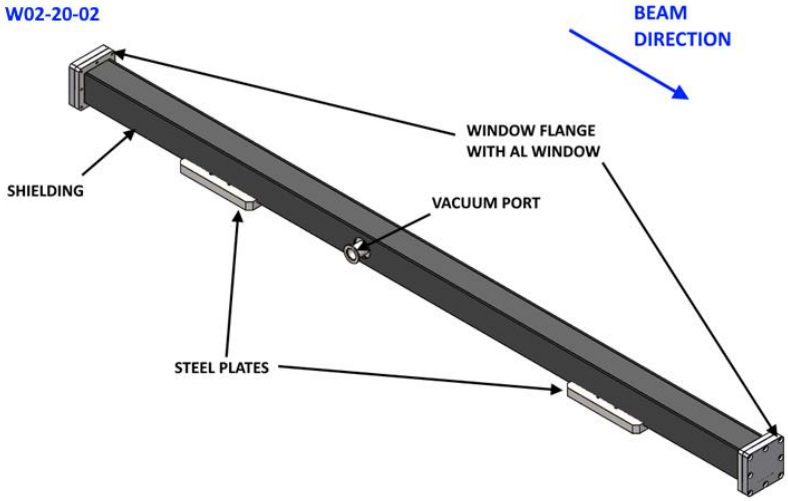
#	ID	Interface
Neutron guides system	BEER.06-Cave.05	*Type:* **Contact** *Description:* **Fixing the exchanger to the cave floor (to the separate concrete foundation)** The exchanger is provided by a 20 mm thick baseplate and it is fixed to the floor inside the cave by Hilti HSC-I M10x50 anchor bolts and DIN 912 M10x60 hex head bolts. Total number of the bolts: 15 pieces  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-8000-00 (Rev. B) (*MR439-8000-00.pdf*).

#	ID	Interface
Neutron guides system	BEER.06-Cave.06	*Type:* **Services** *Description:* **Connection of the slit SL2 and its limit switches to power** The SL2 slit has 4 pieces of stepper motors, each of them have Lemo EEJ.2B.304.CYC type connectors. The motors have in-built AMCI R11X-J10/N resolvers which can be controlled through Lemo EEJ.2B.310.CYB connectors. Required parameters of the electrical connection: 60 V (DC) operating voltage. Each slit blade will be sensed by a Burgess F4T7YCGP limit switch at the fully opened position, the slit blade pairs will be sensed by Cinel UHC Microswitch Tipi3 switches at the fully closed position (where the gap is zero between the slit blades). Each slit blade has individual vacuum feedthrough (Lemo SJG.2B.306.CLAPV). All of the switches are operated by 24 V (DC) voltage.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-7000-00 (*MR439-7000-00.pdf*).

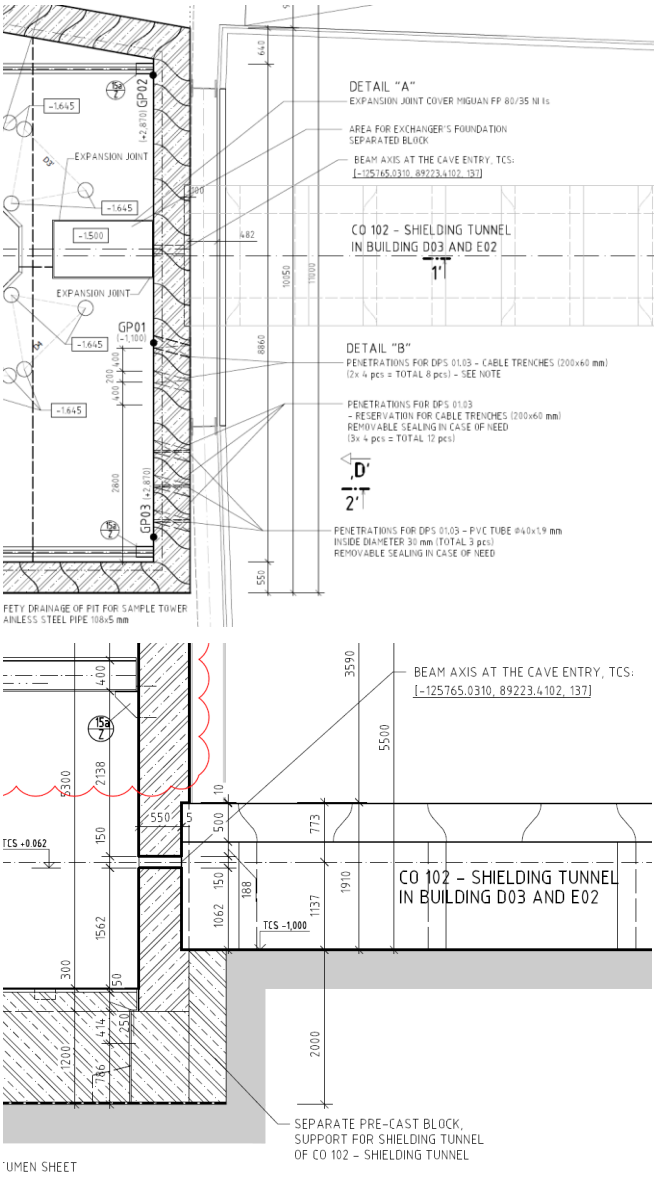
#	ID	Interface
Neutron guides system	BEER.06-Cave.07	*Type:* **Services** *Description:* **Connection of the slit SL2 to vacuum** The SL2 is connected to the vacuum housing by an ISO-160 flange. The whole system is connected to vacuum by ISO KF 40 vacuum ports.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-7000-00 (*MR439-7000-00.pdf*).
Neutron guides system	BEER.06-Cave.08	*Type:* **Services** *Description:* **Connection of the slit SL3 to power** The power connection of SL3 slit from Huber is currently being discussed with the supplier. The assumption is 70V DC. It will be confirmed later.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-8000-00 (Rev.B) (*MR439-8000-00.pdf*).

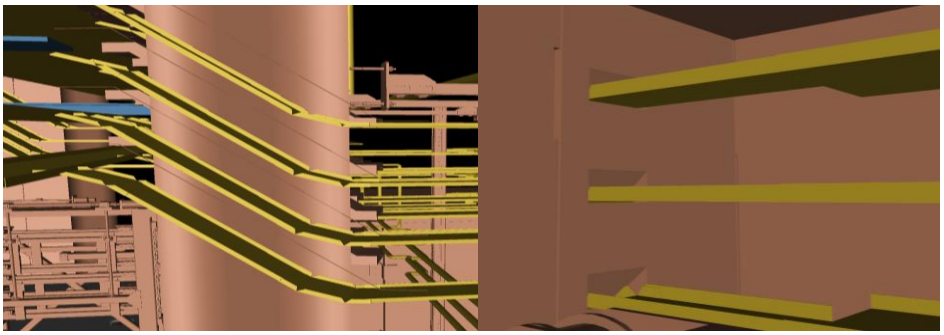
#	ID	Interface
Neutron guides system	BEER.06-Cave.09	*Type:* **Services** *Description:* **Connection of the exchanger to power** Stögra SM88.3.18.M12NWZxxx and SM107.4.18M12W-Zyyy need 120V (DC). Required parameters of the electrical connection: 120V (DC) operating voltage, they have inbuilt Lemo EEJ.3B.305.CYC connectors. Euchner NZ1HS-538-M type limit switches are used for the exchanger frame (2 pcs) and SL3 aligment (4pcs). They require 24 V (DC) mains voltage. 

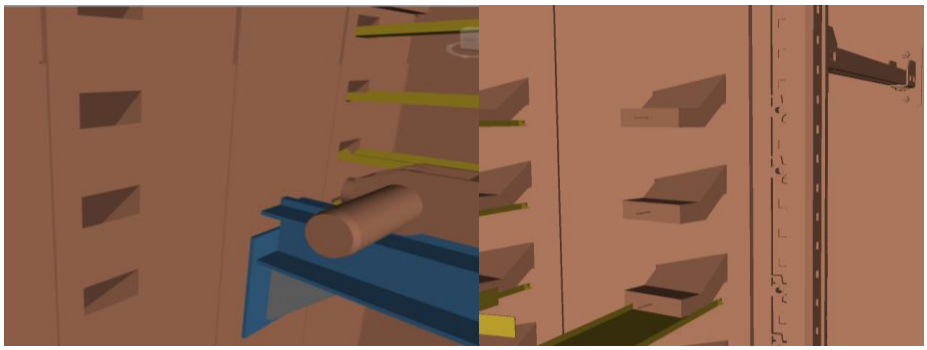
#	ID	Interface
Neutron guides system	BEER.06-Cave.09	

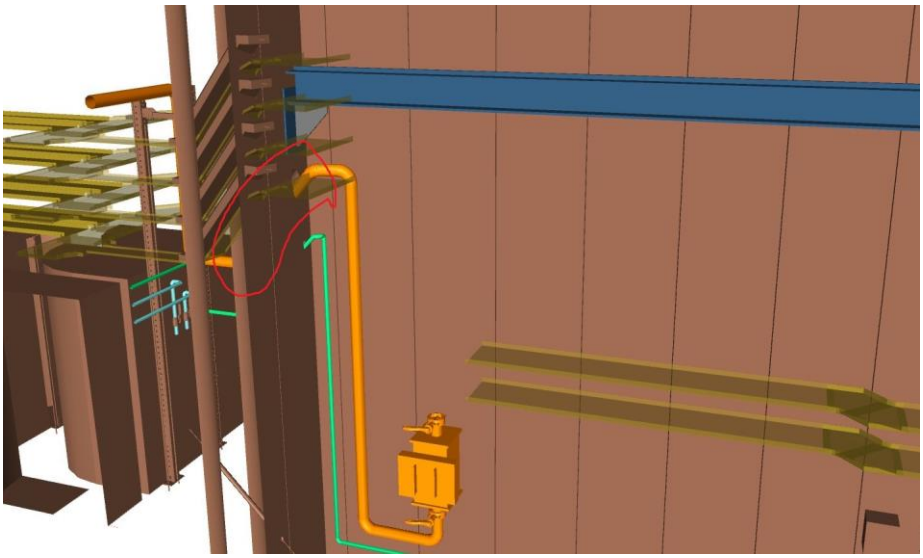
Neutron guides system	BEER.06-Cave.10	*Type:* **Services** *Description:* **Connection of the exchanger to vacuum** A KF 40 vacuum port at ISCS 155514 mm is designed to connect the vacuum housing of guide ID W02-20-01 (on the exchanger) to vacuum.  A KF 25 vacuum port at ISCS 155920 mm is designed to connect flight tube ID W02-20-02 (on the exchanger) to vacuum.  The height of the KF 25 vacuum port on the flight tube is 35 mm. *References:* • ESS – 0083838, BEER Instrument 3D model. • ESS – 1812156, drawing No. MR439-8010-00 (*MR439-8010-00.pdf*), drawing No. MR439-8020-00 (*MR439-8020-00.pdf*).

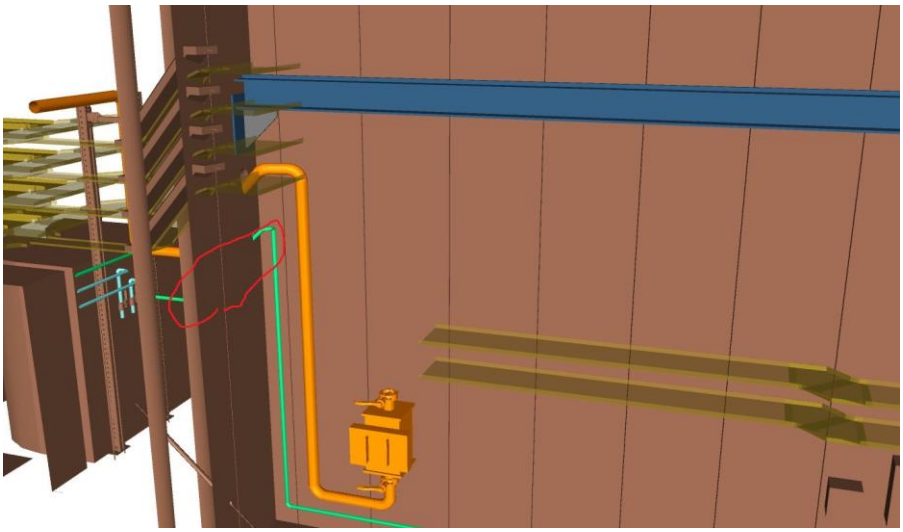
#	ID	Interface
Neutron guides system	BEER.06-Cave.11	*Type:* **Contact** *Description:* **Beam monitor** The technical solution on the interface needs to be solved in cooperation with the designer of the beam monitor. The technical parameters of the monitor are not known at the time of sub TG3.2.

#	ID	Interface
Cave walls	BEER.06-Cave.12	*Type:* **Contact, Boundary** *Description:* **Beamline shielding - contact of structures.** Originally it was considered to embed beamline shielding into the front wall of the cave (see figures below). Since the beamline shielding was moved to the ESS common shielding, the detail needs to be redesigned.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461618, drawing No. EGP5043-D-1817787, Groundplan level -0.600 m. • ESS-0461614, drawing No. EGP5043-D-181789, Sections 1-1', 2-2', 6-6'.

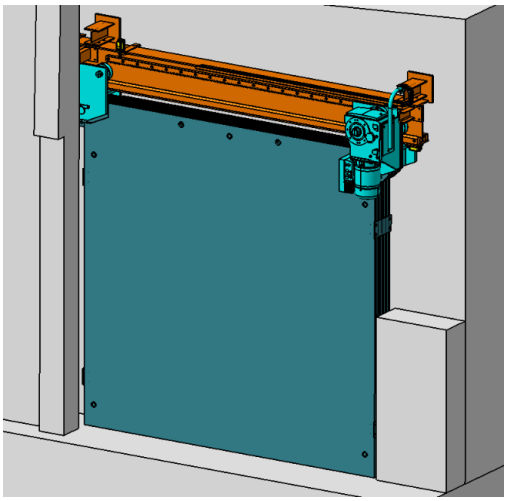
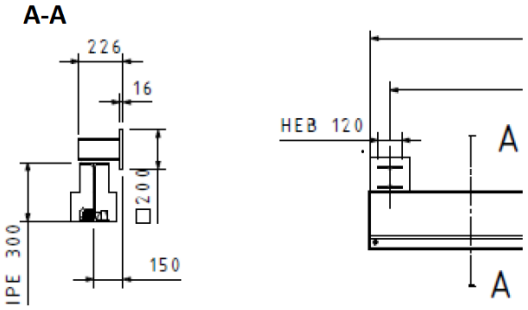
#	ID	Interface
Cave walls	BEER.06-Cave.13	***Type:*** **Hardware** *Description:* **Cable trays and grounding – throughputs** The cables are led into the experimental cave through the openings for cable trays designed in the cave walls. The dimension of the openings is designed for cable trays of 60 x 200mm. Total number of throughputs – cable trays: 32 The cable for grounding of detectors are led into the experimental cave through the openings for PVC tube designed in the cave walls. The dimension of the openings is designed for tube diameter of 40mm. Total number of throughputs – grounding: 2 (1 of them is a spar throughput)  *References:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461589, drawing No. EGP 5032-D-181768, Layout of cable trays.

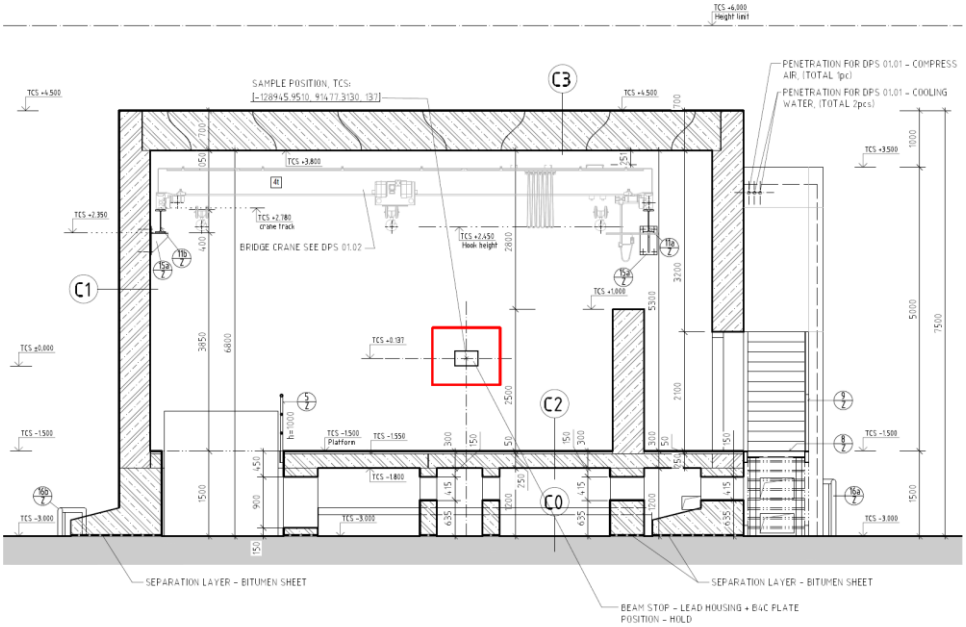
#	ID	Interface
Cave walls	BEER.06-Cave.14	*Type:* **Hardware** *Description:* **Cable trays - spare throughputs** In the cave walls there are spare throughputs designed for possible future use if necessary. The dimension of the openings of the spare throughputs is designed for cable tray size 60 x 200mm. Total number of the spar throughputs: 4  *References:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461589, drawing No. EGP 5032-D-181768, Layout of cable trays.

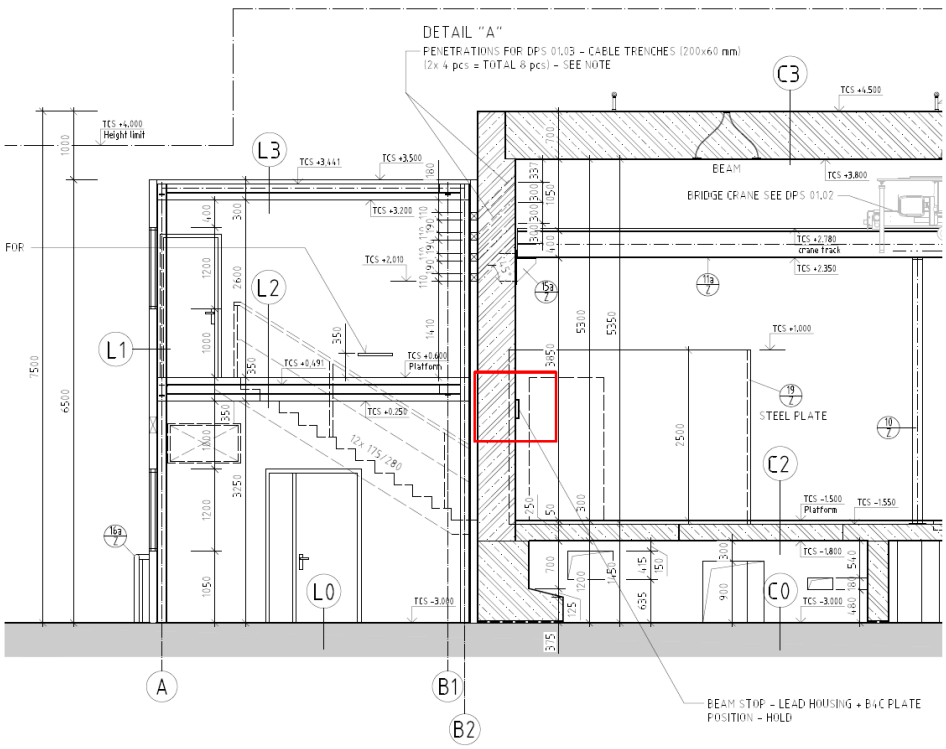
#	ID	Interface
Cave walls	BEER.06-Cave.15	*Type:* **Hardware** *Description:* **Containment ventilation throughput.** The duct of the containment ventilation is led into the experimental cave through the opening designed in the concrete wall panel. The diameter of the opening is 130 mm.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820, SECTION A-A; B-B; C-C. • ESS-1411350, drawing No. 859-3-D-2019-0995, List of wall panels.

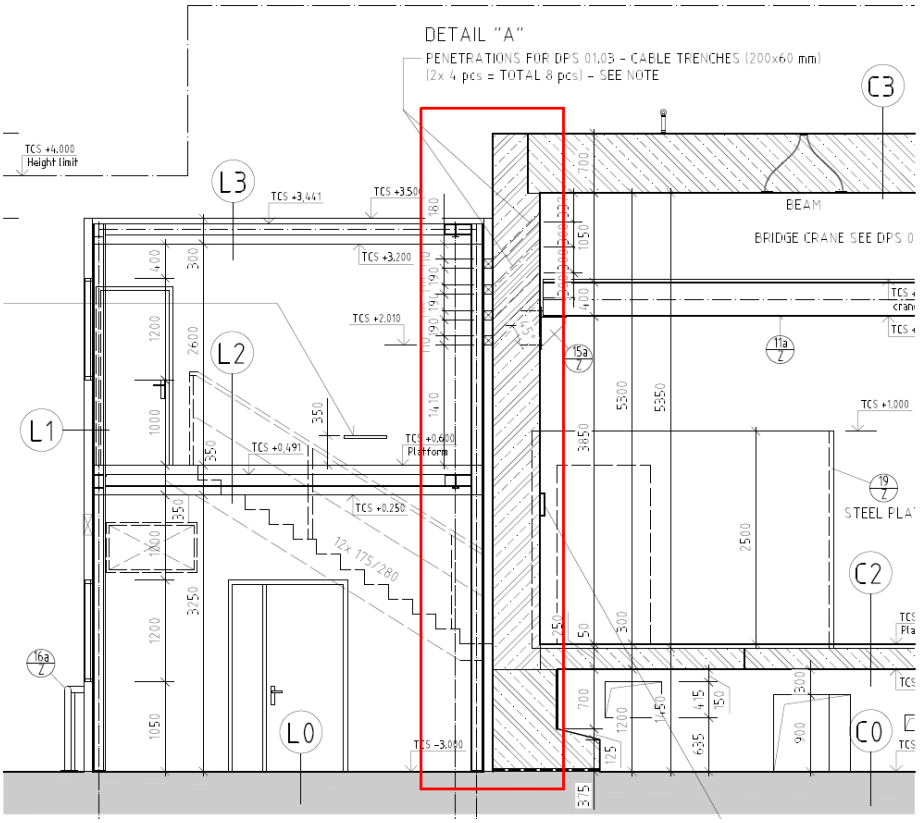
#	ID	Interface
Cave walls	BEER.06-Cave.16	*Type:* **Hardware** *Description:* **Nitrogen – throughput** The piping of the nitrogen is led into the experimental cave through the opening designed in the concrete wall panel. The diameter of the opening is 40 mm.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820, SECTION A-A; B-B; C-C. • ESS-1411350, drawing No. 859-3-D-2019-0995, List of wall panels.
Cave walls	BEER.06-Cave.17	*Type:* **Hardware** *Description:* **Sprinkler system - throughput.** Because the sprinkler system is not part of the design and the exact position of the througput is not known, possible positions for future throughput have been identified. These can also be made into wall panels by drilling a hole (up to 100 mm diameter), in the area under the cave ceiling, out of the level where the wall panels are switched together.

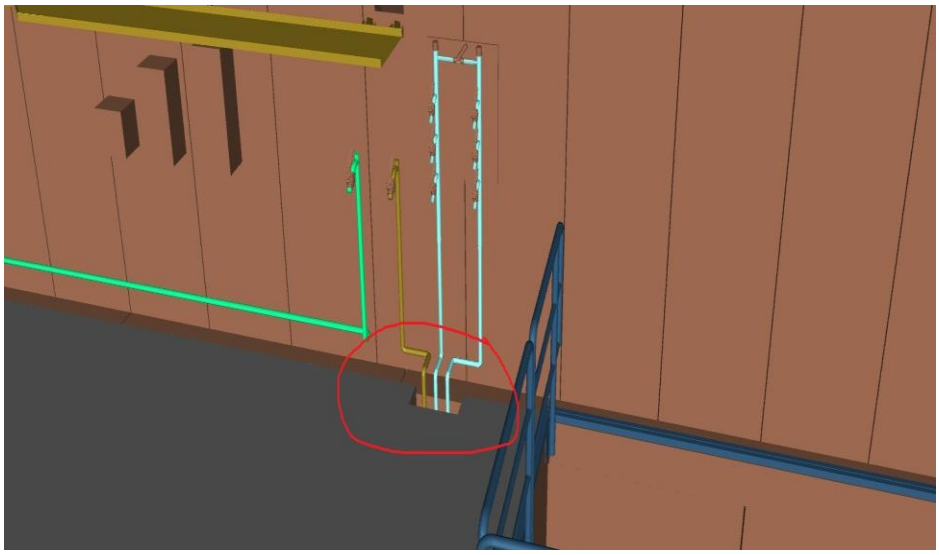
#	ID	Interface
Cave walls	BEER.06-Cave.18	*Type:* **Hardware** *Description:* **Vacuum – throughput** Vacum system is not part of the design and the exact position of the througput is not yet known. Possible positions of future throughput have been identified. These can also be made into wall panels by drilling a hole (up to 100 mm diameter), in the area under the cave ceiling (but not at the level where the panels are connected and fixed to each other).

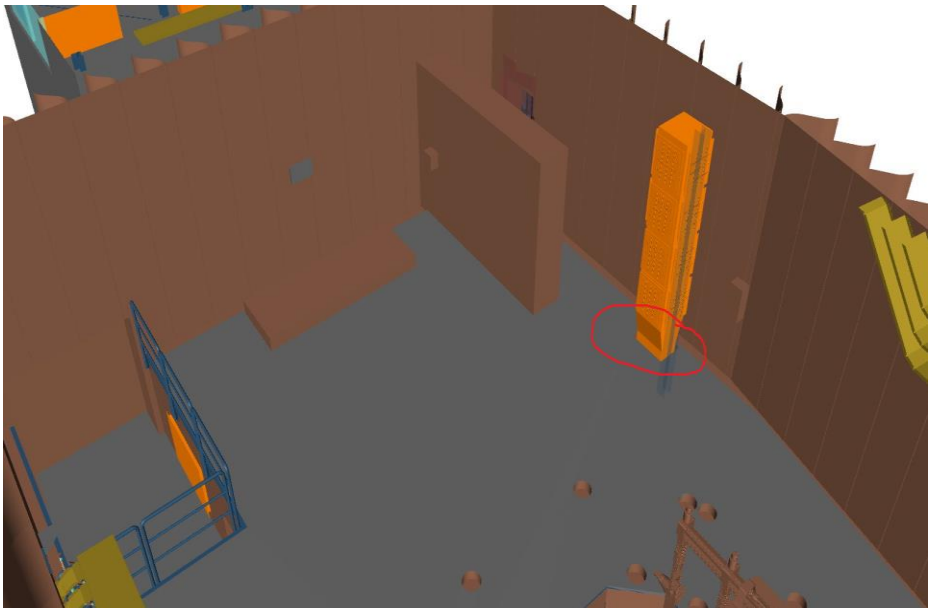
Cave walls	BEER.06-Cave.19	*Type:* **Service** *Description:* **Heavy sliding door - fixing to the cave structure** 3 pieces of the anchoring contact plates are on the back wall of the experimental cave. Dimension of the end-plates is 350 x 350 x 15 mm, dimension of the middle-plate is 350 x 400 x 20. The end-contact plates are fixed by 8 pcs HILTY anchors HIT-RE 500 V3 + HIT-V (8.8) M16 to the wall. The middle-contact plate is fixed by 4 pcs HILTY anchors HIT-RE 500 V3 + HIT-V (8.8) M20 to the wall. 3 pieces of steel consoles are welded to the plates. The door beam is attached to these 3 consoles.  Picture 1 – Assembly of heavy door.  Picture 2 – Detail of beam consoles. *Reference:* • ESS-0462070, document No. BEER-CV-900008d, DPS01.07 - Sliding door – assembly. • ESS-1407431, document No. BEER-CV-900014-T, Technical report. • ESS-0461611, document No. EGP5043-F-180622, Static analysis and technical report.

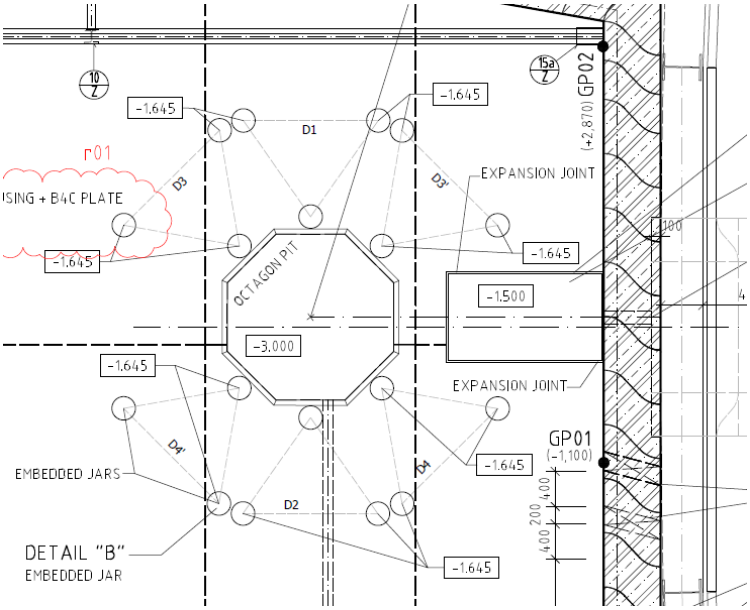
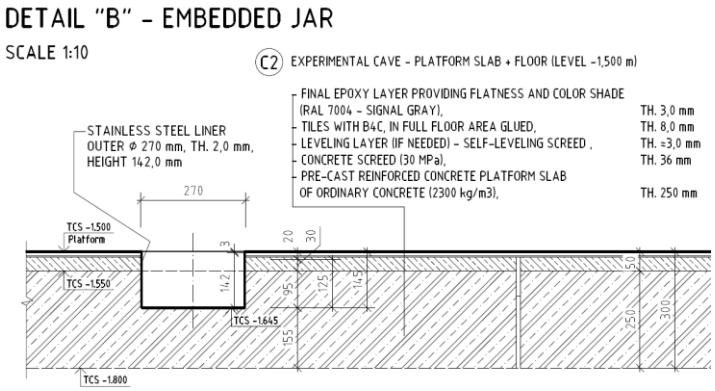
#	ID	Interface
Cave walls	BEER.06-Cave.20	*Type:* **Contact** *Description:* **Beamstop – positioning and fixing to the cave structure** The design of the beamstop is based on simulation calculations and its size and composition is specified in the Radiation Safety Analysis document. The beamstop is supposed to be attached to the cave wall inside the cave. The preliminary beam stop position is shown in the figure below. The final position of the beamstop must be determined by the final TG3. 

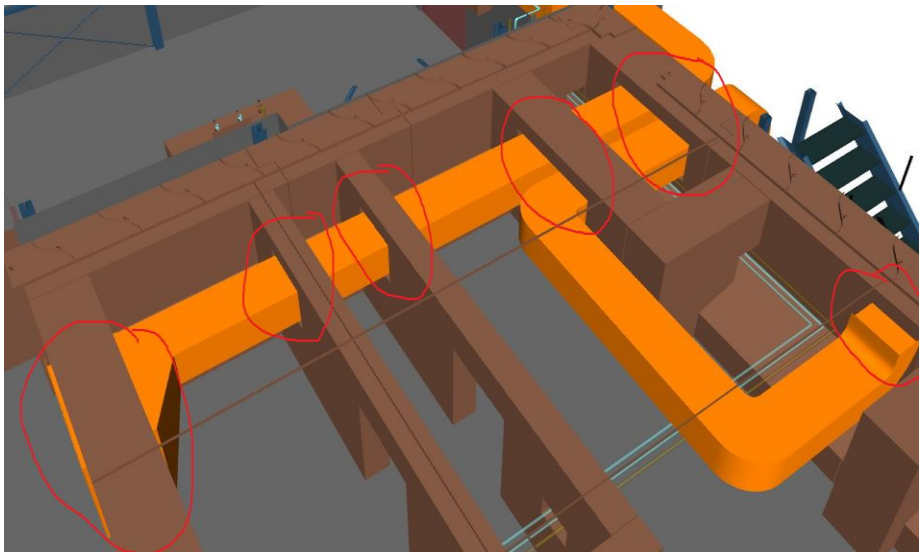
#	ID	Interface
Cave walls	BEER.06-Cave.20	 *Reference:* • ESS-2073206, report No. BEER_-CV-000001-T, Radiation Safety Analysis TR. • ESS-0461618, drawing No. EGP5043-D-181787, Ground plan level +0.600 m. • ESS-0461614, drawing No. EGP5043-D-181789, Sections 1-1', 2-2', 6-6'. • ESS-0461615, drawing No. EGP5043-D-181789, Sections 3-3', 4-4', 5-5'.

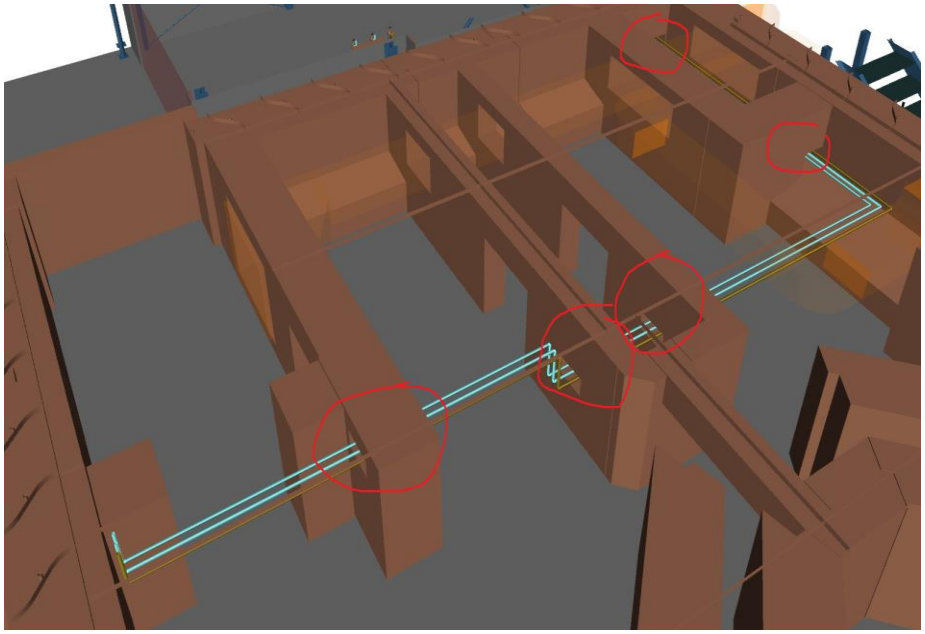
#	ID	Interface
Cave walls	BEER.06-Cave.21	*Type:* **Boundary** *Description:* **Control hutch and sample preparation area** The constructions of the cave and sample preparation area are separated by a contact expansion joint and both constructions are not structurally connected (they are structurally independent of each other)  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461614, drawing No. EGP5043-D-181789, Sections 1-1', 2-2', 6-6'.

#	ID	Interface
Cave floor	BEER.06-Cave.22	*Type:* **Hardware** *Description:* **Chilled water and compressed air – throughput** The piping of the chilled water and compressed air is led into the experimental cave through the opening designed in the concrete platform panel. The dimension of the opening is 370x170 mm.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820, SECTION A-A; B-B; C-C. • ESS-1411348, drawing No. 859-3-D-2019-0994, List of floor platform panels.

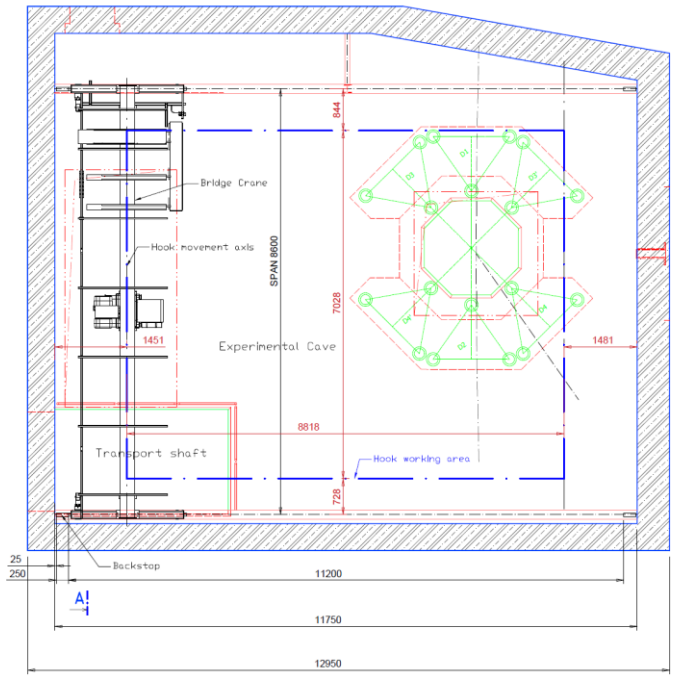
#	ID	Interface
Cave floor	BEER.06-Cave.23	*Type:* **Hardware** *Description:* **Ventilation – throughput** The duct of the ventilation is led into the experimental cave through the opening designed in the concrete platform panel. The dimension of the opening is 685 x 455 mm.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820, SECTION A-A; B-B; C-C. • ESS-1411348, drawing No. 859-3-D-2019-0994, List of floor platform panels.

#	ID	Interface
Cave floor	BEER.06-Cave.24	*Type:* **Contact** *Description:* **Anchoring the detectors** Anchor points are designed in the floor platform of the Experimental Cave to anchor detectors placed around the sample pit. A total of 18 anchoring points are designed in the floor. The anchor point consists of a recess of 145 mm in the floor. During the manufacturing of the precast floor/platform panels, a 270 mm stainless steel (th. 2.0 mm) insertion is installed. The remaining layer of the composition of the floor follows the insertion. The inserts are called “embedded jars”. Anchoring system for supporting detector frame is designed to install it into the jar. Anchoring system is supply of detectors designer(HZG).   *Reference:* • ESS-0461618 drawing No. EGP5043-D-1817787, Groundplan level -0.600 m. • ESS-0461614 drawing No. EGP5043-D-181789, Sections 1-1', 2-2', 6-6’ (detail “B”).

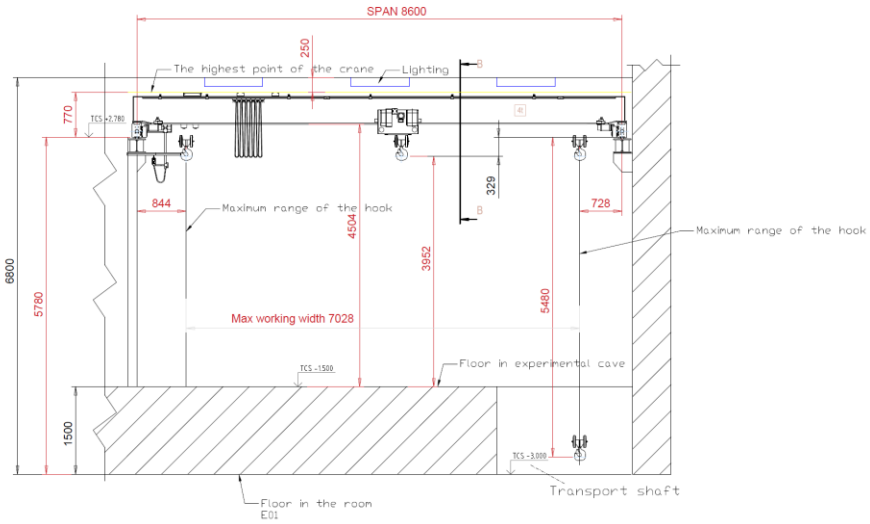
#	ID	Interface
Cave foundations	BEER.06-Cave.26	*Type:* **Hardware** *Description:* **Ventilation – throughputs** There are several openings designed in the foundations as throughputs for ventilation duct.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820, SECTION A-A; B-B; C-C. • ESS-1411346, drawing No. 859-3-D-2019-0997, List of foundation parts.

#	ID	Interface
Cave foundations	BEER.06-Cave.27	*Type:* **Hardware** *Description:* **Chilled water and compressed air – throughputs** There are several openings designed in the foundations as throughputs for piping of the chilled water and compressed air.  *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820, SECTION A-A; B-B; C-C. • ESS-1411346, drawing No. 859-3-D-2019-0997, List of foundation. parts.

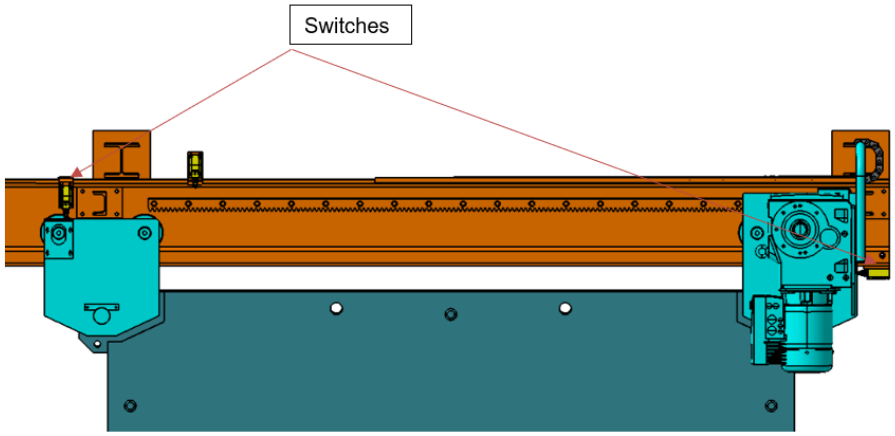
#	ID	Interface
Bridge crane	BEER.06-Cave.28	*Type:* **Hardware** *Description:* **Opreation area of the bridge crane inside the cave as an interface with future users of the crane.** Operation area of the bridge crane inside the cave is shown on schemes below. The operation area is meant as a space that is covered by the crane hook. The first schemes depicts the operation area in horizontal plane and the second one the operation area in vertical plane.

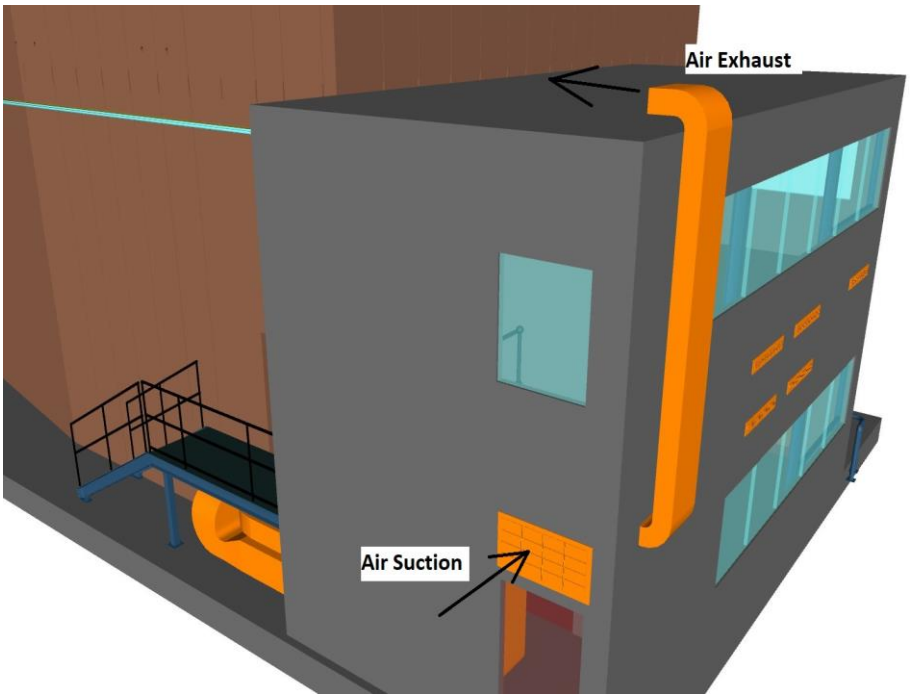


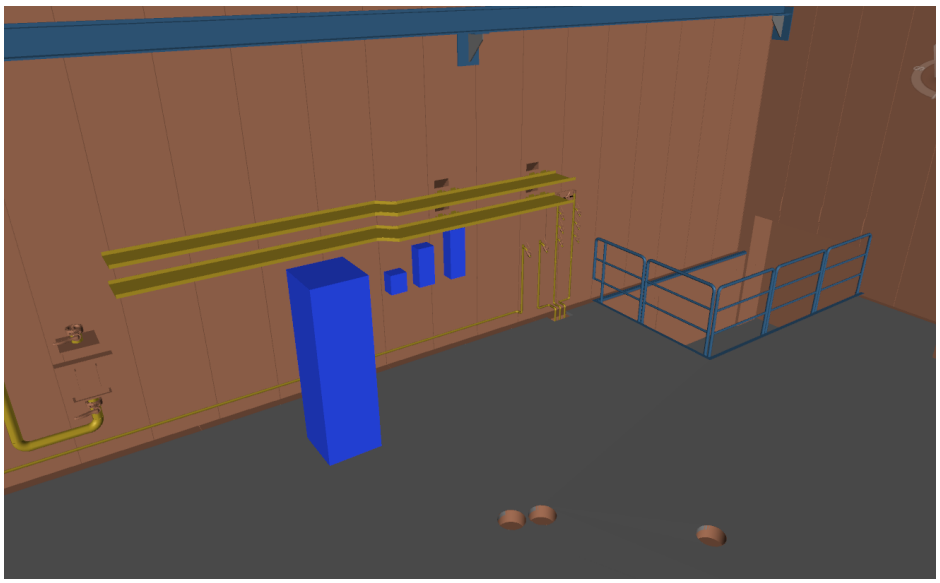
Picture No.1 – Layout of the cave with operation area of the hook.

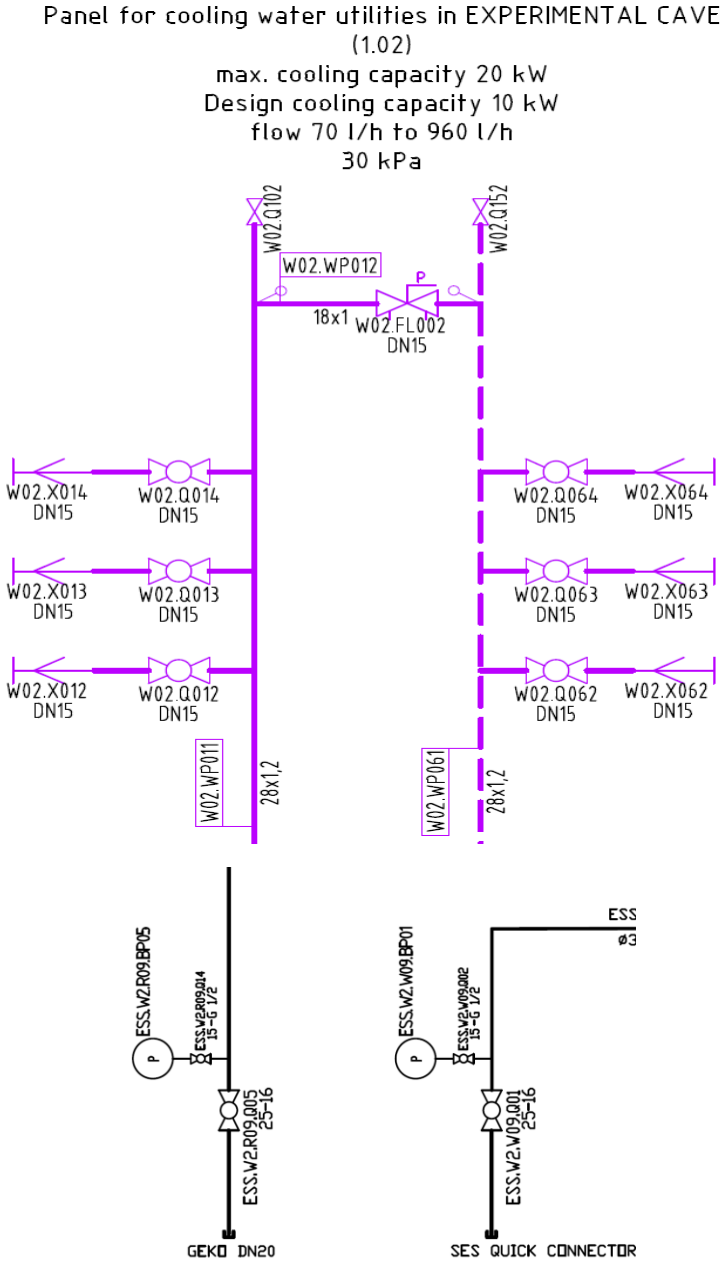


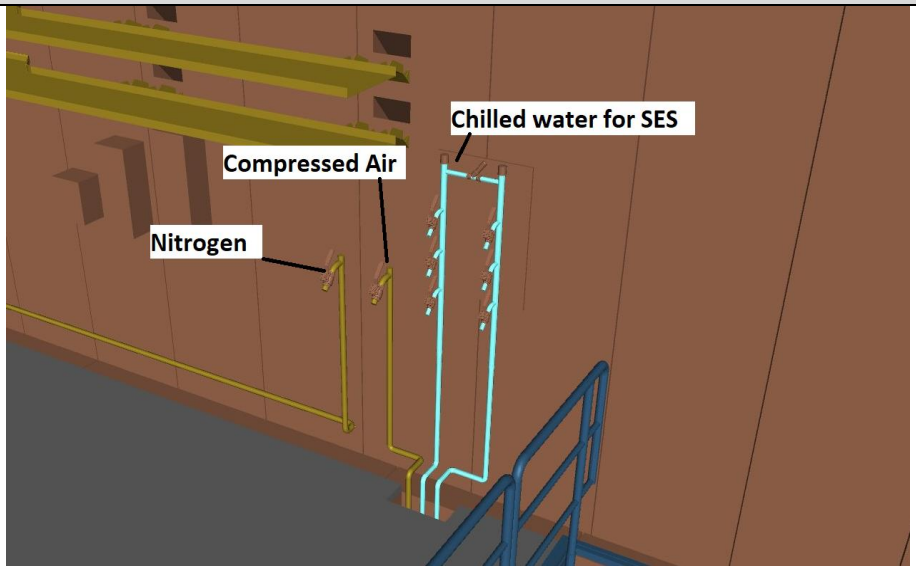
Picture No.2 – View showing the height of the hook range.

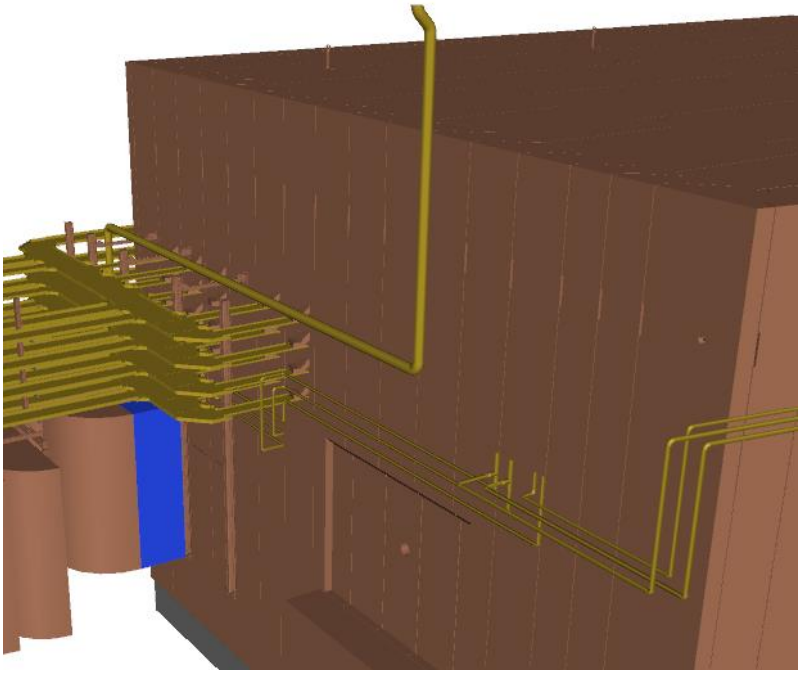
#	ID	Interface
Heavy sliding door	BEER.06-Cave.29	*Type:* **Service** *Description:* **Connection to personal safety system** Two switches are designed to connect the heavy sliding door to PSS system for detecting the door position. (see picture 1). 1. Magnetically operated switch consisting of switching element (type3SE6605-3BA) and switching magnet (type 3SE6704-3BA). 2. Mechanical switch consisting of switching element (type 3SE5112-1QV10) and actuator (type 3SE5000-0AV07-1AK2).  Picture 1 – Heavy door – switches. *Reference:* • ESS-1407431, document No. BEER-CV-900014-T, Technical report.
Ventilation	BEER.06-Cave.31	*Type:* **Hardware** *Description:* **Heat gains from detectors** Heat gains inside the cave from process equipment and detectors is expected to be around 8 kW (assumption from the time the design of the ventilation/cooling was completed). Air Handling unit with a cooling capacity of up to 9.0 kW is designed. If this assumption will be exceeded due to further development of detectors and process equipment, it is necessary to design and install a unit with a higher cooling capacity.

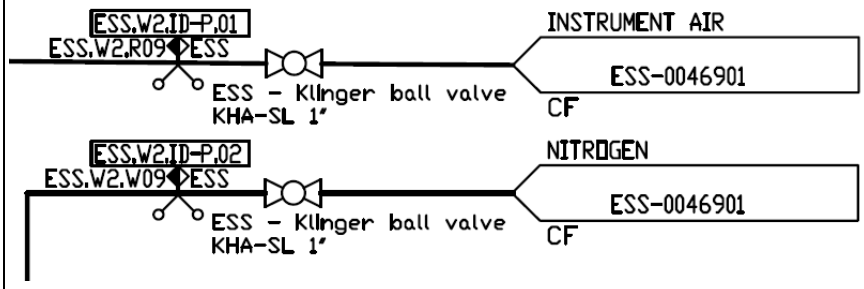
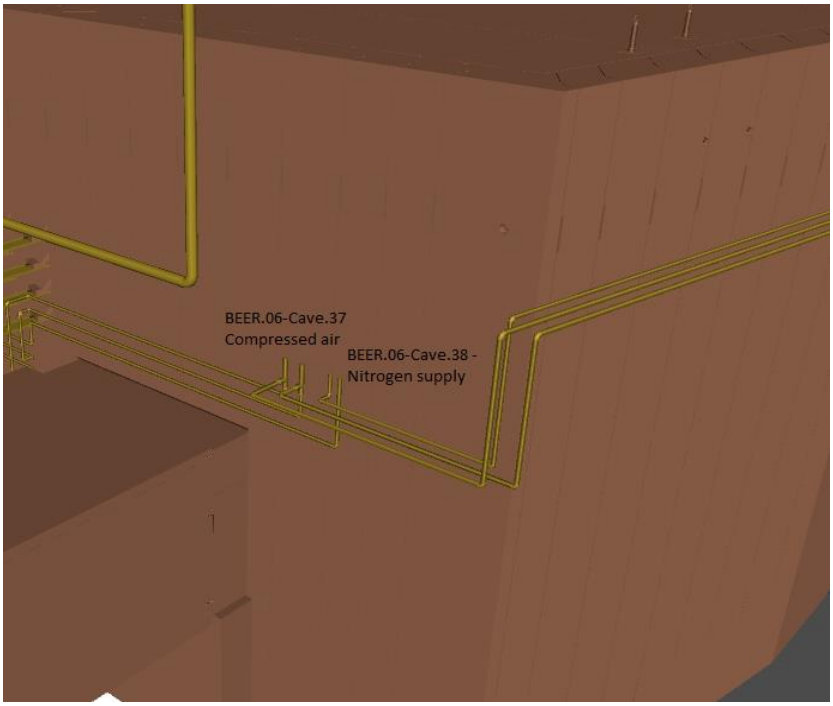
#	ID	Interface
Ventilation	BEER.06-Cave.32	*Type:* **Hardware** *Description:* **Air suction and air exhaust into the E01 interior** Air suction and air exhaust for ventilation of the experimental cave is designed from the interior of the hall E01.  *Reference:* • ESS-0083838, BEER Instrument 3D model. • ESS-0461604, document No. 5021-F-171545, Technical report - DPS 01.01- HVAC system. • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820, SECTION A-A; B-B; C-C.

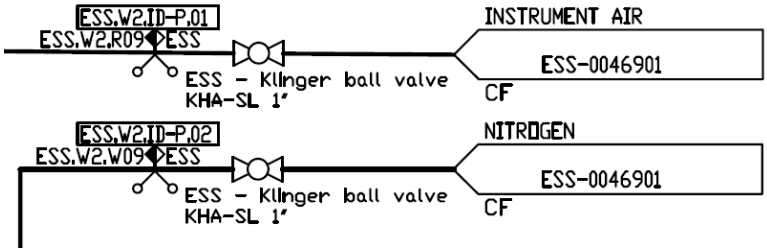
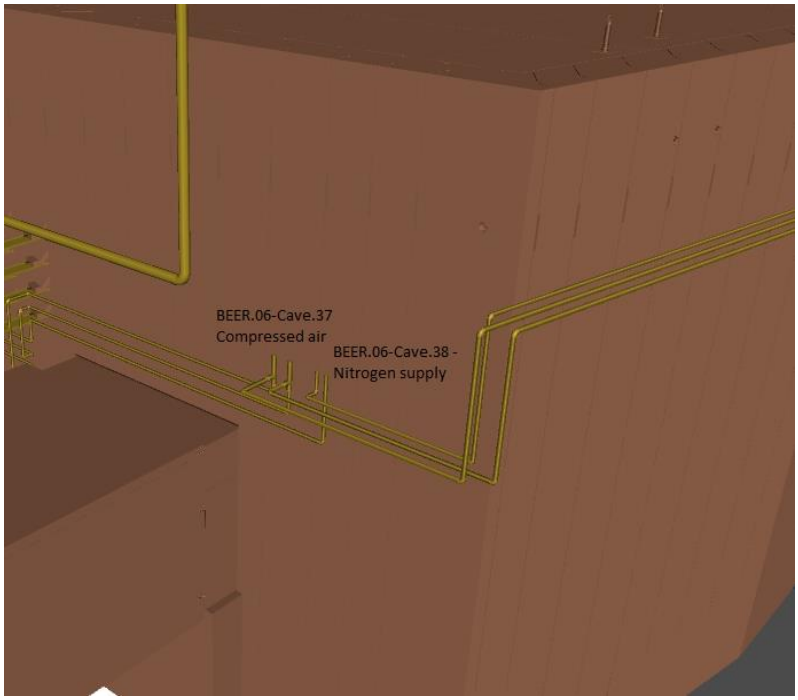
#	ID	Interface
Instrument electrical installation	BEER.06-Cave.33	*Type:* **Service** *Description:* **Electric distribution for SAD** The following equipments of SAD are placed inside the cave: • sockect boxes (Box #1, Box #2 and Box #3), • communication patch panel.  Note: The boxes #1, #2 and #3 are now designed to be supplied by internal instrument power system. The supplying of the boxes in the future is up to ESS. The communication patch panel is not supplyied by internal instrument power system (its power supply has to be solved on ESS side). *Reference:* • ESS-0461594, drawing No. EGP 5032-D-18299, Layout level -1.500m.

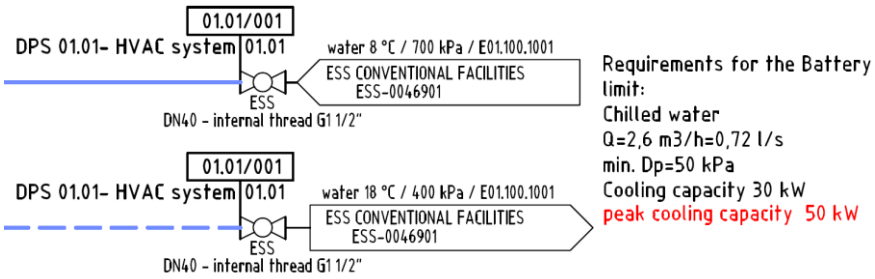
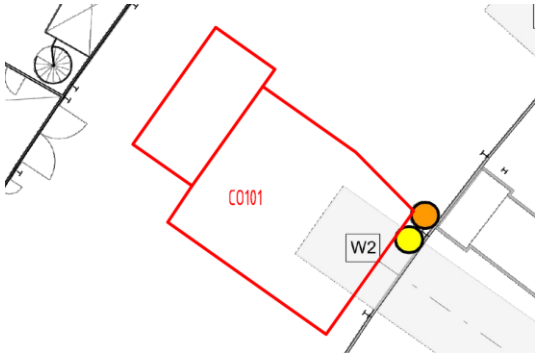
#	ID	Interface
Instrument utilities	BEER.06-Cave.34	*Type:* **Service** *Description:* **Media panels (chilled water, compressed air, nitrogen)** Chilled water (+15°C) is primarily required to remove excessive heat from the SES equipment. Compressed air supply is primarily required for air cushion. Nitrogen supply for various consumers. PFD (P&ID) – Chiled water for SES: 

#	ID	Interface
Instrument utilities	BEER.06-Cave.34	 *Reference:* • ESS-0083838, BEER Instrument 3D model. • ESS-0461604, document No. 5021-F-171545, Technical report - DPS 01.01- HVAC system. • ESS-1407587, document No. 859-1-F-2019-0104,Technical report. • ESS-0461607, drawing No. 5021-D-181817, PFD (P&ID) - systems W01 and W02 (Water circuits). • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820, SECTION A-A; B-B; C-C. • ESS-1407593, drawing No. 859-1-D-2019-0290, P&ID - Systems R09 and W09.
Air cushion	BEER.06-Cave.35	*Type:* **Contact** *Description:* **Flatness of the floor in hall E01** For movement of the air cushion from the sample preparation area to the experimental cave it is necessary to have a concrete floor with a flatness of at least 3 mm per 1 meter or better. This flatness is in consideration with document ESS-0403282. *References:* • ESS-0403282 ESS – Instrument Technical Interfaces. • ESS-0462085 Technical report of the air cushion.

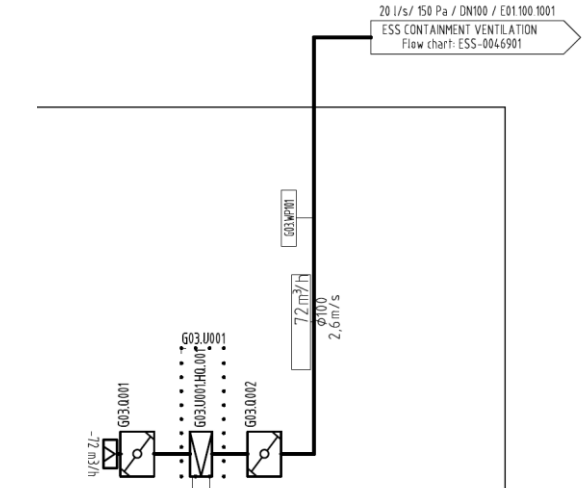
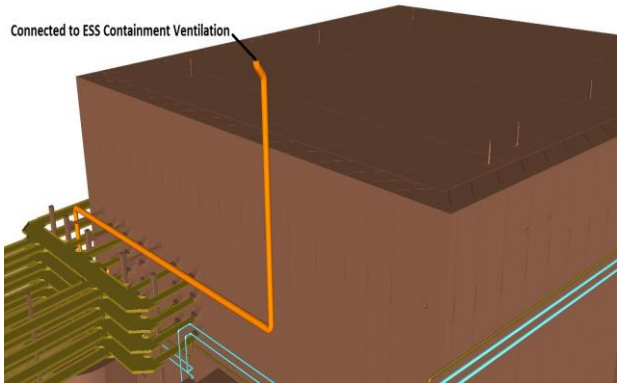
#	ID	Interface
Power supply	BEER.06-Cave.36	*Type:* **Service** *Description:* **ESS connection point** The instrument BEER will be connected to the ESS low voltage (LV) distribution cabinet placed in E02 near the experimental cave (cabinet marked with blue color in the picture). The exact interface is power terminal in ESS LV distribution cabinet. <u>Technical parameters of the power connection:</u> Connection point: FBSname0 Voltage system: 3NPE ~ 50Hz 400 V/TN-S Estimated nominal power of the BEER instrument as whole: 55.5kW / 400V NOTE: FBS name and LBS code of ESS LV main distribution cabinet is not known yet.  *References:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461579, document No. EGP 5032-F-180575, Technical report of Electrical part. • ESS-0461589, drawing No. EGP 5032-D-18176, Layout of cable_trays. • ESS-0461580 , drawing No. EGP 5032-D-18296, Block diagram of Electrical part.

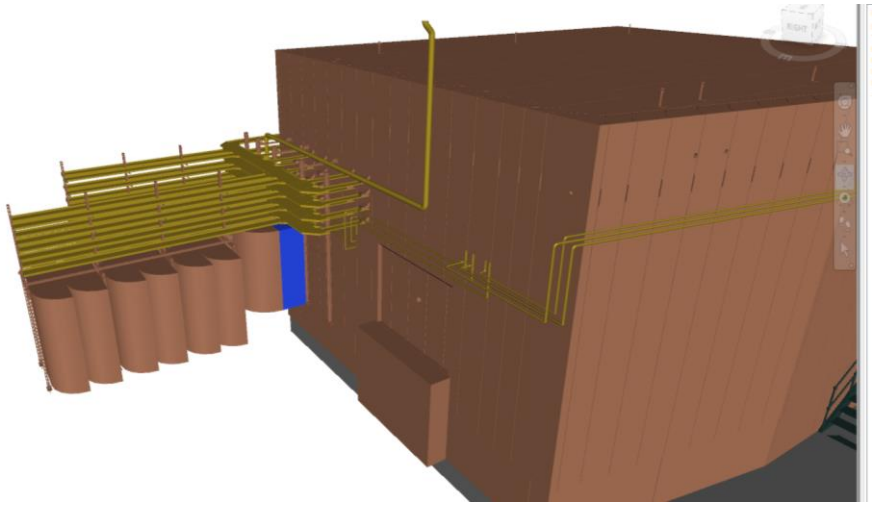
#	ID	Interface
Compressed air	BEER.06-Cave.37	*Type:* **Service** *Description:* **ESS connection point, central compressed air distribution system.** ESS compressed air distribution ensures capacity of 0.1 kg/s (50 m^3/h) at 6.0 barg at the connection point. PFD (P&ID) – ESS Battery limit:   *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-1407587, document No…859-1-F-2019-0104,Technical report. • ESS-046901, D & E Process flow charts. • ESS-0403282, ESS – Instrument Technical Interfaces. • ESS-1407593, drawing No. 859-1-D-2019-0290, P&ID - Systems R09 and W09.

Nitrogen	BEER.06-Cave.38	*Type:* **Service** *Description:* **ESS connection point, central nitrogen distribution system.** ESS distribution system ensures for each connection point in E01 nitrogen at 10 barg (total capacity for E01 is 200 Nm^3/h without particular specification per each connection point). PFD (P&ID) – ESS Battery limit:   Nitrogen Interface between BEER and ESS. *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-1407587, document No. 859-1-F-2019-0104,Technical report. • ESS-046901, D & E Process flow charts. • ESS-0403282, ESS – Instrument Technical Interfaces. • ESS-1407593, drawing No. 859-1-D-2019-0290, P&ID - Systems R09 and W09.

Chilled water	BEER.06-Cave.39	*Type:* **Service** *Description:* **ESS connection point, chilled water distribution system.** Chilled water for BEER HVAC system, Sample Environmental System (SES) and for cooling racks. Technical requirements on the chilled water connection point: Q=2,6 m3/h=0,72 l/s; min. Dp=50 kPa; Cooling capacity 30 kW PFD (P&ID) – systems W01 and W02 (Water circuits), ESS Battery limit:  Battery limit inhall E01: Orange point - chilled water. Yellow point - deionized water, instrument air, nitrogen gass.  

#	ID	Interface
Chilled water	BEER.06-Cave.39	*Reference:* • ESS-0083838, BEER Instrument 3D model. • ESS-0461604, document No. 5021-F-171545, Technical report - DPS 01.01- HVAC system. • ESS-0461607, drawing No. 5021-D-181817, PFD (P&ID) - systems W01 and W02 (Water circuits). • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820 , SECTION A-A; B-B; C-C. • ESS-1407593, drawing No. 859-1-D-2019-0290, P&ID - Systems R09 and W09.

Containment ventilation	BEER.06-Cave.40	*Type:* **Service** *Description:* **ESS connection point, containment ventilation system** The interface is in E01 on the pillars between E01-E02 at higher level. Technical requirements on the containment ventilation connection point: 20 l/s; 150 Pa; DN100. PFD (P&ID) – ESS Battery limit:   *Reference:* • ESS-0083838, BEER Instrument 3D model. • ESS-0461604, document No 5021-F-171545, Technical report - DPS 01.01- HVAC system. • ESS-0461606, drawing No. 5021-D-181816, PFD (P&ID) - systems G01, G02 and G03 (ventilation). • ESS-0461608, drawing No. 5021-D-181818., GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820 , SECTION A-A; B-B; C-C.

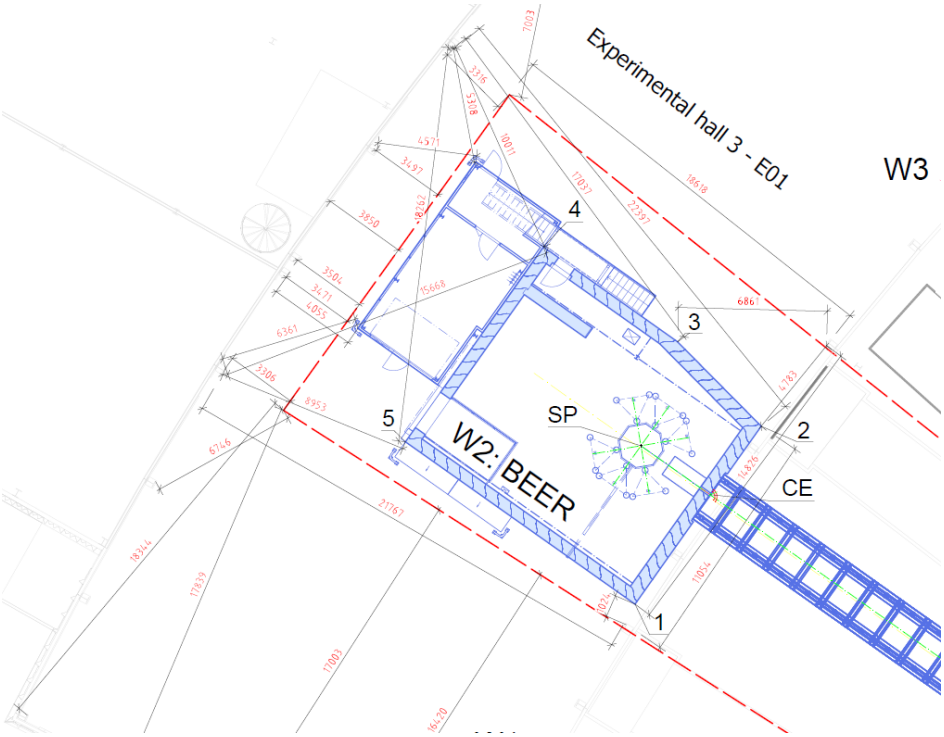
#	ID	Interface
Grounding	BEER.06-Cave.41	*Type:* **Service** *Description:* **ESS connection point** Grounding of the instrument BEER will be connected to the ESS low voltage (LV) distribution cabinet placed in E02 near the experimental cave (cabinet marked with blue color in the picture). The exact interface is grounding terminal in ESS LV distribution cabinet. NOTE: FBS name and LBS code of ESS LV main distribution cabinet is not known yet.  *References:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461579, document No. EGP 5032-F-180575, Technical report of Electrical part. • ESS-0461593, drawing No. EGP 5032-F-183004, Grounding system. • ESS-0461589, drawing No. EGP 5032-D-18176, Layout of cable_trays. • ESS-0461580 , drawing No. EGP 5032-D-18296, Block diagram of Electrical part.

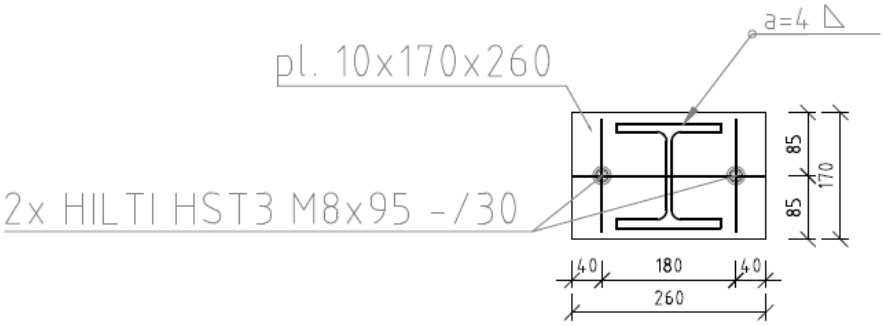
6.7. BEER Interfaces – Control Hutch Sample & Preparation Area

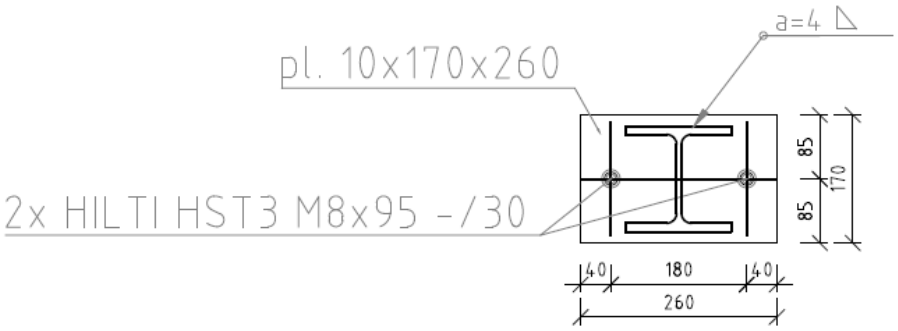
The hutch and sample preparation area is situated in hal E01 right behind the cave. It is two-storey structure. The support structure consists of steel beams and columns. The facade and walls are made of plasterboards. In both storage, there are technical utilities and other equipment needed to operate instrument.

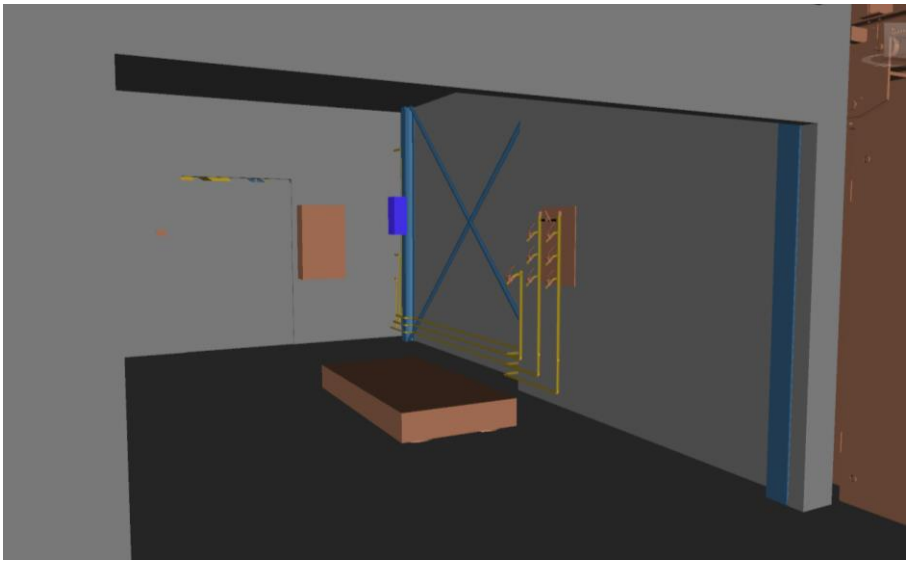
Table 7 describes the interfaces with the different systems in the the hutch and sample preparation area. It shall be updated as further sub-systems are developed.

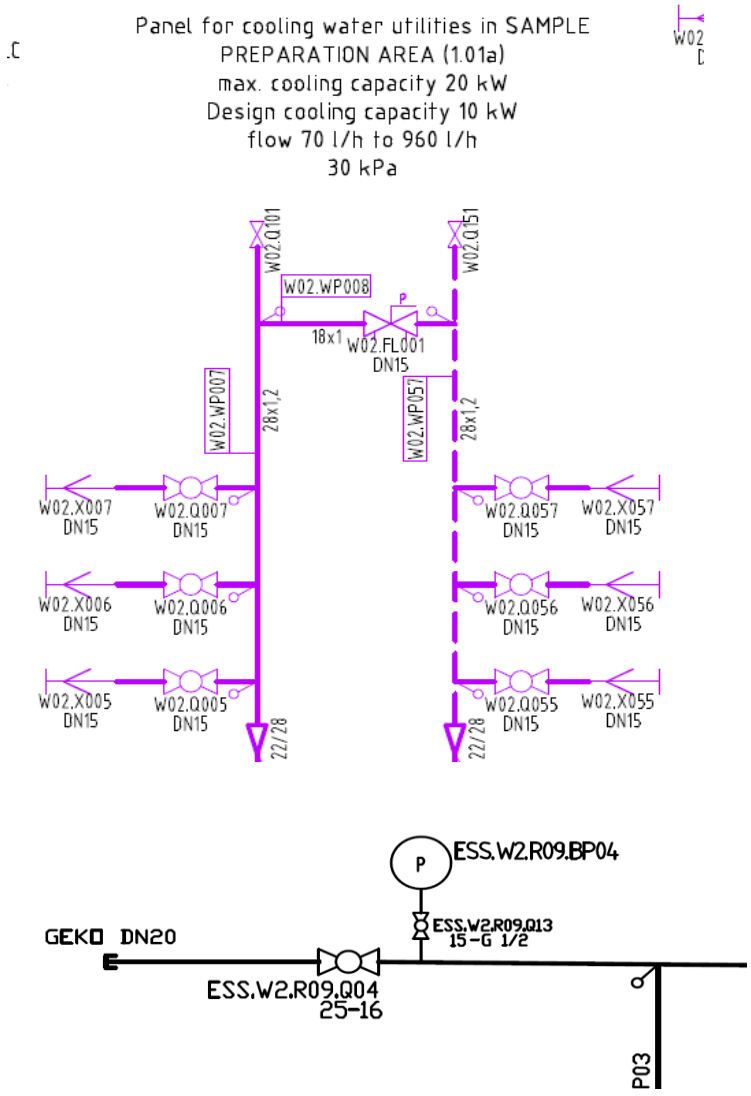
Table 7 - Interfaces in the control hutch and sample preparation area

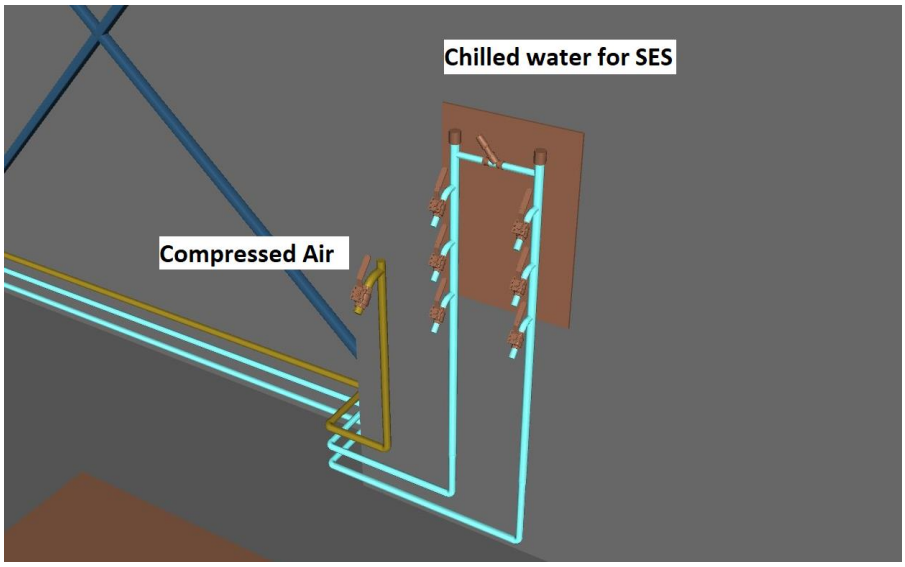
#	ID	Interface
Control Hutch & Sample Preparation Area	BEER.07-Hutch.01	*Type:* **Boundary** *Description:* **Position inside E01. Spatial coordination** The position of the control hutch and sample preparation to the related structures inside the E01 is shown in the figure below.  *Reference:* • ESS – 0083838, BEER Instrument 3D model.

#	ID	Interface
Control Hutch & Sample Preparation Area	BEER.07-Hutch.02	*Type:* **Contact** *Description:* **Floor in E01 (load and fixing)** The permissible load of the floor in E01 20 t/m2 is not exceeded. The steel columns of the hutch support structure are anchored to the floor in E01 by Hilti HST3 anchors. The anchoring depth is not more then 100 mm. The anchors shall be non-conductive. In case of drilling contact with the floor reinforcement, the anchor will be replaced. In this case chemical anchors are used with plastic centralizer rings to avoid grounding problems. The anchoring of the steel columns is shown in the picture below.  The walls of the sample preparation area is anchored to the floor in E01 by mechanical / chemical anchors. The anchoring depth is not more then 70 mm. *Reference:* • ESS-0462068, drawing No. EGP5043-D-181846, Details (Construction part – Steel structure). • ESS-0403282 BEER - Interface Description (chap. 4.2.2.4 Drilling and mounting to floor).

#	ID	Interface
Hutch staircase	BEER.07-Hutch.03	*Type:* **Contact** *Description:* **Floor in E01 (columns of staircase for personal acces)** The permissible load of the floor in E01 20 t/m2 is not exceeded. The steel columns of the staircase are anchored to the floor in E01 by chemical anchors. The anchoring depth is not more then 70 mm. Tha anchors shall be non-conductive. In this case chemical anchors are used with plastic centralizer rings to avoid grounding problems. The anchoring of the steel columns is shown in the picture below.  *Reference:* • ESS-0462068 drawing No. EGP5043-D-181846, Details (Construction part – Steel structure). • ESS-0403282 BEER - Interface Description (chap. 4.2.2.4 Drilling and mounting to floor).

#	ID	Interface
Instrument electrical installation	BEER.07-Hutch.04	*Type:* **Service** *Description:* **Electric distribution for SAD** The following equipments of SAD are placed inside the control hutch and sample preparation area: • sockect box (Box #3, sample preparation area), • NEUS-PLC "Non electrical utility supply" control PLC (control hutch).  Note: The box #3 and NEUS-PLC are now designed to be supplied by internal instrument power system. The supplying of the box and NEUS-PLS in the future is up to ESS. *Reference:* • ESS – 0083838, BEER Instrument 3D model. • ESS-0461594, drawing No. EGP 5032-D-18299, Layout level -1.500m.

#	ID	Interface
Instrument utilities	BEER.07-Hutch.05	*Type:* **Service** *Description:* **Media panels (chilled water; compressed air)** Chilled water (+15°C) is primarily required to remove excessive heat from the SES. Compressed Air supply is primarily required for air cushion. PFD (P&ID) – Chiled water for SES: 

#	ID	Interface
Instrument utilities	BEER.07-Hutch.05	 *Reference:* • ESS-0083838, BEER Instrument 3D model. • ESS-0461604, document No. 5021-F-171545, Technical report - DPS 01.01- HVAC system. • ESS-1407587, document No…859-1-F-2019-0104,Technical report. • ESS-0461607, drawing No. 5021-D-181817, PFD (P&ID) - systems W01 and W02 (Water circuits). • ESS-0461608, drawing No. 5021-D-181818, GR. LEVEL -3.000 m; +0,600 m. • ESS-0461610, drawing No. 5021-D-181820, SECTION A-A; B-B; C-C. • ESS-1407593, drawing No. 859-1-D-2019-0290, P&ID - Systems R09 and W09.

7. GLOSSARY

Term	Definition
ESS	European Spallation Source
ISCS	Instrument Source Coordinate System
FP	Focal point
HZG	Helmholtz-Zentrum Geesthacht
NPI	Nuclear Physics Institute
P&ID	Piping and instrumentation diagram
HVAC	Heating, Ventilation, Air Conditioning
AHU	Air Handling Unit
ID	Unique Identification mark (code) of interface
SES	Sample Environmental System
TCS	Target Coordinate System

8. REFERENCES

[1] Main coordinate systems at the ESS (ESS-0035090)
[2] Optics Report for the BEER Instrument (ESS-0238217)
[3] Basis of structural design (SS-EN 1990)
[4] ESS Instrument Layout (ESS-0017897)
[5] BEER Instrument model (ESS-0083838)
[6] D-E Overview Drawings (ESS-0475569)

DOCUMENT REVISION HISTORY

Revision	Reason for and description of change	Author	Date
1	First issue	Milan Vojir	2019-08-21
1	Joint Sub-TG3.1 and sub-TG3.2 parts	Premek Beran	2020-02-02
1	Complete revision, addition of interfaces	Radim Svejda	2020-19-03
1	Update of ID No. BEER.06-Cave.06, BEER.06-Cave.07, BEER.06-Cave.09, BEER.06-Cave.10.	Radim Svejda	2021-16-03