



# ENG-033 - FDRS - FDR SUMMARY

## PSS FDR Design Review Results

*NSTXU\_1-7-3-1\_FDRS\_100*

Work Planning #: **3032**  
Effective Date: **02/10/2020**  
Prepared By: **Joseph Petrella**

<b>Reviewed By</b>	Joseph Petrella, Cognizant Individual	02/10/2020 14:40:31 PM
<b>Approved By</b>	John Dellas, Design Review Chair	02/10/2020 15:51:29 PM



**DESIGN REVIEW DOCUMENTATION – RESULTS – No: \_\_\_\_\_ #**

**Title:** Personnel Safety System (PSS)

**CAT:** ☒ A1 ☐ A2 ☐ A3

**Type of Review:** ☐ Peer ☐ CDR ☐ PDR ☒ FDR

**Cognizant Individual:** Joseph Petrella **Date of Review:** 1/28/2020 – 1/29/2020

**Review Board Members:**

Chairperson J Dellas

RE T Stevenson

TA (*Elect*) R Camp

TA (*Control and Data*) P Sichta

QA K Cortes

ESH J Levine

Regulatory Compliance \_\_\_\_\_

**Invited Attendees:**

S Gerhardt

G Tchilinguirian

M Cropper

J Corl

P. Bong (Lawrence Berkeley Lab)

J. Kowal (Jefferson Nat'l. Lab)

D. Freeman (Oak Ridge Nat'l. Lab)

J. Malo

J. Veasey (AE Solutions)

**Other Attendees:**

J Galayda C. Hines

R Hawryluk J Browning

P Dugan S. Depasquale

M D'Agostino G. Ascione

X Zhao B Smith

G. Anderson S Davis

B. Berlinger

**Items Reviewed:**

	<b>Sat.</b>	<b>Unsat.</b>	<b>Comments or n/a if not applicable</b>
Appropriate requirements identified	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Development plans and schedules	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Reg. compliance incl. USI/USID and NEPA	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<u>Design aligned with draft SAD</u>
Disposition of CHITS from previous reviews	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Calculations (all listed are signed and filed)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<u>PSS SIS calculation filed</u>
Cost objectives	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<u>Integrated with Centralized Control System</u>
Other review objectives addressed	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<u>Plans developed to satisfactory FDR level</u>

**SUMMARY OF RESULTS:**

This two day review presented the design for the Personnel Safety System (PSS), which detailed four major components in its design: the Safety Instrumented System (SIS), the Configuration Managed Safeguards (CMS), the Trapped Key System (TKS) and the Search and Secure (S&S) Stations.

Significant areas of discussion on Day 1 included the analysis considerations for the single point of failure for a common cable carrying the two SIS chains. There was discussion on the network ring design protecting against interruption of function due to the loss of one cable in the ring.

There was a discussion on the radiation effects of the LED lights used in the Search and Secure stations causing premature failure of the LEDs. Also, for the S&S stations, which use different LED light colors for different access states, there was a concern for color blind people not being aware of the state. It was clarified that there will be audible tones for different state changes as well as marquee signage to display the state as well.

There were questions on how the S&S station locations were determined. The response was that locations were determined in consultation with Lab personnel who are very familiar in performing search and secure. A discussion on how administrative control is used to restart a search if a person is uncovered during the search and secure process.

It was clarified that dedicated conduit will be used for the SIS functions and SIS will have unique color identification of purple and white. Cabinets containing components performing SIS functions have door switches as well as Bryce fasteners, whose keys will be administratively controlled.

The Day 1 committee discussion included various ways the system could be challenged for verification of performance purposes. For example, use of a hidden-dummy to test how effective the search and secure process is, as

allenging various system elements, such as opening one branch of the fiber optic ring. The committee interest in the Centralized Control System (separate FDR already held) and how it interacts with the PSS, so a homework assignment was to develop a slide deck on CCS for the next day (B Smith).

Day 2 commenced with the CCS presentation and the committee was satisfied with its interaction to the PSS. A key discussion point for Day 2 included the LOPA/ Fault Tree Analysis (FTA) presentation and the need for an update to the fault tree for neutral beam and coil operation to change the Boolean logic to accurately reflect the condition under which ionizing radiation could be created. The change ended up having an insignificant impact on the risk reduction factor (RRF), so there was no impact to the design.

Another key discussion point for Day 2 was a demonstration on how the FDR objective of verification of SAD considerations was being addressed. A walk through of the draft SAD and its correlation with features of the PSS design was made and satisfied the committee.

The presented design was well developed. The requirements were effectively implemented into the design. The 200 plus design drawings were in a final stage and the test plans were effectively outlined or drafted. The hardware and software design and implementation planning was sufficiently developed to FDR level. Supporting prototype samples of the S&S station, a physical barrier sample for the CMS and the Fortress locks helped to evaluate the design.

There were a total of twenty nine chits generated. One was rejected by the review board because it was already addressed. The review board recommendation was to concur with twenty six chits and to consider two of the chits.

**Disposition:** [check one]

☐ **Acceptable**

☒ **Acceptable pending resolution of concerns**- CHITS identified above must be resolved prior to installation.

☐ **Incomplete** - Additional design work is required prior to another design review.

☐ **Unsuccessful** – Corrective actions must be taken and another review process must be initiated.

**Design Review Chair Person** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Cognizant Individual Acceptance** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Distribution:** Review Board Members, Operations Center, Responsible Engineer (RE), Cognizant Individuals, Project Manager, Project Director, relevant Technical Authorities (TAs), Chief Engineer (CE), Fire Protection Engineer, Attendees, QA, ES&H, Security, Requesting & Performing Dept. Head