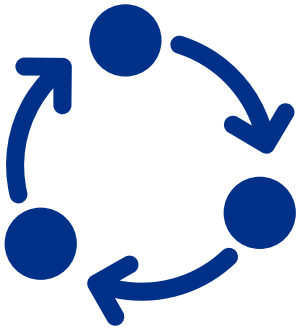
ES&H @ All Engineers Retreat

23 February 2023

ES&H Management System

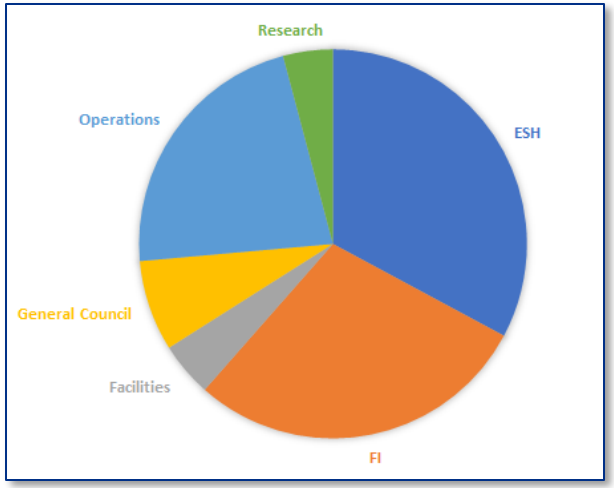


- The purpose of the Environment, Safety and Health management system is to protect the public, the worker, and the environment; ensure compliance with the DOE Contract; improve Fermilab's ability to meet or exceed the customer's ES&H expectations; and through a set of elements that Fermilab uses to plan, direct, control, and coordinate activities that directly and indirectly support the scientific mission.
- The management system describes how ES&H policies, objectives, processes, and procedures are established, implemented, monitored, and achieved, thereby enabling the scientific mission.
- Major elements:
  - Occupational safety (including radiation safety, construction safety, industrial hygiene, occupational medicine, electrical safety, etc.)
  - Environmental protection
  - Fire protection

FRA Prime Contract

PRIME CONTRACT
NO. DE-AC02-07CH11359

Conformed Contract through Modification No. 317
November 19, 2022



- ES&H is responsible for 87 contract requirements - ~33% of all contract requirements
  - Includes federal regulations (e.g. 10 CFR 851, 10 CFR 835) and many DOE Orders
  - Each requirement may have one or many deliverables including
    - Programs (examples)
      - Worker Safety and Health
      - Spill Prevention, Control and Countermeasures
      - Radiation Protection Program
    - Reporting requirements (examples)
      - injury cases
      - groundwater monitoring
      - hazardous waste

ES&H Policies and Implementation Manual

- Policies
- FESHM
  - Includes:
    - ES&H Manual
    - Fermilab Radiological Control Manual
    - Quality Assurance Manual

ES&H Management System — Fermilab ES&H Policy 2

Safety and Health Policy

Fermilab ES&H Policy 2

1. **Purpose**

ES&H Management System — Fermilab ES&H Policy 1

Environmental Policy

ermilab conducts scientific research with regard for
environment, and in compliance with all applicable

ties and operations carried out under the approved
and all leased spaces except where an equivalent
precedent.

, 2017 and replaces the September 2013 version.

Fermilab Environment, Safety and Health Manual (FESHM)

The Fermilab Environment, Safety and Health Manual (FESHM) is a living document that contains Fermilab's policies and procedures designed to manage environmental, safety and health (ES&H) hazards in accordance with the requirements of the Work Smart (WS) set of ES&H standards attached to the U. S. Department of Energy contract. These practices have been developed over many years at Fermilab and have been found to be both efficient and effective. Nevertheless the ES&H program is one of continuous improvement and comments and suggestions are always solicited.

+ 1000. Policy and Administration
+ 2000. Planning For Safe Operations
+ 3000. Investigation and Reporting

Quick Links

Subscribe to receive Email Notifications about FESHM Chapters

Electrical Safety Subcommittee Determinations

Fermilab Work Smart Standards

International Code/Standard Equivalency Process

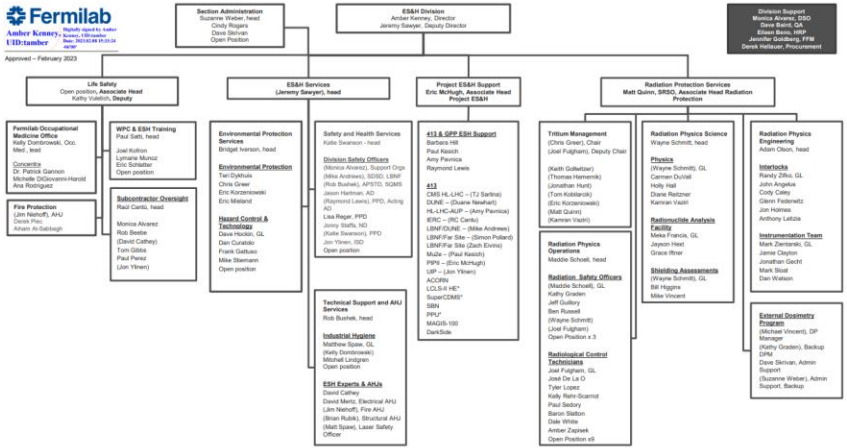
Fermilab

ES&H Division

ES&H Vision

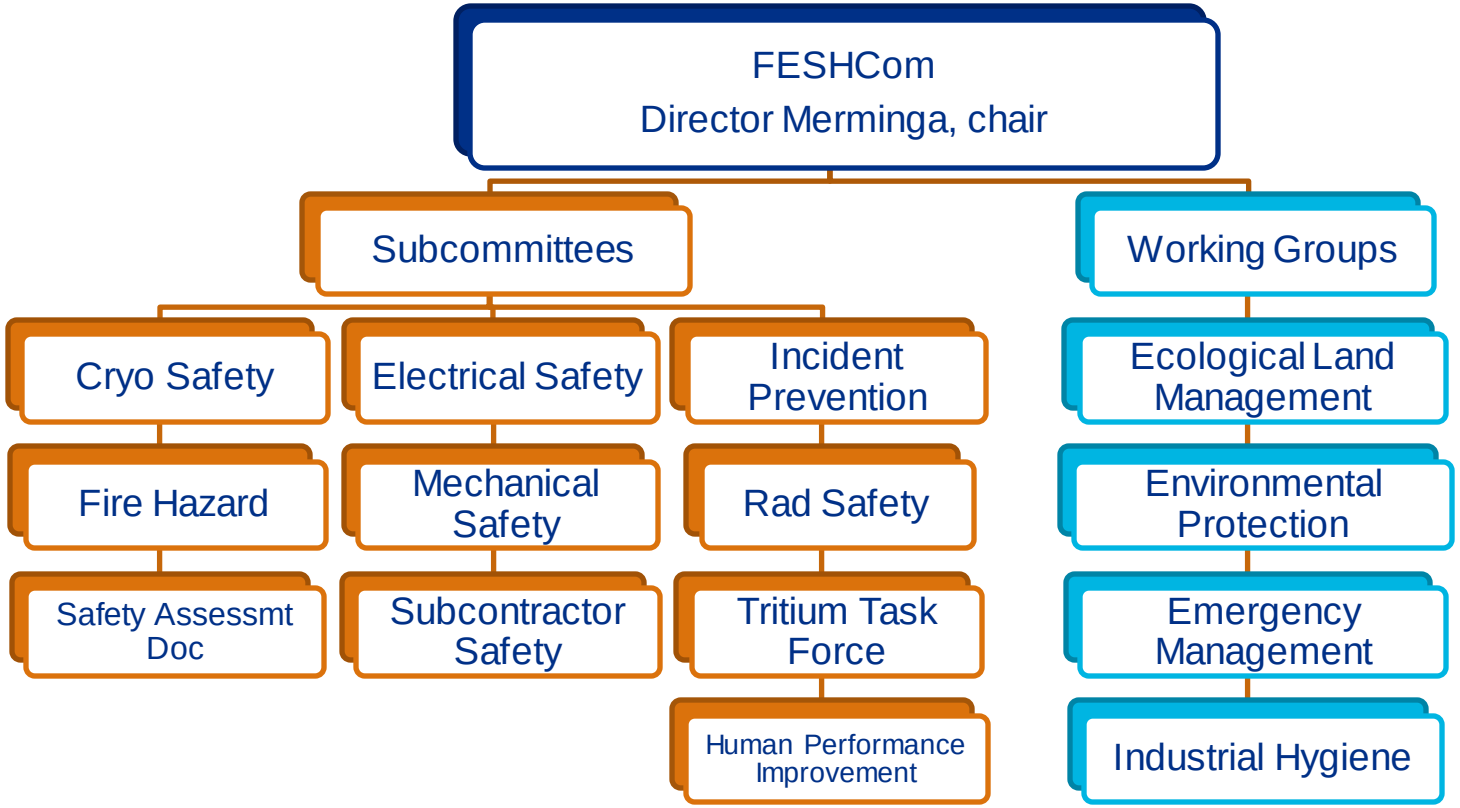
ES&H will provide programs and expertise to assure environment, safety, and health considerations are integrated into lab operations and business practices to reduce risk to personnel, the public and the environment to enable our science mission and ensure every person ends their day healthy and safe.

Additionally, ES&H teams will be an example to the lab in creating a safe and inclusive environment.



- ES&H Division establishes ES&H programs to align with requirements and needs lab input to ensure implementable.
- Broad understanding and participation from around the lab is critical.
- FESHCom is an important mechanism to foster lab input for ESH programs and assist in communicating requirements to the lab.

Fermilab ES&H Committee



Today's Agenda

- **Variance Process and 10 CFR 851** – Jim Niehoff, Mike Andrews
- **HPI Subcommittee** – Jemila Adetunji
- **Cryo Safety Subcommittee Overview** – Mike Zuckerbrot
- **Mechanical Safety Overview** – Roza Doubnik
- ***NEW* MSS Transportation Panel** – Jeremiah Holzbauer, Brian Hartsell
- **Work Planning and Control Program** – Paul Satti
- **Electrical Safety Subcommittee Overview** – Dave Mertz
- ***NEW* Safety Instrumentation Systems and Challenges** – Adam Olson

Variance Process & 10CFR851

James Niehoff / Michael Andrews

Engineers Week

23 February 2023

Bottom Line Up Front (BLUF)

- Office of Science experiments require international partners
- 10 CFR Part 851, Workers Safety & Health Program
  - Does not allow the use of international codes
  - Specifics a required version of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC)
  - Limiting the use of specialized/custom pressure equipment for superconducting accelerators and one-of-a-kind experimental detectors
- FRA has developed a process that establishes a level of safety equivalent to or greater than that required by the ASME BPVC
- FRA is requesting a permanent pressure variance

Background

- DOE Office of Science is increasingly working with international partners who make major contributions to scientific experiments (e.g., LBNF/DUNE-US, Proton Improvement Plan II (PIP-II) at Fermilab) and partners that provide specialized capabilities and equipment.
  - These partners provide pressure equipment may be designed and constructed in accordance with non-US engineering codes (e.g., the European Pressure Equipment Directive (PED)) in the pursuit of the science mission.
- 10 CFR 851 DOE Worker Safety and Health requires contractors to comply with codes and standards incorporated by reference, including the American Society of Mechanical Engineers (ASME) boiler and pressure vessel and piping codes.
  - Unlike other national consensus codes, ASME does not include an explicit process for Authority Having Jurisdiction (AHJ) nor local engineering judgement to determine an equivalent level of safety.
  - Appendix A to Part 851 has a very narrow exception process which addresses only pressure range, vessel geometry, use of special materials, etc.
  - As a result, FRA is seeking a permanent variance in order to accept pressure systems that are not in full compliance with the ASME code.

Charter

The scope.

- Review and provide technical engineering input:
  - Variance is focused on non-ASME Code pressure systems encompassing, equivalent, exceptional, and experimental systems.
  - Evaluate which standards found10 CFR 851.27(d) that should be included in the variance.
- Update the processes found in FESHM Chapters 2005, 2110 and evaluate applicable FESHM 5000 Series Chapters as safe and healthful criteria:
  - Design review by qualified personnel.
  - Qualified personnel and qualified procedures
  - Documentation including traceability and accountability.
  - International code evaluation to ensure pressure systems which have exceptions to ASME requirements are as safe and healthful as equipment constructed that strictly satisfies ASME code requirements.
- Update all International Position Papers (White Papers) as necessary (FESHM 2110)

Team Member	Role
Jim Niehoff, ES&H	Team Lead
Mike Andrews, LBNF US DUNE	Co – Team Lead
Mike Zuckerbrot, ND	Cryogenic Safety Subcommittee Chair
Roza Doubnik, ND	Mechanical Safety Subcommittee Chair
Mike White, APS-TD	Mechanical Safety Subcommittee Relief Device Panel Chair
Lidija Kokoska, PIP-II, MSS Pressure & Vacuum Panel Chair	Mechanical Safety Subcommittee Pressure & Vacuum System Panel Chair
Michael Geynisman, ND, Principal engineer	Subject matter expert
David Pushka, ND Senior Principal Engineer	Subject matter expert

As Safe & Healthful As Process

- Fermilab has established a process to review and accept pressure equipment that does not strictly satisfy ASME code requirements per 10 CFR 851
  - Qualified engineers verify equipment with exceptions to ASME code requirements or that is constructed to alternative standards to ASME code is as safe and healthful as equipment constructed to ASME code
  - Fermilab's Engineering Manual along with Fermilab's Environment, Safety and Health Manual (FESHM) chapters 2005, 2110, 5031 & 5031.1 ensure performance when using international codes or standards to establish as safe and healthful as by providing a level of safety greater than or equivalent to that afforded by ASME code
    - Applies to pressure equipment constructed to international code or pressure equipment that does not meet all ASME requirements
    - Does not apply to pressure equipment that meets the exception in 10 CFR 851 Appendix A, 4(c)

Equipment Categorization per the Pressure Variance

- Pressure equipment is categorized into one of the below categories
  - **Equipment 1**
    - Equipment that is within the scope of a US national code but is constructed to fully complies with an international code or standard that provides “as safe and healthful as” by providing a level of safety and quality greater than or equivalent to that afforded by ASME code.
  - **Equipment 2**
    - Equipment that is constructed per US national code but does not fully satisfy requirements of the code, e.g., due to missing documentation or another deficiency.
  - **Equipment 3**
    - Equipment that is constructed per one of the international codes or standards but does not fully satisfy requirements of that standard, e.g., due to missing documentation or another deficiency

Pressure Equipment 1 – Overview Process

Equipment 1

Equipment Design
- Structural & Design Documents
- List of Codes
- List of Materials
- Calculations
- Relief Sizing

Qualified Person & Procedures
- Fabrication
- Assembly Erection
- Inspection
- Testing
- Operation

Documentation
- Complete Engineering Note
- (Design drawing, sketches, & calculations)
- Stored electronically

Review and Approval
- Engineering note is reviewed by an independent, qualified engineer

Fermilab

Pressure Equipment 2 & 3 – Overview Process

Equipment 2 & 3

Equipment Design
- Structural & Design Documents
- List of Codes
- List of Materials
- Calculations
- Relief Sizing

Qualified Person & Procedures
- Fabrication
- Assembly Erection
- Inspection
- Testing
- Operation

Engineering Analysis
- What-If
- Hazard Analysis
- FMEA

Compensatory Measures
- Proof Test
- Borescope
- Leak Testing
- Material thickness verification Etc.

Documentation
- Complete Engineering Note
- (Design drawing, sketches, & calculations engineering analysis, & compensatory measures)
- Stored electronically

Review and Approval
- Engineering note is reviewed by specific panel made of group qualified engineers

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FESHM 2110 & pressure system variance development

- Pressure Variance / 2110 workshop 9 November with key SME's
- FESHM 2110 draft submitted to DOE-FSO for initial comments 22 November
- Pressure Variance draft submitted to DOE-FSO for initial comments 5 December
- Received comments on variance from DOE-FSO 20 December
- DOE –FSO FESHM 2110 Comments received 27 December
- Pressure systems variance & FESHM 2110 formally submitted to DOE-FSO 29 December
- Variance comments received from DOE-FSO on 9 January
- Re-submitted pressure variance documentation to FSO on 10 February

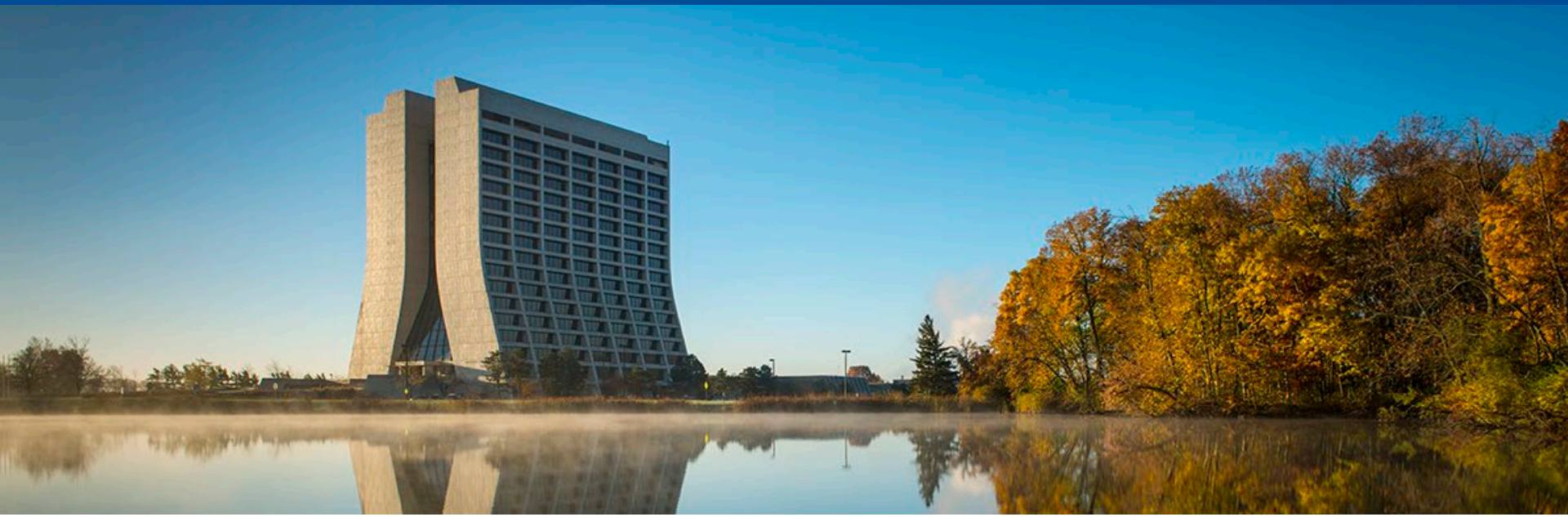
TASK	PROGRESS	START	END
Charter a Committed 2110/Variance	100%	9/20/22	
Develope 1st Draft of Variance documentation	100%	10/1/22	10/26/22
1st Draft Revew & Comment by Charter Committee	100%	10/26/22	11/9/22
Varaince Workshop	100%	11/9/22	11/9/22
Develop FESHM 1071 Codes & Standard	100%	10/1/22	10/21/22
FESHM 1071 Lab-wide Review	100%	10/21/22	11/11/22
Adressed FESHM 1071 Comments & Finalized	100%	11/11/22	11/18/22
Posted & Approved FESHM 1071	100%	11/21/22	11/30/22
Rewrite FESHM Chapter 2110	100%	11/12/22	11/22/22
Submit 1st Draft of FESHM 2110 to FSO for Review & Comment	100%	11/22/22	12/11/22
Submit 1st Draft of Variance to FSO for Review & Comment	100%	12/5/22	12/16/22
Incorporate Comments from FSO from 2110 & Variance	100%	12/11/22	12/30/22
Submit Final Variance & FESHM Chapter 2110 to FSO	100%	12/30/22	12/30/22
Receive DOE-FSO Comment on FESHM 2110 & Variance	100%	1/9/23	1/9/23
Update Variance and Re-Submit to DOE-FSO for Acceptance	100%	1/9/23	2/10/23
DOE-FSO Variance Review & Comments	25%	2/10/23	*3/3/2023
Update Variance and Re-Submit to DOE-FSO for Acceptance		*3/3/23	*3/31/23
DOE-FSO Submits Variance for Review/Comment/Update to DOE SC-4		*4/1/23	*4/31/23
Variance for Review/Comment/Update to DOE EHSS-10 & EHSS-11		*4/1/23	*4/31/23
Update Variance with EHSS Comments and Re-Submit to DOE-FSO		*5/1/23	*5/12/23
Update Variance with DOE SC-4 Comments and Re-Submit to DOE-FSO		*5/1/23	*5/12/23
FSO submits Variance for Review & Approval to DOE EHSS-10 & EHSS-11		*5/13/23	*5/31/23
Submit FSO Variance for Review & Approval to DOE SC-4		*5/13/23	*5/31/23
Final Variance Review and Approval DOE EHSS-1		*6/1/23	*6/30/23
*These are estimated dates			

Back Up Slide

Appendix A to Part 851 – Pressure Safety (c)

- Exception to ASME:
  - When national consensus codes are not applicable (because of pressure range, vessel geometry, use of special materials, etc.), contractors must implement measures to provide equivalent protection and ensure a level of safety greater than or equal to the level of protection afforded by the ASME or applicable state or local code. Measures must include the following:
  - Design drawings, sketches, and calculations must be reviewed and approved by a qualified independent design professional (i.e., professional engineer). Documented organizational peer review is acceptable.
  - Qualified personnel must be used to perform examinations and inspections of materials, in-process fabrications, non-destructive tests, and acceptance test.
  - Documentation, traceability, and accountability must be maintained for each unique pressure vessel or system, including descriptions of design, pressure conditions, testing, inspection, operation, repair, and maintenance.

Fermilab U.S. DEPARTMENT OF ENERGY Office of Science



HPI Subcommittee Overview

Jemila Adetunji

February 2023

Membership

Human Performance Improvement Subcommittee

Member		Title	Term Expires
1	Jemila Adetunji	Chair	Indefinite
2	Dave Baird Jr.	Deputy	Indefinite
3	Matt Green	Fermi Site Office - Observer	09/29/2025
4	Kerry Aschenbach	FE Representative	08/31/2023
5	Eileen Beno	WR Representative	01/12/2025
6	Jamie Blowers	APS-TD Representative	03/09/2024
7	Michael Crisler	PPD Representative	04/21/2025
8	Paul Derwent	AD Representative	08/31/2023
9	Gerald Guglielmo	CD Representative	08/31/2023
10	Cindy Joe	ND Representative	02/09/2025
11	Meredith Lee	AD Representative	08/31/2023
12	Joe Pygott	DI Representative	08/31/2023
13	Paul Satti	ES Representative	09/28/2025
14	Eric Schlatter	ES Representative	08/31/2023
15	Mala Seshadri	FI Representative	08/31/2023
16	Kathy Vuletich	ES Representative	08/31/2023

HPI Subcommittee Charter

Vision:

For Fermilab to become a High Reliability Organization (HRO)*.

Mission:

The purpose of the HPIS is to strengthen latent organizational weakness, reduce top error precursors, and actively address recommendations from HPI Reviews and implement lessons learned.

Guiding Principles:

Integrate HPI principles into D/S processes and work activities; create a data-driven culture (use data to make decisions); become more preventive than reactive; ultimately meet or exceed the expectations of stakeholders.

*Reference: *Strategies for Learning from Failure* by Amy C. Edmondson, Harvard Business Review, April 2011

FY21 HPIS Efforts

- The HPI Subcommittee Members successfully identified and analyzed HPI-related top areas of concern (as of October 2020) and drivers/root causes behind those areas.
- Each member socialized these elements with their respective organizations (leadership or specific groups).
- A summary report was aggregated to highlight the efforts from FY21.

FY22 HPIS Efforts

- The role and impact of reviews using HPI principles.
- Succession Planning and Knowledge Transfer
- Brainstormed on how to address Time Pressure.
  - Have we noticed any impact or changes in supervisors/managers behavior in this regard?
- Evaluated gaps in communication – means and methods.
- Integrated HPI Principles in the new Event Response Program
  - Sufficient level of transparency, openness, and trust
  - Being intentional about capturing positive outcomes
  - Balancing new timeframes with yielding valuable outcomes

FY23 HPIS Efforts

- The HPIS identified the following actions:
  - More positive events, outcomes, and best practices should be documented and shared across the laboratory.
  - Encourage the use of After-Action Reviews (AARs).
    - Procurement Leadership are promoters of this process.
    - Another source for lessons learned.
  - Address the recurring themes/gaps in management / supervisory expectations.
    - Reactive vs. Proactive
    - Not fully implementing processes / holding staff accountable to requirements
    - Lack of effective communication / sharing of information down through organization
    - Ineffective knowledge transfer / succession planning down the organization (e.g., hands-on employee level)

HPIS Evolution

- The HPI Subcommittee will evolve to the new Event Analysis Working Group (EAWG).
- This Working Group will be charged with supporting Event Report and Event Findings Reviews as well as supporting the look-across events to identify systemic gaps and opportunities.
- This diverse cross-functional team will help to improve our analysis, advance our preventive efforts, and enhance the awareness of events.
- This team will continue to address the actions identified during this fiscal year's HPIS efforts.

Thank You for the Time & Attention.

Backup Slides

FY21 HPIS Analysis Results

- Four primary areas of concern that were identified as main drivers behind lab incidents and unwanted outcomes are:
  - Communication
  - Planning and Scheduling
  - Standardization of Processes
  - Time Pressure

FY21 HPIS Analysis Detail

- Communication is a vast issue and recurring causal factor behind several issues. Communication is also a cause identified from various lab assessment activities.
  - Lack of transmitted information
  - Unclear communication; minimal/incomplete details
  - Clear communication not received
  - Lack of transparency; information only communicated to certain forums/groups
  - Insufficient resources can lead to communication gaps
  - Insufficient communication between organizations/groups

- Planning and Scheduling is a recurring causal factor behind several issues. Inadequate planning and scheduling can lead to time pressures, cost overruns, inefficiencies, and incidents.
  - Insufficient resources can lead to inadequate planning and scheduling.
  - Inadequate planning between organizations/groups

FY21 HPIS Analysis Detail

- The lack of process standardization can lead to:
  - Inconsistent process execution that leads to not meeting requirements or expectations.
  - A lack of clarity or understanding.
  - Unwanted outcomes and incidents.

- Lab staff have highlighted actual and perceived time pressure when working on their tasks. Oftentimes, the actual time pressures have been initiated by line management or DOE. This has led to unwanted outcomes or incidents.
  - Insufficient resources can also lead to the effects of time pressure.

Cryogenic Safety Subcommittee Overview

Mike Zuckerbrot

Engineering Retreat

23 February 2023

Overview

The Cryogenic Safety Subcommittee is responsible for providing guidance and review to the Laboratory concerning all engineering systems operating with flammable and non-flammable fluids whose normal boiling point is below –150 C (123 K), as well as systems posing Oxygen Deficiency Hazards.

- Personnel and Structure
- FESHM Chapters and Trainings
- Typical Reviews and Documentation
- Available Resources and Future Staffing

CSS Current Membership

Cryogenic Safety Subcommittee

Member		Title	Term Expires
1	Michael Zuckerbrot	Chair	01/30/2024
2	Erik Voirin	Deputy PPD Representative	01/30/2024 11/30/2023
3	Josh Lewis	Fermi Site Office - Observer	09/13/2025
4	Rob Bushek	ES Subject Matter Expert	04/24/2023
5	Sergey Koshelev	ND Subject Matter Expert	11/14/2024
6	Del Allspach	PPD Representative	07/01/2025
7	Roza Doubnik	ND Representative	01/17/2025
8	Michael Geynisman	ND Representative	01/12/2024
9	Benjamin Hansen	APS-TD Representative	01/24/2025
10	Joe Hurd	APS-TD Representative	12/14/2023
11	Jake Kintner	PPD Representative	10/14/2025
12	Alexander Martinez	APS-TD Representative	12/15/2025
13	Dave Pushka	AD Representative	01/12/2024
14	Michael Sarychev	PPD Representative	02/05/2025
15	Matt Slabaugh	AD Representative	08/16/2024
16	William Soyars	APS-TD Representative	01/24/2024
17	Greg Tatkowski	APS-TD Representative	08/09/2024
18	Terry Tope	APS-TD Representative	09/13/2025
19	Noah Vollmer	ISD Representative	12/20/2025
20	Michael White	APS-TD Representative	02/04/2025

Cryogenic Safety Subcommittee

Zuckerbrot (Chair), Voirin (Deputy), White (Sectry), Soyars, Geynisman, Kintner, Doubnik, Pushka, Martinez, Vollmer
Sarychev, Theilacker, Hansen, Allspach, Tatkowski, Slabaugh, Koshelev, Tope, Lewis (DOE), Bushek (ESH)

PIP II Project

PIP II
(Allspach)
Rabehl-DEP
R. Bruce
Tope
Adamowski
McHugh (ESH)

Accelerator Division

HAB
(Geynisman)
TBD-DEP
Chen
Deshpande
Roger
Adamowski
Schlatter (ESH)

MESON
(Pushka)
Montanari
Prost
Stanek
Kintner
Schlatter (ESH)

NML/CMTF
(Sarychev)
Geynisman-DEP
Wong-Squires
Stanek
Vouris
K. Williams
Koshelev
Schlatter (ESH)

APS-Technical Division

MTF/IB1/MSL/IB4
(Kintner)
Makara-DEP
Schwartz
V. Patel
TBD
Soyars
Koshelev
Huang
Bushek (ESH)

SRF
(Voirin)
Vouris-DEP
Lee
Bohn
Ristori
Tope
Bushek (ESH)

ICB/IB3/LAB2/ FCC/Low Temp
(Hansen)
Soyars-DEP
Tatkowski
Dhuley
Passarelli
Bushek (ESH)

Particle Physics Division

MUON
(Vollmer)
Adamowski-DEP
Koshelev
Kokoska
Cheban
Laureto
Lewis (ESH)
Swanson (ESH)

SIDET/Village
(Pushka)
Slabaugh-DEP
Theilacker
Subedi
Lewis (ESH)
Swanson (ESH)

NM 3/4
(Soyars)
Zuckerbrot-DEP
O. Al Atassi
TBD
Dhuley
TBD
Lewis (ESH)
Swanson (ESH)

Neutrino Division

LARGE LAr & SBN
(Tatkowski)
Nicol-DEP
James
Martinez
Hammond
Adamowski
Dhanaraj
Sarychev
Staffa (ESH)

MINOS HALL
(White)
Martinez-DEP
Allspach
Koshelev
Bruce
Staffa (ESH)

LAr R&D
(Slabaugh)
Theilacker - DEP
Subedi
Jia
Staffa (ESH)

LBNF Project

LBNF
(Martinez)
White -DEP
Beltramello (CERN)
Maupin (SURF)
TBD
Schwartz
Lee
Rabehl
Rubik
Tatkowski
Andrews (ESH)

SME Panels

ODH
(Koshelev)
Geynisman
White
Voirin
Bushek (ESH)

Jan 2023

CSS FESHM Chapters – Responsibilities

4240	(ODH) – Expert ODH Panel
5031.6	(SRF) – SRF Panel
5031.7	(Membrane) – LBNF, Large LAr and SBN
5032	(Cryo Review) – CSS
5032.1	(Dewar Install) – CSS
5032.2	(Liq. Targets) – CSS
5032.3	(Elevators) – CSS

FESHM Chapters and Training Courses

FESHM Chapter	Title	Approval Date
4240	Oxygen Deficiency Hazards (ODH)	JUN-18
5031.6	Dressed Niobium SRF Cavity Pressure Safety	JUN-19
5031.7	Membrane Cryostats	APR-20
5032	Cryogenic System Review	DEC-19
5032.1	LN2 and LAr Dewar Installation and Operation Rules	SEP-18
5032.2	Guidelines for the Design, Review and Approval of Liquid Cryogenic Targets	JUN-22
5032.3	Transporting Gases in Building Elevators	JAN-18

- *Additionally, shared responsibility with MSS on several chapters*
  - *5031 (pressure vessels), 5031.1 (piping), 5034 (pressure testing), etc.*
- **Training Courses**
  - FN000115/CR – Cryogenic Safety (General)
  - FN000475/OJ – Large (160L / 240L) Portable Liquefied Gas Dewar Handling
  - FN000029/CR – O.D.H. Training

Typical Reviews and Documentation

- Review process dictated by FESHM 5032
  - Pressure/vacuum vessel and piping engineering notes
    - Piping/vessel notes include materials and components, pressure/thermal calculations, relief device sizing, structural analysis, etc.
  - ODH analysis
  - Piping and Instrumentation Diagram, Valve/Instrument/Equipment list
  - FMEA, What-if analysis
  - Pressure/proof testing documentation
  - Welding/brazing documentation
  - Additional QA/QC checks and documentation
  - Walkthrough before approval to operate (ORC)

Resources and Future Staffing

- The Cryogenic Safety Subcommittee is an available resource
  - Not just for cryogenic review
  - Can be used as a general resource during design/procurement/etc.
    - i.e. vessels, piping, materials, relief sizing, valves/instruments/equipment, etc.
- Best to engage early with responsible review panel
  - Waiting until later stages can be risky if FNAL requirements are non fully understood

- **Staffing**: Always looking for Subcommittee and Panel members
  - Cryogenics, fluids, process, heat transfer, controls

Cryogenic Safety Subcommittee Overview

Questions?

FESHCom Mechanical Safety Subcommittee

Roza Doubnik, Ph.D.

Engineering Week 2023

23 February 2023

FESHCom Mechanical Safety Subcommittee - Introduction

The Mechanical Safety Subcommittee is responsible for providing guidance and review to the Laboratory concerning the design, construction, fabrication, testing, installation, and use of mechanical systems for experimental and laboratory applications.

These guidelines are intended to ensure the protection of personnel and property from the hazards inherent in the improper or careless use of mechanical systems.

The MSS responds to requests from, and suggests items for action to, the Laboratory Director (Chair of the FESHCom), the Chief Safety Officer (Deputy), other Division/Section/Project (D/S/P) Heads, and end users.

Mechanical Safety Subcommittee Purpose

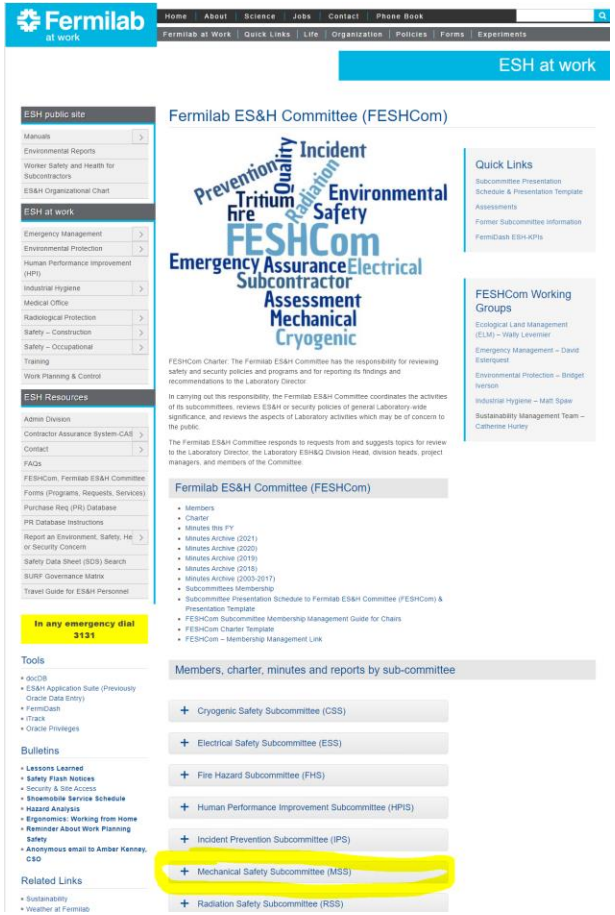
The purpose of the MSS is to serve as a forum of experts in the area of mechanical safety, who are delegated by the Divisions/Sections/Projects, to help assure the management of Fermilab and the Department of Energy that sufficient internal control and oversight systems are in place and are operating properly with respect to the management and operations of the mechanical systems safety aspects of Fermilab to enable:

1. the prompt identification of deficiencies and opportunities for improvement,
2. the prompt and accurate reporting of deficiencies to the responsible Laboratory managers,
3. the timely and effective implementation of corrective actions,
4. timely update of the FESHM chapters and training,
5. provide interpretation of rules of FESHM chapters for the end users.

FESHCom Subcommittee Membership

Mechanical Safety Subcommittee

Member	Title	Term Expires
1 Roza Doubnik	Chair ND Representative	06/22/2024 12/12/2025
2 Dave Pushka	Deputy ND Representative	04/24/2024 05/04/2025
3 Mark Adamowski	LBNFDUNE/LBNF Representative Secretary	11/10/2023 04/24/2024
4 Matt Green	Fermi Site Office - Observer	08/20/2024
5 Josh Lewis	Fermi Site Office - Observer	03/23/2025
6 Eric McHugh	PPD Division Safety Officer	05/01/2025
7 Christine Ader	AD Representative	03/31/2025
8 Marcel Borcean	ISD Representative	05/01/2025
9 Abhishek Deshpande	AD Representative	03/21/2023
10 Nandhini Dhanaraj	AD Representative	07/26/2025
11 Parth Gandhi	PPD Representative	02/24/2025
12 Michael Geynisman	ND Representative	02/16/2024
13 Jeremiah Holzbauer	PIPII/PIPII Representative	05/22/2023
14 Sai Manohari Kancharla	ND Representative	Indefinite
15 Lidija Kokoska	PIPII/PIPII Representative	12/06/2024
16 BRIAN Rubik	ISD Representative	05/15/2023
17 Paul Satti	ES Representative	05/26/2025
18 Erik Voirin	PPD Representative	05/01/2025
19 Noah Vollmer	ISD Representative	07/21/2025
20 Antonios Vouris	APS-TD Representative	11/10/2023
21 Michael White	APS-TD Representative	04/26/2024
22 Michael Zuckerbrot	Other	04/14/2025



Fermilab ES&H Committee (FESHCom) | ESH at work (fnal.gov)

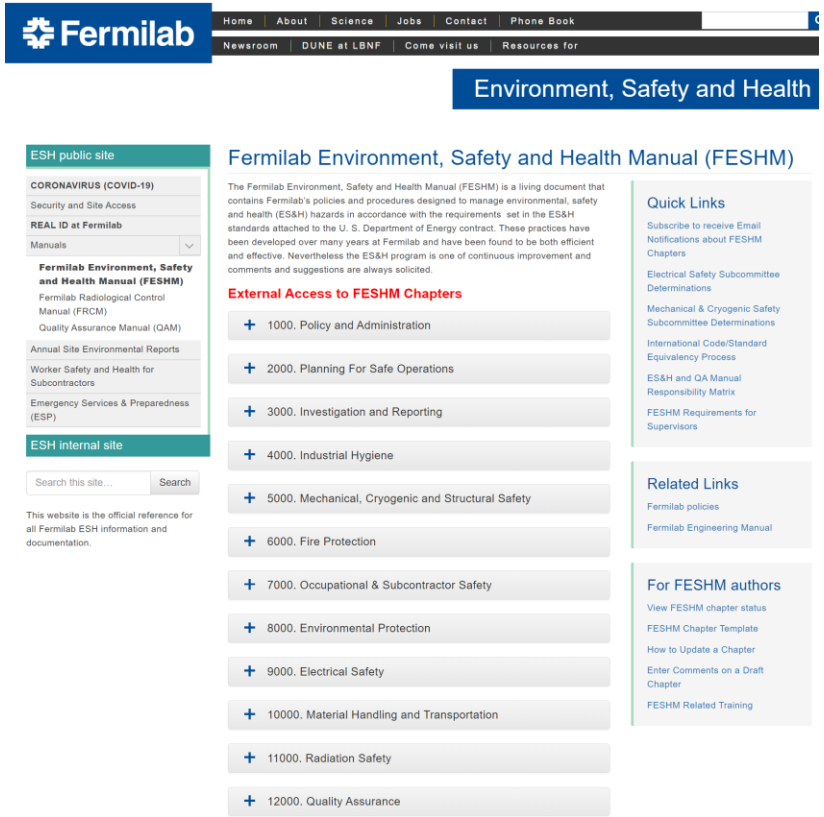
FESHCom Subcommittee – 8 Working Panels

Mechanical Safety Subcomittee								
Representatives	Roza Doubnik (Chair, ND), Dave Pushka (Deputy, ND), Mark Adamowski (Secretary, LBNF)							
	APS-TD	Tony Vouris, Mike White		Inf Serv Div (FESS)	Marcel Borcean, Brian Rubik, Noah Vollmer		PIP-II	Jeremiah Holzbauer, Lidija
	ND	Michael Geynsiman, Roza Doubnik, Dave Pushka, Sai Manohari Kancharla		ES&H	Eric McHugh, Paul Satti		Other	Michael Zuckerbrot
	PPD	Erik Voirin, Parth Gandhi		DOE-FSO Observer	Matt Green, Josh Lewis			
	AD	Christine Ader, Abishek Deshpande, Nandhini Dhanaraj		LBNF	Mark Adamowski			
	Vacuum Windows	Relief Devices	Lifting and Material Handling	Pressure and Vacuum Systems	Welding and Brazing	Structures	Transportation	Prevention through Design
Panel Chair	Christine Ader	Mike White	Paul Satti	Lidija Kokoska	Tony Vouris	Brian Rubik	Jeremiah Holzbauer	Roza Doubnik
Panel Members	Erik Voirin (deputy)	Bill Soyars (deputy)	Marcel Borcean (deputy)	Noah Vollmer (deputy)	Matt Slabaugh (deputy)	Bart Lipinski (deputy)	Brian Hartsell (deputy)	Eric McHugh
	Dave Pushka	Erik Voirin	Eric McHugh	Dave Pushka	Dave Pushka	Chris Ader	Ladia Jakubec	Michael Zuckerbrot (CSS rep)
	Curtis Baffes	Noah Vollmer	Dave Cathey	Jerry Makara	Mike Jeeninga	Dave Cathey	Josh Kaluzny	Dave Mertz (ESS rep)
	Nandhini Dhanaraj	Dave Hixon	Giuseppe Gallo	Michael Geynisman	Jamie Blowers	Arvydas Vasonis	Min Jeong Kim	Tom Digrazia
		Kathy Vuletich	Georgi Lolov	Mark Adamowski	Luke Martin	Kevin Duel	Don Mitchel	Matt Slabaugh
		Greg Tatkowski	Shishir Shetty	Jennifer Chikelu	Ryan Mahoney	Parth Gandhi	Tom Nicol	
		Abishek Deshpande	Charlie Orozco	Sai Manohari Kancharla	Vlad Nikolic	Kathrine Laureto	Brian Niesman	
				Kathrine Laureto			Charles Orozco	
							Vrushank Patel	
							Mike Pfaff	

1. Vacuum Windows
2. Relief Devices
3. Lifting and Material Handling Equipment
4. Pressure and Vacuum Systems
5. Welding and Brazing
6. Structures
7. Transportation
8. Prevention through design

Total MSS 55 members		
Female Members	8	15%
Male Members	47	85%

FESHM Website



[Fermilab Environment, Safety and Health Manual (FESHM) | Environment, Safety and Health (fnal.gov)]

MSS – Responsible

For 24 FESHM Chapters

Chapter	Title
2110	Ensuring Equivalent Safety Performance When Using International Codes and Standards
5031	Pressure Vessels
5031.1	Piping Systems
5031.2	Inert Gas Trailers
5031.3	Gas Regulators for Compressed Gas Cylinders
5031.4	Inspection and Testing of Relief Devices
5031.5	Low Pressure Vessels and Fluid Containment
5031.8	Boilers
5033	Vacuum Vessels Safety
5033.1	Vacuum Windows Safety
5034	Pressure Vessel Testing
5034.1	Retesting Procedures for D.O.T. Gas Storage Cylinders
5035	Mechanical Refrigeration Systems
5100	Structural Safety
7080	Concrete Anchors
10100	Overhead Cranes and Hoists
10110	Below the Hook Lifting Devices
10120	Powered Industrial Trucks
10130	Slings and Rigging Hardware
10140	Mobile Cranes
10180	Aerial Lifts
10190	Crane Personnel Lifting Platforms
10200	Lift Plans
10210	Equipment Transport

For 16 ES&H Training Courses

Course	Title
FN000005/CR	Crane Operator Training
FN000005/EV	Crane Operator Evaluation
FN000005/OJ	Crane Operator On-the-Job Training
FN000014/CR	Forklift Operator
FN000014/EV	Forklift Operator Evaluation
FN000213/CR	Compressed Gas Cylinder Safety
FN000271/CR	Pressure Safety Orientation
FN000360/CR	Mobile Crane Operator
FN000375/CR	Forklift Evaluator
FN000532/CR	Aerial Lift Training
FN000538/CR	In-Process Weld Examination
FN000578/EV	Crane Personnel Basket Operator Training
FN000583/EV	Vertical Lift Evaluation
FN000584/EV	Extended Boom Lift Evaluation
FN000606/CB	Hazardous Energy Control for Pressurized Systems
FN000697/OJ	Crane Evaluator Evaluation

MSS SharePoint

Mechanical Safety Subcommittee - Home (fnal.gov)

SharePoint

Organization Project Service Collaboration Experiment

Roza Doubnik

BROWSE PAGE

SHARE EDIT

Fermilab Mechanical Safety Subcommittee

Search this site

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- FESHCom Presentation Template
- CSS SharePoint Site
- MSS Transportation Panel
- MSS Membership
- MSS Charter
- GIS Viewer for Lab Location Code/FIMS #
- Fermilab Engineering Manual
  - Prevention through Design Assessment Tool
  - Prevention through Design MS PowerPoint Instructions
  - Prevention through Design MS Word Instructions
- Libraries
  - Shared Documents
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- Discussions
  - Team Discussion
- Site Contents

EDIT LINKS

Welcome to the Mechanical Safety Subcommittee Site!

CAUTION: THIS SITE IS AN ACTIVE WORKSPACE FOR MSS MEMBERS. THERE ARE NO OFFICIAL FERMILAB DOCUMENTS ON THIS SITE. DOCUMENTS ARE LIKELY TO BE INCOMPLETE OR MAY CONTAIN ERRORS.

Note: To access documents in FESHCom docdb, you must use internet explorer and have a Kerberos password

All FNAL employees should be able to read documents on the MSS Sharepoint site

All MSS members should have read/write/edit privileges on the MSS Sharepoint site

For any issues with the MSS SharePoint site contact the MSS Chair **Roza Doubnik** (rdoubnik@fnal.gov)

MSS General Links

10 CFR 851 DOE Worker Safety and Health	DOE CERN Neutrino Protocol
10 CFR 851 Existing Variances	DOE CERN Neutrino Protocol Addendum 1 Para 4.7 international stds
10 CFR 851 Implementation Guide	European Pressure Equipment Directive 2014/68/EU
10 CFR 851 Technical Amendment Questions and Answers	European Pressure Equipment Directive 2014/68/EU List of Harmonized Standards
10 CFR 851 Variance Flow Chart	ASME Code Interpretation Search
Energy Facility Contractors Group (EFCOG)	FESHM 2110 Intl Std Equiv White Papers
DOE G 450.4-1C Integrated Safety Management System Guide	Fermilab Worker and Safety Health Plan
Fermilab Engineering Management System	Fermilab ESH Management System
Fermilab Engineering Resource Guide	IAC Title 41 Chapter 3 Part 2120 Boiler and Pressure Vessel Safety
DOE Vacuum Systems Consensus Guideline	430 ILCS 75/ Illinois Boiler and Pressure Vessel Safety Act
DOT 49 CFR PART 173 - Shippers - General Requirements for Shipment and Packagings	IL State Fire Marshal Boiler and Pressure Vessel Safety Division
DOT 49 CFR Part 178 Subpart C - Specifications for Cylinders	Illinois Plumbing Code, Title 77 Part 890
SLAC ESH Manual Chp. 14 Pressure Systems	Fermilab AHJ Designations
PNNL Pressure Systems Stored-Energy Threshold Risk Analysis	Fermilab Welding Procedures
Los Alamos ES&H Manual Chp. 17 Pressure Safety	FESHM 2005 TSW ORC Tool
LBNL ESH Manual Chp. 7 Pressure Safety	JLab Pressure and Vacuum System Supplement
Pressure Relief Device Database	JLab Home Page for Pressure Systems
International Codes and Standard Variances - Amber	Safety Instrumented Systems
Invoked Technical Standards — DOE Directives, Guidance, and Delegations	FESHM 1071
	LANL SIS docs

MSS Documents

New Upload Sync Share More

Name	Modified	Modified By
00. Meeting Minutes Feb 2016-Present	August 21, 2022	Roza Doubnik
01. Vacuum Window Panel - Christine Ader	August 20, 2022	Roza Doubnik
02. Relief Devises Panel - Mike White	August 20, 2022	Roza Doubnik
03. Lifting and Material Handling Panel - Paul Satti	August 20, 2022	Roza Doubnik
04. Pressure and Vacuum System Panel - Lidija Kokoska	August 20, 2022	Roza Doubnik
05. Welding and Brazing Panel - Tony Vouris	August 20, 2022	Roza Doubnik
06. Structural Panel - Brian Rubik	August 20, 2022	Roza Doubnik

Calendar

February 2023

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
29	30	31	1	2	3	4
5	6	7	8	9 1:00 pm - 2:00 pr MSS monthly me	10	11
12	13	14	15	16	17	18
19	20 2:00 pm - 3:00 pr FESHCom	21	22	23 2:30 pm - 3:30 pr MSS Relief Devic	24	25
26	27	28	1	2	3	4

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Please refer any questions to our MSS Team

MSS Chair
Roza Doubnik
Prevention through Design Panel Chair

Vacuum Windows - Christine Ader
Panel Chair

Relief Devices Panel Chair - Michael White

Served as the MSS chair for 6 years 6 months
Thank you, Mike!

Lifting and Material Handling Equipment - Paul Satti
Panel Chair

Pressure and Vacuum Systems Panel Chair - Lidija Kokoska

Welding and Brazing Panel Chair - Antonios Vouris

Structures Panel Chair - Brian Rubik

Transportation Panel Chair - Jeremiah Holzbauer

Questions

MSS Transport Panel

Presented by Brian Hartsell on behalf of the panel

Engineers Week, 23 Feb 2023

Intro – FESHM 10210, Equipment Transport

- FESHM 10210 was written in response to recent high profile transport incidents and approved August 2022.
- Structure is different than a typical chapter since there are few standards regarding transport and each transport has unique challenges, especially within the scientific community.
- It is encouraged to consider transport early in the design process.
- If a transport is deemed critical (high value, multi-modal, sensitive material/design, etc – see table in chapter to evaluate criticality), the transport panel needs to be involved in reviewing critical transport plan.
- We are here to help!
- The technical appendix is a living document and will be updated as more transports are conducted under the chapter.

Panel Members

- Membership from a variety of organizations, list of panel members below:

  - J. Holzbauer (chair) [PIP-II]
  - B. Hartsell (deputy chair) [AD]
  - Ladia Jakubec [SDSD]
  - Josh Kaluzny [APS-TD]
  - Min Jeong Kim [ND]
  - Don Mitchell [PPD]
  - Tom Nicol [APS-TD]
  - Brian Niesman [PIP-II]
  - Charles Orozco [APS-TD]
  - Vurshank Patel [APS-TD]

Examples of Transports Conducted Under 10210

Mu2e Electrostatic Septa

SBND Detector

Work Planning & Control (WPC)

Paul Satti

WPC/Training Manager

WPC/Training Manager Role

- Implement short-term process improvements and drive long-term sustainability.
- Manage WPC tools (IMPACT).
- Create and enhance training programs designed to teach people the benefits of sound work planning and how to do it.
  - Work Planning and Control for Managers/Planners
- Field assistance to provide on-the-ground WPC support.
  - Work package assistance (SME)
  - TRAIN
- Collaborate with everyone across the lab.

1.0 INTRODUCTION AND SCOPE

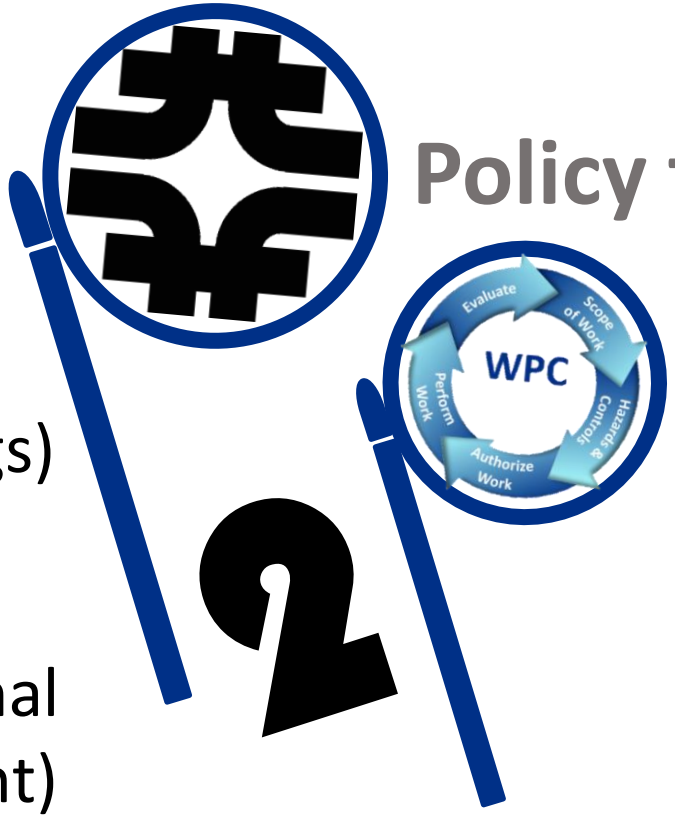
- The goal of the work planning and control (WPC) process is to plan work efficiently and safely before a project or task commences.
- Careful planning of work assures that it is performed efficiently and safely.
- All work activities shall be subject to work planning and control.

Policy to PrACTice

Action (walk-downs)

Communication (job briefings)

Training (professional development)



FRA/DOE Assessments of WPC

Challenges

- Multiple planning tools used across the Lab.
- Quality hazard analysis and risk assessment (HA).
- Management “buy-in” and worker involvement.

Work Planning & Control

Evaluate

- **Post Job Debrief**
  - Lessons Learned
  - Update Work Plan and HA

Perform Work

- **Work within Controls**
  - Stop and reevaluate if conditions change
  - Clean up
  - Release work

Authorize Work

- **Gain approval to work**
  - Approving Supervisor
  - Work Planner
  - Point of Contact
  - Workers

Scope of Work

- **Identify Scope of Work**
  - What
  - Where
  - Who
  - When
  - How
  - Why

Hazards & Controls

- **Identify Hazards and Controls**
  - Engineered Controls
  - RWP, LOTO, etc.
  - SOP, HAs, Permits
  - Checklists, Travelers
  - Training
  - PPE

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Paul Satti, CSP, CHST

psatti@fnal.gov

WPC@fnal.gov

Electrical Safety Subcommittee Overview

Engineers Week 2023

Why there is an Electrical Safety Subcommittee

- The contract between the Department of Energy (DOE) and Fermi Research Alliance (FRA) as the Operations and Maintenance (O&M) contractor for the Fermilab site includes
  - The National Electrical Code (**NFPA 70**)
  - Standard for Electrical Safety in the Workplace (**NFPA 70E**)
  - **29 CFR (OSHA) 1910**, particularly **Subpart S** and **1910.269** for electrical safety in general industry, and **1910.147** for Hazardous Energy Control (Lockout / Tagout)
  - **29 CFR (OSHA) 1926**, particularly **Subpart K** for electrical safety in construction

Roles in the Electrical Safety Subcommittee

- Chair:
  - Electrical Safety Officer [NFPA 70E]
  - Electrical Safety Authority [NFPA 70E Article 350]
  - Contractor Authority Having Jurisdiction [NEC, OSHA 1910]
- Deputy Chair
- Associate Directorate, Division, and Project (D/D/P) Representatives
- Subject Matter Experts
- Fermi Site Office Observers

Responsibilities of the ESO and the ESS

- Develop and promote the Electrical Safety Program (ESP)
  - Develop and maintain electrical safety FESHM chapters, ESS Determinations, and electrical safety and LOTO Training
  - Validate and support electrical safety content in other lab policies and programs
  - Identify Subject Matter Experts (SMEs) to provide clarifications
  - Administer rubber insulating glove exchange program
- Perform the Authority Having Jurisdiction (AHJ) duties assigned by the Fermi Site Office to Fermi Research Alliance (FRA) as the Operations and Maintenance (O&M) contractor
  - Review and inspect facility construction and modifications
  - Review and inspect test and experimental installations
  - Approve electrical equipment for use
    - NRTL listings are key to implementing this function

FESHM Chapters on Electrical Safety

- **FESHM 9100 – Overall Program**
- **FESHM 9110 – Utilization Equipment Safety**
- **FESHM 9120 – AC Electrical Power**
- FESHM 9130 – Cable Trays
- FESHM 9140 – Exposed Electrical Bus
- FESHM 9150 – HV Coaxial Connectors
- FESHM 9160 – Low Voltage, High Current
- FESHM 9170 – AC Power Back Up Systems
- **FESHM 9180 – Safe Work Practices and PPE**
- **FESHM 9190 – Grounding Requirements**
- **FESHM 2100 – Lockout Tagout**

Electrical Safety Subcommittee Determinations

Fermilab news for employees a: | ESH-doc-871-v7: Electrical Safety S:

https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=871

Fermilab

ES&H DOCUMENT DATABASE
Environment, Safety and Health website: public | internal

ESH DocDB Document 871-v7

Electrical Safety Subcommittee Determinations

Document #:
ESH-doc-871-v7
Document type:
Guidance/Information
Submitted by:
Nancy Grossman
Updated by:
David Mertz
Document Created:
19 Nov 2009, 21:25
Contents Revised:
27 Feb 2018, 16:23
Metadata Revised:
27 Jan 2023, 08:54

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Abstract:
From time to time, various electrically related issues are brought to the Electrical Safety Subcommittee for evaluation, advice or determination. Such issues are typically unique but may also involve work practices, details of electrical use or installation, interpretations of FESHM Chapters, or interpretations of regulatory codes and requirements. As the Laboratory moves to apply the principles of NFPA 70E, even more issues are expected to be brought to the Subcommittee. The Chair suggested that these issues be recorded in the meeting minutes in a special way.

Files in Document:

- 2006-01 Is Voltage Testing Necessary for Non-Electrical Work Activity (Is Voltage Testing Necessary for Non-Electrical Work A...pdf, 95.8 kB)
- 2006-02 Is it Permissible to Install New Conductors in a Trough with Live Conductors (Is it Permissible to Install New Conductors in a Troug...pdf, 77.8 kB)
- 2006-03 Use of Installed Voltage Monitoring Devices for Verification (Use of Installed Voltage Monitoring Devices for Verifi...pdf, 116.4 kB)
- 2006-04 Use of Test Points for Verification (Use of Test Points for Verification.pdf, 112.7 kB)
- 2006-05 Does a Person Need to be Qualified to Operate a Circuit Breaker (Does a Person Need to be Qualified to Operate a Circui...pdf, 16.7 kB)
- 2006-06 Achieving an Electrically Safe Work Condition When Disconnects Have Viewing Windows (Achieving an Electrically Safe Work Condition When Dis...pdf, 146.7 kB)
- 2007-01 Is Use of the Fluke T3 Voltage Tester Compliant with NFPA 70E & LOTO Requirements (Is Use of the Fluke T3 Voltage Tester Compliant with N...pdf, 82.4 kB)
- 2007-02 Applicability of the National Electrical Safety Code (NESC, ANSI-C2) to Medium and High Voltage Distribution (Determination of the Applicability of the National Ele...pdf, 85.6 kB)
- 2007-03 Battery Replacement and Maintenance Activities Not Subject to Div. Sec Head or Directorate Approval (Battery Replacement and Maintenance Activities Not Sub...pdf, 82.4 kB)
- 2009-01 Qualifications for Operating a Circuit Breaker as a Switch, 277 Volts and Below (Qualifications for operating a Circuit Breaker as a Sw...pdf, 26.1 kB)
- 2009-02 Guidelines for Resetting a Tripped Circuit Breaker, 480 Volts and Below (Guidelines for Resetting a Tripped Circuit Breaker, 48...pdf, 28.6 kB)
- 2011-01 MCC Bucket Insertion/Removal Determination (MCCBucket_Determination.pdf, 92.9 kB)
- 2012-02 Guidelines for Powering Appliances through Major Appliance Cords (MajorApplianceCords_120425.pdf, 16.8 kB)
- 2013-01 Inspections of cords and plugs prior to use (Cord and Plug Inspections_130606.pdf, 23.8 kB)
- 2013-01a PPE Requirements for Operating a Breaker in 208V Utilization Equipment (LVCB_PPE_Determination_131022a.docx, 101.2 kB)
- 2014-01 Acceptable Uses of Multiple Outlet Strips (ESS Determination 2014-1_20140414.pdf, 609.4 kB)
- 2014-02 Receptacles for Break Rooms and Non-Commercial Kitchens (Kitchen determination 2014-02.pdf, 19.5 kB)
- 2014-03 Power Sources for Xerographic Printers and Copiers (Printer power determination 2014-03.pdf, 15.2 kB)
- 2015-01 Use of Non-NEMA standard 5-wire plugs and receptacles (2015-01 Non-NEMA 5 wire receptacles.pdf, 15.5 kB)
- 2015-02 Labeling of Pass-Through Cables (2015-02 Pass-through cable labeling.pdf, 15.5 kB)
- 2019-01 Written versus Complex LOTO (2019-01 Written vs Complex LOTO.pdf, 157.6 kB)
- 2019-02 Default Arc Flash Boundary (2019-02 Default Arc Flash Boundary.pdf, 351.5 kB)
- 2019-03 Thermal Protection for Electric Heaters (2019-03 Thermal Protection for Electric Heaters.pdf, 341.8 kB)
- 2020-01_AHJ_Approval_NRTL_Listings (2020_01_AHJ_Approval_NRTL_Listings.pdf, 426.9 kB)
- 2020-02 Tool power for donated construction work (2020-02 Tool power for donated construction work.pdf, 361.1 kB)
- 2022-01 Use of Power Converters and Supplies (2022-01 Use of Power Converters and Supplies.pdf, 390.8 kB)
- MCC Bucket Insertion/Removal Determination Rationale (MCCBucket_determination_rationale.pdf, 107.3 kB)
- NFPA 70E (2018) ESS Simplified Guidance Tables (70E ESS Guidance 2018.pdf, 435.3 kB)

Other Files:

- Does a Person Need to be Qualified to Operate a Circui...doc (37.5 kB)
- Guidelines for Resetting a Tripped Circuit Breaker, 48...doc (41.5 kB)
- Qualifications for operating a Circuit Breaker as a Sw...doc (38.0 kB)
- 2006-01 Source File (2006-01 Voltage Testing Necessary for Non-Electrical ...docx, 19.5 kB)
- 2006-02 Source File (2006-02 Permissible to Install New Conductors in a Tr...docx, 19.2 kB)
- 2006-04 Source File (2006-04 Use of Test Points for Verification.docx, 35.5 kB)
- 2006-05 Source File (2006-05 Use of Installed Voltage Monitoring Devices f...docx, 30.6 kB)
- 2006-06 Source File (2006-06 Achieving an Electrically Safe Work Condition...docx, 16.6 kB)
- 2007-01 Source File (2007-01 Is Use of the Fluke T# Voltage Tester Complia...docx, 19.3 kB)
- 2007-02 Source File (2007-02 Determination of the Applicability of the Nat...docx, 20.0 kB)
- 2007-03 Source File (2007-03 Battery Replacement and Maintenance Activitie...docx, 20.0 kB)

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ESH-doc-871-v5
15 Apr 2014, 16:34
ESH-doc-871-v4
22 Oct 2013, 13:16
ESH-doc-871-v3
26 Apr 2012, 14:01
ESH-doc-871-v2
10 Mar 2010, 12:41
ESH-doc-871-v1
11 Jan 2010, 13:48

Type here to search | 20°F Partly sunny | 9:41 AM 2/17/2023

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Electrical Safety Training

- FN000387: **Electrical Safety Orientation***
- FN000235: **Basic Electrical Safety**
- FN000385: **Electrical Safety in the Workplace**
- FN000015: **National Electrical Code****
- FNXXXXX: **LOTO 1*** (Lockout / tagout awareness)
- FN000212: **LOTO 2** (Lockout / tagout Authorized Employee training)
- FN000520: **Arc Flash Hazard Analysis**** (ETAP electrical system modeling software training)

* Part of New Employee / User Orientation

** Training provided by outside subcontractor

Contractor Authority Having Jurisdiction (C-AHJ)

- The ultimate AHJ role rests with the Secretary of the DOE. The Secretary can delegate it to other federal employees (the FSO Site Manager), but as an “inherently governmental function,” contractors can only be assigned certain AHJ tasks.
- The C-AHJ has two primary roles:
- Review and inspection of electrical construction and modification (like a municipal electrical inspector) [NEC]
- Approval of electrical utilization equipment used in the workplace [29 CFR 1910.303(a) and definitions of Acceptable and Approved in 29 CFR 1910.399]

Electrical Safety Officer / Authority

Electrical Safety Officer (ESO)

- The person responsible for the Electrical Safety Program [NFPA 70E Article 110]

Electrical Safety Authority (ESA)

- Ensures appropriate electrical safety related work practices and controls in the laboratory or R&D environment [NFPA 70E Article 350.4]

Operational Readiness Clearance [FESHM 2005]

- The electrical SMEs reviewing experimental and testing setups and installations as part of the ORC process draw authority from all three AHJ, ESO, and ESA roles.
- Three main elements in the ORC:
  - Is the equipment to be used approved and acceptable?
  - Is the approved and accepted equipment being used in accordance with the standard(s) to which it is listed and the manufacturer's instructions?
  - Does the setup or installation present any other hazards such as tripping or clothesline hazards?
- The reviewers may also make recommendations regarding changes that could improve reliability

Approval of Equipment and NRTL listings

- The C-AHJ must approve electrical equipment used in the workplace as required by 29 CFR 1910.303(a)
  - Equipment not listed by a Nationally Recognized Testing Laboratory can only be accepted when the equipment is *"of a kind that no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe"*

- The CE mark is ***not*** a NRTL seal

How can non-NRTL equipment be procured?

The following process should be used to determine if non-NRTL equipment can be purchased:

1. Establish the technical performance requirements that the equipment must meet to serve the intended purpose. Price and delivery are excluded from consideration.
2. Contact at least three major distributors (for equipment types with many manufacturers) or three manufacturers of the type of equipment (for equipment with few manufacturers) and ask about the availability of NRTL listed products meeting the performance requirements.
3. If NRTL listed products that satisfy the performance requirements are found, select from among those. If only one manufacturer is found, this justifies a sole source procurement.
4. If the search in step 2 fails to identify any NRTL listed products that satisfy the performance requirements, contact your Division Safety Officer (DSO) for guidance on procuring the non-NRTL equipment.

Electrical Safety Subcommittee Members

Member	Title	Term Expires
David Mertz	ES Subject Matter Expert, Chair	Indefinite
Michael Utes	PPD Subject Matter Expert, Deputy	10/1/2023
John Scott	Fermi Site Office – Senior Observer	Indefinite
Matt Green	Fermi Site Office - Observer	Indefinite
Trevor Butler	AD Subject Matter Expert	6/2/2023
Timothy Martin	PPD Subject Matter Expert	Indefinite
OPEN	AD-RF Subject Matter Expert	Indefinite
Randal Wielgos	FE Subject Matter Expert	Indefinite
Chris Jensen	Interim AD Representative	Undefined
Steve Chappa	PPD Representative	3/31/2024
Timothy Kasza	CCD Representative	10/1/2023
Miguel Nunez	APS-TD Representative	2/28/2024
John Kruse	FE Representative	Indefinite
Mark Thomas	CCD Representative	5/31/2025
Ryan Crawford	PIP-II Representative	01/04/2024
Jim Niehoff	LBNF / DUNE Representative	01/11/2026

Electrical Safety Subcommittee

- Rubber insulating glove exchange
  - Because these gloves cannot be issued for service longer than six months, qualified electrical workers who need to use these gloves exchange them in April and October
  - You know if you're part of this program
  - ***If you are not part of this program and have some of these gloves, please return them to me at MS 119 or WH 7E #732***

Interrogation and Evasion

Safety Instrumentation Systems and Challenges

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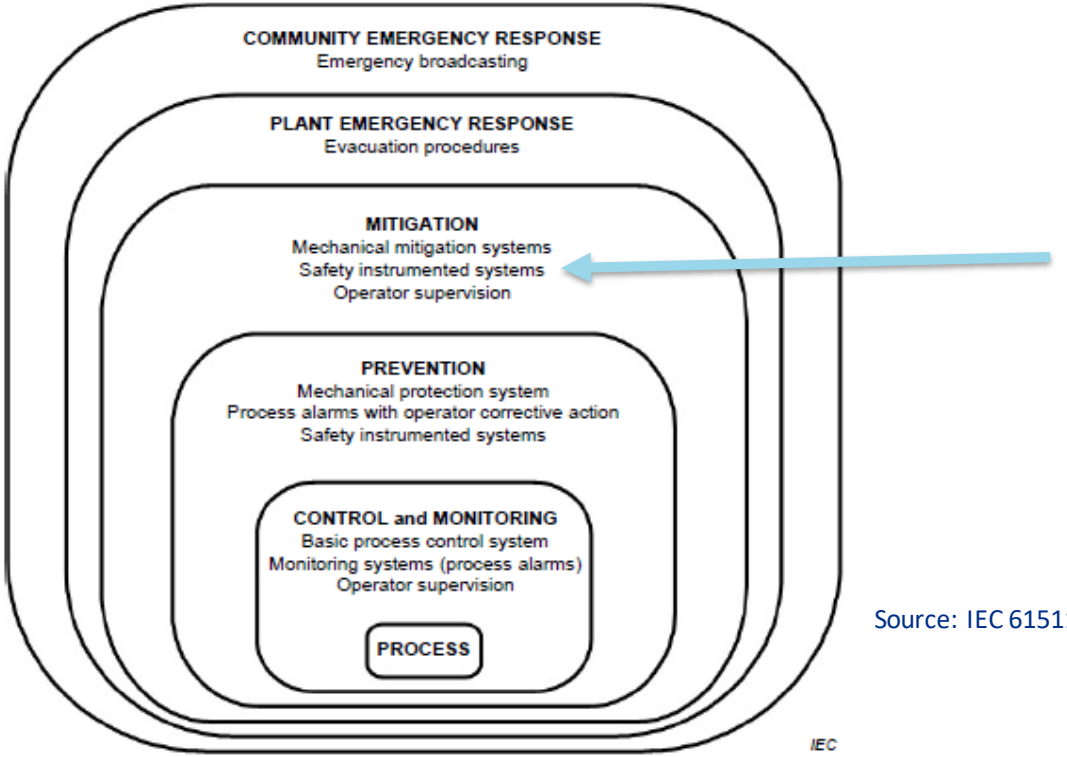
Engineers Week 2023

2/23/2023

Introduction

- What is the overall challenge for the lab currently?
  - The lab needs a comprehensive and standard approach to implementation of IEC 61511 for its Safety Instrumented Systems (SISs).
- What is a Safety Instrumented System?
  - A system, made of instrumented hardware components and, optionally, software components, that performs one or more **Safety Instrumented Functions** to provide a layer of protection with a quantified **Risk Reduction Factor** for personnel, equipment, and environment for an industrial plant process, based on a **Hazard and Risk Assessment (HRA)** for the process.

Layers of Protection – IEC 61511



Source: IEC 61511-1

Figure 9 – Typical protection layers and risk reduction means

Generic Architecture of a SIS

Source: IEC 61511-1

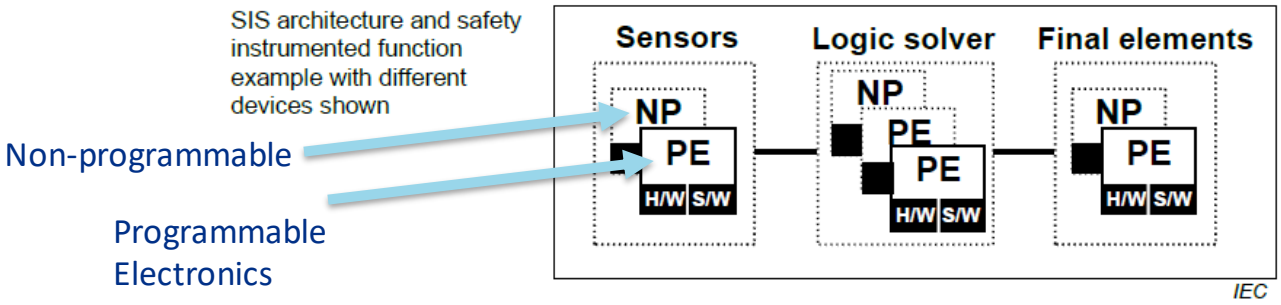


Figure 6 – Example of SIS architectures comprising three SIS subsystems

- What kinds of hazards do SIS protect against at the lab?

  Examples:

  - Electrical
  - Radiation
  - Oxygen Deficiency
  - Laser
  - Flammable gas leaks

- Each of these are covered in FESHM

What is IEC 61511 Series?

- Functional Safety – Safety Instrumented Systems for the Process Industry
  - Provides minimum standards and performance levels with two SIS concepts that are fundamental to its application:
    - Safety Lifecycle (process; reduce systematic errors)
    - Safety Integrity Level (performance; reduce random errors)

- Both concepts must be fully implemented to achieve compliance with IEC 61511

IEC 61511 Series Scope

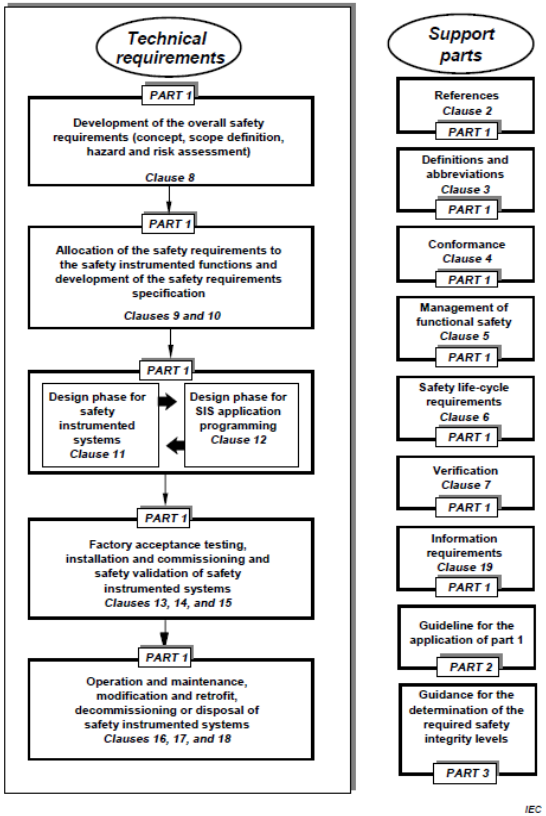


Figure 1 – Overall framework of the IEC 61511 series

Implementation of a SIS for a specific plant process, using IEC 61508 certified components

Source: IEC 61511-1

Why Is This a Challenge?

- Currently, there is little guidance or detail on how DOE labs are expected to fully implement IEC 61511 from the high-level DOE Order: DOE 420.C

- Many of Fermilab's SIS were developed before or during the birth of IEC 61511, and Fermilab has created its own processes and requirements for implementation of IEC 61511 over decades
  - Paul Czarapata remembered the time when Fermilab had originally proposed to DOE to use IEC 61511, which then has become the standard for all DOE accelerator facilities

- Fermilab's guidance and details are also vague for SIS, specifically; until you delve into each type of safety system, each type of hazard mitigated, and each organization that maintains a particular type of SIS.
  - This is because, over history, SIS requirements were defined according to the corresponding hazard's FESHM chapter – Not all hazards treated the same
  - This is also because, over history, different groups were assigned responsibility for implementing the same standards within their varying specific scopes
  - For these reasons, there are inconsistencies and potential blind spots in our application of IEC 61511

Challenge Scope

Implementation of IEC 61511 at the lab presents a broad scope of challenges

- Compliance with DOE requirements
- Organization of roles and responsibilities at the lab
- Training
- Standardization
- Many Interfaces
- SIS Configuration Control
- SIS Designs
- Equipment; hardware and software
- SIS Reviews
- HRAs
- Traceability
- Testing and Maintenance

What are we doing about this challenge?

We have formed an adhoc discussion group together, since July of 2022.

- The group consists of Safety Subcommittee Chairs, SMEs, and senior lab management from multiple divisions to unite our SIS efforts across the lab
- We searched for where the IEC 61511 requirements are traced and considered where they should exist in the existing FESHM chapters and Engineering Manual. For example, we considered the ORC process as potential process to capture SIS reviews, but this was not pursued in the end.
- In these meetings, the group identified action items and areas needing research and information gathering.
- **Many group members contributed greatly to this effort** over the following 4 months.
- Members of the group reached out to other DOE labs for guidance
- Individuals with unique perspectives also joined us to provide excellent feedback and opinions that guided our search for solutions.

Proposed Solutions

The group's proposed solutions included:

- Reposition the Lab's guidance and requirements for IEC 61511 out of the Engineering Manual and into FESHM
- Develop an ITNA safety engineering training and authorization program, using a contractor to provide the specialized training
- Revise FESHM 2090: Development, Maintenance, Procurement and Usage of Software Products Related to Environment, Safety, and Health to include guidance for IEC 61511
- Create a new FESHM Chapter dedicated to SISs that will cover all aspects of SIS implementation

Also, from within the group, and in agreement with senior lab management, it was concluded that a new SIS Subcommittee should be formed, so that the necessary resources and staff may be allocated to a unified approach towards SISs at the lab.

Next Steps

Requesting recommendations for SIS Subcommittee members from Safety Subcommittee Chairs

Once members are identified, there will be a charter developed for the SIS Subcommittee.

The SIS Subcommittee expects to provide guidance and resources for training, reviews, and all aspects of IEC 61511.

Thank you

- Thank you Engineers!!!