

Hanford Site Hazards Guide



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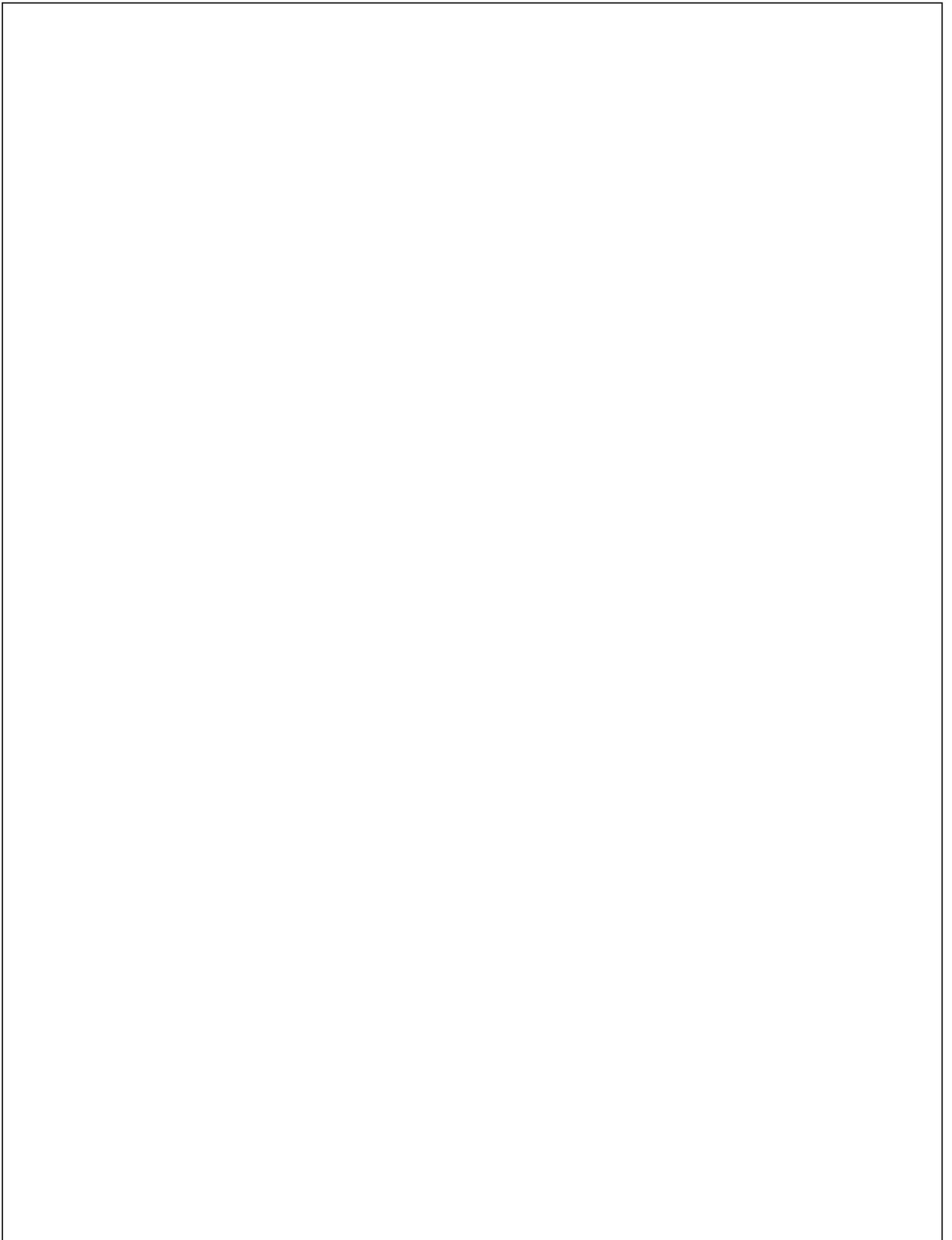
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Cover photo: Laliik (Rattlesnake Mountain) on the Hanford Site, the place where the Wanapum Prophet Smohalla went searching for answers so he could save his people during his vision quest.

Hanford Site Hazards Guide

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INTRODUCTION

The Integrated Environment, Safety and Health Management System (ISMS) is how we integrate environment, safety, health, and quality into all of our operations at the Hanford Site. The ISMS core functions (define scope of work, identify and analyze hazards, develop and implement hazard controls, perform work within controls, and provide feedback and continuously improve) guide our efforts to accomplish that integration.

Therefore, Integrated & Site Wide Standards, with input from Subject Matter Experts, offers this *Hanford Site Hazards Guide* to apply ISMS principles to a broad range of health and safety related topics.

This *Guide* is intended to be a quick reference, rather than an exhaustive treatment. For in-depth questions, see the appropriate Subject Matter Expert. For each topic in the Table of Contents, this *Guide* offers the following:

- An overview of the hazard and control methods
- Governing regulatory standards and links (primarily Occupational Safety and Health Administration (OSHA) standards)
- Applicable Hanford Site Wide Safety Standards and links

For more information about Hanford Site Wide Safety Standards or to contact us, see our [website](#).

ASBESTOS

For construction at the Hanford Site, [29 CFR 1926.1101, Asbestos](#), applies to alteration, repair, renovation, and demolition of structures containing asbestos. For general industry at the Hanford Site, [29 CFR 1910.1001, Asbestos](#), applies to asbestos exposure during activities such as brake and clutch repair and custodial work. All asbestos-containing material (ACM) waste must be disposed in an Environmental Protection Agency (EPA) approved landfill. [29 CFR 1926.1101](#) specifies four different classes of asbestos activities and defines associated requirements. Classes I and II apply to working with friable and non-friable ACM, and Classes III and IV apply to repair and maintenance operations and custodial activities. .

For construction-related activities in Class I and II regulated areas, initial and periodic air monitoring is required in the absence of a Negative Exposure Assessment. [29 CFR 1910.1001](#), requires initial monitoring for workers who may be exposed above the Permissible Exposure Limit (PEL) or the Excursion Limit (EL), with . subsequent monitoring conducted at least every six months.

Exposure Limits and Controls

OSHA 8-hr Time Weighted Average (TWA)	OSHA Excursion Limit - 30 min (EL)
0.1 f/cc	1.0 f/cc

Each OSHA standard establishes specific controls, work procedures, and required personal protective equipment (PPE) to protect workers and the environment. Engineering controls and work practices are required to the extent feasible to . reduce employee exposures to the lowest achievable level. . . .

When engineering controls are work practices are not adequate, then respiratory protection must be used to limit employee exposures. For employees exposed to airborne concentrations exceeding the PEL, PPE (e.g., eye protection, protective clothing, etc.) and decontamination facilities must be provided. . . . Employees may not smoke, drink, or eat in work areas that might expose them to asbestos. Warning signs must be posted in regulated areas where potential exposure to airborne asbestos above the PEL may occur.

Training: In construction, contractors must provide annual training for employees exposed above the PEL and those involved in each identified work classification. . In general industry, contractors must provide annual training to all employees exposed above the PEL. and asbestos awareness training to employees who perform housekeeping operations covered by the standard.

Medical: In construction, contractors must provide medical examinations for workers who, for 30 or more days per year, perform in Class I, II, or III work or are exposed above the PEL. In general industry, contractors must provide medical examinations for workers exposed above the PEL.

*Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)**

- [29 CFR 1910.1001, Asbestos](#)
- [29 CFR 1926.1101, Asbestos](#)

*Some other WAC and EPA codes may apply.

BERYLLIUM

[10 CFR 850, Chronic Beryllium Disease Prevention Program \(CBDPP\)](#), applies to DOE offices and contractors with operations or activities that involve present or past exposure or potential for exposure to beryllium at DOE facilities.

10 CFR 850 also applies to any current DOE or contractor employee who is or was exposed or potentially exposed at a DOE facility. The standard establishes maximum limits of exposure to beryllium for all workers covered, including an airborne permissible exposure limit (PEL) and action level (AL). However, 10 CFR 850 does not cover beryllium articles and DOE laboratory operations that meet the definition in [29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories](#).

Hanford contractors fulfill OSHA PEL and DOE beryllium requirements through implementing [DOE-0342, Hanford Site Chronic Beryllium Disease Prevention Program \(CBDPP\)](#). DOE-0342 is comprehensive, establishes a more conservative airborne action level, and includes surface contamination levels and controls not included in [10 CFR 850](#). [DOE-0342](#) addresses the following:

- Baseline beryllium inventory and hazard assessment
- Permissible exposure limit and an action level
- Exposure monitoring* (initial and periodic*), reduction and minimization
- Regulated areas*
- Hygiene facilities and practices*
- Respiratory protection, protective clothing and equipment*
- Housekeeping, release criteria and waste disposal
- Beryllium emergencies
- Medical surveillance, consent and removal provisions
- Training and counseling
- Warning signs and labels*
- Recordkeeping and use of information
- Performance feedback

**The employer must implement these elements if an airborne concentration of beryllium is \geq the action level.*

Some contractors also have company-specific implementing programs describing their process. DOE field offices have provided interim guidance on some aspects of [DOE-0342](#) in the form of contract direction. Please refer to company-specific implementing programs and DOE field offices for more specific information. Other regulatory requirements (e.g., Environmental Protection Agency (EPA) and Washington Administrative Code (WAC)) may apply, depending on the nature of the work and the potential for contaminating the environment (i.e., air, water, soil).

Airborne Exposure and Surface Contamination

**Exposure Limits
(Time Weighted Average (TWA)-8hr)**

	PEL ($\mu\text{g}/\text{m}^3$)	AL ($\mu\text{g}/\text{m}^3$)
10 CFR 850	0.2 (OSHA)	0.1
Hanford	0.2	0.1

BERYLLIUM (continued)

Removable Surface Contamination Limits

	Release ($\mu\text{g}/100\text{ cm}^2$)	Housekeeping ($\mu\text{g}/100\text{ cm}^2$)	Beryllium Control Area ($\mu\text{g}/100\text{ cm}^2$)
10 CFR 850	<0.2	3.0	---
Hanford Wipe	<0.2	3.0	>0.2
Hanford Bulk	<2 ppm ($\mu\text{g}/\text{g}$)	---	>2 ppm ($\mu\text{g}/\text{g}$)

DOE-0342 Documents

- [DOE-0342, Hanford Site Chronic Beryllium Disease Prevention Program](#)
- [DOE-0342-001, Hanford Site Beryllium Work Permit \(BWP\) and Hazard Assessment Procedure](#)
- [DOE-0342-002, Hanford Site Assessment & Characterization/Verification of Buildings Procedure](#)
- [DOE-0342-003, Hanford Site Beryllium Postings and Labeling Requirements Procedure](#)
- [DOE-0342-004, Hanford Site Assessment & Characterization/Verification of Structures/Conex Boxes](#)
- [DOE-0342-005, Hanford Site Evaluation of Electrical Equipment for Beryllium Procedure](#)

Regulations Incorporated Through 10 CFR 851, Worker Safety and Health Program*

- [10 CFR 850, Chronic Beryllium Disease Prevention Program \(CBDPP\)](#)
- [29 CFR 1910, Subpart Z, Toxic and Hazardous Substances](#)
- [29 CFR 1910.1000, Air Contaminants](#)

*Some other WAC and EPA codes may apply.

CHEMICAL SAFETY

OSHA has chemical safety standards that are specific to a particular industry or process. A summary of the requirements Hanford contractors fulfill include the following:

- [29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*](#). This standard contains requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals. These releases may result in toxic, fire, or explosion hazards.
- [29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*](#). This standard covers:
 - Cleanup operations required by a governmental body that are conducted at uncontrolled hazardous waste sites, and initial investigations of government identified sites that are conducted before the presence or absence of hazardous substances has been ascertained.
 - Corrective actions involving cleanup operations at sites covered by the [Resource Conservation and Recovery Act \(RCRA\)](#).
 - Voluntary cleanup operations at sites recognized by Federal, State, local or other governmental bodies as uncontrolled hazardous waste sites.
 - Operations involving hazardous waste conducted at treatment, storage, and disposal facilities.
 - Emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.
- [29 CFR 1910.1200, *Hazard Communication*](#). The requirements of this standard are intended to be consistent with the provisions of the United Nations Globally Harmonized System (GHS) of Classification and Labeling of Chemicals. Requirements include:
 - Written hazard communication program.
 - Lists of hazardous chemicals present.
 - Labeling for containers of chemicals in the workplace, as well as containers of chemicals being shipped to other workplaces.
 - Safety data sheets for employees and downstream employers.
 - Training programs regarding chemical hazards and protective measures.
- [29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*](#). This standard applies to all employers engaged in the laboratory use of hazardous chemicals. Laboratory use of hazardous chemicals means handling or use of such chemicals in which:
 - Chemical manipulations are carried out on a *laboratory scale*.
 - Multiple chemical procedures or chemicals are used.
 - The procedures involved are not part of a production process, nor in any way simulate a production process.
 - Protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Regulations Incorporated Through 10 CFR 851, Worker Safety and Health Program

- [29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*](#)
- [29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*](#)
- [29 CFR 1910.1200, *Hazard Communication*](#)
- [29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*](#)

CONFINED SPACES

Two OSHA Standards describe the safety and health requirements to safely enter confined spaces, both of which apply to the Hanford Site: [29 CFR 1910.146, *Permit-Required Confined Spaces*](#), covers work in general industry, and [29 CFR 1926.1200, Subpart AA, *Confined Spaces in Construction*](#), applies to construction work.. Confined spaces may require a permit to enter. OSHA defines a *Confined Space* as any space:

- Large enough to enter
- That has limited or restricted means for entry or exit
- That is not designed for continuous employee occupancy

A *Permit-Required Confined Space* is a space that has one or more of the following characteristics:

- Potential to contain a hazardous atmosphere
- Contains a material that has the potential for engulfing an entrant
- An internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls
- Contains any other OSHA-defined serious safety or health hazards

Hanford contractors fulfill OSHA confined space requirements through implementing [DOE 0360, *Hanford Site Confined Space Entry Procedure \(HSCSP\)*](#). The procedure describes the following:

- Training requirements
- Atmospheric testing requirements
- Roles and responsibilities
- Written permit requirements
- Recordkeeping requirements
- Confined space inventory
- Confined space warning sign requirements
- Pre-planning and rescue planning
- Requirements for periodic program reviews

Regulations Incorporated Through 10 CFR 851, Worker Safety and Health Program:

- [29 CFR 1910.146, *Permit-Required Confined Spaces*](#)
- [29 CFR 1926.1200, Subpart AA, *Confined Spaces in Construction*](#)

ELECTRICAL SAFETY

Two OSHA standards require an electrical safety program to protect employees from electrical hazards, both of which apply to the Hanford Site: [29 CFR 1910, Subpart S, Electrical](#), covers work in general industry, and [29 CFR 1926, Subpart K, Electrical](#), applies to construction work OSHA requires the establishment of an electrical safety program to protect employees from electrical hazards in the workplace. Key elements of the OSHA program are:

- Employee technical and safety training
- Installation and maintenance of approved electrical equipment and related devices

In general, employees whose work requires exposure to energized electrical conductors must be adequately trained to recognize specific electrical hazards and be qualified to implement the methods and procedures that prevent shock, arc flash, and explosion. In addition, [NFPA 70E, Electrical Safety in the Workplace®](#), also establishes requirements that must be followed on the Hanford Site.

Therefore, Hanford contractors fulfill OSHA and NFPA electrical safety requirements through implementing [DOE-0359, Hanford Site Electrical Safety Program](#).

DOE-0359 describes the Hanford Site requirements for the following:

- Electrical Safety Training and Qualifications Requirements for: Non-Electrical Workers, Instrument Specialists, Electricians, Electrical Supervisors/Foremen, National Electrical Code Inspectors, , higher risk non-electrical workers, and all personnel working near energized overhead power lines
- Electrical Equipment Listing, Labeling, and Approval Requirements
- Electrical Safe Work Practices
- Ground Fault Circuit Interrupters (GFCI)
- Assured Equipment Grounding
- Cord and Plug Connected Equipment and Flexible Cord Sets for Maintenance, Construction, and Demolition Activities
- Use of Extension Cords and Multiple Outlet Power Strips

The primary electrical hazard control is to de-energize conductors and circuit parts to the extent possible and put into an electrically safe work condition in accordance with [DOE-0336, Hanford Site Lockout/Tagout Procedure \(LOTO\)](#).

All other electrical work (except when the employer can demonstrate that the task presents a greater hazard or is infeasible) requires an Energized Electrical Work Permit (EEWP).

EEWP work can include but is not limited to working within either of the following:

- Restricted Approach Boundary
- Arc Flash Protection Boundary.

Regulations Incorporated Through 10 CFR 851, Worker Safety and Health Program

- [29 CFR 1910, Subpart S, Electrical](#)
- [29 CFR 1926, Subpart K, Electrical](#)
- [NFPA 70E, Electrical Safety in the Workplace®](#)

FALL PROTECTION

Two OSHA standards require employers to prevent falls, both of which apply to the Hanford Site. [29 CFR 1910.23, Subpart D, Walking-Working Surfaces](#), requires fall protection in general industry whenever an employee has the potential to fall 4 feet or more. [29 CFR 1926, Subpart M, Fall Protection](#), requires fall protection in construction whenever an employee has the potential to fall 6 feet or more. .

Fall Protection is designed to mitigate the specific fall hazards an employee may encounter. Protection is provided via one or a combination of the following methods:

- Guardrails
- Handrails
- Personal Fall Arrest Systems
- Personal Fall Restraint Systems
- Warning Lines
- Safety Monitoring Systems
- Administrative Controls

Hanford contractors fulfill OSHA fall protection requirements through implementing [DOE-0346, Hanford Site Fall Protection Program](#). DOE-0346 describes fall protection methods including, but not limited to, the following specific work situations:

- Leading Edge Work
- Working near Excavations
- Roofing Work and Roof Access
- Aerial Lifts
- Crane Suspended Personnel Lift Platforms

Regulations Incorporated Through 10 CFR 851, Worker Safety and Health Program:

- [29 CFR 1926, Subpart M, Fall Protection](#)
- [29 CFR 1910.23, Subpart D, Walking-Working Surfaces](#)

FIRE SAFETY

OSHA requires employers to maintain a workplace fire safety program in [29 CFR 1910, Subpart L, Fire Protection](#). In addition, DOE has adopted National Fire Protection Association ([NFPA 101, Life Safety Code](#)[®]). 29 CFR 1910, Subpart L, focuses on employee safety, and NFPA 101 focuses on employee safety and property protection.

OSHA requires:

- Exit doors must not be blocked or locked
- Exit routes must be kept clear and unobstructed
- Workplace buildings must have extinguishers per NFPA 101
- Emergency evacuation plans must be in writing
- Once the fire has been reported, if employees are willing and trained to use the extinguisher, they may choose to fight the fire and must be trained in its use
- Written evacuation plans are required

All current occupied buildings and new construction at the Hanford Site are also required to comply with NFPA 101. Buildings within the city of Richland may have to comply with additional city codes.

To ensure compliance with the NFPA 101 and OSHA requirements:

- Periodic inspections are conducted to verify compliance
- Scheduled preventive maintenance is performed on fire alarms, fire suppression systems, exit doors
- Code deficiencies are prioritized, tracked, and corrected

Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)

- [29 CFR 1910, Subpart L, Fire Protection](#)
- [NFPA 101, Life Safety Code](#)

HAZARDOUS ENERGY CONTROL

[29 CFR 1910.147, Control of Hazardous Energy](#), requires a hazardous energy control program while employees are servicing and/or conducting maintenance on machines and equipment. The program is required if:

“. . . the unexpected startup of machines or equipment, or release of stored energy, could harm employees.”

OSHA requires employers to implement an energy control procedure that describes:

- Steps for shutting down, isolating, blocking, and securing to control hazardous energy
- Placement, removal, and transfer of lockout devices
- Testing a machine or equipment to determine and verify the effectiveness of lockout methods
- Periodic Inspections criteria
- Training and communication

Hanford contractors fulfill OSHA hazardous energy control requirements through implementing [DOE-0336, Hanford Site Lockout/Tagout Procedure \(LOTO\)](#). DOE-0336 describes the following two energy control methods for ensuring equipment is de-energized before performing servicing or maintenance:

- **Eight Criteria Method.** The eight-criteria process (used for most lockouts) allows Authorized Workers to lock out equipment having a single energy device that can be readily identified, when **all** eight criteria listed below are met:
 1. The equipment has no potential for stored or residual energy or re-accumulation of stored energy after shutdown, which could endanger workers.
 2. The equipment has a single energy source that can be readily identified and isolated.
 3. The isolation and locking out of that energy source will completely de-energize and deactivate the equipment.
 4. The equipment is isolated from that energy source and locked out during servicing and/or maintenance.
 5. A single lockout device will achieve a locked out condition.
 6. The lockout device is under the exclusive control of the Authorized Worker performing the servicing and/or maintenance.
 7. The servicing and/or maintenance does not create hazards for other workers.
 8. There has been no incident or deficiency involving the use of this exception for the machine or equipment pending correction or resolution by the responsible Controlling Organization or contractor employer.
- **Tagout Authorization Form.** The TAF process allows facility-designated Controlling Organization administrators to clearly and specifically outline the scope, purpose, authorization, rules, and techniques used to control hazardous energy through lockout/tagout.

Regulations Incorporated Through 10 CFR 851, Worker Safety and Health Program

- [29 CFR 1910.147, Control of Hazardous Energy](#)
- [NFPA 70E, Standard for Electrical Safety in the Workplace](#)

HEARING CONSERVATION

OSHA requires employers to implement a Hearing Conservation Program where workers are exposed at or above the action level (AL) of 85 dBA, which is a time weighted average (TWA) noise level over an 8-hour work shift. This also equates to the occupational exposure limit used by Hanford contractors required to comply with the more conservative American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV). Hanford contractors have company-specific programs for this hazard.

Exposure Limits and Controls

ACGIH TLV TWA -8 hr	OSHA AL TWA-8 hr
85 dBA	85 dBA

If noise exposures are greater than the AL, the OSHA requirements for employer Hearing Conservation Programs include:

- Noise level measurements
- Annual hearing exams
- Hearing protection
- Training
- Hearing protector evaluations

These requirements are applicable unless changes to tools, equipment, and schedules are made so that they are less noisy and worker exposure to noise is less than the 85 dBA.

Regulations Incorporated Through 10 CFR 851, Worker Safety and Health Program

- [29 CFR 1910.95, Occupational Noise Exposure](#)
- [29 CFR 1926.52, Occupational Noise Exposure](#)
- *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*

HEXAVALENT CHROMIUM

OSHA's Chromium (VI) Standard covers chromium (VI) in all forms and compounds, except exposure during pesticide application and use of Portland cement. The standard establishes maximum limits of exposure to chromium (VI) for all workers covered, including a permissible exposure limit (PEL) and action level (AL).

However, the standard does not apply if the employer has objective data demonstrating the material, process, or activity cannot release dusts, fumes, or mists of chromium (VI) in concentrations at or above $0.5 \mu\text{g}/\text{m}^3$ as an 8-hour time weighted average (TWA) under any expected conditions of use.

Hanford contractors have company-specific programs for this hazard. Other regulatory requirements (e.g., Environmental Protection Agency (EPA) and Washington Administrative Code (WAC)) may apply depending on the nature of the work and the potential for contaminating the environment (i.e., air, water, soil).

Exposure Limits and Controls

Exposure Limit	Control
General	<ul style="list-style-type: none">• Exposure determination (Monitoring or Performance-oriented), Records• Training & Hazard communication• Housekeeping
\geq OSHA AL $2.5 \mu\text{g}/\text{m}^3$	<ul style="list-style-type: none">• Periodic monitoring – \leq 6 months• Medical surveillance• Regulated areas (general industry activities only)• Engineering, work practices, respirators
\geq OSHA PEL $5 \mu\text{g}/\text{m}^3$	<ul style="list-style-type: none">• Periodic monitoring – \leq 3 months• Medical surveillance• Regulated areas (general industry activities only)• Engineering, work practices, respirators
Skin/Eye	<ul style="list-style-type: none">• Personal Protective Equipment (PPE)• Hygiene areas and practices

Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)

- [29 CFR 1910.1026, Chromium \(VI\)](#)
- [29 CFR 1926.1126, Chromium \(VI\)](#)

**Some other WAC and EPA codes may apply.*

HOISTING AND RIGGING

OSHA requires employers to maintain, service, and operate hoisting and rigging equipment in compliance with manufacturer's requirements, OSHA standards, and American Society of Mechanical Engineers (ASME) B30 standards. These practices include, but are not limited to:

- Inspection requirements: Pre-operational, initial, frequent, and periodic
- Maintenance requirements and out-of-service criteria
- Equipment-specific on-the-job training and evaluation to ensure operators are qualified
- Safe working practices, such as calculating loads, ensuring adequate load capacity, maintaining distance from power lines, and properly securing loads

OSHA establishes requirements for rigging equipment, such as wire rope and slings, and requires that employers provide appropriate hardware and lifting attachments.

Hanford Site contractors comply with requirements described in the [Hanford Site Hoisting and Rigging Manual, DOE- RL-92-36](#). This manual is comprehensive and includes procedures and specifications for all hoisting and rigging operations, including:

- Personnel qualifications and training requirements
- Crane hooks
- Forklift Trucks
- Shop Cranes
- Wire Rope
- Slings
- Rigging hardware
- Below-the-Hook Lifting Devices
- Hoists, Jib Cranes, and Monorail Systems
- Overhead and Gantry Cranes
- Mobile Cranes
- Personnel Lifting
- A-Frames and Trolleys
- Critical and Special Lifts

Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#):

- [29 CFR 1910.178, Powered Industrial Trucks](#)
- [29 CFR 1910.179, Overhead and Gantry Cranes](#)
- [29 CFR 1910.180, Crawler Locomotive and Truck Cranes](#)
- [29 CFR 1910.184, Slings](#)
- [29 CFR 1926.251, Rigging Equipment for Material Handling](#)
- [29 CFR 1926.1400, Subpart CC, Cranes and Derricks in Construction](#)

LEAD

OSHA's Lead Standard covers lead in a variety of forms, including metallic lead, all inorganic lead compounds, and organic lead soaps. . Hanford contractors have company-specific programs for this hazard. Other regulatory requirements (e.g., EPA, State) may apply depending on the nature of the work and the potential for contaminating the environment (i.e., air, water, soil).

The OSHA Lead standard requires a worker protection program for employees exposed to lead above the PEL that should include:

- Hazard determination, including exposure assessment
- Medical surveillance and provisions for medical removal
- Job-specific compliance programs
- Engineering and work practice controls
- Respiratory protection
- Protective clothing and equipment
- Housekeeping
- Hygiene facilities and practices
- Signs
- Employee information and training
- Recordkeeping

Exposure Limits and Controls

OSHA PEL-8 hr	OSHA AL
50 $\mu\text{g}/\text{m}^3$	30 $\mu\text{g}/\text{m}^3$

Until the employer performs an exposure assessment and documents that employees are not exposed above the PEL, OSHA requires some degree of interim protection for employees. Measures required by the standard include providing respiratory protection, protective work clothing and equipment, hygiene facilities, biological monitoring, and training for certain tasks prone to produce high exposure.

Employers must make available, at no cost to the employee, initial medical surveillance for employees exposed to lead on the job at or above the action level on any one day per year. . In addition, a medical surveillance program with biological monitoring must be made available to any employee exposed at or above the action level for more than 30 days in any consecutive 12 months. If the initial assessment indicates that no employee is exposed above the AL, the employer may discontinue monitoring. Further exposure testing is not required unless there is a change in processes or controls that may result in additional employees being exposed to lead at or above the AL or PEL.

If lead exposures are expected to meet or exceed the AL, then training and medical surveillance are required for Lead Workers. Exposure controls (engineering, administrative, and/or PPE) would be put in place if exposures are expected to meet or exceed the PEL. Examples of controls include: HEPA vacuums, wet methods, distancing employees from operations, chemical removal instead of hand scraping, replacement of lead-based painted components, brushing/rolling paint instead of spraying, substituting other coatings for lead-based coatings, mobile hydraulic shears for cutting instead of torch cutting, and encapsulating lead surfaces.

*Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)**

- [29 CFR 1910.1025, Lead](#)
- [29 CFR 1926.62, Lead](#)

*Some other WAC and EPA codes may apply

PORTABLE HAND TOOLS

Portable hand tools can be hazardous when used improperly. OSHA requires precautions be taken when using portable hand tools. Additional requirements are documented in [Hanford Site Electrical Safety Program, DOE-0359](#).

Each employer is responsible for the safe condition of tools and equipment used by employees. These include, but are not limited to:

- Non-powered hand tools
- Powered hand tools
- Powered abrasive wheels
- Powder actuated tools
- Hydraulic power tools
- Jacks
- Compressed air
- Wrenches, hammers, screw drivers, chisels, etc.

Hanford contractors have company-specific programs to address hand and power tool requirements including:

- Tool inspection
- Tool storage
- Tool guarding
- Personal protection (safety glasses, hearing protection, shoes, and apparel)

The following general precautions should be observed by power tool users:

- Never carry a tool by the cord or hose
- Never yank the cord or the hose to disconnect it from the receptacle
- Keep cords and hoses away from heat, oil, and sharp edges
- Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits, and cutters
- All observers should be kept at a safe distance away from the work area
- Secure work with clamps or a vise, freeing both hands to operate the tool
- Avoid accidental starting
- Tools should be maintained with care
- Follow instructions in the user's manual
- Maintain good footing and good balance
- Wear proper apparel (no loose clothing, jewelry)
- Remove damaged tools from service and tag the tool appropriately
- Never remove or bypass a guard
- Store electrically-powered tools in a dry place

Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)

- [29 CFR 1910, Subpart P, Hand and Powered Tools](#)
- [29 CFR 1926 Subpart I, Tools – Hand and Power](#)

RADIATION

[10 CFR 835, Occupational Radiation Protection](#), establishes radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of DOE activities. Each contractor develops a Radiation Protection Program Plan (RPP) applicable to their contract scope. The RPP is organized to maintain compliance with the provisions of 10 CFR 835. A *Radiological Control Manual* is then used to promulgate program policy and requirements established within the RPP.

The contractor's RPP contains information under the following topics for controlling contamination/radiation levels and for monitoring employees exposed to radiation:

- Makeup of the Radiological Control organization
- Exposure limits to workers, the public, and embryo/fetus
- Contamination control
- Posting of areas
- Entry and exit requirements
- Radiological work controls
- Radioactive material identification, storage, and control
- Release and transportation of radioactive material
- Radioactive source control
- External and internal dosimetry
- Respiratory protection
- Monitoring and surveys
- Instrumentation and calibration
- General employee, radiation worker, and RCT training
- Radiological records

The (ALARA) As-Low-As-Reasonably-Achievable process is a fundamental principle of reducing radiological releases and radiation exposures. Reducing radiological releases and radiation exposures improves the quality of the workplace and the environment, the protection of the public, and in the long run saves resources.

Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)

- [10 CFR 835, Occupational Radiation Protection](#)

RESPIRATORY PROTECTION

[29 CFR 1910.134, Respiratory Protection](#) establishes the permissible practices and program requirements. [DOE-0352, Hanford Site Respiratory Protection Program \(HSRPP\)](#), provides the comprehensive process for all aspects of respirator use at Hanford. Contractors are required to implement [DOE-0352](#). Contractors have company-specific implementing programs describing their process.

[29 CFR 1910.134, Respiratory Protection](#), and [DOE-0352](#) address the following summarized requirements:

- Respirator selection
- Medical evaluations
- Fit testing
- Proper use for routine and emergency situations
- Cleaning, storing, inspection and maintenance
- Breathing air quality
- Training
- Voluntary respirator use
- Evaluation of program effectiveness
- Recordkeeping

Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)

- [29 CFR 1910.134, Respiratory Protection](#)

SCAFFOLDING

Scaffold safety is directly addressed in [29 CFR 1910.28, *Walking-Working Surfaces*](#), for general industry, and [29 CFR 1926, Subpart L, *Scaffolds*](#), for construction. The standards give specific requirements for:

- Load maximums
- Bracing
- Planking
- Guardrails
- Footings
- Safe access and egress
- Pre-use inspections
- Erector and user training

Hanford Site contractors comply with requirements described in [MSA-PRO-WP-095, *Scaffolding*](#), which describes:

- Training for supervisors, crew leaders, and scaffold users (by a Qualified Person)
- Competent person inspection requirements
- Correct and safe work practices while on scaffolding
- Adequate bases for scaffolds, (base plates, adequate sills), planking, and guardrails
- Scaffold inspection tagging requirements
- Use of manual lifting devices or other specialized scaffolding mechanisms

[MSA-PRO-WP-095](#) also establishes guidelines for safely erecting, inspecting, and dismantling scaffold equipment.

Regulations Incorporated Through [10 CFR 851, *Worker Safety and Health Program*](#)

- [29 CFR 1910.28, *Walking-Working Surfaces*](#)
- [29 CFR 1926, Subpart L, *Scaffolds*](#)

SOLVENTS AND ORGANIC COMPOUNDS

Many materials used at Hanford contain solvents. Some of the hazardous waste clean-up work at Hanford involves removing solvent contamination from the soil and ground water from historical spills. Hanford contractors have company specific programs for this hazard. Examples of solvents, organic compounds and mixtures of include, but are not limited to:

- | | | |
|------------------------|-------------------------|---------------------|
| ➤ Alcohols | ➤ Methyl ethyl ketone | ➤ Toluene |
| ➤ Benzene | ➤ Methylene chloride | ➤ Trichloroethylene |
| ➤ Carbon tetrachloride | ➤ Petroleum distillates | ➤ Turpentine |
| ➤ Gasoline | ➤ Styrene | ➤ Varnish |
| ➤ Isocyanates | ➤ Lacquer | ➤ Xylene |
| ➤ Kerosene | ➤ Mineral Spirits | |

Health Effects

Some examples of health hazards associated with exposure to solvents include damage, including some cancers, to the following systems/organs:

- | | | |
|----------|-----------------------|----------------------|
| ➤ Kidney | ➤ Nervous system | ➤ Respiratory system |
| ➤ Liver | ➤ Reproductive system | ➤ Skin |

Exposure Limits and Control

Exposure limits have been established for over 100 solvents/organic compounds, including those most commonly used. The limits vary for each solvent or organic compound.

If monitoring results indicate an exposure limit has been exceeded, or exceeding the exposure limit is anticipated, various control measures must be implemented to reduce the exposure below the exposure limit. As with the exposure limits, the corresponding . control measures will vary depending upon the unique characteristic(s) of the solvent or organic compound.

Some solvent exposures will require medical surveillance, particularly carcinogens. Compliance with the Hazard Communication standard is required for working with solvents.

Regulations driven by [10 CFR 851, Worker Safety and Health Program](#)*

- [29 CFR 1910, Subpart Z, Toxic and Hazardous Substances](#)
- [29 CFR 1910.120, Hazardous Waste Operations and Emergence Response](#)
- [29 CFR 1910.1200, Hazard Communication](#)
- *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices (2005)*

**Some other WAC and EPA codes may apply. Equivalent OSHA Construction Standards may apply, but are not listed due to space considerations.*

STOP WORK

[DOE-0343, Hanford Stop Work Procedure](#), ensures that all employees are given the responsibility and authority to stop work when employees believe that a situation exists that could lead to one or more of the following results:

- Place them, their coworker(s), contracted personnel, or the public at risk or in danger
- Adversely affect the safe operation or cause damage to the facility
- Release radiological or chemical effluents to the environment above regulatory requirements or approvals

In addition, [DOE-0343](#) provides a method to resolve the issue.

Maintaining a diligent questioning attitude is vital to safe execution of work-scope and is a cornerstone to effective Conduct of Operations and Integrated Safety Management.

- [DOE-0343, Hanford Site Stop Work Procedure](#)

TEMPERATURE EXTREMES

Hanford contractors use the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for evaluating heat and cold exposure hazards. Hanford contractors have company specific programs for this hazard.

Heat: Health Effects

Heat strain usually includes increased core body temperature, increased heart rate or sweating. Heat exhaustion and heat stroke are severe health effects from over exposure to heat.

Heat exhaustion is recognized by profuse sweating, weakness, rapid pulse, dizziness, nausea, and headache. The skin is cool and sometimes pale and clammy with sweat. Body temperature is normal or subnormal, and nausea, vomiting, and unconsciousness may occur.

Heat stroke is a life-threatening heat disorder characterized by diminished or absent sweating. The skin is hot, dry, and flushed. Increased core body temperature may lead to delirium, convulsions, coma, and even death.

Heat: Exposure Limits and Controls

For heat, TLV exposure limits incorporate work exertion level, non-cooling clothing/equipment, and wet bulb globe thermometer (WBGT) temperatures. Exposure controls include engineering (air conditioning the work area), administrative (work/rest regimens, changing to night shifts), and cooling PPE (light weight coveralls, brimmed hats, cooling devices). There are some work conditions that may require employees to be medically evaluated to work in a hot environment. Heat stress awareness and training for work in hot environments is an important part of heat stress control at Hanford.

Cold: Health Effects

Experts have found that fatal exposures to cold (e.g., lowered deep body temperature) have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water.

Frostbite can affect extremities (e.g., ears, nose, fingers, toes). The signs for frostbite include whitening of the skin surface. Numbness, tingling, itching, or a burning sensation can also indicate other cold temperature disorders.

Hypothermia is when the body has a dangerously low core temperature. Uncontrollable shivering, decreased mental coherence, slurred speech, memory lapses, drowsiness, exhaustion, slow or irregular heartbeat, weak pulse, and blood pressure changes are signs of hypothermia.

TEMPERATURE EXTREMES (continued)

Cold: Exposure Limits and Controls

For cold, TLVs also incorporate environmental factors and clothing. Environmental factors affecting the severity of cold exposure include temperature, wetness, and wind chill. Additional factors include length of exposure, type of clothing, amount of exposed skin, and body movement. Because of Hanford's climatic conditions and the nature of the work activities, the primary focus on site is the prevention of cold injury to body extremities, e.g., frostbite. Working in a buddy system and/or having communication devices aid in avoiding these types of injuries. .

Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)

- *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices (2016)*

VEHICLE SAFETY

Washington State traffic and vehicle codes are applicable on the Hanford Site. These include traffic laws, rules, standards, and best practices for cities and counties, see Revised Code of Washington (RCW), Motor Vehicles, 46.08.030 (as adopted by Benton County through Ordinance).

All signage, signaling, and flagging must comply with the Manual on Uniform Traffic Control Devices.

State Law requires:

- Mandatory seat belt use in all vehicles
- Strict enforcement of speed limits, stop signs, and detour requirements
- Possession of a valid driver's license
- Drivers do not use cell phones
- Adherence to parking signage that meets Americans with Disabilities Act requirements
- Controlled substances and alcohol use testing apply to every driver

Enforcement:

- The Benton County Sheriff's Department patrols Hanford roads and parking lots enforcing posted speed limit signs and parking requirements
- The Sheriff's Department can issue citations
- Benton County fines and disciplinary actions apply

Department of Transportation (DOT) requirements apply for all commercial motor vehicle (CMV) drivers (teamsters).

Commercial drivers on the Hanford site must:

- Have a valid driver's license and a Commercial Driver's License (CDL)
- Be 21 years of age
- Read and speak the English language
- Be physically qualified to drive a commercial motor vehicle
- Maintain his/her qualifications
- Be trained on the vehicle he/she operates and the requirements associated with the load (e.g., Hazardous Substances)

Hanford contractors use GSA vehicles which are on a required preventive maintenance schedule. Regular oil changes, brake and light inspection and replacement, when needed, are fundamental parts of this program.

Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)

- [Revised Code of Washington \(RCW\), Motor Vehicles, 46.08.030](#)
(as adopted by Benton County through Ordinance)

WALKING/WORKING SURFACES

OSHA requires employers provide walking/working surfaces that meet specified engineering and administrative control requirements. Identified below are the walking/working surfaces OSHA addresses in [29 CFR 1910, Subpart D, Walking-Working Surfaces](#):

- Protection for floor openings
- Housekeeping
- Protection for wall openings and holes
- Stairway railings and guards
- Railings, toe boards, and cover specifications
- Fixed stairs
- Portable wood ladders
- Portable metal ladders
- General requirements for scaffolds
- Manually propelled mobile ladder stands and scaffolds
- Fixed ladders
- Other walking working surfaces

Hanford contractors have company specific programs that implement OSHA's Walking/Working Surfaces requirements.

[DOE-0346, Hanford Site Fall Protection Program](#), addresses potential fall hazards described in the standard. These include:

- Guarding of floor openings
- Protection for wall openings and holes
- Protection from open-sided floors
- Stairway railings and guards
- Walkway Railings required at a height of 4 feet
- Aerial lift railing requirements
- Personal fall protection equipment requirements when guardrails are not feasible

Other walking/working surface requirements are addressed in Hanford contractor procedures. These include:

- Portable ladders
- Requirements for scaffolds
- Fixed ladders
- Housekeeping

Use of ladders, scaffold erection, use and inspection, in contractor procedures, require users be trained to specific performance requirements. Competency must be demonstrated, for example, before an individual can erect a scaffold for use on a worksite.

Use of portable ladders, by most site contractors, requires the completion of a ladder-user safety course. Users are trained to inspect ladders for deficiencies, how to use a ladder safely, and how to avoid accidents associated with ladder misuse.

Regulations Incorporated Through [10 CFR 851, Worker Safety and Health Program](#)

- [29 CFR 1910, Subpart D, Walking-Working Surfaces](#)