Docket No. S-012B
Ex. 5

SECTION 610 AND EXECUTIVE ORDER 12866 REVIEW OF THE CONTROL OF HAZARDOUS ENERGY SOURCES (LOCKOUT/TAGOUT) STANDARD 29 CFR 1910.147:

RESULTS OF OSHA'S LOOKBACK REVIEW OF THE STANDARD

Docket S-012-B

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EXECUTIVE SUMMARY

This report presents the results of the Occupational Safety and Health Administration's (OSHA's) "Lookback" review of the Agency's Control of Hazardous Energy Sources standard, also known as the Lockout/Tagout standard. The standard, which is codified in OSHA's general industry standards at 29 CFR 1910.147, establishes requirements employers must follow to disable machinery and equipment and to prevent the release of potentially hazardous energy during the servicing and maintenance of that machinery and equipment. The Lockout/Tagout standard requires employers to develop and implement lockout/tagout programs and to train their workers to follow required procedures during servicing and maintenance work. "Lockout" refers to the practice of installing a lock on an energy-isolating device, such as a circuit breaker or shut-off valve, so that the equipment will not be energized by mistake. The term "tagout" refers to the practice of attaching a warning tag to an energy-isolating device to warn employees not to energize the equipment until the warning tag has been removed. OSHA issued the Lockout/Tagout standard in 1989.

In 1997, the Agency initiated a regulatory review of the standard, as required by Section 610 of the Regulatory Flexibility Act (RFA) and Section 5 of Executive Order (EO) 12866. Section 610 of the RFA requires agencies to determine whether their standards should be continued without change or should be amended or rescinded, consistent with the objectives of the Occupational Safety and Health Act (OSH Act), to minimize any significant impact of the rule on a substantial number of small entities. Section 5 of EO 12866 requires agencies to determine whether, to reduce the regulatory burden on the American people, their families, communities, State, local, and tribal governments, and industries, the standard should be modified or eliminated to make it more effective in achieving its regulatory objectives, or less burdensome, or to bring it into better alignment with the President's priorities and the principles set forth in the Executive Order.

Conclusion. Based on the comments and testimony of participants in this Lookback review process and other evidence submitted to the public docket (Docket S-012-B), OSHA concludes that the Agency's Control of Hazardous Energy Sources (Lockout/Tagout) standard should be continued without change. The evidence also demonstrates that the standard does not need to be rescinded or amended to minimize significant impacts on a substantial number of small entities.

OSHA also finds that the Lockout/Tagout standard is necessary to protect employee safety and health, is compatible with other OSHA standards containing lockout/tagout provisions, is not duplicative or in conflict with other Federal, State, or local government rules, is not inappropriately burdensome, and is consistent with the President's priorities and the principles of EO 12866. In addition, although the standard is technically complex, compliance assistance materials will assist employers in interpreting the standard. Further, no changes have

occurred in technological, economic, or other factors that would warrant revision of the standard at this time.

This regulatory review is organized into six chapters: Introduction, Regulatory Environment of the Standard, Continued Need for and Effectiveness of the Standard, Public Comments and Complaints Concerning the Standard, Changes in Technological and Economic Conditions, and Conclusions. These are briefly summarized below.

Chapter I of this review details the compliance assistance and outreach activities OSHA has undertaken to help employers and employees learn about the risks associated with hazardous energy sources and how to comply with the standard. OSHA personnel have given speeches, conducted training sessions, awarded training grants, developed compliance assistance materials, and disseminated documents, and are now testing a Lockout/Tagout expert system designed to help employers comply with the standard.

Chapter II of this review describes changes in the populations affected by the standard since its promulgation, estimates the number of firms and employees currently covered by the rule, and discusses the compliance experience of businesses falling within the standard's scope. The Regulatory Impact Assessment (RIA) performed in support of the final rule in 1989 identified covered industries as high-impact, low-impact, and negligible ("zero") impact industries, depending on the percentage of firms in each group potentially affected by the rule. The manufacturing sector was identified as the most heavily impacted sector, with all establishments in SIC codes 20-39 identified as potentially impacted. The transportation, utilities, trade, and services sectors were designated low impact industries, and retail trade, finance, insurance, real estate, and other industries in the service sector were classified in the negligible impact group.

The 1989 RIA estimated that about 640,000 establishments would be covered by the standard. According to 1994 Bureau of the Census data (provided by the Small Business Administration) and OSHA estimates of the proportion of firms in each impact group currently covered by the rule, the Agency estimates that nearly 1 million firms are now covered by the rule. About 358,000 of these firms have fewer than 20 employees. The number of workers covered has also risen since the rule went into effect: an estimated 2,962,000 authorized employees (authorized employees are those judged to be most at risk from lockout/tagout hazards) were assumed to be covered when the final rule was issued; that number has increased to 3,286,000 authorized employees in the ensuing interval. This increase has occurred in the industries identified in the 1989 RIA as low impact.

The compliance experience of affected firms, and particularly of small businesses, was ascertained for this review on the basis of four sources of data: the docket for this Lookback review; an analysis of OSHA enforcement data; input from OSHA compliance staff and State-plan officials; and a review of the literature on the standard. OSHA's analysis of the Agency's enforcement data shows that violations related to lockout/tagout are frequent: the

Lockout/Tagout standard is routinely among the top five standards most frequently cited. Most of the citations were issued in manufacturing facilities, i.e., in those establishments identified by the RIA as being in high impact industries. Firms with fewer than 100 employees were inspected less frequently than the size distribution of such firms in the United States would suggest.

Representatives of small businesses who submitted comments to the docket indicated that small businesses often have difficulty complying with the rule's requirements to develop, document, and use lockout/tagout procedures and in understanding the compliance requirements of the rule. No small business commented that the standard had a significant impact on their business. OSHA and State-plan compliance personnel generally agreed that "even small employers are able to comply with... the LO/TO standard." However, another compliance official stressed the importance of providing small employers with compliance assistance materials. In particular, assistance in complying with the procedures requirement of the rule would be helpful to some small businesses, according to some compliance personnel. Comments from State-plan personnel generally echoed these comments. Three of the State-plan States (Oregon, Kentucky, and Minnesota) have lockout/tagout standards that cover more workplaces than the Federal standard does or require the use of lockout procedures exclusively (rather than lockout and tagout procedures).

OSHA' s review of the literature related to this standard failed to identify specific problems with the standard, although some articles postulated that compliance with the standard was generally poor. However, it is not possible to determine from the evidence in this record how extensive such noncompliance is, or whether it is due to a lack of understanding of the standard, simple non-compliance, or a lack of awareness that the standard exists.

Chapter III of this review evaluates the continued need for, and the effectiveness of, the Lockout/Tagout rule. OSHA bases its conclusion that the rule is effective and should be continued on four kinds of information: (1) data showing that even more workers are performing work that puts them at risk than was the case when the rule was published; (2) OSHA compliance data showing that workers continue to be injured and killed as a result of failure to follow lockout/tagout procedures properly; (3) data demonstrating the standard's effectiveness; and (4) testimony from employer and employee representatives that the standard has been effective in preventing lockout-related deaths and injuries.

First, 600,000 more workers are exposed to lockout/related hazards than was the case in 1989. Moreover, testimony in the docket and other evidence suggest that more maintenance and servicing tasks are being performed by production workers, who generally have less skill and training in servicing and maintenance activities than maintenance workers. In addition, temporary workers, who are often less than adequately trained, may be performing more maintenance and servicing work than was formerly the case. Both trends—toward the use of production workers and temporary workers in lieu of specially trained maintenance workers—may mean that workers exposed to lockout-related hazards may be at greater risk than was the case when the standard was issued.

Several recent OSHA enforcement cases, including one involving the deaths of eight workers, who were not following the appropriate lockout procedures at the time of the accident, point to the continued need for the standard and for better compliance with it. In addition, three sources of data were submitted to the docket that demonstrate the rule's effectiveness: data from the United Automobile, Aerospace, and Agricultural Implement Workers of America (UAW) fatality database; data from a similar database maintained by the United Steelworkers of America (USWA); and data from a study of sawmill injuries in Maine. The UAW database shows a significant decline in lockout-related fatalities. In the years between 1989 (when the final rule was published) and 1997, lockout-related fatalities declined by 20 percent per year; when the concomitant increase in the proportion of auto workers exposed to lockout hazards is taken into account, the UAW believes that a 30 percent annual decline in the rate of these fatalities has occurred.

The USWA database tells a similar story: over a seven year period (1990-1997), a 55 percent reduction in lockout/tagout-related fatalities occurred at the 10 basic steel producing companies represented in the data base. The third study involved an epidemiological analysis of wood product industry workers in Maine and included 157 cases involving injured workers ("cases") and 251 cases involving uninjured workers ("controls"). This study showed that injured workers were three times less likely than uninjured workers to work in an establishment having a lockout/tagout program. Although the data from this epidemiological study do not establish a direct link between injuries and the absence of lockout programs, they do suggest an association between these factors.

In addition to these analyses, several commenters (including large companies like Bell Atlantic and Kodak), unions (such as the UAW, USWA, and the International Brotherhood of Electrical Workers), employer groups (such as the Organization Resources Counselors), and professional societies, such as the American Society of Safety Engineers, supported the standard, either because it had been effective in saving lives and preventing injuries or because they recognized the importance of having a Federal standard addressing this widespread workplace hazard. These organizations represent small as well as large companies. The evidence presented in Chapter III of this report indicates that lockout/tagout programs of the kind required by the standard have had measurable and positive impacts on worker safety.

The comments submitted to the docket for this regulatory review (Docket S-012B) are summarized in **Chapter IV** of this report. Most comments received supported continuation of the standard because it had been effective in achieving its worker protection goal. Some participants suggested that OSHA revise certain provisions of the rule they felt were burdensome; however, most of these commenters urged OSHA to address these issues by providing compliance assistance materials rather than by reopening the rulemaking. Employee representatives urged OSHA to strengthen the rule and/or extend it to the construction, maritime, and agriculture industries. Other commenters urged OSHA to produce a plain language version of the standard. By and large, however, most commenters asked OSHA to increase its

compliance assistance efforts or to add non-mandatory materials to the rule, rather than to alter the language of the standard itself.

Those commenters to the docket who represented small businesses, such as the National Association of Manufacturers, the Society of the Plastics Industry, and the Synthetic Organic Chemical Manufacturers Association, also generally agreed that additional compliance assistance, rather than a reopening of the rulemaking, was an appropriate way for OSHA to address these commenters' concerns. However, some small-business representatives urged OSHA to revise certain provisions to reflect performance rather than specification-based language, to rely to a greater extent on consensus standards, or to enforce the standard more consistently.

Lookback reviews must specifically evaluate the following factors: (1) the continued need for the rule; (2) the nature of public complaints or comments about the rule; (3) the complexity of the rule; (4) the extent to which the rule overlaps, duplicates, or conflicts with other federal rules; and (5) the length of time since the rule was evaluated or the degree to which technology, economic conditions, or other factors have changed since the rule was promulgated. Comments on each of these issues are summarized below.

Continued need for the rule. The overwhelming majority of commenters agreed that the standard should continue in effect. Many of those commenters who urged OSHA to revise the standard suggested the same revisions they had raised during the original rulemaking.

Nature of Complaints and Comments. Comments touched on a range of topics, from the need to strengthen the standard by extending it to other sectors to the need for additional compliance assistance materials to the need to incorporate material from the compliance directive into a non-mandatory appendix to the rule.

Commenters from the process industries urged OSHA to include as a non-mandatory appendix to the standard the appendix to the compliance directive (Appendix C to STD 1-7.3). This appendix was negotiated by OSHA and representatives of the process industries as part of a settlement of a legal challenge to the standard when it was first published. These commenters stated that, if OSHA reopened the standard at this time, they would recommend modifications to the interpretations agreed to as part of that settlement.

Complexity of the Rule. Some commenters noted that the rule was complex. The suggestions for addressing this problem ranged from rewriting the rule in plain language to providing compliance assistance materials.

Extent of Overlap with other Federal or State Laws. No commenter identified overlap or duplication between the lockout/tagout standard and other Federal or State laws. Some participants, however, believe that some of the hazard-specific lockout provisions in other OSHA standards duplicate provisions of the Lockout/Tagout standard.

Changes in Technology, Economic Conditions, and Other Factors. No comments specifically addressing these issues were received.

Burdens on Small Businesses. No comments specifically addressed the standard's impact on small businesses, and no comments suggested that such impacts needed to be minimized. Two comments described how some small businesses had been able to increase their profitability by implementing safety and health programs that included lockout/tagout procedures. Another participant commented that the costs incurred by a small business to comply with the standard "...will easily be returned by avoiding only one injury or fatality."

Chapter V of this review describes changes in the technological and economic environment since the Lockout/Tagout standard was issued. In general, advances in machine guarding technology and increased reliance by employers on predictive maintenance techniques and technologies have reduced the amount of machine and equipment servicing and maintenance required. In addition, the introduction of software designed specifically to assist employers in administering their lockout programs has facilitated compliance with the standard. This review also did not identify any changes in economic conditions that would have increased the impacts of the standard on small entities since the rule was issued. In addition, no evidence was identified in this review to suggest that the standard needs to be revised to make it more effective or less burdensome, or to bring it into better alignment with the President's priorities.

Chapter VI of this review summarizes OSHA's findings as a result of this Lookback review of the Agency's Lockout/Tagout standard (29 CFR 19 10.147). The review was conducted in accordance with the requirements of Section 610 of the Regulatory Flexibility Act and Section 5 of Executive Order 12866. OSHA finds that the Lockout/Tagout standard:

- Should be continued without change
- Is necessary to protect the safety and health of employees
- Does not need to be rescinded or amended to minimize any significant impact on a substantial number of small entities
- Is compatible with other OSHA standards and is not duplicative or in conflict with other Federal, State, local, or tribal government rules
- Is not inappropriately burdensome
- Is consistent with the President's priorities and the principles of EO 12866.

In particular, OSHA notes that evidence in the record of this review demonstrates that, in at least two high-impact industries—automobile manufacturing and steel production—the standard is credited with reducing lockout-related fatalities by 20 to 55% in the years since the rule was issued.

Although not required by the Regulatory Flexibility Act or the Executive Order to do so, OSHA has decided to respond to the comments and concerns expressed by participants in this regulatory review, most of whom asked OSHA to provide additional compliance assistance

materials. Specifically, OSHA intends to undertake the following actions and to complete them within two years (i.e., by the end of 2001):

- Review and update of the Lockout/Tagout compliance directive, STD 1-7.3

- Review of existing interpretations relating to the standard and development of new letters of interpretations addressing many of the concerns raised by review participants

- Development, in conjunction with the National Automobile Dealers Association, of compliance assistance materials for industries engaged in vehicle maintenance and repair.

OSHA has already completed several activities related to the Lockout/Tagout standard in response to comments made during this Lookback review. These include:

- A Lockout/Tagout Interactive Training Program consisting of three major components comprising a Tutorial, a group of abstracts called "Hot Topics" and a group of Interactive Case Studies. The Tutorial explains the standard in a question/answer format. The "Hot Topics" consist of five abstracts containing a detailed discussion of major issues in which relevant highlighted sections of the all-inclusive documents are linked together. In the Interactive Case Studies, seven simulated Lockout/Tagout inspections are presented.

- An Integrated Preamble which combines the final rule preamble published in the September 1, 1989 Federal Register and the final rule corrections and technical amendments document published in the September 20, 1990 Federal Register.

- The development of the Lockout/Tagout Plus Advisor consisting of an interactive, expert, diagnostic item of software. It allows users to be interviewed about their activities to determine whether workers might be exposed to hazards from moving machinery or electricity or other sources of energy. It asks questions to determine whether the work is covered by the Lockout/Tagout Standard or other standards concerned with hazardous energy. The software responds to the users' facts to provide expert guidance, explanations, and assistance.

OSHA concludes that providing employers, especially small employers, with the compliance assistance tools listed above will make compliance with the Lockout/Tagout standard easier for these employers and will address many of the comments received during this Lookback review. Such compliance assistance should also increase the effectiveness of the standard in protecting workers from the significant risks associated with servicing and maintenance tasks in covered industries. As discussed in Chapter III of this review, information in the record from two databases credits the standard with achieving reductions in lockout-related fatalities of between 20% and 55%.

CHAPTER I
INTRODUCTION

OVERVIEW

In 1989, the Occupational Safety and Health Administration (OSHA) promulgated a final standard that established requirements for the control of hazardous energy during servicing and maintenance of machinery and equipment [FR Vol. 54, No. 269, 9/1/89, pp. 36644-36695]. This standard, the Control of Hazardous Energy Sources (or the "Lockout/Tagout") Standard, is codified at 29 CFR 1910.147. The OSHA Lockout/Tagout Standard was the result of an extended rulemaking effort that took into consideration input from both large and small businesses as well as employer and employee representatives.

The standard addresses practices and procedures that are necessary to disable machinery or equipment and to prevent the release of potentially hazardous energy while maintenance and servicing are being performed. The employer must use lockout for equipment that is designed with a lockout capability unless the employer can demonstrate that tagout provides full employee protection. For equipment that was not designed to be locked out, the employer may use tagout. The standard applies to general industry employment under 29 CFR part 1910, but does not cover maritime, agriculture, or construction employment. The standard also does not cover oil and gas well drilling and servicing; the generation, transmission and distribution of electric power by utilities; and electrical work on electric conductors and equipment. The standard contains definitive criteria for establishing an effective program for locking out or tagging out energy isolating devices and requires training for authorized and affected employees. The rule requires the employer to implement the specified procedures, and to use effective control measures based on the workplace hazards that are encountered.

Following the promulgation of the standard in 1989, OSHA took a number of actions to provide assistance to businesses affected by the standard. These actions included extending the effective date of the standard, addressing key enforcement policy issues in the Compliance Directive for the Lockout/Tagout Standard (STD 1-7.3), making technical amendments to the standard, and devoting resources to outreach and compliance assistance efforts. Some of the outreach and compliance assistance activities undertaken by OSHA included development of resource documents for use by affected employers and employees, provision of targeted training grants, provision of consultation assistance, and delivery of outreach presentations to trade associations and other groups.

In 1997, OSHA announced that it would perform a regulatory review of the Lockout/Tagout Standard to determine, consistent with Section 610 of the Regulatory Flexibility Act, whether this standard should be continued without change or should be amended or rescinded, consistent with the objectives of the Occupational Safety and Health Act, to minimize any significant impact of the rule on a substantial number of small entities. Under the more general review requirements of Section 5 of Executive Order 12866, OSHA is required to determine whether, to reduce the regulatory burden on the American people, their families,

communities, State, local, and tribal governments, and industries, a rule under review should be modified or eliminated to make it more effective in achieving its regulatory objectives, or less burdensome, or to bring it into better alignment with the President's priorities and the principles set forth in the Executive Order. This report summarizes the findings of OSHA's regulatory review of the standard under the Regulatory Flexibility Act and the Executive Order.

PURPOSE OF THE STANDARD

The Lockout/Tagout Standard requires employers to develop and implement lockout/tagout programs and procedures and to use other effective measures such as employee training to eliminate or control exposure to hazardous energy occurring during servicing and maintenance work. The term "lockout" refers to the process of installing a lock on an energy isolating device, such as a circuit breaker, disconnect switch, or shut-off valve, so that the equipment cannot be energized by mistake.[1] The term "tagout" refers to the process of attaching a warning tag to an energy isolating device to warn other persons not to restore energy to the equipment until the warning tag has been removed.[2]

Safety hazards resulting from failure to properly lock out or tag out machinery or equipment during servicing or maintenance can occur in a wide variety of industries. Failure to control hazardous energy in an appropriate fashion can lead to serious injuries or death. The following examples of accidents involving failure to control hazardous energy are summaries of actual incidents that occurred before OSHA promulgated the final Lockout/Tagout Standard:

- An employee was removing paper from a waste hogger. The hogger had been shut down, but not the conveyer feeding the hogger. The employee climbed onto the machine, fell onto the conveyer, was pulled into the hogger opening, and was fatally crushed. There was no energy control procedure in place for this operation. This accident was caused by failure to document and implement an effective energy control procedure and could have been prevented by compliance with §1910.147(c)(4).

- An employee trainee leaned the top part of his body into a flour batch mixer to clean the machine. Another employee activated the wrong switch and the

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[1] The formal definition of the term "lockout" contained in §1910.147 is: "The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed."

[2] The formal definition of the term "tagout" contained in §1910.147 is: "The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed."

machine turned on, resulting in fatal crushing injuries to the neck of the employee who was cleaning the machine. There was an unwritten company procedure for lockout during all maintenance, but the procedure was not followed. This accident was caused by failure to document and implement an effective energy control procedure as well as failure to adequately train employees and could have been prevented by compliance with §1910.147(c)(4) and (c)(7).

- An employee was cleaning the unguarded side of an operating granite saw. The employee was caught in the moving parts of the saw and was pulled into a nip point between the saw blade and the idler wheel, resulting in fatal injuries. This accident was caused by failure to shut down or turn off the equipment to perform maintenance and could have been prevented by compliance with §1910.147(d)(2).

- Two employees were repairing a press brake. The power to the press brake had been shut off for ten minutes. The employees positioned a metal bar in a notch on the outer flywheel casing so that the flywheel could be turned manually. The flywheel had not completely stopped, causing the employees to lose control of the bar. The bar flew across the workplace and struck and killed a nearby employee who had been observing the repair operation. This accident was caused by failure to control stored energy and could have been prevented by compliance with §1910.147(d)(6) [FR Vol. 54, No. 169, 9/1/89, p. 36646].

Compliance with the Lockout/Tagout Standard can prevent accidents such as those described above from occurring. This review has shown that although lockout/tagout accidents continue to occur, the Lockout/Tagout Standard has been effective in reducing these injuries, at least in some industries. (This finding is discussed in detail in Chapter III, Continued Need.)

BACKGROUND TO THE DEVELOPMENT OF THE STANDARD

Brief History of the Rulemaking Process

The development of OSHA's Lockout/Tagout Standard included both an Advance Notice of Proposed Rulemaking stage and a Notice of Proposed Rulemaking stage. These notices provided two opportunities for public comment to the rulemaking record. Public meetings were held following publication of the Advance Notice of Proposed Rulemaking, and public hearings were held following publication of the Notice of Proposed Rulemaking. The Final Rule was promulgated in September 1989.

Advance Notice of Proposed Rulemaking

OSHA published an Advance Notice of Proposed Rulemaking (ANPR) for the Lockout/Tagout Standard on June 17, 1980 [FR Vol. 45, No. 118, 6/17/80, pp. 41012-41015]. The ANPR requested public comments on issues germane to the development of a proposed rule.

OSHA also held a number of public meetings at this stage of the rulemaking [FR Vol. 45, No. 189, 9/26/80, pp. 63883-63884].

A special attempt was made to obtain input from small businesses at this early stage in the rule's development. As part of efforts conducted under a Memorandum of Understanding, the Small Business Administration (SBA) and OSHA jointly issued a mailing consisting of a cover letter from Milton Stewart, Chief Counsel for Advocacy; a letter to small business representatives from Kay Klatt, OSHA Special Assistant for Small Business; and a brief questionnaire asking for information on basic lockout/tagout issues [Docket S-012; Exs. 13, 2-16]. This mailing was sent to representatives of approximately 4,500 trade associations and small businesses on an SBA mailing list. Responses to this mailing were entered into Docket S-012 and, along with the other comments received in response to the ANPR, were evaluated during the process of developing the proposed rule.

Notice of Proposed Rulemaking

OSHA published the proposed Lockout/Tagout Standard on April 29, 1988 [FR Vol. 53, No. 83, 4/29/88, pp. 15496-15521]. The preamble to the proposed rule solicited public comments on a variety of questions of interest to OSHA. Public hearings were held in 1988 and post-hearing comments were gathered until the record closed on May 3, 1989. Most of the public comments addressed the following four major issues: (1) whether OSHA should require the use of locks alone, locks and/or tags, or tags alone, (2) whether OSHA should require employee participation in the development of lockout/tagout procedures and training programs, (3) the scope and application of the standard, and (4) the use of performance language in the regulatory text.

Final Rule

OSHA issued the final Lockout/Tagout Standard on September 1, 1989 [FR Vol. 54, No. 169, 9/1/89, pp. 36644-36690]. Public comments, including comments provided by small businesses and their representatives, were taken into consideration when preparing the final standard. The final Lockout/Tagout Standard was determined to be both technologically and economically feasible at the time of its promulgation. A Regulatory Flexibility Analysis was also performed for this rule. OSHA estimated in the Regulatory Flexibility Analysis that the cost of full compliance with the rule would equal no more than 0.05 percent of an average small or very small firm's operating costs and no more than 2.2 percent of an average small firm's net income [Docket S-012A; Ex. 71, p. VII-6].

OSHA also determined that many small firms, especially those in the manufacturing sector, would potentially be covered by the standard. In the preamble to the final rule, OSHA indicated that "a small business does not necessarily have small energy control problems" and that "much complex machinery and equipment can be found in workplaces with few employees, especially in highly automated companies" [FR Vol. 54, No. 169, 9/1/89, p. 36670]. OSHA also noted that a special Bureau of Labor Statistics injury study had found that "approximately 35

percent of the total number of injured employees responding to the survey were injured at workplaces with fewer than 50 employees...and another 15 percent occurred where there were between 50 and 99 employees" [FR Vol. 54, No. 169, 9/1/89, p. 36671]. Thus, OSHA concluded that many small businesses would have energy control-related hazards that should be regulated by provisions of the standard. OSHA therefore developed the final rule in such a way that "the complexity of an employer's procedure will depend on the complexity of the energy control problem in the specific facility, and not on anything unique to or inherent in the number of employees or size of the facility" [FR Vol. 54, No. 169, 9/1/89, p. 36671].

On the other hand, OSHA recognized that some firms (including smaller firms) might have less complicated energy control situations. For example, employees of some smaller firms might use hand tools or cord-and-plug-connected machinery to perform the same types of tasks performed by employees using hard-wired equipment at the facilities of bigger firms. Therefore, some provisions in the final standard were tailored to reduce unnecessary regulatory burdens. Examples of such provisions include: 1) an exemption from coverage for repair or maintenance of cord-and-plug-connected machinery and equipment kept under the exclusive control of a servicing worker, and 2) an exemption from written lockout/tagout procedure requirements for any machine that can be deenergized and locked out in accordance with the criteria given in the note to §1910.147(c)(4)(i). These provisions responded to concerns expressed by both small and large businesses during the rulemaking process. In addition, OSHA also published non-mandatory Appendix A to §1910.147 to provide a model of an acceptable lockout/tagout procedure for affected firms to use.

OSHA ACTIVITIES FOLLOWING PROMULGATION OF THE FINAL RULE

OSHA took a number of actions after the publication of the final rule to respond to concerns expressed by representatives of industry and labor. First, the compliance deadline for the standard was extended by several months. Second, OSHA worked with industry and labor stakeholders to ensure that its enforcement policy (as documented in OSHA Compliance Directive STD 1-7.3) would address concerns about the possible interpretation of several provisions in the final rule. Third, OSHA published corrections and technical amendments to the rule after its promulgation. Fourth, the Agency undertook a number of outreach and compliance assistance activities to help businesses comply with the rule.

Extension of the Effective Date of the Standard

On November 6, 1989, OSHA published a Federal Register notice suspending the effective date of the standard [FR Vol. 54, No. 213, 11/6/89, pp. 46610]. Through that notice, the requirements of the standard, originally scheduled to become effective on October 31, 1989, were suspended until January 2, 1990. OSHA determined that there was good cause to briefly delay the effective date of the final rule. The effective date was suspended to provide an extension of time for employers to come into compliance with the final rule and to respond to requests received by OSHA for extensions of the effective date and a petition for a temporary variance from the standard.

Efforts to Address Key Enforcement Policy Issues

After the publication of the standard, representatives of some affected industries and employers petitioned for judicial review of the applicability of the final Lockout/Tagout Standard to process systems and piping networks. Following the initiation of this lawsuit, OSHA and the various parties to this lawsuit entered into discussions concerning language to be included in the Compliance Directive to clarify how OSHA intended to enforce the requirements of the standard in the process industries. Portions of the contents of Compliance Directive STD 1-7.3 and the examples and interpretive guidance contained in Appendix C of the Compliance Directive were developed during these negotiations. On September 11, 1990, OSHA issued Compliance Directive STD 1-7.3. The contents of Appendix C specifically addressed the enforcement policy concerns of representatives of the process industries.

Technical Amendments to the Standard

On September 20, 1990, OSHA published a Federal Register notice containing corrections to the preamble and the standard as well as technical amendments to the standard [FR Vol. 55, No. 183, 9/20/90, pp. 38677-38687]. OSHA issued this Federal Register notice to correct errors and inconsistencies in the preamble and final standard. The contents of the notice also provided resolution to a number of questions of interpretation raised after the promulgation of the rule by representatives of affected industries and labor. Technical amendments contained in this notice modified selected provisions of the regulatory text of the Lockout/Tagout Standard to clarify OSHA's regulatory intent.

OSHA Outreach/Compliance Assistance Efforts

Since 1989, OSHA has reached out to affected businesses through its nationwide consultation program as well as through outreach activities such as public speeches and training sessions conducted by enforcement program staff. In addition to directly providing compliance assistance, OSHA has awarded training grants to nonprofit groups to fund the development of training materials to help employers and employees reduce lockout/tagout injuries. OSHA has also prepared a number of free resource documents for public distribution and has developed an expert system computer software package to aid businesses in complying with the Lockout/ Tagout Standard. Reports from employer groups and from OSHA field staff indicate that OSHA's compliance assistance materials have been well received.

Outreach through Consultation and Enforcement Programs

OSHA provides compliance assistance to employers through its consultation program. Consultation program assistance is typically targeted toward specific safety and health problems present at the facilities visited. Although no specific estimates can be made of the number of consultation visits that provided consultation assistance for the Lockout/Tagout Standard, the number of such visits is likely to be significant because of the importance of the standard and the common nature of the hazards regulated by the standard.

OSHA enforcement offices have also been engaged in outreach activities related to the Lockout/Tagout Standard. OSHA Regions II, IV, VI, VII and VIII all indicated that their staff have recently performed outreach efforts and made presentations addressing lockout/tagout hazards. For example, the Jackson Area Office in Region IV reported that it has recently conducted outreach training for groups such as the Mississippi Manufacturers Association, the Gulf Coast Field Federal Safety Council, and various chapters of the American Society of Safety Engineers. In addition, OSHA's Region VII office indicated that Region VII staff have developed a sample written lockout/tagout program that is distributed to help employers comply with the standard.

Targeted Training Grants

OSHA regularly awards training grants to nonprofit groups to help employers and employees reduce workplace injuries and illnesses. Since the promulgation of the Lockout/Tagout Standard, three grants have been awarded for the development of lockout/tagout training programs. In 1992, OSHA awarded two targeted small business training grants for the development of lockout/tagout training programs. One grant was awarded to the National Tooling and Machining Association and one to West Virginia University. A third training grant was awarded to the American Federation of State, County, and Municipal Employees in 1994.

The targeted small business training grant awarded to the National Tooling and Machining Association (NTMA), a trade association representing approximately 3,000 small businesses, funded the preparation of lockout/tagout training videos and training materials targeted toward managers, supervisors, and workers in the tooling and machining industries. The NTMA's Director of Technical Media reported that these training resources have been very favorably received. The training materials developed using this grant are available for purchase from the NTMA.

The grant awarded to West Virginia University (WVU) was also a targeted small business training grant. WVU used the grant funding to provide lockout/tagout training to small businesses in the forest products industry. The WVU training program trained approximately 1,000 individuals, the majority of whom were either employers, managers, or safety directors at small businesses in the forest products industry (WVU also trained approximately 375 employees at a kitchen cabinet manufacturing firm that qualified as a small business according to Small Business Administration employment size criteria). According to the Director of the WVU training program, approximately 300 companies, many with fewer than 10 employees, were reached through this grant.

In 1994, OSHA also awarded a grant to the American Federation of State, County, and Municipal Employees. This grant was awarded for the development of a program providing lockout/tagout training to maintenance and repair workers. Additional funding was provided for this grant in 1996.

OSHA Lockout/Tagout Resource Documents

OSHA has prepared a number of documents, such as the OSHA booklet on the Lockout/Tagout Standard--OSHA Publication 1320--that are designed for public distribution to facilitate understanding of the general requirements of the standard. Most, if not all, of these documents are available through OSHA's World Wide Web site at http://www.osha.gov. OSHA's home page at http://www.osha.gov also contains links to all OSHA interpretations of the Lockout/Tagout Standard, the Compliance Directive, and a set of safety training materials targeted specifically toward small businesses. The set of training materials is designed to provide a training instructor with ideas and organizational assistance for delivering presentations on general safety and health topics. The materials available covering lockout/tagout safety include formatted copies of topic discussions, overhead masters, and student handouts. Table I-1 below gives World Wide Web addresses for the specific locations of these documents.

TABLE I-1

INTERNET ADDRESSES FOR OSHA-DEVELOPED RESOURCE DOCUMENTS

Resource	Internet Address
OSHA 3120 Booklet	http://www.osha-slc.gov/Publications/OSHA3120/osha3120.html
Interpretations	http://www.osha-slc.gov/OshDoc/Interp_toc/Interp_toc_by_std_0010.html http://www.osha-slc.gov/OshDoc/Interp_toc/Interp_toc_by_std_0011.html
Compliance Directive	http://www.osha-slc.gov/OshDoc/Directive_data/STD_1-7_3.html
Training Materials	http://www.osha-slc.gov/SLTC/smallbusiness/sec11.html
Interactive Training Program	http://www.osha-slc.gov/dts/osta/lototraining/index.htm

Lockout/Tagout Expert System

In addition to the other resources listed above, OSHA has developed an expert system computer software package to aid businesses in complying with the Lockout/Tagout Standard. This expert system is now available in a public test version. After public comments have been received and addressed, a final version of the expert system software will be developed and distributed at no charge through OSHA's web site.

CHAPTER II
REGULATORY ENVIRONMENT OF THE STANDARD

OVERVIEW

To conduct this regulatory review under Section 610 of the Regulatory Flexibility Act and Section 5 of Executive Order 12866, OSHA developed estimates of the number of firms and employees currently covered by the Lockout/Tagout Standard and examined the compliance experience of affected businesses. This chapter presents this profile of the firms covered by OSHA's Lockout/Tagout Standard. The chapter also analyzes recent OSHA enforcement data, presents field and State-plan state enforcement officials' perspectives on key compliance issues, and describes information on industry compliance obtained from a review of the occupational safety and health literature. Thus, this chapter provides a description of the regulatory environment currently surrounding the standard.

INDUSTRY PROFILE

The Lockout/Tagout Standard is applicable to general industry employment under 29 CFR Part 1910. The standard does not cover the construction, maritime, agriculture, or oil and gas well drilling and servicing industries. The scope of coverage also excludes work performed on electrical power generation, transmission, or distribution installations.

To develop an industry profile for the 1989 final Regulatory Impact Analysis (RIA) for the Lockout/Tagout Standard, OSHA classified all of the industries in general industry into one of three groups: a "high-impact" group, a "low-impact" group, and a "negligible" or "zero-impact" group [Docket S-012A, Ex. 71]. The Standard Industrial Classification code (SIC) system was used to identify the industries assigned to these groups. OSHA used the industry groupings from the 1989 RIA to develop this updated industry profile.

In the 1989 RIA, the manufacturing sector was determined to be the industry sector most impacted by the standard. Thus, OSHA classified all of the industries in the manufacturing sector (SICs 20-39) in the high-impact group. All establishments in the manufacturing sector were also assumed to be affected by the Lockout/Tagout Standard [Docket S-012A, Ex. 71].

The low-impact group included selected industries in the transportation, utilities, trade, and services sectors that OSHA determined would be impacted by the standard in a non-negligible way. The two-digit SICs classified in the low-impact group were SICs 40, 41, 42, 44, 46 and 47 in the transportation sector; SICs 48 and 49 in the communications and utilities sector; SICs 50 and 51 in the wholesale trade sector; SIC 54 in the retail trade sector; and SICs 72, 73, 75, 76, and 79 in the services sector. In certain of these industries, only a fraction of the total number of establishments was assumed to be affected [Docket S-012A, Ex. 71].

In the RIA, OSHA concluded that the impact on firms in the remaining industries in general industry would be negligible. These industries included retail trade, finance, insurance,

real estate, and service sector industries not included in either the high-impact or low-impact groups [Docket S-012A, Ex. 71].

Estimates of the Number of Affected Firms

OSHA's Regulatory Impact Analysis for the Lockout/Tagout Standard focused on the impacts of the standard on establishments in the high- and low-impact groups. In the RIA, OSHA estimated, based on 1984 data, that a total of approximately 631,485 establishments would be affected by the standard. As discussed above, the high impact group included all establishments in the manufacturing sector. OSHA estimated that there were 340,451 establishments in the high-impact group. In the low-impact group, OSHA estimated that 291,034 establishments in the transportation, communications, utilities, trade, and services sectors would also be affected. The total number of affected firms was not calculated at that time.

According to data provided by the Bureau of Census to the Small Business Administration, in 1994 there were a total of 327,805 firms (and 387,240 establishments) in the manufacturing sector.[1] In 1994, as in previous years, most of the firms in the high-impact manufacturing industries were small businesses. Sixty-five percent, or 212,801, out of the total of 327,805 manufacturing sector firms had fewer than 20 employees. Only 1.4 percent (4,741) of manufacturing sector firms had 500 employees or more.[2] All of these 327,805 firms are assumed to be impacted by the Lockout/Tagout Standard.[3]

The 1994 Census data also provide an estimate of 1,509,900 firms (and 1,860,423 establishments) in the transportation, communication, utilities, trade and service sector industries identified by OSHA as affected during the rulemaking. However, some firms in these sectors were assumed not to have any employees performing work covered under the scope of the standard. For example, smaller firms in some trade and service sector industries were assumed to contract out all covered servicing and maintenance work, and firms in other industries were deemed not to have hazards covered under the scope of the standard. Using the methodology developed in a contractor report prepared for OSHA in 1985 and the 1989 RIA to subtract such firms, OSHA estimates that there were approximately 641,346 affected firms in the low-impact

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[1] The latest year for which the Small Business Administration has provided these data.

[2] Office of Advocacy, Small Business Administration data provided by Bureau of Census, at: http://www.sbaonline.sba.gov/advo/stats/us_ind94.html, July 30, 1997.

[3] Includes firms classified as having zero employees.

industries in 1994.[4,5] About 23 percent, or 145,763, of the estimated 641,346 affected firms had fewer than 20 employees. Again, only 1.4 percent (9,057) of these firms had more than 500 employees.

Thus, the total number of firms currently believed to be affected by the Lockout/Tagout Standard is 969,151 (327,805 high-impact firms + 641,346 low-impact firms). Of these, 358,564 firms, or 37 percent, are estimated to have fewer than 20 employees. Thus, more firms are subject to the requirements of the standard than was estimated to be the case when the standard was promulgated.

Estimates of the Number of Covered Employees

The Lockout/Tagout Standard covers all manufacturing workers as well as millions of workers in other industries. In 1984, the high-impact manufacturing industries employed 21 million workers. Firms classified in low-impact industries employed approximately 19 million workers in 1984 [Docket S-012A, Ex. 71]. Although the total number of workers in the high-impact manufacturing industries declined from 21 million in 1984 to 18.5 million in 1996, the number of workers in the low-impact industries, as defined by OSHA in the RIA, increased from almost 19 million in 1984 to more than 27.5 million in 1996 (see Table II-1).

The Lockout/Tagout Standard contains provisions that categorize employees covered under the standard as either "authorized" or "affected" employees. An "authorized" employee is a person who locks out or tags out machines or equipment to perform servicing or maintenance on that machine or equipment. These employees are considered to be most at risk from exposure to the types of hazards regulated by the standard because of their assigned job duties. An "affected" employee is a worker whose job requires him or her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him or her to work in an area in which such servicing or maintenance is being performed. These employees are also at risk for exposure to hazards in situations where lockout/tagout procedures are not properly followed.

In the final Regulatory Impact Analysis for the Lockout/Tagout Standard, OSHA estimated that, based on 1984 data, there were a total of approximately 2,962,000 authorized employees who would be covered by the Lockout/Tagout Standard. This total included 1,970,000 authorized employees in the high-impact manufacturing industries and 992,000 authorized employees in low-impact industries (see Tables II-2 and II-3) [Docket S-012A; Ex. 71]. An update of these estimates indicates that, in 1996, there were approximately 1,948,000 authorized employees in the high-impact manufacturing industries and 1,339,000 authorized

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[4] Includes firms classified as having zero employees.

[5] Eastern Research Group (ERG), "Industry Profile Study of a Standard for Control of Hazardous Energy Sources Including Lockout/Tagout Procedures," prepared for OSHA, Office of Regulatory Analysis, May 1985 [Docket S-012A, Ex. 3-15].

employees in the low-impact industries (see Tables II-2 and II-3). The total estimated number of authorized employees has therefore increased from approximately 2,962,000 in 1984 to approximately 3,286,000 in 1996.[6]

In the RIA, based on 1984 data, OSHA estimated that there were 4,783,000 affected employees: 3,790,000 in high-impact industries and 992,000 in low-impact industries [Docket S-012A, Ex. 71]. In 1996, OSHA estimates that the Lockout/Tagout Standard would cover approximately 5,086,000 affected employees, including 3,747,000 affected employees in high-impact industries and 1,339,000 affected employees in low-impact industries.[7]

Thus, more workers are benefitting from the protection of the standard than was the case when the standard was promulgated.

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[6] Extrapolated from Bureau of Labor Statistics data and data from the Regulatory Impact and Regulatory Flexibility Analysis of 29 CFR 1910.147, Office of Regulatory Analysis, OSHA [Docket S-012A, Ex. 71].

[7] Extrapolated from Bureau of Labor Statistics data and data from the Regulatory Impact and Regulatory Flexibility Analysis of 29 CFR 1910.147, Office of Regulatory Analysis, OSHA [Docket S-012A, Ex. 71]

TABLE II-1
TOTAL EMPLOYMENT IN HIGH- AND LOW-IMPACT INDUSTRIES COVERED BY THE LOCKOUT/TAGOUT STANDARD 1984 AND 1996

SIC Code	Industry	Total Employment (000s)	
		1984	1996
High-Impact Industries:			
20-39	Manufacturing	20,879	18,468
Low-Impact Industries:			
40-42, 44-47	Transportation	3,024	4,047
48	Communications	1,433	1,338
49	Utilities	462	885
50-51	Wholesale Trade	5,547	6,469
54	Retail Trade (Food Stores)	2,514	3,427
72, 73, 75, 76, 79	Services[1]	6,013	11,356
	Total	18,993	27,522

Note:

[1] Includes Personal Services, Business Services, Automotive Repair, Miscellaneous Repair, and Amusement and Recreation Services.

Sources: Bureau of Labor Statistics data, National Employment, Hours and Earnings: Production Workers, at: http://stats.bls.gov:80/, August 13, 1997, and Eastern Research Group, Inc., "Industry Profile Study of a Standard for Control of Hazardous Energy Sources Including Lockout/Tagout Procedures," prepared for the Office of Regulatory Analysis, OSHA, May 1985 [Docket S-012A, Ex. 71].

TABLE II-2
NUMBER OF PRODUCTION WORKERS AND AUTHORIZED EMPLOYEES IN HIGH-IMPACT INDUSTRIES 1984 AND 1996

SIC Code	Industry Name	1984 Production Employees (000s)	1984 Number of Authorized Employees (000s)	1996 Production Employees (000s)	1996 Number of Authorized Employees (000s)
20	Food	1,119	150	1,254	168
21	Tobacco	49	7	32	5
22	Textile	646	100	528	82
23	Apparel	1,002	28	708	20
24	Lumber	598	51	641	54
25	Furniture	390	33	398	34
26	Paper	508	82	517	83
27	Printing	758	196	839	217
28	Chemicals	583	114	575	112
29	Petroleum	111	19	92	16
30	Rubber	632	83	761	99
31	Leather	158	15	74	7
32	Stone	431	57	421	56
33	Primary Metals	651	140	554	119
34	Metal Fabrication	1,078	184	1,088	186
35	Machinery	1,342	251	1,319	246
36	Electrical	1,112	184	1,051	174
37	Transport Equipment	1,203	206	1,206	207
38	Instruments	508	40	422	33
39	Misc. Manufacturing	278	32	273	31
	Total	13,157	1,970	12,749	1,948

Sources: Regulatory Impact and Regulatory Flexibility Analysis of 29 CFR 1910.147, Office of Regulatory Analysis, OSHA [Docket S-012A; Ex. 71]; Bureau of Labor Statistics data, National Employment, Hours Earnings: Production Workers, at http://stats.bls.gov, May 13, 1997; and OSHA estimates.

TABLE II-3
NUMBER OF PRODUCTION WORKERS AND AUTHORIZED EMPLOYEES IN LOW-IMPACT INDUSTRIES 1984 AND 1996

SIC Code	Industry Name	1984 Production Employees (000s)	1984 Number of Authorized Employees (000s)	1996 Production Employees (000s)	1996 Number of Authorized Employees (000s)
40-42,44-47	Transportation	2,521	132	3,521	184
48	Communications	1,018	329	1,049	339
49	Utilities	719	61	700	59
50-51	Wholesale Trade	4,466	190	5,239	223
54	Retail Trade (Food Stores)	2,441	16	3,116	20
72,73,75,76,79	Services	4,597	264	8,932	513
	Total	15,762	992	22,556	1,339

Sources: Regulatory Impact and Regulatory Flexibility Analysis of 29 CFR 1910.147, Office of Regulatory Analysis, OSHA [Docket S-012A; Ex. 71]; Bureau of Labor Statistics data, National Employment, Hours and Earnings: Production Workers, at http://stats.bls.gov, May 13, 1997; and OSHA estimates.

BUSINESS COMPLIANCE EXPERIENCE WITH THE STANDARD

As part of this regulatory review, OSHA analyzed the compliance experience of affected firms to aid in determining whether the standard was imposing a significant impact on affected firms and whether the standard should be eliminated, modified, or maintained without change. During the review, the Agency paid special attention to information concerning the compliance experience of small businesses. OSHA evaluated three major sources of information on the compliance experience of affected firms in addition to the public comments submitted to the docket for this review. These sources were: (1) an analysis of OSHA enforcement data, (2) input provided by OSHA compliance staff and State-plan state officials, and (3) a review of occupational safety and health literature relating to the Lockout/Tagout Standard. Comments submitted to the docket in response to this Lookback review are addressed in detail in Chapter IV of this report.

Analysis of OSHA Enforcement Data

The Lockout/Tagout Standard (29 CFR 1910.147) is one of the most cited OSHA standards. In 1991, there were more than 6,000 lockout/tagout violations, making it third on the list of OSHA's ten most cited standards. In 1995, provisions of the Lockout/Tagout Standard appeared in the "Top 25 General Industry Violations" list.[8] Again in 1996, the Lockout/Tagout Standard was the third most frequently cited OSHA standard.[9]

OSHA analyzed the patterns in recent enforcement data in two ways. The first analysis identified and ranked by number of inspections the industries where violations of §1910.147 were reported by OSHA compliance staff. The second analysis examined patterns in citation data within firm-size categories for establishments cited under the Lockout/Tagout Standard.

Analysis of Industries Inspected

OSHA analyzed recent enforcement data to determine whether the standard was being more actively enforced in high-hazard industries and to examine patterns in OSHA enforcement activity by the size class of firms inspected. In Fiscal Year 1996, federal OSHA conducted 1,722 inspections where violations of §1910.147 were cited; 1,426 (or 83 percent) of these inspections occurred in the high-impact industries in the manufacturing sector, and 249 (or 14 percent)

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[8] Robert J. Sutay, "Safety & Ergonomics: Basics of Lockout/Tagout," Material Handling Engineering, October 1996, p. 32.

[9] Susannah Zak Figura, "Lockout/Tagout: A Matter of Control," Occupational Hazards, December 1996, pp. 27-29.

occurred in low-impact industries in the transportation, utilities, trade, and services sector industries. A total of 1,480 of the 1,722 inspections occurred at the workplaces of firms employing fewer than 250 employees (432 inspections occurred at firms with 1-19 employees, 763 inspections occurred at firms with 20-99 employees, and 285 inspections occurred at firms with 100-249 employees).

These data indicate that recent federal OSHA enforcement actions have been targeted toward those industries that OSHA identified during the rulemaking as high-impact industries. These data also show that OSHA cited fewer small firms for lockout/tagout violations than the representation of such firms in U.S. industry would suggest. For example, Small Business Administration data on the distribution of firms by size class show that 85.2 percent of U.S. firms have fewer than 100 employees. Approximately 69 percent of the inspections where the Lockout/Tagout Standard was cited occurred at firms with fewer than 100 employees.

In 1996, across all firm size classes, the five SICs with the greatest total number of inspections involving §1910.147 citations were SIC 34, Fabricated Metal Products (283 inspections); SIC 35, Industrial and Commercial Machinery (146 inspections); SIC 30, Rubber and Miscellaneous Plastic Products (143 inspections); SIC 20, Food and Kindred Products (125 inspections); and SIC 24, Lumber and Wood Products (113 inspections). Again, this information shows that OSHA inspections resulting in citations have been concentrated in industries that are known to have a variety of potential hazards. Table II-4 below presents information on the industries with the greatest number of inspections involving §1910.147 citations, as categorized by the size class of the inspected firm. The rank order of the most frequently inspected industries shifts between different firm size classes, but there is nevertheless some overlap between the rank orders in different size classes. Two industries (SIC 34 and SIC 20) appear in the top five in all firm size classes, and one industry (SIC 35) appears in three size classes.

TABLE II-4
TOP FIVE INDUSTRIES WHERE §1910.147 WAS CITED, BY SIZE CLASS OF FIRMS INSPECTED, RANKED BY NUMBER OF INSPECTIONS

Rank	Top Five Industries (and Number of Inspections), by Firm Size			
	Firms With 1-19 Employees	Firms With 20-99 Employees	Firms With 100-250 Employees	Firms With 250+ Employees*
1.	SIC 34 (79)	SIC 34 (136)	SIC 34 (49)	SIC 33 (27)
2.	SIC 24 (39)	SIC 30 (76)	SIC 30 (35)	SIC 20 (22)
3.	SIC 35 (35)	SIC 35 (74)	SIC 20 (29)	SIC 37 (21)
4.	SIC 32 (27)	SIC 24 (54)	SIC 33 (23)	SICs 34, 35, 80 (19)
5.	SIC 20 (23)	SIC 20 (51)	SIC 26 (19)	N/A

* Note: The three SICs that are ranked fourth each had 19 inspections.

Source: OSHA IMIS Enforcement Database

Analysis of Violations Cited

OSHA also conducted an analysis of citation data to determine which provisions of the standard were most frequently violated and to evaluate the most common compliance problems experienced by firms of different sizes. Citations for violations of the Lockout/Tagout Standard are usually issued in situations where serious deficiencies in workplace safety are observed. The Compliance Directive for the standard indicates that where effective lockout/tagout work procedures are in place, paperwork deficiencies in lockout/tagout programs may only be cited as "other than serious" violations of the standard. This is in keeping with OSHA's overall enforcement policy for citing "paperwork" violations (CPL 2.111).

Table II-5 presents citation data for the top five most frequently cited provisions of the Lockout/Tagout Standard by size class of firm. The lockout/tagout program requirement found in paragraph (c)(1) and the lockout/tagout procedures requirement found in paragraph (c)(4) of the standard are the two most commonly cited provisions of the standard. Analysis of the data in Table II-5 shows that the percentage of total citations issued for lockout/tagout program violations varies inversely with firm size (that is, the percentage of total citations by size class given for lockout/tagout program violations decreases as firm size increases). On the other hand, the percentage of citations for lockout/tagout procedure violations varies directly with firm size, although in a less dramatic fashion (that is, the percentage of total citations given for violations of the lockout/tagout procedures requirement increases as firm size increases). These data suggest that failure to comply with the lockout/tagout program requirement is the most important problem faced by smaller firms, while larger firms may have more problems developing lockout/tagout procedures.

Citation patterns are very similar for firms with 1-19 employees and firms with 20-99 employees. Of the top five provisions cited for firms in these size classes, the most commonly cited provision was the requirement for lockout/tagout programs, followed by the requirements for lockout/tagout procedures, employee training, provision of lockout/tagout hardware, and periodic inspections of lockout/tagout procedures. These data suggest that the most common compliance problem small firms experience must involve either the complete absence of a lockout/tagout program or the existence of a program judged to be deficient. Forty-seven percent of all citations given to firms with 1-19 employees and 40 percent of all citations given to firms with 20-99 employees were for violations of the lockout/tagout program requirement.

The pattern of citations given to larger small firms (100-499 employees) is slightly different. In this size class, firms are almost equally likely to be cited for failure to comply with the requirement for lockout/tagout procedures as they are for the complete absence of, or a deficiency in, a lockout/tagout program (29 percent versus 27 percent of the total number of citations). Again, other common citations involve violations of the training, periodic inspection, and lockout/tagout hardware requirements.

TABLE II-5
TOP FIVE MOST FREQUENTLY CITED PROVISIONS
BY SIZE CLASS OF FIRM INSPECTED,
USING CITATION DATA FROM 1989-1997

Rank	Top Five Provisions Cited (and Number of Citations), by Firm Size*			
	Firms With 1-19 Employees	Firms With 20-99 Employees	Firms With 100-500 Employees	Firms With 500+ Employees
1.	(c)(1) *(5,592)*	(c)(1) *(9,822)*	(c)(4) *(4,267)*	(c)(4) *(4,561)*
2.	(c)(4) *(2,623)*	(c)(4) *(6,077)*	(c)(1) *(4,022)*	(c)(7) *(2,972)*
3.	(c)(7) *(1,993)*	(c)(7) *(4,422)*	(c)(7) *(2,722)*	(c)(1) *(2,469)*
4.	(c)(5) *(994)*	(c)(5) *(1,793)*	(c)(6) *(1,430)*	(c)(6) *(1,792)*
5.	(c)(6) *(267)*	(c)(6) *(1,231)*	(c)(5) *(1,023)*	(c)(5) *(1,226)*

§1910.147 (c)(1)	The employer shall establish a program consisting of energy control procedures, employee training and periodic inspection.
§1910.147 (c)(4)	Procedures shall be developed, documented and utilized for the control of potentially hazardous energy.
§1910.147 (c)(5)	Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided...for isolating, securing or blocking of machines or equipment.
§1910.147 (c)(6)	The employer shall conduct a periodic inspection of the energy control procedure at least annually.
§1910.147 (c)(7)	The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required...are acquired by employees.

* Note: The total numbers of citations issued by firm size class from 1989 to 1997 were: 11,846 (firms with 1-19 employees), 24,481 (firms with 20-99 employees), 14,739 (firms with 100-499 employees), and 15,294 (firms with 500 or more employees).

Sources: OSHA IMIS Enforcement Database; 29 CFR 1910.147

Large firm (firms with more than 500 employees) citation data indicate that failure to comply with the lockout/tagout procedures requirement is the most common compliance problem for large firms (30 percent of total citations). Violations of the lockout/tagout program requirement represent a much smaller percentage of total violations (16 percent) for firms in this largest employment size class than for firms in the other three size classes (47 percent, 40 percent, and 27 percent of total citations, respectively). This finding suggests that large firms may be more likely than smaller firms to have at least some type of lockout/tagout program. Training citations are the second most common type of citation received by large firms, followed by citations for the lockout/tagout program requirement, the periodic inspection requirement, and the lockout/tagout hardware requirement.

OSHA Enforcement Program/State Plan Comments on OSHA's Compliance Experience

As part of this regulatory review, OSHA requested input from the public as well as from OSHA enforcement officials and OSHA State-plan state officials on the effectiveness of the rule especially as implemented by small entities. OSHA evaluated comments from these sources to gain insights into the compliance experience of small businesses.

In comments submitted to Docket S012-B, representatives of small businesses indicated that some small businesses experience difficulties complying with the standard and also find some aspects of the standard's requirements burdensome. Their comments indicated that the most common problems small employers experience in complying with the standard are: (1) complying with the requirement to develop, document, and use lockout/tagout procedures, and (2) general difficulties in understanding the compliance requirements of the standard. Overall, the concerns expressed by representatives of small business focus on the need for additional compliance assistance. In addition, the comments do not contain any information suggesting that the standard has had a significant economic impact on small businesses. (These comments are discussed in greater detail in Chapter IV, Public Comments and Complaints Concerning the Standard.) The problems identified by small business representatives in their comments are consistent with the problems identified by OSHA enforcement officials and OSHA State-plan state staff.

Field Office Input Concerning the Compliance Experience of Small Businesses

OSHA asked OSHA enforcement officials in the field offices to comment on their impressions concerning the ability of small businesses to comply with the standard. These comments indicate that enforcement officials believe that small businesses are able to comply with the standard. Examples of such comments include the following:

- "Generally, it has been found that even small employers are able to comply with...the LO/TO standard" (Region I official)

- "It has been the experience of our CSHOs [compliance officers] that small business should be able to successfully comply..." (Region II official)

- "Small businesses are often able to comply with assistance from OSHA. One way to assist small employers is to provide a model lockout/tagout program..." (Region IV official)

- "Small businesses may have the easiest time complying with the Lockout/Tagout Standard, because they normally do not have that many pieces of equipment covered by the standard..." (Region VII official)

However, enforcement officials also reported that small businesses do have difficulties in understanding the standard's requirements. Examples of this type of comment are the following:

- "We have found that some small businesses are confused about the types of programs they must have. Many small employers model their LOTO program on the Appendix to the standard but fail to develop specific energy control procedures..." (Region III official)

- "Many small employers believe that if they have a written program that states equipment is to be locked out, and if employees use their lockout equipment, they would not be cited by OSHA. They do not realize that the written program must be more comprehensive, stating what equipment is to be locked out, and who is to perform the maintenance." (Region IV official)

- "...employers have had difficulties with the identification and documentation of individual equipment lockout techniques..." (Region II official)

Enforcement officials reported that the lockout/tagout procedures requirement was a requirement of particular concern to small businesses. Some enforcement officials suggested that, to improve the ability of small businesses to comply with the standard, OSHA should provide additional compliance information in simple language and develop additional compliance tools such as model lockout/tagout programs, checklists, and flowcharts.

State Plan Input Concerning the Compliance Experience of Small Businesses

To assist in determining whether the standard is imposing significant impacts on a substantial number of small entities, OSHA asked the State-plan states to provide input to the regulatory review of the Lockout/Tagout Standard. The comments provided by the State plans were generally similar to the comments made by OSHA enforcement officials. In general, where State-plan officials had concerns about the standard, they related to the ability of small businesses to understand compliance requirements. Examples of these comments include the following:

- "A lot of employers have trouble understanding what they need to do to comply with the rule after they read it." (Oregon state official)

- "...the lockout/tagout standard could be a little more specific and give more guidance to employers. It is too vague for most small employers..." (Hawaii state official).

- "While this is considered a performance standard, many smaller employers still just want specific guidelines on what is required for compliance." (Iowa state official)

- "We would like to see OSHA put more emphasis on education of small entities..." (Nevada state official)

The comments provided by State-plan officials indicated that actions such as providing simpler regulatory language, more specific guidance on regulatory requirements, or additional plain language compliance information would be helpful to small businesses. There were no comments suggesting that small businesses had experienced economic burdens as a consequence of complying with the standard. There were also no comments indicating any overlap, duplication, or conflict with state, local, or tribal laws.

Three States (Oregon, Kentucky, and Minnesota) indicated to OSHA that their States have lockout/tagout regulations that are more stringent than §1910.147. The State of Oregon adopted the federal standard (§1910.147) in its entirety but chose to apply the requirements of the federal standard to three additional sectors: the agriculture, construction, and maritime sectors. Oregon also has a separate state standard requiring that locks have unique combinations or keys. The State of Minnesota also adopted the federal standard in its entirety, but retained its former state lockout/tagout devices standard as a construction industry standard so that coverage would still be provided to workers in the construction sector. Finally, the regulation adopted by the Commonwealth of Kentucky explicitly prohibits the use of tagout.

Review of the Literature on Business Compliance Experience

A review of the occupational safety and health literature conducted during the regulatory review of the Lockout/Tagout Standard found few sources of information on the compliance experience of affected businesses and industries. Most articles about the standard were informational in nature, usually containing general information on the requirements of the standard, with only passing mention of industry-specific compliance concerns. A study suggesting that businesses, and small businesses in particular, are more likely to be providing the required lockout/tagout protections to their workers is the 1995 National Federation of Independent Businesses/Insurance Research Council (NFIB/IRC) study, "Motivating Safety in the Workplace."

The 1995 NFIB/IRC study analyzed the responses of 3,218 small businesses to a survey about safety policies and practices in their workplaces.[10] The survey evaluated findings for small businesses in four broad industry groupings: (1) manufacturing, (2) trade, (3) services, and (4) construction and other industries. Of the 3,218 respondents to the NFIB/IRC survey, 934 were manufacturing firms, 716 were trade sector firms, and 710 were service sector firms. Twenty-four percent of the respondents employed between 1 and 19 employees, 24 percent between 20 and 49 employees, 21 percent between 50 and 99 employees, and 26 percent employed 100 or more employees. Five percent of respondents failed to report employment size information.

Table II-6 presents information on workplace safety improvements undertaken by the surveyed small businesses over the five-year period preceding the survey date in mid-1993. This five-year period, extending from mid-1988 to mid-1993, includes the effective date of the Lockout/Tagout Standard (January 2, 1990) as well as three and a half years following the effective date of the standard. The survey results show that a significant percentage of manufacturing, trade, and service sector respondents reported installing safety controls or devices on equipment during this period.

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[10] The 10,000 businesses surveyed were randomly selected from the membership database of the NFIB. A stratified sampling strategy was used to oversample the manufacturing sector and several other sectors to provide statistically valid results for firms in those industries.

TABLE II-6
PERCENT OF SMALL BUSINESSES SURVEYED TAKING SELECTED SAFETY ACTIONS BETWEEN 1988 AND 1993, BY INDUSTRY SECTOR

Actions Taken*	Mfg.	Trade	Services
Provided safety-related employee training	70%	48%	54%
Installed safety controls or devices on equipment	82%	44%	38%
Inspected for safety hazards	70%	47%	44%
Adopted written safety rules	62%	44%	48%
Purchased safer equipment	62%	46%	42%

*Note: The NFIB/IRC study also reported information on safety actions that were not directly relevant to this regulatory review.

Source: National Federation of Independent Businesses/Insurance Research Council, "Motivating Safety in the Workplace," June 1995, p. 14.

Although the NFIB survey does not provide specifics about the nature of the safety controls or devices purchased (or the hazards to be abated using these devices), it is likely that many of the reported interventions involved lockout/tagout related controls or devices because of the importance of such safeguards in improving the safety of manufacturing equipment. It is worth noting that 82 percent of the small manufacturing firm respondents reported installing safety controls or devices on equipment during this period. Although the percentages are lower for small businesses in what OSHA considered to be the "low-impact industries," 44 percent of businesses in the trade sector and 38 percent in the services sector also reported installing safety controls or devices on equipment between 1988 and 1993.

In addition to modifying equipment by installing safety controls or devices, small businesses reported purchasing safer equipment. Sixty-two percent of the manufacturing firms responding to the survey indicated that they had purchased safer equipment between 1988 and 1993. Forty-six percent of firms in the trade sector and 42 percent of firms in the service sector also reported purchasing safer equipment. Small businesses in all three sectors also commonly reported providing safety training, inspecting for safety hazards, and adopting written safety rules, in addition to performing other safety actions.

The findings of the NFIB study suggest that small businesses generally take the kinds of actions necessary to comply with the Lockout/Tagout Standard. The study results also indicate that a large fraction of small businesses were engaged in taking safety actions and making

equipment modifications of the types required by the standard during the time the standard first became effective and in the following years. This evidence is consistent with limited evidence available from articles in the literature suggesting that sales of many types of lockout/tagout compliance products were strong during the years immediately following the promulgation of the standard.[11]

SUMMARY

A total of 969,151 firms, 3,286,000 authorized employees, and 5,086,000 affected workers are covered by the Lockout/Tagout Standard at the present time. It is one of the most significant safety standards ever issued by OSHA. Enforcement data demonstrate that there are still many employers who do not comply with the standard or comply only in part. It is not possible to determine how much of the non-compliance found by OSHA compliance personnel is due to lack of knowledge of the regulation, difficulties in interpreting it, or simply the inherent difficulties in identifying and controlling numerous potentially hazardous sources of energy. However, the problems identified by small business representatives in their comments are generally consistent with the problems identified by a review of OSHA enforcement program citation data and with comments made by OSHA enforcement officials and OSHA State-plan state staff. These problems include establishing and implementing a lockout\tagout program, difficulty in training employees in lockout\tagout procedures, and failure to perform periodic inspections of lockout\tagout procedures. The limited evidence in the occupational safety and health literature generally supports OSHA's conclusion that firms have found the standard to be technologically and economically feasible, regardless of size class. However, this review of business compliance experience with the standard also suggests that many employers have had difficulty complying with the standard.

[11] L. Elliott Oppriecht, 1995 and Michael J. Major, 1992.

CHAPTER III
CONTINUED NEED FOR AND EFFECTIVENESS OF THE RULE

OVERVIEW

Section 610 of the Regulatory Flexibility Act requires that OSHA review its existing rules to consider whether, to reduce a significant impact on a substantial number of small businesses, there is a need to amend or rescind the rule or whether the rule should continue without change. Executive Order 12866 requires OSHA to determine whether, to reduce regulatory burden, the rule should be modified or eliminated. OSHA has selected the Lockout/Tagout Standard for review under the Regulatory Flexibility Act and Executive Order 12866.

During the original rulemaking, OSHA determined that the Lockout/Tagout Standard was needed to prevent the occurrence of fatalities and injuries caused by exposure to uncontrolled hazardous energy and that the standard would be effective in achieving that goal. Information gathered by OSHA and comments submitted to Docket S-012B during the regulatory review process support these determinations. The evidence available to OSHA can be grouped into four main points demonstrating the continued need for, and effectiveness of, the standard: (1) more workers are potentially exposed to lockout hazards, and some of these workers may be exposed to an even greater risk than was the case in 1989, (2) OSHA enforcement data indicate that fatalities and severe injuries continue to occur at workplaces that are not in compliance with the standard and that significant numbers of employers are still not in compliance with the standard, (3) several sources of data provide evidence of the standard's effectiveness in reducing fatalities and injuries, and (4) both employer and employee representatives testified to the effectiveness of the standard and to a continued need for it. OSHA has therefore concluded that the standard should continue in effect.

CHANGES IN THE NUMBER OF WORKERS AT RISK AND EXPOSURE PATTERNS

As indicated in the industry profile section of Chapter II, the Lockout/Tagout Standard covers all manufacturing workers as well as millions of workers in other industries. Although the total number of workers in the high-impact manufacturing industries declined from 21 million in 1984 to 18.5 million in 1996, the number of workers in low-impact industries, as defined by OSHA in 1989, increased from almost 19 million in 1984 to more than 27.5 million in 1996 (see Table II-1). Thus, the total number of workers potentially exposed to lockout/tagout hazards has increased since promulgation of the standard.

In the Regulatory Impact Analysis for the Lockout/Tagout Standard, OSHA estimated that, based on 1984 data, approximately 1,970,000 workers in high-impact manufacturing industries and 992,000 workers in low-impact industries would be covered under the rule's definition of "authorized employee" (see Tables II-2 and II-3). Thus, in 1984, 2,962,000 workers in "at-risk occupations" were classified as authorized employees having responsibility for performing lockout/tagout activities [Docket S-012A; Ex. 71]. An update of these estimates

indicates that, in 1996, there were approximately 1,948,000 authorized employees in the high-impact manufacturing industries and 1,339,000 authorized employees in the low-impact industries (see Tables II-2 and II-3). The total estimated number of authorized employees has therefore increased from about 2,962,000 in 1984 to approximately 3,286,000 in 1996.[1] OSHA's estimates also indicate that the number of employees covered under the definition of "affected employee" contained in the Lockout/Tagout Standard has grown from 4,783,000 affected employees in 1984 to approximately 5,086,000 affected employees in 1996.[2] OSHA therefore believes that more workers are benefitting from the protection of the standard than was the case in the past.

In addition to the increase in the number of workers potentially exposed to hazards, workplace trends may also be placing some authorized workers at greater risk during the performance of service and maintenance tasks. For example, in certain high-risk industries, the introduction of automation and complex manufacturing machinery and equipment may have increased the proportion of skilled trade workers assigned to servicing and maintenance tasks [Ex. 5]. Although the introduction of this type of equipment may have reduced some hazards associated with the production process, this equipment introduces new and potentially more serious hazards for employees servicing or maintaining it. Furthermore, in some industries, production workers may increasingly be expected to service and maintain the machines with which they work, tasks previously done by skilled maintenance workers more likely to be familiar with machinery and the use of lockout/tagout procedures.[3] For instance, according to one commenter, production workers are now typically assigned to complex tasks involving setup, minor troubleshooting, unjamming of parts, preventive maintenance, and fault clearance in the automobile manufacturing industry [Ex. 5]. Although data are unavailable to quantify the magnitude of these effects, such trends may well have increased the number of workers exposed to hazardous energy in the high-impact industries. Finally, a review of OSHA's IMIS Fatality/Catastrophe Accident Database indicated that some of the lockout/tagout-related accidents recently reported to OSHA have involved temporary workers who did not receive training in the hazards associated with their temporary positions. The growing use of temporary workers in the manufacturing sector requires extra vigilance on the parts of both contracting employers and the temporary service firms who actually employ such workers to ensure that temporary workers receive the protections required by the standard.

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[1] Extrapolated from Bureau of Labor Statistics data and data from the Regulatory Impact and Regulatory Flexibility Analysis of 29 CFR 1910.147, Office of Regulatory Analysis, OSHA [Docket S-012A, Ex. 71].

[2] Extrapolated from Bureau of Labor Statistics data and data from the Regulatory Impact and Regulatory Flexibility Analysis of 29 CFR 1910.147, Office of Regulatory Analysis, OSHA [Docket S-012A, Ex. 71].

[3] Robert J. Sutay, "Safety & Ergonomics: Basics of Lockout/Tagout," Material Handling Engineering, October 1996, p. 32.

ENFORCEMENT PROGRAM DATA POINT TO CONTINUED NEED

The information presented in Chapter II indicates that, although many employers are complying with the standard, there are still many employers who do not comply or comply only in part. The Lockout/Tagout Standard is one of the most frequently cited OSHA standards. In 1991, there were more than 6,000 lockout/tagout violations, making it third on the list of OSHA's ten most cited standards. In 1995, provisions of the Lockout/Tagout Standard figured in the "Top 25 General Industry Violations" list.[4] Again in 1996, the Lockout/Tagout Standard was the third most frequently cited OSHA standard.[5] Because of OSHA's citation policy for "paperwork" violations, these citations reflect serious deficiencies in employers' workplace safety programs rather than paperwork violations.

Since the issuance of the standard, OSHA has continued to be notified of fatalities and injuries that occurred in workplaces that were found to be in violation of one or more provisions of the standard. A recent enforcement case, which resulted in penalties of $1.8 million, illustrates the seriousness of some lockout accidents.[6] The penalties followed an OSHA investigation of a December 1996 accident at a Houston facility in which eight workers died and two others were injured. The accident occurred as workers performed maintenance that required lockout/tagout of a large hydraulic press and related equipment. The workers were replacing seals on vessels containing nitrogen pressurized at 5,000 pounds per square inch. The unexpected release of the pressurized nitrogen led to the accident, which could have been prevented by full implementation of a lockout/tagout program and adherence to the standard. Although there was a specific lockout/tagout procedure in place for this maintenance operation, it was not being followed at the time of the accident. A number of other recent enforcement cases have involved egregious violations of the Lockout/Tagout standard.

OSHA believes that the continued evidence of injuries and fatalities occurring in workplaces that are not complying with the standard and the citation data from OSHA's enforcement program demonstrate not only that the standard is still needed but that renewed compliance assistance efforts may be needed. OSHA further notes that the Canadian federal and provincial governments also place emphasis on hazardous energy control issues as part of their enforcement and compliance assistance policies.[7]

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[4] Sutay, p. 32.

[5] Susannah Zak Figura, "Lockout/Tagout: A Matter of Control," Occupational Hazards, December 1996, pp. 27-29.

[6] U.S. Department of Labor, "News Release," June 18, 1997.

[7] L. Elliott Oppriecht, "Control Energy at its Source," Occupational Health and Safety, Vol. 64, No. 3, March 1995, pp. 40-49.

STUDIES INDICATE THAT THE STANDARD IS EFFECTIVE

As part of the regulatory review of the standard, OSHA sought evidence suggesting that the promulgation of the rule had reduced fatalities or injuries. Data submitted to Docket S-012B demonstrate that the Lockout/Tagout Standard has had a measurable impact on reducing occupational fatalities and injuries [Exs. 5, 2-10]. Three sources of data indicate that the standard has been effective. These sources are the United Automobile, Aerospace, and Agricultural Implement Workers of America (UAW) fatality database, the United Steelworkers of America (USWA) fatality database, and a study entitled "Case-Control Study of Sawmill Injuries in Maine." These sources provide evidence of the standard's effectiveness in three high-hazard industries where significant numbers of OSHA inspections have been conducted (SIC 37, Transportation Equipment; SIC 33, Primary Metal Industries; and SIC 24, Lumber and Wood Products).

Two of the sources demonstrating that lockout/tagout programs are effective come from analyses of data from larger unionized employers in the automaking and basic steel sectors. It is not surprising that most of the data demonstrating the standard's effectiveness would come from studies of workers employed by large businesses because studies of the effects of workplace interventions such as safety standards typically require the study of large numbers of similarly exposed workers to develop statistical associations between interventions and outcomes. However, the third source of data indicates that the effectiveness of the standard could also be demonstrated by performing a carefully controlled analysis of injuries occurring among workers employed in small businesses in the same industry.

The first source of data on the effectiveness of the standard is the UAW's fatality database. Energy control and power lockout have been a major focus of UAW's overall fatality prevention effort for a number of years. More than a decade before the OSHA standard, the UAW and the automobile manufacturers developed a lockout/tagout program for use in that industry. The number of fatalities subsequently began to fall, with a significant decline occurring between 1989 and 1997, that is, in the years following promulgation of the standard.

UAW records list lockout/tagout-related fatalities since 1973 by job-title and company size.[8] Most of the 95 workers who died in these accidents were employed at larger firms (this would be expected because most of the firms in this data set are large). Seventy-three deaths occurred in firms with more than 1000 employees, 21 in medium-sized firms (100-1000 employees), and one in a smaller business (with fewer than 100 employees). Electricians accounted for nearly one-third (30) of the fatalities.[9] Ten millwrights died, along with seven

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[8] Data provided by Jim Howe, Assistant Director, UAW Health and Safety Department, to OSHA, July 1997.

[9] To the extent that the work performed by these electricians involved only exposure to electric shock, §1910.333(b) applies. However, if the electricians were exposed to hazards from

machine repairmen and seven pipefitters. Most of the fatalities were in Big Three auto plants -- 40 at General Motors, 11 at Ford, and 9 at Chrysler.

A statistical analysis of data from the UAW fatality database indicates that there was a decline in lockout-related fatalities of approximately 20 percent per year between 1989 and 1997. This decline occurred despite an increase in the proportion of autoworkers exposed to lockout hazards. The comments submitted by the UAW to Docket S-012B indicate that this decline occurred while the percentage of the total number of autoworkers assigned to the skilled trades at Big Three firms was increasing and production workers were also more commonly being assigned to duties involving maintenance and repairs on the equipment they used. As a result of adjusting for these factors, the UAW projected that the standard had contributed to an estimated decrease of approximately 30 percent per year in the number of deaths that might otherwise have occurred as a result of failed lockout during service and maintenance tasks. The UAW also reported that there were no UAW lockout/tagout-related fatalities at the Big Three auto companies from April 1994 through July of 1997 when these comments were submitted [Ex. 5]. According to the UAW, "These trends clearly demonstrate that lockout efforts, in part stimulated by the standard promulgated in 1989, have been effective in reducing fatalities related to the performance of service and maintenance tasks in the auto sector" [Ex. 5].

The second source of data on the effectiveness of the standard is the United Steelworkers fatality database. Since 1980, ten companies from the basic steel industry have reported all fatal accidents involving USWA members to the USWA Health, Safety and Environment Department. The USWA reported that an analysis of data from this database showed a reduction of more than 55 percent in the number of lockout/tagout-related fatalities in the ten basic steel industry companies over the last seven years [Ex. 2-10]. Before the Lockout/Tagout Standard went into effect, there were 148 fatalities reported to the USWA, of which 22 (approximately 15 percent) were caused by not locking out equipment. Since promulgation of the standard, there have been an additional 74 fatalities in the same ten companies, of which 5 (less than 7 percent) involved failure to lock out equipment [Ex. 2-10].

The third source of data on the effectiveness of the standard was a case-control study conducted by Dr. Laura Punnett of the University of Massachusetts Lowell entitled "Case-Control Study of Sawmill Injuries in Maine."[10] This epidemiologic study found evidence of a statistically significant association between injuries and the absence of lockout/tagout programs.

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other types of hazardous energy sources, the generic lockout/tagout provisions in §1910.147 apply. It is not clear from the UAW fatality database what portion of the electrician fatalities fall under the generic lockout/tagout standard rather than §1910.333. Even discounting all of these accidents, the UAW database shows a significant drop in lockout/tagout-related fatalities.

[10] Dr. Laura Punnett, "Case-Control Study of Sawmill Injuries in Maine: Final Report to the National Institute of Occupational Safety and Health (Grant #1 R01 OH02741)," December 22, 1994.

The study was originally undertaken to determine the contribution of preventable risk factors to the causes of acute and chronic injuries among workers in the wood products industries (SIC 242-249) in Maine. The study, which was primarily designed to address ergonomic hazards, included 157 employers (cases involving injured workers) and 251 controls (cases involving uninjured workers). These workers were employed at 51 firms (20 firms employing both cases and controls, and 31 firms employing controls only). The 51 participating firms represented approximately 14 percent of all firms in SICs 242-249 in Maine and were mostly small firms with an average of 112 employees and $5.6 million in sales. (The SBA size class definition for small businesses in SIC 24 is 500 employees.)

Dr. Punnett's study found that a lockout/tagout program had not been instituted in approximately 18 percent of the workplaces and that lockout/tagout programs were much less common in the workplaces of cases than controls.[11] Injured workers (cases) were approximately 3 times less likely than uninjured workers (controls) to have a lockout/tagout program in place in the worksite (OR=.3 for lockout/tagout program, 95 percent CI=0.1, 0.5). The significance of this finding may even be understated, considering that it is based on the association between the presence of lockout/tagout programs and all injury cases rather than on the association between lockout/tagout programs and cases of acute injuries (acute injuries are more likely to be lockout/tagout-related than the other types of cases studied). The study also reports that injured workers were less likely than controls to have received any occupational safety and health training and that posted emergency procedures were also significantly less likely to be present in the workplaces of cases than in those of controls (OR=.6).

The findings of these three evaluations demonstrate that lockout/tagout programs are effective in reducing fatalities and injuries at both large and small firms. In addition, there are other benefits that may be realized through compliance with the standard. Comments in the record provide some evidence that compliance with the standard can have positive benefits for small businesses in the form of cost savings. For example, a consulting electrical engineer representing DuPont discussed two cases in which small businesses were able to improve their profitability by implementing comprehensive safety programs that included lockout/tagout procedures [Exs. 2-1, 2-17]. The President of IBEW also commented that the costs of complying with the standard "will easily be returned by avoiding only one injury or fatality" [Ex. 2-8].

EMPLOYERS AND EMPLOYEES SUPPORT CONTINUANCE OF THE STANDARD

This regulatory review of the Lockout/Tagout Standard included a public meeting held on June 30, 1997 and a request for information from interested persons, including small businesses. Many of the employer and employee representatives providing comments indicated support for the continuance of the standard. Even those few organizations who criticized specific provisions of the existing rule typically emphasized revision of the rule rather than rescission.

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[11] As reported by employees.

The types of organizations expressing support for the standard included employers, trade associations and employer representatives, employee representatives, and two professional safety and health organizations [Exs. 2-1, 2-3, 2-4, 2-7, 2-8, 2-10, 2-11, 2-14, 2-15, 2-16, 2-21, 2-22, 2-25, 5]. Support for continuing the rule was typically based on both perceptions of the effectiveness of the standard and recognition of the importance of having a federal standard to prevent exposure to uncontrolled hazardous energy.

A number of commenters indicated that the standard is effective. Examples of comments of this type are provided below:

- Bell Atlantic commented that the standard "is effective in providing employee protection" [Ex. 2-15].

- Kodak commented that, "the OSHA regulation covering lockout tagout, 29 CFR 1910.147, is relatively effective" [Ex. 2-4].

- The USWA commented that the standard "has saved many lives" [Ex. 2-10].

- The International Brotherhood of Electrical Workers (IBEW) indicated that "injuries and fatalities have been prevented" by the rule [Ex. 2-8].

- The Associated Builders and Contractors (ABC) commented that "the regulation under review is effective in saving lives and guarding against serious injury due to the release of hazardous energy" [Ex. 2-16].

- The American Society of Safety Engineers (ASSE) indicated that the standard "is an important component of an efficient/effective safety and health program" [Ex. 2-14].

- Organization Resources Counselors, Inc. (ORC) commented that the standard is "necessary for the protection of workers and that, in general, it is effective in achieving that goal" [Ex. 2-25].

Commenters also supported the continuance of the standard because of the severity of the hazards associated with servicing and maintenance work and the importance of having a federal regulation to cover such hazards. Examples of comments of this type are:

- The National Association of Manufacturers (NAM) commented, "A federal regulation carries considerable impact and can help motivate employees and management to redouble their efforts to reduce the chances of accidents on the job" and "The NAM believes that the principal requirements of the regulation help promote the development of appropriate safety procedures for service and maintenance operations" [Ex. 2-11].

- The Institute for Interconnecting and Packaging Electronic Circuits (IPC) commented, "IPC member companies understand the importance of the Lockout/Tagout standard. As a result, IPC members oppose any relaxing of the standard's substantive requirements" [Ex. 2-2].

- The Synthetic Organic Chemical Manufacturers Association (SOCMA) commented, "Because employees of small chemical batch processors fully benefit from the protection of Lockout/Tagout procedures, SOCMA supports the continuation of Lockout/Tagout programs" [Ex. 2-7].

- The National Grain and Feed Association (NGFA) commented that "the standard is needed to outline requirements to prevent the release of potentially hazardous energy..." [Ex. 2-21].

- The Associated Builders and Contractors (ABC) commented that "We see a continued need for lockout and tagout procedures under circumstances addressed by the regulation" [Ex. 2-16].

The support expressed by these commenters provides further evidence that the standard has been effective and should be retained in its present form.

SUMMARY

OSHA believes that continuing the Lockout/Tagout Standard will ensure that workers in covered industries are protected from the release of uncontrolled hazardous energy. The evidence reviewed in this chapter indicates that lockout/tagout programs can have a measurable impact on the reduction of fatalities and injuries. In addition, both employer and employee representatives indicate that there is a continued need for the standard and testified to its effectiveness. OSHA has therefore concluded that the standard is necessary and should continue in effect.

CHAPTER IV
PUBLIC COMMENTS AND COMPLAINTS CONCERNING THE STANDARD

OVERVIEW

As part of this regulatory review of the Lockout/Tagout Standard, OSHA opened a public docket, Docket S-012B, to gather information from affected persons about their experience with the rule and to obtain comments on any material changes in circumstances since issuance of the rule. Under Section 610 of the Regulatory Flexibility Act, OSHA is required to evaluate public comments and complaints received on the rule. Under Section 5 of Executive Order 12866, OSHA is required to periodically review significant rules to determine if they should be eliminated or be modified to make them more effective or less burdensome, or to bring them into better alignment with the President's priorities.

Docket S-012B was opened on May 29, 1997 and remained open through August 8, 1997. In the Federal Register notice announcing the opening of the docket, OSHA specifically asked for comments on eight aspects of the rule, including the benefits and utility of the rule in its current form or in an amended form; potential feasible alternatives to the rule; the continued need for the rule; the complexity of the rule; evidence of overlap, duplication, or conflict between the rule and other federal, state, and local rules; information on economic, technological, and other material changes since the promulgation of the rule; alternatives to the rule or portions of the rule that could minimize significant impacts on small businesses; and the effectiveness of the rule as implemented by small entities [FR Vol. 62, No. 103, 5/29/97, p. 29089]. Comments were accepted both at a public meeting on the regulatory review of the Lockout/Tagout Standard held on June 30, 1997 and in the form of written submissions to the docket.

The organizations commenting during this regulatory review of the Lockout/Tagout Standard included affected employers, employee representatives, trade associations, professional safety and health organizations, consulting firms, one law firm, and the Small Business Administration (SBA). During the process of performing the regulatory review, OSHA considered all of the comments placed in the docket but gave special attention to comments concerning small business issues to address the requirements of the Regulatory Flexibility Act. Comments from the following organizations were considered especially relevant to the concerns of small employers:

- the Institute for Interconnecting and Packaging Electronic Circuits (IPC);
- the Chemical Manufacturers Association (CMA);
- the Synthetic Organic Chemical Manufacturers Association (SOCMA);
- the National Association of Manufacturers (NAM);
- the Society of the Plastics Industry (SPI);

- the Associated Builders and Contractors (ABC);
- the National Grain and Feed Association (NGFA); and
- the National Automobile Dealers Association (NADA).

The remainder of this chapter contains a brief summary of the comments, a summary of those comments that specifically addressed small business issues, and an analysis of the more detailed issues raised by commenters.

SUMMARY OF DOCKET COMMENTS

Many of the commenters indicated that the Lockout/Tagout Standard had been effective in reducing occupational hazards related to the control of hazardous energy and that there was a continued need for the standard. These commenters included employers (Alabama Power, Bell Atlantic, DuPont and Kodak), trade associations and employer representatives (SOCMA, ABC, NGFA and Organization Resources Counselors, Inc. (ORC)), employee representatives (IBEW, UAW, and USWA), and two membership organizations (the American Society of Safety Engineers (ASSE) and the National Fire Protection Association (NFPA)) [Exs. 2-1, 2-3, 2-4, 2-7, 2-8, 2-10, 2-11, 2-14, 2-15, 2-16, 2-21, 2-22, 2-25, 5]. In addition, data presented by the UAW and USWA in their comments demonstrated measurable declines in lockout/tagout fatalities in two industries following the promulgation of the standard [Exs. 2-10, 5].

A number of employers, trade associations, and employer representatives, such as NAM, SOCMA, ABC, ORC, Alabama Power, and Kodak, indicated that they did not recommend revision of the standard [Exs. 2-4, 2-7, 2-11, 2-16, 2-22, 2-25]. Four industry representatives (IPC, SOCMA, ORC, and Kodak) specifically indicated that additional OSHA compliance assistance would be a preferred means of relieving any regulatory burden imposed by the standard [Exs. 2-2, 2-4, 2-7, 2-25]. Only a few comments were received that addressed the costs of complying with the standard. The law firm of Keller and Heckman presented an estimate suggesting that the total annual cost of complying with the standard is in excess of $100 million [Ex. 2-19]. Dow was the only other commenter to provide quantified compliance cost estimates, and these estimates were only calculated for a portion of Dow's compliance-related expenditures [Ex. 2-6]. Similarly, only a few comments addressed feasibility issues, and these comments were very general in nature.

Some industry representatives, particularly representatives of the process industries such as API, CMA, and Dow, suggested revision of those provisions of the standard that they felt raised feasibility issues or were excessively burdensome [Exs. 2-5, 2-6, 2-20]. Many of the issues raised by these commenters had previously been raised during the rulemaking process and subsequent litigation. The revisions recommended by these commenters addressed several provisions of the standard, including the requirements for developing, documenting, and verifying lockout/tagout procedures, requirements for periodic review of lockout/tagout procedures, and specifications for tagout devices. However, API and CMA (along with

commenters such as SOCMA and ORC that did not recommend any revisions to the rule) indicated a clear preference for OSHA to provide additional compliance assistance in the form of one or more non-mandatory appendices to the standard rather than to reopen the standard at this time [Exs. 2-5, 2-7, 2-20, 2-25].

Employee representatives such as those from the USWA and IBEW indicated that the standard should be expanded to cover additional industries and workers who are not currently covered by the lockout standard [Exs. 2-8, 2-10]. This concern was shared by DuPont and the National Fire Protection Association [Exs. 2-1, 2-3]. The IBEW, NFPA, and DuPont were particularly concerned about the current lack of a comprehensive lockout/tagout standard in the construction industry [Exs. 2-1, 2-3, 2-8]. The UAW also commented that, in recent years, the energy control-related risks faced by workers had increased due to workplace trends such as increasingly involving production workers in servicing and maintenance tasks. The UAW recommended that the standard be modified to add new provisions that the UAW felt would strengthen the rule. The provisions recommended by the UAW included requirements for task and hazard analysis, feasible design changes and engineering controls, and worker participation in the lockout/tagout program [Ex. 5].

A number of the commenters, for example, the American Society of Safety Engineers (ASSE) and RRS Engineering, indicated that the rule was complicated and difficult to understand [Exs. 2-9, 2-14]. RRS Engineering and members of the ASSE suggested that the standard be revised into a Plain English format [Exs. 2-9, 2-14]. The NGFA recommended that several major provisions of the standard be revised to use performance language [Ex. 2-21]. Additional compliance assistance was another recommended means of addressing the complexity of the rule. Some of the commenters argued that the relationship of the Lockout/Tagout Standard to other OSHA standards containing lockout/tagout provisions was evidence of the kind of current or potential regulatory overlap specifically of concern under Section 610 of the Regulatory Flexibility Act. These commenters felt that OSHA should address this overlap through this regulatory review process [Exs. 2-1, 2-5, 2-20].

Most of the commenters who suggested alternatives to the standard urged OSHA to reference or substitute industry consensus standards for provisions of the existing standard. For example, the ASSE indicated that OSHA should reference the existing ANSI lockout standard in §1910.147 [Ex. 2-14]. Similarly, the IBEW, DuPont, and NFPA recommended incorporating a reference to an NFPA consensus standard within §1910.147 in place of an existing reference to Subpart S of 29 CFR 1910 [Exs. 2-1, 2-3, 2-8]. In addition, SPI requested that OSHA consider compliance with industry equipment-based consensus standards to be an acceptable compliance alternative to portions of the rule [Ex. 2-12]. The CMA and API commented that the work authorization permit systems used in the process industries even before the promulgation of the Lockout/Tagout Standard were more effective than the procedures required by the standard [Exs. 2-5, 2-20], but presented no effectiveness data to support this assertion.

If OSHA decided to reopen the rule as a result of this review, the ASSE asked OSHA to consider using either a negotiated rulemaking format or a process similar to the one currently

being used to develop OSHA's forthcoming proposal for the Safety and Health Programs rule [Ex. 2-14]. In the event that OSHA were to choose to reopen the rule as a negotiated rulemaking, the ASSE offered to serve in the capacity of facilitator [Ex. 2-14].

SUMMARY OF COMMENTS ADDRESSING SMALL BUSINESS ISSUES

An analysis of the comments specifically addressing small business issues indicates that the concerns expressed by representatives of small business focus more on the complexity of the standard and the need for additional compliance assistance than on the need for modifying the standard itself. Despite the compliance concerns expressed by representatives of small business, a number of the trade associations representing small businesses, including NAM, SOCMA, IPC, NGFA and ABC, indicated support for continuance of the standard [Exs. 2-2, 2-7, 2-11, 2-16, 2-21]. For example, the NAM commented, "Although we are concerned about the Secretary's interpretation of certain provisions, the NAM believes that the principal requirements of the regulation help promote the development of appropriate safety procedures for service and maintenance operations" [Ex. 2-11]. NAM also wrote, "We oppose reopening the rule, which would introduce the possibility of creating additional paperwork and/or rearguing issues that were resolved in the initial rulemaking. We appreciate this opportunity to provide this brief statement in support of the current regulation" [Ex. 2-11].[1] Comments in the record also provided evidence that small businesses experience benefits by complying with the standard [Exs. 2-1, 2-8, 2-17].

The comments received from trade associations and other representatives of small businesses indicate that the most common problems small employers experience in complying with the standard are: (1) complying with the requirement to develop, use, and document lockout/tagout procedures, and (2) general difficulties in understanding how the compliance requirements of the standard apply to their specific industries and work sites. The comments suggest that the most difficult compliance problem for small businesses is the identification and documentation of individual equipment lockout techniques. Commenters such as SPI, SOCMA, IPC, RRS Engineering, and SBA all identified the requirement to develop specific procedures as an area of concern [Exs. 2-2, 2-7, 2-9, 2-12, 2-26].

The support in the record for providing additional compliance assistance to help businesses develop required lockout/tagout procedures suggests that the model procedure currently provided in non-mandatory Appendix A may not be sufficient. For example, RRS Engineering commented that "employers attempting to construct their procedures from it [the standard] often have a tough time" [Ex. 2-9].[2] The comments prepared by IPC, SOCMA, and

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[1] The National Association of Manufacturers (NAM) is an industrial trade association representing nearly 14,000 members. Its membership includes more than 10,000 small firms.

[2] Risk, Reliability, and Safety (RRS) Engineering is a safety consulting firm supplying safety and compliance consulting to clients in business and industry.

SBA also indicated that more specific guidelines for complying with this requirement would be helpful [Exs. 2-2, 2-7, 2-26]. IPC commented that OSHA should develop "generic 'energy control procedure' templates for specific categories of equipment that will facilitate small company compliance" to reduce regulatory burden on small businesses [Ex. 2-2].[3] RRS Engineering suggested that checklists and work permits were a useful means of complying with the requirement for lockout/tagout procedures [Ex. 2-9]. SOCMA indicated that it would be willing to share member lockout/tagout protocols that OSHA could include in a non-mandatory appendix to the standard [Ex. 2-7].

It is also clear from the comments that small businesses would like to receive additional compliance assistance that would relate the general requirements of the standard to their specific industries and work sites. These concerns are best expressed in the comments submitted by SPI, SOCMA, and NADA [Exs. 2-7, 2-12, 2-23]. As SPI commented, "the general nature of the LOTO rule permits varying interpretations of its requirements, differing implementation patterns, and creates confusion, especially for small businesses, when determining how to achieve compliance, yet maintain efficient operations" [Ex. 2-12].[4] Similarly, SOCMA commented, "Small businesses could lessen their burden by adopting some of the alternative procedures that OSHA officials have accepted as satisfying the regulatory requirements." SOCMA further commented that "small companies are at a disadvantage because their resources are limited, thereby limiting their ability to routinely gain access to the letters of interpretation and compliance directives that are not published concurrently with the standard." SOCMA recommended incorporation of Appendix C of the Compliance Directive as a non-mandatory appendix to the standard as a solution to the concerns of its members [Ex. 2-7].[5] Finally, NADA commented, "For each of its standards (including lockout/tagout), OSHA must make more of an

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[3] The Institute for Interconnecting and Packaging Electronic Circuits (IPC) represents approximately 2,100 companies that manufacture bare printed circuit boards and electronic assemblies as well as industry suppliers, original equipment manufacturers, and other types of members. The majority of IPC members are small to medium-sized enterprises with annual sales of less than $10 million.

[4] The Society of the Plastics Industry, Inc. (SPI) is a 2,000 member not-for-profit trade association representing all segments of the plastics industry. SPI's members include processors and manufacturers of plastics and plastic products, suppliers of raw materials, processors and converters of plastics resins, and manufacturers of equipment used in the plastics industry.

[5] The Synthetic Organic Chemical Manufacturers Association, Inc. (SOCMA) is a trade association representing 283 companies in the batch and custom chemical industry. SOCMA's members are typically small businesses with fewer than 50 employees and less than $50 million in sales.

effort to work with small business on compliance implementation concerns, especially...where the issues involved aren't directly addressed in the standard itself" [Ex. 2-23].[6]

Analysis of the comments provided by the trade associations and other representatives of small business suggests that OSHA should provide additional compliance assistance but leave the standard in its current form. However, some of the comments in the docket addressed other means of improving compliance with the standard. For example, the NGFA advocated revising several provisions of the standard to contain performance rather than specification language [Ex. 2-21]. In addition, the use of consensus standards to provide compliance guidelines was also raised as a means of reducing burden. The SPI suggested that national and international machine-specific consensus standards could serve as an alternative to some of the compliance requirements of the Lockout/Tagout Standard. The SPI indicated that the ability to use such standards to determine compliance responsibilities could eliminate the "uncertainties associated with the current general language" of the Lockout/Tagout Standard. The SPI asked OSHA "to recognize compliance with machine-specific consensus standards as equivalent compliance with the applicable portions of the LOTO rule" [Ex. 2-12].

Several comments made by small business representatives focused on OSHA's enforcement policy for the standard. In its comments, the NAM urged OSHA "to ensure that current enforcement interpretations of this performance-based generic rule properly reflect what is necessary to achieve workplace safety. We remain concerned about interpretations that are overboard or require unjustified or redundant levels of safety" [Ex. 2-11]. The SBA echoed this concern, stating that "The Office of Advocacy has been contacted by representatives of small businesses who are concerned that the standard is being inconsistently enforced...The Office of Advocacy recommends that the agency evaluate its implementation of the standard for inconsistencies with the intent of the final rule" [Ex. 2-26]. Furthermore, one trade association representing small businesses specifically requested that OSHA review its enforcement policies with respect to its industry: NADA expressed concern about previous OSHA enforcement actions in vehicle maintenance facilities and asked for flexibility from OSHA in administering the standard in these workplaces [Ex. 2-23].

ANALYSIS OF PUBLIC COMMENTS AND COMPLAINTS

To comply with the review requirements of Section 610 of the Regulatory Flexibility Act, OSHA must evaluate: (1) the continued need for the rule; (2) the nature of public complaints or comments about the rule; (3) the complexity of the rule; (4) the extent to which the rule overlaps, duplicates, or conflicts with other federal rules; and (5) the length of time since the rule was evaluated or the degree to which technology, economic conditions, or other factors have changed

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[6] The National Automobile Dealers Association (NADA) is a trade association of 20,000 franchised automobile and truck dealerships involved in the retail sale of new and used motor vehicles. NADA members also engage in automotive service, repair, and parts sales. Over 85 percent of NADA's members are small businesses. The average dealership has 45 employees.

since the rule was promulgated. Section 5 of EO 12866 requires agencies to consider similar factors during their reviews of existing regulations. For example, the EO directs agencies to consider whether a rule under review has become unnecessary as a result of changed circumstances, whether it is compatible with other rules, and whether it is duplicative. The following discussion has therefore been organized by the review criteria established by the Regulatory Flexibility Act. The first section discusses general comments addressing the continued need for the rule. The second section discusses a number of more specific comments and complaints grouped by topic. Some of these topics include the applicability of the standard to the control of hazardous energy in process industries, concerns about the requirement for the development of lockout/tagout procedures, the potential for expansion of the standard's scope to cover additional industries, and OSHA's enforcement policy concerning the standard. The third section analyzes general comments on the complexity of the rule. The fourth section discusses general comments on overlap, duplication, and conflict issues, and the fifth section covers general comments on changes in technology, economic conditions, and other factors.

Most commenters indicated that there was a continuing need for the standard [Exs. 2-1, 2-3, 2-4, 2-7, 2-8, 2-10, 2-11, 2-14, 2-15, 2-16, 2-21, 2-22, 2-25, 5]. However, a variety of modifications were suggested for individual provisions of the rule. Some commenters suggested modifying the scope and application of the standard in ways that would expand or limit the coverage of the standard. Other commenters suggested restating provisions such as the specification requirements for periodic review of procedures, tagout materials, and group lockout in performance terms. In a few cases, commenters recommended outright elimination of entire provisions. Suggested additions to the standard included additional provisions dealing with the special concerns of the process industries and new requirements for task and hazard analysis, engineering controls, and worker participation. Many of these suggested revisions and modifications had been suggested to OSHA during the original rulemaking process.

Several comments indicate that the rule is considered complex. However, compliance assistance was more often recommended as a potential solution to the standard's complexity than direct methods of reducing complexity such as rewriting the standard in Plain Language. The comments did not indicate the presence of any burdensome duplications, overlaps, or conflicts with the rules of other federal agencies. However, the interrelationship between the Lockout/Tagout Standard and lockout-related provisions in other OSHA standards was raised as an example of overlap by several commenters. Very little information was submitted to the docket concerning changes in technology, economic conditions, or other factors that might necessitate revision of the rule. A few comments addressed the relationship between the provisions of the rule and the use of control circuits or interlocked equipment [Exs. 2-19, 2-21]

COMMENTS ON THE CONTINUED NEED FOR THE RULE

The majority of the comments received by OSHA indicated support for the continuance of the standard either in its current form or in a revised form. Comments indicating that the standard has been effective were received from employers, trade associations and employer representatives, employee representatives, and two membership organizations. This support

stemmed from general perceptions of the effectiveness of the standard and general recognition of the importance of regulating such a severe safety hazard [Exs. 2-1, 2-3, 2-4, 2-7, 2-8, 2-10, 2-11, 2-14, 2-15, 2-16, 2-21, 2-22, 2-25, 5]. Many of the commenters who indicated that the standard was effective, including NAM, SOCMA, ABC, ORC, Alabama Power, and Kodak, also indicated that they did not recommend making modifications to the rule [Exs. 2-4, 2-7, 2-11, 2-16, 2-22, 2-25]. Those organizations who criticized aspects of the existing rule, such as API, CMA, Dow, and RRS Engineering, typically emphasized revising the rule rather than eliminating it entirely [Exs. 2-5, 2-6, 2-9, 2-20].

A number of employers commented that the existing rule was effective in its current form. For example, Alabama Power wrote that the standard "does not require revision," and Bell Atlantic commented that the standard "is effective in providing employee protection" [Exs. 2-15, 2-22]. Kodak also commented that, "The OSHA regulation covering lockout tagout, 29 CFR 1910.147, is relatively effective. OSHA should not reopen the rule at this time..." [Ex. 2-4].

Employee representatives praised the standard and expressed the need for its continued, if not strengthened, existence. Three groups of employee representatives provided comments testifying that the standard had saved lives of workers that they represent -- autoworkers (UAW), electricians (IBEW), and steelworkers (USWA) [Exs. 2-8, 2-10, 5]. UAW and USWA provided statistical evidence of lives saved from implementing lockout/tagout programs [Ex. 2-10, 5]. (For a discussion of this evidence, see Chapter III.)

Trade associations representing small businesses also indicated strong support for the existing rule. For example, SOCMA wrote that, "Because employees of small chemical batch processors fully benefit from the protection of Lockout/Tagout procedures, SOCMA supports the continuation of Lockout/Tagout programs" [Ex. 2-7]. The IPC indicated that, although the standard imposes a regulatory burden on its members, "IPC member companies understand the importance of the Lockout/Tagout standard. As a result, IPC members oppose any relaxing of the standard's substantive requirements" [Ex. 2-2]. Similarly, the NAM commented, "Although we are concerned about the Secretary's interpretation of certain provisions, the NAM believes that the principal requirements of the regulation help promote the development of appropriate safety procedures for service and maintenance operations. We oppose reopening the rule, which would introduce the possibility of creating additional paperwork and/or rearguing issues that were resolved in the initial rulemaking" [Ex. 2-11]. In addition, the ABC commented that "ABC members report general satisfaction that the regulation under review is effective in saving lives and guarding against serious injury due to the release of hazardous energy. We are not aware at this time of any major changes that should be made to the standard as it is now written" [Ex. 2-16].[7] Finally, the NGFA wrote that the standard was "a very important rule....We believe the

[7] The Associated Builders and Contractors (ABC) is a national trade association representing over 19,000 construction and construction-related firms.

standard is needed to outline requirements to prevent the release of potentially hazardous energy while maintenance and servicing activities are being performed" [Ex. 2-21].[8]

Two professional organizations, the ASSE and NFPA, and one employer organization, ORC, also commented that the standard was needed. The ASSE wrote "The Lockout/Tagout Standard is an important component of an efficient/effective safety and health program."[9] The NFPA commented that OSHA should retain the standard because it felt the standard was "a valuable workplace safety standard" [Ex. 2-3].[10] ORC commented that "ORC has reviewed the Lockout/Tagout standard and believes that the standard is necessary for the protection of workers and that, in general, it is effective in achieving that goal" [Ex. 2-25].[11]

Comments in the record also provided evidence that compliance with the standard can have benefits for business such as improved profitability due to lower workers' compensation costs. For example, a consulting electrical engineer representing DuPont discussed two cases in which small businesses were able to improve their profitability by implementing comprehensive safety programs that included lockout/tagout procedures [Exs. 2-1, 2-17]. In addition, the President of the IBEW commented that, based on IBEW's experience with the standard, "A small business can easily comply with requirements contained in this standard...There is some cost associated with purchase of devices used in the lockout/tagout process (that is, locks and tags) but those costs will easily be returned by avoiding only one injury or fatality" [Ex. 2-8].

COMMENTS ON SPECIFIC ISSUES, GROUPED BY TOPIC

The majority of the comments submitted to Docket S-012B could be separated into groups of specific topics that are discussed individually in this section. The nine topics covered in this section are:

- the control of hazardous energy in the process industries;

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[8] The National Grain and Feed Association (NGFA) is a national non-profit trade association of about 1,000 grain, feed, and processing firms.

[9] The American Society of Safety Engineers (ASSE) is a society of safety professionals with a membership of almost 33,000 professionals from a variety of safety disciplines.

[10] The National Fire Protection Association (NFPA) is a non-profit membership organization that promotes safety from fire, electricity, and related hazards through research, codes and standards, technical advisory services, and public education.

[11] Organization Resources Counselors, Inc. (ORC) is a human resources management consulting firm. ORC sponsors Occupational Safety and Health Groups comprised of major U.S. corporations with strong commitments to providing safe and healthy workplaces.

- the lockout/tagout program requirement;
- the lockout/tagout procedures requirement;
- the stringency of tagout requirements;
- expansion of coverage to additional industries;
- exemptions from the standard;
- alternatives to the standard;
- enforcement policy; and
- compliance assistance policy.

Comments on Control of Hazardous Energy in the Process Industries

Representatives of both large and small businesses in the process industries indicated continued concern about the feasibility of complying with a number of the standard's requirements. Although representatives of the process industries such as CMA and API acknowledge that the standard is acceptable for controlling mechanical and electrical energy in their facilities, they also have maintained since the outset of the rulemaking that the control of hazardous energy from process systems and piping networks requires special regulatory consideration.[12,13] The API and CMA, in particular, feel that the standard is not feasible for controlling hazardous energy from piping and process systems without the "framework for compliance" provided by interpretative guidance contained in OSHA Compliance Directive 1-7.3 [Exs. 2-5, 2-20].

Industry representatives indicate that they still have concerns arising out of the settlement of litigation following the promulgation of the Lockout/Tagout Standard and the settlements negotiated at that time. The API comments stated that API's principal problems with the standard include: (1) the strict requirement for individual locks and direct participation of every individual, (2) the greater hazard created by requiring numerous persons to access blinding points

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[12] The Chemical Manufacturers Association (CMA) is a non-profit trade association whose member companies manufacture basic industrial chemicals. CMA members are a mix of both small and large companies. CMA member companies employ contractors that are considered to be small businesses.

[13] The American Petroleum Institute (API) is a trade association representing over 300 companies in the petroleum industry. API member companies employ contractors that are considered to be small businesses.

in process systems, and (3) the requirement for all individuals to apply their own locks and tags at each end of pipelines that are often separated by significant distances [Ex. 2-20]. Similarly, the CMA indicated that the strict requirement for individual locks and direct participation of every individual was a concern. The CMA's comments emphasized what CMA characterized as the standard's "failure to provide for or recognize the equivalency and effectiveness of procedures already in place in the industry" and the "excessive burden in various parts of the standard without commensurate benefit or safety" [Ex. 2-5]. Furthermore, Dow indicated in its comments that it felt that the standard's requirement for notification of affected employees prior to removal of lockout/tagout devices and reenergization of machines was unnecessary. Dow commented that, at its facilities, such employees are trained to understand that when a tag is not present, a process system has "all of the hazards intrinsic to its normal operation...if there is no red tag, the equipment still should be assumed to...be capable of being energized" [Ex. 2-6]. Because of their continued concerns about the standard, CMA, API, and Dow indicated that, if the standard were to be reopened, they would recommend modifications to numerous portions of the standard to resolve the concerns addressed above, as well as to address other concerns discussed later on in this chapter [Exs. 2-5, 2-6, 2-20].

Many of the issues raised in the API and CMA comments were issues that had been raised by the same commenters during the rulemaking and subsequent litigation. In the litigation, OSHA and the parties to the lawsuit negotiated language to be included in the compliance directive to clarify how the standard would be enforced in these industries. The contents of the compliance directive for the Lockout/Tagout Standard, Compliance Directive 1-7.3, and the examples and interpretive guidance contained in Appendix C of that compliance directive, were developed during these negotiations.

The API and CMA indicate that their member companies are currently controlling hazardous energy sources in process systems in accordance with Appendix C of OSHA's Compliance Directive [Exs. 2-5, 2-20]. The API and CMA both indicated that compliance with Appendix C is more costly and burdensome than would have been the case if they had been permitted to use the work authorization systems previously used by the process industries [Exs. 2-5, 2-20]. Dow also commented that it found that using the guidance in Appendix C was burdensome because its use required Dow to maintain two separate lockout/tagout protocols, one for individual and one for group lockout [Ex. 2-6]. Nevertheless, the API and CMA, as well as SOCMA, indicated that the guidance in the Compliance Directive is of value to their members and should be more widely available to businesses who are regulated under the standard [Exs. 2-5, 2-7, 2-20].

The comments presented by the API, CMA, and SOCMA suggest that both small and large firms in the process industries would welcome the incorporation of Appendix C of the Compliance Directive into a non-mandatory appendix to §1910.147 [Exs. 2-5, 2-7, 2-20]. SOCMA, in particular, supported this idea, indicating that many small businesses are currently unaware of guidance contained in the Compliance Directive and letters of interpretation that could potentially relieve compliance burdens. SOCMA commented that, "It is SOCMA's belief that many of these documents facilitate understanding of the regulatory requirements and often

clarify areas of confusion in the regulations. Small businesses could lessen their burden by adopting some of the alternative procedures that OSHA officials have accepted as satisfying the regulatory requirements" [Ex. 2-7]. Furthermore, the API and CMA indicated that contractors operating at process industry facilities would be another set of small businesses that would benefit from publication of the Appendix C guidance as a non-mandatory appendix [Exs. 2-5, 2-20]. The API and CMA indicated that contractors often rely on host employers to learn about the requirements of the standard, and that many contractors, in addition to the companies that employ them, are not aware of the Appendix C guidance [Exs. 2-5, 2-20].

To resolve uncertainties about the permanence of the guidance in the directive, the API and CMA recommended that OSHA incorporate Appendix C of the Compliance Directive as a non-mandatory appendix to the Lockout/Tagout Standard [Exs. 2-5, 2-20]. SOCMA and ORC also supported this recommendation [Exs. 2-7, 2-25]. The API and CMA also asked that OSHA consider adding a paragraph of suggested language to Appendix C to address issues concerning pipeline operations [Exs. 2-5, 2-20].

Comments on the Lockout/Tagout Program Requirement

Paragraph (c)(1) of the Lockout/Tagout Standard requires employers to establish lockout/tagout programs consisting of energy control (lockout/tagout) procedures, employee training, and periodic inspections to control hazardous energy. This requirement is central to the entire standard. Several organizations addressed the overall program requirement in their comments, although more comments were received on the requirements associated with program components. For example, the ASSE indicated that some of its members felt that "employers creating a first time lockout/tagout program would have a difficult time creating one from the standard" [Ex 2-14]. SOCMA commented that small employers may lack access to OSHA interpretations that would help them to develop compliant programs [Ex. 2-7]. In addition, the UAW commented that it believed that the program requirement should be strengthened because of perceived shortcomings in the existing standard as well as increased worker exposure to the hazards of servicing and maintenance in UAW-organized industries in the interval since the rule was published [Ex. 5].

The UAW comments indicated that there has been an increase in the proportion of UAW members exposed to the hazards of service and maintenance tasks. One factor in this trend has been an increase in the proportion of the total workforce that is classified as belonging to the skilled trades due to the introduction of automation and complex manufacturing machinery and equipment. A second factor involves assigned job responsibilities. According to the UAW, production workers are now more commonly expected to perform complex tasks including setup, minor troubleshooting, unjamming of parts, preventive maintenance, and fault clearance [Ex. 5].

In its comments, the UAW indicated that the standard's "chief shortcoming is the failure to require structured participation by workers and their representatives in the development and implementation of facility lockout programs" [Ex. 5]. In addition, the UAW indicated that the standard should be expanded to require that "service and maintenance tasks be explicitly

identified for that machinery and equipment currently required to have machine specific lockout procedures" and to require that the hazards of such tasks also be identified [Ex. 5]. Additional requirements suggested by the UAW would require the results of such task and hazard analyses to trigger implementation of feasible design changes and use of engineering controls for tasks that are performed on a frequent basis [Ex. 5]. The UAW further commented that "the standard should require that all aspects of the program be reviewed with workers and their representatives" and that "all records and documents relevant to lockout programs should be made available to employees and their representatives on the same basis as chemical and exposure records" [Ex. 5]. The API and CMA disagreed with the UAW's recommendations for adding provisions on task and hazard analysis and engineering controls [Exs. 2-5, 2-20]. The SBA also expressed concern about the potential costs of an engineering control requirement [Ex. 2-26].

Comments on the Lockout/Tagout Procedures Requirement

Paragraph (c)(4) of the Lockout/Tagout Standard requires that energy control (lockout/tagout) procedures be "developed, documented, and utilized" for controlling potentially hazardous energy. The comments indicate that there are a number of areas of concern involving this requirement. A commenter representing DuPont even asked OSHA to provide a definition of the term "procedure" in the standard because the commenter felt that OSHA's use of the term was not consistent with the use of that term in industry [Ex. 2-1]. In general, commenters indicated that more compliance assistance is needed to help businesses comply with the requirements for lockout/tagout procedures and to help them understand the level of detail that must be included in such procedures. This is especially true of small businesses. Representing small businesses, the IPC, SOCMA, and SBA asked OSHA to develop and provide compliance assistance tools, such as samples of equipment-specific lockout/tagout procedures and non-mandatory appendices to the standard, and to provide consultation assistance to help small businesses comply with the standard [Exs. 2-2, 2-7, 2-26]. In addition, the UAW commented that additional requirements were necessary to strengthen the lockout/tagout procedures requirement to permit worker participation and to require the posting of procedures [Ex. 5].

Commenters were particularly concerned about the potential burdens associated with developing large numbers of separate procedures, and thus, with the acceptability of generic lockout/tagout procedures. Although OSHA has already indicated that generic procedures accompanied by tailored checklists are acceptable for compliance purposes, commenters such as ORC and Keller and Heckman indicate that OSHA interpretations and enforcement actions may have discouraged employers from using generic procedures [Exs. 2-13C, 2-19, 2-25]. The CMA and API indicated that if the rule were to be reopened they would seek to have the use of generic procedures specifically authorized by the standard [Exs. 2-5, 2-20].

Although some industry representatives commented on the burden associated with documenting lockout/tagout procedures, these commenters did not argue that written documentation was unnecessary. Instead, these commenters indicated dissatisfaction with the degree of specificity that they feel OSHA currently requires as part of these procedures. Some

commenters asked that OSHA consider simplifying the standard's requirements dealing with the periodic review of lockout/tagout procedures.

Development of Compliant Energy Control Procedures

The Lockout/Tagout Standard requires employers to develop "specific" energy control procedures. Each procedure must contain a statement of the intended use of the lockout procedure, complete instructions for deenergizing the machine and for the use of lockout/tagout devices, and information on how to test machines or equipment to verify the effectiveness of the energy control measures used. Individual circumstances present at an employer's facility determine the number of separate procedures that need to be developed. Many of the commenters report difficulties in understanding how to comply with this provision.

The comments received in Docket S-012B indicate some confusion about the proper level of detail needed to comply with the requirement to produce "specific" procedures. The commenters felt that this confusion might be resulting in unnecessary burdens on employers. For example, the NGFA commented that the wording of the lockout/tagout procedures requirement suggests that "hundreds or thousands of separate procedures" would be needed and therefore recommended restating paragraph (c)(4) in performance terms [Ex. 2-21]. Similarly, Kodak wrote, "Some companies spend tremendous resources writing detailed written procedures for standard equipment when a generic procedure may be suitable" [Ex. 2-4]. Bell Atlantic also indicated that more flexibility in using generic lockout/tagout procedures tailored to machine types should be permitted in lieu of "specific manufacturer/equipment procedures" [Ex. 2-15]. The CMA and API indicated that being allowed to use generic procedures for standard types of equipment such as pumps, compressors, and mixers would be desirable and that, if the rule were to be revised, they would seek to have such procedures explicitly recognized as acceptable in the provisions of the standard [Exs. 2-5, 2-20].

Some commenters indicated that OSHA enforcement policy may have discouraged the creation and use of generic procedures, even though OSHA interpretations have acknowledged that generic procedures supplemented with specific checklists can be acceptable for compliance. The comments of Keller and Heckman and ORC reflect their belief that OSHA interpretations contain language suggesting that OSHA has reservations about the use of generic procedures [Exs. 2-13C, 2-19, 2-25]. Keller and Heckman indicated concern "about interpretations of the standard and enforcement actions which push employers toward developing increasingly more detailed, energy-specific, equipment-specific, and even task-specific procedures for locking out or tagging out each piece of equipment" [Ex. 2-19].[14]

Several representatives of small business indicated that it would be helpful if the Agency could provide examples of lockout/tagout procedures that go beyond the model procedure

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[14] Keller and Heckman is a law firm that represents both large and small employers from a variety of industries.

currently provided in non-mandatory Appendix A of the standard. For example, the IPC recommended that OSHA develop generic "energy control procedure" templates for specific categories of equipment that would facilitate small company compliance [Ex. 2-2]. The SBA indicated that "supplemental OSHA guidance on generic equipment procedures might be beneficial to facilitate compliance among small businesses" [Ex. 2-26].

Content and Format of the Required Procedures

The UAW urged OSHA to add additional provisions to the content criteria for the lockout/tagout procedures requirement. As described above, the UAW indicated that lockout/tagout procedures should explicitly identify the affected service and maintenance tasks. The UAW also recommended that the standard require employers to involve workers in the process of preparing and documenting procedures to ensure that procedures would be accurate and would not prevent the job from being performed. The UAW also suggested adding a provision to require the posting of machine-specific lockout procedures near such machines. The UAW commented that posted procedures provide an effective job aid for workers who have not previously worked on the specific machinery or equipment as well as a quick review for more experienced workers. The UAW indicated that posted lockout procedures are in place at almost every General Motors, Ford, and Chrysler plant in the United States [Ex. 5]. The CMA and API disagreed about requiring enhanced written procedures, however [Exs. 2-5, 2-20].

Documentation of Procedures

Paragraph (c)(4)(i) of the rule requires that energy control (lockout/tagout) procedures be documented. However, the standard does contain an exemption from this requirement. The note to paragraph (c)(4)(i) exempts employers from creating a written procedure for servicing or maintaining a machine or piece of equipment when all of the following conditions are met:

- the machine does not contain and cannot reaccumulate stored energy when shut down;
- the machine has a single, readily identifiable, isolated energy source;
- the machine can be deenergized by isolating and locking out the single energy source;
- the machine is kept isolated from the energy source and locked out during maintenance;
- the machine requires a single lockout device to achieve a locked-out condition;
- the lockout device is under the exclusive control of the servicing employee;
- the machine can be serviced without creating hazards for other employees; and

- no lockout accidents have previously occurred during work covered by this exemption.

Only a few comments addressed this requirement. None of the commenters argued that it was unnecessary to prepare written procedures, although some commenters indicated that the process could be burdensome or detract from a focus on actual safety practices [Exs. 2-9, 5]. On the other hand, the UAW indicated that the process of developing written procedures had produced many benefits in UAW workplaces. According to the UAW, many defective energy isolation devices, as well as shortcomings in current procedures that did not completely control energy, were discovered in the process of writing machine-specific procedures [Ex. 5].

Periodic Inspection of Lockout/Tagout Procedures

Paragraph (c)(6)(i) requires employers to conduct an annual inspection of energy control (lockout/tagout) procedures. Three commenters expressed the opinion that this requirement was unnecessarily burdensome and that such a requirement would be equally effective and less burdensome if phrased using performance language. The NGFA indicated that it feels that performing an annual documented review is not needed to ensure compliance. The NGFA recommended that "OSHA scale back this section and make it more performance oriented" [Ex. 2-21]. Kodak also found this requirement "burdensome" and "of little value" and suggested that it be restated in performance terms [Ex. 2-4]. In addition, ORC indicated that the requirement to annually review procedures with authorized and/or affected employees was "a source of much confusion and unnecessary burden among employers with many employees, operating many different types of equipment, over several work shifts." ORC also recommended that this requirement be made more performance oriented and suggested several approaches to revising the requirement [Ex. 2-25].

Paragraph (c)(6)(ii) requires the preparation of a certification statement documenting annual inspections of energy control. Two commenters indicated that this requirement was burdensome. The CMA stated that the requirements "to identify particular machines or processes and to identify the employees included in the inspection" were particularly burdensome [Ex. 2-5]. Dow also felt that this requirement was burdensome [Ex. 2-6]. On the other hand, the UAW indicated that these records had sufficient value to warrant the addition of a provision requiring that these certification records be made available to workers and their representatives [Ex. 5].

Comments on the Stringency of Tagout Requirements

Although they did not challenge the feasibility of the standard, the CMA, Dow, and other industry representatives commented that the extra requirements placed on tagout programs by the standard are burdensome [Exs. 2-5, 2-6, 2-9, 2-21]. This issue was litigated after the promulgation of the standard and was resolved when the court upheld OSHA's decision to place additional requirements on tags to ensure that tagout procedures were as effective as lockout procedures.

Three commenters indicated that the current specification requirements for the composition of tagout devices were excessive. The CMA, Dow, and NGFA commented that the requirement should be restated in performance language [Exs. 2-5, 2-6, 2-21]. The specific recommendations included eliminating the specification for the strength of ties used to attach tags and replacing the requirement for all-weather tag materials with a performance requirement stating that tags must be legible. Dow provided an extensive cost analysis of the additional costs incurred due to the need to purchase nylon cable ties, tie-cutting tools, and Tyvek tag materials to comply with the specification requirements [Ex. 2-6]. Dow also indicated that complying with the requirement in paragraph (c)(5)(ii) to standardize the appearance of lockout/tagout devices had forced Dow to discontinue using a previously developed tag system for generic safety hazards [Ex. 2-6].

Another area of concern regarding tagout programs was an issue concerning preamble language in the Federal Register notice for the final rule stating that annual training was required for employees using tagout systems. This concern was raised by both CMA and Dow [Exs. 2-5, 2-6]. The language in question reads: "In addressing this limitation, OSHA is requiring additional training for employees who work with tagout or who work in areas in which tagout is used. Such training must be provided on at least an annual basis" [FR Vol. 54, No. 169, 9/1/89, p. 36669]. As Dow correctly indicates, this language is not contained in either the standard itself or the compliance directive. Dow commented that this language has "led Dow to annually train/and or compensate for training approximately 19,000 employees and contractors." Dow indicates that providing this training, which requires approximately two hours away from job tasks per affected employee, costs Dow about $836,000 plus administrative fees per year [Ex. 2-6]. CMA also commented that this preamble language placed an "excessive and unwarranted" burden on employers using tagout systems [Ex. 2-6].

Comments on Expanding Coverage to Additional Industries

Commenters indicated concern for workers who are not currently protected by a comprehensive lockout/tagout program standard. In their comments, the USWA asked OSHA to expand the protections of the standard to workers in industries not currently covered under the scope of §1910.147. Examples of such industries include the construction, agriculture, maritime, and oil and gas industries [Ex. 2-10]. Several other commenters specifically recommended that the construction industry be covered by a comprehensive program standard [Exs. 2-1, 2-3, 2-8].

DuPont and the IBEW indicated that servicing and maintenance workers employed in the construction industry are often exposed to hazards identical to those faced by workers in general industry covered under the Lockout/Tagout Standard [Exs. 2-1, 2-8]. DuPont, the IBEW, and the NFPA all expressed support for a standard covering the construction industry that would go beyond the limited standard currently provided at §1926.417 [Exs. 2-1, 2-8, 2-3]. These three commenters indicated that §1910.147 should be expanded to cover the construction industry. The API disagreed with this suggestion, recommending instead that "control of hazardous energy sources in construction should be addressed in the continued development of an appropriate construction industry standard" [Ex. 2-20]. The CMA also indicated that it was "not convinced

that including construction in the scope of the general industry standard (§1910.147) is the appropriate solution" [Ex. 2-5]. However, both the API and CMA indicated that since both construction and general industry standards are applicable to work performed at their facilities, it was essential that OSHA avoid creating differing standards or provisions that could result in conflicts with other OSHA regulations [Exs. 2-5, 2-20].

Comments on Exemption Provisions of the Standard

Some commenters provided feedback about the utility of the various exemptions in paragraph (a) of the standard. The application portion of the scope paragraph contains three major exemptions from coverage under the standard. These exemptions are: (1) an exemption for minor servicing during normal production operations, (2) an exemption for servicing and maintenance of cord and plug connected electrical equipment, and (3) an exemption for hot tap operations. Keller and Heckman commented on several issues concerning the minor servicing exemption [Ex. 2-19]. The IPC and CMA requested expansion of the exclusive control exemption to other types of equipment to relieve regulatory burden [Exs. 2-2, 2-5].

The Minor Servicing Exemption

The Lockout/Tagout Standard is not intended to apply to normal production operations. Under paragraph (a)(2)(ii)(a) of the standard, servicing and maintenance occurring during normal production operations are covered only when: (1) an employee is required to remove or bypass a guard or safety device, or (2) an employee is required to place a part of the body into a point of operation or an associated danger zone during a machine operating cycle. This section of the rule also contains an exemption for "minor tool changes and adjustments" and "other minor servicing activities" occurring during normal production operations. A comment submitted to the record suggests that industry representatives are interested in understanding the application and limits of this exception and that OSHA has not provided enough interpretative guidance concerning activities covered under this exemption. Keller and Heckman believe that OSHA uses an "overly restrictive definition" of the minor servicing activities exemption [Ex. 2-19]. Keller and Heckman also commented that OSHA's strict enforcement interpretation of this provision and of a similar provision for testing equipment during servicing contained in §1910.147(f) had resulted in the need to further explore the concept of "unexpected energization" contained in the rule [Ex. 2-19].

The Exclusive Control Exemption

Two commenters felt that OSHA should expand a provision exempting work on cord-and-plug-connected electrical equipment to cover other types of equipment under the exclusive control of the person performing the servicing or maintenance. Paragraph (a)(2)(iii)(a) of the Lockout/Tagout Standard specifically exempts "work on cord and plug connected electrical equipment for which exposure to the hazards of unexpected energization or startup is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance." The IPC

commented that OSHA should create a similar exemption for equipment powered by non-electrical sources of energy, such as hydraulic or pneumatic energy, in cases where the single energy source can be disconnected and remain under the exclusive control of the employee performing the servicing or maintenance. The IPC indicated that such an exemption would relieve unnecessary compliance burden. The CMA also raised the possibility of such an exemption [Exs. 2-5, 2-20]. Examples of equipment that could be covered under an expanded exemption are air-driven pumps and isolating block valves that could be kept under the exclusive control of the worker performing maintenance [Exs. 2-2, 2-5].

Comments on Alternatives to the Standard

A number of commenters identified potential alternatives to the rule or portions of the rule. For example, the ASSE indicated that some of its members felt that the forthcoming OSHA Safety and Health Programs Standard proposal could be drafted to incorporate a lockout program component [Ex. 2-14]. The CMA and API both commented that they continue to feel that the work authorization systems used by their members prior to the promulgation of §1910.147 were a less burdensome and more effective means of eliminating lockout/tagout hazards [Exs. 2-5, 2-20].

Some commenters suggested that industry consensus standards could serve as alternatives or supplements to specific provisions of the Lockout/Tagout Standard. Several commenters recommended that OSHA incorporate references to consensus standards into §1910.147. For example, the ASSE commented that OSHA should incorporate the ANSI lockout/tagout standard (ANSI Z244.1-1982) by reference and also commented that OSHA should evaluate the possibility for harmonization of OSHA's Lockout/Tagout Standard with international standards [Ex. 2-14]. The use of consensus standards as references or guidelines was also discussed in comments concerning the control of hazardous electrical energy and a comment concerning the development of lockout/tagout procedures. Although some commenters advocated the use of consensus standards, other commenters, namely the CMA, API, and the SBA, raised concerns about the use of consensus standards. The CMA and API indicated concern that adding references to consensus standards developed outside of the rulemaking process would have the effect of bypassing the rulemaking process [Exs. 2-5, 2-20]. The SBA indicated that OSHA should evaluate the degree of small business input into consensus standards and consider the potential impact on small businesses that might result from an OSHA decision to propose adoption of such standards by reference [Ex. 2-26].

Alternative Means of Controlling Hazardous Electrical Energy

Control of hazardous electrical energy was one area in which a reference to an industry consensus standard was proposed as an alternative to a provision of §1910.147. DuPont, the IBEW, and the NFPA all recommended that OSHA reference NFPA consensus standard 70E within §1910.147 instead of continuing to reference Subpart S of 29 CFR 1910 in paragraph (a)(1)(ii)(c) [Exs. 2-1, 2-8, 2-3]. NFPA 70E is a national consensus standard that contains electrical safety requirements designed to protect employees from exposure to hazardous

electrical energy. The three commenters supporting the idea of referencing NFPA 70E within §1910.147 indicated their belief that NFPA 70E provides a more flexible standard that also offers more specific and direct requirements for eliminating hazardous electrical energy [Exs. 2-1, 2-3, 2-8].

Two main distinctions between NFPA 70E and OSHA Subpart S standards were described by the commenters. First, NFPA 70E requires the establishment of an "electrically safe work condition,"[15] while the Subpart S standard simply requires electric circuits to be deenergized and locked out or tagged. Second, Subpart S requires voltage tester operation to be verified only at voltage levels greater than 600 volts, whereas NFPA 70E requires that voltage tester operability be verified at all voltages greater than 50 volts [Exs. 2-3, 2-8]. The commenters indicate that since most incidents, injuries, and fatalities related to electrical hazards are associated with voltage levels below 600 volts, they believe that the NFPA standard would provide better protection for workers. DuPont, the IBEW, and the NFPA therefore recommended that §1910.147 be changed to reference NFPA 70E [Exs. 2-1, 2-3, 2-8]. The CMA and API indicated that they disagreed with this recommendation [Exs. 2-5, 2-20].

Alternative Specifications for Developing Lockout/Tagout Procedures

The SPI suggested that national and international machine-specific consensus standards such as ANSI standards could serve as an alternative to some of the compliance requirements of the Lockout/Tagout Standard. The SPI indicated that the ability to use such standards to determine compliance responsibilities could eliminate the "uncertainties associated with the current general language" of the Lockout/Tagout Standard by supplying more specific compliance guidance. The SPI asked OSHA "to recognize compliance with machine-specific consensus standards as equivalent compliance with the applicable portions of the LOTO rule" [Ex. 2-12]. The SPI indicated that permitting the substitution of machine-specific consensus standard requirements for portions of the rule would "reduce compliance burdens, eliminate uncertainties associated with the current general language of the LOTO rule, and provide workers with equally effective protection from the hazards addressed by the rule" [Ex. 2-12].

Comments on OSHA Compliance Policy

A number of commenters expressed concern about issues related to OSHA's compliance policies. Keller and Heckman commented that, in their view, OSHA has a tendency to convert performance standards into specification standards through interpretation letters and enforcement actions [Ex. 2-19]. Furthermore, Keller and Heckman suggested OSHA compliance personnel may use the experience they gain from inspecting the lockout/tagout programs of some employers "to 'raise the bar' as to what they consider acceptable performance" for other employers [Ex. 2-19]. Several comments made by small business representatives also suggested

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[15] Putting an electric circuit in an "electrically safe work condition" could include grounding the circuit in addition to deenergizing it.

that there were outstanding issues concerning OSHA compliance policy. For example, the SBA stated that, "The Office of Advocacy has been contacted by representatives of small businesses who are concerned that the standard is being inconsistently enforced" [Ex. 2-26]. The NAM also indicated in its comments that it remains "concerned about interpretations that are overboard or require unjustified or redundant levels of safety" [Ex. 2-11]. Two other subjects of comment concerning compliance policy addressed the issues of "unexpected energization" and the proper role of the compliance directive in enforcement policy.

Unexpected Energization

Two commenters, the law firm of Keller and Heckman and the National Automobile Dealers Association (NADA), commented on the issue of "unexpected energization." This term is used in the scope section of §1910.147 and in other provisions as well. Keller and Heckman submitted comments exploring the possible ways in which the term "unexpected energization" might be interpreted by OSHA compliance officials following the issuance of a 1996 court decision in an enforcement case reviewed first by the Occupational Safety and Health Review Commission and later appealed to the Sixth Circuit Court [Secretary v. General Motors Corporation, Delco Chassis Division, 89 F.3d 313 (6th Cir. 1996)]. This case addressed the relatively uncommon situation of an employer's use of a multi-step start-up procedure, time delays, and audible warnings to enable employees to avoid injury even when the machine was started during the middle of a servicing procedure.[16]

In its decision finding for GM, the Sixth Circuit concluded that the precautions used by GM would effectively protect servicing workers from machine hazards. Two articles provided by Keller and Heckman as attachments to their comments contained an analysis of the potential effects of this decision on OSHA compliance policies [Ex. 2-13D]. According to these articles, the GM decision could affect OSHA compliance policies in workplaces where machines containing control circuit devices are used. One possible extension of the GM finding, according to this article, might be that the servicing of machines in situations where "relevant control circuits were under the exclusive control of the employee performing the servicing work and were adequate enough to prevent unexpected energization" might be excluded from coverage under the scope of the Lockout/Tagout Standard [Ex. 2-13D].

The NADA also brought up the concept of unexpected energization in its comments. The NADA indicated that it had recently been made aware that a number of automobile dealerships, primarily located in Pennsylvania, had been cited for lockout/tagout violations associated with vehicle repair operations. The NADA expressed concern that vehicle maintenance and repair facilities, where vehicles are worked on -- usually with batteries connected and often with motors running -- had "little, if any potential for unexpected hazardous energy situations involving those vehicles." The NADA also raised the issue of "the extent to which vehicle maintenance and repair facilities should reasonably be expected to know of the standard's potential application to

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[16] Memorandum from John Miles to OSHA Regional Administrators dated 10/30/96.

these activities." The NADA therefore asked for flexibility from OSHA in administering the standard with regard to vehicle repair and indicated that it was willing to work with OSHA to develop and disseminate guidance related to this issue [Ex. 2-23].

Role of the Compliance Directive

The comments in the record show that the Compliance Directive (STD 1-7.3) has been used by employers to gain information on how to comply with the standard. It is clear from the public comments that industry representatives consider Appendix C to be an important source of information needed to develop compliant lockout/tagout programs. RRS Engineering commented that the compliance directive is not an appropriate place to provide information modifying the requirements of the standard [Ex. 2-9].

Comments on OSHA Compliance Assistance Policy

Many commenters requested that OSHA provide additional compliance assistance on the standard. These commenters included representatives of both large and small businesses from a wide variety of industries (IPC, CMA, SOCMA, SPI, API, and NADA) as well as the SBA [Exs. 2-2, 2-5, 2-7, 2-12, 2-20, 2-23, 2-25, 2-26]. The two most commonly requested forms of compliance assistance involved incorporation of Appendix C of the compliance directive as a non-mandatory appendix and the creation of model or generic lockout/tagout procedures that would provide equipment-specific examples for use by small businesses. The SBA also indicated that OSHA should provide resources to small businesses that need consultation assistance to comply with the existing rule [Ex. 2-26]. Several groups, including SOCMA, NADA, and the ASSE, offered to work with OSHA to develop or publicize compliance assistance materials developed as a result of this review [Exs. 2-7, 2-14, 2-23].

COMMENTS ON THE COMPLEXITY OF THE STANDARD

Two types of comments were received concerning the complexity of the rule. The first type of comment evaluated the complexity of the rule in terms of the ease of understanding and interpreting the standard's requirements. The second type of comment evaluated the complexity of the rule in terms of the ease of complying with the standard's requirements.

Commenters who discussed issues associated with the ease of understanding the rule indicated that some of the terms and language used in the rule could use additional clarification. The IBEW indicated that "in concept, the rule is not complex" and DuPont indicated that "The essential content of the current rule is complex only in the choice of language" [Exs. 2-1, 2-8]. However, both of these commenters indicated that providing additional definitions for critical words and phrases would improve the standard's understandability [Exs. 2-1, 2-8]. Dow and members of the ASSE also commented on an existing definition in the standard. These commenters indicated that the definition of "affected employee" in the standard added unneeded complexity [Exs. 2-9, 2-14]. ORC also indicated that there are "some provisions of the standard that could be amended or clarified to make them less burdensome" [Ex. 2-25]. Finally, some

members of the ASSE and RRS Engineering suggested that the standard be revised and be rewritten in Plain Language [Exs. 2-9, 2-14].

Several other commenters discussed issues associated with the complexity of complying with the rule. The API, CMA, and Dow all indicated that they found the rule to be very complex because of the burdens associated with complying with the rule [Exs. 2-5, 2-6, 2-20]. The specific concerns that led to their conclusions about the complexity of the rule are presented in detail in the section on "Comments on Control of Hazardous Energy in the Process Industries," above.

COMMENTS ON DUPLICATION, OVERLAP, OR CONFLICT WITH OTHER RULES

None of the comments received indicated that OSHA's Lockout/Tagout Standard duplicated, overlapped, or conflicted with any federal or state government regulation administered by another agency. However, some of the commenters believe that the relationship of the Lockout/Tagout Standard to lockout provisions in other OSHA standards reflects the kind of regulatory overlap or conflict envisioned by the Congress in writing the Regulatory Flexibility Act. Commenters such as DuPont and CMA provided suggestions for changes in the way the Lockout/Tagout Standard relates to other OSHA rules containing lockout/tagout provisions [Exs. 2-1, 2-5]. These comments were in addition to comments concerning suggestions that OSHA should expand the scope of §1910.147 to cover the construction industry.

The Lockout/Tagout Standard is one of three major OSHA general industry standards addressing lockout/tagout hazards. The other two major regulations are OSHA's Electrical Safety Work Practices Standard in Subpart S (§1910.331-§1910.335) and the Electrical Power Generation, Transmission, and Distribution Standard in Subpart R (§1910.269). These two standards address specific aspects of the control of electrical energy. The Electrical Safety Work Practices and Electrical Power Generation, Transmission, and Distribution standards were both promulgated after the Lockout/Tagout Standard. They are the result of the evolution of OSHA safety standards from consensus standards and the existence of systems under central control and other conditions unique to the electric power generation, transmission, and distribution industry.

Both the Electrical Safety Work Practices and the Electrical Power Generation, Transmission, and Distribution standards contain cross-references to §1910.147. Certain provisions of these two standards specifically indicate that compliance with comparable provisions in §1910.147 will be considered equivalent to compliance with specific requirements of those standards. These cross-references were provided to reduce compliance burden on those employers whose employees perform activities covered by more than one of these standards. The CMA indicated that it felt that OSHA should revise the Lockout/Tagout Standard to exclude the coverage of electrical energy hazards and to take other actions to eliminate what CMA perceives to be an overlap between the Lockout/Tagout Standard and these other separate standards [Ex. 2-5].

As explained in the preamble to the Lockout/Tagout Standard, lockout-related provisions are also included in a number of OSHA machine guarding standards [FR Vol. 54, No. 169,

9/1/89, pp. 36664-36665]. In addition, a basic lockout/tagout requirement for construction work is included in an OSHA standard for the construction industry, §1926.417. DuPont suggested that §1926.417 be incorporated into §1910.147 "to eliminate any apparent conflict." [Ex. 2-1]. As indicated above, both the API and CMA were concerned about the potential for regulatory conflict arising from potential or actual differences between general industry and construction standards. These commenters indicated that since both construction and general industry standards are applicable to work performed at their facilities, it was essential that, in the future, OSHA avoid creating differing standards or provisions for the two industry sectors that could result in conflicts between OSHA regulations [Exs. 2-5, 2-20].

COMMENTS ON CHANGED TECHNOLOGICAL AND ECONOMIC CONDITIONS

Only a few participants commented on the effects of new developments in technology on compliance with the Lockout/Tagout Standard. The UAW and IBEW both commented that new machine and equipment safeguarding devices had been developed that provided improved safety during servicing and maintenance tasks but did not provide details about these devices [Exs. 2-8, 5]. Comments provided by Keller and Heckman and the NGFA indicate that some provisions of the standard may be burdensome for employers who use certain types of modern equipment [Exs. 2-19, 2-21]. None of the commenters indicated that there were changes in economic conditions that were relevant to this regulatory review of the standard.

The Lockout/Tagout Standard currently requires the use of energy isolating devices and prohibits the use of control circuits as energy isolating devices. Keller and Heckman commented that they believe that the GM case (discussed above in the section on compliance policy) should "properly be read to say that where control circuits or other effective measures reliably prevent exposure to unexpected energization or release of stored energy the lockout/tagout standard should not apply" [Ex. 2-19]. Machine guarding, interlocks, and other safety mechanisms were among the measures cited by Keller and Heckman as possible alternatives to "manually-performed lockout/tagout procedures" [Ex. 2-19]. Keller and Heckman encouraged OSHA to consider this information "in determining what actions would be appropriate to achieve the laudable goals of the lockout/tagout standard on a more straightforward and cost-effective basis" [Ex. 2-19].

In addition, in its comments, the NGFA concluded that the provision for verification of lockout procedures in paragraph (c)(4)(ii)(D) is "overly burdensome in situations where the equipment operation is under computer control or otherwise interlocked. In this situation, verification requires extensive efforts to overcome computer systems to determine if lockout/tagout has been accomplished." The NGFA requested that this provision either be deleted or be made more performance oriented [Ex. 2-21].

CHAPTER V
CHANGES IN TECHNOLOGICAL AND ECONOMIC CONDITIONS

OVERVIEW

The Lockout/Tagout Standard was determined by OSHA to be technologically and economically feasible at the time of issuance. The widespread availability of a range of lockable machinery and equipment designs, lockout/tagout devices, and lockout/tagout compliance aids has made it relatively easy for companies in various industries to comply with the standard. Recent technological developments have led to more effective and economical ways of preventing incidents involving the release of hazardous energy. Beyond existing lockout/tagout products and equipment, there have been advances in machine guarding technology and an increased use of predictive maintenance techniques and technologies, both of which can serve to minimize servicing and maintenance activities covered by §1910.147. In addition, new computer software programs designed specifically to administer lockout/tagout programs are now available.

CONVENTIONAL LOCKOUT/TAGOUT TECHNOLOGIES

In 1989, OSHA concluded that the Lockout/Tagout Standard was technologically feasible for all affected industries. Many of the most common methods of complying with the standard involve the use of conventional technologies that were in existence at the time that the Lockout/Tagout Standard was promulgated. Among these conventional technologies are lockable machine and equipment designs, traditional lockout and tagout devices, and a wide variety of lockout/tagout compliance aids.

Lockable Machine and Equipment Designs

The Lockout/Tagout Standard requires employers to ensure that all newly installed and overhauled machines and equipment are capable of accepting lockout devices. This requirement has been effective since January 2, 1990. (Older machines and equipment that lacked built-in means of attaching lockout devices were grandfathered.) However, even before the standard was promulgated, many machines were already capable of being locked out [FR Vol. 54, No. 169, 9/1/89, pp. 36655-36656]. In the 1989 Regulatory Impact Analysis for the Lockout/Tagout Standard, OSHA determined that 90 percent of existing electrical disconnects were already designed to accept padlocks and 66 percent of valves were capable of being locked out by either padlocks or chain and lock combinations [Docket S-012A; Ex. 71].

For machines that are electrically powered, the means of attaching a lockout device to an electrical energy isolating device (also known as a disconnecting means) is typically built into the disconnect switch itself. When the switch is deactivated, a padlock is inserted into an opening, preventing the switch from being activated until the padlock is removed. Hydraulic and pneumatic power systems can be locked out by using special built-in valves or by placing lockout devices on existing valves.

Lockout Devices and Related Equipment

The Lockout/Tagout Standard mandates employers to supply locks and related equipment, such as chains, blocks, pins, and hasps, if required for energy control. Since the promulgation of the standard, safety equipment and lock manufacturers have made a number of innovations to improve the features of conventional lockout devices without fundamentally altering the technologies behind their designs. Examples of conventional lockout devices, lockout-related equipment, and other compliance aids currently in use include:[1,2]

- Keyed or Combination Padlocks. Keyed padlocks are considered better than combination locks since keys can be assigned and managed. Laser-engraved padlocks can be personalized with company-, department-, or employee-specific information. Color-coded locks can also be used to help identify individuals or crafts involved in lockout/tagout procedures. Some manufacturers produce metal tags that can be marked with an employee's name or identification number. These tags can be attached to the shackles of unmarked locks to identify the employee responsible for the lock.

- Multiple Lockout Devices. These devices allow all persons working on the equipment to use their individual padlocks to lock out the equipment. The machines or equipment being serviced thus cannot be operated until all padlocks have been removed. These devices typically hold six padlocks. Tags can be used along with the padlocks to identify all people working on the equipment.

- Electrical Plug Boxes. These devices prevent plug connection to an outlet during maintenance. The disconnected plug is placed in a small box, which is then locked.

- Pneumatic Valves. These valves are level-operated air valves that can be locked open or shut for pneumatic machines. A sliding-sleeve valve can cut off air-supply and exhaust the line pressure at the same time.

- Valve Lockouts. These devices are available to fit many different types of valves and valve handles. These devices prevent accidental opening of valves.

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[1] Mark Turek, "Lockout/Tagout: Maintaining Machines Safely," Professional Safety, November 1991, pp. 33-35.

[2] James E. Roughton, "Lockout/Tagout Standard REVISITED," Professional Safety, April 1995, pp. 33-37.

- Lockout Centers. These centers serve as highly visible storage units for locks, tags, other lockout devices and even training materials. They also help to ensure that the devices are used only for lockout/tagout purposes.

- Lockout Signs. Signs and placards warn of hazards and remind employees to follow lockout/tagout procedures when performing maintenance or repairs.[3] Signs are available in different sizes and materials for placement on or near machines and equipment.

In addition to using these devices and compliance aids, some companies also choose to post their lockout/tagout procedures in production areas near associated machines and equipment. Although posting of lockout/tagout procedures is not required by the standard, OSHA notes that articles in the literature suggest that many companies find it an effective practice.[4,5] This practice was also recommended by the United Autoworkers during the public meeting and in comments to Docket S-012B [Ex. 5]. The UAW indicated that posted lockout procedures are in place at "almost every General Motors, Ford, and Chrysler plant in the United States" [Ex. 5].

Posting lockout/tagout procedures at operator work stations or lockout locations can provide helpful information for workers who have not previously worked on the specific machinery or equipment as well as provide a quick review for more experienced workers [Ex. 5]. The information posted on these signs can go well beyond simple warning messages.

Tagout Devices

Tagout devices do provide limited physical restraint but serve primarily as warning devices. These devices notify employees of the presence of specific hazardous conditions by posting messages such as "Do Not Operate," "Do Not Start," and "Do Not Close." Tags must be standardized within facilities by either color, shape, or size, and must have a standard print and format. In addition to being legible and easily understood, they must be capable of withstanding hostile environmental conditions. Tag attachment devices must be self-locking, non-reusable, capable of being affixed by hand, and have a minimum unlocking strength of 50 pounds. One example of an attachment device that meets all of these criteria is a one-piece nylon cable tie.

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[3] These signs are not required by the Lockout/Tagout Standard, but some employers have found them useful.

[4] Brendan B. Read, "Locking Out Equipment so That OFF Means Off," New Steel, May 1995, pp.56-62.

[5] Susannah Zak Figura, "Lockout/Tagout: A Matter of Control," Occupational Hazards, December 1996, pp. 27-29.

Tags are used both as stand-alone tagout devices and along with locks, to identify the person who placed the lock in position. Pre-printed tags feature assorted legends and provide space for employees to enter their names and other details (for example, the reason for placing the tag or the time the tag was attached). Photo identification is sometimes used to supplement tagging systems. In one system a passport-size photograph of the employee attaches directly to the tag, while in another, the employee inserts his or her photograph into a self-adhesive-backed plastic sleeve, which then wraps around the body of the lock.[6]

NEW TECHNOLOGIES FACILITATING COMPLIANCE WITH THE STANDARD

The literature review performed by OSHA and comments to Docket S-012B indicate that employers affected by the standard have increased their use of advanced manufacturing technologies and equipment since the promulgation of the standard in 1989 [Exs. 5, 2-13]. For example, the number of industrial robots installed in factories in the United States has grown from 17,000 units in 1986 to 66,000 units in 1995.[7,8] This growth in the use of complex machinery has increased the potential for exposure to hazards related to service and maintenance of that machinery. Use of complex machinery has also created new operational challenges for employers, such as the need to ensure that robots and other computer-controlled machines can be locked out without creating unacceptable production delays when computer programs must be reloaded.[9,10]

Over the same period, machine guarding technologies such as optoelectronic safety devices and safety interlock switches have improved in ways that can help to reduce the hazards of maintenance work.[11] The increasing use of predictive maintenance techniques throughout the

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[6] John Rekus, "Locked Out for Entry," Occupational Health and Safety, September 1994, pp. 37-40, 65.

[7] James W. Collins, "Hazard Prevention in Automated Factories," Robotics Engineering, July 1986.

[8] "Robotics Industry Confronts U.S.: Technology Leader or Follower?," New Technology Week, August 18, 1997.

[9] Jim Howe, UAW, presentation at OSHA's public meeting on review of the Control of Hazardous Energy Sources (Lockout/Tagout) Standard, June 30, 1997.

[10] Robert J. Sutay, "Ergonomics & Safety: Basics of Lockout/Tagout," Material Handling Engineering, December 1996, p. 26.

[11] As noted earlier, the Lockout/Tagout Standard currently requires the use of energy isolating devices and prohibits the use of control circuits as energy isolating devices. However, interlocks can help provide an additional measure of protection for employees servicing or maintaining machines or equipment.

manufacturing sector is another recent development helping to reduce worker exposure by eliminating unnecessary maintenance and repair work. Finally, computer software has become available to manage complex lockout/tagout programs. These new techniques and technologies can help employers to reduce their compliance burdens and improve workplace safety while offering opportunities to increase productivity and realize cost savings.

Advances in Machine Guarding Technology

New developments in machine guarding technology have improved operator safety during production operations while simultaneously providing additional protection for workers performing servicing and maintenance operations. A literature review conducted by OSHA indicated that the most relevant recent developments in machine guarding technology have been in the areas of optoelectronic safety device technology and safety interlock switch technology. While OSHA does not consider reliance on these engineering control measures to be a substitute for the use of lockout/tagout procedures, these controls can still play a role in protecting workers from exposure to uncontrolled hazardous energy.

Optoelectronic Safety Devices (Safety Light Curtains and Grids)

Optoelectronic safety devices provide continuous worker protection in hazardous zones around machinery or equipment. These devices are available for use as point of operation machine guards and for area, perimeter, and entry and exit safeguarding. They offer improved safety for workers who perform testing or positioning operations while machines or equipment are energized (as permitted by paragraph (f) of the Lockout/Tagout Standard). Optoelectronic point of operation guards are typically referred to as safety light curtains. Optoelectronic perimeter and area guards are sometimes referred to as safety light grids.

An optoelectronic safety device typically consists of a transmitter which is an array of infrared light emitting diodes, a receiver which is an array of phototransistors, a control box, and interconnecting cables. The transmitter creates a field of synchronized, parallel, infrared light beams that are normally received by the matching phototransistor array. When an opaque object interrupts the beams, a computerized controller sends a stop signal to the guarded machine. New technologies have reduced the size of infrared transmitters and receivers, allowing optoelectronic controls to be used to guard machines previously considered too small to be effectively guarded by these devices.[12] Improvements have also been made in the control reliability of these devices because of the issuance of international standards requiring manufacturers to use Failure Mode and Effects Analysis (FMEA) testing procedures on the component circuits.[13]

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[12] Daniel S. Levine, "Shedding Light on Workplace Injuries: Scientific Technologies Brighten Bottom Line With Safety Devices," San Francisco Business Times, November 1, 1996.

[13] Robert H. Garwood, Banner White Paper, "Control Reliability: How Safe is Your Safety Light Screen System," Banner Engineering Corporation, 1996.

Safety light curtains typically have resolutions between 14 mm (finger resolution) and 40 mm (arm resolution).[14] These devices are designed to reliably detect the entry of operator body parts into machine points of operation and are commonly used on hydraulic and pneumatic power presses, molding presses, and automated production equipment.[15, 16] Whenever the protective field is interrupted, hazardous machine motion is signaled to stop. Point of operation guards typically reset machines to operate automatically after the object that triggered the stoppage is removed. Use of safety light curtains thus permits unrestricted worker access, making material placement and work piece removal possible at all times. This allows for ergonomic improvements and reduction in manufacturing costs.

Safety light grids typically have resolutions from 50 mm to 116 mm.[17] These perimeter and area guarding devices are designed to detect human entry into guarded areas. These devices typically require a manual reset to permit machines to restart after the interrupting object is removed. However, since hazardous areas come in all kinds of irregular shapes and sizes, the grids can also be configured to allow the continuing presence of equipment or objects that must travel through or remain within the area scanned by the device. Safety light grids can be used horizontally to create a sensing field in front of machines and also in vertical positions to detect entry into a particular area. Safety light grids employing mirrors can be used to guard up to 4 sides of large danger areas such as punching or laser cutting machines.[18]

Safety Interlock Switches

The use of safety interlock switches, while not sufficient for compliance with the Lockout/Tagout Standard, can help to achieve the goals of the standard by serving as an extra layer of protection against inadvertent operation of machinery or equipment during maintenance operations. In addition, employers can use interlocks along with additional protective measures to meet the minor servicing exemption in paragraph (a)(2)(ii)(B) of the Lockout/Tagout Standard.

Paragraph (d)(5) of the Lockout/Tagout Standard requires that, following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy must be relieved, disconnected, restrained, and otherwise rendered safe. The use

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[14] Heinz Schreyer, "Modern Safety Light Curtains and Light Grids—EU Approved Technology for Most Applications," Welding Review International, November 1, 1997.

[15] 29 CFR 1910.217 prohibits the use of presence-sensing-device initiating tripping mechanisms on mechanical power presses.

[16] Banner Engineering Corporation, Machine Safety Products Catalog, 1997-98.

[17] Schreyer, 1997.

[18] Ibid.

of safety interlock switches can enhance conventional lockout/tagout procedures since, in some situations, even after electrical power has been locked out, harmful amounts of residual energy may remain.[19] Examples of sources of such residual energy include free-running rotating machine parts or hot thermal surfaces.[20] These switches protect workers during the deenergization process by preventing the opening or removal of machine guards while machines are still in an unsafe state. Safety interlock switches can also protect workers who perform testing or positioning operations while machines or equipment are energized (as permitted by paragraph (f) of the Lockout/Tagout Standard).

Safety interlock switches can be attached to machine guards such as access doors, protective grating, equipment hoods and covers, and work-area barriers. Safety interlock switches are used in a wide variety of machines and equipment such as metal-cutting tools, metal-forming machines, packaging machinery, woodworking equipment, textile manufacturing equipment, bending brakes, stamping presses, grinding/crushing equipment, printing equipment, automatic assembly machinery, plastic molding machines, mixing machinery, power saws, and robot work cells.[21] Some common types of safety interlock switches used in industry include:[22, 23]

- Single-Piece Limit Switches. These switches are used for sliding and lift-off guard designs.
- Single-Piece Hinge Switches. These switches are used on hinged access doors and barrier gates.
- Key-Actuated Interlock Switches. These switches are used for all types of movable guards. This new type of switch features a built-in key attached to a gate or access door and a mating lock attached to the machine being guarded.

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[19] An interlock is an electromechanical device for preventing one mechanism from operating when another mechanism is in such a position that the two operating simultaneously might produce undesirable results.

[20] Burkhart Seim and William B. Beutler, "Ancillary Safety Interlocks Enhance Conventional Lockout/Tagout Procedures," Occupational Health and Safety, October 1993, pp. 47-50.

[21] Seim and Beutler, 1993.

[22] Don Miller, "Protect the Worker, Protect Yourself," Machine Design, April 17, 1997, pp. 86-88.

[23] Andrei Moldoveanu, "Key to Safety? Systems Approach to Safety Interlocking," Automation, September 1991, pp. 28-30.

- Solenoid-Latching Key-Actuated Switches. These switches are used to limit access to a hazardous area until safe conditions exist. This type of switch consists of an electrically-latched actuator key attached to the machine guard and a mating lock consisting of an electrical interlock mechanism containing positive-opening contacts. Power to the latch must be removed to allow the guard to be opened.

- Emergency Stop Push Buttons. New versions of this type of control switch feature positive-opening contacts and latching with no teasing.

- Cable-Pull Limit Switches. This type of switch enables the user to shut down production operations by pulling a cable. This type of switch is typically used on conveyor lines.

Safety interlock switches are typically designed to be locked out with a padlock. This feature prevents inadvertent restoration of power to the machine by keeping the machine guard padlocked in place. Thus, these devices can also provide an additional layer of lockout protection in addition to their machine guarding capabilities.

Modern safety interlock switch designs are more tamper resistant than older versions and now typically incorporate positive-opening (fail-safe) electrical contacts. Positive-opening contacts were pioneered in the 1960's and are required by European machine safety standards.[24] Positive-opening contacts are designed always to open under specified actuation conditions (for example, travel or force) even if contacts have been welded due to a short circuit or the internal springs have broken.

One of the most recent developments in safety interlock design is the key-actuated interlock switch. This type of switch incorporates a built-in key that is attached to the machine guard with tamper-proof screws. The switch prevents the machine from operating unless the guard is in the proper position with the key inserted. Design improvements have also recently been made to cable-pull limit switches. New versions of these switches actuate not only when the cable is pulled but also if the cable is cut, the anchor dislodged, or the tension-adjustment turnbuckle changed out of specification.[25]

Advances have also been made in the design of the latches used in machine guard interlocks. For example, electromagnets can be used to trigger unlatching when specified environmental conditions are met. A motion detector can be used to detect when the speed of an inertial mechanism (for example, a rotating saw blade) is below a certain threshold and therefore permit the latch to be opened by an operator only after a safe condition has been achieved. These

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[24] Moldoveanu, 1991.

[25] Ibid.

latches can be triggered from either local or remote locations. Remote latching helps to prevent unsafe operator work practices.[26]

Use of Predictive Maintenance Techniques and Technologies

The increased use of predictive maintenance techniques and technologies in the manufacturing industry may provide worker safety benefits in addition to significant cost savings. Manufacturers have found that the use of predictive management techniques can help to prevent catastrophic equipment failures, reduce equipment downtime, and increase productivity by allowing maintenance work to be scheduled for off-peak production periods. Companies that use predictive maintenance techniques typically use relatively low-cost, high-tech inspection equipment to perform infrared imaging, vibration analysis, fluid analysis, ultrasound testing, and electrical testing.[27] Computerized maintenance management systems (CMMSs) are other tools that can be used to accomplish predictive maintenance tasks by storing maintenance information and machine repair histories. To the extent that the use of these techniques and technologies helps to avoid unnecessary servicing and maintenance operations, they also help to reduce lockout/tagout hazards to employees. Employers using these techniques can realize a corresponding reduction in the burden of complying with the Lockout/Tagout Standard.

Infrared Imaging

Infrared imaging (also known as thermography) uses infrared cameras to detect equipment problems associated with over-temperature or under-temperature. An infrared survey can be conducted with the tested equipment in normal operation, thus avoiding equipment downtime. In 1993, the cost of these instruments ranged from $11,000 to $60,000 per unit, depending on the sophistication of the model. These cameras can be used to help ensure proper heat distribution in process equipment and systems during production as well as to perform predictive maintenance on electric equipment, mechanical equipment, and steam and other fluid systems.[28] For example, at U.S. Steel's Clairton plant, an infrared camera was used to monitor circuit breakers protecting circuits throughout the mill. The infrared equipment identified hot spots that would indicate a loose or corroded connection or an overloaded circuit. This permitted circuit breakers to be replaced before failures interrupted the power supply to production

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[26] Ibid.

[27] John Schriefer, "Smarter Planning, Fewer Emergencies," New Steel, May 1995, pp. 50-53.

[28] Ed Palko, "Thermography Instruments for Predictive Maintenance," Plant Engineering, August 12, 1993.

operations. Use of one such camera, priced at $40,000, saved $150,000 during its first year of use at one of the twelve coke batteries at the Clairton plant.[29]

Vibration Analysis

Vibration analysis helps to identify machine parts that need maintenance or replacement and can help to identify the causes of excess wear.[30] In vibration testing, a small accelerometer is placed at fixed points on the machinery to take horizontal and vertical vibration readings. A computer analyzes the readings by comparing them with the baseline vibration measurements for the equipment. Reports are then generated for review by maintenance staff. Although the basic vibration analysis is done by the computer and relevant software, employees still need to do a skilled interpretation of the information to determine what is causing the problem. Restoring a machine to its proper alignment typically reduces wear and improves product quality.

Vibration analysis can also be used to check the work of equipment installers and repairmen since improper installations and faulty repair work can often be detected by analyzing machine alignment.

Fluid Analysis

Solid particulate contamination originating from sources such as new components, system assembly, new or make-up fluid, and maintenance work is responsible for approximately 70 to 80 percent of hydraulic system breakdowns.[31] Because fluid contamination can significantly affect system cost and performance, establishing specifications for fluid cleanliness levels in process systems and maintaining fluids at that level of cleanliness is critical. Fluid analysis (also known as tribology) involves regularly examining the fluid quality in process systems to determine when oil and hydraulic fluids should be changed. Manufacturers of lubrication oil and hydraulic fluid products often provide these services at no cost or low cost to their customers.[32]

Operating a system on clean fluid greatly decreases the possibility of catastrophic failure of pumps or valves. Fluid analysis can also help to detect excess wear and tear on other important system components, permitting scheduling of repairs and preventing unnecessary

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[29] Schriefer, 1995.

[30] Ibid.

[31] "Fluid Monitoring Reduces Operating Costs," Machine Design, July 10, 1997, Vol. 69, No. 13.

[32] Cate Jones, "Turbines, Engines, and Generators: More to Lube-Oil Services Than Meets the Eye," Power Magazine, August 1, 1997, Vol. 141. No. 4.

machine downtime. The effective fluid contamination control ensured by regular inspections can also enable fluids to be used for longer periods of time, resulting in cost savings from avoiding unnecessary fluid replacement and disposal costs. Effective contamination control can extend oil life by as much as four to six times.[33]

Computerized Maintenance Management Systems

The growing use of computerized maintenance management systems (CMMS) is another development related to the increasing use of predictive maintenance techniques. In 1993, the market for CMMS software was estimated to be worth $288 million and was projected to grow at an annual rate of 9 percent through 1998.[34] These software packages are capable of storing and displaying helpful maintenance information such as OEM drawings, maintenance histories, repair instructions, and lockout procedures.

CMMS software packages vary in features and complexity. Simpler, less expensive software packages can create work orders, store and track maintenance histories on specific pieces of equipment, and schedule maintenance tasks to be done. More complex packages have features such as repair trend analysis and maintenance cost tracking. The use of CMMS software to manage equipment maintenance programs helps to minimize downtime and unscheduled maintenance, which may cost as much as ten times the cost of scheduled maintenance. One manufacturer of CMMS software claims that good asset management practices (of the type fostered by use of CMMS systems) can reduce machinery repair costs and breakdown frequency by 50 percent while raising both maintenance and production worker productivity.[35]

Computer Software Specifically Designed to Manage Lockout/Tagout Programs

Computers are an important audit tool that can help employers to comply with the Lockout/Tagout Standard. In addition to the general CMMS programs described above, there are also commercial software programs available to make compliance with the Lockout/Tagout Standard easier. These programs can perform a variety of administrative functions, including providing information to identify the person who has tagged a specific piece of machinery in a plant, identifying when the tagging was done, and also notifying safety managers which

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[33] David C. Downs, "Clean Hydraulics Cuts Downtime," Machine Design, December 14, 1995.

[34] Nicholas Basta, "Maintenance Management Goes Multimedia," Chemical Engineering, August 1994, pp. 151-152.

[35] Ibid.

machines have been set for maintenance but have not been locked out. Two examples of such software are the "Taglink™" and "Gescade" software packages.[36]

Taglink™, a software program first introduced on U.S. Navy ships and in naval shipyards, is one of the new breed of lockout/tagout software programs. According to the software manufacturer's vice president, this program saved the Navy $6.5 million in direct costs and reduced the time required to complete a tagout by 70 percent. The improved administration provided by the program also reportedly helped the Navy to improve its average rate of one serious tagout-related accident per six million hours to thirty-two million hours without a single serious accident.[37,38] The Taglink™ software is most adaptable to commercial navy yards, nuclear power plants, chemical plants, refineries, and manufacturing firms. This program can be installed either at single stations or on a local area network. The Taglink™ sales brochure indicates that the software has the following features:

- The program stores all entered lockout/tagout, tag, and component information.
- It performs searches by lock, tag, work control document, or component while providing multiple levels of access and maintaining historical records.
- It creates lockout/tagout templates.
- It associates multiple lockout/tagouts and multiple work permits.
- It prints "Danger" and "Caution" tag labels, tag record sheets, templates, and search results.
- It audits by division, prefix, space location, log serial number, or component.

The manufacturer claims that Taglink™ meets OSHA's lockout/tagout documentation and safety requirements, reduces lockout/tagout audit requirements, automatically generates lockout/tagouts for recurring work, and integrates maintenance requests with lockout/tagouts while reducing time spent in generation of lockout/tagouts and improving accuracy and safety. The basic Taglink™ software costs $2,495.

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[36] Discussion of specific manufacturers is for illustrative purposes only and should not be construed as OSHA endorsement of a specific product.

[37] A vice president of Stilwell & Associates, manufacturer of Taglink™.

[38] Jerry Laws, "Is Lockout/Tagout Software the Next Big Thing?" Occupational Health and Safety, October 1996, p. 77.

Another lockout/tagout software program, Gescade, offers computerized safety lockout and centralized database management. It allows control of data through use of several security levels. According to the manufacturer, Le GROUPE ID, the other features of the software are:[39]

- Updating of padlock listing and application of the padlock (keys, owners, location, etc.);
- Tracking of lost or defective padlocks;
- Cost management;
- Assuring availability of all necessary information required for lockout, such as special instructions, numbers of padlocks, specialized manpower, start-up verification, etc.;
- Assignment of roles and responsibilities relative to safety lockout;
- Reducing lost production time and eliminating communication gaps;
- Facilitating use of lockout instructions and association of lockout instructions with specific pieces of equipment; and
- Ensuring identification of the means for isolation of power sources and providing automatic updating related to changes made in the plant.

In addition to computerized lockout/tagout program management software, OSHA also found evidence indicating that many companies are using computer-based safety training on lockout/tagout principles to help workers understand the safety hazards associated with the release of hazardous energy. A number of lockout/tagout training packages are available for use on personal computers.[40] One training company has even reported plans to distribute lockout/tagout training courses over the Internet.[41]

CHANGES IN ECONOMIC CONDITIONS

In 1989, OSHA concluded that the Lockout/Tagout Standard was economically feasible for all affected industries. As part of this review, OSHA reviewed basic sources of information

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[39] Arkon Inc., "Safety Lockout - Software," safety equipment brochure, 1997.

[40] "Molder Creates Software on OSHA Rules," Plastics News, May 13, 1996.

[41] Bill Pietrucha, "Safety and Health Training Courses Available on Web," Newsbytes News Network, November 6, 1997.

on the current costs of complying with the standard and examined whether there had been any significant adverse economic impacts on affected small businesses as a result of the standard's promulgation.

The only cost estimate submitted to Docket S-012B that estimated the current total cost of complying with the standard suggests that the Agency's original cost estimates were reasonable. The law firm of Keller and Heckman states that "Based on our assessment of the requirements of the standard...our best guess is that the annual cost of compliance with the standard continues to exceed 100 million dollars" [Ex. 2-19]. In comparison, OSHA estimated in 1989 in the Regulatory Impact Analysis of the Lockout/Tagout Standard that the annual recurring cost of the standard would be $135.4 million [FR Vol. 54, No. 169, 9/1/89, p. 36634]. Dow was the only other commenter to provide quantified compliance cost estimates and these estimates were only calculated for a portion of Dow's compliance-related expenditures [Ex. 2-6]. No evidence was presented to OSHA suggesting that changed economic conditions warranted any modification to the Lockout/Tagout Standard. OSHA's literature review also failed to produce evidence of changes in economic conditions that would have increased the impacts of the final Lockout/Tagout Standard on small entities during the post-promulgation period.

Costs of Lockout/Tagout Devices and Other Compliance Materials

The most commonly used lockout/tagout devices were relatively inexpensive in 1989 and remain so today. Table V-1 gives current prices for a number of commonly used lockout/tagout products. Quotes from representatives of lockout/tagout product supply companies found in several articles in the literature indicate that the promulgation of the Lockout/Tagout Standard did lead to a noticeable increase in the availability and sales of these traditional lockout/tagout devices as well as other compliance aids such as signs, labels, and training videos.[42, 43] Lockout systems were also cited in one trade magazine article as a product line that could help distributors to expand overall sales of products and value-added consultation services.[44]

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[42] Michael J. Major, "Industry and OSHA Face Roadblocks in Way of Lockout/Tagout Compliance," Occupational Health and Safety, July 1992, Vol. 81, No. 7, pp. 18-28.

[43] L. Elliott Oppriecht, "Control Energy," Occupational Health and Safety, Vol. 64, No. 3, March 1995, pp. 40-49.

[44] "Playing It Safe (Extending Safety Product Inventory)," Industrial Distribution, July 1, 1993.

TABLE V-1
PRICES OF COMMONLY USED LOCKOUT/TAGOUT PRODUCTS

Lockout/Tagout Product	Approximate Price Per Set or Unit*
Locks and Padlocks	$14.00-19.00
Tags	$40.00-50.00
Lockouts (metal)	$6.00-8.00
Lockouts (nylon)	$5.00-7.00
Gate Valve Cover Lockouts (plastic)	$10.00-60.00
Ball Valve Lockouts (plastic)	$14.00-52.00
Plug Lockouts (plastic)	$9.00-14.00
Butterfly Valve Lockouts (plastic)	$40.00-50.00
Circuit Breaker Lockouts (plastic)	$5.00-10.00
Switch Plate Lockouts (plastic)	$6.00-7.00
Lockout Labeling	$10.00-30.00
Mini Lockout Center (with padlocks & tags)	$170.00
Single Lockout Center (with padlocks, tags & labels)	$320.00
Double Lockout Centers (with padlocks, tags, labels & binder)	$500.00-550.00

Note:

* Price range is based on the total quantity purchased. Products are usually offered in sets of 10, 25, 40 or more; sets are more cost-effective to purchase than individual items.

Sources: Top Tape & Label Ltd. 1996/1997 Catalogue and Lab Safety Supply, Safety & Industrial Supplies, General Catalog, August 1997.

Costs of Upgrading Existing Equipment for Lockout/Tagout Compliance

During this regulatory review, OSHA examined the issue of whether or not affected industries experienced adverse economic impacts as a result of the requirement to upgrade existing equipment during major repair, renovation, or modification of machines or equipment. This issue was an area of some concern during the rulemaking. For example, in the preamble to the Lockout/Tagout Standard, OSHA indicated that the lack of cost information on retrofitting machines and equipment to accept lockout devices was one reason for permitting the use of tagout to comply with the standard [FR Vol. 54, No. 169, 9/1/89, p. 36656]. No public comments were received in Docket S-012B concerning the burdens and costs of overhauling existing machines to be compliant with the standard.

The findings of OSHA's literature review indicate that the upgrading of hydraulic systems to be compliant with the standard was one significant area of employer compliance concerns following the promulgation of the standard.[45, 46, 47, 48] Locking out hydraulic control valves and bleeding and releasing pressure from the systems that feed such equipment was viewed as more complicated than locking out other types of equipment, and apparently it was also less common for hydraulic systems to incorporate designed-in lockout capability prior to the promulgation of the standard.[49, 50, 51] One article published in Occupational Health and Safety in 1993 identified the cost of upgrading hydraulic systems as a concern of affected employers. At that time, hydraulic system lockout devices ranged in price from $900 to $3,000 per machine.[52]

The literature review also produced one article that cited the need to make old machines compliant with the standard as a factor in the decision to purchase new equipment rather than upgrade. In an article published in Tooling and Production in 1994, the president of a press manufacturing company stated that the cost of bringing older mechanical presses into compliance

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[45] Richard Schneider, "Isolation Valves Work With Central Hydraulic Systems," Hydraulics & Pneumatics, February 1, 1991.

[46] Major, 1992.

[47] Read, 1995.

[48] James E. Roughton, "Lockout/Tagout: Is Your Plant in Compliance?" Plant Engineering, April 1996, pp. 88-92.

[49] Schneider, 1991.

[50] Roughton, 1996.

[51] Major, 1992.

[52] Ibid.

with OSHA regulations and the increase in use of just-in-time manufacturing operations were both factors in stimulating demand for new hydraulic presses.[53] However, OSHA found little evidence to suggest that companies have faced any undue cost burdens associated with upgrading overhauled equipment to comply with the Lockout/Tagout Standard.

SUMMARY

OSHA concludes that there have been no technological or economic changes that have increased the impacts of the standard on small businesses or that require the standard to be modified to make it more effective or less burdensome, or to bring it into better alignment with the President's priorities. This review did find that recent technological developments have led to more effective and economical ways of preventing hazardous energy incidents.

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[53] Paul C. Miller, "Hydraulic Presses: Where's the Advantage?," Tooling and Production, Vol. 60, No. 6, September 1, 1994.

CHAPTER VI
CONCLUSIONS

FINDINGS

OSHA has completed its review of the Lockout/Tagout Standard (29 CFR 1910.147) in accordance with the requirements of Section 610 of the Regulatory Flexibility Act and Section 5 of Executive Order 12866. The Agency concludes that the rule should be continued without change and does not need to be rescinded or amended to minimize significant impacts on a substantial number of small entities. OSHA also finds that the Lockout/Tagout Standard is necessary to protect employee safety and health, is compatible with other OSHA standards, is not duplicative or in conflict with other Federal, State, or local government rules, is not inappropriately burdensome, and is consistent with the President's priorities and the principles of EO 12866. In addition, information gathered during this regulatory review supports OSHA's original findings concerning the economic and technological feasibility of the Lockout/Tagout Standard and demonstrates that the standard has been effective in reducing fatalities and injuries. Specifically, OSHA finds that: (1) there is a continued need for the standard; (2) OSHA can best address the specific complaints and comments raised about the standard and its complexity by providing additional compliance assistance; (3) no changes have occurred in technological, economic, or other factors that would warrant a reopening of the Lockout/Tagout rulemaking.

OSHA'S RESPONSES TO CONCERNS RAISED BY STAKEHOLDERS

Although not required by this regulatory review to do so, OSHA has decided, after reviewing all of the comments received from stakeholders, to explain its reasons for accepting or rejecting the suggestions and recommendations made in the course of the review process. This section discusses the Agency's reasoning; comments are grouped under the topics to which they apply.

SMALL BUSINESS IMPACTS

No comments received by OSHA (Docket S012-B) suggest that the standard has had a significant economic impact on a substantial number of small entities. However, representatives of small business did indicate that some small businesses have difficulty complying with the standard and also find some requirements burdensome. These comments focus more on the complexity of the standard and the need for additional compliance assistance than on the need for modifying the standard itself. The most common problems that small employers appear to experience are: (1) complying with the requirement to develop, document, and use lockout/tagout procedures, and (2) understanding how the compliance requirements of the standard apply to their specific industries and work sites. These were also the issues of concern to OSHA compliance officials and OSHA State-plan state staff who were asked about their experience with the standard.

Findings Concerning Specific Public Comments and Complaints

Control of Hazardous Energy in the Process Industries

Representatives of both large and small businesses in the process industries indicated continued concern about complying with a number of the standard's requirements and about the regulatory burden of the standard. For example, the CMA, API, and Dow indicated that if the standard were to be reopened, they would recommend modifications to numerous provisions [Exs. 2-5, 2-6, 2-20]. Many of the issues raised in the API and CMA comments had been raised by the same commenters during the 1989 rulemaking and subsequent litigation. Negotiations between OSHA and the parties to the lawsuit resulted in the development of a compliance directive that was deemed by litigants to be responsive to many of the needs expressed by the process industries during the rulemaking process [Exs. 2-5, 2-20].

Comments indicate that employers in the process industries are currently using the guidance provided in Compliance Directive STD 1-7.3 to comply with the standard. Despite the comments made by the API, CMA, and Dow about the "framework" provided by the Compliance Directive, the API, CMA and SOCMA indicated that the Compliance Directive is of value to their members and should be more widely available to small and large businesses that are regulated by the standard [Exs. 2-5, 2-6, 2-7, 2-20]. In fact, the API, CMA, SOCMA, and ORC recommended that Appendix C of the Compliance Directive be added as a non-mandatory appendix to §1910.147 [Exs. 2-5, 2-7, 2-20, 2-25]. The API and CMA also requested that a paragraph concerning pipelines be added to the Appendix C guidance. The SOCMA also recommended that other key OSHA guidance documents as well as sample protocols prepared by SOCMA members be considered for inclusion as non-mandatory appendices [Ex. 2-7].

In response to these comments, OSHA has decided not to add Appendix C to the standard as a non-mandatory appendix. Although representatives of both large and small businesses testified to its usefulness, the Agency believes that it can disseminate the information in the compliance directive more quickly and more effectively using other methods. First, as noted earlier, the directive is available on the Internet (http://www.osha-slc.gov/OshDoc/Directive_data/STD_1-7_3.html), which is widely available to many employers. The Agency has included the compliance directive with OSHA-developed lockout-tagout materials on the Agency's Home Page. Second, OSHA will include the information in the directive in the compliance assistance materials it is developing in response to this Lookback review. In addition, it is much easier for OSHA to change the directive periodically to incorporate guidance on other compliance issues (such as the pipeline issue raised by API and CMA) as they arise than it would be to revise the rule.

There are several disadvantages associated with revising the Lockout/Tagout Standard to include Appendix C as a non-mandatory appendix. First, as with any rulemaking activity, adding an appendix, even one that is not mandatory, takes time and resources. Additionally, a non-mandatory appendix is more difficult to revise in the future, should the need arise.

The Lockout/Tagout Program Requirement

Several organizations addressed the standard's overall requirement for a lockout/tagout program in their comments [Exs. 2-7, 2-14]. The UAW urged that the program requirement be strengthened [Ex. 5]. The UAW also recommended that the standard should include requirements for task and hazard analyses, feasible design changes and engineering controls, worker participation, and employee access to records and documents relevant to lockout programs [Ex. 5]. The API and CMA disagreed with the UAW's recommendations for adding provisions on task and hazard analysis and engineering controls, however [Exs. 2-5, 2-20]. The SBA also expressed concern about the potential costs of an engineering control requirement of the kind recommended by the UAW [Ex. 2-26].

OSHA has carefully considered the UAW's suggested additions to the standard, because incorporation of any or all of these provisions would require reopening of the record of this rulemaking. After considering the relative priority of such an undertaking in the context of the Agency's other rulemaking priorities,[1] OSHA has decided not to reopen the rule at the present time. OSHA notes that the overwhelming majority of comments received in this regulatory review, both from industry and employee groups, recommended against reopening the record to revise the standard.

The Lockout/Tagout Procedures Requirement

The Lockout/Tagout Standard requires that procedures be "developed, documented, and utilized" for controlling potentially hazardous energy. The comments indicate that some businesses are concerned about this requirement. In general, commenters indicated that more compliance assistance is needed to help businesses comply with the requirements for lockout/tagout procedures and to help them understand the level of detail that must be included in such procedures. According to these commenters, this is especially true of small businesses.

Some commenters were also concerned that OSHA interpretations and enforcement actions may have discouraged employers from using generic procedures [Exs. 2-13C, 2-19, 2-25]. The CMA and API indicated that, if the rule were reopened, they would seek to have the use of generic procedures specifically authorized by the standard [Exs. 2-5, 2-20].

In response, OSHA notes that individual circumstances present at an employer's facility determine the number of separate lockout/tagout procedures that need to be developed. This fact makes it difficult to provide compliance interpretations about the specific number of procedures needed at specific work sites. The choice of whether to use a generic procedure supplemented by checklists or appendices versus a set of machine-specific procedures is an important decision that

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[1] OSHA will be addressing some of the UAW's concerns with respect to employee participation in the upcoming proposed Safety and Health Program rule.

should be made by the employer after careful consideration of the best means of controlling the energy hazards present at a specific work site.

The effectiveness of any given machine-specific lockout/tagout procedure or one generic procedure (supplemented by checklists or appendices) in eliminating hazards is determined, in part, by the employer's attention to significant details during the development of the procedure. In other words, although the development and use of the procedure may, for example, require the preparation of less documentation, its implementation requires an equal amount of employer attention to procedure design considerations and individual workplace circumstances. OSHA's compliance policies with respect to the use of generic versus specific procedures were recently documented in a letter sent by John B. Miles, Jr., former Director of OSHA's Directorate of Compliance Programs, to Lawrence P. Halprin of Keller and Heckman on September 19, 1995 [Ex. 2-13C]. This letter is available to the public on OSHA's World Wide Web site (http://www.osha-slc.gov:80/OshDoc/Interp_data/I19950919.html). The letter contains the following statements of OSHA compliance policy with respect to the use of generic procedures:

> OSHA does agree...that a separate procedure does not have to be developed for each and every machine or piece of equipment and that a comprehensive (generic) energy control procedure with supplemental checklists or appendices may very well address adequately the steps necessary to perform servicing and maintenance safely. Such a procedure would normally be considered one procedure. OSHA believes, however, that there are also situations which require a unique energy control procedure to deal with the servicing and maintenance hazards.
>
> OSHA will carefully examine the energy control procedure of any employer who claims that only one comprehensive procedure is necessary in its workplace to ensure that the single procedure is indeed adequate. While the Agency does not insist on a multiplication of procedures, it does insist that they not become so complex that service and maintenance employees cannot easily follow them. To qualify as one procedure, the supplemental checklists or appendices must support the basic comprehensive (generic) energy control procedures by having the same:
>
> (1) intended uses for different machines or equipment;
>
> (2) procedural steps for shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy;
>
> (3) procedural steps for the placement, removal, and transfer of lockout or tagout devices and the responsibility for them; and
>
> (4) requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures [Ex. 2-13C].

None of the commenters argued that it was unnecessary to document lockout/tagout procedures in writing, although some commenters indicated that the process of creating a set of procedures could be burdensome or detract from a focus on actual safety practices [Exs. 2-9, 5]. On the other hand, the UAW indicated that the process of developing written procedures had produced many benefits in UAW workplaces [Ex. 5].

In addition to reviewing public comments on this requirement, OSHA researched the history of public comments on this requirement in the docket for the paperwork package associated with the Lockout/Tagout Standard. To the best of OSHA's knowledge, no comments have ever been received concerning the paperwork burdens of this provision of the standard. This provision also contains an exemption which permits employers using machines with simple lockout/tagout requirements to be exempted from preparing written documentation as long as safety procedures are carefully observed and no accidents occur. OSHA therefore concludes that no action is necessary at this time with respect to this requirement.

Some commenters asked that OSHA consider simplifying the rules dealing with the periodic review of lockout/tagout procedures. Three commenters (NGFA, Kodak, and ORC) stated that the requirement for annual review was unnecessarily burdensome and that such a requirement would be equally effective and less burdensome if phrased using performance language [Exs. 2-4, 2-21, 2-25]. However, as noted above, OSHA has decided not, at this time, to reopen the record to revise the rule, which the change recommended by this group of commenters would require.

Two commenters, the CMA and Dow, indicated that the requirement in paragraph (c)(6)(ii) for preparing a certification statement documenting annual inspections of lockout was burdensome [Exs. 2-5, 2-6]. On the other hand, the UAW indicated that these records were of sufficient value to warrant the addition of a provision requiring that these certification records be available to workers and their representatives [Ex. 5]. Again, because OSHA will not be reopening the rule at this time, this requirement will remain unchanged.

The Stringency of Tagout Requirements

The CMA, Dow, and the NGFA commented that OSHA should eliminate the specification requirements for the composition of tagout devices and replace them with performance requirements [Exs. 2-5, 2-6, 2-21]. However, OSHA does not agree with this recommendation. The standard's provision does state the requirements for tagout devices in performance terms. The performance requirements given in the standard are designed to ensure that tagout systems are as effective as lockout systems. OSHA's decision to place additional requirements for tagout to ensure that it would be as effective in protecting employees as lockout was one of the fundamental safety principles expressed in the standard.

The other area of concern to commenters regarding the use of tagout systems was the preamble language on annual training for employees performing tagout. This language, which was published in the preamble to the final rule in 1989, reads as follows: "In addressing this

limitation [i.e., the use of tagout], OSHA is requiring additional training for employees who work with tagout or who work in areas in which tagout is used. Such training must be provided on at least an annual basis" [FR Vol. 54, No. 169, 9/1/89, p. 36669]. Both the CMA and Dow expressed concern about the implications of this preamble statement [Exs. 2-5, 2-6]. As Dow indicated in its comments, this language is not contained in either the standard itself or the compliance directive [Ex. 2-6].

OSHA is grateful to the commenters who pointed out this inconsistency and takes this opportunity to state that the preamble statement is in error; the revised compliance directive resulting from this review will make this change explicit. In addition, the Integrated Preamble has corrected this error and the complete corrected preamble can be accessed at http://www.osha-slc.gov/dts/osta/lototraining/preamble/pre-147com.htm

Expansion of Coverage to Additional Industries

A number of commenters (DuPont, the NFPA, IBEW, and USWA) asked OSHA to expand the protections of the standard to workers in industries not currently covered under the scope of §1910.147 [Exs. 2-1, 2-3, 2-8, 2-10]. Examples of such industries included the construction, agriculture, maritime, and oil and gas drilling and servicing industries [Ex. 2-10]. Several commenters (DuPont, the NFPA, and the IBEW) specifically recommended that the construction industry be covered by a comprehensive program standard [Exs. 2-1, 2-3, 2-8]. The CMA and API expressed concern about the potential for conflicts between separate general industry and construction standards [Exs. 2-5, 2-20].

OSHA is aware of the need for a comprehensive lockout/tagout standard in the construction industry. However, as indicated in the preamble to the final rule, OSHA believes that the special needs of the construction industry warrant a separate standard [FR Vol. 54, No. 169, 9/1/89, p. 36657]. Although OSHA believes that DuPont and the IBEW are correct in stating that servicing and maintenance workers employed in the construction industry are often exposed to hazards identical to those faced by workers covered under the general industry lockout/tagout standard, this is not true of all or even most construction industry processes [Exs. 2-1, 2-8]. In 1989, in the preamble to the final rule, OSHA identified the difficulty of providing adequate training to a transient work force and the uniqueness of certain types of construction industry equipment (for example, earthmoving equipment) as examples of the special conditions present in the construction industry [FR Vol. 54, No. 169, 9/1/89, p. 36657].

OSHA has already begun to develop a separate proposal for a comprehensive construction lockout/tagout standard. This standard will address the unique nature of the construction industry, its workforce, and working conditions. The plan and schedule for developing this standard have been published in the Regulatory Agenda. OSHA encourages those commenters who participated in this regulatory review of the Lockout/Tagout Standard to participate actively in the rulemaking process for the upcoming construction industry standard addressing lockout/tagout in that industry.

Exemption Provisions of the Standard

Some commenters provided feedback about the utility of the minor servicing exemption and the exclusive control exemptions found in the application portion of paragraph (a) of §1910.147. Keller and Heckman commented on issues concerning the minor servicing exemption [Ex. 2-19], and the IPC and CMA requested expansion of the exclusive control exemption to other types of equipment to relieve employers' regulatory burden [Exs. 2-2, 2-5].

Keller and Heckman commented on the limited and allegedly "restrictive" guidance that OSHA has made publicly available concerning the use and limits of the minor servicing exemption. A review of OSHA interpretations shows that the minor servicing exemption has been a topic of interest to employers, particularly those in the printing industry.[2] Input from OSHA compliance officials indicates that they also believe that having more official guidance on this topic would be useful. OSHA has therefore determined that providing additional guidance on activities covered under this exemption would be a helpful form of compliance assistance, and the Agency plans to develop such guidance.[3]

The CMA and IPC asked OSHA to expand a provision exempting work on cord-and-plug-connected electric equipment to cover other types of equipment under the exclusive control of the person performing the servicing or maintenance. At this time, OSHA believes that such an expansion, which would require reopening the record to revise the rule, is not warranted. However, OSHA notes that the 1997 OSHA Review Commission decision in Top Markets, Inc. v. Secretary of Labor provides additional guidance on the cord-and-plug exemption. OSHRC Docket No.94-2527 (03/03/1997)

Alternatives to the Standard

A number of participants provided comments identifying potential alternatives to the rule or portions of the rule. For example, the ASSE indicated that some of its members felt that the forthcoming OSHA Safety and Health Program rule could be drafted to incorporate a lockout

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[2]Letter from John B. Miles, Jr., Director, OSHA Directorate of Compliance Programs, to Mr. Neil Wasser of Constangy, Brooks, and Smith dated 6/20/96; Letter from Raymond E. Donnelly, Director, OSHA Office of General Industry Compliance Assistance to Mr. Regis J. Delmontagne, President, The Association for Suppliers of Printing and Publishing Technologies, dated 11/15/93; Memorandum from Roger A. Clark, Director, OSHA Directorate of Compliance Programs to OSHA Regional Administrators dated 6/14/93; and Letter from Patricia Clark, Director, Directorate of Compliance Programs to John Runyan, Director of Political Affairs, Printing Industries of America, dated 5/17/93.

[3]Additional clarifications on the minor servicing exception, §1910.147(a)(2)(ii), was provided in a memorandum from Richard E. Fairfax, Director, OSHA Directorate of Compliance Programs, to Michael Connor, OSHA Regional Administrator, dated 10/5/99.

program component [Ex. 2-14]. The CMA and API both commented that they continue to feel that the work authorization systems used by their members prior to the promulgation of §1910.147 were a less burdensome and more effective means of eliminating lockout/tagout hazards, although no data demonstrating this point were provided [Exs. 2-5, 2-20]. The ASSE, DuPont, IBEW, and NFPA suggested that OSHA incorporate a number of consensus standards by reference in the text of §1910.147 [Exs. 2-1, 2-3, 2-8, 2-14]. Other commenters, namely the CMA, API, and SBA, expressed concerns about several specific and general issues associated with the proposals to incorporate such references into §1910.147 [Exs. 2-5, 2-20, 2-26].

Control of hazardous electrical energy was one area in which an industry consensus standard was proposed as an alternative to a provision of §1910.147. DuPont, the IBEW, and the NFPA recommended that OSHA reference the consensus standard NFPA 70E within §1910.147 instead of continuing to reference Subpart S of 29 CFR 1910 [Exs. 2-1, 2-8, 2-3]. Similarly, the SPI suggested that national and international machine-specific consensus standards such as ANSI standards could serve as an alternative to some of the compliance requirements of the Lockout/Tagout Standard. SPI indicated that the ability to use such standards to determine compliance responsibilities could eliminate the "uncertainties associated with the current general language" of the Lockout/Tagout Standard and asked OSHA "to recognize compliance with machine-specific consensus standards as equivalent compliance with the applicable portions of the LOTO rule" [Ex. 2-12]. However, these changes, like most others suggested, would require OSHA to reopen the rule, which the Agency has concluded would not be appropriate at this time. When Subpart S, the Electrical Safety Work Practices standard, is revised in the future, OSHA will consider the issue of referencing NFPA 70E in that standard.

Compliance Policy Issues

A number of commenters expressed concern about issues related to OSHA's compliance policies with regard to the standard. For example, some commenters stated that the standard has not been enforced in a consistent way, that some of OSHA's interpretations of the standard's requirements may be overboard or unjustified, that performance requirements have been converted into specification requirements over time, and that compliance personnel have used their knowledge of best industry practices to raise the standards for acceptable compliance practices at other facilities [Exs. 2-11, 2-19, 2-26]. These participants also commented on the concept of "unexpected energization" and the role of the compliance directive in compliance policy. In addition, NADA requested that OSHA give special consideration to compliance policy issues involving the vehicle repair industry.

The law firm of Keller and Heckman submitted comments conjecturing about ways in which the term "unexpected energization" might be interpreted by OSHA following the issuance of a 1996 court decision in an enforcement case [Secretary v. General Motors Corporation, Delco Chassis Division, 89 F.3d 313 (6th Cir. 1996)]. This case addressed the relatively uncommon situation of an employer's use of a multi-step start-up procedure, time delays, and audible

warnings to enable employees to avoid injury even when the machine was started during the middle of a servicing procedure.[4]

In response to Keller and Heckman's comments, OSHA notes that it has already publicized its compliance policies for situations similar to those present in the GM case. An October 30, 1996 memorandum from John B. Miles, Jr., Director of OSHA's Directorate of Compliance Programs, and sent to all OSHA Regional Administrators, contains specific guidance to Regional Administrators and field staff regarding changes in the enforcement of the Lockout/Tagout Standard following the decision in the GM case. This guidance letter is available to the public via OSHA's World Wide Web site (http://www.osha-slc.gov:80 /OshDoc /Interp_data/I19961030.html).

In the Miles memorandum of October 30, 1996, OSHA indicates that "citations should not be issued under circumstances comparable to GM." However, OSHA has concluded that in most workplaces where the Lockout/Tagout Standard applies, the decision will have no effect on compliance because the facts will be dissimilar. The Miles memorandum indicates that OSHA compliance officers (CSHOs) must evaluate and document the adequacy and reliability of the safety features in question in circumstances where (1) an employer claims that it falls under the GM decision, or (2) the CSHO determines that an employer is relying on safety features in lieu of lockout tagout procedures. In the case of accident inspections, CSHOs are also required to document the type of failure that led to the accident. CSHOs are given the following factors to use as a guide to assess employer compliance with the Lockout/Tagout Standard:

- the particular configuration and operation of the equipment;
- the nature of the servicing operations which put employees at risk;
- the ability of the servicing employees to move quickly out of the way of hazardous machine movement if other employees prematurely started the equipment;
- the ease of operating the machine's safety devices and whether the safety features could easily be circumvented by employees;
- the reliability of the safety features, including whether mechanical failure can defeat their function;
- the adequacy of the instructions that are provided to employees regarding the safety features; and

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[4]Memorandum from John B. Miles, Jr., Director, OSHA Directorate of Compliance Programs, to OSHA Regional Administrators, dated 10/30/96.

- OSHA has developed an interactive LOTO Training Program, which can be accessed at

- facts peculiar to individual situations which might have an effect on the adequacy or reliability of the safety features.

OSHA believes that the information provided in this memorandum provides a sufficient statement of OSHA's compliance policy at this time.

NADA also raised the issue of "the extent to which vehicle maintenance and repair facilities should reasonably be expected to know of the standard's potential application to these activities." NADA therefore asked for flexibility from OSHA in administering the standard with regard to vehicle repair [Ex. 2-23]. In response to NADA's concerns, OSHA reviewed the interpretative letters concerning vehicle repair issues and consulted with representatives of OSHA's Directorate of Safety Standards and Directorate of Compliance Programs on this matter. OSHA has determined that additional guidance would help the industry comply with the standard. OSHA has already begun to work with NADA to develop best management practices and to communicate them to vehicle maintenance and repair facilities. The target date for this project completion is June of 2001.

The final topic of concern regarding compliance policy that was raised in the comments was the role of Compliance Directive STD 1-7.3 in OSHA's enforcement and compliance assistance efforts. The Agency uses this compliance directive, in conjunction with memoranda to the field, to inform compliance staff about how the standard is to be enforced.

OSHA also intends to review and revise Compliance Directive STD 1-7.3 in response to the comments received on that directive in the course of this Lookback review. These actions should help ensure uniform enforcement of the Lockout/Tagout Standard and address outstanding issues of interpretation. The directive revision target completion date is December of 2000.

Compliance Assistance Issues

Many commenters requested that OSHA provide additional compliance assistance [Exs. 2-2, 2-5, 2-7, 2-12, 2-20, 2-23, 2-25, 2-26]. The two most commonly requested forms of compliance assistance involved incorporation of Appendix C of the Compliance Directive as a non-mandatory appendix and the creation of model or generic lockout/tagout procedures that would provide equipment-specific examples for use by small businesses. Considering these two recommendations, OSHA has decided to pursue its study of Appendix C for possible areas of improvement while continuing the overall directive review and to have Appendix C remain as part of the directive and not be included as a non-mandatory appendix in the regulatory text. Also, in the case of the latter recommendation, OSHA believes that the creation of model or generic lockout/tagout procedures to be generally determined by each case-to-case situation. To

accomplish this effort as suggested would become resource intensive and OSHA has thus decided not to accept this commenter recommendation.

The SBA also indicated that OSHA should provide resources to small businesses that need consultation assistance to comply with the existing rule [Ex. 2-26]. Several groups, including the SOCMA, NADA, and ASSE, offered to work with OSHA to develop or publicize compliance assistance materials developed as a result of this review [Exs. 2-7, 2-14, 2-23].

Findings Concerning Complexity of the Standard

Some commenters [Exs. 2-1, 2-8, 2-9, 2-14, 2-25] told OSHA that the rule was complex. Suggested means of addressing this type of complexity included creating new definitions for critical words and phrases in the standard, revising existing definitions, clarifying the meaning of existing provisions, or revising the standard in a Plain Language format. Other commenters [Exs. 2-5, 2-6, 2-20] stated that compliance with the standard was difficult. OSHA has taken note of these comments and may, in the future, add this standard to the list of rules being considered for plain language revision.

Findings Concerning Duplication, Conflict or Overlap

None of the public comments received indicated that OSHA's Lockout/Tagout Standard duplicated, overlapped, or conflicted with any federal or state government regulation's although a few commenters were concerned about the interrelationship of OSHA's Lockout/Tagout Standard with a number of other OSHA standards containing lockout/tagout provisions, such as the Electrical Safety Work Practices Standard in Subpart S (§1910.331-§1910.335), the Electrical Power Generation, Transmission, and Distribution Standard in Subpart R (§1910.269), and the construction industry standard (§1926.417). These issues were raised as examples of regulatory overlap and potential conflict.

As indicated in the discussion in Chapter IV, both the Electrical Safety Work Practices and the Electrical Power Generation, Transmission, and Distribution standards contain cross-references to §1910.147. These standards were the result of two complete notice-and-comment rulemaking proceedings concluded after the promulgation of §1910.147. These two standards specifically indicate that compliance with comparable provisions in §1910.147 is equivalent to compliance with the specific requirements of these standards. OSHA provided these cross-references to reduce the compliance burden on employers whose employees perform activities covered under the scope of more than one of these regulations. OSHA therefore does not believe that this example represents a case of regulatory overlap, as envisioned by the Regulatory Flexibility Act or the EO.

OSHA disagrees with the CMA's recommendation that electrical energy be excluded from the scope of §1910.147 to reduce overlap between §1910.147 and Subpart S. The Lockout/Tagout Standard was purposely designed to cover all sources of hazardous energy. This principle is a fundamental part of the standard and is required to ensure that the standard remains

effective across the wide variety of industries and work situations covered by the standard. Additionally, the Subpart S lockout and tagging provisions apply only to electric shock and burn hazards. They do not apply to other hazards related to the unexpected startup of electrically powered machines, such as the hazard of being caught in the point of operation. Excluding electrical energy from the scope of §1910.147 would leave many workers and a large amount of servicing and maintenance work without coverage by any OSHA lockout/tagout standard.

In addition to seeking input through the public comment process, OSHA also asked its field staff and the staff of state OSHA programs to indicate whether there were any duplications, conflicts, or overlaps between the standard and existing state laws that had come to their attention. No information was received that suggested that there were any such conflicts. However, OSHA notes that three states (Oregon, Kentucky, and Minnesota) indicated to OSHA that their states have lockout/tagout regulations that are more stringent than §1910.147.

The State of Oregon adopted the federal lockout/tagout standard (§1910.147) in its entirety. However, Oregon chose to apply the requirements of the federal standard to three additional industry sectors, the agriculture, construction, and maritime sectors. In addition, Oregon has a separate state standard requiring that locks have unique combinations or keys. The State of Minnesota also adopted the federal lockout/tagout standard in its entirety, but retained its former state lockout/tagout devices standard as a construction industry standard so that coverage would still be provided to the construction sector. Finally, the regulation adopted by the Commonwealth of Kentucky explicitly prohibits the use of tagout.

Findings Concerning Changes in Technology and Economic Conditions

OSHA concludes that at this time there are no changes in technology or economic conditions that would require the reopening of the Lockout/Tagout Standard. Only a few of the participants commented on the effects of new developments in technology on compliance with the Lockout/Tagout Standard, and none of the commenters indicated that there were changes in economic conditions that were relevant to the regulatory review of the standard.

OSHA understands that technology in the area of machine and equipment safeguarding devices has continued to improve since the promulgation of the standard. The public comments contained only limited information on such technological advancements. However, despite the progress that has been made in the design and implementation of such technologies, control circuits and interlock systems may still contain elements that can fail due to poor design, exposure to process and ambient conditions, software errors, and direct attempts to defeat them. OSHA therefore believes that the current state of technology does not warrant a general reconsideration of OSHA's existing prohibition on the use of control circuit-type devices as energy isolating devices or the applicability of the standard to the servicing and maintenance of machines or equipment using such technologies.

Keller and Heckman states that, in its opinion, the GM case should "properly be read to say that where control circuits or other effective measures reliably prevent exposure to

unexpected energization or release of stored energy the lockout/tagout standard should not apply" [Ex. 2-19]. As discussed earlier, OSHA does not agree with this conclusion. Instead, OSHA believes that the finding of the GM decision is limited by the facts of the case in question and believes that, in most workplaces where the LOTO standard applies, there will be no effect on compliance because the facts will be dissimilar.[5]

OUTCOME OF EXECUTIVE ORDER 12866 REVIEW

Under the review requirements of Section 5 of Executive Order 12866, OSHA is required to determine whether this rule should be eliminated or modified to make it more effective or less burdensome, or to bring it into better alignment with the President's priorities and the principles of the EO. OSHA has determined that the strong evidence supporting the continued need for the standard indicates that the rule should not be eliminated; in addition, no evidence was submitted to the docket suggesting that the rule was imposing either a significant impact on a substantial number of small entities or that it was causing an excessive compliance burden on any part of the regulated community. Accordingly, OSHA finds that there is no need at this time to modify the rule to make it more effective or less burdensome. However, as described below, OSHA has decided, in response to some of the concerns expressed by commenters, to undertake a number of compliance assistance activities that will facilitate compliance with the standard.

SUMMARY OF PLANNED OSHA ACTIONS IN RESPONSE TO THIS LOOKBACK

As a result of this regulatory review, OSHA intends to undertake the following activities:

- The Compliance Directive (STD 1-7.3) will be thoroughly reviewed; a revision is projected by December of 2000.

- OSHA compliance policy related to specific issues raised by commenters will be revisited. Additional interpretations will be developed to provide guidance in areas where misunderstandings or requests for clarification were evident in the public comments (for example, OSHA's recent (10/5/99) clarification memorandum[6] on the nature of activities covered under the "minor servicing exemption"). These interpretations will be consistent with the revised Compliance Directive (STD 1-7.3). These activities will be completed by end of year 2001.

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[5]Memorandum from John B. Miles, Jr. to OSHA Regional Administrators dated 10/30/96.

[6]Additional clarification on the minor servicing exception, §1910.147(a)(2)(ii), was provided in a memorandun from Richard E. Fairfax, Director, OSHA Directorate of Compliance Programs, to Michael Connor, Regional Administrator, dated 10/5/99.

- Additional best management practice guidance with a project target completion date of June of 2001 will be provided to industries engaged in vehicle maintenance and repair to respond to the concerns expressed by NADA.

- OSHA is currently testing and will soon disseminate a free software package, "The Lockout/Tagout Plus Advisor," which will provide interactive compliance assistance to employers.

- In response to comments received in the course of this review, OSHA has developed an interactive LOTO Training Program, which can be accessed at http://www.osha-slc.gov/dts/osta/lototraining/index.htm. This program, arranged in three parts, consists of a tutorial, a detailed discussion of major issues, and a group of interactive case studies.

- Comments concerning the LOTO preamble received from the lookback review required that a corrected preamble be developed. Accordingly, an integrated preamble was prepared by combining the final rule preamble published in the September 1, 1989 Federal Register and the final rule corrections and technical amendments document published in the September 20, 1990 Federal Register. This corrected preamble can be accessed at http://www.osha-slc.gov/dts/osta/lototraining/preamble/pre-147com.htm.