Z244 COMMITTEE

ANSI ACCREDITED STANDARDS COMMITTEE
CONTROL OF HAZARDOUS ENERGY – LOCKOUT/TAGOUT
AND ALTERNATIVE METHODS
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OSHA Docket Office
Docket No. OSHA-2016-0013 or RIN 1218-AD00
Technical Data Center, Room N3653
Occupational Safety and Health Administration
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210

ANSI/ASSP Z244 COMMITTEE COMMENT
29 CFR Part 1910 [Docket No. OSHA-2016-0013]
RIN: 1218-AD00 [The Control of Hazardous Energy (Lockout/Tagout)]

The ANSI/ASSP Z244.1 Accredited Standards Committee (ASC) is pleased to submit these comments for the record responding to the U.S. Occupational Safety & Health Administration's (OSHA), Request for Information (RFI) concerning the "Control of Hazardous Energy (Lockout/Tagout)." Because this subject matter is not only complicated but also extremely important, the Z244 Committee is recommending that an interactive dialog(s) with the Agency be initiated following this information gathering initiative.

This comment was approved by the Z244 Committee, in accordance with its accredited procedures for reaching consensus. This statement reflects a wide range of professionals representing a diverse range of organizations, business, professional associations, etc. The collective experience within the Z244 committee is particularly well suited to assist OSHA in this endeavor. The members have been engaged in developing effective, productive, and safe solutions on this topic for many years, including developing the most up-to-date requirements for controlling hazardous energy as contained in ANSI/ASSP Z244.1(2016).

The nature of lockout/tagout has significantly advanced since the 1970s when the original Z244.1 text was drafted. During the development of 29 CFR 1910.147 OSHA made decisions that altered or added to the intent of the content and meaning of various provisions of Z244.1. One critical decision involved the eventual interpretation and enforcement of the bracketed sentence ("Push buttons, selector switches and other control circuit devices are not energy isolating devices") found in the definition of energy isolating

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device. The OSHA position expanded the meaning of "other control circuit devices" to include any "control system" regardless of sophistication and effectiveness.

In 1989, the OSHA position was to exclude all control systems as a means to control energy. Early electronic control systems were generally not reliable enough to prevent the unexpected energization or release of stored energy unless they were specifically designed for that purpose. Advances in control system technologies in the past 20 years provide an excellent opportunity to improve upon the current requirements in terms of both safety and productivity for machinery, equipment or processes.

While the traditional control of hazardous energy has relied on locking out an energy isolating device, advances in control systems now allow for Alternative Methods to control hazardous energy. These alternative methods allow for solutions that are as safe or safer than traditional lockout consistent with the hazard control hierarchy.

Occupational Safety and Health Professionals (OSH), and implementers of Z244, have consistently noted to this committee that there are significant international implications of 29 CFR 1910.147 that negatively impact the competitiveness of U.S. manufacturers in the global marketplace. Alternative methods are safely and successfully used as a preferred means rather than lockout/tagout, thus placing U.S. employers at a competitive disadvantage.

The key issue for Occupational Safety and Health Professionals (OSH) and the Z244 Committee is that a risk assessment is what should drive the deployed remediation technique. The Z244 Committee notes that the time of a one-size-fits-all approach to hazardous energy control is over. We believe these alternative methods warrant additional consideration by OSHA and the time has come to incorporate these methodologies.

The concept of alternative methods, which has been referred to using a variety of terms, has been increasingly prevalent in many instances as a resolution to employer citations at Informal Conferences. Additional cases have been successfully resolved at the administrative court level and at the OSHRC by applying alternative methods. Alternative methods address the real-world issues where traditional lockout/tagout is not feasible.

We believe this statement from Z244 is of a critical nature and points to the key points being made by with this technical comment:

> *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*

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> *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 is 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 in particular the use of alternative methods.*

The ANSI/ASSP Z244.1 (2016) American National Standard contains information that addresses the issues raised in the RFI. This Committee recommends that OSHA consider adopting, accepting or incorporating the methodologies in the Z244.1 standard, and would welcome the opportunity to meet with the Agency to discuss these matters further. Engagement with the subject matter experts who wrote the standards language will be very important to arriving at suitable solutions.

We note this consideration is already part of public policy as contained in Public Law 104-113 and the current OMB Circular A-119. The Z244 Committee and ASSP have historically championed the use of the standard by OSHA, but our endeavors have yielded limited success. Since OSHA is active with the Z244 Committee we also understand and appreciate the process and constraints the Agency must work within. We hope this initiative will allow for more discussion on this issue and we look forward to working together to arrive at the best practicable and timely solutions.

The American Society of Safety Professionals (ASSP), serves as the secretariat of the Z244 Committee and would be willing to assist with additional support to discuss these issues. We recommend that OSHA consider holding a series of stakeholder meetings in different locations (four to five) in different parts of the country to get diverse viewpoints. ASSP noted it would be open to holding such a meeting at its facility in Park Ridge, Illinois. This is part of the Chicago area and is approximately fifteen minutes from O'Hare Airport.

Our detailed technical comments are provided in Attachment A. In addition, the following materials are submitted with this comment:

American National Standards:

- ANSI/ASSP Z244.1 - 2016 The Control of Hazardous Energy Lockout, Tagout and Alternative Methods, (Current American National Standard)
- ANSI/ASSE Z244.1-2003 (R2008) as a Historical Document

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- ANSI/ASSE Z244.1-2003 as a Historical Document
- Z244.1-1993 (Reaffirmed) as a Historical Document
- Z244.1-1982 as a Historical Document
- Z244.1-1970 as a Historical Document

Additional Materials:

- Book: *The Battle for Control of Hazardous Energy: The Tortured Conflicts & Impacts of ANSI Z244.1 and OSHA's 29 CFR 1910.147(2016)*
- ASSE (ASSP) *Professional Safety Journal Article: Hazardous Energy – The Battle for Control in the Standards Area (2017)*
- ANSI Essential Requirements Documents
- ANSI/ASSP Accredited Standards Development Procedures (Z244 Procedures)

We thank you for the opportunity to engage with OSHA on this important work and look forward to collaborating with the Agency.

Respectfully Submitted,

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ATTACHMENT A
ANSI/ASSP Z244 COMMITTEE TECHNICAL COMMENT
29 CFR Part 1910 [Docket No. OSHA-2016-0013]
RIN: 1218-AD00 [The Control of Hazardous Energy(Lockout/Tagout)]

Technical Summary:

OSHA is preparing for potential rulemaking in order to revise 29 CFR 1910.147 on the control of hazardous energy. OSHA issued a Request for Interpretation (RFI) on 20 May 2019 with comments due on 18 August 2019. The "RFI seeks information regarding two areas where modernizing the Lockout/Tagout standard might better promote worker safety without additional burdens to employers: control circuit type devices and robotics." The full text of the RFI is available at:

https://www.federalregister.gov/documents/2019/05/20/2019-10247/the-control-of-hazardous-energy-lockouttagout

It has been over 30 years since this OSHA standard has been updated. This RFI offers an unprecedented opportunity to employers and industry to provide feedback to the Agency as to how the control of hazardous energy should be best addressed.

The Z244 Committee and the American Society of Safety Professionals (ASSP), as our secretariat, appreciate this opportunity. The ANSI/ASSP Z244 committee views this RFI as an exciting opportunity to make a significant impact in improving worker safety. More than thirty years have passed since 29 CFR 1910.147 was written. We anticipate that many more years will come and go before it is revised again. We believe that OSHA needs to write a rule that will *stand the test of time*. We also believe that OSHA and industry need to work together on this opportunity; not in adversarial roles, but cooperatively as there are many common goals and interests including:

- Protecting workers from hazardous energy
- Providing safer workplace
- Making use of technological advances
- Making machinery and equipment safer, easier to use, more productive, etc.

The Z244 committee also believes that this opportunity offers us all a unique opportunity for government and industry cooperation to achieve a mutually satisfactory outcome for the betterment of all involved.

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Z244 Background

The Z244 Committee is long-time national committee responsible for the development of voluntary national consensus standards addressing control of hazardous energy. The secretariat of the committee is the American Society of Safety Professionals, (ASSP). Since its inception this committee has written energy control standards used in both the United States and now world-wide.

Z244 is a well-balanced committee with a diversity of different interests and organizations: business, industry, government, academia, etc. Standards and positions of the committee, including this technical comment, are processed and reached via the requirements of our accredited procedures. It is important to note that this technical comment, and the standard, reflect a wide range of different views and opinions from a wide variety of interests. The language below from the ANSI Essential Requirements document (attached), should be of key consideration for OSHA when considering both the standard and this comment:

> *Section 1.2 Lack of dominance: The standards development process shall not be dominated by any single interest category, individual or organization. Dominance means a position or exercise of dominant authority, leadership, or influence by reason of superior leverage, strength, or representation to the exclusion of fair and equitable consideration of other viewpoints.*
>
> *Section 1.3 Balance: The standards development process should have a balance of interests. Participants from diverse interest categories shall be sought with the objective of achieving balance. If a consensus body lacks balance in accordance with the historical criteria for balance, and no specific alternative formulation of balance was approved by the ANSI Executive Standards Council, outreach to achieve balance shall be undertaken.*

Supporting Data:

We are aware from past discussions with OSHA personnel that one of the concerns with Z244 relates to the use and implementation of the ANSI/ASSP Z244.1 Standard. We understand that OSHA is interested in data from users on their experiences with the standard.

The following data points, we contend, buttresses our technical positions in this comment:

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ASSP took on secretariat responsibilities from the National Safety Council in 2003 and implementation data below is from 2003 to the present:

- Approximately 10,000 copies of ANSI/ASSP Z244.1 have been sold or distributed by ASSP and/or its distributors
- Over 3,500 organizations and individuals have attended ASSP Z244.1 related webinars
- Distribution of the article (Hazardous Energy – The Battle for Control in the Standards Arena), to approximately 40,000 OSH Professionals and ASSP Members
- Distribution of the original 2003 Z244 Alternative Control Methods OSHA correspondence was distributed to approximately 100,000 recipients
- ASSP has released approximately twenty-five (25) calls for public comment on Z244.1 since 2003 with total distribution to over 500,000 stakeholders

ASSP reports that it has received approximately 500 responses to the overtures listed above and received three (3) responses that criticized the Z244 position(s). This data should not be construed to mean universal acceptance of the standard, but we do maintain the data indicates support for the Z244 position of the need for additional discussion on the OSHA LOTO rule and that steps need to be made to consider revision.

Key Points

In response to this RFI, the Z244 Committee recommends the following:

- Team OSHA. OSHA is not alone in this effort. Workers, industry and the Agency all can assist in developing solutions. We can collaborate with OSHA and assist the Agency so that it need not try to "do it all."

- LOTO and Alternative Methods. Alternative methods to LOTO should be allowed for machinery, equipment or processes where the hazards have been identified, the risks assessed and evaluated and as a result, reduced to an acceptable level as documented in a risk assessment.

- System Approach. Fundamentally, when considering alternative methods in lieu of LOTO, OSHA should realize that the *system* is the key, not just the components or devices in isolation.

- Hazard Control Hierarchy. According to the hazard control hierarchy that has been adopted in several ANSI and ISO standards, lockout is an administrative control

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that relies on human behavior, whereas alternative methods usually involve engineering controls and control systems which are more preferred than administrative controls. Worker safety would be better served if appropriately designed and implemented alternative methods according to Z244.1 were allowed and encouraged consistently with the hazard control hierarchy.

- What Not How. OSHA should focus on the *what* - not the *how* - of energy control. OSHA's future Rule must *stand the test of time*. Strict and prescriptive rules on *how* to control hazardous energy will fail to keep up to date and will become quickly outdated/obsolete. The means of *how* to control hazardous energy will change greatly in the coming years and should be left to industry standards which are required to be maintained and kept current, while *what* will remain constant.

- Vertical Integration. In 5-10 years, vertical integration will occur where employers/end users will require machinery, equipment and processes to have compliant alternative methods built-in upon delivery. Machine and equipment builders have qualified controls engineers on staff who create these systems in accordance with industry standards. OSHA has an exciting and unique opportunity with this revision to make a huge potential impact on workplace safety through this vertical integration.

- Terminology of Servicing and Maintenance. The Agency should reconsider its current position on servicing and maintenance. By placing requirements based on the characterization of a task, the discussion quickly turns to the nuances characterizing a task, rather than enabling the work to be done safely through the control of hazardous energy. By following the ANSI/ASSP Z244.1 lead, OSHA could and should focus on the control of hazardous energy and not on labels or characterizations attached to a particular task.

- Scope of Industries. A revised rule needs to better address energy control in processing industries. The current rule has a machinery bias that is a very poor fit for processing applications.

- Precedent Decisions. Alternative methods, which has been referred to using a variety of terms, has been increasingly prevalent as a resolution to many employer citations at Informal Conferences, at the administrative court level, and with the U.S. Occupation Safety and Health Review Commission (OSHRC).

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- Experiences in Industry. Alternative methods are commonly used today in industry, in developed countries internationally, and even in consumer products.

- Types of Energy. Not all energies are hazardous. As the Agency evaluates new requirements, the Z244 Committee encourages OSHA to distinguish between hazardous energy that needs to be isolated or controlled, and other forms of energy that do not.

Fundamentally, the Z244 Committee recommends that OSHA consider adopting, accepting or incorporating the methodologies in the ANSI/ASSP Z244.1 standard, and would welcome the opportunity to meet with the Agency to discuss these matters further.

Team OSHA

The Z244 committee would like to emphasize that OSHA is not alone in this effort. OSHA has a role to play. Industry has a role to play. Each has different strengths, weaknesses, and expertise. The Agency should use these as best as it is able. More specifically, OSHA should *not* try to "do it all." We point to the following as examples where we believe there is room for partnership:

- OSHA writes enforceable rules and defines what is acceptable but does not design alternative methods.

- Industry, through the Z244 committee, has the technical expertise to write the methods/processes to control hazardous energy.

- Operators/maintenance personnel use alternative methods but do not design them. They help define the tasks and hazards associated with equipment and can offer valuable insight into feasible risk reduction measures

- Controls engineers design systems to meet the requirements. They design and build alternative methods but do not use them.

Each of these 'team members' brings valuable insights regarding how to control hazardous energy most effectively in ways that will reduce harm to workers yet cannot be circumvented.

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The collective experiences of the Z244 committee are particularly well suited to assisting OSHA in its endeavor. The members have been engaged in developing effective, productive, and safe solutions on the control of hazardous energy for many years, including developing the most up to date requirements as contained in ANSI/ASSP Z244.1. OSHA should make a concerted effort to use the skills of this "Team OSHA."

LOTO and Alternative Methods

The Z244 committee recognizes that LOTO works in many applications, but not all. This was a key premise in revising the American National Standard in 2016. LOTO relies on human procedures, which are not always reliable even when well-intended. In a recent conversation with a day-shift supervisor at a manufacturing facility, he shared that 85% of the LOTO violations they had were simply honest mistakes of workers: for example forgetting a step in the process (such as verify), or missing an energy source (particularly when multiple lockouts are required to complete a task). These were not employees intentionally trying to circumvent the LOTO procedures or bypass the systems; they were human errors.

Alternative methods using current technological advances are very reliable if properly designed and implemented. Alternative methods can be "as safe or safer than LOTO" if properly integrated. The key element is that alternative methods must be appropriate for the application in order to protect workers from harm. OSHA should encourage the use of effective alternative methods in lieu of LOTO where the methods are applicable and properly designed and implemented.

As described in ANSI Z244.1, alternative methods are only allowed on systems under very specific conditions, including where a documented risk assessment has been performed. Risk assessment serves as the underpinning of machinery safety around the world, and the basis for many modern safety standards. Z244.1 presents an abbreviated description of the risk assessment process and refers readers to ANSI B11.0 *Safety of machinery* for more detailed information. The significant point is that alternative methods are only allowed for machinery, equipment or processes where the hazards have been identified, and the risks reduced to an acceptable level as documented in the risk assessment.

The System Approach

The Z244 committee encourages OSHA to expand the focus of its inquiry to look at the broader system in which energy exists. All energy sources are not necessarily hazardous and may even be beneficial during some tasks. Alternative methods leverage controlling various energies within a system as opposed to solely relying on isolation.

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Contrary to some thinking, "control circuit type devices" are not a discrete element like a disconnect switch, but rather work within a system, the 'safety-related parts of a control system (SRP/CS)' as described in ANSI B11.26 and ISO 13849-1. A control system is a group of components that act together to achieve an end effect.

OSHA needs to raise its focus to the system level, where the aforementioned standards provide guidance on proper implementation. The system is an array of interrelated components such as sensors, manual input and mode selection elements, interlocked decision-making circuitry and logic control elements, and output elements to the machine actuators, operating devices and mechanisms.

OSHA correctly notes that under the variance granted to NSCI (Nucor Steel Connecticut Incorporated), "OSHA granted the variance based on a safety evaluation of the complete system, not just its individual components." This is an excellent observation and the way that systems should be evaluated.

Fundamentally, when considering alternative methods in lieu of LOTO, OSHA should realize that the *system* is the key, not just the components or devices in isolation.

The Hazard Control Hierarchy

The national and international safety community has used the hazard control hierarchy as a framework for reducing risk. There are several different presentations of the concepts, but all follow a generally accepted progression from most preferred methods to least preferred methods. One representation is shown below from ANSI/ASSP Z244-2016 Table 1:

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Table 1: The Hazard Control Hierarchy

	Risk Reduction Measures	Examples	Influence on Risk Factors	Classification
Most Preferred	Elimination or Substitution	• Eliminate pinch points (increase clearance) • Intrinsically safe (energy containment) • Automated material handling (robots, conveyors, etc.) • Redesign the process to eliminate or reduce human interaction • Reduced energy • Substitute less hazardous chemicals	• Impact on overall risk (elimination) by affecting severity and probability of harm • May affect severity of harm, frequency of exposure to the hazard under consideration, and/or the possibility of avoiding or limiting harm depending on which method of substitution is applied.	Design Out
	Guards, Safeguarding Devices	• Barriers • Interlocks • Presence sensing devices (light curtains, safety mats, area scanners, etc.) • Two hand control and two-hand trip devices	• Greatest impact on the probability of harm (Occurrence of hazardous events under certain circumstance) • Minimal if any impact on severity of harm	Engineering Controls
	Awareness Devices	• Lights, beacons and strobes • Computer warnings • Signs and labels • Beepers, horns and sirens	• Potential impact on the probability of harm (avoidance) • No impact on severity of harm	Administrative Controls
	Training and Procedures	• Safe work procedures • Safety equipment inspections • Training • Lockout/Tagout/ Verify	• Potential impact on the probability of harm (avoidance and/or exposure) • No impact on severity of harm	
Least Preferred	Personal Protective Equipment (PPE)	• Safety glasses and face shields • Ear plugs • Gloves • Protective footwear • Respirators	• Potential impact on the probability of harm (avoidance) • No impact on severity of harm	

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As the Table shows, lockout is an administrative control that relies on human behavior to correctly follow the necessary procedures each and every time that energy has to be controlled. Conversely, alternative methods usually involve engineering controls and control systems which can be reliable and more preferred than administrative controls. Several other industry standards, safety texts, and research papers present similar teachings. These examples can be seen in the technical materials submitted with this technical comment.

OSHA's current position that control systems cannot be used to control hazardous energy because they are not energy isolating devices is inconsistent with the fundamental principles of the hierarchy. The Z244 Committee suggests that worker safety would be better served if appropriately designed and implemented alternative methods according to Z244.1 were allowed and encouraged consistent with the hazard control hierarchy.

OSHA should focus on the *what* not the *how*

OSHA's future Rule must *stand the test of time*. Prescriptive rules on *how* to control hazardous energy will fail to keep up to date and will become quickly outdated/obsolete. The means of *how* to control hazardous energy will change greatly in the coming years. Manufacturing is going to change dramatically moving forward with advances in:

- machine learning,
- Artificial intelligence (AI),
- mobile platforms,
- robotics / automation,
- flexible manufacturing / mass customization,
- Industry 4.0 / industrial internet of things, etc.

The *how* to control hazardous energy is far better suited to industry standards and the ANSI/ASSP Z244.1 process. Industry has the technical knowledge to answer this question, and the ANSI consensus process is designed for updating and accommodating changes. The ANSI process requires that a standard be revised or reaffirmed every five years to ensure effectiveness and accounting of evolving best practices. In contrast, the OSHA process struggles greatly with updating due to the political and regulatory systems within which it must operate.

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Vertical integration

In 5-10 years, employers/end users of machinery and equipment will require machines and equipment to have compliant alternative methods built in upon delivery. This is vertical integration. OEMs will build in the capabilities because the end users will require them. Many suppliers already integrate alternative methods, as this is the norm in the global marketplace. The lack of OSHA acceptance immediately sets the employer at odds between compliance and utilizing systems that are proven to keep workers safe in other regions of the world. Machine and equipment builders have qualified controls engineers on staff who create these systems in accordance with industry standards.

In due course, productivity gains will likely influence end users to improve existing/legacy machines and equipment, thus raising safety for workers. Some employers will be motivated to upgrade legacy equipment in order to use alternative methods in lieu of LOTO. Other employers will decide that the time/expense to upgrade is not economical and will continue to use LOTO on their legacy equipment. Other employers will work with a mix of LOTO and alternative methods.

Fundamentally, OSHA has an exciting and unique opportunity with this revision to make a huge potential impact on workplace safety through this vertical integration. There may never have been before, or will be again, such a potential to impact worker safety and productivity at the broadest level.

Terminology of Servicing and Maintenance.

The RFI states that:

"Based on preliminary research and alliance-partner feedback, OSHA believes the use of control circuit type devices is typically limited to the types of tasks that do not meet the minor serving exception in the LOTO standard but also do not require either extensive disassembly of the machine or worker entrance into hazardous areas that may be difficult to escape quickly."

The Z244 committee agrees that extensive disassembly should be done under LOTO, unless the Alternative Method is specifically designed for disassembly tasks. Tasks that might fall under the minor servicing exception may not be on the Agency's radar as there is less discussion or conflict as to how these tasks are performed. If alternative methods are allowed, then there could be more instances/applications than are currently envisioned under the minor servicing exception.

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We can share that the minor servicing exception construct certainly does drive employer responses and requests. It is common for employers to go to great lengths to frame a task to fit the language of the minor servicing exception. This is not good practice since it focuses the discussion on how to characterize the tasks, rather than how to perform the task safely and how to best control hazardous energy.

The "ability to escape quickly" is not a parameter used in the evaluation of alternative methods in Z244.1. The ability to escape, or more specifically the ability to avoid a hazardous situation, would commonly be part of a risk assessment, and as a factor in evaluating the effectiveness of a risk reduction measure (e.g., safe/reduced speed). However, it should probably not be applied as a black letter criterion.

More generally, the Agency should reconsider its current position on servicing and maintenance. With the 2016 edition, ANSI/ASSP Z244.1 abandoned the service and maintenance construct, and with it the minor servicing exception. The following explanation appears in the Introduction to the revised standard:

The Service and Maintenance Construct

With the 2016 revision, 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 it.

By placing requirements based on the characterization of a task, the discussion quickly turns to the nuances characterizing a task, rather than enabling the work to be done safely through the control of hazardous energy. Many discussions occur in industry as to whether a task is or is not servicing, or if it can be characterized in a manner to fit under the minor servicing exception. These conversations are not worthwhile or productive in terms of protecting workers or controlling hazardous energy. By following the ANSI/ASSP Z244.1 lead, OSHA could and should focus on the control of hazardous energy and not on labels or characterizations attached to a particular task.

The current OSHA standard does not expressly address the situation where energy is required in order to conduct certain tasks that OSHA might consider servicing or maintenance. The Z244.1 standard does address this, and other situations, where full lockout is not feasible (see clause 8 of the standard). If OSHA follows the lead of Z244.1, more clarity will be provided to employers on how to address these types of situations.

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Scope of Industries

During the drafting of the original 1910.147 language, OSHA either intentionally or inadvertently - created a built-in regulatory bias toward the universe of hazardous energy control. First, in the preamble, OSHA eliminated the term "process" from the standard that was imbedded in the 1982 ANSI cardinal document. OSHA explained that the term "equipment" would be sufficient for the process world and was not needed. Second, OSHA attempted to address production support tasks by adding the reference to Subpart O (Machinery and Machine Guarding) and the criteria in 1910.147(a)(2)(ii)(A) and 1910.147(a)(2)(ii)(B). When read together "guarding", "point of operation", and "machine operating cycle" complete the "bias" toward machinery at the expense of all else. The process universe is a poor fit for this type of exclusionary language. See below:

> *Normal production operations are not covered by this standard (See Subpart O of this Part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if:*
>
> *1910.147(a)(2)(ii)(A)*
>
> *An employee is required to remove or bypass a guard or other safety device; or*
>
> *1910.147(a)(2)(ii)(B)*
>
> *An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.*
>
> *Note: Exception to paragraph (a)(2)(ii): Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection (See Subpart O of this Part).*

The 2016 ANSI/ASSP Z244.1 standard and its predecessor documents did not introduce the need for establishing "machine guarding" as a dominant criteria for treating normal production operations and the broader complex of hazardous energy control. This OSHA introduction only results in confusion in the process world since machine guarding is rarely

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appropriate when considering production operations. Because of this machine bias, regulatory thinking has often narrowly described 'production' as when a machine is making widgets; any other task or mode of operation is 'servicing and maintenance'. In the process industry, should transferring liquid product from vessel to vessel or to a tanker not be considered 'production'? How is this task not synonymous with making widgets by a machine? There is no realistic need for having the 29 CFR 1910.212 standard reference surface in the 29 CFR 1910.147 standard for the control of hazardous energy.
Unfortunately, OSHA did not engage the Z244.1 Standards Committee responsible for writing the language of the 1982 edition when developing 29 CFR 1910.147 to understand the Committee's views on issues such as "control circuit devices," "production operations" or "process." OSHA should engage the Z244 committee if any adoption in whole or part is contemplated by the Agency. There is no beneficial value in assuming what certain language in the Z244.1 standard means or in altering it when not understanding its etiology. In addition, differences between understanding of terms or requirements will only lead to confusion which is also deterimental to worker safety.

Precedent Decisions

The concept of alternative methods, which has been referred to using a variety of terms, has been increasingly prevalent as a resolution to many employer citations at Informal Conferences. Additional cases have been successfully resolved at the administrative court level and at the OSHRC by applying alternative methods. Alternative methods address the real-world issues where traditional lockout/tagout is not feasible.

Monitored Power System (MPS) was a term used by General Motors as early as the 1990s. In the 1995 litigation *Secretary of Labor v General Motors Corporation*, an MPS was used to control energy to the machinery and prevent restart without workers completing a multi-step sequence of operations. Although the case involved extensive discussions as to whether there could be an unexpected restart of the machinery, the key point is that the machinery would not start because the MPS was an alternative method that provided effective protection.

Slide locks is another term used in the machine tool industry for presses. OSHA's slide lock CPL 02-01-043 allows control reliable circuitry to de-energize energy sources in lieu of other energy isolation devices to provide effective alternative employee protection.

More recently, decisions rendered in *Secretary of Labor v Matsu Ohio, Inc.* (2016) and *Secretary of Labor v Swiss Logistics and Walmart* (2018) have found that alternative methods prevented employees from being exposed to hazards.

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OSHA also invites comment on any unintended consequences and consistencies or inconsistences with other policies or regulatory programs that might result if OSHA revises the 29 CFR 19101.47 standard.

If, as recommended, OSHA ceases to use the service and maintenance construct, a large body of case law, interpretations, citations, and training of both compliance officers and employer personnel will no longer be relevant. In most cases, this should be considered as a positive as there is the opportunity to wipe the slate clean and start anew with the focus where it should be - controlling hazardous energy.

Experiences in Industry

The reality today is that many, many U.S. companies are already using various forms of alternative methods now to control hazardous energy. In many cases, the methods are carefully designed and implemented. Others are much less so and may not provide an acceptable level of risk reduction. This is currently occurring without updated guidance or requirements from OSHA.

Internationally, alternative methods are safely and successfully used in the developed world as a preferred means rather than lockout/tagout. This difference negatively impacts U.S. competitiveness in the global marketplace and may increase the incentive to intentionally bypass/defeat traditional lockout procedures.

Alternative methods are commonly used today even in consumer products. In millions of homes, hands are placed in the hazard zone of kitchen food processors while relying on an interlock switch to prevent unexpected start, and not by unplugging and locking the plug.

Many of the control system designs which are required for production operations also apply for safety. These control systems manage the same energy(s) for operational efficiencies and effectiveness. For example, an interlocked access panel that allows for quality sampling. The same circuitry is used at other parts of the machine for access doors for jam clearing, cleaning, etc. When properly designed, the control system can be applicable for both safety and production.

Industry has progressed and developed new systems that did not exist in 1989. That progress will continue in the future as well. OSHA should provide some structure to U.S. employers that will help ensure that these methods provide an appropriate level of safety such as described in Z244.1.

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Types of Energy

In its enforcement activities and various documents, OSHA seems to assume that all energy is hazardous and must be controlled. However, not all energy is hazardous. Some energy is actually beneficial to worker safety. For example, the hold down device on the unwinder for a coil of steel requires hydraulic energy to engage and hold the coil. Without the hold down device energized, the steel coil can unwind in a very hazardous manner when the securing bands are cut by the worker. Many injuries have occurred to workers when the hold down device is not used.

In addition, other energies that may be present during a task are not hazardous and need not be isolated or controlled. For example, low voltage power to sensors or power to a computer is often not hazardous and isolating these power sources creates unnecessary work with no impact to worker safety.
As the Agency evaluates new requirements, the Z244 Committee encourages OSHA to distinguish between hazardous energy that needs to be isolated or controlled, and other forms of energy that do not.

Answers to Specific Questions

The Z244.1 Committee is pleased to provide the following answers to OSHA's questions based on our understanding of what the Agency is asking. However, it is very important to reiterate that our responses consider "control circuit type devices" to be a part of an alternative method and that these elements operate in a system to provide a safety function. Thus, the responses are based on the details provided in Z244.1 Clause 8.1 that cover many aspects of system performance that go well beyond individual components.

1. In what work processes should OSHA consider allowing the use of control circuit type devices for hazardous energy control?

Response: The answer is those circumstances that comply with the requirements of the revised ANSI/ASSP Z244.1. The requirements were developed specifically to address this type of question.

In the Z244 committee's December 9, 2016 letter to then Assistant Secretary of Labor/OSHA, Dr. David Michaels announcing the newly revised ANSI/ASSE Z244.1-2016 Standard, *Control of Hazardous Energy – Lockout, Tagout and Alternative Methods*. In the revised standard, the thrust of your current information request is addressed in numerous clauses and annexes. We specifically call to your attention Clause 8.1 Alternative Methods where seven situations are identified:

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NOTE: Situations where alternative methods may apply include, but are not limited to:

- *when hazardous energy is present because it is required to do the task;*
- *when lockout or tagout is not feasible or practicable (see Annex L for example practicability evaluation);*
- *when a documented risk assessment shows the task can be performed with acceptable risk;*
- *when inherent hazards (e.g., thermal, radiation) are unable to be controlled using lockout or tagout;*
- *when energy is required to maintain equipment in a safe state;*
- *when repetitive cycling of an energy isolation device compromises its safe function;*
- *when the operation of a standard energy isolation device creates an additional hazard.*

In these situations, alternative methods may be as safe or safer than conventional lockout, or conventional lockout may be inappropriate, not feasible or not practicable.

The situations mentioned in Clause 8.1 are commonly encountered in the current manufacturing and process universe.

Conversely, alternative methods should not be used for major repairs or disassembly where LOTO should be applied.

In 29 CFR 1910.147 the definition of energy isolating device (EID) reads:

Energy isolating device. A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

The last sentence has been historically problematic. Taken very broadly, the intent has been misused or misinterpreted to infer that it applies to any control system no matter how sophisticated and protective.

The definition of this term is nearly identical to the definition included in the original 1982 edition of the Z244.1 standard:

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energy isolating device. **A physical device that prevents the transmission or release of energy, including, but not limited to, the following: a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch, a slide gate, a slip blind, a line valve, blocks, and similar devices with a visible indication of the position of the device. (Push buttons, selector switches, and other control-circuit type devices are not energy isolating devices.)**

The series of device types addressed in that last sentence in the Z244.1 standard were aimed at a specific application of simple devices, with lower levels of reliability, used for isolation. The intent was never to limit technology nor exclude engineered solutions that offer effective protection. Properly designed alternative methods are an effective means to control hazardous energy.

In the 1982 edition of the Z244.1 standard, Clause 6.8 *Production Operations* contains important text that was omitted by OSHA in 29 CFR 1910.147. This clause supports the true intent of the phrase "other control circuit devices."

6.8 Production Operations. **Personnel performing the activities listed in 3.1, other than normal operating activities, should do so under de-energized conditions in accordance with the lockout/tagout procedures required in this standard (see 5.2.1). In the case of required repetitive minor adjustments where this is not feasible, or in the case of normal production operations, these activities shall be accomplished under the protection of specially designed control circuits, control equipment, and operating procedures, that provide proven effective protection for the affected personnel.**

The 1982 standards committee realized that more robust "specially designed control circuits and equipment" existed, and future advances would be made, and therefore Clause 6.8 was an effort to differentiate simple circuit devices from the more effective systems.

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2. What are the limitations to using control circuit type devices? Do they have specific weaknesses or failure points that make them unsuitable for hazardous energy control?

Response: All devices have failure modes, including those listed in the 29 CFR 1910.147 definition for EID. Proper design and implementation of ANY solution includes evaluation of failure modes and reliability data. Control system solutions typically require more knowledge to apply and have more factors to consider. Z244.1 as well as the aforementioned control system standards require formal evaluation of these limitations and failure modes as a part of the design process.

3. If OSHA were to allow the use of control circuit type devices or other methods to control hazardous energy, would your firm choose to use them? Why or why not? Do you anticipate that these devices would save your firm money? For example, would these devices simplify operations or maintenance? Are there fewer steps needed to implement the controls? How frequently do you employ some form of lockout/tagout system in your facility?

Response: Yes, reduced incentive to defeat or bypass safety systems and reduced downtime are two reasons many companies in industry are starting to use alternative methods that comply with the requirements in Z244.1. If OSHA were to formally allow the use of alternative methods, their use will increase significantly due to the safety and productivity improvements. This is a significant opportunity.

4. Are there any specific conditions under which the use of control circuit type devices would not be advisable?

Response: The Z244.1 standard specifically addresses conditions where alternative means are not appropriate. An example would be new or unplanned tasks that are not specially identified to be completed under the alternative method. The standard requires a documented program to specify acceptable tasks.

5. When the Lockout/Tagout standard was originally drafted, OSHA rejected the use of control circuit type devices for hazardous energy control due to concerns that the safety functions of these devices could fail as a result of component failure, program errors, magnetic field interference, electrical surges, or improper use or maintenance. Have new technological advances to control circuit type devices resolved these concerns? How so?

Response: Yes, technology has greatly improved control circuit type devices and the systems in which they are used. The Z244.1 standard addresses these topics in the fault tolerance and tamper resistance subclauses of 8.2. These topics are also addressed in a consistent manner in ANSI B11.19 (2019) and ANSI B11.26.

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6. Are there issues with physical feedback for control circuit type devices?

Response: The meaning of this question is not clear and the answer depends on the meaning of 'physical feedback.' Please provide more information on OSHA's meaning of 'physical feedback'. The committee feels there is not enough information in the question to properly respond.

7. What are the safety and health issues involving maintenance, installation, and use of control circuit type devices? Have you found that alternative safety measures themselves cause any new or unexpected hazards or safety problems? Please provide any examples if you have them.

Response: One of the limitations of using alternative methods is the potential for 'copycat' or 'cheater' systems that have not been evaluated to meet the requirements of an alternative method. For example, an alternative method on a machine may include locking out using a group lockout hasp on a lockable E-stop device which has the appropriate structure, components, exclusivity of control and other applicable requirements of an alternative method under Z244.1. An employee might then decide that locking out any E-stop on any other machine is then acceptable, even on machinery or equipment for which it may not be appropriate.

Another limitation of alternative methods generally, which may include control circuit type devices, is the potential for tasks being performed that are not appropriate to be done using the alternative method (sometimes referred to as "task creep"). For example, clearing a jam may be an approved task using the alternative method, but changing a belt is not. Personnel should not perform tasks for which the alternative method is not intended as identified through a task-based risk assessment.

End users have expressed concerns about the training and implementation of alternative methods for equipment in a single facility (or organization) that has different capabilities for controlling hazardous energy. For example, Line 11 has alternative methods capability, but Line 10 does not. How are they to effectively communicate and train workers which tasks are permitted on Line 11 using the alternative method(s) but must be locked out for Line 10. This does not lend itself to a single session of training and "now go do it correctly."

8. Do control circuit type devices address over-voltage or under-voltage conditions that may signal power-off, power-on, or false negatives on error checking?

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Response: In general, yes. Technology has greatly improved control circuit type devices and the systems in which they are used. The Z244.1 standard addresses these topics in the fault tolerance subclauses of 8.2. These topics are also addressed in a consistent manner in ANSI B11.19 (2019) and ANSI B11.26.

9. How do control circuit systems detect if a component of a control circuit device breaks, bends, or otherwise goes out of specification? How do the systems signal this to the exposed employee? Could these types of failures create a hazard while the system continues to signal that conditions are safe?

Response: This question provides an excellent example of considering the device rather than the system. Individual devices are often too simple to provide diagnostic coverage taken on their own. As a part of a well-designed control system however, even a simple device can be monitored, cross checked and enhanced with diversity and redundancy to achieve high levels of reliability. Annunciation of fault conditions is most commonly considered secondary to achieving a safe state, but in its simplest form the signal to the employee is often the equipment being prevented from restarting.

This is further addressed in Z244.1 under monitoring and fault tolerance. These topics are also addressed in a consistent manner in ANSI B11.26 (2018), and in Annex C in B11.19 (2019).

10. What level of redundancy is necessary in determining whether a control circuit type device could be used instead of an EID?

Response: Worldwide, the most common design tenet for safety control systems is that their level of reliability shall be commensurate with the risk. Z244.1 also follows this requirement. As an example, many applications require Category 3, PL=d, or control reliable architecture. Under these requirements no single failure will result in the loss of a safety function. The various systems for evaluating this situation are well documented in the standards and have achieved broad acceptance.

11. Lockout/tagout on EIDs ensures that machines will not restart while an employee is in a hazardous area. How do control circuit type devices similarly account for employees working in areas where they are exposed to hazardous machine energy?

Response: The control circuit type devices do not. It is the system in which they are used. This issue is addressed by exclusivity of control in Z244.1. Additionally, ANSI B11.19 addresses a number of methodologies to reduce risk when an employee can enter into the hazardous area (safeguarded space), also known as “whole body access.” LOTO is a

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primary approach, but other alternative methods, used either singularly or in combination with other elements, are also presented. The determination of which approach(es) to integrate are based upon a risk assessment.

12. How do control circuit type devices permit an employee to maintain control over his/her own safety?

Response: Similar to #11 above, Z244.1 requires that alternative methods offer an appropriate level of exclusivity, such that workers are in control of the restoration of normal operation. This can range from simple proximity, to the application of physical locks to a device.

13. How do control circuit type devices permit employees to verify that energy has been controlled before beginning work in danger zones? How do the devices account for exposed employees before equipment is restarted?

Response: There is a tremendous range of answers depending on the system, but often the same test methods used for LOTO can be applied. In other applications lights, sounds, or display screen can provide feedback; however, none of those feedback means are possible under LOTO. Restart also covers a huge range of applications, but typically effective protection is assured by exclusivity and procedures that are similar to LOTO.

This point is well considered and is part of the process in Z244.1.

14. Control circuit type devices have a number of claimed benefits compared to energy isolating devices, including workers' greater willingness to use such devices, better efficiency, less downtime, and the lack of a requirement to clear programming on computer controlled devices. Are there any other benefits to using control circuit type devices? Are there certain situations where these devices are especially advantageous? For example, where machine tasks require frequent repetitive access, is the process faster and/or less physically demanding than applying mechanical lock(s)?

Response: Certainly, the benefits listed above occur. As an engineering control solution, alternative methods are far more reliable than LOTO which is a lower order administrative control solution. Examples in Z244.1, Clause 8.2. *Evaluating Alternative Methods* and Annexes L through V provide insight concerning the use of alternative measures with relevance to safety-related control systems. Annex V *Control System Example Methodologies* reveals international criteria for assessing safety reliability and performance.

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15. What other methods or devices, if any, are being used with control circuit type devices to control the release of hazardous energy, especially in cases where the control circuit devices are only used to prevent machine start-up? Are there control circuit type devices that require additional methods or devices to fully control the release of hazardous energy? What improvements to safety or health does the use of these devices or methods provide?

Response: There is no one alternative method that suits all applications. Good controls engineering design and industry standards require a separate manual actuation to restart a machine.

16. What are the unit costs for installing and using control circuit type devices or other alternative methods of hazardous energy control? Are the costs of installing and using control circuit type devices or other alternative methods of controlling hazardous energy dependent on the capacity or efficiency of the devices? If so, please include details on the effects of capacity on these unit costs including the capacity of any equipment you use in your facility. Are these devices generally integrated into newly purchased machinery, or are they purchased and installed separately? What steps need to be taken, and how long do those steps take, for these systems to be engaged in a manner that fully protects workers from the release of hazardous energy?

Response: It could be either built into machinery and equipment or purchased and installed separately. Engineering controls will become part of new machinery purchase specifications in due time. In many cases, new machinery already includes alternative methods as current best practice. The only discrepancy in industry is *when* a specific task allows the use of alternative methods as opposed to the energy isolating device.

17. What additional actions is your firm taking to protect workers when they are servicing machinery with control circuit type devices in order to meet OSHA's Lockout/Tagout standard requirements? For example, does your firm purchase and use physical devices that you feel do not enhance worker protections but nonetheless are required by the OSHA standard? What are these items and how much do they cost? Please explain why you feel these items do not enhance worker protections.

Response: Z244 is not a firm/company but has a wide range of diverse organizations on its committee reflecting the views put forth in this document.

18. The American National Standards Institute (ANSI), the International Organization for Standardization (ISO), and the International Electrotechnical Commission (IEC) all have standards that may be applicable to control circuit type devices. Should OSHA consider adopting portions of any ANSI, ISO, or IEC standard that specifies requirements for

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control circuit devices as part of an updated OSHA standard? Are there recommendations in the consensus standards that you choose not to follow? If so, please explain why. Are there any requirements in these standards that would impose significant cost burdens if OSHA were to include those requirements in a revised Logout/Tagout standard? Are there provisions of one consensus standard when compared to the others that you perceive as having lower costs to implement and use on a day-to-day basis while providing protection to workers that is equal to or greater than that provided by the other standards? If so, please explain.

The information in both domestic and international consensus standards represents the best practices and knowledge for worker safety with machinery and equipment. Not all requirements in these standards apply to every possible situation. In some circumstances, a requirement in the voluntary consensus standard is not followed because a documented risk assessment demonstrates that acceptable risk is achieved using another alternative risk reduction measure(s).

19. ISO categorizes "the ability of safety-related parts of control systems to perform a safety function under foreseeable conditions" into one of five levels, called performance levels. These performance levels "are defined in terms of probability of dangerous failures per hour." Should OSHA consider requiring a specific performance level in determining whether a control circuit type device could be a safe alternative to an EID?

Response: We need to consider Functional Safety Standards. The RFI asks for insight about certain consensus standards: *"As part of this RFI, OSHA is also evaluating criteria used by consensus standards to determine the safety effectiveness of control circuits."* In particular, OSHA asks about ISO 13849-1 and IEC 62061.

These two standards are tools that controls engineers use to address the functional safety or reliability of a SRP/CS. The Performance Levels and Safety Integrity Levels (SILs) are two distinct but similar evaluation methods. These methods are a newer/updated methodology of what was "control reliability," which OSHA has referenced in the past. A very common method that came from an earlier version of ISO 13849-1 uses Categories. Although some methods are newer/more refined than others, all of these methods remain valid as none has been shown to be invalid. That is, a machine designer can use any one of these methods (categories, performance levels, control reliability, safety integrity levels) to develop an appropriate control system for a given application based on a risk assessment.

These two consensus standards are written for machine designers, and more specifically for controls engineers. The skill level required to use these standards is not trivial, and usually beyond the capabilities of maintenance personnel in a typical employer's facility.

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Maintenance personnel can often maintain such systems, but designing a new machine, or evaluating existing equipment is typically beyond what OSHA should expect of employers.

Even with these limitations on the ability for some personnel to apply these standards, OSHA could reasonably set performance specifications per those standards. If OSHA set a requirement of "Category 3, PL=d or control reliable, with permitted deviations from the requirements based on a documented risk assessment," employers will find ways to meet these requirements if they see benefit in using alternative methods versus LOTO. OSHA should anticipate that industry would be very receptive to its setting such a specification.

Setting a specific Category/PL/SIL/control reliability requirement would simplify communications with employers but could easily result in overspecification of a requirement. Not specifying a specific requirement would allow for employers to determine the appropriate level based on a documented risk assessment. Setting a specific level but allowing deviations based on a documented risk assessment may be the best answer.

20. Can System Isolation Equipment, as discussed in the UL consensus standard UL6420 Standard for Equipment Used for System Isolation and Rated as a Single Unit, provide protection equal to that obtained through lockout/tagout?

Response: It depends on the system in which this equipment is used. Companies will, and are, developing such single purchase solutions. The use of such systems can achieve levels of risk reduction equivalent to LOTO with the added benefit that these systems tend to significantly reduce the probability of defeating/bypassing by employees.

21. The ANSI/ASSE Z244.1 consensus standard encourages the use of risk assessment and hazard control hierarchy as alternative methods of hazardous energy control. Should OSHA consider incorporating these methods in any new standard with respect to the use of control circuit type devices?

Response: The ANSI/ASSP Z244 Committee's approach to revising the Z244.1 standard used a systems approach. ASSE (now ASSP) gathered subject matter experts (SMEs) on control of hazardous energy from across industries and the country. Industries represented included:

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- consumer products manufacturing
- construction equipment

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- general manufacturing
- government
- industrial machinery
- labor
- metals manufacturing
- plastics
- railway operations
- packaging machinery
- printing
- robotics
- semiconductors

This diverse committee revised the standard on how to best control hazardous energy. The committee used the ANSI consensus process to build on the best ideas. If OSHA were to start with a blank page and write a new standard for the control of hazardous energy, it would very likely follow this same approach. Therefore, the Agency should look closely at the resulting Z244.1 standard.

Z244.1 is both specific in its requirements and enforceable. An explicit intent of the Committee was that the standard be enforceable.

LOTO is part of the standard as an approach to control hazardous energy. Z244.1 includes requirements for LOTO because it is a very important method to control hazardous energy.

Z244.1 requires significant assessment be conducted by employers before an alternative method is allowed. If the assessment is not done, then an alternative method is not allowed. In those cases, LOTO should be applied.

The requirements for alternative methods in Clause 8.2 represent far too much work for employers unwilling to do the homework. There are no shortcuts. Diligent employers willing to do the homework and work the process within Z244.1 will develop alternative methods that meet the standard and increase safety in the workplace.

In the RFI, OSHA describes the history of ANSI Z244.1 in relation to 29 CFR 1910.147. Z244.1 presents the most current knowledge and information on how to effectively control hazardous energy. The Agency should adopt - or incorporate - the methodologies in the 2016 standard.

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One limitation of Z244.1 is that it currently does not permit the use of alternative methods that provide solutions that are "as safe or safer than LOTO." Under the current Z244.1 standard, if LOTO is feasible, it is expected to be used because LOTO is considered the primary method to control hazardous energy. In the next revision of Z244.1 it is likely that this limitation will be removed, and alternative methods will be on equal footing as LOTO, thus giving employers the choice as to the best method to control hazardous energy based on the application.

Another limitation of Z244.1 is that the analysis required to use an alternative method is currently fairly complex. As companies become more familiar with the process, this is expected to get easier. Indeed tools, templates and checklists are currently being developed to assist companies in working through the alternative method process.

The elements of an alternative method as described in ANSI Z244.1 clause 8.2 need to be considered as the means to evaluate the systems to control hazardous energy, not just the control circuit type device. The potential parameters used in evaluating an alternative method include:

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8.2 Evaluating Alternative Methods

In evaluating an alternative method to lockout or tagout, the risk reduction measures that will comprise the alternative method shall be identified. Based on current analyses and best practices, alternative methods shall consist of the following parameters as applicable:

- practicability/justification analysis (clause 8.2.1)
- risk assessment based on the tasks being performed (clause 8.2.2)
- industry best practices/methods (clause 8.2.3)
- architecture/structure (clause 8.2.4)
- using well-tried components (clause 8.2.5)
- using well-tried designs (clause 8.2.6)
- common cause failure (clause 8.2.7)
- fault tolerance (clause 8.2.8)
- exclusivity of control (clause 8.2.9)
- tamper resistance (clause 8.2.10)
- program to support (clause 8.2.11)
- procedures in place (clause 8.2.12)
- periodic checking and testing (clause 8.2.13)
- review by a qualified person (clause 8.2.14)

Each topic is addressed in greater detail as follows. Not all of the above parameters will necessarily apply to a specific situation.

NOTE: When considering alternative methods, it should be understood that conventional energy-isolating devices are also subject to failure and the user should exercise care when subjecting them to use beyond their inherent performance capability (disconnects can arc or experience mechanical fault, valves can leak, powered valves can experience upstream control failures, etc.).

These parameters were used to evaluate the alternative method used in the NSCI Variance that OSHA granted as described in the RFI. Thus, these parameters have been proven effective and approved by OSHA in at least one instance.

22. Do you currently utilize the services of a specialized safety engineer or employment safety administrator to test for competency and/or ensure that the hazardous energy control system is operational? If so, how many hours does this individual spend on these tasks? Do you anticipate you would need to make use of these services if OSHA revised the Lockout/Tagout requirements to align with the consensus standards? Based on data from the Bureau of Labor Statistics, OSHA estimates that an occupational health and safety specialist makes $33.14 an hour or $68,930 annually plus benefits. If you have used the services of such specialists, how does this compare with your experience?

Response: There are very different skill sets between a safety administrator and a safety engineer. The rates above are very low for an engineer. To develop an alternative method requires special expertise as currently done. If OSHA simplified this process, such a need

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for external expertise would be reduced. However, fear of change should not be a deciding factor; any improvement can only be achieved by enhancements which differ from past methodologies.

23. How much training do you currently provide on Lockout/Tagout requirements? How long does training on this subject take and how often do employees receive training on the subject? If OSHA were to revise the Lockout/Tagout standard to permit use of control circuit type devices in some circumstances, would newly hired workers require more training or less than under the current standard? What format do you use to provide training on the Lockout/Tagout standard at your facility (i.e., small group classroom session, self-guided computer modules, etc.)? If you have used third-party training vendors to provide similar training, what are the costs? If training is provided in-house, what sort of employee provides the training (i.e., a first-line supervisor, a safety and health specialist, etc.)?

There are certainly compliance costs associated with the current 29 CFR 1910.147. The basic costs of training, annual re-training, and implementation will not change because LOTO remains a useful method to control hazardous energy, and alternative methods cannot be used for all tasks. The primary costs for compliance involve the downtime to operations, particularly where alternative methods provide an effective alternative in lieu of LOTO.

The compliance costs with the current requirements also include engaging legal counsel and outside experts to understand what is required, then provide a solution that meets the requirements. Employers may avoid these costs if a) they have sufficient in-house expertise, or b) they avoid a citation. In the event that neither is true, the outside compliance costs come into play. Those costs can be significant and considerably larger than the new citation penalty limits. If OSHA can clearly define what is required, the added external costs of compliance will be removed or diminished.

Compliance costs under new requirements for new equipment or machinery purchases are not expected to be significant. System design for operational risk reduction may already be available for application in control of hazardous energy. Once OSHA specifies the requirements, employers will acquire machinery and equipment that includes the necessary capabilities. This may not be a trivial expense, but it will be absorbed into new purchases.

Compliance costs under new requirements for existing/legacy equipment are more significant. With some systems, the costs will exceed the equipment value and no upgrades will be made. For these systems, LOTO will remain the method to control hazardous energy. With some systems, the upgrades will be made. These costs are likely to be

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significant as there will be engineering/design time to evaluate the system and determine necessary upgrades, and manufacturing time to implement them. However, the system design for control of hazardous energy often offers opportunities for improving the production operation safety system design, leading to reduction of risk and possible production improvements.

Training
OSHA seeks to receive information on the following:

1. The training courses necessary;
2. The topics training would cover;
3. The types of employees who would need training and what percent (if any) of those employees currently receive the training;
4. The length and frequency of training;
5. Any retraining necessary; and
6. The training costs, whether conducted by a third-party vendor or by an in-house trainer.

Presuming that the Agency will make changes to the 29 CFR 1910.147 requirements during the Rulemaking process, the new rules and requirements will require training for employers, employees and compliance officers.

Assuming that the Agency allows alternative methods to be used, there will be offsetting training costs. To use - and to be trained to use - an alternative method will require very limited training compared with LOTO. Alternative methods almost always make the operator's job much easier to perform. The training associated with maintaining alternative methods could be significant, particularly to maintenance personnel tasked with troubleshooting and maintaining the control systems. Yet new tools and resources are being developed to address these issues, such as ANSI B11.TR8 *Maintenance of safety-related components of machinery*.

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The time to design and implement alternative methods should not be significantly different than what controls engineers currently do. For controls engineers familiar with Categories, Performance Levels from ISO 13849-1, or control reliability, they will simply need to meet the requirements. The requirements may be increased over what they currently provide, but the training and implementation is inconsequential. For employers that do not have control engineering personnel or expertise, the training and learning curve could be a significant challenge; however, many consultants are available in the marketplace to offload this burden.

After the rules are determined, there will be considerable in-person training offerings by consultants and others. As the new requirements become better understood, the training will move from third party offerings to in-person, in-house training. Subsequently, other forms of training will very quickly become available including online, web based, computer modules and other options. The initial training costs will likely be relatively high and in high demand. Subsequently, the costs should be expected to drop considerably as more is understood about the requirements and fewer questions arise.

Applying alternative methods, based on risk assessment, are considered a higher order approach to reduce risk in the workplace according the hazard control hierarchy. Alternative methods are an engineering control which reduce risk independent of human behavior. LOTO, on the other hand, is entirely dependent on human behavior, thus putting a higher reliance on training and supervision, and therefore are included in the lowest order of measures to reduce risk.

24. Should OSHA consider making revisions to the Lockout/Tagout standard that address advances to robotics technology with respect to hazardous energy control? If so, what revisions should OSHA consider?

Response: Robots are manufacturing systems in some instances, such as in a robotic welding cell. As a manufacturing system, these are deserving of systematic attention for the control of hazardous energy.

In other systems, robots are merely components of manufacturing systems, such as a pick and place or product transfer robot in a packaging machine. In these instances, robots are not deserving of any special attention at all – they are just components, no different than motors, brakes, belts, switches, control circuit devices, etc. In these instances, robots should be treated just like any other component.

As with control circuit type devices, the focus needs to be on the *system* that the robot or device operates within, not the robot or the device individually.

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The RFI seeks information on the control of hazardous energy related to the increased interactions of employees with robots. As described previously, robots can be an integrated machinery system, or simply a component within a machinery system. With advancing technology, these differences can be expected to blur. It would be a mistake for the Agency to single out robots for special handling under the control of hazardous energy. Such an approach would take the Agency into the details of *how* to control hazardous energy for a particular industry sector for which it is expected that the methods will rapidly change.

Robots offer an excellent example(s) of where industry applications will be advancing with little limitation to their application. Collaborative robots, mobile robots, service robots, medical robots, and others will continue to quickly evolve and enter the workplace. Hazards will be introduced with new situations/applications. The appropriate risk reduction measures will depend on the specific situations. By developing a ruling that will *stand the test of time*, The Agency can trust that employers following the risk assessment process and applying the ANSI/ASSP Z244.1 requirements will control hazardous energy for evolving applications and technology.

25. What are the aspects of design and build, the features, or the specifications of modern robots that are relevant to an evaluation of whether a robot has the potential to release hazardous energy while in the presence of employees? How do you use robotics? Are robotics isolated from nearby employees? Near employees? Directly employed or worn by employees?

Response: We believe our comments above respond and applies to this question.

26. Are you aware of any instances where workers have been injured or killed by the release of hazardous energy when working with robotic technologies? Please provide examples if you have them.

Response: We are not aware of any situations with applications that have been designed to industry standards including ANSI/ASSP Z244.1 and ANSI/RIA R15.06. There have been serious injuries and fatalities with robotic systems that have not met the requirements of these industry best practices.

27. Robots operate using software. What processes or tools exist to ensure that this software is safely operating (including protection from malware, tampering, and other threats) or displaying signs that a robot could malfunction and lead to a release of hazardous energy while in the presence of employees? Should OSHA consider making revisions to the Lockout/Tagout standard with respect to the safe functioning of robotics

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software? If so, what revisions should OSHA consider? To the extent that there are such revisions, how much would they increase the costs of or development hours for the software?

Response: No, malware or tampering is well beyond the scope or needs of this project. These are very real issues that are being addressed by industry in other committees. This is a very dynamic situation that changes daily. OSHA is not well suited to include this issue within the scope of the control of hazardous energy.

28. Are you currently using some form of lockout/tagout to control hazardous energy in robots? What steps do you take? How long do those steps take? Do you use any specially purchased equipment or materials for this process? How frequently do you take steps to control hazardous energy releases in your industrial robots? How does the process compare to the steps undertaken to comply with OSHA's Lockout/Tagout standard? How many labor hours do these additional steps require? Do these steps require any additional equipment? If so, what does this equipment cost?

Response: We believe that our comments above respond and applies to this question.

29. Should OSHA consider adopting portions of the ANSI/RIA R15.06-2012 standard on Industrial Robots and Robot Systems, which outlines the safety requirements for risk assessments of robotic system installations? Are there any requirements in the ANSI/RIA standard that would be prohibitively expensive for your company to implement? Are there any requirements that do not provide sufficient protections for workers?

Response: Adopting a current industry standard in lieu of writing a separate OSHA standard is always a better solution and represents good public policy. However, it is important to note that R15.06 does not explicitly address the control of hazardous energy. A new robot standard is under revision and anticipated to be published in 2021 or 2022, based upon an international standard.

30. Is there another standard, besides ANSI/RIA R15.06-2012 Industrial Robots and Robot Systems - Safety Requirements, that OSHA should consider in developing requirements for the control of hazardous energy involving robotics?

Response: We recommend it would be better policy to stay with a larger view. Focusing on robots is too narrow. Robots are sometimes a system, sometimes a component. A new robot standard is under revision and anticipated to be published in 2021 or 2022, based upon an international standard.

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Specific Questions Regarding Economic Impacts.

31. Please describe in detail how a standard for the control of hazardous energy that incorporates the use of control circuit type devices or new robotic technology could create more jobs; eliminate outdated, unnecessary, or ineffective requirements; or produce other economic benefits. Please provide information supporting your view, including data, studies and articles.

Response: This call for information is about safety with controlled energy and not about job creation. However, Z244 would contend that job creation could ensue as manufacturing of new components would be increased to meet user demand.

32. The Regulatory Flexibility Act (5 U.S.C. § 601, as amended) requires OSHA to assess the impact of proposed and final rules on small entities. OSHA requests comments, information, and data on how many and what kinds of small businesses, or other small entities, in general industry employment could be affected if OSHA decides to revise provisions in 29 CFR 1910.147. Describe any such effects. Where possible, please provide detailed descriptions of the size and scope of operation for affected small entities and the likely technical, economic, and safety impacts for those entities.

Response: We contend our answers to the other questions go into great detail on impact and how this would positively impact safety. We do note that Z244 is applicable to all organizations regardless of size. Z244 has never received one comment indicating the standard could not be implemented by small entities.

33. In addition, are there any reasons that the benefits of reducing exposure to hazardous energy might be different in small firms than in larger firms? Are there any reasons why the costs for controlling hazardous energy would be higher for small employers than they would be for larger employers? Are there provisions that would be especially costly to small employers? Please describe any specific concerns related to potential impacts on small entities that you believe warrant special attention from OSHA. Please describe alternatives that might serve to minimize those impacts while meeting the requirements of the Occupational Safety and Health Act of 1970, 29 U.S.C. 651 et seq.

Response: We contend our detailed answers to the other questions go into great detail on impact and how this would positively impact safety.

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Closure

It is now almost 40 years since the original language was crafted and 30 years of compliance application by OSHA. We endorse the current re-evaluation of the current Agency view on "control circuit type devices" and the use of advanced control system technology to contemporize our human protective approach. The current regulatory interpretation has created significant compliance defense costs, impeded the use of advanced technologies and best practices, and inadvertently affected a wide range of business, industry, and organizations in a manner not conducive to good safety practice or from the perspective of global competitiveness.

Notification: This statement was created, approved, and submitted by the ANSI/ASSP Z244 Committee in accordance with its accredited procedures.

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