Presentation on NIST Safety for the Safety Commission, January 4, 2023

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Overview of NIST Safety

- Safety Management System
- Core Programs
- Performance Metrics
- Recent Events
- Safety Culture at NIST
- Risks, Opportunities, Action Plan

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OSH: Occupational Safety and Health
SMS: Safety Management System
OSHE: Office of Safety, Health and Environment
OU: Organizational Unit (Offices/MR and Labs/LP)

NIST Safety Management System

Aligned with ISO 45001: Occupational Health and Safety Management System

Documented in the NIST Directives Management System

- Policy: Organizational commitments, signed by NIST Director
- Order: Roles and responsibilities
- Suborder: Regulatory and technical requirements
- Notice: Requirements (one year, maybe renewed)

Communicated in many ways

- Required training
- Briefings on new and revised safety programs
- Newsletters, safety minutes, emails
- Website content
- Discussions at meetings

ISO International Organization for Standardization

ISO 45001:2018

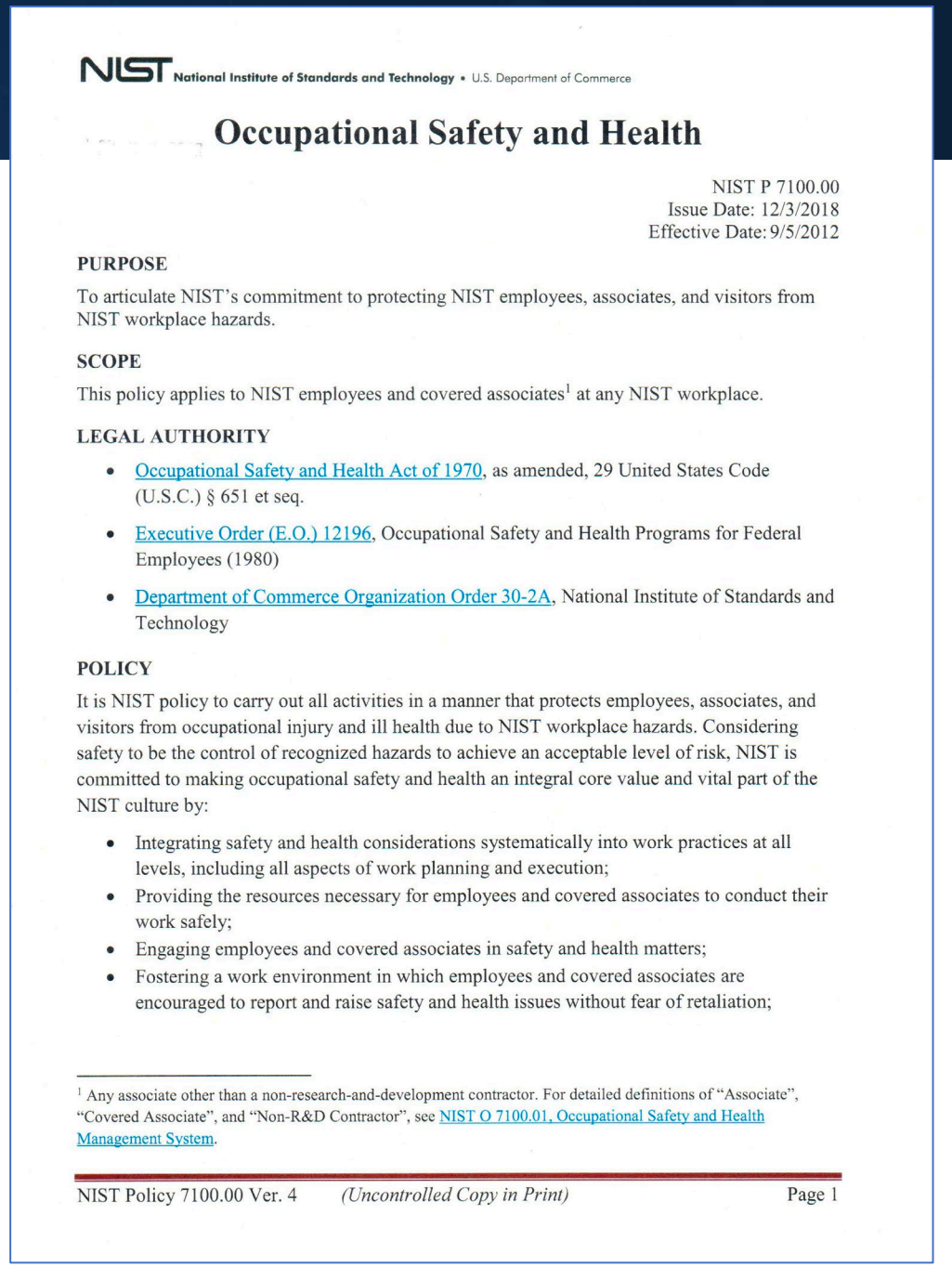
NIST Safety Policy

Policies are signed by the NIST Director

Basic OSH Policy commitments:

- Systematically integrate safety and health into work practices
- Provide adequate resources to support safe conduct of work
- Engage employees
- Foster environment for reporting safety concerns without fear of retribution
- Continual improvement
- Regulatory compliance
- Communicating safety objectives

NIST OSH Policy sets the expectation for all staff, employees and associates, to take personal responsibility for the safety of themselves and others, and for making safety an integral core value and vital part of the NIST culture.



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Occupational Safety and Health

NIST P 7100.00
Issue Date: 12/3/2018
Effective Date: 9/5/2012

PURPOSE

To articulate NIST's commitment to protecting NIST employees, associates, and visitors from NIST workplace hazards.

SCOPE

This policy applies to NIST employees and covered associates[1] at any NIST workplace.

LEGAL AUTHORITY

- Occupational Safety and Health Act of 1970, as amended, 29 United States Code (U.S.C.) § 651 et seq.
- Executive Order (E.O.) 12196, Occupational Safety and Health Programs for Federal Employees (1980)
- Department of Commerce Organization Order 30-2A, National Institute of Standards and Technology

POLICY

It is NIST policy to carry out all activities in a manner that protects employees, associates, and visitors from occupational injury and ill health due to NIST workplace hazards. Considering safety to be the control of recognized hazards to achieve an acceptable level of risk, NIST is committed to making occupational safety and health an integral core value and vital part of the NIST culture by:

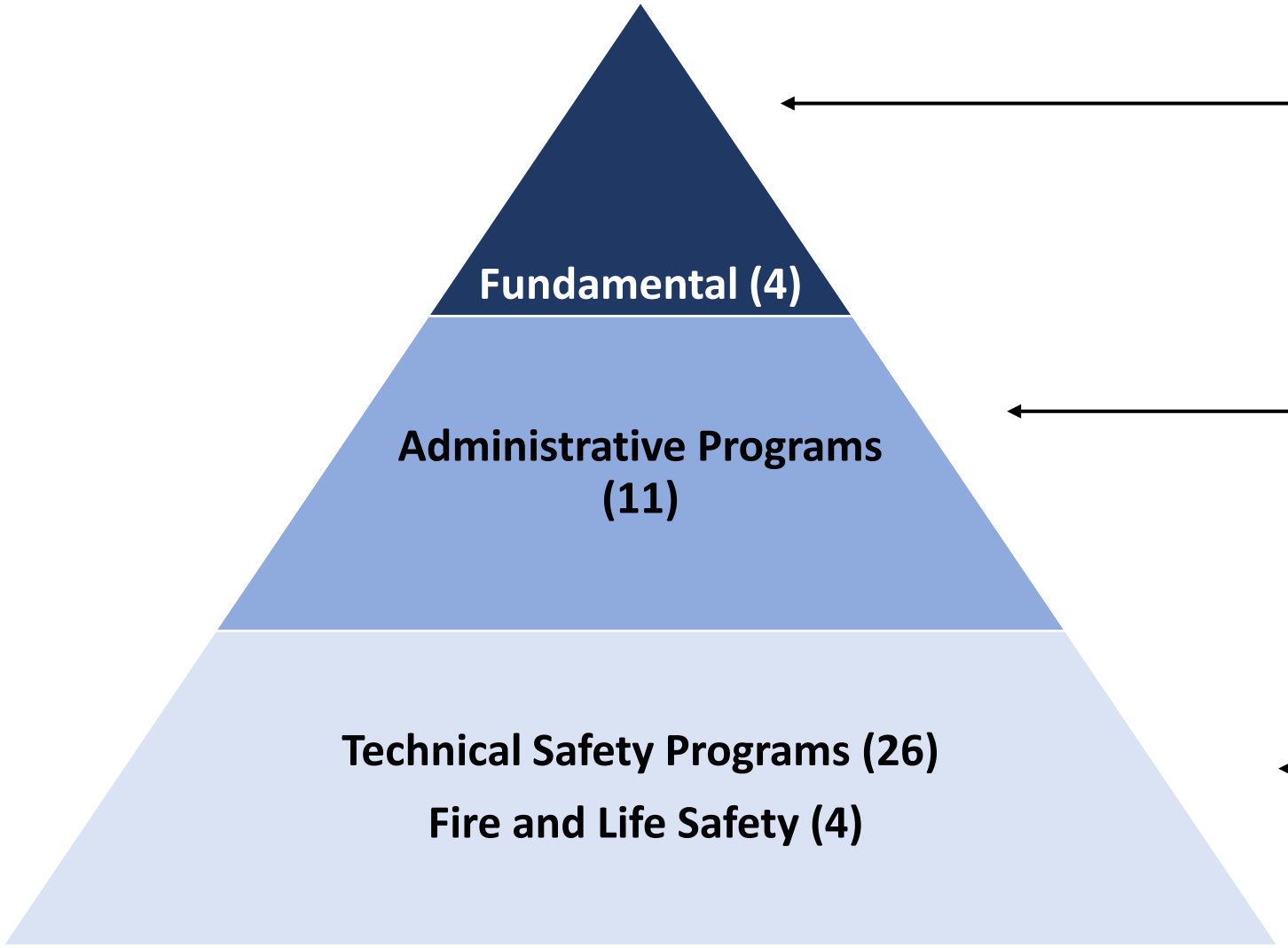
- Integrating safety and health considerations systematically into work practices at all levels, including all aspects of work planning and execution;
- Providing the resources necessary for employees and covered associates to conduct their work safely;
- Engaging employees and covered associates in safety and health matters;
- Fostering a work environment in which employees and covered associates are encouraged to report and raise safety and health issues without fear of retaliation;

[1] Any associate other than a non-research-and-development contractor. For detailed definitions of "Associate", "Covered Associate", and "Non-R&D Contractor", see NIST O 7100.01, Occupational Safety and Health Management System.

NIST Order: Key Safety Roles and Responsibilities

NIST Director	Set safety policy, accept responsibility for safety at NIST, demonstrate commitment including allocating resources, ensure the SMS and associated roles, and responsibilities are defined, regularly review SMS, direct changes as necessary
Associate Directors	Ensure SMS implementation and implement accountability in their directorate, participate in management review of SMS
Chief Safety Officer	Develop and maintain SMS aligned with ISO 45001, ensure programs in place to support regulatory compliance, assign program managers
OU Directors and Line Managers	Demonstrate commitment including allocating resources, participate in management observations, ensure employee engagement and participation in hazard and risk assessment
Employees and Associates	Take personal responsibility for safety of self, others and for making safety a core value and integral part of NIST's culture

Occupational Health & Safety Management System



Basic employee safety rights and responsibilities, right to report unsafe conditions, stop work, work prohibited for minors

Basic SMS requirements, e.g. training, incident reporting, hazard reviews, inspections, change management (see slide 7 for full list)

Regulatory and technical requirements for specific subject areas, e.g., biosafety, cryogens, nanomaterials, fall protection, personal protective equipment (see next slide for full list)

Technical Safety Programs, n=26

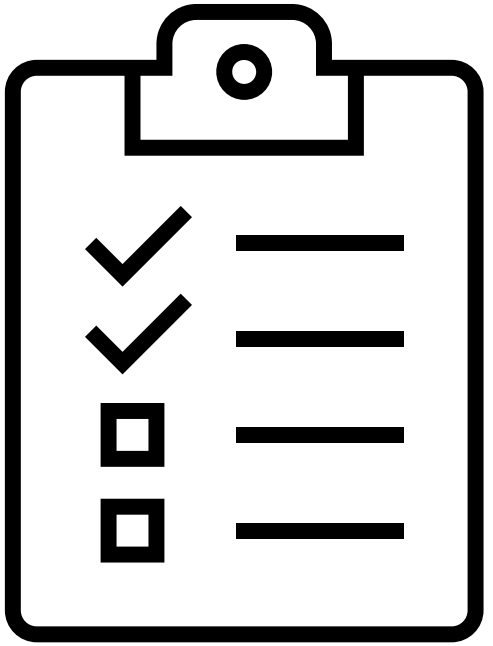
Biosafety	Lock-Out Tag Out
Bloodborne Pathogens	Magnetic Field
Chemical Hazard Communication	Machine and Equipment Safety
Chemical Management	Material Handling
Compressed Gas	Office Safety/Ergo resources
Cryogen Safety	Out of Service
Dispersible Engineered Nanoparticles	Overhead Cranes and Hoists
Electrical Safety (Notice posted)*	Permit-required Confined Spaces
Fall Protection	Personal Protective Equipment
Hazard Signage	Powered Industrial Trucks
Hearing Protection	Radiofrequency and Microwave
Ladder Safety (Draft posted)*	Respiratory Protection
Laser Safety	Walking Working Surfaces (Draft posted)*

*Planned for deployment in FY23

Resources & Guides
Bike and Scooter Safety
COVID-19 Safety
Drone Safety
Ergonomics
Fleet Safety
Heat and Cold Stress
Microwave and Radiofrequency
Office Safety
Pest Control
Visitor Safety

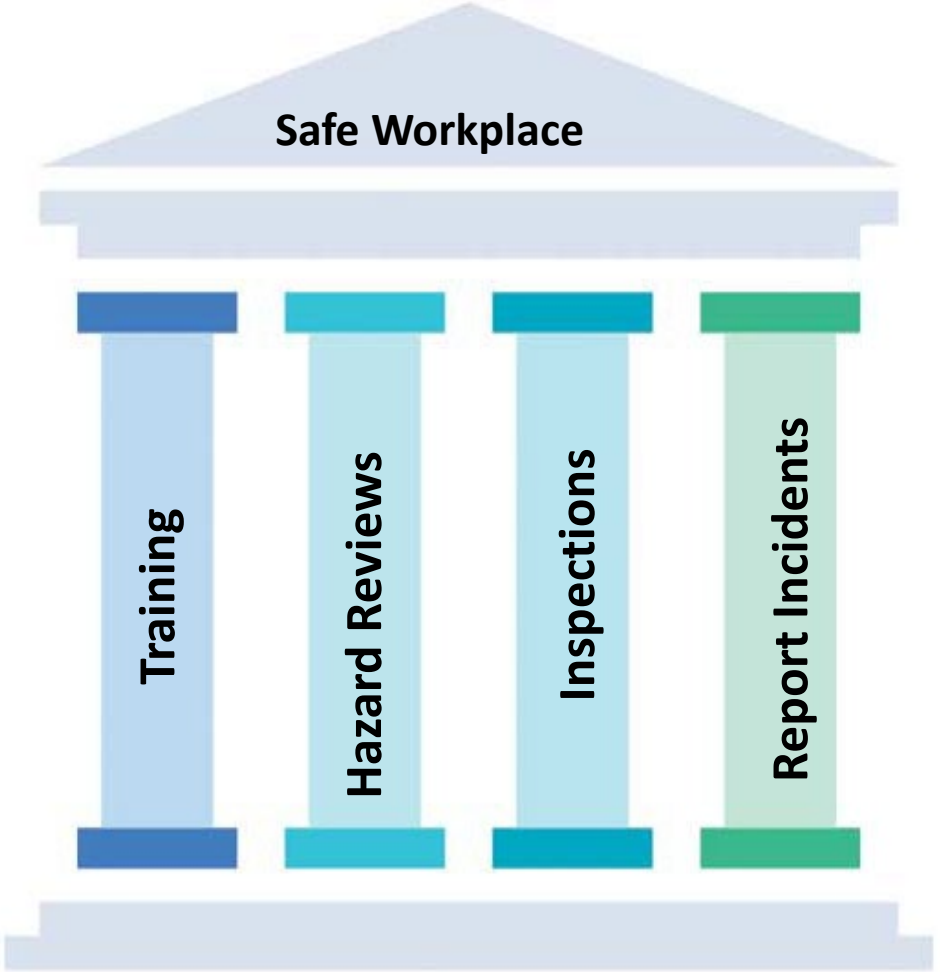
Administrative Safety Programs (n=11)

Management Observation Process
Safety Culture Program* (ESC approved)
Monitoring, Measurement, and Assessment*
Document and Record Control
- Safety Directive Creation, Deployment, Revision
Hazard Review
Safety Education and Training
Incident Reporting and Investigation
Workplace Inspection
Corrective and Preventive Actions* (Draft in OSHE)
Non-R&D Contractor Safety* (Draft in OSHE)
Management of Change* (Draft in OSHE)



*Planned for deployment in FY23/24

Four Pillars of Safety: Core Programs



We start by educating staff on how to recognize and mitigate hazards, and meet requirements.

We put that training into action by conducting hazard reviews to mitigate risk associated with work practices…

And by inspecting our spaces to abate hazards and fix non-compliances.

We report both incidents and near misses. We investigate these to identify causes and implement corrective actions to prevent future incidents with similar circumstances or causes.

Safety Education and Training Program

- NIST General Safety Training is assigned to all new staff
- Supervisors are responsible for ensuring that other courses are assigned based on the hazards associated with job duties, work locations
- NIST Leadership Training is required for all supervisors
- Supervisors are required to complete the same training as their direct reports so that they are aware of program requirements and hazard mitigation strategies
- Programs with refresher training requirements are re-assigned with specified frequency

Gain the knowledge and skills to stay headed in a

SAFE DIRECTION

For Non-Supervisory Staff

For Supervisory Staff

For Facility Users

SET IT Application*

*NIST IT Application to assign, complete, and record training

Work and Worker Authorization based on Hazard Reviews (Hazard Review)

ADMIN | MORE

This suborder defines the requirements for authorizing both hazardous activities ("work") and workers based on a systematic level of work planning and control commensurate to the hazards, job complexities, and physical location, i.e., based on hazard reviews. Hazard Reviews are required for all activities conducted by NIST employees/associates as part of their assigned duties except for low-risk activities and common everyday tasks not involving extraordinary hazards.

- Risk-Assessment Methodology
- Hazard-Review Process
- Conduct of Hazard Reviews
- Approval of Hazard Reviews
- Authorization of Work
- Authorization of Workers
- Re-Review, Re-Approval & Re-Authorization
- Re-Training & Re-Authorization of Workers
- Records
- Activities Involving Workers from Multiple OU
- Training

- Safety website provides information on program requirements with link to training
- MML IT application for documenting hazard reviews used by most lab-based staff at NIST
- Short forms available for use for simpler tasks
- JHAs forms are used by facilities staff

Hazard Review Program

- Required for work activities involving hazards beyond those found in a typical office
- Lead staff member for the activity analyzes the procedure to identify hazards, proposes mitigation using the hierarchy of controls, assesses the residual risk using the RHI matrix based on potential severity and likelihood of occurrence
- Managers review and approve work based on the procedures, hazard mitigations, level of residual risk. Level of review is based on RHI value.
- RHI=4 work is prohibited
- RHI=3 work is re-reviewed annually
- RHI=2, 1 work is re-reviewed every 3 years
- First level supervisors authorize workers based on competency and training
- Updated when work processes or hazards change

	Catastrophic Death or permanent disability System or facility loss Lasting environmental or public-health impact	**Severe** Serious injury; temporary disability Subsystem loss or significant facility/property damage Temporary environmental or public-health impact	**Moderate*** Medical treatment beyond first aid; lost-work-day(s) More than slight facility/property damage External reporting requirements; more than routine clean-up	**Minor**** First-aid only Negligible or slight facility/property damage No external reporting requirements; routine clean-up
Frequent Likely to occur repeatedly	**CRITICAL RHI=4**	**CRITICAL RHI=4**	**SERIOUS RHI=3**	**Medium RHI=2**
Probable Likely to occur multiple but infrequent times	**CRITICAL RHI=4**	**CRITICAL RHI=4**	**SERIOUS RHI=3**	**Medium RHI=2**
Occasional Likely to occur at some time	**CRITICAL RHI=4**	**SERIOUS RHI=3**	**Medium RHI=2**	**Low RHI=1**
Remote Possible, but not likely to occur	**SERIOUS RHI=3**	**Medium RHI=2**	**Medium RHI=2**	**Low RHI=1**
Improbable Very unlikely; can reasonably assume it will not occur	**Medium RHI=2**	**Low RHI=1**	**Low RHI=1**	**Minimal RHI=0**

Workplace Inspection Program (29 CFR 1960)

- Offices are inspected annually
- Labs, shops, spaces with hazards beyond those in a typical office are inspected twice per year
- Lead inspectors are trained by OSHE staff
- The inspection team must be trained on programs that apply to hazards in the workspace
- Safety program managers provide checklists of items to be verified during inspections (optional use)
- OU notify OSHE of dates and locations of inspections, OSHE participates regularly
- Workspace inspectors identify, record and classify deficiencies in WIRS* (iPad or desktop)
- Space owners remediate deficiencies to eliminate hazards and non-compliances (within 30 days)
- Managers ensure deficiencies are addressed and close out deficiencies using WIRS*

*NIST IT Application to create checklists, record inspections, track abatement of deficiencies

Incident Reporting and Investigation Program

Incident Reporting and Investigation Program: Staff members report incidents and near misses to their supervisor. The report is entered into IRIS.* One or more trained investigators from the OU or OSHE lead the investigation to understand the circumstances, determine contributing and root causes, and develop corrective actions to prevent future incidents. Lessons identified are posted with the report. Managers verify that corrective actions have been completed and close them out in the Action Tracking System. All supervisors are subscribed to IRIS report notices.

- What if You Are Involved in an Incident?
- Incidents Requiring Immediate Notification
- IRIS Investigation Process
- IRIS Roles and Responsibilities
- IRIS Tutorials (Under Development)
- Information for OSHE Program Managers
- Frequently Asked Questions
- What Must Be Reported?
- What is the Reporting Process?
- Training Requirements
- Using ECOMP to Complete an OSHA Form 301
- OU Implementation Procedures
- Annual OSHA 300A Injury and Illness Summaries
- More Lessons Learned Resources!

*NIST IT Application used to report incidents and near misses, associated investigations, causes, corrective actions, and lessons identified

Management Observation Process

"MOP" visits are designed to promote a safe work environment and continual improvement through frequent conversations about safety between staff and line managers

Each Organizational Unit must:

- Establish requirements for frequency of visits for each level of management
- Have a plan to cover all staff
- Track to completion any action items resulting from MOP visits
- Hold line managers accountable

Performance Metrics and Continual Improvement

- ✓ Safety Management System
  - ✓ Completion status (8 remaining OSH programs planned for FY23/24)
  - ✓ Implementation assessed annually by program managers (qualitative)
- ✓ Communications Data (average 70% click rates, webpage views)
- ✓ Training Data (course completion (≥80%)
- ✓ Safety Culture Survey Results (every three years)
- ✓ Workplace Inspection Data (inspections, 96% closed deficiencies)
- ✓ Incident Reporting and Investigation Data
- ✓ Corrective Action Data (91% complete)

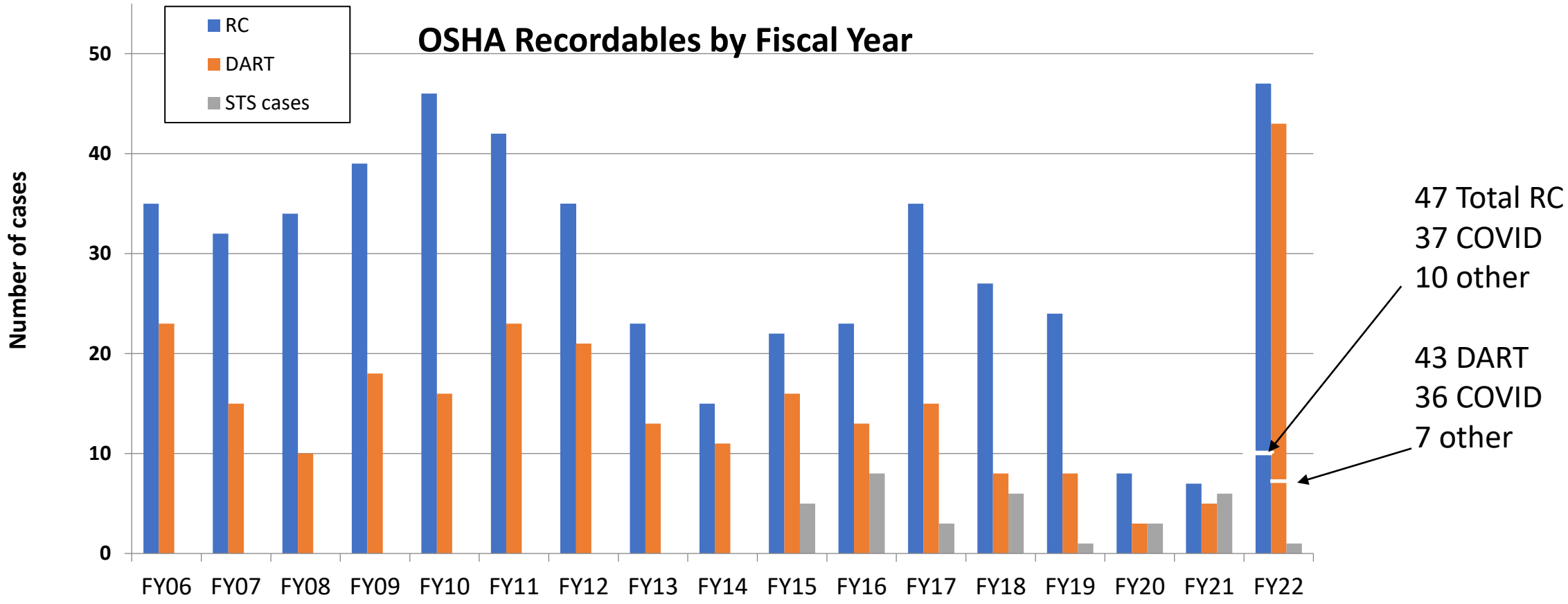
- ❑ Monitoring Measuring and Assessments (under development)
- ❑ Corrective and Preventive Actions (under development)
- ❑ Management Observation Visits (no associated metrics at the NIST level)

Leading Indicators

Lagging Indicators

Under Development

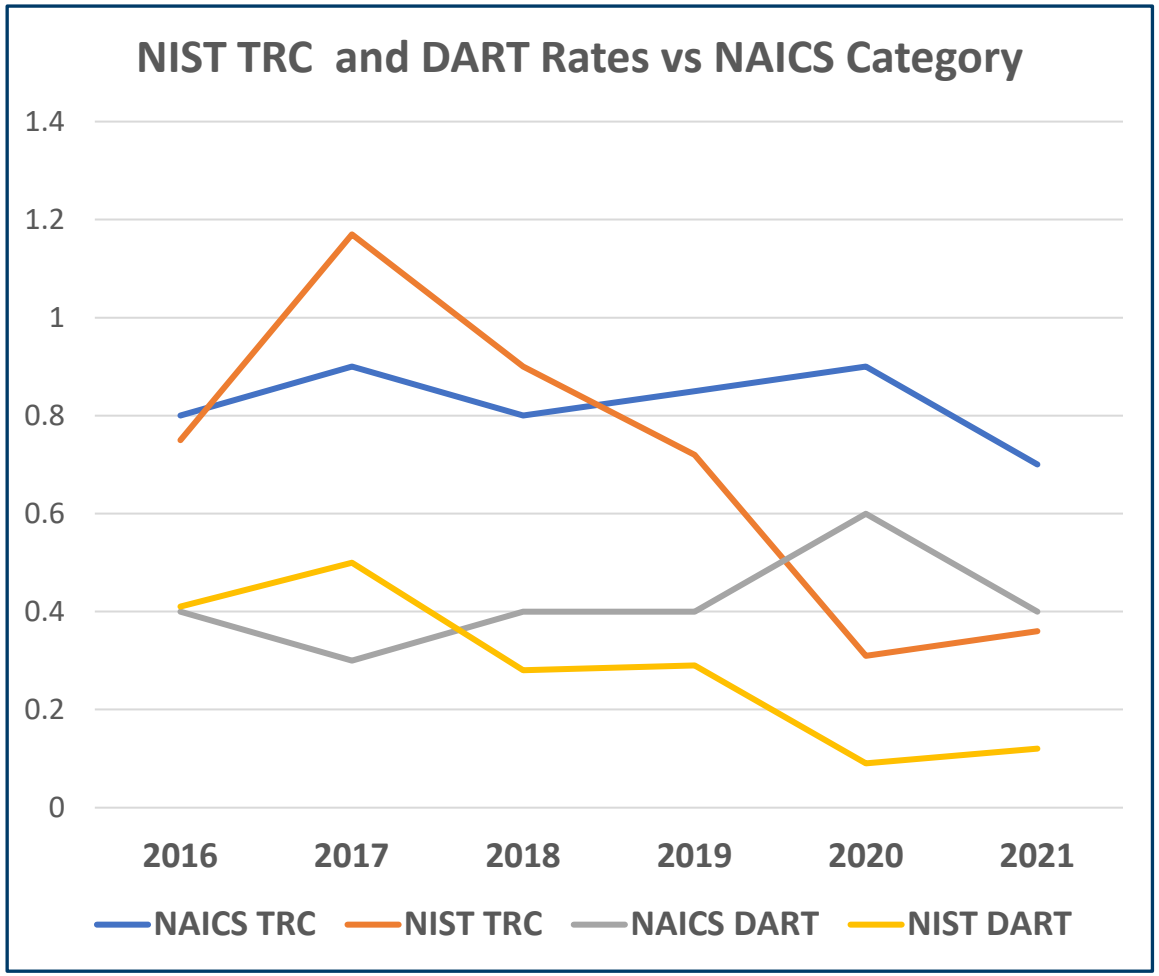
OSHA Recordable Cases (RC), and Days Away, Restricted or Transferred (DART) Case Numbers for each Fiscal Year

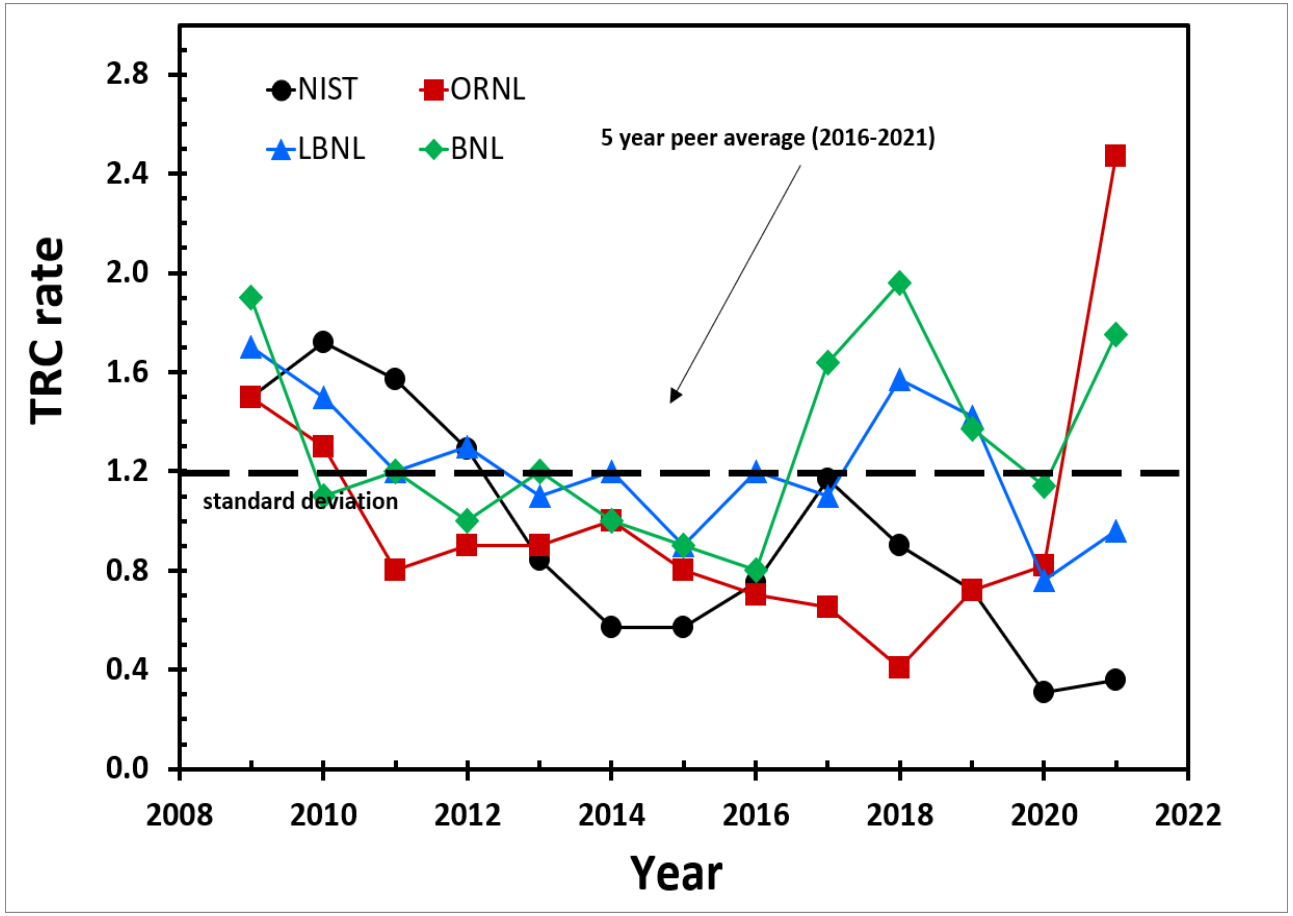


*STS= standard threshold shift for hearing loss cases

NIST Staff report ~150 incidents and near misses each year

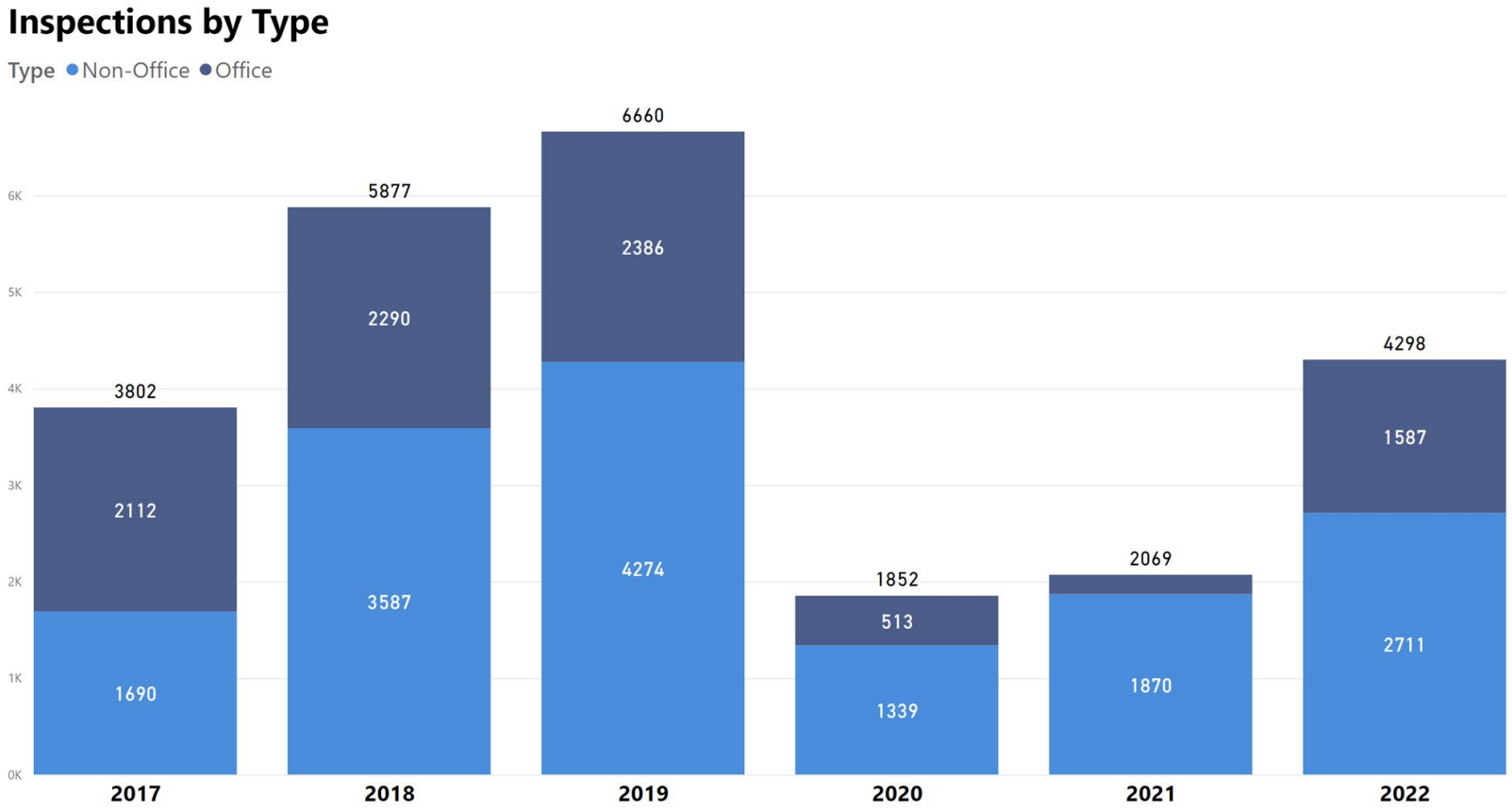
Total Recordable Case and Days Away, Restricted or Transferred Rates





NIST RC and DART rates compared with Bureau of Labor Statistics industry category for Research and Development in the Physical, Engineering and Life Sciences, and Dept. of Energy laboratories with similar work environments

Workplace Inspections Conducted



Offices inspected annually, labs and shops, twice each year

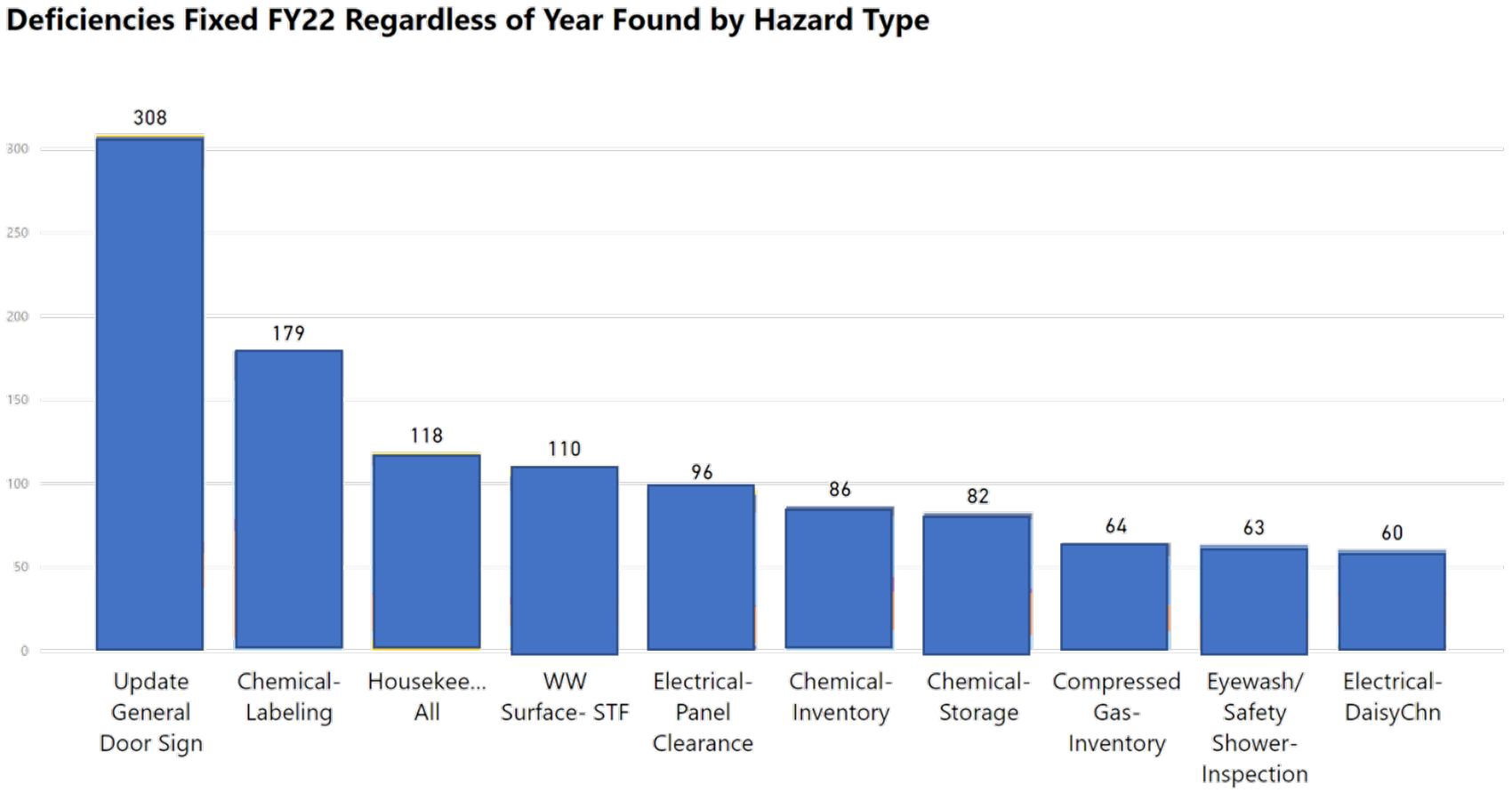
Number of unique rooms inspected was

- 3192 in FY22
- 3920 in FY19

Anticipated that in FY23 inspections will be similar to pre-pandemic numbers.

Some spaces are not occupied due to ongoing renovations

Deficiencies Fixed in FY22 by Hazard Type



Deficiencies fixed match those found:

1. Update General Door Sign (1)
2. Chemical Labeling (2)
3. Housekeeping (6)
4. Slips, Trips, and Falls (3)
5. Electrical Panel Clearance (5)
6. Chemical Inventory (7)
7. Chemical Storage (4)
8. Compressed Gas Inventory (8)
9. Eyewash/Safety Shower Inspection
10. Electrical Daisy Chain (9)

Recent Serious Safety-Related Events

COVID-19 Pandemic, February 2020 – August 2022

- Long-term decrease in on-site staffing, lower occupancy work environment
- Possible loss of safety "muscle memory"
- Focus on health, but many routine safety activities suspended/postponed

TR-5 Incident: Partial melt of reactor fuel element, Feb 3, 2021

- Staffing attrition with loss of experienced workforce played a key role
- Root causes: inadequate change management, procedures, oversight, training program, and safety culture

NFRL Incident: Fall from elevated structure during demolition, Sep 26, 2022

- Under investigation by NIST and OSHA

NIST Strategy and Actions To Improve Safety

Safety Stand-down (October 7, 2022)

- Recommit to the basic NIST philosophy and policy of taking personal responsibility for safety of oneself and others
- Review hazardous activities and think about how to work safely

Focus on Re-Review of Hazardous Activities in FY23

- Fresh eyes, appropriate expertise, observe work practices as feasible
- Lab and Office Directors report progress to NIST Associate Directors

Accelerate Safety Culture Survey Launch (survey start date 12/12/22)

Engage external Safety Commission to review safety program implementation and safety culture (January 2023)

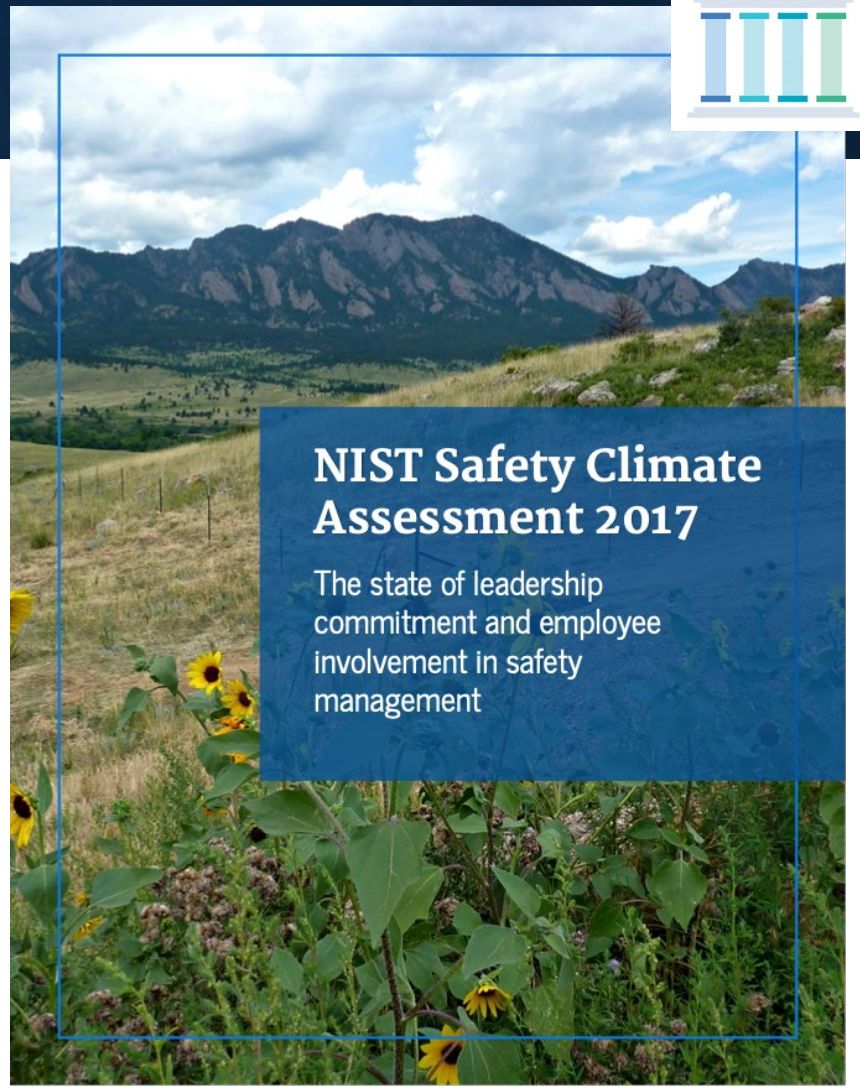
NASEM Workshop to evaluate the effects of the post-pandemic, hybrid work on safety culture, practices, training, mentoring in a research lab environment

Safety Culture Program Foundation for Safety

In the summer of 2022, NIST developed a safety culture program to formalize existing practices and add to those. This program, approved by the ESC in October 2022, is being deployed in FY23.

Elements of the Safety Culture Program:

1. Establish and communicate vision for safety culture
2. Develop action plan to support and achieve vision
3. Assess staff and management views (conduct survey)
4. Evaluate performance indicators of safety culture
5. Recognize proactive contributions to safety
6. Encourage participation and engagement at all levels
7. Sustain safety culture efforts through a focus on continuous improvement, creating a learning environment and encouraging questioning attitudes



- **Safety Climate Assessments were issued 2011, 2014, 2017**
- **A new Safety Culture Survey was issue by a 3rd party Dec 2022**

Safety-Related Risks and Opportunities: 30,000' View

Risks	Opportunities
Ageing infrastructure	Prioritization of funding to address facilities issues; collaboration between facilities and safety
Safety Management System is not fully integrated into operations	Strengthen partnerships and provide safety services in a manner that facilitates integration
No audit or assessment program in place to assess safety compliance	Develop and implement Monitoring, Measurements and Assessment Program
Safety complacency	Create conditions to strengthen safety culture, NIST-wide, at all levels

FY23 Action Plan Designed to Address Risks

Key Elements of FY23 Safety Action Plan

- **Safety Management System: Program Implementation, Deployments, Tools**
  - Issue and deploy 9 of the 11 remaining safety programs
  - Improve integration of safety IT applications into dashboard for ease of use
- **NIST Director's Initiative: Re-evaluate Hazard Reviews**
  - Fresh eyes, observe work to ensure documentation reflects practice
  - Lab and Office Directors report to Associate Directors on status
- **Executive Safety Committee Initiative: Safety Culture Program**
  - **Conduct safety culture survey**
  - **Build safety culture expectations into training, conversations**
  - **Increase employee engagement**