



Accident Investigation Report

Construction Worker Injury at the Surplus Plutonium Disposition Project at the Savannah River Site

October 14, 2025



U.S. DEPARTMENT
of ENERGY

NNSA
National Nuclear Security Administration

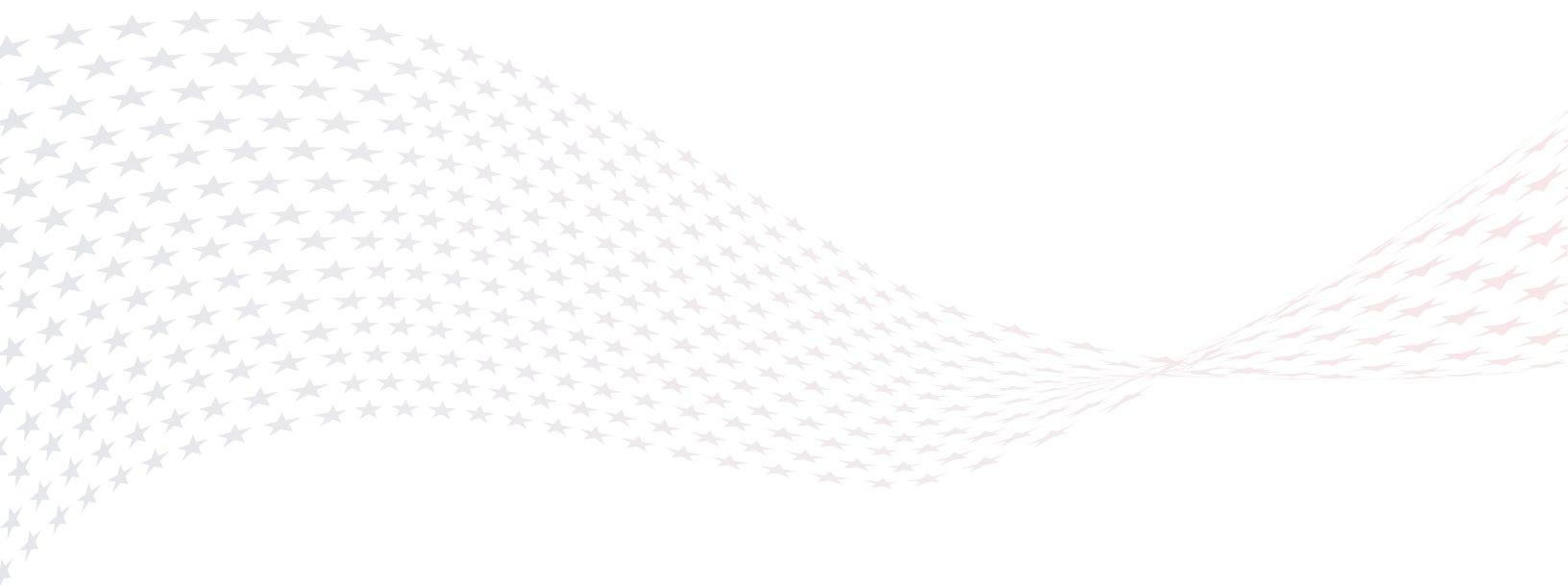
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Disclaimer

This report is an independent product of the Accident Investigation Board (AIB) appointed by Ahmad M. Al-Daouk, Cognizant Secretarial Officer for Safety, National Nuclear Security Administration. The AIB was appointed to perform an Accident Investigation and to prepare an investigation report in accordance with Department of Energy Order 225.1B, *Accident Investigations*.

The discussion of the facts as determined by the AIB and the views expressed in the report do not assume, and are not intended to establish, the existence of any duty at law on the part of the U.S. Government, its employees or agents, contractors, their employees or agents, or subcontractors at any tier, or any other party.

This report neither determines nor implies liability.



Release Authorization

On August 8, 2025, an Accident Investigation Board (AIB) was appointed to investigate an accident at the Surplus Plutonium Disposition Project at the Savannah River Site on August 6, 2025, that resulted in serious injury to a construction worker. The AIB's responsibilities have been completed with respect to this investigation. The analysis and the identification of the contributing causes, the root cause, and the Judgments of Need resulting from this investigation were performed in accordance with Department of Energy Order 225.1B, *Accident Investigations*.

The report of the Accident Investigation Board has been accepted and the authorization to release this report for general distribution has been granted.

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Executive Summary

This report was developed in accordance with the requirements in Department of Energy (DOE) Order (O) 225.1B, *Accident Investigation*, in response to a serious injury accident that occurred at the Savannah River Site (SRS) on August 6, 2025. The report explains what happened and why it happened to use this understanding to prevent future accidents. The report identifies the causes (both individual and organizational) that contributed to the accident and identifies critical learning organizational opportunities.

On August 6, 2025, an ironworker (IW1) at the SRS K-Area Complex (KAC) was guiding a drill bit into a concrete wall when the worker's gloved right hand became entangled with the rotating bit, resulting in the traumatic amputation of the right thumb. After receiving first aid from co-workers, Emergency Medical Services (EMS) responded, and the injured worker was transported offsite for medical treatment.

In accordance with DOE O 225.1B criteria, the National Nuclear Security Administration Cognizant Secretarial Officer for Safety, formally appointed an AIB and Chair on August 8, 2025. The AIB conducted onsite inspections, interviews, and document reviews at SRS from August 11–15, 2025. From August 18–September 5, 2025, the AIB conducted additional document reviews, performed analysis, and developed the final report.

After thorough interviewing, evidence gathering, and analysis, the AIB concluded that this accident was preventable and was a result of the following systemic weaknesses allowing for less than safe practices to become normalized and unchallenged:

- Hazard analyses failed to identify drilling-specific hazards, and work instructions relied on generic steps and assumptions rather than enforceable controls.
- Workers were not meaningfully engaged in identifying hazards or developing safe methods, and repeated requests for proper tools and equipment were not acted upon.
- Contractor oversight and lack of Union Steward awareness failed to verify that work practices aligned with approved controls.
- Training did not fully address drilling hazards, and qualification verification was inconsistent.
- Lessons learned from near misses at SRS and other DOE sites were not acknowledged.

These conditions resulted in the Direct Cause of this accident – the practice of hand-guiding rotating drill bits at high speed.

This report provides detailed analysis that supports the identification of Causes, Conclusions, and Judgments of Need to prevent the recurrence of similar accidents.

Table of Contents

Disclaimer.....iii

Release Authorizationiv

Executive Summaryv

Acronyms and Abbreviations viii

1.0 INTRODUCTION.....1

1.1 Background..... 1

1.2 Site Description..... 1

1.3 Organizational Relationships 2

1.3.1 U.S. Department of Energy..... 2

1.3.2 National Nuclear Security Administration 2

1.3.3 NNSA Savannah River Field Office..... 3

1.3.4 NNSA Savannah River Acquisition and Project Management Office 3

1.3.5 Savannah River Nuclear Solutions, LLC..... 3

1.4 Accident Investigation Process 3

1.4.1 Investigation Timeline 3

1.4.2 Investigation Process..... 4

1.4.3 Report Contents..... 5

2.0 THE ACCIDENT6

2.1 Description of Work Activity..... 6

2.2 Accident Description 6

2.3 Chronology of Events..... 8

2.3.1 Before, Day Of, and Day After Accident..... 8

3.0 Facts and Analysis10

3.1 Flow Down of Requirements 10

3.2 Integrated Safety Management / Work Planning and Control Application to Drilling Operations..... 11

3.2.1 Define the Scope of Work 11

3.2.2 Analyze the Hazards..... 13

3.2.3 Develop/Implement Hazard Controls 17

3.2.4 Perform Work Within Controls 18

3.2.5 Feedback and Improvement 22

3.2.6 Oversight Program..... 24

3.3 Emergency Response..... 29



3.4 Post-Event Accident Actions 30

4.0 Accident Analysis.....32

4.1 Barrier Analysis 32

4.2 Change Analysis 32

4.3 Direct, Contributing, and Root Causes..... 33

4.3.1 Direct Cause 33

4.3.2 Contributing Causes 33

4.3.2.1 Work Planning and Control 33

4.3.2.2 Oversight..... 34

4.3.2.3 Organizational Factors 34

4.3.3 Root Causes 35

5.0 Human Performance Improvement..... 36

5.1 Organizational Factors..... 36

5.2 Error Precursors..... 37

6.0 Conclusions and Judgments of Need..... 39

7.0 Additional Points of Interest..... 43

8.0 AIB Signatures.....44

9.0 AIB Members, Advisors, and Consultants..... 45

Appendix A: AIB Appointment Letter 46

Appendix B: ORPS Report..... 49

Appendix C: Barrier Analysis..... 51

Appendix D: Change Analysis55

List of Figures

Figure 2.2-1: Close-up of Gloves Used for Drilling Operations..... 6

Figure 2.2-2: Example of Horizontal Guiding of Drill Bit with Hyflex 11-591 Gloves..... 7

Figure 2.2-3: Palm of HyFlex 11-591 Gloves..... 7

Figure 3.2-1: Longer Drill Bit with Silica Control 14

Figure 3.2-2: Longer Drill Bit for Concrete Horizontal Dowel Drilling 15

Figure 3.2-3: Outside Work Location (Handball Court) for Emplacement Holes 19

Figure 3.2-4: Reenactment of Ironworker Hand Guiding Horizontal Drill Bit 20

List of Tables

Table 2.3-1: Events Prior to Accident..... 8

Table 2.3-2: Events on Day of Accident..... 8

Table 2.3-3: Events After Day of Accident 9

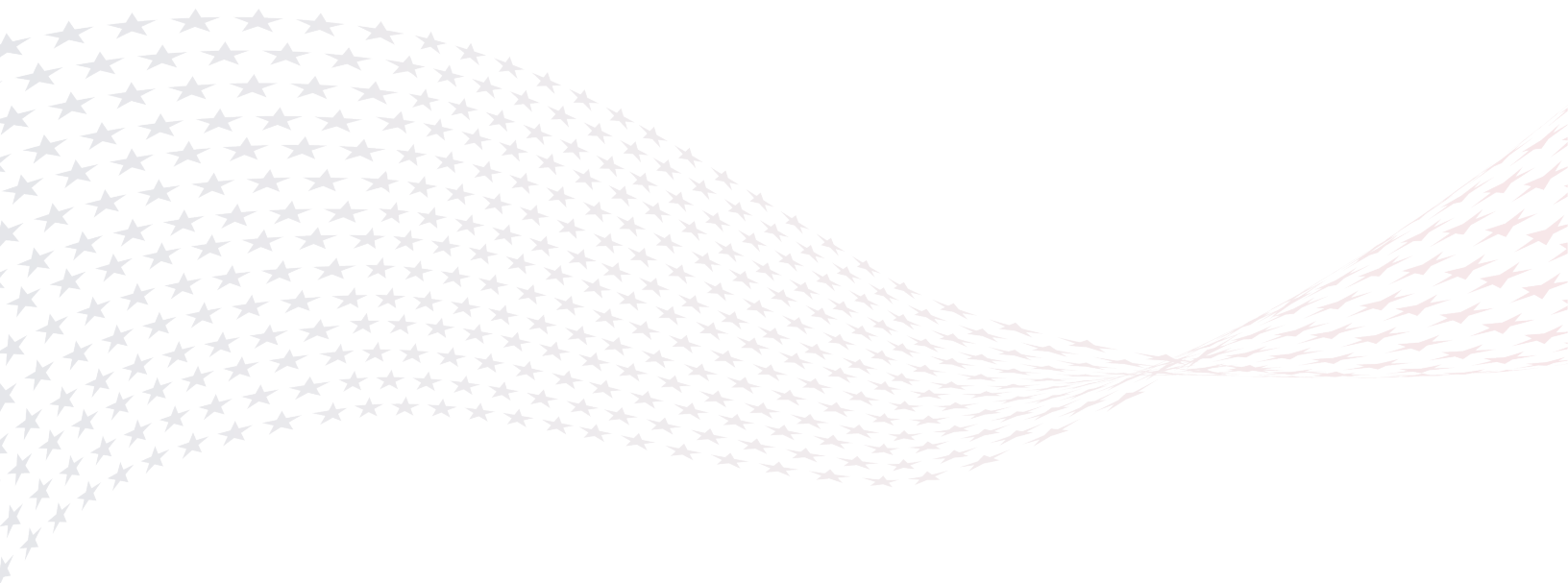
Table 6.0-1: Conclusions and Judgments of Need 40



Acronyms and Abbreviations

AHA	Activity Hazard Analysis
AIB	Accident Investigation Board
APMO	Acquisition and Project Management Office
CC	Contributing Cause
CD	Critical Decision
CF	Causal Factor
CFR	Code of Federal Regulations
CON	Conclusion
CSO	Cognizant Secretarial Officer
DC	Direct Cause
DOE	Department of Energy
EHSS	Office of Environment, Health, Safety and Security
ECP	Employee Concerns Program
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
ERO	Emergency Response Organization
ES&H	Environment, Safety and Health
FR	Facility Representative
HEPA	High Efficiency Particulate Air
HPI	Human Performance Improvement
IH	Industrial Hygienist
ISM	Integrated Safety Management
ISM-GP	ISM Guiding Principle
ISMS	Integrated Safety Management System
IW	Ironworker
JHA	Job Hazard Analysis
JON	Judgment of Need
KAC	K-Area Complex
MCP	Management Control Plan
M&O	Management and Operations
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NA-ESH	NNSA Office of Environment, Safety, and Health
NA-94	NNSA Savannah River Acquisition and Project Management Office
NCRs	Nonconformance Reports
NNSA	National Nuclear Security Administration
O	Order
OA	Operational Awareness
OPS	Operations
ORPS	Occurrence Reporting and Processing System
PPE	Personal Protective Equipment
RC	Root Cause
R2A2	Roles, Responsibilities, Accountabilities, and Authorities
S&H	Safety & Health
SME	Subject Matter Expert

SOM	Shift Operations Manager
SPD	Surplus Plutonium Disposition
SRFO	Savannah River Field Office
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SRSOC	Savannah River Site Operations Center
STAR	Site Tracking, Analysis, and Reporting
STARRT	Safety Task Analysis Risk Reduction Talk
WO	Work Order
WP&C	Work Planning and Control
WSHP	Worker Safety and Health Program



1.0 INTRODUCTION

1.1 Background

This report was developed in accordance with the requirements in the U.S. Department of Energy (DOE) Order (O) 225.1B, *Accident Investigation*, in response to a serious injury accident that occurred at the Savannah River Site (SRS) on August 6, 2025. The purpose of this report is to detail the circumstances leading to the event, analyze its underlying causes, and provide recommendations to prevent future accidents. The report identifies the causes (both individual and organizational) that contributed to the accident to help explain how systemic deficiencies contributed to an otherwise controllable hazard. The report also identifies essential organizational learning opportunities.

On August 6, 2025, an ironworker (IW1) at the SRS K-Area Complex (KAC) was guiding a drill bit into a concrete wall when the worker's gloved right hand became entangled with the rotating bit, resulting in the traumatic amputation of the right thumb. After receiving first aid from co-workers, Emergency Medical Services (EMS) responded and IW1 was transported offsite for medical treatment.

This accident meets DOE O 225.1B Criteria 2.a.2 of Appendix A, for the appointment of an Accident Investigation Board (AIB) which states, "Any single accident that results in hospitalization for more than 5 calendar days, commencing within 7 calendar days of the accident, of one or more DOE, contractor, or subcontractor employees or members of the public due to a serious personal injury."

On August 8, 2025, the National Nuclear Security Administration (NNSA) Cognizant Secretarial Officer (CSO) for Safety, formally appointed an AIB and Chair to investigate this accident in accordance with DOE O 225.1B. The AIB initiated its investigation on August 11, 2025, and conducted onsite fact-finding, interviews, and document reviews. The AIB completed its analyses and submitted a final draft report to the CSO on September 8, 2025.

1.2 Site Description

SRS is located near Aiken, South Carolina, along the Savannah River bordering the states of South Carolina and Georgia. SRS encompasses 198,046 acres, including parts of Aiken, Barnwell, and Allendale counties. With an annual budget of approximately \$3.8 billion and a workforce of about 12,700, SRS plays a critical role in producing, securing, storing, and processing nuclear material in support of national defense and nuclear nonproliferation efforts. SRS also manages legacy liquid nuclear and hazardous waste left from the Cold War. NNSA activities at SRS primarily serve two NNSA missions: 1) managing the nuclear stockpile to support U.S. nuclear deterrence, and 2) advancing nonproliferation policy goals. On October 1, 2024, landlord ownership of SRS, including the K-Area Complex (KAC), was transferred from the DOE Office of Environmental Management to NNSA.

KAC has been engaged in plutonium downblending as the method to dispose of surplus plutonium since September 2016, utilizing the K-Area Interim Surveillance glovebox. The Surplus Plutonium Disposition (SPD) Project is currently underway to expand this existing downblending capability through the installation of three new gloveboxes and other supporting system enhancements.

The SPD Project aligns with the NNSA Office of Material Management and Minimization mission, which focuses on managing and disposing of excess weapons-usable nuclear material from both domestic stockpiles and material returned from abroad. The SPD Project also supports a Settlement Agreement (Fed. Cir. No. 19-2324) between the Federal government and the State of South Carolina, which mandates the removal of “subject defense plutonium materials” from South Carolina by 2036.

The current scope of the SPD Project includes the installation of three shielded gloveboxes, modernized equipment, and supporting infrastructure within KAC. These modernized capabilities are designed to enhance personnel safety and increase throughput. The SPD Project involves the modification of an existing building to house the gloveboxes on the first floor, with ancillary equipment on the second floor, and the construction of a new building for supporting utilities such as ventilation. The SPD Project is scheduled to transition to operation by Fiscal Year 2031.

1.3 Organizational Relationships

The following section provides an overview of the key organizational entities with involvement and responsibilities related to the work performed at KAC.

1.3.1 U.S. Department of Energy

DOE is both the owner and regulator of DOE sites, including SRS, and maintains responsibility for ensuring that all DOE mission activities, regardless of whether they are performed by DOE Federal or contractor employees, are performed safely (i.e., protective of the worker, the public, and the environment) and efficiently. DOE is led by the Secretary of Energy appointed by the President of the United States.

DOE’s mission is to ensure security and prosperity of the United States by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions. This mission includes maintaining a safe, secure, and effective nuclear deterrent and reducing the threat of nuclear proliferation, and overseeing the U.S. energy supply, carrying out the environmental clean-up from the Cold War nuclear mission, and the 17 National Laboratories and other Federal assets including SRS.

1.3.2 National Nuclear Security Administration

Established by Congress in 2000, NNSA is a semi-autonomous agency within DOE responsible for enhancing national security through the military application of nuclear science. NNSA maintains and enhances the safety, security, and effectiveness of the U.S. nuclear weapons stockpile; works to reduce the global danger from weapons of mass destruction; provides the U.S. Navy with safe and militarily effective nuclear

propulsion; and responds to nuclear and radiological emergencies in the U.S. and abroad. The Under Secretary for Nuclear Security and Administrator of the NNSA reports directly to the Secretary of Energy. As previously stated, NNSA became responsible for all K-Area operations at SRS on October 1, 2024.

1.3.3 NNSA Savannah River Field Office

The NNSA Savannah River Field Office (SRFO) is responsible for overseeing a complex and diverse mission portfolio. It contributes to national security and supports U.S. allies and partners by fostering a resilient and responsive Nuclear Security Enterprise. This is achieved through effective contract management and oversight, ensuring safe, secure, and reliable delivery of the Nation's tritium mandates, and providing and overseeing essential stewardship services of SRS. SRFO ensures landlord and essential services are provided across the entire SRS through the management of prime contracts, agreements, environmental permits, and associated assets. SRFO plays a critical role in providing these landlord services to the NNSA Savannah River Acquisition and Project Management Office (NA-94).

1.3.4 NNSA Savannah River Acquisition and Project Management Office

The NNSA Savannah River Acquisition and Project Management Office (APMO or NA-94) oversees design, construction, and testing/start-up of NA-94 portfolio projects. The SPD Project is under construction on a location within SRS under the responsibility of SRFO, meaning site-level programs remain the responsibility of SRFO with NA-94 having responsibility for implementation, participation, and, in some cases, shared responsibility within the construction area.

1.3.5 Savannah River Nuclear Solutions, LLC

Savannah River Nuclear Solutions, LLC (SRNS), a Fluor-led partnership comprising Fluor Corporation and Newport News Nuclear (a subsidiary operating under the Newport News Shipbuilding division of Huntington Ingalls Industries and Honeywell until Honeywell divested in July 2023), is the management and operations (M&O) contractor for SRS and responsible for safe operations and management of SRS. SRNS employs approximately 6,000 people, with corporate and community offices located in Aiken, South Carolina. SRNS under contract with DOE/NNSA provides site management and operations, environmental management, and nuclear operations management services at SRS.

1.4 Accident Investigation Process

1.4.1 Investigation Timeline

After discussing with the Savannah River Field Office Manager, the NNSA CSO for Safety formally appointed an AIB and Chair on August 8, 2025, to investigate this accident in accordance with DOE O 225.1B. The appointment memo (see Appendix A) identified the AIB members and Chair, provided the scope of the investigation, and established a timeline for submitting a final report within 30 days from the date of the memorandum.

The AIB initiated its investigation by conducting field activities at SRS from August 11–15, 2025. The AIB received an initial in-briefing from NA-94 and SRNS leadership, which provided essential information regarding the project work scope, accident history, ongoing work activities, accident scene status, and logistics. Following the in-briefing, the AIB conducted document reviews, performed walkdowns of the accident location, and conducted interviews with personnel from NA-94, SRFO, and SRNS.

From August 18–September 5, 2025, the AIB conducted additional document reviews, interviews, analyses, and developed the report. Daily progress meetings were conducted to ensure dissemination of pertinent information and to maintain progress, and the AIB Chair provided periodic updates to the Appointing Official. A final draft report was provided to the Appointing Official on September 8, 2025.

1.4.2 Investigation Process

The AIB conducted a tailored investigation utilizing DOE O 225.1B and the methodology prescribed in DOE Handbook 1208-2012, *Accident and Operational Safety Analysis*, summarized as follows:

- Facts relevant to the accident were gathered and identified through interviews, documents and evidence reviews, and examination of physical evidence, allowing AIB members to develop the chronology.
- Barrier Analysis, Change Analysis, and Error Precursor Analysis techniques were used to analyze the facts, identify the cause(s) of the accident, and draw conclusions.
- Judgments of Need (JONs) were identified based upon the Conclusions (CONs) to prevent recurrence.

The definition and description of Barrier Analysis, Change Analysis, and Causal Factors are as follows.

Barrier Analysis reviews the Hazards, the Targets (people or objects) of the hazards, and the Controls or Barriers that management systems put in place to separate the Hazards from the Targets. Barriers may be physical or administrative. For an accident to occur, there must be exposure of the Hazard to the Target. A Hazard is the potential for unwanted energy flow that results in an adverse consequence. A Target is a person or object that a Hazard may damage, injure, or fatally harm. A Barrier is any means used to control, prevent, or impede the Hazard from reaching the Target, thereby reducing the severity of the resultant accident or adverse consequence. Barriers are a part of a system or work process to protect personnel and equipment from Hazards. Thus, when an accident occurs, a Hazard comes in contact with a Target because Barriers did not exist, were not used, or were not effective in mitigating the Hazard.

Change Analysis is a systematic approach that examines planned or unplanned changes in a system that caused the undesirable results related to the accident.

Change is anything that disturbs the balance of a system operating as planned. Change can be planned, anticipated, and desired, or it can be unintentional and unwanted. The Change Analysis process compares the difference between what is normal or ideal (Work-as-Imagined) and what occurred (Work-as-Done).

Causal Factor (CF) is an event or condition in the accident sequence necessary and sufficient to produce or contribute to the unwanted result. There are three types.

- **Direct Cause (DC):** Immediate event or condition that caused the accident.
- **Root Cause (RC):** Factor that, if corrected, would prevent the recurrence of the same or similar accidents. A Root Cause may be derived from or encompass several contributing causes, i.e., higher-order, fundamental Causal Factors that address classes of deficiencies rather than single problems or faults.
- **Contributing Cause (CC):** Event or condition that, collectively with other causes, increased the likelihood of an accident but that individually did not cause the accident. A Contributing Cause may be longstanding condition or a series of prior events that, alone, were not sufficient to cause the accident but were necessary for it to occur. A Contributing Cause is the event and condition that “set the stage” for the accident and, if allowed to persist or reoccur, increase the probability of future accidents.

Judgments of Need (JONs) are the managerial controls and safety measures necessary to prevent or minimize the probability or severity of a recurrence of an accident.

1.4.3 Report Contents

This report contains the following key sections.

- **Accident Description:** Detailed descriptions of the accident, including events leading up to and immediately following.
- **Accident Analysis:** A comprehensive analysis of the accident, incorporating findings related to current management practices and the work-site environment.
- **Conclusions and Judgments of Need:** Overarching Conclusions derived from the analysis, accompanied by specific Judgments of Need (recommendations) to prevent recurrence.
- **Supporting Information:** Additional points of interest, AIB signatures, lists of personnel, AIB appointment letter, and other supporting documentation provided in the Appendices.

2.0 THE ACCIDENT

2.1 Description of Work Activity

As part of the ongoing work at KAC to construct the new High Efficiency Particulate Air (HEPA) Filter and Fan House Building, SRNS is installing a new raised concrete slab under Work Order (WO)-02137123-01, which includes installation of dowels, rebar, formwork, and concrete. On the day of the accident, SRNS was performing horizontal drilling into the existing walls of 105-K to attach the slab to the new HEPA building using a Dewalt Heavy Duty Slotted Drive System Max Rotary Hammer.

2.2 Accident Description

On August 6, 2025, a first-year ironworker apprentice, IW1, was manually guiding a horizontal rotating hollow core unguarded drill bit into the HEPA Building concrete wall while another worker, IW2, operated the drill. The right-hand glove of IW1 became entangled with the unguarded drill bit resulting in a traumatic amputation of the worker's right thumb and severe tendon damage.

At the time of the accident, the worker was wearing HyFlex 11-591 gloves, which offer puncture resistance but are not compatible with rotating equipment hazards. Figure 2.2-1 depicts the gloves available to IW1 on the day of the event. The drill bit involved was 39-3/8 inches in length and operated at full rotational speed when the entanglement occurred.



Figure 2.2-1: Close-up of Gloves Available for Drilling Operations

(Left, leather non-puncture resistant gloves historically used;
Center, HyFlex 11-591 gloves used by IW1 on day of event; Right, anti-vibration gloves)



Figure 2.2-2: Example of Horizontal Guiding of Drill Bit with HyFlex 11-591 Gloves



Figure 2.2-3: Palm of HyFlex 11-591 Gloves

2.3 Chronology of Events

2.3.1 Before, Day Of, and Day After Accident

The following events occurred prior to the accident.

Table 2.3-1: Events Prior to Accident

Date	Event
06/20/2022	Exposure assessment for silica hazard performed for downward drilling; did not include all hazards associated with horizontal drilling.
06/24/2023	Memorandum of Agreement (MOA) between NA-94 and SRFO established.
10/2023	Construction Execution Plan approved.
05/23/2024	Addendum to 1Y-8.20 for SPD Project effective; deviations to site work planning and control (WP&C) Procedure.
07/2024	Last horizontal hole drilled prior to 06/2025.
09/25/2024	G-MOU-K-00004 MOU between SPD-KAC signed.
01/2025	SRFO Facility Representative (FR) oversight tours in K-Area; no drilling hazards documented.
02/12/2025	Federal Project Director issued a Work Pause for SPD Project due to construction design issues.
02/25/2025	NNSA Letter of Concern issued to SPD Project.
02/27/2025	Memo, SRNS-KA00-2025-00009, <i>Interim Process for Resumption of Construction Work Scopes</i> , issued for SPD Project work release.
05/12/2025	SPD Project Management issued Management Control Plan (MCP) to supersede Interim Work Release memo – SRNS-RP-2025-00715, <i>Management Control Plan</i> .
05/30/2025	SPD Project WO formally approved.
05/30/2025	Task preview and formal Pre-Job Briefing (WO 2137123-01) conducted.
06/2025	Inside emplacement hole drilling restarted in Dilute Process Area.
07/29/2025	Outside horizontal emplacement hole drilling for HEPA concrete slab project commenced.
Unknown date (week prior to accident)	Ironworker (not IW1 or IW2) had unreported near miss with rotating bit of same drill type (per interview).

The following events occurred on the day of the accident, August 6, 2025 (all times approximate).

Table 2.3-2: Events on Day of Accident

Time	Event
0630	Workers arrived onsite to continue ongoing horizontal drilling.
0645	Start set-up; continued drilling work.
0645+	Seven holes drilled.

Time	Event
0820	While drilling hole eight, IW1 traumatic thumb amputation occurred. Co-workers performed first aid (e.g., pressure on wound to stop bleeding, tourniquet, recovery of glove with thumb) and transported IW1 to nearby Handi House picnic table area for further assistance. Co-workers called Shift Operations Manager (SOM) who then called EMS.
0830	EMS arrived at K-Area Site.
0834	EMT contact with IW1.
0839	EMS transported IW1 to Well Star Medical College of Georgia to receive initial medical attention.
0840	After IW1 was taken by ambulance, Operations (OPS) personnel initiated preparations for cleanup. Workers vacated area after walking down to ensure everything was in a safe state. Response personnel went to onsite medical facilities to get cleaned up. Initial scene was not cleaned up (just the travel path from scene to Handi House).
0850	All construction work (SPD Project construction work in K-Area and N-Area; K-Area Construction, and K-Area Subcontractor work) was stopped.
1015	DOE Occurrence Reporting and Processing System (ORPS)2(A)5 declared.
1114	Heads Up issued by the Operations Center.
Unknown	Safety Engineer obtained personnel statements.
Unknown	Areas were barricaded; verified that other work was placed in safe state; removed all personnel from SPD Project Construction Area.
Unknown	Notifications were made in accordance with SRNS Procedure 18.58, Emergency Notifications and Reporting.
Unknown	Work was stopped at KAC (construction, OPS, maintenance, roofers) and in SPD Project areas outside KAC and to other subcontractors.
Unknown	Photos of accident site were taken.
Unknown	Accident scene was covered in plastic.

The following events occurred after the day of the accident.

Table 2.3-3: Events After Day of Accident

Date	Event
Unknown	Reenactment of accident was performed and additional photos of the scene obtained.
08/07/2025	SRNS released a Safety Alert Notification to SRNS employees regarding the accident, explicitly stating the employee “grabbed the drill bit.”

3.0 FACTS AND ANALYSIS

3.1 Flow Down of Requirements

For construction safety, the *SRNS Worker Safety and Health Program* (WSHP) flows down the requirements of Title 10 of the U.S. Code of Federal Regulations (CFR) Part 851, *Worker Safety and Health Program*, and serves as the safety and health plan for the SPD Project. The WSHP adopts SRNS's Integrated Safety Management System (ISMS) and describes roles and responsibilities necessary to carry out a safety and health program, thus fulfilling the construction requirements specified by DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, and as defined by 10 CFR 851, and 10 CFR 851, Appendix A-1, *Construction Safety*. Safety and health regulations such as promulgated by the Occupational Safety and Health Administration's 29 CFR 1926, *Safety and Health Regulations for Construction*, are standards for the construction industry. SRNS did not develop a project-specific safety and health plan for construction activities at the SPD Project as required by DOE O 413.3 B.

In October 2024, SRFO approved an addendum to the WSHP submitted by SRNS. This addendum incorporated two procedures (NCP6-08.122A, *Job Hazard Analysis for the Surplus Plutonium Disposition (SPD) Project*, and NCP9-01.04, *SPD Construction Work Control*) specifically developed for the SPD Project and only applied to capital construction projects. These procedures were developed to streamline the process; however, they deviated from SRNS established Work Planning & Controls (WP&C) processes as defined in Manual 1Y, Procedure 8.20, *Work Control Procedure*.

Although not included in the addendum, an additional third procedure, NCP9-01.02, *Additional Work Controls for SPD Construction Work*, was also in use. The procedure provides clarification to and deviations from Manual 1Y, Procedure 8.20, for the SPD Project, stating “*the deviations meet the intent and overall governing requirements with a tailored approach appropriate for a capitol line-item construction project.*”

SRNS's ISMS program, SRNS-RP-2008-00087, *SRNS Integrated Safety Management System Description*, flows down the DOE Acquisition Regulation 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution*, applying mechanisms to integrate ISMS into SPD Project activities. The G-PRP-K-00014, *Surplus Plutonium Disposition Project Y-744 Project-Specific Integrated Safety Management Plan*, describes the ISMS used to integrate safety into the SPD Project. Additionally, G-PRP-K-00013, *Surplus Plutonium Disposition (SPD) Project Y-744 Project Specific Contractor Assurance Plan*, was developed to integrate safety into work performed for the SPD Project.

The AIB verified that not all hazard mitigation requirements for safety and health during drilling operations were effectively captured in SPD Project documents, including the Safety Task Analysis Risk Reduction Talk (STARRT) cards, Activity Hazard Analyses (AHAs), and Job Hazard Analyses (JHAs). Due to an over-reliance on “skill of the craft” and a pervasive perception that horizontal concrete drilling using hollow core drill bits is

a less hazardous operation, hazards of concern were not fully vetted in the documents. WO 02137123-01, *HEPA Building Slab Install SPD-(Y744)*, identifies noise, silica dust, electrical hazards, and penetration checks as hazards but does not identify or control the following hazards: rotating parts, miscommunication, heat stress, and loose clothing.

Additionally, multiple project documents (e.g., Construction Execution Plan; Roles, Responsibilities, Accountabilities, and Authorities (R2A2); Project Construction Area) described roles and responsibilities for key personnel associated with the SPD Project. These documents were developed to define roles and responsibilities to ensure that safety and health requirements are flowed down to the workers.

The AIB determined that safety and health documents currently in place for the SPD Project, and the AHAs, JHAs, and STARRT cards, do not adequately capture high risk/high hazard activities for planned construction.

Construction safety activities are managed and overseen by the M&O contractor, i.e., SRNS, and Federal project oversight is performed by NA-94 in accordance with the MOA between the two organizations. The SRSAPMO-MAN-003, *Project Construction Oversight Manual*, Rev. 2, provides guidance for overseeing the SPD Project. This manual is used in conjunction with SRSAPMO-PRO-013, *Conduct of Assessment Procedure*; SRSAPMO-PLN-002, *Annual Assessment Plan and Schedule*; and SRSAPMO-DTI-037, *Construction Activity Daily Log*, for the development of assessment plans, completion of construction assessments, and daily activities observations flow down requirements for NA-94 personnel. The *General Safety Walkdown Assessment Checklists* established in the SPD Project Construction Oversight Manual were not used.

The SRSAPMO-MOA-001, *MOA Between SRS APMO and NNSA SRFO Regarding SRFO Support to the SRS APMO and Clarification of Responsibilities*, establishes and clarifies area of responsibilities and support between NA-94 and SRFO. The MOA has an expired sunset review date of June 24, 2025, and SRFO implementation of oversight responsibilities were inconsistent with the MOA.

3.2 Integrated Safety Management / Work Planning and Control Application to Drilling Operations

3.2.1 Define the Scope of Work

Facts

As part of the ongoing work to construct the new HEPA Filter and Fan House Building to house supporting utilities for the SPD Project, SRNS is installing a new raised concrete slab in accordance with WO-02137123-01, *HEPA Building Slab Install SPD-(Y744)*, which includes installation of dowels, rebar, formwork, and concrete. On the day of the accident, SRNS was performing horizontal drilling into the concrete walls in K-Area for the HEPA building slab installation. The scope of work for this portion of the SPD

Project included drilling concrete with and without a hollow core drill bit, chipping/bushing concrete, and cutting concrete.

According to the G-PRP-K-00014, *Project Specific Integrated Safety Management Plan*, during each design stage, safety and design documentation are progressively developed, become more detailed, and the additional detail then comes under change control. During this process, the project documentation from a previous stage becomes the baseline for the next stage.

Analysis

The AIB determined that not all hazards were identified and mitigated as required by the implementation of 10 CFR 851 and ISMS. The hazards that were identified were generic in nature and lacked procedural guidance to workers regarding work controls and operational expectations. This hands-off approach by SRNS oversight led to the creation of a work environment that lacked adequate oversight, thus resulting in conditions which led to the accident. SRNS overreliance on “skill of the craft” and omission of workers during development of the AHA and JHA resulted in a WO that did not identify or mitigate all hazards.

Following the NA-94 identification of multiple issues with rebar and dowel installation in December 2024, SRNS initiated five Nonconformance Reports (NCRs) on January 7, 2025. The first issue investigation meeting was held on January 13, 2025, 2 weeks after the issue was identified. On February 4, 2025, additional nonconforming items were identified related to the NCRs. Insufficient extent of condition during the initial nonconformance identification resulted in Title III Engineering rework and the delayed identification of potentially significant field rework. The engineering drawings were found to be inadequate, and field/engineering rework affected the SPD Project schedule. These factors contributed to schedule pressure for the SPD Project.

Over the life of the SPD Project, NA-94 oversight activities identified a lack of understanding and adherence to safety requirements by SRNS. In addition, the oversight identified that quality and construction engineering inspection personnel were overly confident in their knowledge of code and design requirements, resulting in improperly accepting nonconforming field conditions. These issues impacted the cost and schedule of the SPD Project and contributed to pressures to accelerate work activities.

There were clear breakdowns in ISM where the scope of work was insufficiently defined and failed to identify and address all hazards. The WP&C and oversight sections of this report describe these breakdowns in detail.

Identified Causal Factors

- Failure by SRNS to include the ironworkers in development of the AHA and JHA, coupled with an overreliance on “skill of the craft,” led to a WO that failed to adequately identify safety hazards.

- SRNS construction management mindset of considering drilling operations to be “common sense” created an environment of complacency and inadequate oversight.
- Lack of ironworkers’ involvement during the initial hazard evaluation and SRNS’s inadequate oversight in conjunction with schedule pressures created a work culture that relied on workers’ judgment on how to perform work safely to keep up with the schedule.
- Ironworkers were not provided with the proper tools needed to perform the work, specifically lacking shorter drill bits or guards needed to safely perform the scope of work without having to guide the longer drill bits into the concrete.
- Overall planning for the scope of work was inadequate, and identified hazards were generic and failed to account for the work intricacies associated with the utilization of extra-long drill bits.

3.2.2 Analyze the Hazards

Facts

The SRNS Approved WO 02137123-01, *HEPA Building Slab Install SPD-(Y744)*, did not identify all hazards associated with horizontal concrete drilling. The only hazards documented in the AHA and JHA were standard hazards such as silica, noise, penetration checks, and electrical hazards. Hazards directly relevant to drilling operations – including rotating-bit entanglement, glove compatibility, loose clothing, miscommunication, and heat stress – were not identified or analyzed. Under SRNS Procedure 8Q 122 R.18, *Hazard Analysis Process*, Section 5.3.1, hazard identification is required for work activities, work location and environment, and co-located work. This requirement was not met, as hazards associated with the work and co-worker activities were not consistently analyzed in accordance with the procedure.

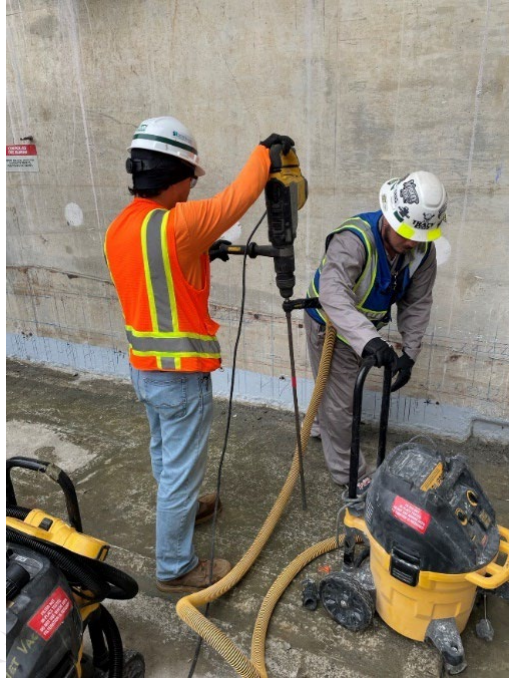


Figure 3.2-1: Longer Drill Bit with Silica Control

The WO was prepared under an approved deviation from the site Work Control Procedure 1Y-8.20, using the SPD Addendum 1Y-31.02-2, which allowed for a streamlined approach for construction activities. Applying this streamlined approach resulted in a generic JHA and work instructions that relied heavily on “skill of the craft” to conduct the drilling safely. Preparation of the WO did not include participation by the ironworkers performing the drilling activities. In addition, ironworkers made repeated requests for shorter drill bits, drill jigs, or guards to their foreman, and subsequently to the SRNS construction manager, to reduce risk, which were unfulfilled. SRNS construction management assumed that a two-bit method would be used but was never documented or enforced in the WO or procedure. In practice, workers used long drill bits and horizontal hand-guiding to initiate drilling holes into the concrete.

The WO was approved on May 30, 2025, and included a Pre-Job Briefing that day. The briefing discussed lessons learned from prior construction activities but did not identify the specific hazards associated with entanglement. When construction resumed in July 2025 after a stand-down, STARRT cards were used as the Pre-Job Briefing and did not include any lessons learned. The STARRT card identified rotating equipment only in generic terms (“keep hands clear”), with no engineered or administrative controls specified. All craft workers on August 6, 2025, signed the STARRT card before beginning work.

The work instructions did identify nuclear safety hold points to ensure design requirements were met (e.g., drill bit interaction with installed rebar) but provided only generic direction for drilling, stating: “Drill holes to the required embedment depth per the design documents.” This language did not provide explicit personnel safety requirements. The WO referenced Alternate Compliance Method 8Q-124 Rev. 1, which

permitted elimination of the drill stop device (which automatically shuts off power to the drill motor if it encounters rebar) when embedded rebar was approved to be cut by design. Based on interviewee responses, the AIB determined that this exemption was not well understood by SRNS construction management or employees, further contributing to the inconsistent application of controls.

During interviews, SRNS construction management stated they were unaware that workers were hand-guiding the horizontal drill bit into the wall and believed the safer two-bit method was being used. Ironworkers reported they had requested shorter drill bits to enable safer pilot holes, but none were provided. The workers improvised their activities with the equipment available to meet the accelerated schedule. Based on interviews with workers, near-miss events, including one in July 2025 where a worker's glove was caught and pulled by a rotating bit, were not reported or incorporated into hazard analysis. In addition, DOE operating experience from prior glove entanglements at the Hanford Site, and Los Alamos, Idaho, and Brookhaven National Laboratories was not reviewed or integrated. This was a missed opportunity for sharing lessons learned.

The drills used had speed controls ranging from one (slowest) to seven (fastest). Workers reported that the drills were always operated at the highest setting. By the time of the accident, over 150 holes had been drilled using this practice without SRNS construction management identifying the hazard. Time Out Authority was available but not exercised, and the Employee Concerns Program (ECP) was unused despite near misses and long-standing worker concerns about less than safe drilling methods.



Figure 3.2-2: Longer Drill Bit for Horizontal Concrete Dowel Drilling

Analysis

The AIB determined that the hazard analysis process applied to drilling operations in the SPD Project was incomplete and inconsistent with SRNS Procedure 8Q 122 R.18,

Hazard Analysis Process. Although the WO identified common industrial hazards such as silica, noise, penetration checks, and electrical risks, it failed to address the most significant hazard: entanglement of clothing or gloves with rotating drill bits. Hazards associated with glove compatibility, heat stress, miscommunication, and co-worker activities were similarly absent. These omissions reflect a failure to meet the requirements of Section 5.3.1 of Procedure 8Q 122 R.18, which directs planners to identify hazards associated with the work activity, work environment, and co-located activities.

Instead of analyzing the hazards in detail, the SPD Addendum to 1Y-8.20 allowed a streamlined approach that produced generic work instructions and placed reliance on “skill of the craft” to manage safety in the field. This reliance effectively shifted hazard identification from the planning phase into the hands of workers, bypassing the systematic analysis required by ISM. SRNS construction management did not communicate that workers should use the two-bit method, and this requirement was not listed in the WO, allowing workers to rely on long-bit horizontal hand-guiding. Worker requests for shorter bits, drill jigs, or guards were disregarded, indicating that field knowledge was not incorporated in the hazard analysis.

The hazard analysis also failed to incorporate lessons learned from DOE operating experience, despite multiple prior glove entanglement events documented across the complex, as previously noted. Also, a similar near miss that occurred at the SPD Project in July 2025 was not reported or used to update the hazard analysis, further demonstrating a breakdown in ISMS Core Function 5, *Feedback and Continuous Improvement*. Oversight reviews and contractor approvals of the hazard analyses by SRNS subject matter experts (SMEs) were cursory, and no evidence was provided that any personnel observed the horizontal outdoor concrete drilling operations directly or compared work practices to written controls. The result was a hazard analysis process that left critical hazards unrecognized and uncontrolled, directly contributing to less than safe practices being normalized in the field.

Identified Causal Factors

The AIB determined that multiple interrelated causal factors contributed to the inadequate analysis of hazards. The JHA and AHA for WO 02137123-01 did not identify hazards such as rotating-bit entanglement, glove incompatibility, loose clothing, miscommunication, or co-located work. These omissions were inconsistent with SRNS Procedure 8Q 122 R.18, which requires hazard identification for the work activity, environment, and co-located operations. Instead, the SPD Addendum to 1Y-8.20 institutionalized a streamlined process that produced generic hazard language and placed responsibility on the workers themselves under the assumption of “skill of the craft.”

SRNS construction management assumed that a two-bit method would be used, but this expectation was never documented or enforced. In practice, workers hand-guided long hollow core horizontal drill bits, a technique repeatedly identified as less safe by

workers. Requests for shorter bits were not acted upon. The only personal protective equipment (PPE) provided were HyFlex 11-591 gloves, which were selected for puncture resistance but increased entanglement risk when used with rotating equipment.

Lessons learned from prior DOE glove-entanglement events and a July 2025 near miss at SRS were not reviewed or incorporated into the hazard analysis. Pre-Job Briefings and STARRT cards listed rotating equipment only in generic terms and did not specify engineered or administrative controls. SRNS SMEs did not evaluate if drilling work activities aligned with safe work practices and controls in the JHA. Supervisors viewed drilling as “common sense” and failed to identify less than safe techniques. These conditions created an environment in which critical hazards were overlooked, less than safe practices were normalized, and feedback mechanisms failed to correct deficiencies.

3.2.3 Develop/Implement Hazard Controls

Facts

The WO and supporting AHA/JHA identified generic industrial hazards such as silica, dust, noise, and electrical exposure, but no specific hazard controls were developed for rotating-bit entanglement. On the day of the accident, the pre-job STARRT card listed “rotating equipment” as the hazard, and “keep hands clear” as the only control, without additional administrative requirements or engineered solutions.

Resource controls were inadequate: shorter drill bits, drill guides, and vibration-dampening gloves were requested to foreman but not procured. Instead, ironworkers continued using the available HyFlex 11-591 gloves issued during rebar installation. HyFlex 11-591 gloves have an increased grip and draw-in risk. This substitution addressed puncture hazards from rebar ties but exacerbated entanglement risk. Supervisors and oversight personnel assumed that safe practices, i.e., two-bit method, were being used, but this expectation was undocumented and unverified. Due to lack of oversight, less than safe practices (hand-guiding long horizontal drill bits with HyFlex 11-591 gloves) became normalized.

Analysis

Under ISM, hazard controls must flow from hazard analysis, be tailored to the task, and be implemented in the field. For SPD Project drilling operations, hazard analysis failed to identify entanglement hazards, and therefore controls were never developed. The only documented measure – “keep hands clear” – was vague, ineffective, and unrealistic given the equipment in use.

The failure to procure and provide equipment allowed workers to use workarounds. PPE controls, i.e., HyFlex 11-591 gloves, adopted to address puncture hazards, materially worsened entanglement risk. Also, SRNS supervisory and oversight personnel failed to implement or enforce hazard controls in the field as demonstrated by

signing off on hazard analyses and walkdowns without verifying actual practices. In effect, hazard controls for the rotating drill bit hazard were not developed, not provided, and not enforced. ISM Core Function 3, *Develop and Implement Hazard Controls*, was not achieved.

Identified Causal Factors

The AIB determined that multiple interrelated causal factors contributed to the failure to develop and implement adequate hazard controls. The WO and supporting JHA/AHA identified only generic industrial hazards such as silica, dust, noise, and electrical exposure, but did not develop specific controls for rotating-bit entanglement. On the day of the accident, the only documented control for rotating-bit entanglement (on the STARRT card) was to “keep hands clear,” which was vague, unenforceable, and unrealistic given the equipment in use.

Workers requested shorter drill bits and safer equipment but none were provided before the accident. PPE substitution to use HyFlex 11-591 gloves addressed puncture hazards but increased the risk of entanglement by increasing grip on the rotating bit.

Although there were weekly SRNS construction management and environment, safety and health (ES&H) safety personnel walkthroughs of the work area, supervisors and oversight personnel did not enforce hazard controls in the field or reconcile assumed safe two-bit method with observed less than safe practices. As a result, hand-guiding long horizontal drill bits became normalized without intervention.

The absence of engineered and administrative controls, combined with inadequate equipment and PPE, left workers to improvise. In effect, hazard controls were not developed, implemented, or enforced, demonstrating a complete failure of ISMS Core Function 3.

3.2.4 Perform Work Within Controls

Facts

Two ironworkers were using a Dewalt Heavy Duty Slotted Drive System Max Rotary Hammer to drill emplacement holes for rebar dowels. The drilling activities were being conducted under an approved WO 02137123-01, *HEPA Filter Slab Install SPD (Y744)*. The WO was prepared under an approved deviation from the 1Y8.20, *Work Control Procedure*, utilizing the 1Y31.02-2, *Addendum to 1Y8.20 for the Surplus Plutonium Disposition Project*, which allowed for a streamlined approach for construction activities.

Applying the streamlined approach in this situation resulted in generic work instructions which relied heavily on “skill of the craft” to conduct the drilling activity safely. In addition, preparation of the WO did not include participation by the ironworkers performing the drilling activities. However, the work instruction was generic concerning drilling: “*Drill Holes to the required embedment depth per the design documents...*” and did not provide explicit personnel safety requirements for the activity. Union workers are

required to follow the safety requirements specified in SRNS Procedure 8Q 122 R.18 like all other SRNS workers.

At the time of the accident, drilling was being conducted outside along the north wall of the K-Area reactor building next to the hatches that were historically used to access heat exchangers for the K-Area reactor. The general area was called the “handball court” area by workers (see Figure 3.2-3). The workday started with attending a Pre-Job Briefing to discuss daily activities and the STARRT card requirements. All ironworkers placed initials on the STARRT card to acknowledge they reviewed and marked all potential hazards, PPE, and required safety controls. In addition, the initials acknowledged all comments had been addressed and they understood their duty to stop/call a Time Out if a less than safe condition was identified.

When drilling restarted for the emplacement holes in June 2025, a shorter drill bit was used in the process for a limited number of emplacement holes. The shorter bit allowed a single person to conduct the entire drilling process. The shorter bit could establish a pilot hole so the longer drill bit could be inserted to drill the emplacement hole to required depth. Soon after the restart of drilling inside the building in June 2025, the shorter drill bits became clogged and could not be used. The ironworkers attempted on multiple occasions to obtain replacement shorter bits, but their requests were not fulfilled until after the accident occurred.



Figure 3.2-3: Outside Work Location (Handball Court) for Emplacement Holes

Analysis

The rotational hazard or energy transfer potential of the drill or bit was not addressed in the WO. It only appeared once in the STARRT card of the day of the accident stating: “Hazard: Rotating equipment,” and “Control: Keep hands clear.” This control was insufficient given the work conditions. Due to the unavailability of shorter drill bits and the inherent challenge for a single individual to safely initiate an emplacement hole with the longer bits (i.e., establish the “initial bite”), ironworkers developed an improvised

two-person workaround. This process involved a drill operator (Driller) and a horizontal drill bit Supporter, as depicted in Figure 3.2-4.



Figure 3.2-4: Reenactment of Ironworker Hand Guiding Horizontal Drill Bit

The “initial bite” refers to successful engagement of the drill bit with the concrete surface without slipping or “walking.” Masonry drill bits, characterized by a non-cutting flat spot (web or chisel point) on the tip, tend to skid across the surface until the outer cutting edges engage. Interviews with the ironworkers indicated that the drill’s speed adjustment dial, ranging from one (slowest) to seven (fastest), was never used; and operations consistently occurred at the highest speed setting.

The two-person workaround involved the Supporter guiding the long horizontal drill bit with gloved hands, assisting the Driller in aligning the tip on the wall. The Driller would then apply forward pressure, securing the drill tip, at which point the Supporter would remove their hands. The Driller would then pulse the drill trigger until the bit achieved its initial engagement with the concrete. Even with this workaround, the drill bit occasionally “walked away” from the intended location due to the high rotational speed prior to engagement.

Interviews with the ironworkers revealed that some would use the palms of their hands to stabilize the horizontal drill bit while it was rotating. Journeymen attested that open-hand support was the established common practice. The accident suggests that even a slight grasping or contact with the rotating bit while wearing HyFlex 11-591 gloves

(selected for rebar puncture resistance) facilitated entanglement due to the gloves' high-friction rubberized inner surface. Given the generic nature of the work instruction, ironworkers may have perceived this two-person process as a compliant process.

Alternative processes that could have achieved initial drill bit engagement without requiring direct contact with the energized drill bit by a Supporter include:

- Use of Center Punch: Creating a small, centered indentation by striking a punch with a hammer would provide a starting point for the drill bit, preventing slippage.
- Slower Drill Speed: Initiating drilling at a slower speed with light pressure could facilitate bit engagement with the concrete.
- Use of Drill Guide: Securing a guide block to the concrete wall with double-sided tape would contain the drill bit during initial engagement on smooth surfaces.
- Use of Pilot Hole: Drilling a shorter pilot hole initially provides a starting point for the larger drill bit to engage.

During the AIB in-brief, SRNS leadership prematurely communicated a narrative that IW1 “grabbed” the rotating bit, causing the accident. This assertion was also present in a safety alert notification issued to SRNS employees the day following the accident. The AIB concluded that such a narrative was released without exhaustive investigation or comprehensive review of all available evidence. IW1’s interview indicated that contact with the rotating horizontal drill bit was not intentional but rather occurred during the execution of a task as trained and understood on the job. The AIB found no evidence to support the claim that IW1 intentionally grabbed the rotating horizontal drill bit as the Direct Cause of this accident.

Identified Causal Factors

The AIB determined that multiple interrelated causal factors contributed to the failure to perform work within established controls. On the day of the accident, IW1 and IW2 were drilling emplacement holes under WO 02137123-01. This streamlined WO provided only generic instructions and failed to identify any specific personnel safety requirements. While nuclear safety requirements were explicitly controlled, industrial safety hazards (e.g., rotational hazards, entanglement) were addressed only in broad, non-specific terms.

Based on interviews with the ironworkers, there was pressure exerted on the workforce to get the work completed due to project scheduling issues. With the schedule pressures, lack of shorter drill bits, and a generic WO; workers developed a two-person workaround in which one worker operated the drill, and another guided the horizontal drill bit by hand until it established a bite in the concrete. This workaround became normalized after shorter bits became clogged and were not replaced as requested. Interviews confirmed that some workers used their palms to stabilize the drill bit, and journeymen described this method as an accepted, on-the-job practice. The HyFlex 11-591 gloves used by IW1 increased grip on the rotating horizontal bit, making the

practice more hazardous in conjunction with the fact that workers continually operated the drills at maximum speed.

Alternative safe methods, such as drilling pilot holes, using guide blocks, or reducing drill speed, were not incorporated into the WO or enforced. SRNS construction management oversight failed to detect or correct this practice, despite hundreds of holes being drilled in this manner.

After the accident, SRNS communications prematurely stated that the injured worker “grabbed the drill bit.” The AIB’s investigation confirmed that the worker was performing the task as trained and did not intentionally contact the rotating horizontal drill bit. This mischaracterization deflected attention from systemic failures in work planning, equipment provision, and oversight. Collectively, the lack of clear instructions, inadequate tools, and ineffective supervision demonstrates that work was not performed within controls, in violation of ISMS Core Function 4, *Perform Work within Controls*.

3.2.5 Feedback and Improvement

Facts

Input for the SPD Project feedback and improvement is obtained through multiple mechanisms which include SRNS and NA-94 oversight. NA-94 oversight results are captured in a computerized database called the Construction Daily Activity Logs. The oversight results are reviewed by SPD Project SRNS construction management and feedback is developed and provided to SRNS. SRNS inputs feedback into their Site Tracking, Analysis, and Reporting (STAR) system to document, evaluate, and identify corrective actions for resolution.

The SRNS WP&C process requires a STARRT card briefing before daily work activities begin to cover the scope of work activities, hazards associated with work activities, and controls to mitigate the hazards associated with the work. In addition, when issues are identified by SRNS oversight, the STAR computerized issue management system is used to develop corrective actions and track to closure.

In the past year, SRNS has conducted two reviews due to issues with: 1) damaging the K-Area structure while conducting demolition activities for the SPD Project, and 2) the installation of rebar dowels with the incorrect length. Both reviews resulted in multiple corrective actions which were captured in the STAR system for tracking and resolution.

SRNS employees have access to an ECP and, when interviewed, demonstrated knowledge of how to contact and provide concerns if needed. Based on employee interviews, the ECP was not utilized due to fears of potential reprisal.

There were various recent lessons learned from across the DOE complex related to drilling or entanglement hazards, including a near-miss at SRS in July 2025 which were not incorporated or shared during work planning and execution.

Analysis

Though oversight was being conducted, it sometimes lacked formality in the resolution of identified issues. For example, NA-94 identified through operational awareness (OA) activities that the SRNS Safety SME for the SPD Project was not spending sufficient time in the work area providing oversight of work activities. The observation was verbally reported to the SRNS SPD Project construction manager on multiple occasions. SRNS construction management attempted to resolve the NA-94 concern by sending multiple e-mails to the management of the SRNS Safety SME, but no timely resolution was achieved and the issue remained open at the time of the accident with no compensatory measure.

SRNS construction management knowledge of workplace conditions and work practices being followed was lacking. During an interview/walkthrough of the work area, SRNS construction management was not knowledgeable of the type of PPE or that it was being staged in a gang/day box within the work area. SRNS construction management was also under the perception that a two-step process was being followed to drill the emplacement holes. The two-step process was only followed early in restart of drilling but stopped when short drill bits became clogged and not replaced.

Ironworkers made repeated verbal requests for shorter drill bits, drill jigs, or guards to their foreman, and subsequently SRNS construction manager, which were unfulfilled. The ironworkers did not pursue this beyond their foreman and continued to perform the work with the tools provided.

The Union Steward inspections of the worksite to identify and address safety or health hazards were ineffective due to limited time in the work area because of poor relationships with ironworkers. As documented during interviews, this was mainly due to a contentious working relationship between the ironworkers and the Union Steward.

Though the STARRT card process provided a mechanism to provide feedback on daily activities, there was no Post-Job Briefing being conducted to capture work-related issues that could generate lessons learned to improve the safety of the work activities.

Identified Causal Factors

The AIB determined that multiple interrelated causal factors contributed to the failure of feedback and improvement mechanisms. Oversight activities by SRNS construction management were intended to provide feedback through daily STARRT cards, Pre-Job Briefings, and the STAR issue management system, but these processes were inconsistently applied and often lacked rigor.

NA-94 oversight activities identified concerns about insufficient field presence by SRNS safety specialists; however, these issues were never formally addressed or resolved by SRNS construction management. Also, SRNS construction management lacked knowledge of field conditions and did not ensure the two-bit method was in use.

Furthermore, workers were unable to perform the two-bit method because of lack of proper tools. Union Steward inspections were ineffective due to poor relationships with the workforce, and workers did not view use of the Union Steward as a viable means of raising safety concerns. The ECP was available but unused, even after a near miss in July 2025 that directly foreshadowed this accident.

STARTR cards provided a daily forum for hazard identification; however, they were generic, not reviewed for trends, and lacked support from Post-Job Briefings to capture lessons learned. SRNS construction management failed to share relevant lessons learned or operating experience from across the DOE complex. Oversight issues were often addressed through informal emails rather than tracked to closure in STAR, weakening accountability.

These deficiencies show that feedback loops were ineffective. Known hazards and near misses were not elevated, lessons learned from operating experience were not shared, and less than safe practices persisted uncorrected. ISMS Core Function 5, *Feedback and Improvement*, was not achieved.

3.2.6 Oversight Program

Facts

For this investigation, oversight was considered in terms of roles, responsibilities, and expectations to verify that worker, safety, and health requirements were being implemented. Due to the nature of the activities for the SPD Project, the oversight roles and responsibilities include those applicable to: 1) SRNS and their safety and health professionals and construction management, 2) NA-94 and their safety and construction oversight personnel as part of the NNSA Integrated Project Team, and 3) SRFO and their FRs and safety professionals. The following sections describe the requirements that establish oversight roles for each party and an analysis of the AIB findings related to oversight activities.

SRNS as the M&O contractor for SRS was selected for the SPD Project construction because of their existing on-site operating experience and established workforce. SRNS has an established WP&C program at the SRS Site, however the procedures were streamlined to accommodate construction activities under the exclusion for “Grass Root Construction.” Deviation from Site procedures is permitted in specific areas that are not considered beneficial or cost effective, including a large construction project such as the SPD Project.

SRNS construction management is responsible for ensuring a safe and healthy workplace for all their employees to include effective oversight to ensure work is conducted in accordance with the requirements of the M&O contract and in a safe manner. Interviews with SRNS personnel indicated that work within the SPD Project was considered “low risk,” which led to less rigorous oversight of skill of the craft construction activities. Throughout the investigation, the AIB identified several instances of ineffective oversight from SRNS/SPD Project construction management.

For example, the SRNS construction management misconception that horizontal concrete dowel drilling was “common sense” and relied on “skill of the craft” to get the work done. Additionally, SPD Project construction management presumed that the skilled craft workers (journeymen) had the practical knowledge, abilities, and experience necessary to perform drilling safely and effectively.

The posture that construction activities are common sense led SRNS to allow drilling activities to continue without conducting regular management field observations, verification of craft qualifications, or explicit instructions. SRNS assumed that the ironworkers understood the tools, materials, and processes involved, allowing for independent work by the crafts. SRNS construction management did not recognize that horizontal concrete dowel drilling with a longer drill bit was unique and needed additional scrutiny by SRNS construction management. Although the work control documents were signed by the SRNS construction manager, the AIB could find no evidence that SRNS construction management oversight had reviewed work practices for drilling to ensure that all activities – including horizontal concrete dowel drilling closer to the ground – were analyzed and controlled.

Based on interviews with ironworkers and supervision, SRNS construction management did not provide shorter drill bits as requested by the workers. The use of longer drill bits required a Supporter to guide the rotating horizontal drill bit with their hands while the Driller operated the drill. SRNS construction management did not participate in the development of the WO, were not aware of the work scope and associated hazards, and did not observe work being performed. SRNS construction management can delegate authorities to employees, but this delegation does not remove line management’s responsibilities for safe operations of these work activities. The SRNS construction managers, superintendent, general foremen, and journeymen all had oversight responsibilities to ensure work was performed safely, but oversight was inconsistent and attitudes about safety were not rigorous.

The *Project Specific Integrated Safety Management Plan* describes the ISMS to be used to ensure that safety is integrated into work performed; however, it was not effectively implemented on the SPD Project. As the Plan pointed out, ISM is only effective if integrated into normal project routines, programs, and practices, which did not occur on this project. The mechanism of implementation is primarily through the generation and approval processes of the various programs and project plans. Based on an analysis of project requirements and plans (e.g., Construction Execution Plan, R2A2, project construction area, ISM plan, staffing plan), oversight roles and responsibilities were defined but not effectively executed. R2A2s were misunderstood across SRNS construction management, safety, and ironworkers.

According to the *Construction Execution Plan*, the SPD Project requires at least one full-time equivalent dedicated safety professional to monitor daily field activities and assist with work planning issues. However, the SRNS Safety and Health (S&H) Specialist is only able to devote about 50 percent to the SPD Project due to also having oversight of safety for K-Area operations. During the AIB interview, the SRNS S&H specialist

discussed staffing shortages and significant turnover in the SRNS safety organization, which led to limited oversight by the SRNS S&H Specialist. The drilling operation was never observed from beginning to end and SRNS S&H was unaware that a Supporter was required to guide the horizontal rotating drill bit with their hands while the Driller operated the drill. The SRNS S&H Specialist also considered drilling to be “common sense” and a low-risk activity.

The SPD Project had an Industrial Hygienist (IH) evaluate health hazards associated with drilling operations. Although the IH was engaged in heat stress monitoring and worked with SRNS construction management to implement controls, SRNS construction management told the AIB that construction work is exempt from SRNS heat stress monitoring requirements because construction workers are acclimated to weather conditions. This is an example of construction management not implementing an established control for a known hazard and relying on the ironworkers to self-monitor/self-correct.

Multi-disciplined ES&H walkthroughs are performed on a weekly basis and include staff from the SPD Project, NA-94, and occasionally the SRFO FRs. These regular ES&H walkthroughs created a mechanism for SRNS construction management to maintain cognizance of field work activities. The ES&H walkthroughs did not include craft workers or the Union Steward.

On February 25, 2025, NA-94 sent a *Letter of Concern* regarding the SPD Project performance. The letter stated that the SPD Project was not being effectively managed to ensure that it could be finished within budget and scope. In addition, NA-94 identified multiple issues related to rebar and dowel installation, engineering/field rework, and significant schedule delays. SRNS construction management stated they did not have time to observe low-risk activities as they were focused on other pressing issues related to project management.

Per the MOA between SRS NA-94 and SRFO, NA-94 oversees design, construction, and testing/start-up of the SRS NA-94 projects. However, since the SPD Project Site is under the responsibility of NNSA as the landlord, the site-level programs remain under the responsibility of SRFO.

SRFO has established an MOA with NA-94 that is specific for capital projects executed at SRS and describes Federal roles and responsibilities. Table A of the MOA lists functions, responsibilities, and authorities applicable to the NA-94 and/or SRFO. According to the MOA, the SRFO FRs are responsible for providing support to NA-94 projects. However, based on discussions with SRFO and NA-94, there is an understanding at the Site that the FRs do not oversee construction activities. The FRs' role is to provide day-to-day oversight of operations at nuclear facilities. However, FRs perform occasional walkdowns of construction activities at the SPD Project.

Per the MOA between NA-94 and SRFO, NA-94 oversees design, construction, and testing/start-up of the SRS NA-94 projects as well as oversight of industrial and

occupational safety (SRFO has program ownership). However, since the SPD Project site is under the responsibility of NNSA as the landlord, the site-level programs remain under the responsibility of SRFO. The AIB identified through interviews that K-Area FRs do not have responsibility for SPD Project oversight until it is ready for pre-commissioning because that is when integrated SPD Project operations begin.

The SRSAPMO-MOA-001 is inconsistent with NNSA-SPD-24-0090, *Surplus Plutonium Disposition Project Integrated Project team Charter*, R2A2s with respect to Industrial/Occupational Safety and FRs. Interviews with SRFO and APMO found inconsistency with the understanding of the R2A2s as documented in the MOA. Specifically, the MOA states that the SRFO FR Program is responsible for conducting oversight of implementation of DOE O 422.1 Chg. 1, *Conduct of Operations*. Also, this is inconsistent with NNSA-SPD-24-0090.

NA-94 is responsible for the planning, industrial/occupational safety for design and construction, acquisition, and management of line-item construction and major infrastructure projects. These projects are governed by the NNSA's Critical Decision (CD) process. NA-94 is involved in monitoring project performance at a high level, such as attending ES&H weekly walkthroughs, performing random walkdowns, and tracking project progress, costs, and schedules. These responsibilities are hindered by insufficient staffing levels at NA-94 as mentioned by NA-94 management.

NA-94 S&H is currently staffed at a 33 percent level when compared to the staffing analysis. One safety SME is currently on-boarding and there is still one vacancy. Due to inadequate staffing levels, line oversight was impacted.

Analysis

The Root Cause Analysis highlights that oversight and inspection functions lacked independence and effectiveness. The AIB identified the same pattern in the accident: no independent barrier verified the work setup, analyzed the tool hazard, or reviewed PPE adequacy before execution. Numerous repetitive drilling evolutions occurred without SRNS construction management recognizing that ironworkers were guiding the horizontal rotating drill bits with their hands. This condition represented a breakdown in contractor oversight and illustrates a systemic failure to verify that work planning (Work-as-Imagined) matched work practices (Work-as-Done).

Staffing issues, culture, and R2A2s directly correlated with the AIB findings that were identified during the investigation. SRNS construction management did not provide adequate training or verification of qualifications of the ironworkers at the jobsite and did not actively engage in the WO development. Interviews with NA-94 and SRFO indicate a lack of clarity in understanding some oversight roles and responsibilities as stated in the MOA.

SRNS and NA-94 both reported staffing shortages of safety oversight personnel. The staffing shortages have limited the field presence of S&H personnel due to competing

work responsibilities (e.g., reviewing WOs). Had SRNS conducted effective oversight and corrected less than safe practices, this accident may have been preventable.

The weekly multi-disciplined ES&H walkthroughs primarily focused on surface-level hazards such as PPE use, housekeeping, scaffolding, and barricades. This approach could unintentionally omit systemic issues or root causes of safety problems. After the July 2024 extended work pause, the ES&H team did not observe the restart of the horizontal concrete dowel drilling operation. Furthermore, hazards identified during the walkthroughs are not always documented for tracking and trending analysis, and only serious issues are entered into the STAR system.

Identified Causal Factors

The AIB determined that multiple interrelated causal factors contributed to the failure of oversight by SRNS who has primary oversight responsibility for the SPD project. Interviews revealed that SRNS construction management considered horizontal concrete dowel drilling to be low risk, “common sense” work that could be safely completed by relying on “skill of the craft.” This mindset led to inadequate field engagement, limited verification of hazard controls, and failure to ensure workers were qualified and supervised appropriately.

The SPD Project-specific ISM plan called for integration of safety into daily routines, but it was not effectively implemented in practice. The AIB identified that hazard reviews, JHAs, and pre-job verifications were treated as administrative exercises, not as independent or technically rigorous safeguards. Based on AIB interviews, SRNS construction management assumed that ironworkers had the necessary knowledge and abilities, allowing less than safe practices (e.g., hand-guiding long horizontal drill bits) to continue unchecked. Requests for shorter drill bits and safer equipment were not fulfilled, further demonstrating SRNS construction management’s lack of active engagement.

NA-94 oversight was limited by inadequate staffing and competing priorities, and FRs reported that they did not routinely oversee construction activities. In practice, Federal personnel attended some STARTR card briefings and performed occasional walkthroughs, but these reviews did not identify the hand-guiding practice that had been occurring for months.

Oversight by SRNS S&H and construction management was similarly ineffective. The training that ironworkers receive at the Union Hall and associated qualification records are not reviewed by supervisors or construction management. The SRNS Safety Specialist assigned to the SPD Project reported spending a significant amount of time on document reviews rather than observing work in the field. They acknowledged that they had never observed a hole being drilled from start to finish, despite the high frequency of drilling operations. Multi-disciplinary safety walkthroughs were conducted weekly but focused on surface-level issues such as housekeeping and PPE.

Inspections rarely engaged workers directly, did not involve Union Stewards, and failed to address systemic issues such as the normalization of less than safe drilling methods.

There was a systemic breakdown in SRNS oversight that allowed the inadequacies to persist in the WO that resulted in hazards remaining unmitigated. In addition, oversight at all levels did not verify that work practices matched the approved work controls in the field. This systemic breakdown in oversight allowed less than safe methods to be implemented without challenge, which is inconsistent with implementation of ISMS core functions.

3.3 Emergency Response

Facts

Immediately following the accident, co-workers initiated basic first aid and transported IW1 to the nearby Handi House picnic table area for further assistance. The severed thumb was placed in a glove and then packed in ice for preservation. Simultaneously, personnel in the area halted all operations and shut down additional equipment. Nearby OPS personnel heard shouting and responded immediately. OPS support personnel arrived from the 804 Door, along with roofing personnel and the K-Area Interim Surveillance crew, who retrieved a first aid bag from the personnel wing.

An SRNS employee initiated contact with the Shift Operations Manager (SOM), who then directed emergency response efforts, notified the SRS Operations Center (SRSOC), and dispatched additional Emergency Response Organization (ERO) personnel. Emergency Medical Technicians (EMTs) arrived, removed a fence panel from the construction area to access the scene, applied a commercial tourniquet, and transported IW1 and the severed thumb on ice to the ambulance.

IW1 was taken initially to the Medical College of Georgia and later transferred to Doctors Hospital of Augusta. Notifications to SRNS construction management and the employee's emergency contact were made in accordance with SRNS Procedure 18.58, *Emergency Notifications and Reporting*.

Analysis

The AIB found that the initial on-scene response by co-workers was rapid and effective. Immediately after the injury, nearby workers stopped work, rendered first aid, and moved IW1 to a safer staging area where bleeding control could continue. Several of the responding workers were former military where they had received life-saving trauma training. These employees fashioned and applied a tourniquet and placed the severed thumb on ice for preservation and transport. These actions materially reduced physiological deterioration and preserved tissues for potential surgical reattachment, consistent with best practices for traumatic amputation care.

The documented timeline indicates injury, internal notifications, and EMS dispatch at ~0819, EMS arrival at K-Area at ~0830, EMT contact with patient ~0834, and EMS

departure at ~0840. The sequence demonstrates a coordinated hand-off from co-workers to first aid responders to EMTs, with OPS and SOM/SRSOC providing command-and-control support once notified.

In addition to providing rapid medical aid, the AIB was advised that scene preservation steps were initiated almost immediately once the medical needs of IW1 and IW2 were attended to. Workers barricaded the area, left the drill and worksite undisturbed, covered items at the scene with plastic to prevent effects of rain, secured PPE, and recovered materials. These actions show an acute awareness of the gravity of the accident and the importance of preserving the scene for evidence collection, reconstruction, and future review by an accident investigation team. This behavior reflects strong procedural awareness and facilitated the AIB's ability to reconstruct the sequence of events.

The AIB identified a notification-pathway discrepancy between SRNS emergency response procedures (SRNS Procedure 18.58) and how employees initiated notifications during this accident. Procedure 18.58 requires that 33911 be called first whenever EMS response is needed for injury or illness, ensuring immediate dispatch of EMS/ERO resources. Interviews, however, indicate some workers called or were directed to call the SOM or SRNS construction management first, with 33911 contacted later in the sequence. This chain of events added latency and increased dependence on ad-hoc relay, both of which potentially delayed EMS time-to-patient. Calling the SOM first conflicts with SRNS emergency response Procedure 18.58, which specified calling 33911 first.

Identified Causal Factors

The AIB determined that one causal factor was linked to the emergency response. Although co-workers acted quickly with first aid and EMS responded within minutes, SRNS personnel did not follow Procedure 18.58, which requires calling 33911 first. Instead, they contacted the SOM and Operations Center before 33911, creating an unnecessary delay in dispatching EMS.

While the medical care provided was effective in reducing the severity of the injury, the failure to follow the required notification pathway reveals a weakness in emergency response discipline. Less favorable conditions could have resulted in a slower medical response and worse outcomes.

3.4 Post-Event Accident Actions

Facts

Following the departure of EMS personnel, OPS staff initiated preparations for scene control and biohazard cleanup. Biohazard bags and disinfectants such as bleach were brought to the site in accordance with established hazardous material handling procedures. Initial focus was placed on securing the scene, and barricades were erected to prevent entry and to preserve physical evidence for the investigation. The

immediate accident location remained undisturbed, while only the travel path from the scene to the Handi House picnic area was cleaned to address visible biological contamination.

All non-essential personnel were directed to leave the area after confirming their equipment was in safe condition. Response personnel who had rendered assistance were evaluated at medical facilities and underwent decontamination as appropriate.

The accident scene was formally preserved for investigation. The accident was initially reported under DOE Occurrence Reporting and Processing System (ORPS) using reporting criteria 2A(5), “Injury or exposure requiring hospitalization.” As a precautionary measure, all construction and maintenance activities across the site (including all SPD Project field work) were paused pending management evaluation and release. In parallel, all KAC Operations and Maintenance activities were suspended until further notice.

On August 8, 2025, the NNSA CSO for Safety appointed an AIB to formally investigate the accident. In accordance with local site guidance, the ORPS report was subsequently updated to include an additional reporting criterion 10(1), “Management Concern.” On August 11, 2025, initial reporting criteria was further upgraded from 2A(5) to 2A(3), based on confirmation that the injured employee required in-patient hospitalization for 5 or more days.

Analysis

Accident Scene preservation was appropriately controlled by SRNS. The accident scene was released back to SRNS by August 14, 2025.

Identified Causal Factors

None.

4.0 ACCIDENT ANALYSIS

4.1 Barrier Analysis

The AIB identified multiple barriers designed to mitigate hazards associated with horizontal concrete drilling activities. While several barriers were present, they were either ineffective, inconsistently applied, or not implemented in the field. This condition essentially eliminated necessary layers of defense-in-depth controls and allowed a hazardous work practice (e.g., hand-guiding a horizontal rotating bit) to become normalized and uncorrected until an injury occurred.

Though not exhaustive, specific examples of key Barriers include the following.

- STARRT Card/Daily Briefing: Executed, but hazard identification and control implementation less than adequate.
- PPE: HyFlex 11-591 gloves provided puncture resistance but incompatible with rotating hazard.
- ESH Weekly Facility Walkdowns: Performed, but superficial.
- SRNS Supervisory and Construction Management Oversight: No evidence submitted that oversight was performed.
- NA-94 Project Construction Oversight Manual (SRSAPMO-MAN-003): Checklist provided but not used.
- AHA/JHA Work Planning: Generic hazards documented.
- Time Out Authority: Used post-accident.
- Pilot-Hole/Two-Bit Method: Not used; expectation undocumented.

Appendix C is the AIB's Barrier Analysis Worksheet, containing a detailed description of identified Barriers that the AIB determined to be ineffective.

4.2 Change Analysis

The AIB analyzed multiple changes identified during the investigation, detailed in the Change Analysis Worksheet contained in Appendix D. This section identifies key changes that, had they not occurred, or a greater focus was on the effects of the change itself to worker safety, could have had a significant impact on the likelihood of the accident occurring or preventing it entirely.

Key changes include (in chronological order):

- MOA between SRS NA-94 and NNSA SRFO (June 24, 2023): Important as it was intended to clearly define oversight roles, in practice, the interpretation of responsibilities by NA-94 and SRFO was inconsistent with the MOA.
- Construction Execution Plan Approved (October 2023): The Plan should have ensured alignment with site WP&C; however, the SPD Project used alternate

tailored processes masking deviations from site-level rigor and creating a false sense of compliance.

- Addendum to 1Y-8.20 for SPD Project Effective (May 23, 2024): Crucial change because the addendum narrowed hazard evaluation scope, excluded steps like pilot-hole and entanglement analysis, and codified reduced rigor into work planning, which allowed less than safe drilling practices.
- Glove Substitution to HyFlex 11-591 (~CY2024): Highly relevant since PPE was changed to address puncture hazards from rebar ties. Continued use of HyFlex 11-591 during drilling operations increased entanglement risk with horizontal rotating bits, thus directly contributing to the severity of the accident.
- Management Control Plan (MCP) Issued to Supersede Interim Work Release (May 12, 2025): Important because it was intended to restore rigor but lacked enforcement. Hazards remained under-analyzed and management action was ineffective, allowing hand-guiding practices to continue.
- SPD Project WO Formally Approved (May 22, 2025): Critical because approval implied all hazards were addressed but entanglement hazards and PPE misalignments were still missing. Approval created a false assurance of safety readiness.
- Ironworker Near-Miss with Rotating Bit (~July 2025): This near-miss was an important precursor event. A glove entanglement occurred but was not reported or acted on, representing a missed opportunity to correct less than safe practices before the accident causing the injury to IW1.

4.3 Direct, Contributing, and Root Causes

The AIB assessed the causal factors and determined as to whether they were a Direct Cause (DC), individually or collectively a Contributing Cause (CC), and/or a Root Cause (RC).

4.3.1 Direct Cause

The AIB concluded the Direct Cause of this accident was direct contact of IW1's gloved hand with an unguarded 39-3/8 inch rotating hollow core drill bit at full rotational speed while guiding the horizontal drill bit into a concrete wall, causing the right-hand glove to become entangled with the drill bit resulting in thumb amputation.

4.3.2 Contributing Causes

The AIB recognized 13 Contributing Causes (CCs) that foundationally shared common traits. The CCs are organized under WP&C, Oversight, and Organizational Factors.

4.3.2.1 Work Planning and Control

CC-1: The WP&C process produced a WO that did not adequately identify, analyze, and mitigate hazards specific to drilling operations.

CC-2: Streamlined WP&C processes and reliance on “skill of the craft” institutionalized the use of a standing JHA with generic hazards, preventing systematic identification and control of hazards posed by drilling.

CC-3: The use of HyFlex 11-591 gloves was not compatible with rotating equipment and contributed to the severity of the injury.

CC-4: Drilling and Penetration Training (TMAR7000) did not identify the hazard of the rotating drill bit and did not have periodic retraining requirements, reducing the workforce’s preparedness to recognize and manage this hazard.

4.3.2.2 Oversight

CC-5: An overreliance on “skill of the craft” and SRNS construction management’s perception that drilling operations are “common sense” resulted in reduced field engagement and oversight by SRNS.

CC-6: Safety oversight by SRNS was insufficient due to understaffing, workload competition, and ineffective prioritization of hazard construction activities.

CC-7: SRNS construction management did not ensure that appropriate equipment was available and its use enforced for safe drilling, leaving workers to improvise work practices that resulted in less than safe methods with the tools provided.

CC-8: Worker qualifications were not consistently verified prior to start of work activities, which undermined confidence that all workers were prepared to perform work safely.

4.2.3.3 Organizational Factors

CC-9: Less than safe practices, such as hand-guiding rotating horizontal drill bits with gloves, became normalized – reinforced by schedule pressure and lack of corrective feedback.

CC-10: Schedule pressures incentivized workarounds, leading to greater risk-taking and exposure to hazards as priorities shifted from disciplined hazard control toward production.

CC-11: The ECP was not utilized despite recent near misses and longstanding concerns, due to fears of potential reprisal from SRNS construction management.

CC-12: Time Out Authority was available but unused; work continued under visible hazardous conditions without intervention.

CC-13: Mechanisms of capturing and applying lessons learned, such as the STARRT card and Pre-Job Briefing processes, were ineffective at fostering a learning culture as recurring hazards and near misses were unaddressed and pertinent lessons learned from other DOE sites unshared.

4.3.3 Root Causes

The AIB identified five RCs of the accident:

RC-1: The SRNS WP&C process was not executed with the rigor necessary to identify and analyze drilling-specific hazards and to establish effective hazard controls, allowing less than safe practices such as hand-guiding rotating horizontal drill bits to persist.

RC-2: SRNS oversight activities did not identify less than safe use of hands to guide rotating horizontal drill bits by ironworkers despite workers stating this was a routine practice. This reflected a failure to observe field conditions, assess hazard controls, and correct less than safe methods.

RC-3: SRNS construction management's perception that drilling operations are "common sense" and reliance on the "skill of the craft" fostered complacency in planning, training, and oversight.

RC-4: SRNS construction management expectations for workers to use the two-bit method were never documented, verified, or communicated, and requests from workers for shorter bits and safer equipment were not addressed. The absence of specific procedures and tools left workers to improvise, placing their hands in direct contact with rotating equipment.

RC-5: SRNS construction management failed to adequately communicate to ironworkers all hazards and risks associated with the work and ensure mitigation measures commensurate with risk were implemented. Known risks, including near misses and operating experience lessons learned from other DOE sites, were not incorporated into job hazard analyses, training, or daily briefings.

5.0 HUMAN PERFORMANCE IMPROVEMENT

5.1 Organizational Factors

The AIB determined that organizational conditions at SRNS and within the SPD Project created a context where less than safe practices became normalized and unchallenged. Management systems did not effectively bridge the gap between formal expectations and actual work practices. While policies and procedures existed to ensure hazard identification, worker involvement, and oversight, in practice, these mechanisms were weakened by production pressure, resource constraints, and cultural attitudes that minimized industrial safety hazards compared to nuclear safety requirements. The result was a work environment where deviations were tolerated, feedback mechanisms were ineffective, and less than safe improvisations were reinforced as acceptable practice.

- **Normalization of Deviation:** The practice of hand-guiding long rotating horizontal drill bits, despite recognized entanglement hazards, became routine and accepted as “skill of the craft.” The absence of corrective feedback from SRNS supervisors and SRNS construction management reinforced this normalization.
- **Production Pressure:** The SPD Project was experiencing significant schedule delays and cost pressures. These conditions created latent organizational drivers that encouraged workarounds and risk acceptance, rather than pausing work to resolve equipment and hazard control deficiencies.
- **Disconnect Between SRNS Construction Management and Work-as-Done:** SRNS construction management failed to verify safer methods (e.g., two-bit drilling) were being used in the field. Numerous holes were drilled using less than safe practices without SRNS construction management recognition.
- **Failure to Formalize and Verify Safe Methods:** SRNS construction management failed to include the two-bit method in the WO or hazard analysis, despite believing this safer method would be used. This assumption was never communicated to or enforced with workers, nor was field verification conducted to confirm actual practices.
- **Training and Qualification Gaps:** Training content did not address entanglement hazards or the specifics of horizontal drilling. Apprentice ironworkers performed hazard drilling without consistent oversight from journeyman workers; qualification verification was conducted on an ad hoc basis. Multiple workers that entered the work area following the accident had expired or missing training requirements.
- **Ineffective Learning Culture:** DOE operating experience, which documented similar glove entanglement injuries at other DOE sites and laboratories, was ignored. Worker requests for safer tools (e.g., shorter drill bits, jigs, guards), along with a July 2025 onsite near miss involving glove entanglement, were not captured in the hazard analysis nor incorporated into lessons learned. Post-Job Briefings and structured lessons learned processes were absent, further weakening feedback and improvement.

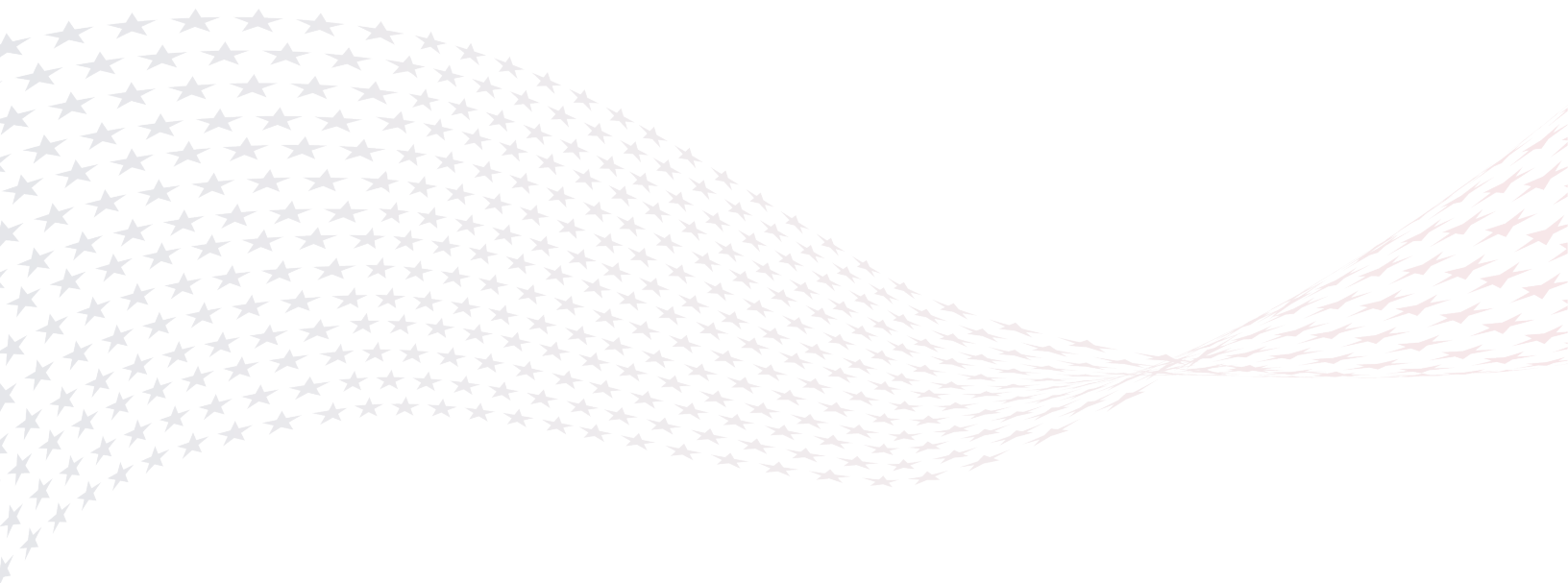
- **Suppressed Reporting and Union Steward Ineffectiveness:** Workers did not report near misses through formal channels and the ECP remained unused despite its availability. Based on worker interviews, the Union Steward had a limited presence in the field due to poor relationships with workers, which further weakened the feedback loop.
- **Blame-Oriented Communication:** SRNS released a site-wide Safety Alert the day after the accident, stating that the injured employee “grabbed the drill bit.” This message was premature, inaccurate, and inconsistent with evidence, fostering a perception of blame rather than learning and further undermining worker trust in management systems.
- **Oversight Gaps:** SRNS oversight roles were diluted by staffing shortages.

5.2 Error Precursors

The AIB identified Error Precursors that created an environment where errors were likely and even minor lapses could result in severe consequences. These Error Precursors were embedded in both the physical conditions of the work and the organizational culture surrounding the task. Workers faced ambiguous standards, inadequate tools, and inconsistent supervision, while managers underestimated the risk posed by routine drilling operations. Together, these conditions significantly increased the likelihood of human error and the severity of its outcome.

- **Time Pressure:** The SPD Project was behind schedule and workers perceived pressure to maintain progress despite less than safe conditions.
- **Complacency/Overconfidence:** Supervisors and workers treated drilling as “common sense” and low risk, underestimating the hazard of entanglement.
- **Workarounds:** Workers improvised hand-guiding the longer drill bits due to the absence of shorter drill bits, jigs, or guides that had been requested, increasing exposure to rotating equipment.
- **Unclear Standards:** Work instructions were generic and relied on “skill of the craft,” leaving the drilling method ambiguous and inconsistent across crews.
- **Inadequate Controls:** Rotating parts were not safeguarded to keep hands away from moving parts.
- **Inadequate Tools and PPE:** The substitution of HyFlex 11-591 gloves, intended for puncture resistance, created an entanglement hazard with rotating drill bits.
- **Lack of Proficiency/Inexperience:** Apprentice-level ironworkers were performing hazardous drilling tasks without consistent journeyman oversight or verification of qualifications.
- **Inaccurate Risk Perception:** Both SRNS construction management and workers underestimated the potential severity of glove entanglement despite DOE operating experience documenting similar injuries at other DOE sites and laboratories.

- Suppressed Reporting/Time Out Authority Not Exercised: Despite visible less than safe practices, workers did not utilize their Time Out Authority or escalate concerns through formal reporting systems, indicating both cultural and procedural barriers to intervention.



6.0 CONCLUSIONS AND JUDGMENTS OF NEED

The Accident Investigation Board (AIB) concludes that the accident on August 6, 2025, resulting in severe injury to IW1, was preventable and directly attributable to a combination of systemic failures across multiple organizational functions. These failures created an environment where known hazards were not adequately controlled, safer work practices were not consistently enforced, and essential feedback mechanisms were ineffective. The AIB's detailed analysis leads to the following conclusions regarding the root causes and contributing factors:

- Hazard analyses failed to identify drilling-specific hazards, and work instructions relied on generic steps and assumptions rather than enforceable controls.
- Workers were not meaningfully engaged in identifying hazards or developing safe methods, and repeated requests for proper tools and equipment were not acted upon.
- Contractor oversight and lack of Union Steward awareness failed to verify that work practices aligned with approved controls.
- Training did not fully address drilling hazards, and qualification verification was inconsistent.
- Lessons learned from near misses at SRS and other DOE sites were not acknowledged.

These conditions allowed the less than safe practice of hand-guiding rotating horizontal drill bits to become normalized and unchallenged.

The following table contains the detailed CONs, JONs, and Contributing & Root Causes developed by the AIB.

Table 6.0-1: Conclusions and Judgments of Need

Conclusions (CON)	Judgments of Need (JON)	Contributing & Root Causes
CON 1: The approved WO 02137123-01 and associated hazard analyses and work instruction failed to identify the full range of hazards and controls associated with drilling operations. Critical risks such as rotating-bit entanglement, glove compatibility, and co-located worker activities were omitted. Hazard identification was generic and did not meet the rigor expected for construction work, undermining the systematic analysis of hazards that should form the foundation of safe work planning.	JON 1: Reinforce Integrated Safety Management (ISM) Principles: Implement comprehensive measures to ensure all five core functions of ISM are rigorously applied across all phases of work, from planning and hazard analysis to execution and feedback, with clear accountability at all organizational levels. Also, mandate a rigorous improvement of hazard analysis processes (e.g., AHAs, JHAs), ensuring specificity for task-level risks like rotating equipment entanglement. This must include active worker involvement, thorough vetting of controls, and validation of suitable PPE and tooling to eliminate reliance on improvised methods.	CC-1 CC-2 CC-3 CC-7 RC-1 RC-4 RC-5
CON 2: Journeymen did not provide structured oversight of apprentice work activities, and less than safe practices such as hand-guiding long drill bits persisted unchecked. Effective SRNS construction management engagement is essential to ensure that hazardous work is conducted safely.	JON 2: SRNS needs to ensure that journeyman oversight of apprentice work is structured, consistent, and effective in verifying that hazardous tasks are performed safely.	CC-5 CC-8
CON 3: SRNS oversight did not verify that field practices matched approved hazard controls. This ineffective oversight contributed to less than safe practices not being recognized despite numerous holes being drilled.	JON 3: Strengthen Oversight and Accountability: Establish clear lines of authority and responsibility for safety oversight across all organizational interfaces. Implement robust, visible, and proactive SRNS oversight programs that routinely verify work practices align with approved controls and intervene immediately for non-compliance. SRNS should work with NNSA to ensure effective safety oversight.	CC-6 RC-2

Conclusions (CON)	Judgments of Need (JON)	Contributing & Root Causes
CON-4: Training did not address entanglement hazards, horizontal drilling techniques, or the incompatibility of certain PPE with rotating equipment. Qualification verification was inconsistent; workers without current or complete training were permitted to participate in or access the work area. These deficiencies meant that workers were not fully competent to recognize or manage the hazards of the task. In addition, emergency response actions were not consistent with emergency management procedures in all cases.	JON-4: Review and Revise Training and Qualification Programs: Conduct a thorough review and revision of all relevant training and qualification programs to ensure they effectively address specific task hazards, including rotating equipment, and equip workers with the necessary knowledge, skills, and tools for safe execution.	CC-4 CC-8 RC-2 RC-3
CON-5: Schedule and cost pressures led to the normalization of less than safe improvisations and diminished attention to hazard controls. Mechanisms intended to support feedback and improvement – such as near-miss reporting, lessons learned, ECP, and Time Out Authority – were ineffective or unused, weakening organizational learning and creating conditions where less than safe practices persisted unchallenged.	JON-5: Establish a Robust Organizational Learning System: Implement demonstrable mechanisms for systematically capturing, analyzing, and integrating internal near-miss data and external operating experience into all relevant work planning and training. This must include active solicitation of worker feedback and a non-retributive ECP to foster continuous improvement.	CC-9 CC-10 CC-11 CC-12 CC-13 RC-3 RC-4 RC-5
CON-6: The culture lacked trust in SRNS construction management, with workers expressing fear of retaliation and even being fired if they raised concerns. This climate suppressed reporting of hazards and near misses, weakening feedback mechanisms. After the accident, SRNS prematurely communicated that the injured worker had “grabbed the drill bit.” This message was inaccurate and inconsistent with the evidence, reinforcing a perception of blame and further discouraging open reporting. Such communication eroded workforce trust and undermined organizational learning, allowing less than safe practices to persist unchallenged.	JON-6: Cultivate a Proactive Organizational Culture: Implement leadership programs and management systems that actively demonstrate commitment to safety over production, incentivize hazard reporting and corrective action, and empower workers to exercise stop-work authority without fear of reprisal. This includes ensuring adequate resource allocation for safety-related requirements.	CC-5 CC-9 RC-3 RC-5

CC-1: The WP&C process produced a WO that did not adequately identify, analyze, and mitigate hazards specific to drilling operations.

CC-2: Streamlined WP&C processes and reliance on “skill of the craft” institutionalized the use of a standing JHA with generic hazards, preventing systematic identification and control of hazards posed by drilling.

CC-3: The use of HyFlex 11-591 gloves was not compatible with rotating equipment and contributed to the severity of the injury.

CC-4: Drilling and Penetration Training (TMAR7000) did not identify the hazard of the rotating drill bit and did not have periodic retraining requirements, reducing the workforce’s preparedness to recognize and manage this hazard.

CC-5: An overreliance on “skill of the craft” and SRNS construction management’s perception that drilling operations are “common sense” resulted in reduced field engagement and oversight by SRNS.

CC-6: Safety oversight by SRNS was insufficient due to understaffing, workload competition, and ineffective prioritization of hazard construction activities.

CC-7: SRNS construction management did not ensure that appropriate equipment was available and its use enforced for safe drilling, leaving workers to improvise work practices that resulted in less than safe methods with the tools provided.

CC-8: Worker qualifications were not consistently verified prior to start of work activities, which undermined confidence that all workers were prepared to perform work safely.

CC-9: Less than safe practices, such as hand-guiding rotating horizontal drill bits with gloves, became normalized – reinforced by schedule pressure and lack of corrective feedback.

CC-10: Schedule pressures incentivized workarounds, leading to greater risk-taking and exposure to hazards as priorities shifted from disciplined hazard control toward production.

CC-11: The ECP was not utilized despite recent near misses and longstanding concerns, due to fears of potential reprisal from SRNS construction management.

CC-12: Time Out Authority was available but unused; work continued under visible hazardous conditions without intervention.

CC-13: Mechanisms of capturing and applying lessons learned, such as the STARRT card and Pre-Job Briefing processes, were ineffective at fostering a learning culture as recurring hazards and near misses were unaddressed and pertinent lessons learned from other DOE sites unshared.

RC-1: The SRNS WP&C process was not executed with the rigor necessary to identify and analyze drilling-specific hazards and to establish effective hazard controls, allowing less than safe practices such as hand-guiding rotating horizontal drill bits to persist.

RC-2: SRNS oversight activities did not identify less than safe use of hands to guide rotating horizontal drill bits by ironworkers despite workers stating this was a routine practice. This reflected a failure to observe field conditions, assess hazard controls, and correct less than safe methods.

RC-3: SRNS construction management’s perception that drilling operations are “common sense” and reliance on the “skill of the craft” fostered complacency in planning, training, and oversight.

RC-4: SRNS construction management expectations for workers to use the two-bit method were never documented, verified, or communicated, and requests from workers for shorter bits and safer equipment were not addressed. The absence of specific procedures and tools left workers to improvise, placing their hands in direct contact with rotating equipment.

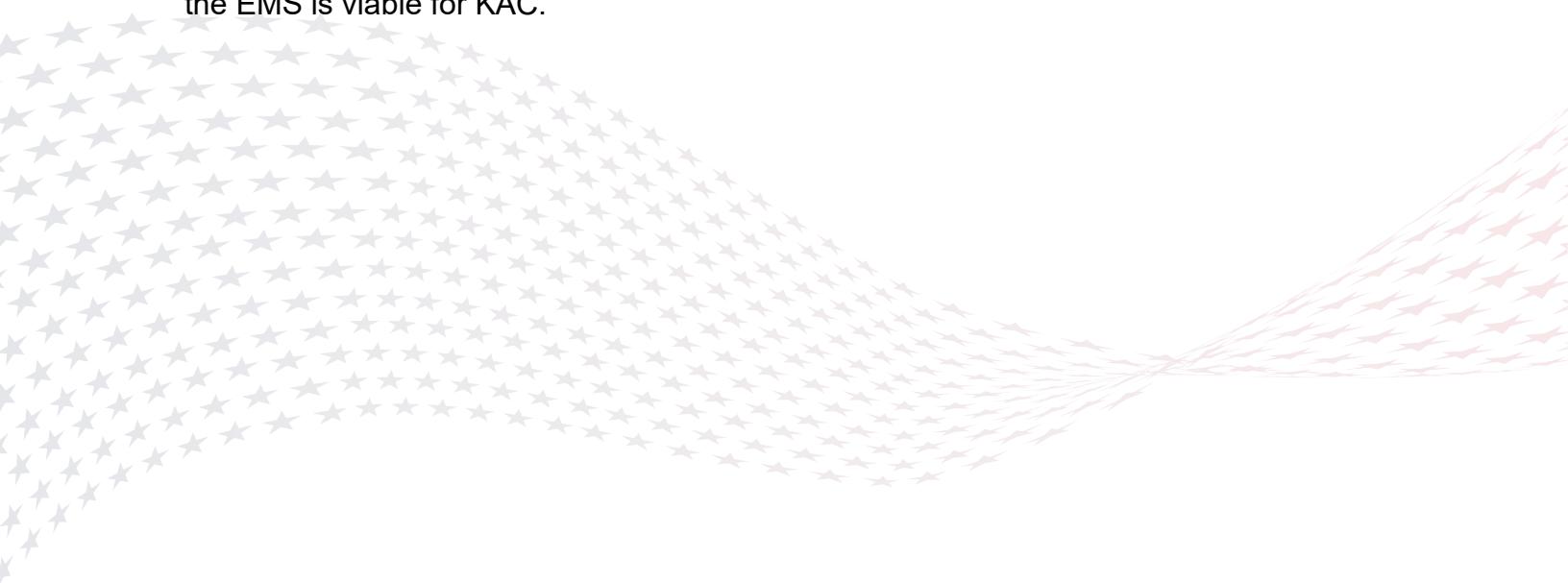
RC-5: SRNS construction management failed to adequately communicate to ironworkers all hazards and risks associated with the work and ensure mitigation measures commensurate with risk were implemented. Known risks, including near misses and operating experience lessons learned from other DOE sites, were not incorporated into job hazard analyses, training, or daily briefings.

7.0 ADDITIONAL POINTS OF INTEREST

The AIB noted a minor delay associated with EMS site access/security at K-Area during the response to the accident scene. Even slight delays in emergency response can be critical in determining medical outcomes. Several NNSA sites mitigate this risk through pre-authorized, streamlined entry protocols that balance security requirements with life safety.

For example, some sites allow EMS to proceed directly to the injured individual while one crew member (or a designated security liaison) remains at the entry control point, temporarily surrendering the crew's badges for scanning and accountability. This approach maintains perimeter control and chain-of-custody requirements while ensuring life-saving aid is not delayed.

The AIB recommends SRNS evaluate whether a similar streamlined entry process for the EMS is viable for KAC.



8.0 AIB SIGNATURES

This report was prepared and concurred upon by the following AIB members and Senior Advisor to the AIB:

JIMMY
DYKE

Digitally signed by JIMMY
DYKE
Date: 2025.09.17
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Jimmy Dyke
Accident Investigation Board Chair
NNSA, NA-ESH-21
Director of the Risk Management Division

ROBERT
PLONSKI

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ROBERT PLONSKI
Date: 2025.09.17
16:33:53 -06'00'

Rob Plonski
NNSA, NA-ESH-23
Deputy Director of the Safety Engineering Division
Accident Investigation Program Sponsor

RONNIE
ALDERSON

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RONNIE ALDERSON
Date: 2025.09.17
12:06:22 -07'00'

Ronnie Alderson
NNSA, NA-ESH-22
Nuclear Safety Specialist for the Nuclear Safety Operations Division
NA-ESH Safety Site Point of Contact for Savannah River Site

Cynthia A.
Casalina

Digitally signed by
Cynthia A. Casalina
Date: 2025.09.17
13:15:40 -06'00'

Cynthia Casalina, CIH, CSP
NNSA, NA-ESH-23
Worker Safety and Health Expert for the Safety Engineering Division

MOISES
ATILES

Digitally signed by
MOISES ATILES
Date: 2025.09.17
15:30:22 -04'00'

Moises Atilas
DOE, EHSS-12
General Engineer

RIZWAN
SHAH

Digitally signed by
RIZWAN SHAH
Date: 2025.09.17
15:40:52 -04'00'

Senior Advisor to the AIB
Rizwan Shah
DOE, EHSS-20
Accident Investigation Program Manager/Organizational Culture Advisor

9.0 AIB MEMBERS, ADVISORS, AND CONSULTANTS

AIB Members

Chair	Jimmy Dyke, NA-ESH-21
Member	Robert Plonski, NA-ESH-23
Member	Ronnie Alderson, NA-ESH-22
Member	Cynthia Casalina, NA-ESH-23
Member	Moises Atilas, EHSS-12

Contributing Member and AIB Consultant/Advisor

Member	Rizwan Shah, DOE-EHSS
--------	-----------------------

Coordinators

Savannah River Interface Administrative Coordinator	Devin Kelley
Administrative Coordinator	Emily Kaminski
	Rachel Roberts

Appendix A: AIB Appointment Letter



Department of Energy
National Nuclear Security Administration
24600 20th Street SE
KAFB, NM 87117-5507

NNSA-2025-006455



August 8, 2025

MEMORANDUM FOR JIMMY S. DYKE

DIRECTOR, RISK MANAGEMENT DIVISION
NNSA OFFICE OF ENVIRONMENT, SAFETY, AND HEALTH

AHMAD AL-

FROM:

AHMAD M. AL-DAOUK DAOUK
COGNIZANT SECRETARIAL OFFICER FOR SAFETY
APPOINTING OFFICIAL

Digitally signed by
AHMAD AL-DAOUK
Date: 2025.08.08
15:00:42 -06'00'

SUBJECT:

Accident Investigation into the Construction Worker Injury
while working on the Surplus Plutonium Disposition Project at
the Savannah River Site on August 6, 2025

In accordance with the requirements of Department of Energy (DOE) Order (O) 225.1B, *Accident Investigations*, I am establishing an Accident Investigation Board (AIB) to investigate the construction worker serious injury event while working on the Surplus Plutonium Disposition Project at the Savannah River Site on August 6, 2025. The construction worker experienced a serious injury which resulted in the medical amputation of the worker's thumb. The injured worker is expected to remain hospitalized until at least August 11, 2025. I have determined the event meets the criteria of DOE O 225.1B, Appendix A item 2.a.(2) "Any single accident that results in the hospitalization for more than five calendar days... due to a serious personal injury..." Therefore, I am directing the appointment of an AIB.

You are appointed to the role of Accident Investigation Board Chairperson. The AIB will be composed of the following members:

- Jimmy Dyke – NNSA Office of Environment, Safety, and Health (NA-ESH) Director of the Risk Management Division, (*AIB Chairperson*)
- Robert Plonski – NA-ESH Deputy Director of the Safety Engineering Division and Accident Investigation Program Sponsor (*AIB Member*)
- Ronnie Alderson – NA-ESH Nuclear Safety Specialist for the Nuclear Safety Operations Division and NA-ESH Safety Site Point of Contact for Savannah River Site (*AIB Member*)
- Cynthia Casalina – NA-ESH Worker Safety & Health Expert for the Safety Engineering Division (*AIB Member*)

- Rizwan Shah – DOE Office of Environment, Health, Safety, and Security (EHSS) Accident Investigation Program Manager (*AIB Contributing Member and Accident Investigation Board Consultant/Advisor*)

All members of the AIB, by this memo, are released from their normal regular duty assignments to serve on the AIB during the period the AIB is convened. Additional members may be added at the discretion of the AIB Chairperson with my concurrence.

The scope of the AIB's investigation is to include, but is not limited to, identifying all relevant facts and determining direct, contributing, and root causes of the event. The investigation shall use the core analytical techniques discussed in DOE O 225.1B, Accident Investigations (i.e., events and casual factors, change analysis, and barrier analysis). Lessons learned shall also be disseminated from the event.

The AIB shall include, but is not limited to, reviewing the injured employee's medical reports and official documentation from the hospital related to the accident, interviewing individuals as appropriate, reviewing documentation related to the accident and employee training, as well as applicable DOE programs and oversight activities involving similar work. Furthermore, I expect the outcome of the investigation to include the following:

- A comprehensive articulation of the facts including timeline, involved organizations, actions, and outcomes;
- An assessment of the accident facts and circumstances as well as recommendations regarding identified Judgments of Need; and,
- Human Performance Improvement and causal analysis supporting the identified Judgments of Need.

The AIB is expected to provide my office with periodic reports on the status of the investigation. Please submit draft copies of the factual portion of the investigation report to me, NA-SV Field Office, the DOE EHSS, and the affected contractor for factual accuracy review prior to finalization. As AIB Chairperson, please provide the draft report to the Office of the Associate Administrator for Environment, Safety, and Health (NA-ESH-1.1) for review prior to public release.

Please instill a sense of urgency in completing the final report, which should be provided to me within thirty (30) days of the date of this memorandum. Discussion of the investigation and copies of the draft report will be controlled until I authorize release of the final report.

The Office of Management and Budget (NA-MB) has allocated funds to NA-ESH for expenses associated with this investigation. Coordination for all funding needs, including allocations to travel and necessary purchase requisitions for support services shall be coordinated with Wendy Doyle (NA-ESH-1.1).

If you have any further questions, please contact Jim Todd, NA-ESH Deputy Associate Administrator for Safety, at 505-284-6668.

cc:

James McConnell, NA-2
Cathy Tullis, NA-CoS
Sean Muth, NA-1.1
Nicole Nelson-Jean, NA-90
Benjamin Walker, NA-90
Michael Mikolanis, NA-SV
Timothy Fischer, NA-SV
Devin Kelly, NA-SV
Brian Schepens, NA-SV
Andrew Kuo, NA-SV
Lauren Hill, NA-SV
Stephine Martin, EHSS-1
Garrett Smith, EHSS-2
Sarah Honaker, EHSS-1.1
Josh Silverman, EHSS-20
Rizwan Shah, EHSS-20
Larry Perkins, EHSS-30
Lara Beasley, NA-ESH-2
James Todd, NA-ESH-20
Takeira Benoit, NA-ESH-22
Ronnie Alderson, NA-ESH-22
Lynn Maestas, NA-ESH-23
Robert Plonski, NA-ESH-23
Cynthia Casalina, NA-ESH-23
Duane McLane, SRNS
Leeanna Biery, SRNS

Appendix B: ORPS Report

3)Report Number: [NA-SR-SRSO-SRNS-KAREANA-2025-0001](#) **Post 2017 Redesign**
Secretarial Office: National Nuclear Security Administration
Lab/Site/Org: Savannah River Site
Facility Name: K-Area
Subject/Title: Horizontal Dowel Drilling Injury (U)
Date/Time Discovered: 08/06/2025 08:20 (ETZ)
Date/Time Categorized: 08/06/2025 10:15 (ETZ)
Report Type: Notification
Report Dates:

Notification Type	Notification Date	Notification Time
Notification	08/12/2025	21:45 (ETZ)
Initial Update		
Latest Update		
Final		

Reporting Level: H
Reporting Criteria:: 2A(3) - Any single occurrence, injury, or exposure resulting in an occupational injury that requires in-patient hospitalization for five or more days, commencing within seven days from the date the injury.
 10(1) - An event, condition, or series of events that does not meet any of the other reporting criteria, but is determined by the Facility Manager or line management to be of safety significance or of concern for that facility or other facilities or activities in the DOE complex.

Cause Codes:
ISM:
Subcontractor Involved: No
Occurrence Description: On 8/6/2025 at 0820 hours, a construction employee was assisting with horizontal dowel drilling into concrete when their glove became engaged in the rotating drill bit.
 This resulted in the employee's thumb detaching from their hand.

Cause Description:
Operating Conditions:
Activity Category:
Immediate Action(s): Work was immediately stopped and Savannah River Site Operations Center (SRSOC) and Shift Operations Manager (SOM) were notified. K Area first aid response immediately reported to the scene and provided first aid treatment. Emergency Medical Technicians (EMT's) responded and transported the individual to an offsite hospital with supervision. The accident scene was preserved, and this event was declared an ORPS 2A(5). All construction (including all Surplus Plutonium Disposition (SPD) Project field work in other areas) and maintenance work paused until further evaluations are conducted with management release. Additionally, K-Area Complex (KAC) Operations and Maintenance activities were paused until further notice.
 On 8/8/25, NA-ESH appointed an Accident Investigation Board for this issue. Personnel are supporting this investigation. Per site guidance, an additional reporting criteria of 10(1) Management Concern has been added to this report.
 On 8/11/25, the reporting criteria for this report was upgraded from 2A(5) to 2A(3) because the injury required in-patient hospitalization for five or more days.

FM Evaluation:**Facility Representative or
Designated DOE****Representative Input:****DOE Program Manager****Input:****Further Evaluation is
Required:** NA**Division or Project:** SRNS/M&O/NMD/HMD**Plant Area:** K-Area**System/Building/Equipment:** 105-K SPD Area**Facility Function:** Plutonium Processing and Handling**Corrective Action:****Lessons(s) Learned:****HQ Keywords:****HQ Summary:****Similar OR Report Number:****Facility Manager:**
Name Smith, M.
Phone (803) 557-3333
Title**Originator:**
Name Abshire, Robert
Phone (803) 208-3026
Title ENVIRONMENTAL MANAGEMENT PROGRAMS**HQ OC Notification:**

Date	Time	Person Notified	Organization
08/06/2025	10:35 (ETZ)	C. Borders	SRSOC

Other Notifications:

Date	Time	Person Notified	Organization
08/06/2025	09:04 (ETZ)	S. Stephens	Safety
08/06/2025	09:04 (ETZ)	D. Colligan	RPD Mgr
08/06/2025	09:04 (ETZ)	A. Kline	Ops Mgr
08/06/2025	09:04 (ETZ)	D. Nesteruk	Dep OM
08/06/2025	09:04 (ETZ)	L. Biery	Dep FM
08/06/2025	09:04 (ETZ)	P. Szilvester	FR
08/06/2025	09:04 (ETZ)	M. Smith	FM
08/06/2025	09:04 (ETZ)	J. Rice	SPD Cons
08/06/2025	09:04 (ETZ)	A. Deagorn	SPD Cons
08/06/2025	09:04 (ETZ)	H. Smoak	SPD Cons
08/06/2025	09:04 (ETZ)	B. Blackwell	SPD Cons
08/06/2025	09:04 (ETZ)	S. Formby	SPD Cons

Derivative Classifier (DC): Abshire, R. Date: 08/11/2025

Appendix C: Barrier Analysis

What were the barriers?	How did each barrier perform?	Why did the barrier fail?	How did the barrier affect the accident?	ISM/HPI
STARTRT/Daily Briefing	Executed, but hazards and controls less than adequate	Did not address hand-guiding horizontal drill bit SRNS construction management did not review for trends/concerns	Behavioral reinforcement of less than safe practice Worker placed hand on bit	ISM-2 Analyze Hazards ISM-3 Implement Controls HPI-N4 Complacency HPI-N6 Inaccurate Risk Perception
Gloves (HyFlex 11-591)	Provided puncture resistance but incompatible with rotating hazard	Increased grip on bit Mismatch between PPE intent and hazard	Escalated laceration hazard into thumb amputation	ISM-3 Implement Controls HPI-W4 Workarounds HPI-I5 Inexperience
ESH Weekly Facility Walkdowns	Performed, but superficial	Did not observe or identify less than safe hand-guiding horizontal drill bit practice	Less than safe practice persisted uncorrected	ISM-4 Perform Work Within Controls ISM-5 Feedback HPI-N4 Complacency
NA-94 Project Construction Oversight Manual (SRSAPMO-MAN-003)	Checklist provided but not used	Key hazards (rotating bit, guards, PPE) not reviewed	Less than safe practice never challenged by Federal oversight	ISM-GP-4 Qualified Personnel HPI-N2 Habit Patterns HPI-N4 Complacency
SRNS Supervisory and Construction Management Oversight	No evidence submitted that oversight was performed.	Viewed drilling as common sense Relied on “skill of the craft”	Normalization of less than safe improvisation	ISM-3 Hazard Controls ISM-GP-1 Line Management Responsible HPI-T1 Time Pressure HPI-N2 Habit Patterns

What were the barriers?	How did each barrier perform?	Why did the barrier fail?	How did the barrier affect the accident?	ISM/HPI
Union Steward Awareness	Ineffective	Poor relationships with workers reduced trust and engagement Limited field presence	Hazards and near misses went unreported, allowing less than safe practices to persist	ISM-5 Feedback HPI Suppressed Reporting
SRNS-KA000-2025-0009, <i>Interim Process for Resumption of Construction Work Scopes</i> Independent Oversight Team established to evaluate SPD Project and provide feedback on current processes and organization	Integrated Project Team was not effective Expectations and implementation of actions required were not met	Pressure to get the SPD Project restarted, resume all work scopes that involved field work	Had the barrier been implemented: -Technical work documents would have been revised, providing appropriate level of detail in WOs -Task readiness of tools and equipment would have been verified -Senior SPD Project construction manager would have overseen initial Pre-Job Briefing for WO and ensure all Foremen and craft clearly understood work to be performed	ISM-4 Perform Work Within Controls ISM-5 Feedback and Improvement ISM-GP-1-Line Management Directly Responsible for Safety Oversight ISM-GP-5 Before Work is Performed, Associated Hazards Shall be Evaluated ISM-GP-6 Admin/Engineering Controls to Prevent and Mitigate Hazards ISM-GP-7 Conditions and Requirements to be Satisfied for Operations to be Initiated HPI-T1 Time Pressure HPI-I7 Less than safe Attitudes HPI-N1 Stress HPI-N4 Complacency (Oversight)

What were the barriers?	How did each barrier perform?	Why did the barrier fail?	How did the barrier affect the accident?	ISM/HPI
Speed Dial on Hammer Drill	Speed dial was consistently used at highest level for all drilling work	Common practice during initial contact with wall while drill was being hand-guided to keep drill on at highest speed instead of starting slower	If speed was reduced for initial drill bit bite with wall, injury severity may have been reduced	ISM-3 Hazard Controls HPI Error-likely Situations Predictable
AHA/JHA Work Planning	Generic hazards documented	Did not analyze rotating-bit hazard or glove/bit interaction	Authorized less than safe method Hazard remained invisible	ISM-2 Analyze Hazards ISM-3 Implement Controls HPI Work-as-Imagined vs Work-as-Done
Time Out Authority	Used post-accident	Workers did not feel empowered to stop less than safe hand-guiding before injury	Did not prevent initial injury Only halted work afterward	ISM-5 Feedback and Improvement HPI Defenses Must be Effective Before Event
Engineering Controls (Guides/Guards)	Not provided	Worker requests ignored No engineered solutions procured	Forced reliance on less than safe hand-guiding	ISM-3 Hazard Controls HPI Error-likely Situations Predictable
Pilot-Hole/Two-Bit Method	Not used Expectation undocumented	SRNS construction management never formalized requirement Workers improvised	Hands remained near rotating hazard	ISM-4 Perform Work Within Controls HPI Leadership Reinforcement Absent
Training and Qualification Verification	Incomplete and outdated	No verification of drill qualifications Training omitted entanglement hazard	Workers unaware of risks Apprentices unsupported	ISM GP-3 Personnel Qualified HPI Learning Organization Absent

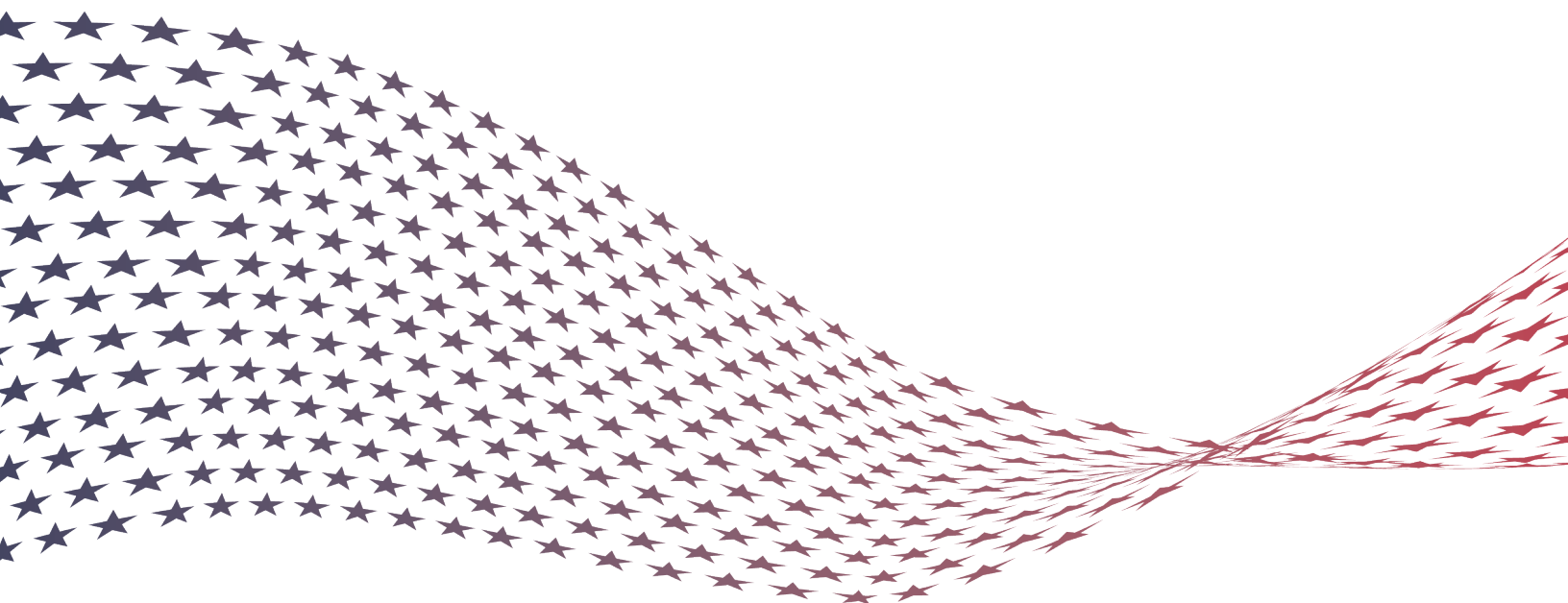
What were the barriers?	How did each barrier perform?	Why did the barrier fail?	How did the barrier affect the accident?	ISM/HPI
Resource/Procurement Controls (Short Drill Bits, Vibration Gloves, Guards)	Requests for other tools unmet	Short drill bits, jigs, PPE not provided	Less than safe workarounds normalized	ISM-3 Hazard Controls HPI Organizational Processes Shape Behavior
Employee Concerns Program (ECP)	Despite recent near misses of similar nature, no concerns related to hand-guiding of drill bits were brought up by workers	ECP was available but not utilized Low engagement from employees	Hazards/Near Misses not elevated formally before accident, which could have prevented this accident	ISM-5 Feedback and Improvement HPI-6 Learning Organization Missing
Emergency Medical Services (EMS)	Effective (mitigation)	First Aid/EMS timely and organized Some confusion among workers on who to call first to dispatch EMS occurred	Mitigated consequences Did not prevent accident	ISM-4 Perform Work Within Controls HPI-5 Events Are Managed by Context (Effective Mitigation)

Appendix D: Change Analysis

Date	Event Description	Work as Imagined	Work as Done/ Change/Effect
09/22/2022	Exposure assessment done for downward drilling but does not include horizontal drilling	Hazards assessed for all drilling operations	Only vertical drilling evaluated, horizontal omitted Gap in hazard identification for horizontal drilling created unmitigated exposure
06/24/2023	MOA between SRS NA-94 and NNSA SRFO	Oversight roles clearly defined	MOA language unclear, oversight diluted between NA-94 and SRFO Left construction oversight weak and fragmented
10/2023	Construction Execution Plan approved SPD Project managed in accordance with site NCP procedures	CEP ensures full alignment with site WP&C	Processes tailored to SPD Project Formal SRNS management plan masked deviations from site-level rigor
05/23/2024	Addendum to 1Y-8.20 for SPD Project Effective Deviations to site WP&C Procedure	SPD Addendum fully integrates hazards	Addendum narrowed scope, excluded critical steps (e.g., pilot-hole, entanglement analysis) Deviation codified, reduced rigor
07/2024	Last horizontal concrete dowel drilled prior to 07/29/25	Safe method (e.g., pilot hole, guarded alignment) in use	Hand-guiding horizontal drill bit normalized prior to pause in drilling
09/25/2024	MOU SPD-KAC	Unified WP&C regime	Split control regimes (inside vs. outside) Fragmented oversight and procedures created confusion and inconsistencies

Date	Event Description	Work as Imagined	Work as Done/ Change/Effect
12/2024	Work gloves were changed to HyFlex 11-591 during rebar installation to mitigate puncture hazard from rebar ties HyFlex 11-591 gloves were used as standard PPE for all future work activities	Gloves specified in WO were being used (e.g., vibration gloves)	HyFlex 11-591 gloves adopted for puncture hazard, increased entanglement hazard
02/12/2025	Project Director issued Time Out for SPD Project due to construction design issues	Time Out Authority used for all safety-critical concerns	Stop focused narrowly on design issues Less than safe drilling continued Time Out Authority not applied to industrial safety risk
02/25/2025	NA-94 Letter of Concern issued to project	Federal concern triggers broad corrective actions	Letter addressed limited scope Broader hazard culture issues remained unresolved
02/27/2025	Issued memo SRNS-KA00-2025-00009, Interim Process for Resumption of Construction Work Scopes	Interim process ensured readiness and detailed hazard review before resumption	Interim controls treated as administrative Less than safe drilling practices persisted
05/12/2025	SPD Project SRNS construction management issued Management Control Plan (MCP) to supersede Interim Work Release memo SRNS-RP-2025-00715	MCP restored rigor of site WP&C	MCP lacked enforcement Hazards still under-analyzed SRNS construction management action ineffective in addressing less than safe practices
05/22/2025	SPD Project WO formally approved	Approval meant all hazards addressed	WO approved with missing entanglement analysis PPE misaligned Formal approval created false assurance

Date	Event Description	Work as Imagined	Work as Done/ Change/Effect
05/30/2025	Task Preview and Formal Pre-Job Briefing (WO 2137123-01)	Pre-Job Briefing reinforced safe method, no hand-guiding of horizontal drill bit	Pre-Job Briefing normalized less than safe hand-guiding practice Pre-Job communication reinforced deviant norm
07/29/2025	Horizontal drilling for HEPA slab installation project commenced	Safe methods in place prior to accident	Less than safe long-bit horizontal hand-guiding resumed Direct precursor to accident
~07/2025	Ironworker Near-Miss with rotating bit (per interview)	Near-Miss triggers corrective action	Near-Miss unreported, uncorrected Opportunity to prevent recurrence lost
08/06/2025 0630	Workers arrived onsite and continued ongoing drilling work	Task resumed under controlled safe conditions	Less than safe practices normalized and continued into day of accident
08/06/2025 0645	Start setup, continue drilling work Seven holes drilled	Safe progress with pilot-hole and guard	Continued long-bit horizontal hand-guiding Less than safe practice repeated without correction
08/06/2025 ~0820	ACCIDENT – during drilling of hole eight, IW1's glove contacted rotating bit amputating thumb	Barriers and controls prevent entanglement	Missing guard Less than safe method Glove entanglement Accident occurred due to alignment of failures
08/06/2025 ~0820-0830	Workers responded with first aid and EMS response	Emergency response mitigates outcomes	Response timely but only after severe injury Mitigated consequences, not prevention



U.S. DEPARTMENT
of ENERGY

