



**Department of Energy**  
Savannah River Operations Office  
P.O. Box A  
Aiken, South Carolina 29802  
**APR 01 2013**

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DNF SAFETY BOARD

The Honorable Peter S. Winokur  
Chairman  
Defense Nuclear Facilities Safety Board  
625 Indiana Avenue, NW, Suite 700  
Washington, DC 20004

Dear Mr. Chairman:

SUBJECT: Transmittal of Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2012-1 Implementation Plan (IP) Deliverable 2c-2, (Letter, Hunt to McGuire, Fire Detection and Alarm System Design Study Revision, 03/27/13)

This letter transmits a deliverable consistent with Commitment 2c-2 of the Department of Energy's IP for DNFSB 2012-1, Savannah River Site Building 235-F Safety. The deliverable describes the results of Building 235-F Fire Detection and Alarm Systems (FDAS) enhancement study. The study includes the review criteria used to determine the FDAS design enhancements (to include criteria, scope and schedule), operation and maintenance necessary to assure fire detection and alarm system reliability is commensurate with its safety functions.

We will continue to work with your staff to effectively respond to the concerns raised in the recommendation, and complete the IP.

If you have any questions please contact me, or have your staff contact Patrick McGuire, Assistant Manager for the Nuclear Material Stabilization Project at (803) 208-3927.

Sincerely,

A handwritten signature in black ink, appearing to read "T. R. Moody".

FOR David C. Moody  
Manager

NMPD-13-0025

Enclosure:  
Letter, Hunt to McGuire, 03/27/13

cc w/encl:  
David Huizenga, EM-1  
Matthew Moury, EM-40  
Todd Lapointe, EM-41  
Marie-Josette Campagnone, HB-1.1

Enclosure: Letter, SUBJECT: Transmittal of Defense  
Nuclear Facilities Safety Board Recommendation 2012-1  
Implementation Plan Deliverable 2c-2, dated **APR 01 2013**



March 27, 2013

SRNS-N0000-2013-00025  
RSM Track No. 10048

Mr. Patrick W. McGuire, Assistant Manager  
Nuclear Material Stabilization Project  
Savannah River Operations Office  
P. O. Box A  
Aiken, SC 29802

Dear Mr. McGuire:

**FIRE DETECTION AND ALARM SYSTEM DESIGN STUDY REVISION**

The purpose of this letter is to provide an updated response to the Department of Energy-Savannah River (DOE-SR) deliverable listed in Action 2c-2 of the approved DOE Implementation Plan for Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2012-1. This revised document incorporates final DOE comments and has been coordinated with James Harris of DOE Fire Detection.

Please feel free to contact me or Dewitt Beeler, 2-4372, of my staff if you need additional information.

Sincerely,

Paul D. Hunt, Senior Vice President  
Environmental Management Operations

db/ccc

Att.

c: J. J. Hynes, DOE-SR, 703-H  
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**Building 235-F  
Fire Detection &  
Alarm System Upgrades  
Design Study**

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**Tracking No. : 10755**

**Authority: N1.434.98.28.01.K.03**

**Retention: 75 Years After Decommissioning**

Document Control Number: F-ESR-F-00193  
Revision: 1



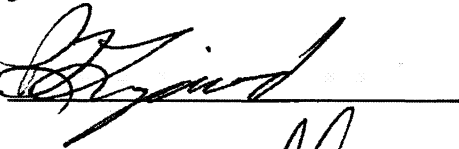
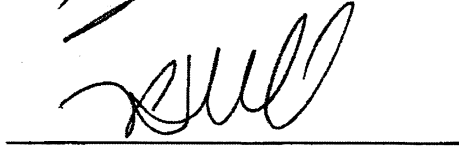


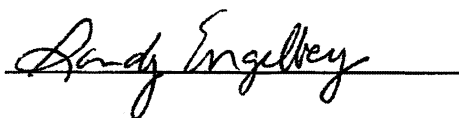
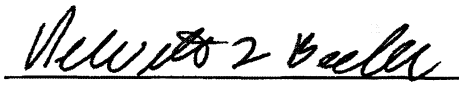
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Building 235-F Fire Detection & Alarm System Upgrades Design Study

Savannah River Site

F-ESR-F-00193

SRNS APPROVAL SIGNATURES

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This document was prepared in conjunction with work accomplished under Contract No. DE-AC090-08SR22470 with the U. S. Department of Energy.

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Printed in the United State of America

Prepared for

U. S. Department of Energy

And

Savannah River Nuclear Solutions, LLC

Aiken, South Carolina

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**Document Revision History**

<b>Rev. Number</b>	<b>Status</b>	<b>Date</b>
0	Initial Issue	02/27/13
1	Incorporated DOE comments.	03/25/13

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## ACRONYMS

DOE	Department of Energy
DNFSB	Defense Nuclear Facilities Safety Board
FACP	Fire Alarm Control Panel
FDAS	Fire Detection & Alarm System
FPE	Fire Protection Engineering
IP	Implementation Plan
NFPA	National Fire Protection Association
Pu	Plutonium
PuFF	Plutonium Fuel Form
SB	Safety Basis
S & M	Surveillance & Maintenance
SRNS	Savannah River Nuclear Solutions
SRS	Savannah River Site
SRSOC	Savannah River Site Operations Center

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## **Executive Summary**

Building 235-F contains significant residual radiological contamination (primarily plutonium 238 oxide in particulate form). An accident (e.g. a seismic event with resultant fire) could breach the confinement (e.g. cells and gloveboxes) for the radiological contamination, and cause it to be dispersed to the environment. Then, worker exposure may result, which would lead to an uptake and dose to the exposed workers. An upgrade to the Building 235-F Facility Fire Detection & Alarm System (FDAS) is desirable because it will mitigate the consequences of a fire and thus reduce the severity of worker exposure.

To this end, the Defense Nuclear Facilities Safety Board (DNFSB) issued recommendation 2012-1 which made recommendation 2c stating "Evaluate the condition and operability of early detection and alarm systems in the Plutonium Fuel Form (PuFF) facility such as the heat and smoke detectors (with the exception of those located within the PuFF facility cells if evaluating them would require intrusion into the cells). Take action as necessary to ensure that these systems are credited in the Safety Basis (SB), are remotely monitored, provide reliable detection of hazards, and are maintained in accordance with National Fire Protection Association (NFPA) 72, National Fire Alarm and Signaling Code."

The Department of Energy (DOE) issued *Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2012-1* to address these recommendations, in which Action 2c-2 states "Develop a Fire Alarm and Detection design study that will recommend the PuFF FDAS system design enhancements (to include criteria, scope and schedule) for S&M and deactivation phases." This document serves as the deliverable for DOE Action 2c-2.

The upgrades to the Building 235-F Facility FDAS will be accomplished using existing procedures and processes for configuration management established in Manual E7, "Conduct of Engineering". The scope will be completed using approved design change documents. These documents will be incorporated into the appropriate configuration management documents such as system drawings.

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The schedule to accomplish the 235-F FDAS upgrades includes the following significant milestones:

<b>Activity</b>	<b>Description</b>	<b>Start</b>	<b>Finish</b>
1	Complete Design Input	Complete	Complete
2	Prepare Design Output (Drawings & Specifications)	03/01/2013	06/30/2013
3	Mobilize Site Forces or Unit-Price Contractor	07/01/2013	08/30/2013
4	Perform 235-F FDAS Upgrades	09/01/2013	10/30/2013
5	As-Built System Drawings and Incorporate Design Change Documents	11/01/2013	11/30/13
6	Perform Acceptance Testing	11/01/2013	11/30/2013
7	Notify DOE IP Action 2c-3 is Complete	12/01/2013	12/20/2013

Completing the scope as described will significantly reduce the risk of exposure as a result of a fire in Building 235-F.

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## 1.0 Introduction

The Building 235-F Facility Fire Detection & Alarm System Upgrades Design Study (F-ESR-F-00193) serves as the deliverable for Action 2c-2 from the United States Department of Energy Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2012-1.

This Design Study defines the criteria, scope, and schedule for the planned installation and maintenance of the upgrades to the Building 235-F Facility Fire Detection & Alarm System.

## 2.0 Background

The United States Department of Energy Implementation Plan (IP) for Defense Nuclear Facilities Safety Board Recommendation 2012-1, Savannah River Site Building 235-F Safety, specifies actions to reduce the hazards associated with the Plutonium 238 (Pu-238) that remains as residual contamination within Building 235-F. This residual Pu-238 contamination poses a potential dose risk consequence associated with a radiological release. The DNFSB recommendations included evaluating the condition and operability of early detection and alarm systems in the Building 235-F Facility and taking action as necessary to ensure that these systems are remotely monitored, provide reliable detection, and are maintained.

The IP contains three actions pertaining to the DNFSB recommendations listed above. Those actions are listed as follows:

- Action 2c-1 states “Complete evaluation of existing FDAS for functionality and maintainability.” The stated deliverable is an Evaluation Report, which has been completed.
- Action 2c-2 states “Develop a Fire Alarm and Detection design study that will recommend the PuFF FDAS system design enhancements (to include criteria, scope and schedule) for S&M and deactivation phases.” The stated deliverable is a letter describing the Building 235-F Facility FDAS design enhancements (to include criteria, scope and schedule), operation and maintenance necessary to assure Building 235-F Facility fire detection and alarm system reliability is commensurate with its safety functions. The expected delivery date for this deliverable is April 1, 2013.
- Action 2c-3 states “Complete installation and acceptance testing of the PuFF FDAS for S&M and deactivation phases.” The stated deliverable is a letter to the DNFSB notifying them that the FDAS installation and acceptance test is complete. The expected delivery date for this deliverable is December 20, 2013.

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In response to the IP, SRNS (Fire Protection Engineering Services) has issued F-EPF-F-00014, Revision 0 (Fire Protection Engineering Services Recommendations for the 235-F Corrective Action Plan to address DNFSB Concerns). Attachment VII (Suggested Draft Conceptual Action for Consideration to Address PuFF Fire Detection Upgrades) of F-EPF-F-00014 provided recommendations regarding fire detection system upgrades in 235-F.

MT-V35-2012-00009 (Building 235-F Fire Detection and Alarm System Enhancements) was issued by SRNS to have SRNS's Design Engineering design the installation of a new nonproprietary analog addressable fire alarm control panel (FACP) with associated compatible peripheral devices.

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### 3.0 Discussion

DOE IP Action 2c-2 requires that the criteria, scope, and schedule be provided for the design enhancements to the Building 235-F Facility Fire Detection & Alarm System. These items are discussed in the following subsections.

#### 3.1 Criteria

Section 4.0 (Near-Term Actions and Related Activities) of the United States Department of Energy Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2012-1, Savannah River Site Building 235-F Safety, states the following:

“An initial evaluation of all Building 235-F facility fire detection and alarm systems for functionality and maintainability relative to facility missions is being developed. The facility and DOE are presently evaluating the recommendations. A path forward will be developed and tracked as an action relative to sub-recommendation 2C-3.”

F-ESR-F-00191 (Engineering Evaluation for 235-F Fire Detection and Alarm System) concluded that the primary concern with the 235-F Fire Detection and Alarm Systems was maintainability, rather than reliability. Pyrotronics, Gamewell and Fenwal systems are no longer supported by the manufacturer and parts are no longer readily accessible for purchase.

Section 4.6.1 of F-EPF-F-00014 (Reference 5.2) states that a new detection system is not required by NFPA code or other applicable codes and the design criteria will be tailored to specific areas of the facility (PuFF area and adjacent areas) based on inherent hazards. F-ESR-F-00191 states “Under the existing status (S&M mode) of the facility, the fire alarm and detection system is no longer required by life safety code because the occupant load of the building will be maintained below 100 persons and fewer than 25 persons will be maintained above the level of exit discharge” and “This building is no longer used for routine habitation. The facility will only be entered to perform surveillance and maintenance activities as well as future risk reduction activities.” Therefore, new detectors will only be installed in areas with “inherent hazards” and immediate surrounding areas.

Based on these considerations and the initial recommendations that were provided in Attachment VII of Reference 5.2, a scope of work (see following section) for upgrading the Building 235-F Fire Detection & Alarm System has been developed. The installation and maintenance of the upgrades will comply with NFPA 72 (National Fire Alarm and Signaling Code) and NFPA 70 (National Electric Code) requirements. The building as a whole will not be NFPA 72 compliant.

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### 3.2 Scope

The scope of work for upgrading the Building 235-F Fire Detection & Alarm System was developed and documented in Reference 5.4. Additional design input was obtained from the following:

- Walkdowns
- Drawing Reviews

The "BLDG. 235-F PUFF FIRE DETECTION & ALARM SYSTEM SCOPE OF WORK" is provided below.

1. Replace existing Notifier Panel Model SFP-1024, Silent Knight DACT and XDACT and Gamewell Flex III Fire Alarm Panel with Notifier Model NFS-320 and peripheral devices compatible with NFS-320. All existing devices in rooms described below will be disconnected and removed or replaced by peripheral devices compatible with NFS-320 panel.

**Note:** All conduits and cables currently terminate in Room 135 and will be reused. It was determined that Room 135 was the best location for the new panel to minimize the amount of rework/new installation associated with the conduits and cables. Therefore, this is the most cost effective approach.

2. Disconnect and remove all Halon Control Panels (as identified below) and associated manual release stations and local horns. Disconnect and properly insulate 120 Vac power to Halon Control Panels leads at both ends and abandon in place.

- Room 107B (2), 107G (1), Room 153 (1), Room 116 outside Vault 102 (2), Corridor 126 (1).
- Fenwal Control Panels for System #1 thru 10 (10).
- Gamewell Fire Alarm Panel in Room 116 (1)
- Room 2007 (1)
- Corridor outside Room 216B (1)
- Manual Release Stations PS1-1 thru PS1-6, PS2-1 thru PS2-6, PS3-1 thru PS3-6, PS4-1 thru PS4-10, PS5-1 thru PS5-6, PS6-1 thru PS6-8. These release stations are located throughout building at various locations.
- Disconnect & remove smoke/heat detectors connected to these panels in Rooms 101, 102, 148, 150, & 2000.
- Install cover plate over the opening from where smoke detectors and manual release stations are removed.
- Disconnect and remove local horns associated with each panel.

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3. Rooms 107A, 107D, 107B, 107G, 153, 154, Vault 106, Rooms 1002, 1003, 1004, and 1005:

- Replace existing smoke/heat detectors with addressable smoke detectors compatible with Notifier NFS-320 Fire Alarm Panel.
- Install addressable smoke detectors in Room 106 compatible with Notifier Model NFS-320 Panel.
- Install linear heat detection wire in cable trays above corridor 126 and cable trays above ceiling in Rooms 1002, 1003 & 1004.
- Install flexible cable with addressable smoke detector to support temporary radiation control installations in Rooms 107A, 107D, 107G, 1002, 1003, 1004, and 1005. Provide enough length of cable for movable smoke detector to provide coverage to entire area/room.

Note - Detectors will be installed in Rooms 107A, 107B, 107D, and 107G because those rooms contain the Actinide Billet Line, a shutdown radiologically-contaminated process. Similarly, detectors will be installed in Rooms 153, 154, 1002, 1003 and 1004 because those rooms contain portions of the Plutonium Experimental Facility and the PuFF, which are shutdown radiologically-contaminated processes. Also, detectors will be installed in Vault 106 and Room 1005 because wastes will be staged/processed in those areas in support of future deactivation.

4. Rooms 2000, 2003, 2004, 2007, 2008, 2009, 2010, 2011, and Vault 204:

- Replace existing smoke/heat detectors with addressable smoke detectors compatible with Notifier NFS-320 Fire Alarm Panel.
- Install addressable smoke detectors in Room 2007 compatible with Notifier Model NFS-320 Panel.
- Install linear heat detection wire in cable trays above ceiling in Rooms 2000, 2003, 2004, 2008, 2009, 2010, & 2011. Disconnect and remove heat detector located in storage Room 224.
- Install flexible cable with addressable smoke detector to support temporary radiation control installations in Rooms 2000, 2003, 2004, 2008, 2009, 2010, and 2011. Provide enough length of cable for movable smoke detector to provide coverage to entire area/room.

Note - Detectors will be installed in Rooms 2003, 2008, 2009, 2010 and 2011 because those rooms contain portions of the PuFF, a shutdown radiologically-contaminated process. Similarly, detectors will be installed in Rooms 2003 and 2004 because those rooms contain portions of the Plutonium Experimental Facility and the Old



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Metalography Laboratory, which are shutdown radiologically-contaminated processes. Also, detectors will be installed in Room 2000 because that room contains radiologically-contaminated filtration equipment, which is a key component of Building 235-F's exhaust ventilation. Finally, detectors will be installed in Vault 204 and Room 2007 because wastes will be staged/processed in those areas in support of future deactivation.

5. Replace all horns or strobes with horn/strobes compatible with Notifier Model NFS-320 Panel. Install new horn/strobes as necessary to provide reasonable acknowledgement of alarm. Existing horns located in locked rooms shall be abandoned in place. New horns shall not be installed in locked rooms. The sound level will be subjectively evaluated.
6. Replace existing smoke detector located above existing Fire Alarm Panel SFP-1024 compatible with Notifier Model NFS-320 Panel.
7. Monitor all existing conventional pull stations by addressable module compatible with Notifier Model NFS-320 Panel or replace the existing pull stations with new pull stations that are addressable.
8. Connect Bldg. 292-2F devices and sprinkler system components to Bldg. 235-F Fire Alarm Panel for reporting to Savannah River Site Operations Center. Building 292-2F alarm circuits are already connected to the existing panel in Building 235-F.
9. The new Fire Alarm Panel will report directly to the Savannah River Site Operations Center (SRSOC) for all fire alarms in Building 235-F. The Building 772-1F Control Room will be added to the SRSOC Call List for notifications of fire within Building 235-F.

A schedule for the implementation of this scope of work and associated acceptance testing is provided as Attachment A of this document.

### **3.3 Operation & Maintenance**

The upgraded Building 235-F Facility Fire Detection & Alarm System will be maintained consistent with Savannah River Site standards and NFPA 72 (National Fire Alarm and Signaling Code) inspection & testing requirements. Additionally, SRNS's Fire Protection Program includes the implementation of compensatory measures if the system were to become impaired.

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#### **4.0 Summary and Conclusions**

To determine the scope of the upgrades to the Building 235-F Facility Fire Detection & Alarm System, SRNS utilized a team approach made up of engineering and facility personnel familiar with the facility operational and safety requirements. Extensive document research and multiple facility walk-downs has resulted in the development of a scope that focuses on inherent hazards to reduce the risk of exposure due to a facility fire.

Established configuration management procedures and practices will be used to control the resultant FDAS configuration. Project completion of field activities are projected for 11/30/2013.

The summary of actions to be completed to accomplish the scope for the upgrades to the Building 235-F Facility FDAS is:

- Complete Design Input
- Prepare Design Output (Drawings & Specifications)
- Mobilize Site Forces or Unit-Price Contractor
- Perform 235-F FDAS Upgrades
- As-Built System Drawings and Incorporate Design Change Documents
- Perform Acceptance Testing
- Notify DOE IP Action 2c-3 is Complete

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## 5.0 References

- 5.1 *Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2012-1, Savannah River Site Building 235-F Safety, Revision L, U.S. Department of Energy, December 2012.*
- 5.2 F-EPF-F-00014, Revision 0, *Fire Protection Engineering Services Recommendations for the 235-F Corrective Action Plan to address DNFSB Concerns, 11/12/2012*
- 5.3 F-ESR-F-00191, Revision 0, *Engineering Evaluation for 235-F Fire Detection and Alarm System, 9/27/12.*
- 5.4 MT-V35-2012-00009, Revision 0, *Building 235-F Fire Detection and Alarm System Enhancements.*
- 5.5 Manual E-7 *Conduct of Engineering, Revision Date 1/22/2013*
- 5.6 NFPA 72, *National Fire Alarm and Signaling Code*
- 5.7 NFPA 70, *National Electric Code*
- 5.8 NFPA 101, *Life Safety Code*

## 6.0 Attachments

- Attachment A, Schedule for Implementation of Building 235-F Facility Fire Detection & Alarm System Upgrades.
- Attachment B, F-ESR-F-00193-SK-001, Building 235-F First Floor Fire Protection Upgrade Instrument Location Plan.
- Attachment C, F-ESR-F-00193-SK-002, Building 235-F Second Floor Fire Protection Upgrade Instrument Location Plan.

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**Attachment A: Schedule for Implementation of Building 235-F Facility Fire  
Detection & Alarm System Upgrades**

Note – Except for the final milestone listed below, the following activities and durations are subject to change at the discretion of SRNS, whose overall goal/commitment is to complete the scope identified in this document by 12/20/2013. In the pursuit of the final milestone, SRNS reserves the authority to accelerate or extend activities as needed to accommodate the sharing of resources with other Savannah River Site (SRS) activities and to address emergent issues and concerns related to the design, planning and execution of work.

<b>Activity</b>	<b>Description</b>	<b>Start</b>	<b>Finish</b>
1	Complete Design Input	Complete	Complete
2	Prepare Design Output (Drawings & Specifications)	03/01/2013	06/30/2013
3	Mobilize Site Forces or Unit-Price Contractor	07/01/2013	08/30/2013
4	Perform 235-F FDAS Upgrades	09/01/2013	10/30/2013
5	As-Built System Drawings and Incorporate Design Change Documents	11/01/2013	11/30/13
6	Perform Acceptance Testing	11/01/2013	11/30/2013
7	Notify DOE IP Action 2c-3 is Complete	12/01/2013	12/20/2013



