

SNS OPERATIONS PROCEDURES MANUAL



SNS-OPM 2.H-7.4 Review of SNS Radiation Shielding

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RAD Accelerator Operations Manager Date

Approved: Bob L C 2-6-2015
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SNS-OPM 2.H-7.4
Review of SNS Radiation Shielding

1. Purpose

- 1.1 To provide instructions for system **Shielding Designers, Shielding Modelers, Lead Engineers, Liaison Physicists** (e.g. Commissioning Area Managers, Instrument Scientists, etc.), the **SNS Radiation Safety Officer (RSO)**, members of the **SNS Radiation Safety Committee (RSC)** and **Instrument Systems Safety Committee (ISSC)** in the process of review of shielding design for SNS Radiation Shielding.
- 1.2 Task specific shielding which is installed and removed on a short-term basis for work and is reviewed as a part of an ALARA review or a Radiological Work Permit (RWP) process is **not** under the scope of this procedure.

2. Responsibilities

- 2.1 The **SNS RSC, ISSC**, or assigned subcommittee may review shielding designs and make recommendations to provide reasonable assurance that the design provides the required level of protection.
- 2.2 The **SNS RSC** will make recommendations to SNS Management in cases where policy issues raised during ISSC review need to be resolved.
- 2.3 The **Shielding Designers** (e.g. Responsible Instrument Scientist, Area Engineers and Lead Engineers) are responsible for preparing documentation supporting the adequacy of a proposed design and for informing the SNS RSO or **Division Radiological Control Officers (DRCO's)** of proposed changes to existing shielding or proposed new designs for shielding.
- 2.4 The **Shielding Modelers** (e.g. Neutronics Group) are responsible to perform calculations and radiation shielding modeling.
- 2.5 The **SNS RSO** is responsible for approving the shielding design and monitoring its effectiveness.

3. Prerequisites

- 3.1 Compliance with [ORNL SBMS management system: Radiological Protection](#) and [ORNL SBMS subject area: Radiological Design Requirements](#).

4. Precautions

- 4.1 Failure to carefully review the shielding design can result in costly re-working or retrofitting of radiation shielding and could lead to unnecessary dose to personnel (contrary to ALARA policy).

5. Procedures

- 5.1 The **Shielding Designers** or their designee should develop, analyze and document the new or modified shielding design and should provide a written description of radiation issues and protection methods to the **SNS RSO or DRCO's**.

- 5.2 The **SNS RSO** shall determine if implementation of the design constitutes a "minor" or "non-minor" change to shielding.

- 5.2.1 Examples of non-minor changes that should institute a shielding design review are the following:

- Installation of a new experiment that could affect the integrity of the shielding.
- Installation of a beamline, or beam dump.
- Extension or significant modification of an existing beamline.
- Substantial increases in beam intensity in an existing primary or secondary beamline.
- Removal of a substantial amount of material that acts as shielding for either the accelerator, accumulator ring, or an existing beamline.

These examples are not meant to be exhaustive.

- 5.2.2 The **SNS RSC Chairperson** shall be notified when minor changes to shielding have been approved and authorized by the **SNS Radiation Safety Officer (RSO)**.

- 5.2.3 Minor changes to the shielding, once approved by the **SNS RSO**, do **not** require further review.

- 5.3 The **SNS RSO** shall report **non-minor changes** in shielding design to the **SNS RSC**, which shall review and make recommendations on the shielding design, or assign a **subcommittee** for the review.

- 5.4 For **non-minor changes**, the shielding design should be presented to either the **RSC, ISSC**, or their designated **sub-committee** for review. The shielding design presentation is to include radiation calculations of the anticipated prompt and residual radiation and activation. The following are presented as suggested guidelines for topic areas to be considered in the calculations:
- 5.4.1 Prior to beam operation of the SNS facility into a new area, calculations should be made of the expected prompt and residual radiation and activation generated by operation of the beam. These calculations should also be re-examined or revised for areas where significant changes have been made to the amount or composition of radiation shielding, beamline components, or other materials exposed to ionizing radiation.
- 5.4.2 The SNS **Radiation Safety Officer (RSO)** is to determine if the changes in the amount or composition of shielding or potentially activated material is significant enough to require re-calculation. The RSO may call upon the expertise of neutronics transport shielding experts to aid in his determination.
- 5.4.3 The list of issues to be considered in the supporting radiation calculation should include but not be limited to:
- Prompt radiation levels with no shielding in place.
 - Residual radiation levels in occupied and in access controlled areas.
 - Potential for producing airborne contamination.
 - Potential for loose surface contamination.
 - Potential for fire to cause dispersion of radioactivity.
 - Activation of items such as:
 - Beamline components.
 - Structure adjacent to beamline components.
 - Cooling Water.
 - Fire Sprinkler Water.
 - Soil outside of the beam enclosure.
 - Ground Water outside the beam enclosure.
 - Recommended decay times before accessing beam areas.
- 5.5 The review shall establish that the shield meets the goals set forth in the “SNS Radiation Safety Policy” ([SNS-OPM 2.H-5](#)) and the “Spallation Neutron Source Shielding Policy” ([Shielding Policy \(SNS 102030000-ES0008-R00\)](#)), or recommend changes for such compliance.

- 5.6 The **SNS RSC/ISSC Chair** (or designee) shall assure that the review proceedings and recommendations are documented in the Committee minutes or reports and are submitted to the Document Control Center (**DCC**).
- 5.7 The **Shielding Designers** shall work to complete the shielding design and drawings in accordance with the review recommendations.
- 5.8 The **SNS Fire Safety Engineer** shall be consulted to identify fire safety concerns associated with the use of combustible shielding and/or the obstruction of fire protection coverage. The calculated mass of the combustible shielding shall be noted on the design drawings.
- 5.9 Shielding documentation shall be assigned identifying numbers in compliance with DCC practices.
- 5.10 If shielding policy issues are identified during an ISSC shielding review, the SNS RSC shall also review the shielding design, following the relevant portions of the process in Section 5.5 above.
- 5.11 The **SNS RSO** shall review the shielding design drawings, and if necessary work with the **Shielding Designers** and **SNS Fire Safety Engineer** to adhere to the review recommendations and fire safety issues.
- 5.11.1 Upon successful reconciliation, the SNS RSO shall approve the design drawings. The record of approval can be a separate document, should be distributed to **RSC/ISSC members**, and signed by the following personnel or their designees:
- **Shielding Designers,**
 - **Shielding Modelers,**
 - **SNS RSO,**
 - **SNS Fire Safety Engineer,**
 - **SNS Operations Manager**
- 5.12 The **Responsible Engineer/Scientist** shall use the design-approved drawings to direct the completion of the shielding.
- 5.13 Upon completion of the shielding, the **Shielding Designers, Shielding Modelers, SNS RSO, the SNS Fire Safety Engineer** and the **SNS Operations Manager** (or designees) shall verify the shielding has been installed in compliance with the approved drawings (or equivalent descriptive documents) and other requirements, and shall then add their installation-approval signature to the drawings.
- 5.14 The fully-approved shielding drawings shall be submitted to the **DCC** and become a project record of the shielding for the area.

5.15 To verify the adequacy of the shielding, fault study plans and procedures should be written and conducted in accordance with [SNS-OPM 2.H-16](#). “Fault Study Preparation Guidelines and Fault Study Procedure for Primary and Secondary Beam Areas”.

6. Documentation

6.1 The minutes of the **SNS RSC, ISSC, and/or subcommittee** meeting(s) as appropriate.

6.2 The final approved and signed shielding drawings.

7. References

7.1 ORNL SBMS management system: Radiological Protection
https://sbms.ornl.gov/sbms/SBMSearch/Msd/RPS/RPS_MSD.cfm

7.2 ORNL SBMS subject area: Radiological Design Requirements
<https://sbms.ornl.gov/sbms/sbmsearch/subjarea/RadDesign/sa.cfm>

7.3 SNS-OPM 2.H-5. “SNS Radiation Safety Policy”
<http://ns-staff.ornl.gov/operations/SNS-OPM/02-H-05.pdf>

7.4 “SNS Shielding Policy”
[Shielding Policy \(SNS 102030000-ES0008-R00\)](#)
(in ProjectWise at <https://pwweb-prod.ornl.gov/>)

7.5 SNS-OPM 2.H-16. “Fault Study Preparation Guidelines and Fault Study Procedure for Primary and Secondary Beam Areas”
<http://ns-staff.ornl.gov/operations/SNS-OPM/02-H-16.pdf>

8. Attachments

8.1 None.

9. Revision History

- Rev. 05 February 6, 2015 – Changed titles on signature page to reflect current organizational structure. **Section 5.11.1** – Removed bullet for NSSD Operations Manager. SNS RAD Operations Manager changed to SNS Operations Manager. **Section 5.13** – NSSD Operations Manager removed from list and SNS RAD Operations Manager changed to SNS Operations Manager. Added **Sections 5.4.2, 5.4.3, and 5.4.4** to replace bullets. Corrected links throughout the document. Added **Section 9** - Revision History.