Operating Experience Summary

OES 2025-04 April 2025

Ironworker Near Fatal Fall: A Preventable Tragedy

Translating Investigations into Prevention & Learning

This Operating Experience Summary (OES) provides a concise and informative synopsis of a Department of Energy (DOE) accident investigation and, through the lens of Integrated Safety Management (ISM), converts the outcomes into actionable and practical steps that can help an organization prevent similar serious events from impacting our workforce and mission in the future.

Imagine This

An ironworker arrives at work, ready for the day. By afternoon, they are being airlifted to a trauma center after a 23-foot fall from a concrete wall form. This isn't a hypothetical scenario. It is the reality of an accident that occurred at Fermi National Accelerator Laboratory on May 25, 2023.

Why This Matters to You

Every year, falls devastate families and workplaces. In 2022, 419 construction workers never went home again because of a fatal fall. In 2023, that number climbed to 421. This OES isn't just about **what happened** at Fermilab, it's about **what could happen** at your site – and, more importantly, how you can prevent it. Whether you're a senior manager, work planner, supervisor, or craftsman, the lessons from this incident are critical for ensuring the safety of your team.

The Incident

On May 25, 2023, at Fermi National Accelerator Laboratory, an ironworker (IW1) fell approximately 23 feet from a concrete wall form, sustaining serious injuries, including head trauma. Despite wearing a fall protection harness, it was not adequately anchored to arrest the fall.

On May 26, 2023, the Office of Science Deputy Director for Operations directed a DOE Accident Investigation Board (AIB) be assembled to identify the causes related to the accident (Accident Investigation Report).

Key Takeaways: Identified Weaknesses in the Safety Net

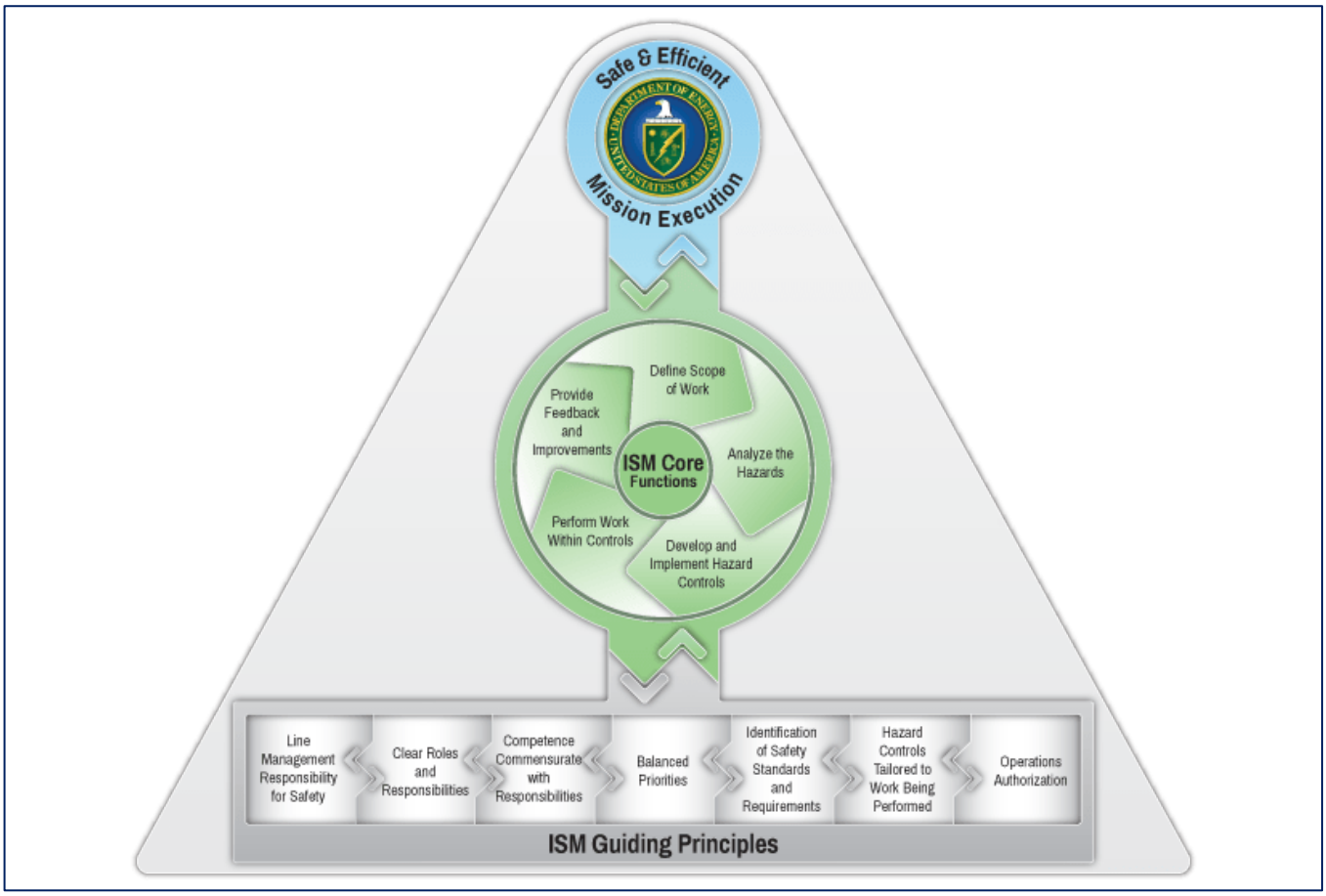
The AIB investigation revealed critical areas for improvement within the Integrated Safety Management (ISM) system. These are not just "Fermi problems." They are potential vulnerabilities within any organization performing similar work:

- **Scope of Work:** Inadequate translation of fall protection management to subcontractors.
- **Hazard Analysis:** Site-Specific Safety Plans lacking rigor and employee involvement.
- **Hazard Controls:** Commencement of work without adequate controls and missed opportunities for safer alternatives (e.g., aerial lifts).
- **Work Performance:** Work was allowed to begin without an approved safety plan in place, limiting the project's ability to identify necessary controls to mitigate the associated risk.
- **Feedback/Improvement:** Lack of effective feedback mechanisms to identify and address safety gaps that existed in multiple areas.

Integrated Safety Management (ISM) System

In this OES, we will observe the event through the lens of the ISM framework to identify potential areas that can be strengthened in our work processes across the Department. How can we more effectively use the structured and consistent set of ISM tools in the work planning and control cycle to incorporate critical requirements such as 10 CFR 851 (Worker Safety and Health Program) and to safely plan and execute our complex and high-risk mission work?

DOE has implemented the ISM Policy (DOE P 450.4A, Chg1) to integrate safety into management and work practices at all levels in the planning and execution of work. This policy sets expectations for a systematic approach to work planning and control for the DOE complex for the protection of workers, the public and the environment. All organizations develop, maintain, and implement ISM systems into their operations and work practices based upon the ISM Guiding Principles and Core Functions shown in the DOE ISM pictogram:



Guiding Principles (GP)

The guiding principles, shown above, are the foundational framework for developing and implementing an effective ISM System.

Core Functions

Core functions build on the guiding principles, providing the necessary structure for any work activity that could potentially affect workers (as well as the public and environment) and are applied as a continuous cycle with the degree of rigor appropriate to address the type of work activity and hazards involved.

The DOE G 450.4-1C, *Integrated Safety Management System Guide* provides valuable additional information, including helpful terminology and narrative that describes the relationship between ISM principles, functions, operational work, and performance results.

NOTE: DOE **requirements** for implementing an ISM System are contained in DOE O 450.2, *Integrated Safety Management* (for federal organizations) and DOE Acquisition Regulation (DEAR) clause 48 CFR 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution* (for DOE contractors).

Background

The Proton Improvement Plan II (PIP-II) construction project is located just east of Fermilab's iconic Wilson Hall and was initiated in April 2022. It is important to note the following organizational relationships (**see Figure 1**), as there were a total of three sub-contracted companies involved with the project at the time of the accident-identified as follows:

1. Prime Contractor
2. Primary Sub-Contractor (PSC)
3. Level-1 sub-contractor
4. Level-2 sub-contractor

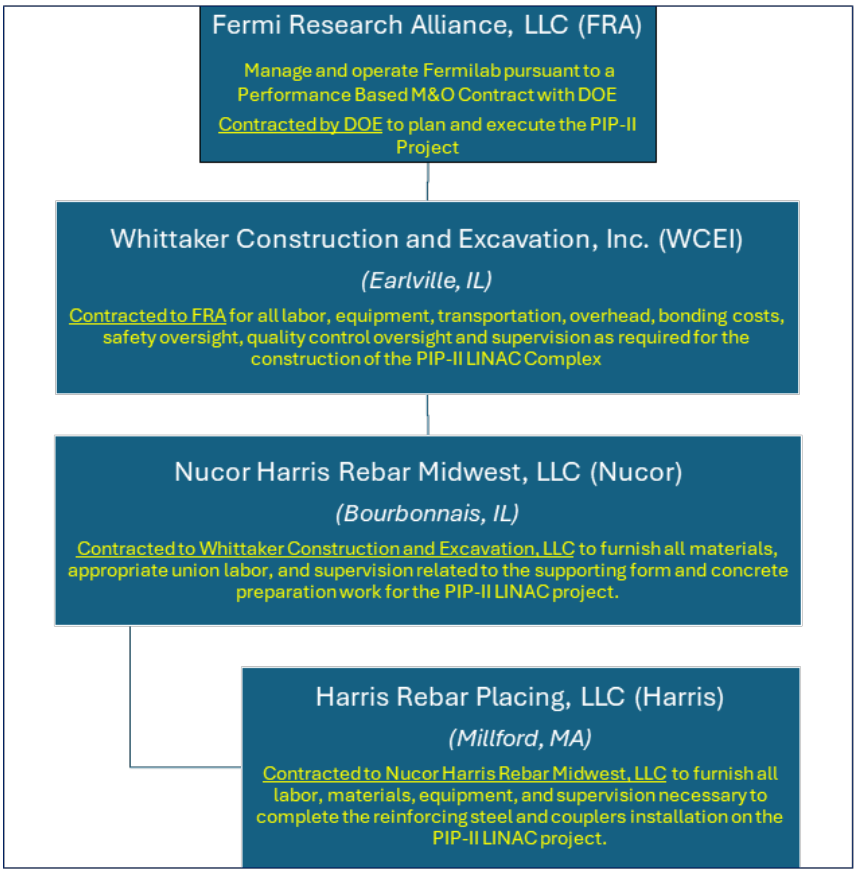


Figure 1: Organizational Chart

Work Location and Activity

The formwork assembly for the northwest corner of the PIP-II structure commenced on May 24, 2023, and continued into May 25, 2023 (see **Figure 2**).

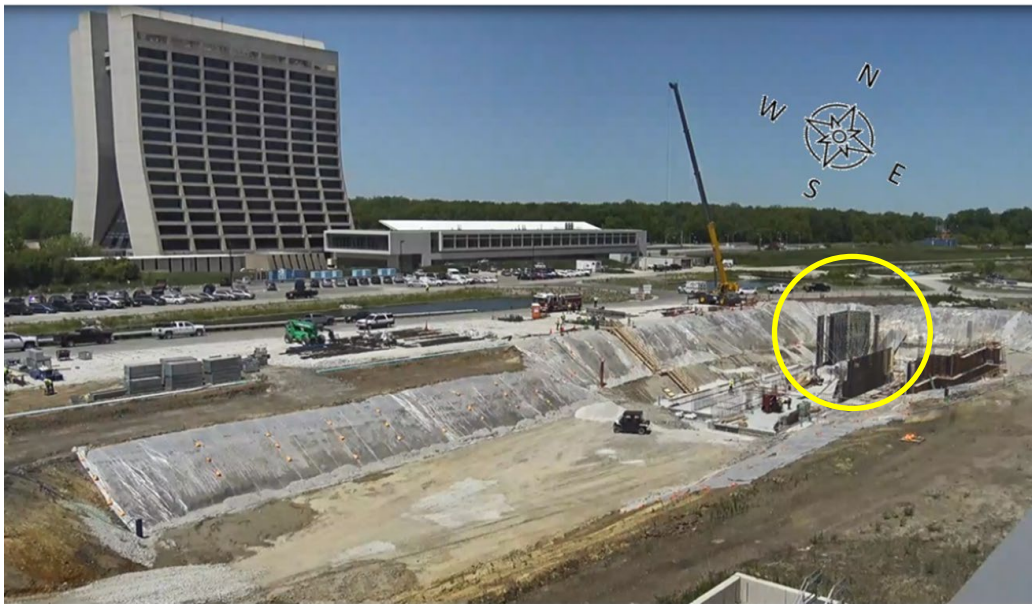


Figure 2: PIP-II Construction Site

On the morning of May 25, 2023, ironworkers used a crane to install a templated rebar column on the northwest corner of the forms. IW1 was assigned the task of passing connecting wires through holes in the formwork at various points that would allow for securing of the templated rebar column to the very formwork IW1 was on.

Though other carpenters and ironworkers had used an available aerial lift (Genie®) in the days prior to the accident (see **Figure 3**), nobody, including IW1, elected to use the Genie® for this specific work evolution that day.

Figure 3: Aerial lift (Genie®)

At approximately 1245 (CST), IW1 discussed the tasks to be performed for the day with their foreman, including working at elevated heights on concrete formwork. It should be noted that this specific formwork was manufactured by a company named Doka© and was not a familiar type of formwork to many of the workers at the construction site.

At 1258, IW1 began climbing the ~26 foot tall formwork (wall), reaching the top around 1301. IW1 was working alone on one side of the wall, while three other ironworkers were on the other side of the wall preparing to raise the templated rebar column into place. Once the rebar column was put into position, the plan was to secure it with connecting wires which were to be inserted from the other side of the formwork by IW1.

Based on video footage from cameras installed to allow members of the scientific community around the world to view the construction progress, both of IW1's hands were observed grabbing the top edge of the formwork and engage the wall in a manner that allowed them to lean back and support their weight. The mechanical means used by IW1 to initially engage their fall protection harness to the form wall is not clear. However, when IW1 repositioned themselves just a minute later, the means of engagement with the form wall became ineffective in preventing their fall. Once IW1 leaned back again, they immediately fell towards the concrete slab below, striking a diagonal cross brace just prior to hitting the concrete slab.

IW1 was flown via a medivac helicopter to a Level 1 Trauma Center for treatment of the serious injuries sustained.

The Event as seen through the Eyes of the ISM system

During their investigation, the AIB noted organizational weaknesses in all five of the ISM Core Functions that contributed to the ironworker's fall from the formwork. Though human performance issues were at play during the event, the goal of this OES is to build organizational resilience and increase the level of awareness of the organizational performance deficiencies present at the time of the accident.

The following provides a synopsis of the weaknesses in each ISM Core Function. These weaknesses are further identified in the Fermi Accident Investigation Report that can be found at the DOE Accident Prevention and Investigation Program Website.

CF-1: Define the Scope of Work

The Bottom Line: The management of fall protection, both administratively and physically, had been lost during the translation of work scope from the primary sub-contractor (PSC) down to the level-2 subcontractor.

Supporting Facts

- ✓ The PSC was responsible for making fall protection anchors available for the scope of work. The selection and installation of concrete form walls, however, did not include information on the location of the fall protection anchor points specifically associated with the Doka Form Wall System being used.
- ✓ The prime contractor accepted the PSCs form wall proposal without information on the anchor points.
- ✓ The PSC Safety Representatives had no prior familiarity with the Doka Form Wall System and made no attempt to acquire further information.

CF-2: Analyze the Hazards

The Bottom Line: The PSC's and level-2 subcontractor's Site Specific Safety Plan (equivalent to a construction project safety and health plan or Worker Safety and Health Plan) lacked the rigor and discipline required to fully understand and analyze the hazards involved with the work being performed.

Supporting Facts

- ✓ The Site Specific Safety Plan (SSSP) deficiencies included:
    - Though the plan stated employees should be involved in all phases of hazard analysis, none were involved in the development of the daily jobsite plans, or the hazard analysis for the work being performed.
    - There was no provision for medical services and first aid.
    - No Job Task Analysis (JTA) or description of what the JTA process involves.
    - The SSSP was returned from the prime contractor to the PSC with questions, comments, and a requirement to "Revise & Resubmit", however, no response or revision was provided back prior to commencing work.
- ✓ The Hazard Analysis used to brief all PIP-II construction workers and visitors indicating their acknowledgement of associated hazards had NOT been approved.
- ✓ All parties involved failed to ensure IW1 had a full understanding of all potential hazards associated with the task of climbing the Doka Form Wall System.

CF-3: Develop and Implement Hazard Controls

The Bottom Line: The prime contractor, the PSC and level-1 subcontractor all allowed the level-2 subcontractor to commence work without including adequate controls in an approved SSSP.

Supporting Facts

- ✓ The Job Hazard Risk Analysis (JHRA) did not include details for tasks, risk analysis, or hazard controls for climbing form walls, including the Doka Form Wall System IW1 had climbed at the time of the accident.
- ✓ The level-1 subcontractor JHRA signed by IW1 on May 25, 2023, failed to include specific details for tasks such as climbing form walls.
- ✓ Comments originally provided by the prime contractor were not incorporated into the PSC JHRAs.
- ✓ A hazard control option to eliminate the need for workers to attach and detach personal fall arrest lanyards during formwork climbing was not included in the JHRA (installing a retractable lanyard at the top of the form wall).

CF-4: Perform Work Within Controls

The Bottom Line: Employees were allowed to commence work absent an approved SSSP in place, limiting each organization's ability to identify and communicate the necessary controls for their workers to perform the work safely.

Supporting Facts

- ✓ The PSC failed to submit a revised SSSP to the prime contractor and was neither challenged nor stopped from working.
- ✓ The aerial lift previously used by ironworkers was available but not used for the activity on May 25, 2023.
- ✓ Oversight personnel and field supervisors failed to recognize that employees had a poor awareness and/or poor compliance with requirements when working at heights.
- ✓ IW1 was assigned the task of climbing the formwork when several options to reduce the risk of the work activity were available (ladder, aerial lift, radios).

CF-5: Provide Feedback and Continuous Improvement

The Bottom Line: There was no mechanism in place to effectively capture feedback to improve safety including work planning and control.

Supporting Facts

- ✓ Neither the PSC Superintendent nor Fermi Site Office personnel attended the level-2 subcontractor daily work meetings, eliminating the opportunity to provide input on safety expectations.
- ✓ Despite assessments identifying weaknesses in subcontractor hazard analyses and work control documents, corrective actions and mitigating plans to strengthen them were not effectively implemented by the prime contractor.
- ✓ The prime contractor had no centralized contractor hazard analysis management system to establish standardized procedures and coordination which may have contributed to inconsistencies and deficiencies in hazard analysis practices among subcontractors.
- ✓ Fermi Site Office observations of work being performed at the PIP-II project were largely conducted from the perimeter of the site, and did not include directly interacting with sub-contracted tradespersons greatly reducing the chance for direct feedback to be obtained or even discussed.

Take the Next Steps: Implementing the ISM Lessons

The ISM System and associated work planning and control processes are designed to mitigate the risks present in DOE operations and prevent adverse impacts to our people and our mission. These processes are particularly important when multiple organizations are involved in trying to execute the work. The question remains, “What can we learn from this experience that can be applied across the DOE complex or even our own specific work?”.

Many of the event takeaways reinforce the importance of understanding that the ISM System is only as good as those who are implementing it. Many of us are familiar with the reality that any core function can continue to evolve during the execution of work from planning to “wrench turning.” With that in mind, consider asking the following questions prior to commencing work:

- Have we tested and confirmed there are clear roles and communication channels among the various organizations (e.g., oversight, prime contractor, subcontractors) contributing to the project?
- Does our Construction Project Safety and Health Plan (or equivalent Worker Safety & Health Plan) have the rigor and clarity required to fully understand and analyze the hazards involved with unfamiliar equipment (e.g., Doka wall form)? Are we all working from the approved plan?
- Are we physically and administratively managing the barriers we currently have in place to protect our workforce from unintended consequences?
- Do we have the necessary controls in place needed to safely accomplish hazardous work prior to commencing? How do we know?
- Do we have effective processes in place throughout the evolution that can capture feedback from and provide feedback to personnel involved with the work?

In Closing

The goal of this Operating Experience Summary was to tell the story of a tragic accident to help prevent one like it from happening again. Working at heights is inherently dangerous.

This OES was developed to provoke those who read it, to ask themselves and their co-workers, “Could this happen to us?”, and if so, prompt change. Regardless of if you’re a senior manager, work planner, supervisor, or craftsman, consider asking “Is the organization that I’m a part of, including myself, doing everything reasonably possible to help ensure my “work family” goes home today?”. In doing so, we pay tribute to those who no longer can work with us, and honor those with whom we still do.

Think About This: As you read this OES, don't ask "How did they let that happen?". Instead, ask "Could this happen to us?" and, more importantly, "How will we prevent it from happening to us?".

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Operating Experience Summary (OES): An informative operating experience-based article published by the Office of Environment, Health, Safety, and Security (EHSS) and distributed across the DOE complex through the DOE Corporate Operating Experience Program to promote safety and mission success through the open exchange of valuable experiences, good practices, and performance summaries.

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