The Bunker & Temporary Beamstops

An Overview for the Review Committee

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Agenda

1 Technical overview

2 Quality and compliance

3 Cold commissioning

4 Hot commissioning

5 Summary

The Bunker & TBS

Technical readiness

2. Do systems in the review scope that are classified as SSCI2S, have its radiation safety requirements covered by completed tests, documented and released in the FBS?

Yes. CIDL of ESS.NSS.F01.F01 released and all relevant documentation connected.

5. Are all the test scope planned up to the SAR, covered by completed tests, documented and released in the FBS?

Yes. V&V reports fully released and connected to FBS nodes.

6. Are deferred but required (if any) system tests without beam scheduled?

Bunker and TBS: following completion of testing a number of punchlist items remain to resolved. These are tracked by NITs.

7. Are pre-SAR punch-items (if any) been resolved and documented?

All blocking pre-SAR items have been resolved.

The Bunker & TBS

Technical readiness

8. Are technical NCRs (if any) approved and not blocking, considered and communicated?

NCR 10626 still pending (NCR for the inclination of Bunker's R6 pillars (ESS-5878227))

9. Are all changes completed with updated documentation in CHESS? If no, argue why this is not impacting the upcoming commissioning?

Yes – documentation released.

10. Is the Work Package(s) ready to close its activities?

Yes.

The Bunker & TBS

Organisational & procedural readiness

11. Are required Internal and External (as needed) resources, including replacement, staff in place?

Yes.

20. Are the commissioning activities sufficiently planned and documented, with scheduled activities, resources and targeted goals?

Yes.

21. Are necessary instructions, manuals and process descriptions in place, sufficiently prepared to be able to start upcoming commissioning activities?

Yes.

29. Are “Safe State” defined and corresponding procedure to reach safe state established, according to “Safe state of ESS regarding radiation hazards”

Yes, the safe state of the system has been established in the radiation safety report - S&SS RSA ESS-5850978.

The Bunker & TBS

Organisational & procedural readiness

31. Are operator instructions available and released in CHESS for SSCI2S?

Yes.

35 Are all SSCI2S fulfilling the requirements as described in the OLC SSCI2S periodic maintenance rules (ESS-5337280)?

Yes.

37. For electrical installations, does the system comply with the rules defined in chapter 11 of the ESS Rules for Coordination of Electrical Safety (ESS-0328120)?

Yes.

43. All relevant Energisations Permits obtained?

Yes.

The Bunker & TBS

Organisational & procedural readiness

47. Will the system be operated/commissioned without presence of flammable substance?

Yes.

50. Does the system(s) fulfil applicable directives: (LVD) (MD) (PED) (ATEX) (EMCD) and is CE marked, and Declaration of Conformity (DoC) is issued complete with user instructions for the equipment life cycle.

The Bunker & TBS fall outside of these directives.

Technical Overview

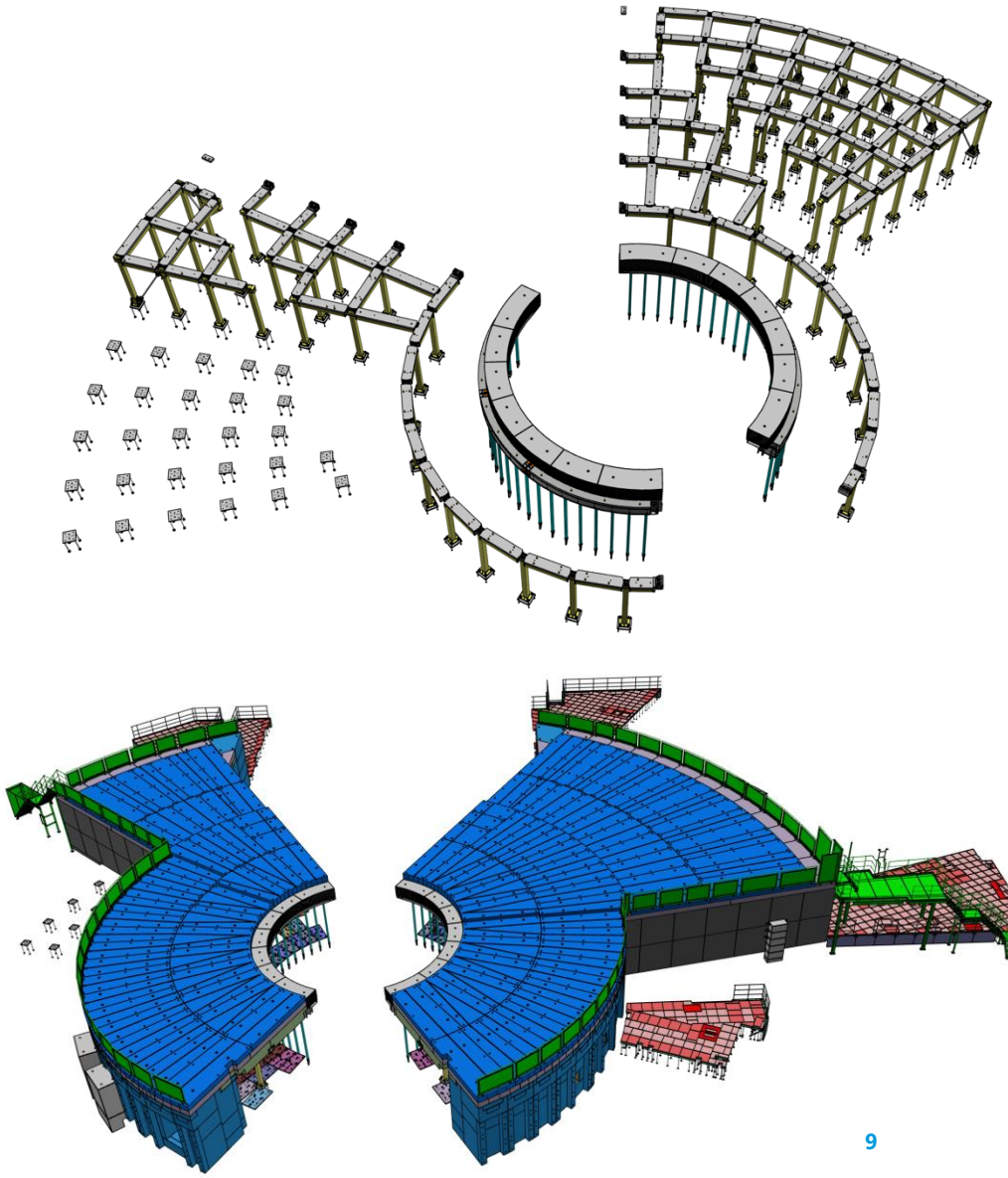
System overview

ESS.NSS.F01.F01 – The Bunker System

The main functions of the Bunker and Temporary Beamstops are:

- To attenuate prompt and residual radiation.
- To host Instrument and Target Systems, together with their associated equipment.

FBS tag	Name
ESS.NSS.F01.F01	Bunker System
ESS.NSS.F01.F01.F01	Bunker Shielding Roof System
ESS.NSS.F01.F01.F02	Bunker Shielding Wall System
~~ESS.NSS.F01.F01.F03~~	~~Bunker Personnel Safety System~~
~~ESS.NSS.F01.F01.F05~~	~~False Floors for In-Bunker Components~~
ESS.NSS.F01.F01.F06	Bunker Feedthrough Cases
ESS.NSS.F01.F01.F07	Instruments Temporary Beamstops
ESS.NSS.F01.F01.U01	Bunker Structural Support System
ESS.NSS.F01.F01.U02	Bunker Upstream Supports
ESS.NSS.F01.F01.U03	Bunker Fences and Stairs
ESS.NSS.F01.F01.U04	Bunker Instrument Baseplates
ESS.INFR.W01.W01.W02.W26	Bunker Area Socket Outlets

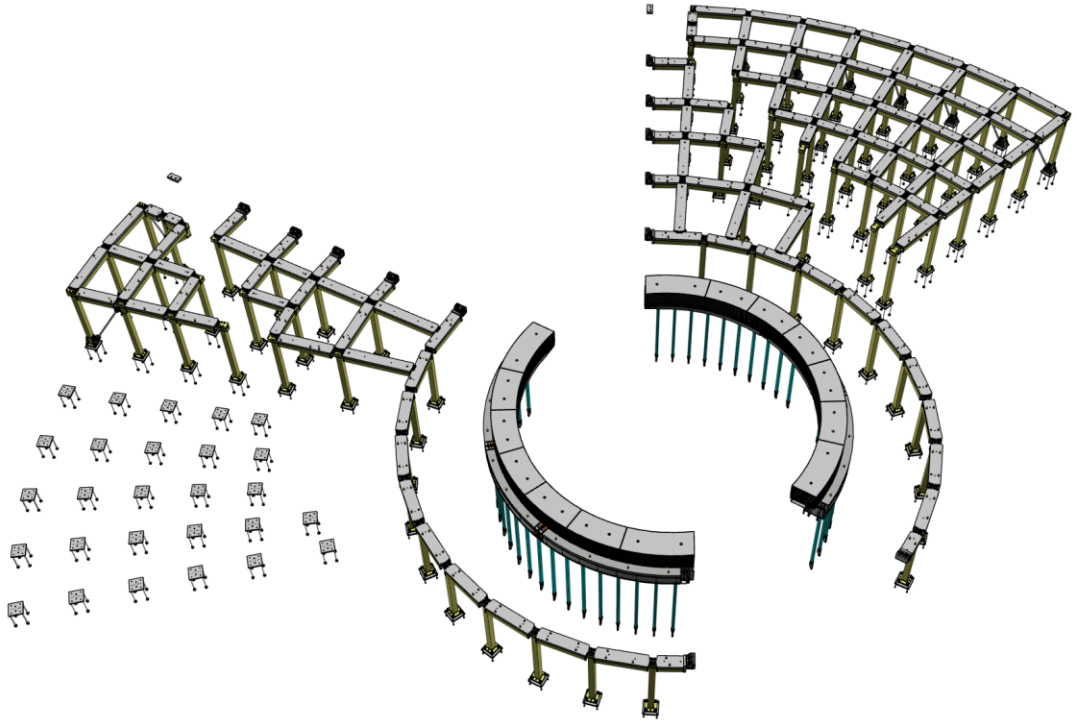


System overview

ESS.NSS.F01.F01.U01 - Bunker Structural Support System

The Bunker Structural Frame System:

- Provides load paths to the bunker base.
- Offers structural support for the bunker roofs and serves as an interface for routing necessary utilities within the bunker.
- Allocates reserved volume along each Instrument System designated beam-port central axis, extending from the target to the bunker walls, for the installation of front-end system elements within the bunker.

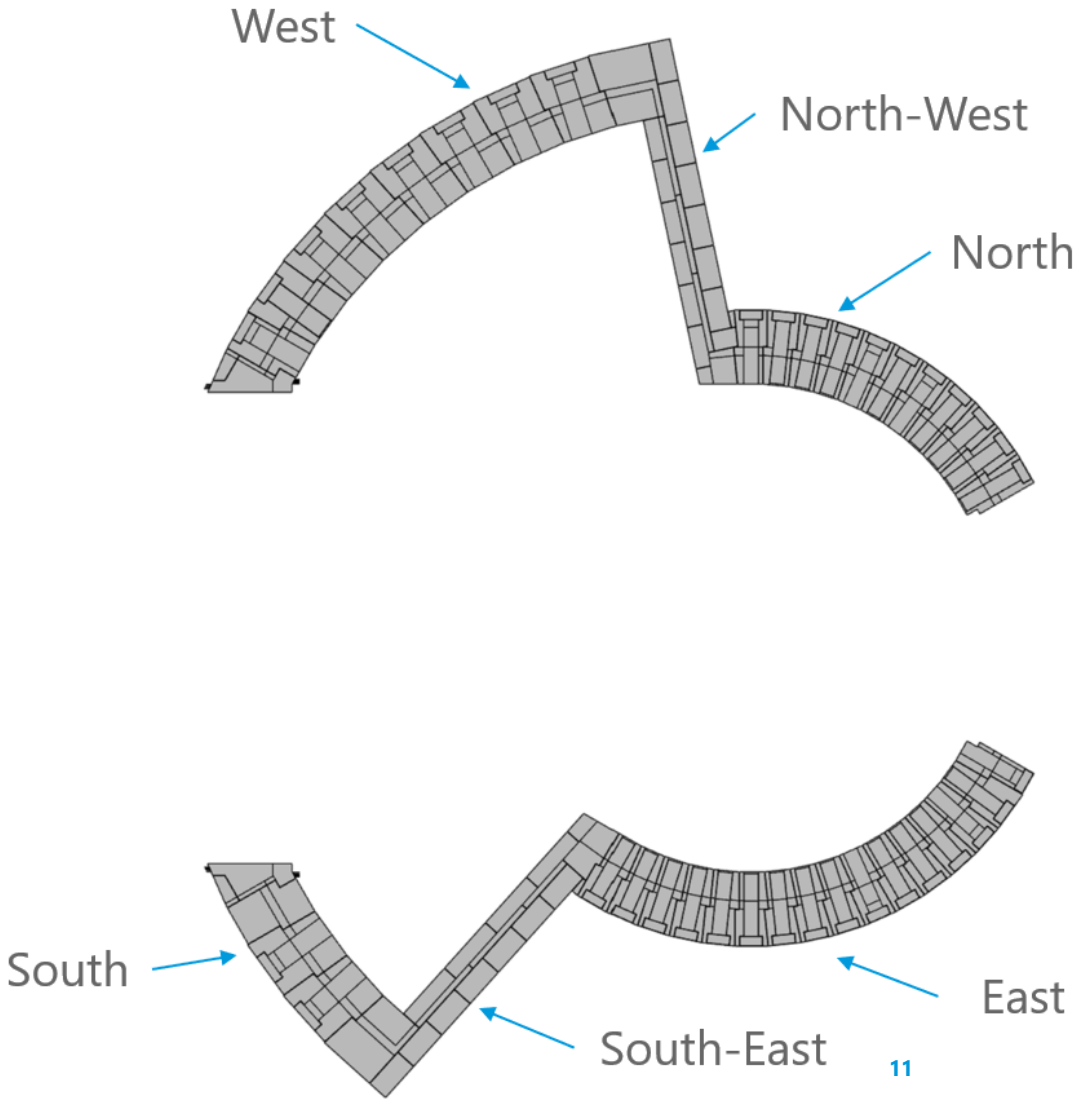


System overview

ESS.NSS.F01.F01.F02 - Bunker Shielding Wall System

The Bunker Wall System:

- Provides attenuation of radiation emanating outwards from within the bunker.
- Is modular, allowing for the safe feed-through of Instrument Systems (InS) elements.
- Its modular design facilitates modifications to accommodate the installation or removal of InS elements.
- Allows for the safe routing of utilities from D01 and D03 into the bunker for use by InS elements within.
- Is designed to impede unauthorized access to the bunker.

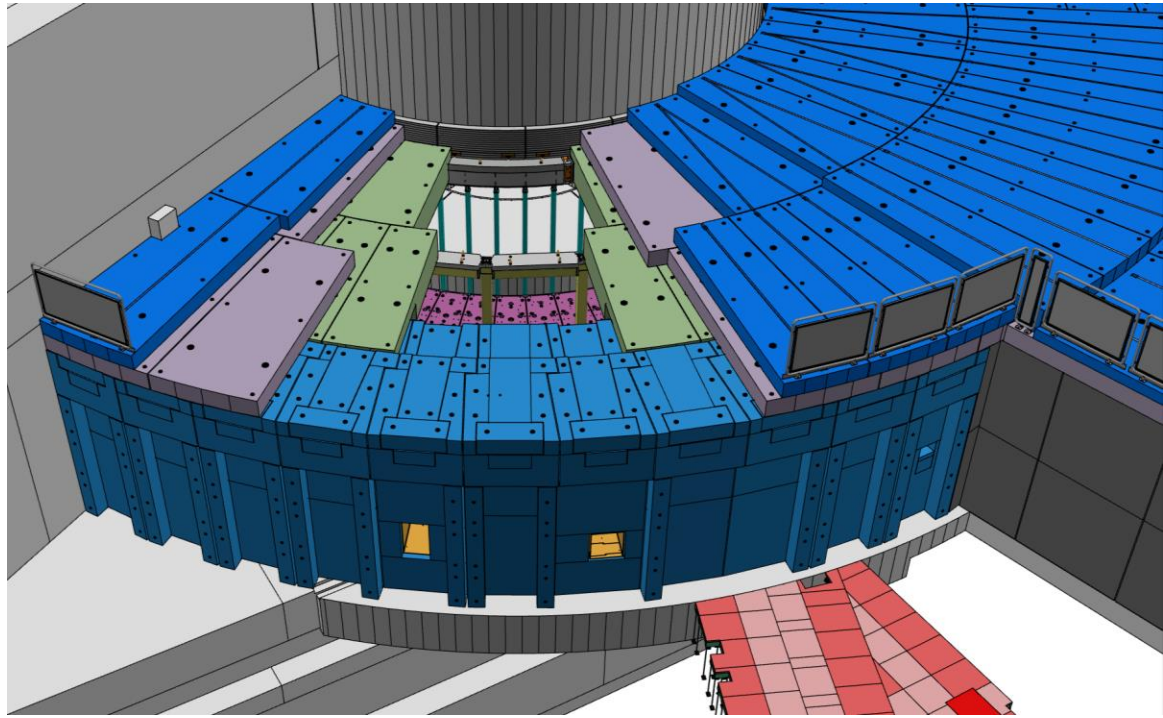


System overview

ESS.NSS.F01.F01.F01 - Bunker Shielding Roof System

The Bunker Shielding Roof System:

- Attenuates radiation emanating upwards from within the bunker.
- Is modular in design, allowing for restricted personnel access to the bunker.
- Provides primary access for the passage of Instrument Systems elements, Target Systems elements, and associated equipment, supporting their installation or removal.

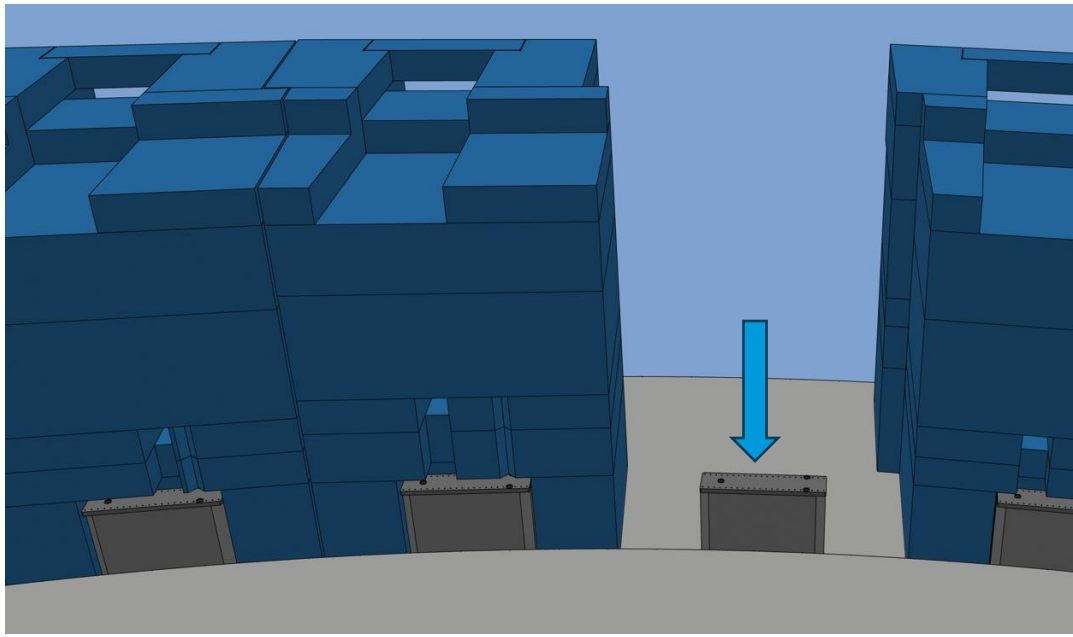


System overview

ESS.NSS.F01.F01.U02 - Bunker Upstream Supports

The Bunker Upstream Supports System:

- Are required to establish an interface between the floor slabs within the bunker and the wall inserts provided by the instrument teams.
- Wall inserts must not make physical contact with the bunker wall blocks to accommodate potential movements caused by settling of the building and slabs.
- The upstream supports are supplied as an integral component of the bunker system, while the downstream supports are included in the instrument deliverables.

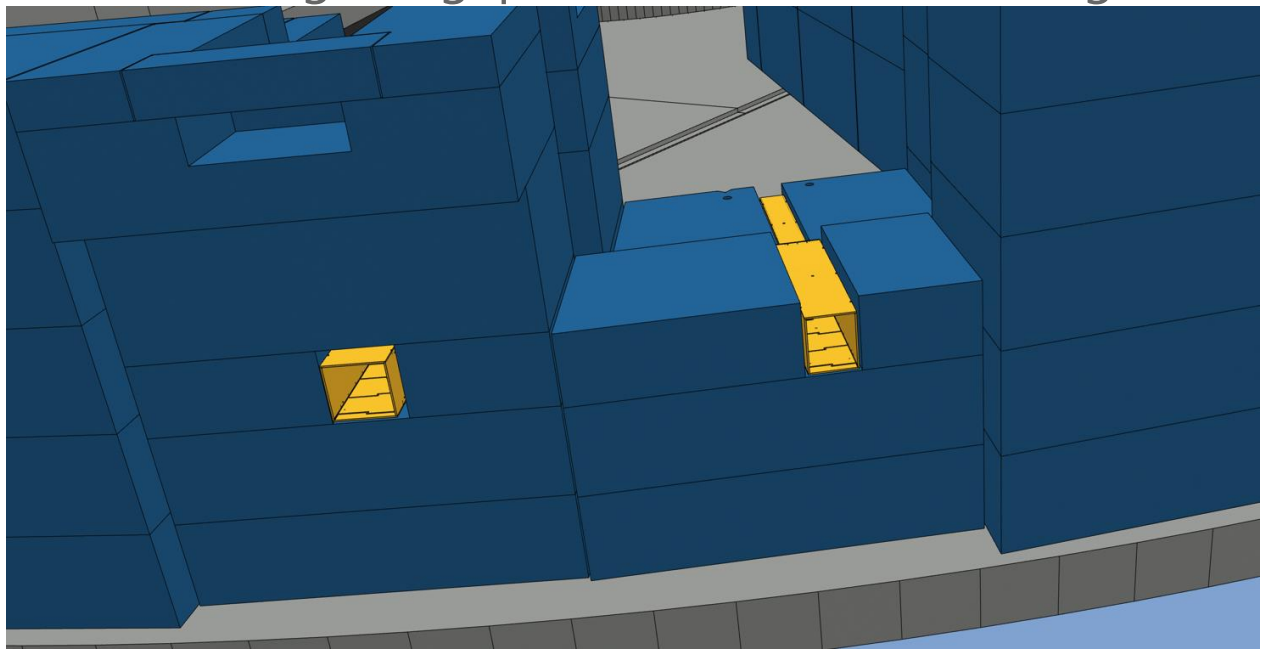


System overview

ESS.NSS.F01.F01.F06 - Bunker Feedthrough Cases

The Bunker Feedthrough Cases:

- Are integrated into the concrete structure of the bunker wall, providing a precise envelope for the installation of additional hardware within the sleeves (wall inserts supplied by the instrument teams).
- Most feedthrough cases are designed with overlapping shims that are essential for minimizing the gap between the feedthrough case and the wall insert.

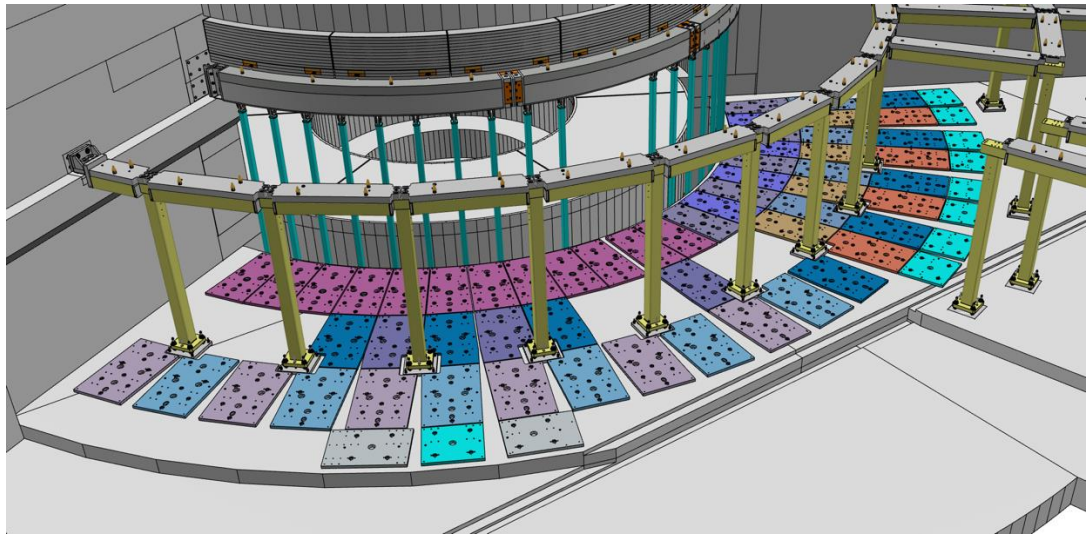


System overview

ESS.NSS.F01.F01.U04 - Bunker Instrument Baseplates

The Bunker Instrument Baseplates:

- Simplifies future in-bunker activities for both instrument and target systems by providing a stable, well-controlled floor interface with predefined mounting holes.
- Minimizes contamination and reducing the duration of future installation and upgrade activities inside the Bunker.
- Supports the efficient mounting of neutron instrument components, following the instruments' conceptual design.

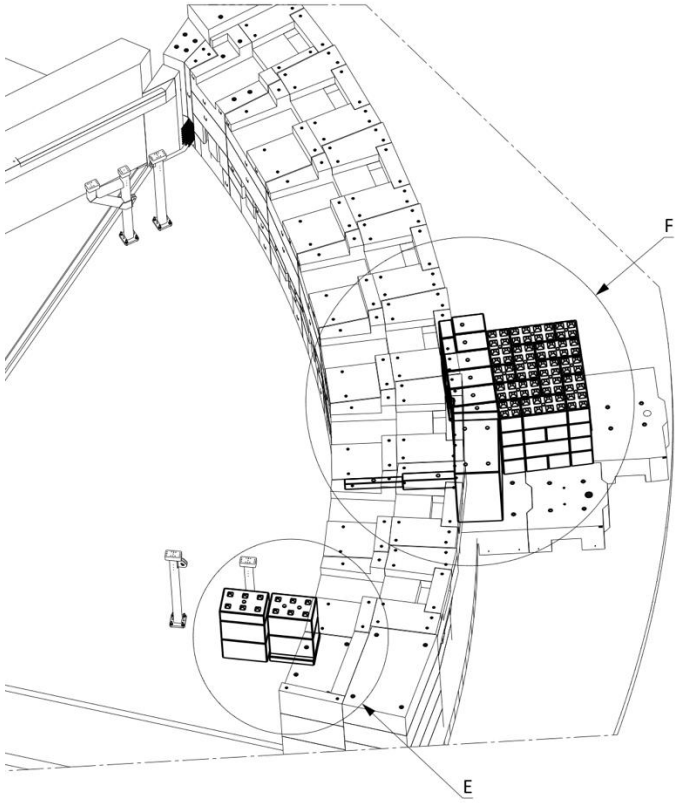


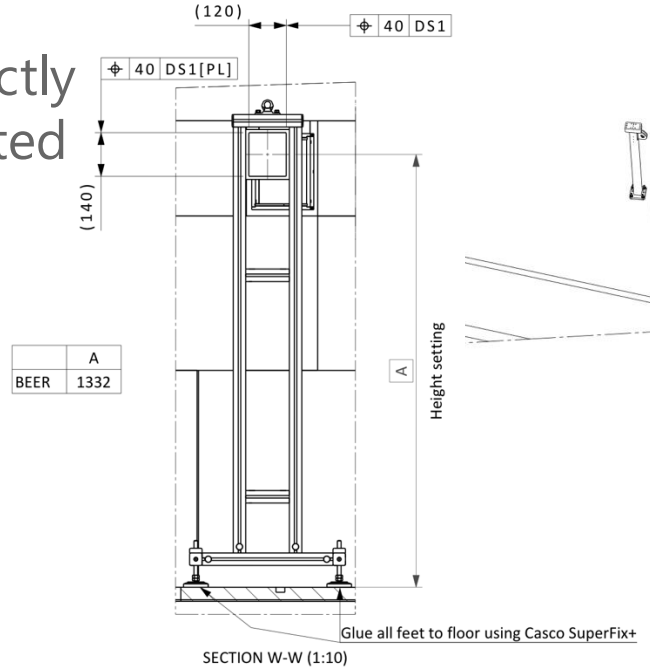
System overview

ESS.NSS.F01.F01.F07 - Instruments Temporary Beamstops

The Instruments Temporary Beamstops System:

- Provides temporary shielding for instruments without shutters installed.
- Will be used for all instruments that still not have a fully installed beamline inside the Bunker at NSS Ready for BOT (Beam On Target).
- In addition, a B4C layer is positioned either directly after the monolith neutron port insert or mounted on a support at the end of the vacuum pipe to mitigate air activation inside the Bunker.



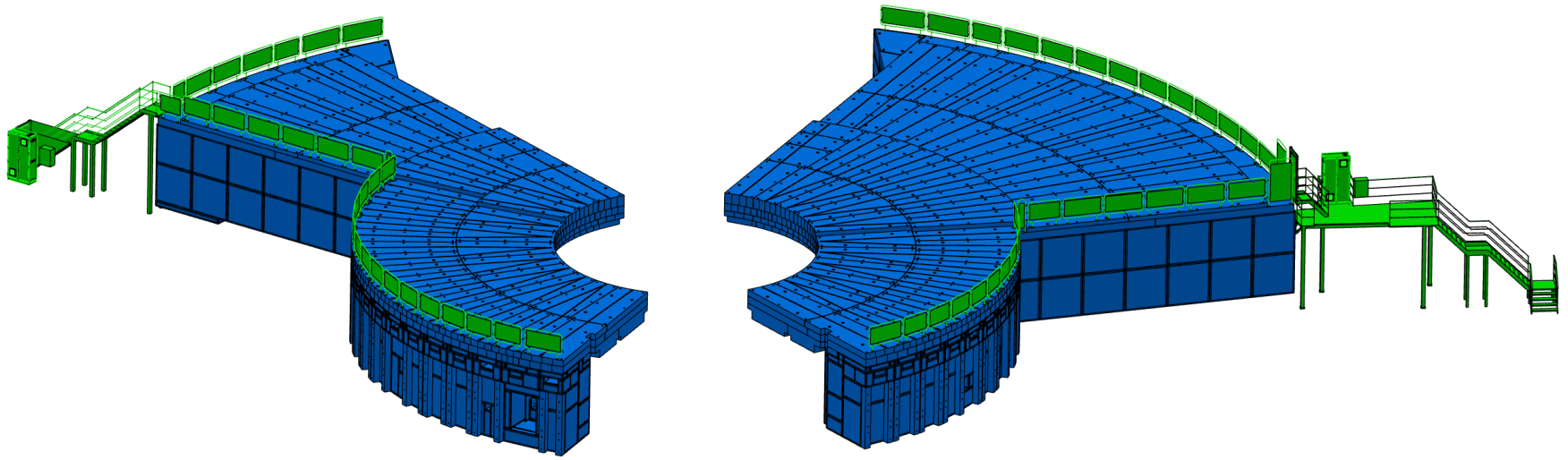


System overview

ESS.NSS.F01.F01.U03 - Bunker Fences and Stairs

The Bunker Fences and Stairs System:

- Is designed with the purpose to fulfil the need of safe restricted authorised personnel accessing the bunker.
- Provides physical barriers at the perimeters, i.e. around the Bunker roof and also the staircases between experimental halls and the Bunker roof.
- In cases when the fence at the Bunker roof perimeter can limit the operation of the crane, parts of the fence may be temporarily dismantled.

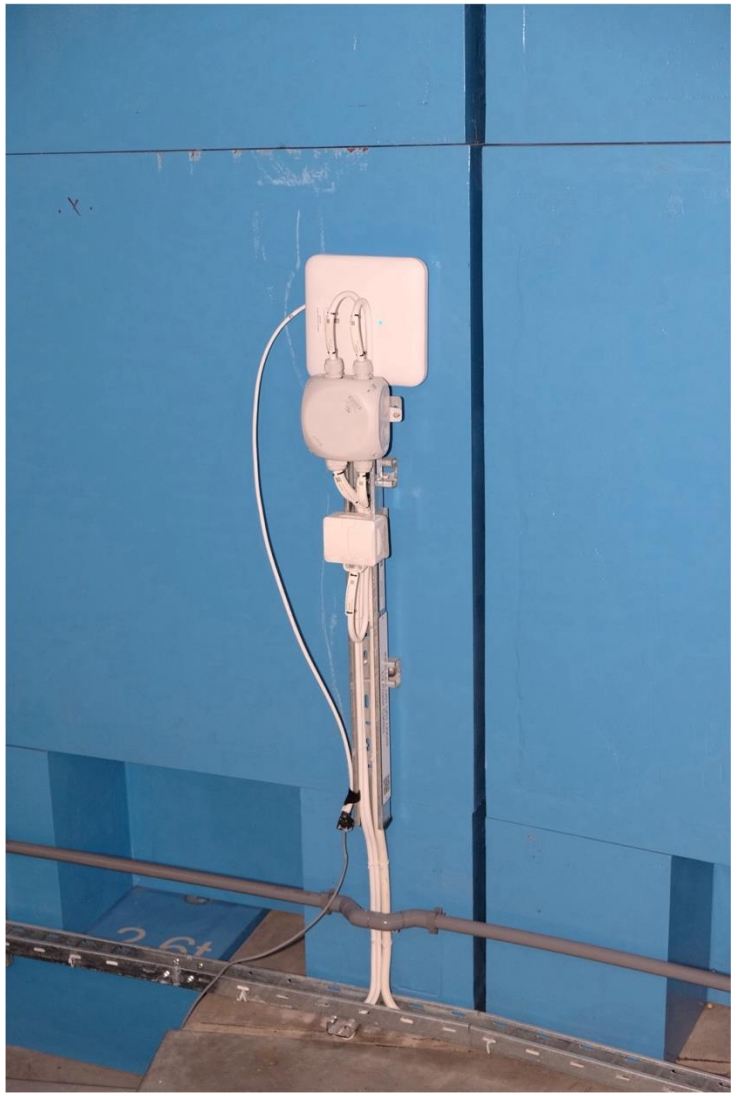


System overview

ESS.INFR.W01.W01.W02.W26 - Bunker Area Socket Outlets

The Bunker Area Socker Outlets:

- Provide power utilities within the bunker for service and maintenance activities in both long and short sector instrument zones.
- Each instrument zone is equipped with a double socket for powering maintenance lights and tools.



Quality & Compliance

Quality

ESS.NSS.F01.F01 – The Bunker System

Applicable directives and standards:

- Eurocode 2
- EN 1090
- Etc.
- CE marking not applicable.

NCR 10626 (for the inclination of Bunker's R6 pillars, ESS-5878227) still pending.

No other outstanding QC items identified.

Commissioning

Cold commissioning

ESS.NSS.F01.F01 – The Bunker System

All required SATs have been performed, and Verification & Validation reports have been released:

- Verification Reports for the Bunker System (D01 and D03) – rejected
- Validation Reports for the Bunker System (D01 and D03) – rejected
- V&V Reports for the Bunker Temporary Beamstops (D01 and D03) – rejected
- V&V Reports for the Bunker Stairs and Fences (D01) – approved
- V&V Reports for the Bunker Stairs and Fences (D03) – rejected
- V&V Reports for Bunker Instrument Baseplates (D01 and D03) – approved
- Verification Report of Bunker Area Socket Outlets – approved

A few SATs will be redone to address the identified punch list items.
Re-release of the V&V reports will follow.

Cold commissioning

ESS.NSS.F01.F01 – The Bunker System

Outstanding NITs:

- NIT-173 - Shielding infill of all utility feedthroughs not installed (D01 Bunker)
- NIT-468 - Shielding infill of all utility feedthroughs not installed (D03 Bunker)
- NIT-469 - Straight Wall blocks physically connected to the TBL cave must be clearly marked to avoid accidental lifting (D03 Bunker)
- NIT-470 - An installation report confirming correct alignment of B4C screens shall be provided by SAM (D03 Bunker)
- NIT-471 - Two fence elements were found to be unstable and need reinforcement (D03 Bunker)
- NIT-472 - A significant gap was identified between two fence segments. One of the segments needs to be extended to close the gap (D03 Bunker)

Hot Commissioning

ESS.NSS.F01.F01 – The Bunker System

As stated in Validation Reports of the Bunker and Temporary Beamstops:

- Validation will follow RP's procedures and will be carried out by RP itself.
- The "Shielding validation for target station (ESS-5765213)" will be used during the hot commissioning.

Summary

Summary

ESS.NSS.F01.F01 – The Bunker System

To fully finalize and deliver the Bunker Project, the following actions must be completed:

- Resolution of one NCR and all registered NITs (as listed earlier).
- Re-release of not approved V&V reports.

All activities shall be completed by the end of 2025.

Finish presentation