An Overview of the Voluntary Consensus Standard:

Control of Hazardous Energy – Lockout, Tagout, and Alternative Methods

AMERICAN SOCIETY OF SAFETY PROFESSIONALS
STANDARDS

Technical Brief for ANSI/ASSP Z244.1-2024

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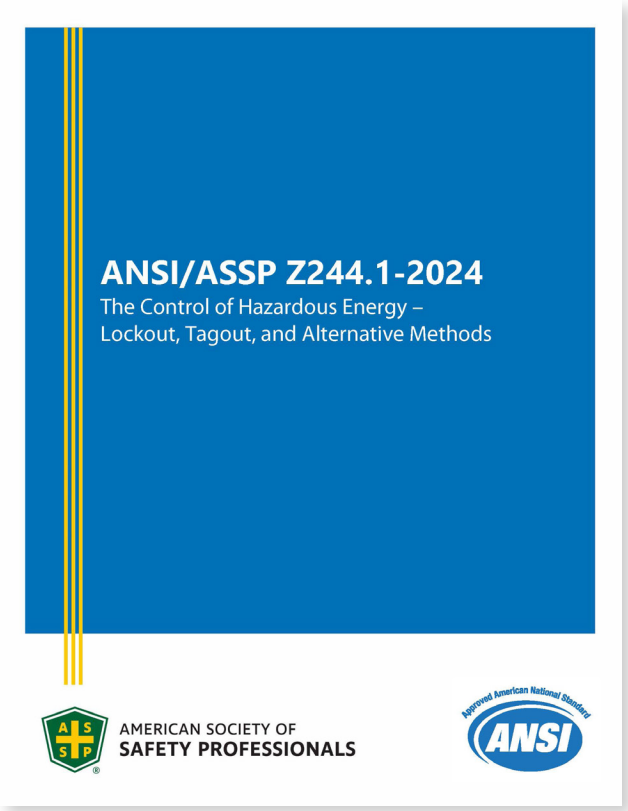
Background and Introduction

ANSI/ASSP Z244.1-2024 Background Materials

Since the release of the revision of the Z244.1 standard in 2024, there continues to be significant interest from ASSP members and EHS professionals in the standard and lockout/tagout (LOTO). LOTO-related hazards and exposures are addressed by EHS professionals in many industries on an almost daily basis. Incidents related to the release of hazardous energy continue to be a significant cause of fatalities, injuries, and citations.

Due to these inquiries for information about the standard, we have put together a guide to the Z244.1 standard.



Introduction

This standard provides guidance regarding:

- Responsibilities of the principal parties involved in hazardous energy control (section 4);
- Hazardous energy control methods (section 5);
- Hazardous energy control program necessary for employee protection (section 6);
- Design of machines/equipment/processes for the control of hazardous energy (section 7);
- Isolation of hazardous energy (section 8);
- Alternative methods of hazardous energy control (section 9); and
- Other applications (section 10)

The standard provides flexibility for methodologies used to control hazardous energy. Lockout isolates energy, while alternative methods control it. Use LOTO when appropriate—don't wait for OSHA—and reference standards B11.0, B11.19, and B11.26. When applied, alternative methods are equivalent to LOTO for the control of hazardous energy when based on a risk assessment and the hazard control hierarchy (see Section 9.1.2).

Past Versions of the Standard

Z244.1 has a long and significant history of addressing hazardous energy risks and exposures. Below is a short rendition of the publication history for the standard:

- ANSI/ASSP Z244.1-2016 (R2020)
- ANSI/ASSP Z244.1-2016
- ANSI/ASSE Z244.1-2003 (R2008)
- ANSI/ASSE Z244.1-2003
- Z244.1-1993 (Reaffirmed)
- Z244.1-1982
- NSC B199-1970 also listed as Z244.1-1970

Z244.1-2024 was approved as a revised an American National Standard by ANSI on November 26, 2024.

Foreword

History

In March 1973, the Z244 standards committee held its first organizational meeting in New York to develop a standard on lockout/tagout. The National Safety Council functioned as the initial secretariat and provided a draft document "Guidelines for a Lockout Program" dated November 1971 that was used as a reference for the committee's deliberations. In March 1982, the first American National Standard for Personnel Protection - Lockout/Tagout of Energy Sources - Minimum Safety Requirements Z244.1 was published.

The next revision of the standard was published in 2004 by the new secretariat, the American Society of Safety Engineers (now known as American Society of Safety Professionals). The standard more effectively addressed the need for greater flexibility through the use of alternative methods based on risk assessment and application of the hazard control hierarchy. In addition, the standard emphasized management's responsibility for protection of personnel against the release of hazardous energy.

December 2016 saw the next revision of the Z244.1 standard. Major changes occurred in section 8 "Alternative Methods of Hazardous Energy Control" and in the appendices. Of extreme significance was the addition of section 8.2 "Evaluating Alternative Methods" and the supporting appendices found in L through V.

In July 2023, the committee convened to update this edition of the standard.

Significant Changes Include:

- Elevating alternative methods to be a co-equal choice with LOTO for the control of hazardous energy
- Updated definitions
- Added a new Section 5 on Hazardous Energy Control Methods
- Partially reorganized the document content
- Updated the flow chart in Figure 1
- Addressed cybersecurity aspects
- Added content for mobile applications
- Modified text to become group energy control and complex energy control
- Added requirements for piping systems
- Updated requirements for alternative methods in Section 9
- Added content on feasible risk reduction
- Added content on fault annunciation
- Added new content on zoned or partitioned machines or equipment
- Developed new content for energy control for processes
- Updated the appendices

Need for a Standard

Despite substantial efforts by employers, unions, trade associations, and government during the past 50 years, the annual toll of injury and death related to hazardous energy release incidents remains unacceptable. We now know that all forms of energy must be addressed; that operational personnel are injured as often as maintenance workers; that often thermal and gravitational forces and trapped materials under pressure are overlooked; that complex equipment and processes frequently demand unique approaches to energy isolation or control; and that employers need to commit resources and substantial effort in planning, training, procedure development, and infrastructure before lockout/tagout application ever occurs.

The rapid growth of technology continues to require different methods and techniques for reducing risks to workers from the unexpected release of hazardous energy. Each business sector is actively changing the way traditional work is done, which then requires employers to develop new equally effective responses for hazardous energy control. Protective standards need to be improved continually to provide guidance for current conditions as well as evolving technical developments. Advanced control systems provide new opportunities for addressing energy control where conventional lockout is not feasible, where energy is required to perform a task, where repetitive cycling of an energy-isolating device increases risk, and where energy is required to maintain equipment in a safe state, etc.

Standard Perspective

The content of this standard was approached from a business and industry perspective. However, the principles, methods, and guidance are applicable to a variety of other settings and circumstances where unexpected release of hazardous energy can occur. The procedures, techniques, methods, and design guidance contained in this standard are recommended for use by all those whose activities fall within their scope and purpose.

The standard recognizes that zero risk is only a theoretical possibility but is not an operative reality—zero risk does not exist. The concept of feasible risk reduction to achieve acceptable or tolerable risk is emphasized whether using conventional lockout, tagout, or alternative methods. With regard to hazardous energy control, the term “safe” suggests the absence of risk. More accurately, “safe” should be viewed as the acceptability of risk to those who may be exposed. There are numerous terms that reflect the circumstances under which servicing and maintenance are done routinely today. Terms such as AFARP (as far as reasonably practical), ALARA (as low as reasonably achievable), or ALARP (as low as reasonably practicable) convey a more realistic approach to risk reduction, and particularly the use of alternative methods.

The Z244 standards committee and the secretariat have made a concerted effort to produce a standard that represents the best practice regarding the control of hazardous energy. All circumstances or situations where personnel are exposed to unexpected energy release may not have been anticipated and adequately addressed with respect to the standard’s content. New developments are expected, and revisions of the standard will be necessary as advancements continue, and more experience is gained. However, uniform requirements are needed and the standard in its present form provides performance requirements that are necessary when developing and implementing a system for protecting personnel from the unexpected release of hazardous energy.

Current Status

With the increased use of risk assessment and advancing technologies, there are now conflicting views on the requirements for how and when to control hazardous energy. The current requirements for the control of hazardous energy appear in 29 CFR 1910.147 under OSHA, and in this American National Standard ANSI/ASSP Z244.1. A thorough discussion of the similarities and differences between OSHA 29 CFR 1910.147 and the ANSI/ASSP Z244.1 standard can be found in other documents (see Bibliography).

There is no disagreement on the basic principle that workers should be protected from the unexpected startup or release of hazardous energy. There continues to be disagreements over how, when, and which requirements apply. The committee concentrated on how to control hazardous energy using methods based on current knowledge. The committee discussions focused on what was the right thing to do given current technology and industry best practices to protect workers from harm due to the unexpected release of hazardous energy.

This revised standard presents distinct requirements for controlling hazardous energy through three different approaches: lockout, tagout, and alternative methods. Alternative methods and risk assessment have received additional attention to emphasize their importance in the energy control process. The revision better clarifies the necessary elements for a policy, program, and procedures for controlling hazardous energy. The intent of the committee has been to write a standard that enables readers to effectively control hazardous energy based on current knowledge.

The Service and Maintenance Construct

With the 2016 Z244.1 standard, the committee has rejected the normal production operations versus service and maintenance construct as an artificial distinction without real world application. More specifically, the committee realized that work gets done based upon the tasks to be performed without regard to a characterization of whether the task is normal production operations, service, or maintenance. Hazards associated with the unexpected release of hazardous energy need to be addressed, regardless of any labels or characterization attached to them.

Alternative Methods

The committee developed updated requirements for alternative methods for hazardous energy control. New requirements were written, and new guidance was provided to assist readers to determine when lockout is required and when an alternative method may be used. Text was also developed that describes the parameters for what constitutes acceptable alternative methods.

The committee believes the new ANSI/ASSP Z244.1-2024 provides greater clarity and direction to companies seeking to control the release of hazardous energy. In particular, better guidance is provided for if, when, and how alternative methods may be used to provide effective protection. These improvements should enable companies to use modern technology and innovative solutions to improve the safety and productivity of operations in the workplace.

Scope and Purpose

1.1 Scope

This standard establishes requirements for machines, equipment, and processes in which the unexpected energization or start-up of the machines or equipment, release of stored energy, or the actions of persons could result in harm to personnel. The standard specifies the use of lockout, tagout or alternative methods to control hazardous energy associated with machines, equipment, or processes.

This standard applies to activities such as erecting, installing, constructing, repairing, adjusting, inspecting, unjamming, set-up, testing, troubleshooting, cleaning, dismantling, servicing and maintaining machines, equipment, or processes.

Note: Different organizations characterize the above tasks as servicing, maintenance, or operations. Each organization should evaluate how best to control hazardous energy for tasks that are performed.

This standard does not apply to work completed on cord and plug connected electric equipment for which electricity is the single source of energy; it is solely controlled by the unplugging of the equipment from the energy source; and by the plug being under the exclusive control of the person.

This standard does not apply to hot tap operations involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products when they are performed on pressurized pipelines.

This standard does not apply to standard passenger vehicles, personal pleasure boats, private aircraft, or recreational/sport type vehicles.

This standard does not apply to construction and demolition operations as covered in ANSI/ASSP A10.44.

1.2 Purpose

The purpose of this standard is to establish requirements that protect personnel where harm can occur as a result of the unexpected release of hazardous energy.

This document is a performance standard and, as such, is not intended to limit or restrict the use of other existing specific standards, procedures, or regulations that meet the performance objectives defined in this standard and provide an acceptable level of personal protection from exposure to hazardous energy.

Deviations from the requirements of this standard shall be based on a documented risk assessment.

Note: Deviating from the requirements of this document should be considered only when it is not feasible to apply the requirements.

1.3 Application Exceptions

The presence of an energy source alone does not by itself warrant the need for energy control. The risk assessment process shall determine which energy sources are considered hazardous for each task.

Energy sources that do not present a hazard, or exposure to the hazard, do not require control of hazardous energies.

Note 1: An electrical shock example includes voltages with electromotive force rated at less than 50V nominal line to line AC, or less than 30V DC to ground, and limited to 5 amperes.

Note 2: Energy sources that help prevent the hazardous release of energy for the performance of a task do not require control of hazardous energies or alternative methods. An example includes a counterbalance on a press during a die change.

Certain tasks require partial (or full) energization to perform the task. Additional tasks shall not be performed on the machine, equipment, or process if partial energization is not required for those other tasks.

Note 3: The scope of work should not be allowed to creep to include tasks beyond the scope of the chosen method of hazardous energy control. Certain diagnostic activities may require power, but the scope of activities should not expand to include repair activities that can be performed without power.

Hazardous energy isolation is not required for activities where energy is necessary to perform a task and other risk reduction measures to protect personnel allow the task to be completed with acceptable risk.

Our standards promote recognized best practices that prevent worker injuries, illnesses and fatalities.

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Resources

Controlling hazardous energy through lockout, tagout, and alternative methods is essential for protecting workers from serious injuries or fatalities during the servicing and maintenance of machines and equipment. Failure to properly control hazardous energy is a leading cause of workplace accidents. The following is a collection of resources providing background information and guidance on effective lockout/tagout procedures and alternative methods to ensure worker safety.

OSHA-Related Federal Links

Recognition of ANSI/ASSE Z244.1-2003 "Control of Hazardous Energy — Lockout/Tagout and Alternative Methods" consensus standard

Safety and Health Topics: OSHA Assistance for the Electrical Contractors Industry – Standards

9/14/2007 - CPL 02-01-043 - Slide-locks – Enforcement Policy, Inspection Procedures and Performance Guidance Criteria

1910 Subpart S App A – Referenced Documents

11/10/2004 - Recognition of ANSI/ASSE Z244.1-2003 "Control of Hazardous Energy — Lockout/Tagout and Alternative Methods"

9/14/2007 - CPL 02-01-043 - Slide-locks – Enforcement Policy, Inspection Procedures and Performance Guidance Criteria

Safety and Health Topics: OSHA Assistance for the Electrical Contractors

Safety and Health Topics: Control of Hazardous Energy (Lockout/Tagout)

Safety and Health Topics: OSHA Assistance for the Plastics Industry

Remediation Technology for Safety and Health Hazards

Additional Z244 Links

The Case for Safety Podcast, Episode 158: ANSI/ASSP Z244 and Controlling Hazardous Energy: What You Need to Know

The Case for Safety Podcast, Episode 10: ANSI/ASSP Z244.1 Standard

ASSP Updates Standards on Safety Training and Hazardous Energy

Safety Is So Much More Than OSHA Compliance

ANSI/ASSP Z244.1-2024: Control of Hazardous Energy: Lockout, Tagout

Sample Lockout or Tagout Procedure

From Appendix F, Section 8.2.1 (Informative)

Purpose

The purpose of this procedure is to prevent harm to employees from unexpected start-up, energization, or release of stored energy from machines, equipment, or processes during servicing or maintenance of equipment.

Scope

This document specifies the minimum locking, tagging, clearing, and verifying procedures required to prevent harm from start-up or release of hazardous energy.

Steps to Follow:

1. **Preparation For Shutdown –** Employees authorized to lockout or tagout equipment shall identify the type and magnitude of the energy to be controlled, all hazards (including stored energy) and the method or means of controlling the energy. They shall also notify all affected personnel in the area that the equipment will be locked or tagged out.
2. **Equipment Shutdown –** The equipment shall be shut down by following established shutdown procedures.
3. **Equipment Isolation –** Use of disconnect switches, line valves, blocks, blinds, removal of spools, and capping of lines, etc. shall be used.
4. **Application of Lockout or Tagout Devices –** Locks or tags shall be applied to the isolation device. Each employee working on the equipment shall be responsible for attaching their personal locks without exception.
5. **Stored Energy –** After applying locks or tags to the energy-isolation devices, all potentially hazardous stored or residual energy must be relieved, blocked, bled, restrained, or rendered safe.
6. **Verification of Isolation –** Prior to starting work, after isolation and locking or tagging energy sources, turn on (try) all start buttons and other activating controls on the equipment to make sure the equipment has been de-energized. Be sure to return all controls to the off or neutral position after trying to start.
7. **Release From Lockout or Tagout Control –** Prior to restoring energy to the equipment, remove all tools, ensure all affected employees are clear and informed that energy to the equipment will be restored and guards are in place. Then all locks or tags can be removed and energy restored.

Sample Lockout or Tagout Procedure

From Appendix F, Section 8.2.1 (Informative)

Specific Instructions:

1. No changes, adjustments, or repairs that require shutting down the equipment will be made without proper authorization.
2. If more than one employee works on the same equipment, each person must attach their lock and tag.
3. When an employee is reassigned from a job which is incomplete and the equipment must of necessity remain locked out, the employee involved will notify their supervisor before removing their lock or tag. The supervisor will then lockout or tagout the equipment or arrange for such lockout and tagging prior to the first employee removing their lock and tag.
4. No attempt shall be made by anyone to operate a control device to which a lock or tag is attached.
5. When a job is to be extended from one shift to another, the relieving employee or the supervisor shall attach their lock or tag to the lockout device before the employee going off shift removes their lock or tag. If the supervisor places their lock or tag on the device instead of the oncoming employee, the oncoming employee shall place their lock or tag on the device before starting work.
6. In the event an employee leaves a lock or tag on equipment and cannot be found, the supervisor may have the lock or tag removed only after following the company's procedures.
7. When requested by operating personnel, maintenance personnel shall perform electrical disconnects. The employees performing the work must go with the person making the disconnect and attach their lockout or tagout device to the control device.
8. When locking out electrical disconnects, push buttons shall be tried to make sure the correct switch has been opened.
9. In no case shall anyone be assigned to remove another employee's lockout or tagout device except the supervisor as authorized in number 6 above.
10. Locks and danger tags issued for use in performing lockouts will not be used for any purpose other than as outlined.
11. A supervisor shall lockout or tagout equipment when the equipment is to be out of service for an extended period of time (e.g., over eight hours).
12. Outside contractors shall be informed of lockout or tagout procedures and be required to follow them.