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Supervisors' Orientation to Occupational Safety in DOE

Safety and Health Training
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MASTER

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SUPERVISORS' ORIENTATION TO OCCUPATIONAL SAFETY IN DOE

Day 1

Welcome/Introductions/Administrative Tasks
Course Introduction (1 hour)
OSHA Compliance and DOE Orders (1 hour)
Walking/Working Surfaces (1 hour)
Lunch
Fire Hazards (2 hours)
Physical Hazards (2 hours)

Day 2

Office Safety (1 hour)
Confined Space Safety (2 hours)
Lockout/Tagout (30 minutes)
Lunch
Material Handling and Storage (1 hour)
Machine Safeguards (2 hours)
Hand and Portable Power Tools (1 hour)

Day 3

Welding and Compressed Gas Safety (1 hour)
Electrical Safety (2 hours)
Lunch
Chemical Hazards (2 hours)
Hazard Communication (1 hour)

Day 4

Injury/Illness Recordkeeping (1 hour)
Inspections and Investigations (1 hour)
Job Safety Analysis (1 hour)
Hazard Control (2 hours)
Lunch
Hazard Violation Workshop Review (1 hour)
Test and Evaluation (2 hours)

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EVALUATION FORM

S-101—Supervisors Orientation to
Occupational Safety in DOE

Date _____
Name (optional) _____
Title _____
Location _____

Please evaluate various features of the course you have just completed. The information you provide here will be combined with that from other trainees and summarized for the sponsor, the U.S. Department of Energy. Results from this evaluation will be used to improve this course.

Course Content

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Overall, as a result of this course I believe that I:					
developed specific skills and competencies in health and safety that I can use on the job.5	4	3	2	1	
gained a greater understanding of safety liability, hazard recognition, hazard evaluation and hazard control.5	4	3	2	1	
gained factual knowledge about health and safety issues and procedures (terminology, classifications, regulations) ...5	4	3	2	1	
learned fundamental principles, generalizations, and theories.5	4	3	2	1	
can use the course materials to improve thinking, problem-solving, and decision-making of supervisory health and safety work.5	4	3	2	1	
would recommend this course to others.5	4	3	2	1	
this course will help supervisors to make their work environments safer.5	4	3	2	1	

Testing Materials

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
The final test was a good measure of the knowledge gained in the course.5	4	3	2	1	

Topic Areas

Please evaluate each topic area using the 5-point scale below.

5 Excellent 4 Very Good 3 Good 2 Satisfactory 1 Unsatisfactory

		Content					Instructor				
1. Course Introduction	5	4	3	2	1	5	4	3	2	1	
2. OSHA Compliance and DOE Orders	5	4	3	2	1	5	4	3	2	1	
3. Walking/Working Surfaces	5	4	3	2	1	5	4	3	2	1	
4. Fire Hazards	5	4	3	2	1	5	4	3	2	1	
5. Physical Hazards	5	4	3	2	1	5	4	3	2	1	
6. Office Safety	5	4	3	2	1	5	4	3	2	1	
7. Confined Space Hazards	5	4	3	2	1	5	4	3	2	1	
8. Lockout/Tagout	5	4	3	2	1	5	4	3	2	1	
9. Material Handling and Storage	5	4	3	2	1	5	4	3	2	1	
10. Machine Safeguards	5	4	3	2	1	5	4	3	2	1	
11. Hand and Portable Power Tools	5	4	3	2	1	5	4	3	2	1	
12. Welding and Compressed Gas Safety	5	4	3	2	1	5	4	3	2	1	
13. Electrical Safety	5	4	3	2	1	5	4	3	2	1	
14. Chemical Hazards	5	4	3	2	1	5	4	3	2	1	
15. Hazard Communication	5	4	3	2	1	5	4	3	2	1	
16. Injury/Illness Recordkeeping	5	4	3	2	1	5	4	3	2	1	

17. Inspections and Investigations	5	4	3	2	1	5	4	3	2	1
18. Job Safety Analysis	5	4	3	2	1	5	4	3	2	1
19. Hazard Control	5	4	3	2	1	5	4	3	2	1
20. Hazard Violation Workshop	5	4	3	2	1	5	4	3	2	1

Comments

1. Please briefly describe how your expectations of this course were or were not met. _____

2. The **most** helpful topics covered or activities presented in this course were: _____

3. The **least** helpful topics or activities in this course were: _____

4. More emphasis should be given to: _____

5. Less emphasis should be given to: _____

6. What specific suggestions do you have for improving future sessions?

7. Other materials to supplement or substitute for the provided handouts? _____

8. Daily schedule/timing of activities, worktime? _____

9. Facilities/training room arrangements? _____

10. What other types of safety training courses would you like to see available? _____

11. Any further comments? _____

12. **Overall rating:** Based on your comments above, please rate the course on a 5-point scale by circling the number of your choice.
5 Excellent 4 Very Good 3 Good 2 Satisfactory 1 Unsatisfactory

INTRODUCTION

TERMINAL OBJECTIVE

The purpose of this section is to discuss OSHA regulations, safety and health guidelines and DOE findings with regard to their applicability to the first-line supervisor.

ENABLING OBJECTIVES

1. Discuss general industry violations and DOE findings in a work facility and control measures to correct them.
2. Explain the concept of recognition, evaluation and control.
3. Discuss the concepts of the VPP Program.

REFERENCES

1. Supervisor's Safety Manual, National Safety Council, 6th ed., 1985.
2. Occupational Safety and Health Services, National Safety Council, 3rd ed., 1988.
3. 29 CFR 1910, Occupational Safety and Health Standards.
4. SEN-39-92

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes.

Overhead projector/viewer assembly

VCR/TV

Video tape, "Safety is Caring", BNA Communications

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S-101

Supervisor's Orientation to Occupational Safety in DOE

- Instructor introduces self; discusses the Safety and Health Training Program and other classes; discusses class requirements (attendance at least 80% of course and 75% score on exam).
- Students introduce themselves and make name tents. How many are supervisors? How long have they been supervisors?
- Discuss with the class that this intro section will give them some background information on common safety and health hazards, costs of these hazards, DOE findings. This information is presented in order to emphasize the importance of recognizing, evaluating and controlling these hazards.
- Explain the importance of learning objectives. Begin each module with a review of the objectives and end each module with a summary of the objectives. Explain that exam questions are directly related to the learning objectives

Terminal Objective

The purpose of this section is to discuss OSHA regulations, safety and health guidelines and DOE findings with regard to their applicability to the first-line supervisor.

Enabling Objectives

- 1. Discuss general industry violations and DOE findings in a work facility and control measures to correct them.**
- 2. Explain the concept of recognition, evaluation and control.**
- 3. Discuss the concepts of the VPP Program.**

Introduction

Most Frequently Cited OSHA Standard Sections in FY 1992

- Have the class look up some common citations:
 - hazard communication-1910.1200(a)(1)
 - posting of OSHA notice-1903. (a)
 - abrasive wheel safety guarding-1910.215(b)(9)
 - personal protective equipment-1910.132(a)

Safety & Health Violations

5

- Briefly describe each of these DOE facilities:
 - Mound, Miamisburg, OH - explosives
 - Y-12, Tennessee - assembly and machining
 - Pantex, Amarillo, TX - final high explosive assembly
- Have the class look at 10 potential problem areas listed and ask them what areas an audit team would focus on in their facility?

Typical Findings

- **failure to follow commonly understood safety practices suggests insufficient training and discipline**

- This is an example of less tangible hazards but points the importance of supervisors setting good examples

Typical Findings

- No follow through
- DOE management inconsistencies
 - program office
 - field office
 - roles

- No follow through—hazards were identified, but not resolved
- Ask the class if they have ever noticed inconsistencies in their areas!

Typical Findings

- Door to electrical panel was open, exposing live parts
- No emergency lights and no illuminated exit signs exist in building
- Bench grinders with top guard missing

- 1910.303 (g)(2)(i)
- 1910.36(b)(6)
- 1910.215(b)(9)

- Explain that indirect costs of workplace accidents, injuries and illnesses are from 3 to 10 times more than the direct costs.
- Direct costs—"tip of iceberg", compared to loss due to indirect costs
- Discuss the cost of accident investigation

The Foundation of a Major Injury

Objective 2

10

- Discuss injury recordkeeping requirements
- A good place to start your hazard hunt may be in areas with no-injury accidents. Start there to prevent minor and major injuries.

Loss Control (REC)

- **Hazard recognition**
- **Hazard evaluation**
- **Hazard control**

- Have the class list examples of areas where you might expect hazards to be present:
 - old sites or poorly designed facilities
 - new jobs
 - procedure changes
 - high accident rate trends
- The REC method of hazard analysis will be presented throughout this class.
- Recognition of specific hazards will be present in each section.
- Evaluating health hazards through the use of air monitoring will be discussed in the measurements and testing section of this course.
- Evaluating safety hazards may be done through the use of checklists and planning questions prior to inspections. Safety hazards may be evaluated based on their likely severity and how many employees are likely to be affected.
- Specific control measures will be presented in each section. Detail on health hazard controls will be presented in the Hazard Control section.

Hierarchy of Controls

- Engineering Controls
- Administrative Controls
- Personal Protective Equipment

- Engineering controls—the containment or elimination of the hazard through physical means, such as a ventilation system to control exposures to airborne contaminants
- Administrative controls—the manipulation of work schedules to reduce exposure, such as limiting the time employees may spend in a high noise or radiation area.
- Personal protective equipment—the use of protective equipment such as earmuffs to attenuate noise or of respirators to filter out airborne contaminants.

Safety & Health Training

■ **In order to be effective,
supervisors must:**

- recognize
- evaluate
- control
- reinforce

- Supervisors should be able to look for potential hazards, not necessarily violations. Supervisors should also be able to convince employees to "buy into" safety.

Compliance with OSHA

- **DOE volunteered to comply with OSHA standards**
- **OSHA Reform Act**

- With the passage of the OSHA Reform Act (due out in 1993), DOE will be required to comply with OSHA
- may be totally partial or limited

Voluntary Protection

- **Voluntary Protection Program (VPP)**
- **SEN-39-92**

- DOE's VPP=Voluntary Prevention Program
- Implementation by 3-1-93
- Working with PSOs

Voluntary Protection Program

■ Safety and health management guidelines:

- management commitment and employee involvement
- worksite analysis
- hazard correction and control
- safety and health training
- periodic program evaluation

- Since this was implemented in 1980 (under Reagan), only 76 companies have opted to participate in this program.

Summary

- Recognition, Evaluation and Control
- Loss Control
- Typical Findings
- VPP

- In the next section, the class will learn more about OSHA and DOE Orders.
- At the end of this section, the video "Safety is Caring About Identifying Hazards" will be shown. The first part of the video shows potential hazards. Stop at the discussion break and have the class list as many hazards as they observed. The second part of the video illustrates the consequences of these hazards (in a rather slapstick manner!).

OSHA COMPLIANCE AND DOE ORDERS

TERMINAL OBJECTIVE

The purpose of this lesson is to introduce the participant to DOE and Federal safety and health program requirements, and the changes presently underway in the Department of Energy regarding safety and health.

ENABLING OBJECTIVES

1. Recognize the role PL 91-596 played in the development of Federal employee safety and health protection.
2. Locate subparts and list types of information located in 29 CFR 1910.
3. Given a situation involving a DOE safety and health concern, apply the correct standards or policies from the DOE Orders.

REFERENCES

1. PL 91-596, Williams-Steiger Occupational Safety and Health Act of 1970 (especially Section 19)
2. DOE 3790.1, Federal Employee Occupational Safety and Health Program
3. DOE 5480.1B, Environment, Safety and Health Program for DOE Operations
4. DOE 5480.4, Environmental Protection, Safety and Health Protection Standards
5. DOE 5480.8, Contractor Occupational Medical Program
6. DOE 5480.9, Construction Safety and Health Program
7. DOE 5480.10, Contractor Industrial Hygiene Program
8. DOE 5480.19, Conduct of Operations
9. DOE 5482.1B, Environment, Safety and health Appraisal Program
10. DOE 5483.1A, Contractor Safety and Health Programs
11. DOE 5484.1, Environment, Safety and Health Protection Information Requirements

DURATION

1 1/2 hours

INSTRUCTOR MATERIALS

Course manual with instructors notes.
Overhead projector/viewer assembly
TV/VCR

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OSHA Compliance and DOE Orders

- This section of the manual will focus on jurisdiction and compliance for health and safety at DOE sites for DOE and its contractors. We will also address the present and potential application of OSHA regulations. The supervisor should be able to understand their responsibilities for health and safety at the end of this section.

Terminal Objective

The purpose of this lesson is to introduce DOE federal safety and health program requirements, and the changes presently underway in the Department of Energy regarding safety and health.

Enabling Objectives

- 1. Recognize the role PL 91-596 played in the development of Federal employee safety and health protection.**
- 2. Locate subparts and list types of information located in 29 CFR 1910.**
- 3. Given a situation involving a DOE safety and health concern, apply the correct standards or policies from the DOE Orders.**

Public Law 91-596 (OSH Act)

Williams-Steiger Occupational Safety and Health Act December 29, 1970

"Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."

"Each employer shall comply with occupational safety and health standards promulgated under this Act."

Each Employee shall comply with occupational safety and health standards and all rules, regulations ... which are applicable to his own conduct."

OSHA 1
4

- The OSH Act was enacted in 1970. The fundamental premise of the Act is that "employers have a general duty to furnish a place of employment that is free from recognized hazards likely to cause death or serious physical harm to employees. This duty is contained in section 5(a)(1) of the Act and is known as the general duty clause.
- Employers have a duty to comply with OSHA regulations, and so do employees.

OSH Act Application to Federal Agencies, Section 19

"It shall be the responsibility of the head of each Federal Agency to establish and maintain an effective and comprehensive Occupational Safety and Health Program."

Objective 1
5

- PL 91-596 is the foundation for Federal Safety and Health Programs
- Section 19 is the basic mandate for Federal Programs. It requires that Federal Programs be consistent with standards promulgated under Section 6 for private employers.
- Federal Agency programs are mandated to include all aspects of a comprehensive program—not just hazard free workplaces and compliance with standards, but also Federal program must include the human element in employee jobs, motivators and attitudes.

OSH Act and DOE Exemption Section 4 (b)(1)

■ Exemption for DOE facilities

- OSHA Reform Act may change this if passed in its present form.

■ Provisions of The Act not applicable to GOCO employees

■ However, DOE Order 5483.1A requires compliance with 29 CFR 1910, General Industry and 29 CFR 1926, Construction Standards

October 1
8

- Section 4(b)(1) of the OSHA Act exempts DOE from OSHA's jurisdiction. Therefore, OSHA presently can not come on DOE property and inspect and fine DOE or its contractors for safety and Health violations.
- However, for your information, there is presently an OSHA Reform Act(HR 3160, S 1622) going through Congress which may be passed into law in 1993. The exemption for DOE is specifically removed in that the bill specifically states the law shall apply to employment performed at Federal Nuclear Facilities under DOE. Therefore, it is possible that the OSHA Act may directly apply and OSHA could inspect DOE facilities and fine in the near future.
- But even with this exemption, the OSHA regulations already apply through a series of Presidential and DOE Orders at DOE sites.

Price Anderson Amendments Act of 1988

- **Authorizes civil penalties against most DOE profit making contractors, subcontractors and suppliers (except multiprogram labs) for violations of DOE rules and regulations.**
- **Authorizes criminal penalties against all DOE contractors, subcontractors, and suppliers for knowing and willful nuclear safety violations (prosecuted by the Department of Justice).**

Chapter 1

7

- Discuss who is and isn't covered by this Act.
- 42 USC 2271 - The DOE multiprogram labs are generally exempt from civil penalty provisions.
- Criminal - K
 - 25K in fines and 2 years imprisonment for first conviction
 - 50K in fines and 5 years imprisonment for subsequent convictions

Price Anderson Amendments Act of 1988

- **Civil penalties are assessed by DOE and can be up to \$100K per day per violation**
- **Penalties unlikely to be reimbursable under DOE M&O contract**
- **Suspected criminal violations are referred to the Department of Justice**

8

- **M&O = management and operations**
- **Civil penalties do not require criminal intent. An example would be a violation of DOE rules and regulations. This applies only to profit contractors.**
- **Criminal penalties require criminal intent and apply to everyone, including supervisors!**
- **Exam question: Which Act makes DOE contractors liable for violation of DOE rules?**

OSHA Compliance and DOE Orders

29 CFR 1910

Book Review

Objective 1

9

- Look at book
- Find Table of Contents
- Review Subparts

29 CFR 1910 Subpart E

1910.36(b)(2)

Objective 1
10

- 1910.36(b)(2)(i)
 - Marking exercise
 - Look-up number
 - Index
 - Incorporated by reference
 - Table of CFR titles
 - Look at second book

Location of Subparts and Section

- **Lockout/Tagout**
- **Ventilation**
- **Woodworking and Machinery**
- **Portable Wood Ladders**

OSHA 1

11

- **LOTO—Subpart J, 1910.147**
- **Ventilation—Subpart G, 1910.94**
- **Woodworking Machinery—Subpart O, 1910.213**
- **Portable Wood Ladders—Subpart D, 1910.25**

Location of Subparts and Section

- 1910.94(a)(4)
- 1910.133(a)(6)
- 1910.141(b)(1)
- 1910.151(c)

Objective 2

12

- 1910.94(a)(4)—Exhaust Ventilation System
- 1910.133(a)(6)—Design, Construct
- 1910.141(b)(1)—Potable Water
- 1910.151(c)—Where the eyes

29 CFR 1910.110 (b)(13)(ii)(b)(7)(ii)

PINK - FULL COLUMN
WIDTH

Portable containers shall not be
taken into buildings except as provided in
paragraph (b)(6)(i) of this section.

CODE OF

TITLE	FED. REG.	PART	SECTION
29	CFR	1910	.110

(b)(13)(ii) (b)^{*}(7)(ii)

YELLOW - FULL COLUMN
WIDTH
LOWER CASE ALPHABETICAL

DOT - YELLOW
ARABIC NUMBER

LOWER CASE ROMAN

ITALICIZED

*Standards promulgated after 1979 may be identified
as follows: 1910.304(O)(5)(i)-(F)(1). A capital letter is
used instead of an italicized one in the fourth set of
letters.

DOE Order 3790.1A Federal Employee OSH Program

**DOE emphasizes its'
commitment to compliance
with OSHA Standards.**

Objective 3

13

- Now we will cover the series of DOE orders for occupational health and safety.
- Covers federal employee OCC safety and health program for DOE.
- Minimum OCC Health Standards are to include:
 - all OSHA standards and regulations
 - requirements at 29 CFR part 1160 covering occupational safety and health programs for federal employees (Rich suppl. order RL 3790.1B)

DOE 5483.1A Contractor Safety and Health Programs

- **This order assures that GOCO contractor employees receive safety and health protection consistent with OSHA.**

Objective 3

14

- Contractors must assure that:
 - there is meaningful employee participation in all occupational safety and health programs.
 - the workplace is monitored for and records maintained of known toxic substances and harmful physical agents
 - employees are informed of their rights, protections, obligations and responsibilities
 - complaints are investigated promptly and resolved equitably

DOE Order 5483.XX (Draft)

- **This proposed DOE Order will strengthen training and more specifically direct contractor programs.**

- Uses requirements in "Occupational Safety and Health Training Requirements and Implementation Guidance"
- Restates policy to comply with OSH regulations
- Reference all mandatory standards and regulations
- Reiterates importance of cross-training
- This is why we're here.

DOE 5480.4 Environmental Protection, Safety and Health Protection Standards

- **This order establishes mandatory standards applicable to all DOE and DOE contractor operations.**
- **Mandatory standards include:**
 - 29 CFR 1910
 - 29 CFR 1926
 - ANSI Standards

Objective 3
16

- Three attachments are included with DOE 5480.4.
- These include Attachment 1 which are statutory requirements of non-DOE Federal or State statutes, for example EPA Executive Orders, CWA, SDWA, FIFRA, RCRA.
- Attachment 2 includes standards which are mandatory as a matter of DOE Policy, for example, EPA General Regulations, NFPA Fire Codes, ANSI Radiation Protection, ACGIH TLVs, all OSHA standards.
- Attachment 3 includes non-mandatory reference standards which include guidelines, National Safety Council manuals, criteria documents, IEEE standards.

DOE 5480.8 Contractor Occupational Medical Program

- **This order establishes occupational medical program requirements for DOE contractors, including:**

- a written medical plan
- periodic worksite visits by occupational health physicians

Objective 3

17

- Many OSHA regulations require medical examinations for exposure to hazardous substances or noise. This will help insure employee health is addressed.

DOE 5480.10 Contractor Industrial Hygiene Program

- **This order states that it is DOE policy to assure that:**
 - contractor employees and representatives have the opportunity to participate in their employer's industrial hygiene program
 - contractors make well defined assignments of responsibilities within their organization for an employee industrial hygiene program

Objective 3

18

- This order addresses industrial hygiene evaluation of health hazards at DOE facilities.

5480.19 Conduct of Operations

- **Establishes Administration and Organization**
- **Defines personnel protection and roles of jurisdiction**
- **Delineates training, investigations and notification steps**
- **Chapter IX is dedicated to lockout/tagout**
- **Provides for operating policies and procedures**

Objective 3
19

- Established July, 1989, this order will become the baseline for all other activities, including environmental work.

DOE 5482.1B Environment, Safety and Health Appraisal Program

- **This order requires that each DOE field office conduct functional and management appraisals of ESH activities at least every three years.**
- **Contractors must also conduct internal appraisals.**

Objective 1
20

- The objectives of this program are to:
 - determine that policies and requirements are appropriately interpreted and implemented by DOE and contractors
 - evaluate the effectiveness of policies, requirements and standards
 - provide management with information on significant ESH achievements and deficiencies
 - provide management with recommendations to improve ESH program performance
 - determine the adequacy of DOE requirements for achieving compliance with Federal statutory requirements

DOE 5484.1 ESH Protection Information Requirements

- **This order establishes ESH reporting requirements and procedures.**
- **It applies to DOE prime contractors and certain subcontractors and covers preparation of summary and investigative reports.**

- **Injury and Illness Recordkeeping.**

OSHA Compliance Mechanism

- **Employers are cited by OSHA for regulatory violations**
- **Civil Penalties are assessed for failure to comply**
 - Other than serious, serious, willful, repeat, egregious
- **Criminal penalties against employers**
 - Willful violation causing death of an employee
- **Criminal penalties against employees**
 - False statements, falsifying OSHA required documents

Chapter 1

22

- When OSHA does an inspection of a work site, the compliance officer looks for violations of the regulations or the general duty clause. When the compliance officer discovers the violation and if there is a probability that harm could result to an employee, then the company will be cited.
- Penalties are addressed in Section 17 of the OSH Act.
- Serious, willful, repeat, failure to abate, and egregious violations always have penalties. Other than serious (general) violations may carry penalties.
- Egregious penalties are issued by OSHA when an employer has usually willfully and violated the regulations, or caused a number of injuries or deaths. Some of these penalties are in the millions of dollars.
- Criminal penalties against employers are usually only issued when a willful violation in combination with the death of an employee occurs.
- Criminal penalties against individuals are usually for lying to OSHA, and for falsifying documents.

Summary and Review

- **OSHA does not have enforcement jurisdiction at DOE sites.**
- **OSHA regulations apply at DOE sites and to GOCO contractors through Presidential and DOE Orders.**
 - DOE has Safety and Health Enforcement Authority at DOE sites.
 - GOCO Contractors are required by DOE Orders and contract to comply with OSHA regulations

Terminal
Objective
23

- This slide is self explanatory, and covers previous material. Included after this section are examples of violations found by Tiger Teams at the various sites. You'll notice in every violation that the specific location and exact violation in relation to the regulation is cited, and the severity of the potential injury assigned by the compliance officer.

WALKING/WORKING SURFACES

TERMINAL OBJECTIVE

The purpose of this lesson is to enable the supervisors to recognize, evaluate and control hazards associated with walking/working surfaces

ENABLING OBJECTIVES

1. List and describe three common causes of walking/working surface accidents, and control measures for each.
2. List three general requirements regarding scaffolds or ladders. For each requirement, describe the type of hazard that is being controlled.
3. Describe control measures for walking/working surface hazards.

REFERENCES

1. 29 CFR 1910

DURATION

1 hour

INSTRUCTOR MATERIALS

Course manual with instructors notes.

Overhead projector/viewer assembly

TV/VCR

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Walking/Working Surfaces

Terminal Objective

The purpose of this lesson is to enable the supervisors to recognize, evaluate and control hazards associated with walking/working surfaces

Enabling Objectives

- 1. List and describe three common causes of walking/working surface accidents, and control measures for each.**
- 2. List three general requirements regarding scaffolds or ladders. For each requirement, describe the type of hazard that is being controlled.**
- 3. Describe control measures for walking/working surface hazards.**

Common Walking/Working Surface Hazards

- **Slips, trips & falls**
 - Slippery surfaces
 - No guardrails
- **Poorly constructed stairs**
- **Improper use of ladders and scaffolds**
- **No fall protection**

Objective 1

4

- Over 1500 fatalities and 300,000 disabling injuries/year
- Second largest source of work fatalities
- Twenty percent of all worker compensation payments
- Ask class how many facilities they have been through with items stored in hallways, blocking exits, with electrical cords across the floor or spills on the floor.

Evaluation of Hazards—Ladders

- Uniform step spacing shall not be more than 12 inches
- Non-slip material on the bottom of the rails
- Rung diameters
 - 3/4" for metal ladders
 - 1-1/8" for wood

Objective 2

5

- Evaluating hazards involves the use of inspections and checklists
- No paint allowed on wooden ladders. Although not specifically required by OSHA, this is a good management practice to follow. Paint could hide cracks or defects in the wood.
- Shall be inspected frequently, which in OSHA terms means daily to weekly. It's good management practice to inspect prior to use.

Evaluation of Hazards—Ladders

- Cages are required on ladders of more than 20 feet
- Ladder wells--at least 15" from center line with a clear width

Objective 2

6

- The minimum design capacity shall be a single concentrated load of 200 pounds, in accordance with 1910.27(a)(1)(i). Other fixed ladder requirements listed here are found in 1910.27.

Evaluation of Hazards—Scaffolding

- Each day prior to use and after incidents that may strain the scaffold
- Posts—accurately spaced on suitable bases
- Cross-bracing
- Sound footing capable of supporting maximum intended load

Objective 3

7

- Every component of the scaffold system is regulated by OSHA in 1910.28 and must be inspected: suspension lines, attachments, platform, guard rails, etc.

Control of Slipping Hazards

■ Housekeeping

- floors shall be clean and dry
- floors shall also "be kept free from protruding nails, splinters, holes, or loose boards."

Objective 3

8

- This includes all employee workrooms, storerooms, and passageways and is an OSHA requirement in 1910.22(a)
- Drainage shall be maintained either through floor drains or slanted floors. Chemical storage areas often have slanted floors.
- False floors, mats or dry standing places should be provided where practicable
- If you have ever been in a shop with a number of open surface tanks, you've probably noticed that they have raised metal walkways around the tanks. This controls slipping hazards for tank operators. There may also be diking, or raised barriers, around the tanks to control spills.

Control of Fall Hazards—Guardrails

■ Standard railing:

- Top rail, mid rail and posts
- 42-inch top rail height
- Toeboard required where people pass below

Objective 1

9

- Guardrails are one of the primary control measures to prevent fall hazards. They are required in 1910.22, 1910.23 and 1910.28 for scaffolding also.
- shall withstand 200 pounds force in any direction
- Explain why toeboards are important--to prevent tools or equipment from falling and creating an overhead hazard to those working below

Control of Fall Hazards—Guardrails

■ Railings required:

- Open-sided floors, walkways or platforms over 4 feet high
- Open-sided floors, walkways or platforms above or adjacent to dangerous equipment
- Floor openings
- Floor holes through which a person may walk

Objective 3
10

- Guarding may be by way of a standard railing or a fence or other method that provides equivalent protection.
- Temporary wall openings shall be adequately guarded, but those guards needn't be of standard construction

Fixed Industrial Stair Requirements

- Stairs shall carry a load 5 times the normal live load but not less than a moving concentrated load of 1000 pounds
- Minimum stairway width is 22 inches
- Standard railing shall be provided on open sides
- Vertical clearance shall be at least 7 feet

Objective 3

11

- Fixed stairs are required for access from one level to another or where employees must access elevations for gauging or other exposures to harmful substance or where carrying of tools is required
- Riser height and tread width shall be uniform throughout any one floor; treads shall be "reasonably" slip resistant.

Control of Fall Hazards—Ladder Requirements

- **Portable stepladders longer than 20 feet shall not be supplied**
- **Single ladders longer than 30 feet shall not be supplied**

Objective 3

12

- Found in 1910.25, portable wood; 1910.26, portable metal; 1910.27, fixed industrial ladders.
- Use only for intended purpose e.g. do not use ladders to form a makeshift scaffold or sawhorse
Also, the top rung of a stepladder is not intended to be a step
- 4 to 1 The ratio of rise to run
- 3 Foot Side Rail Extension-When ladder is used to climb to another level
- Worker's should not climb a ladder while carrying things in their hands.
- Non-conductive ladders near power lines

Control of Fall Hazards—Scaffolding

- **Sound rigid footing**
- **Guardrails with toeboards**
- **Scaffold grade planking**
- **Secured to the building**
- **Erected by competent/experienced personnel**

Objective 3
13

- **OSHA standards include specific regulations for 25 distinct types of scaffolds at 1910.28**
- **Guardrails, midrails and toeboards are required on the open sides and ends if the scaffold is over 10 feet high. Wire mesh is required if persons pass underneath.**
- **Scaffold grade planking=minimum of 1500 f. stress grade construction lumber**

Fall Protection

- Belts
- Harnesses
- Combination body harnesses
- Personal lifelines
- Retracting lifelines
- Lanyards

Objective 3

14

- Fall protection systems arrest falls and absorb shock and should provide freedom of movement
- It is recommended that belts be used for falls of less than 2 feet and harnesses for falls of up to 6 feet. Harnesses are the preferred method
- Combination body harnesses have pelvic and chest belts to distribute impact force and prevent slipping out
- Lifelines are vertical lines suspended from a fixed anchorage or between two fixed anchorages to which the fall arrest device is secured
- Retracting lifelines retract as the user moves closer to the anchor point and extend as the worker moves away from them
- Lanyards are short flexible lines up to 6 feet long that secure the fall arrest device to a lifeline or anchorage; they should have minimum slack to limit free fall distance

Walking/Working surfaces

Summary

- Scaffolds
- Ladders

FIRE HAZARDS

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to recognize, evaluate and control fire hazards in the workplace.

ENABLING OBJECTIVES

1. Identify the principal OSHA codes related to fire safety and egress in the workplace.
2. List the 3 parts of an exit and define each, and describe the requirements of each.
3. Describe exit sign requirements and state their location in 1910.
4. List the four classifications of fire extinguishers and the location of the regulation in 1910.
5. Locate the regulation pertaining to sprinkler and alarm system.
6. List the four components of the fire tetrahedron and describe their relevance to fire prevention.
7. State the definitions of flammable and combustible liquids, give common examples of these chemicals, and explain the classification system related to their use.

REFERENCES

1. Supervisor's Safety Manual, National Safety Council, 6th ed., 1985.
2. Accident Prevention Manual for Industrial Operations, 9th ed., National Safety Council.
3. 29 CFR 1910.35-40, 1910.155-165, 1910.106
4. NFPA 70, Article 500
5. NIOSH Pocket Guide

DURATION

Two hours

INSTRUCTOR MATERIALS

Course manual with instructor notes.

Fire Safety Slides with Slide Manual

Overhead projector/viewer assembly

VCR/TV

Video "Introduction to Reactive and Explosive Materials" 22:45 in length

NIOSH Pocket Guide

Pacific Northwest Laboratory is
operated for the U.S. Department of
Energy by Battelle Memorial Institute.

Fire Hazards

Terminal Objective

The purpose of this section is to enable the supervisor to recognize, evaluate and control fire hazards in the workplace.

Enabling Objectives

- 1. Identify the principal OSHA codes related to fire safety and egress in the workplace.**
- 2. List the 3 parts of an exit and define each, and describe the requirements of each.**
- 3. Describe exit sign requirements and state their location in 1910.**
- 4. List the four classifications of fire extinguishers and the location of the regulation in 1910.**

Enabling Objectives

- 5. Locate the regulation pertaining to sprinkler and alarm system.**
- 6. List the four components of the fire tetrahedron and describe their relevance to fire prevention.**
- 7. State the definitions of flammable and combustible liquids, give common examples of these chemicals, and explain the classification system related to their use.**

Fire and Egress

■ DOE Order 5480.7

- Subpart E
 - means of egress 1910.35-.40
- Subpart L
 - fire protection 1910.155-.165 and appendices

Objective 1

5

- Discuss with the class that sections related to fire hazards and safety are found in several sections of the OSHA manual. There are areas we also will cover in Subpart H, Hazardous Materials in the material handling and storage and compressed gas sections of the course, where requirements for flammable liquid handling and storage, compressed gases, and explosives are located.
- Include in appendix to section - DOE Fire Protection orders, other mandatory standards
- Show the introductory fire safety violation slides and discuss these with the class.

Egress vs. Exit

- The three parts to an exit are
 - Access
 - Exit
 - Discharge
- Egress is a way out—a path

Objective 1

6

- Means of Egress are discussed in 1910.35-.40
- The three parts to an exit are:
 - 1. Access
 - 2. Exit
 - 3. Discharge
- Egress is a way out; a path.
 - When protecting people/egress—consider the path of smoke.

Fire Hazards
Exit—1910.37(f)

Objective 2

7

- easy to locate
- swing-out door
- no access through lockable doors
- no hangings, mirrors
- no access through high hazard area
- not < 28"

Exit Access—1910.37(g)

CAUTION

**KEEP AISLE CLEAR
AT ALL TIMES**

EMERGENCY

EXIT

DO NOT BLOCK

Objective 7

8

- exterior access
- smooth floor, guardrails
- if snow and ice, need protection
- reasonably straight
- no dead ends > 20'

Fire Hazards

Exit Discharge—1910.37(h)

CAUTION LOW OVERHEAD CLEARANCE

Objective 2

9

- discharge to open space
- clear direction to street;—interrupt at ground level
- ceiling > 7' 6"; projection > 6' 8"
- change in elevation require ramps or stairs

Fire Hazards

Exit Discharge—1910.37(k), (l)

**KEEP CLOSED
=ALARM=
WILL SOUND**

Objective 2

10

- substantial construction
- free of all obstruction
- device or alarm on exit shall be fail-safe

Exit Signs—1910.37(q)

Objective 3

11

- readily visible on exit
- access marked if not readily visible
- if it might be mistaken for an exit—mark "Not an Exit"
- size and shape—LSC-NFPA 101
- no decoration
- distinctive color and contrast
- reliable light source
- internal illumination if reduction of normal illumination
- size of letters

Fire Hazards

Subpart L—Portable Fire Extinguisher

1910.157

**FIRE
EXTINGUISHER
INSIDE
BUILDING**

Objective 4

12

- 1910.155 is Definitions section
- 1910.156 Fire brigades

Fire Hazards

Portable Fire Extinguisher
1910.157(b)

**FIRE
HOSE AND
EXTINGUISHER
HERE**

**HALON FIRE
EXTINGUISHER**

**USE ON
COMPUTER/TELEPHONE/
ELECTRICAL EQUIPMENT**

Objective 4

13

- Exempt if the employer are not required to use them

Portable Fire Extinguisher 1910.157(c)

FIRE ESTINGUISHER
HERE
BREAK GLASS

Objective 4

14

- provide, mount, locate and identify so they are readily assessable
- (c)(4) must be maintained in a fully charged and operable condition and kept in their designated area

Fire Hazards

Portable Fire Extinguisher Selection and Distribution

1910.157(d)

Objective 4

15

- select based on classes

Fire Extinguishers (Class A)

Fires in ordinary combustible materials, such as wood, paper, cloth, rubber, and many plastics, where the quenching and cooling effects of water or of solutions containing large percentages of water are of prime importance.

Objective 4

16

- If you have a fire and if it can be quickly and easily extinguished, then a fire extinguisher is one of the control measures.
- There are classes of fire extinguishers if a fire takes place.
- If a fire is bigger than a trash can, it may not be able to be extinguished with a limited capacity extinguisher.
- Fire extinguishers can only be used in short duration and for small fires.
- 1910.157 (d)(2)—travel distance is 75 ft
- may use hoses in facility—but must be trained annually
- What's on fire?

Fire Extinguishers (Class B)

Fires in flammable liquids and gases, greases, oils, tars, oil-base paints, lacquers, and similar materials, where smothering or exclusion of air, and interrupting the chemical chain reaction are most effective. This class also includes flammable gases.

Objective 4

17

- This is a dry extinguisher.
- CO² extinguisher can blow around fire if used improperly.
- Powder extinguishers are very messy to clean.
- 1910.157(d)(4)—travel distance is 50' or less

Fire Extinguishers (Class C)

Fires in or near live electrical equipment, where the use of a nonconductive extinguishing agent is of first importance. The material that is burning is, however, either Class A or Class B in nature.

Objective 4

18

- Extinguisher for electrical fires. These contain nonconductive extinguishing agents.
- If you cut the electrical, then you no longer have an electrical fire, it may become an A or B.
- 1910.157(d)(5)

Fire Extinguishers (Class D)

Fires that occur in combustible metals, such as magnesium, lithium, and sodium. Special extinguishing agents and fire-fighting techniques are needed for fires of this type.

Objective 4

19

- D-Exotic metal fires.
- Cannot use water on these fires—may create a hydrogen explosion
- These extinguishers suffocate the fire.
- 1910.157(d)—75' travel
- required in combustible metal working areas

Fire Hazards
**Portable Fire Extinguisher
Inspection, Maintenance and Testing**
1910.157(e)

Objective 4
20

- Employer is responsible
- Monthly visual inspection
- Annual maintenance check—must be recorded
- hydrostatic
- alternate while extinguisher in gone

Portable Fire Extinguisher Training 1910.158(g)

ANNUAL FIRE EXTINGUISHER TRAINING CLASS

To: Tommy Wright

From: Byron Robertson

You have been scheduled to attend the Fire
Extinguisher Training class on Monday,
February 22 from 10 AM to 11 AM.

Objective 4

21

- (g)(1) must provide training when hired and then annually
- (g)(4) if you are designated to use one in an emergency action plan—must have appropriate training on use

Fire Hazards

Sprinkler System

1910.159-163

Objective 1

22

- maintenance
- tests
- water supplier
- defer to fire protection engineers

Fire Hazards

Alarm Systems

1910.165

Objective 1
23

- (b)(2) capable of being perceived
- (b)(3) distinctive
- (b)(4) explain to employers how to report and post numbers near phones
- (e) manual pull boxes must be unobstructed conspicuous and readily accessible

- Explain the fire tetrahedron. Fire tetrahedron represents the flaming mode of fire which includes the presence of uninhibited combustion chain reaction.
- Oxidizer is usually oxygen, but it may be chemicals that give off Oxygen.
- Heat is also any ignition source.
- Halon fire extinguishers interfere with the continuing chain reaction
- Halon fire extinguishers are being phased out, so don't purchase one.
 - Why? Because they damage the ozone layer.
- Fuel—is anything that will burn

- Have them make a list of possible ignition sources

Ignition Sources (Heat)

- Electricity
- Friction
- Open flames
- Hot surfaces
- Sparks
- Static electricity
- Radiant heat

Objective 6

25

- This list of ignition sources is so significant in terms of fire causes that they are listed several times in Subpart L and H. These are listed in 1910.106(b)(6).
- Remember the fire tetrahedron, without the ignition source, no fire.
- Beside each bulleted word, list one example. Such as, open flames-matches (temp. wiring, portable heaters, gas engines)

AIM

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301/587-8202

Centimeter

Inches

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2 of 6

- Have them make a list of possible oxidizing agents
- oxygen
- chemicals (chlorine, nitric acid)

Fire Hazards

Fuels

- Trash
- Wood
- Paper
- Liquids
- Grease
- Electrical Equipment

Objective 6

28

- What will burn? Anything!
- Have them highlight 1910.106

Definitions of Flammable & Combustible Liquids

■ Flammables

- flash point $< 100^{\circ}\text{F}$

■ Combustibles

- flash point $> \text{ or } = 100^{\circ}\text{F}$

■ Flash point definition in 106(a)(14):

The lowest temperature at which a liquid gives off enough vapor to cause a momentary flame in the presence of an ignition source.

Objective 7

29

- Next discuss the following definitions. These are important because flammable and combustible liquids are very hazardous, and are large contributors to large fires. Also, storage areas and many requirements in the codes are based on these classifications.
- The difference between a flammable and combustible liquid can be less than one degree.
- Safety solvents - Many of these are combustible and not flammables, but the flash point may not be very high. Check the MSDS.
- 1910.106(a)(14)—flash point
- 1910.106(a)(18)—combustible liquid
- 1910.106(a)(19)—flammable liquid

Common Flammable Liquids

<u>Liquid</u>	<u>Flash Point</u>
Gasoline	-50° F
Ether	-49° F
Benzene	12° F
Turpentine	+95° F
Acetone	0° F
Carbon disulfide	-22° F
Toluene	40° F
Methanol	52° F

Objective 7

30

- Common chemicals used at DOE sites, and some of their flash points
- Gasoline is a combination chemical

Combustible Liquids

<u>Liquid</u>	<u>Flash Point</u>
Stoddard solvent	110° F
Picric acid	302° F
Acetic acid	102° F

Objective 7

31

- These are common combustible liquids used at DOE sites.
- Show the NIOSH Pocket Guide to Chemical Hazards and show where to find flash point

Fire Hazards

Flammable and Combustible Liquids

1910.106(a)(19)

1910.106(d)(3)(i) and (ii)

LEVELS OF HAZARDS

		Flash Point	Boiling Point
CLASS I	A	<73°	<100°
	B	<73°	≥100°
	C	≥73°	<100°
CLASS II		≥100° to <140°	
CLASS III	A	≥140° to <200°	
	B	≥200°	

Objective 7

32

Explosive Limits

Objective 7

33

- For these flammable and combustible liquids to burn, there has to be the right combination of air to fuel to burn. This table shows the combination for a fire to occur, vapor level must be between two specific concentrations, the LEL and UEL (below the LEL, too lean to burn; above the UEL, too rich to burn). Explain this in terms of driving a car.

Fire Hazards

Compressed Gases

BLEVE
(Boiling
Liquid
Expanding
Vapor
Explosion)

- Many are fuels
- If involved in a fire—they can BLEVE
- The water tower in this photo is 250 feet tall.

Fire Hazards
**By-Product
of Fire**

- Can be anything
- Styrofoam
- PCBs
- Can create explosive situation

Fire Hazards
Explosions!

- Show video tape on reactive and explosive materials

Summary

- Exits
- Extinguishers
- Tetrahedron
- Liquids

PHYSICAL HAZARDS

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to recognize physical hazards in the workplace.

ENABLING OBJECTIVES

1. Explain potential adverse health effects of:
 - noise
 - lasers
 - temperature extremes
 - ergonomic problems
 - bloodborne pathogens
2. Discuss common physical hazards found in the workplace and measures to control them.

REFERENCES

1. Occupational Safety and Health Services, National Safety Council, 3rd ed., 1988.
2. Supervisor's Safety Manual, National Safety Council, 6th ed., 1985.
3. 29 CFR 1910.1200, "HAZCOMM".

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes.

Overhead projector/viewer assembly

VCR/TV

"Ergonomics—Your Body at Work", Coastal Video

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Physical Hazards

Terminal Objective

The purpose of this section is to enable the supervisor to recognize physical hazards in the workplace.

Enabling Objectives

- 1. Explain potential adverse health effects of:**
 - noise
 - lasers
 - temperature extremes
 - ergonomic problems
 - bloodborne pathogens
- 2. Discuss common physical hazards found in the workplace and measures to control them.**

Hazard Recognition

- Noise
- Non-ionizing radiation
- Extreme temperatures
- Ergonomics
- Bloodborne pathogens

Objective 1

4

- 29CFR1910 Subpart G--Occupational Health and Environmental Control addresses the following physical hazards:
 - 1910.95 Occupational noise exposure
 - 1910.96 Ionizing radiation
 - 1910.97 Non-ionizing radiation electromagnetic/radiofrequency
- There are no OSHA standards for temperature extremes, ergonomics, or lasers. ACGIH adopts Threshold Limit Values for Physical Agents in the Work Environment yearly. These include:
 - Heat and cold stress
 - Vibration
 - Ionizing radiation
 - Lasers
 - Radiofrequency/microwave radiation
 - Ultraviolet radiation
- ANSI Z136.1-1986 covers lasers
- List bloodborne standard here

Hazard Recognition—Noise

- Temporary or Permanent Hearing Loss
- Interferes with Communication
- Continuous Noise Disrupts Vigilance, Reaction Time, Memory
- Masking Alarms

Objective 1

5

- Conductive hearing loss is not related to noise exposure but to problems with the bones in the middle ear; it can be treated with a hearing aid. Noise induced hearing loss cannot be treated with a hearing aid.
- A standard threshold shift (STS) is what OSHA calls the permanent hearing loss caused by occupational noise exposure that occurs at higher frequencies. It is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000 and 4000 Hz (the speech frequencies) in either ear.
- Standard threshold shifts are recordable illnesses and are now required to be reported on the OSHA 200 log.
- Temporary threshold shift is the term used to describe the ear's temporary loss of hearing acuity after exposure to high noise levels, i.e., ringing or a vacuum like sound after a rock concert! It is the ears' way of protecting itself, a recovery period for the cochlea. Because of this phenomenon, OSHA requires a 14 hour quiet period before audiometric testing.
- In addition to hearing loss, exposure to noise may also result in safety hazards as listed here.

Evaluation of Noise Hazards

- **Employer shall conduct noise monitoring in accordance with 1910.95(d)**
- **Monitoring strategies must be designed to:**
 - identify workers to be included in the Hearing Conservation Program
 - aid in the selection of hearing protection

Objective 1

6

- Three types of noise monitoring instruments are used:
 - Noise dosimeters—This instrument calculates TWA exposures by integrating all sounds between 80 and 130 dBA. For OSHA compliance, dosimeters must meet ANSI standards and be accurate within 2 dBA.
 - Sound Level Meters (also ANSI approved)—used to :
 - spot check dosimeter readings
 - aid in engineering feasibility of individual noise sources
 - evaluate hearing protection
 - Octave Band Analyzers—used to measure sound pressure levels at various frequency ranges. Useful in the design of acoustical controls.
- Employees shall be notified of noise monitoring results, 1910.95(e).

Noise Control

- Audiograms and hearing protection required at sound levels above the OSHA action level of 85 dBA
- Engineering controls required at sound levels above the OSHA PEL-TWA of 90 dBA

Objective 2

7

- As discussed previously, control measures include:
 - administrative—rotating workers, noisiest operations when fewest employees present, hire legally deaf workers
 - engineering—vibration isolation, enclosures, insulation, isolation, lubrication
 - personal protective equipment—muffs, plugs
- The ACGIH TLV of 85 dBA is actually half the OSHA TWA, or equal to the OSHA action level. This is because the logarithmic decibel scale results in a five decibel doubling rate.

Evaluating Laser Hazards

■ Classes of Lasers

- Class 1
- Class 2a
- Class 2
- Class 3a
- Class 3b
- Class 4

Objective 1

8

- Lasers are split into 4 classes. The basis of the hazard classification scheme is the ability of the primary laser beam or reflected primary laser beam to cause biological damage to the eye or skin during intended use. Class 1 is the least hazardous, class 4 the greatest hazard.

Evaluating Laser Hazards

- **Class 1**
- **Incapable of damage**
- **No warning label required**

- Class 1 laser is one that is considered to be incapable of producing damaging radiation levels and is, therefore, exempt from any control measures or other forms of surveillance.
- Class 1, or exempt lasers, are those which cannot under normal operating conditions emit a hazardous level of optical radiation. No warning label or control measure is required for this class.

Evaluating Laser Hazards

- **Class 2**

- **Class 2a**

- "Caution—Do not stare into beam"

- Class 2 lasers (low-power) are divided into two subclasses, 2 and 2a. A class 2 laser emits in the visible portion of the spectrum (0.4 to 0.7 μm) and eye protection is normally afforded by the aversion response including the blink reflex.
- Class II, or low-power laser devices, are those visible lasers which do not have enough output power to injure a person accidentally, but which may produce retinal injury when stared at for a long period. A "Caution-Do Not Stare Into Beam" label is required.

Evaluating Laser Hazards

■ Class 3a

- "Caution—Do not stare into beam or view directly with optical instruments"

■ Class 3b

- "Danger—Avoid direct exposure to beam"

- Class 3 lasers (medium-power) are divided into two subclasses, 3a and 3b. A Class 3 laser may be hazardous under direct and specular reflection viewing conditions, but the diffuse reflections is usually not a hazard. A Class 3 laser is normally not a fire hazard.
- Class IIIa covers visible lasers that cannot injure the unaided eye of a person with a normal aversion response to a bright light, but may cause injury when the energy is collected and put into the eye, as with binoculars. A "Caution-Do not stare into beam or view directly with optical instruments" label is required.
- Class IIIb consists of lasers which can produce accidental injury if viewed directly. The danger from such a laser is the direct or specularly reflected beam. A warning label which states "Danger-Avoid Direct Exposure to Beam" is required.

Evaluating Laser Hazards

■ Class 4

- "Danger—Avoid eye or skin exposure to direct or scattered radiation"

- Class 4 laser (high-power) is a hazard to the eye and skin from the direct beam and sometimes from a diffuse reflection and also can be a fire hazard.
- Class IV lasers not only produce a hazardous direct or specularly reflected beam but can also be a fire hazard or produce a hazardous diffuse reflection. A label stating "Danger-Avoid eye or skin exposure to direct or scattered radiation" is required.

Controlling Laser Hazards

- Time—nanoseconds to seconds of pulse duration
- Distance—aperture opening
- Shielding—eye protection

- Controlling laser hazards includes limiting apertures of exposure source and length of time of exposure, and the use of eye protection.
- Selection of eye protection depends on:
 - Wave length
 - Radiation exposure
 - Desired optical density

Hazard Recognition

■ Extreme Temperatures

- Heat—temperature range from 77°F to 95°F WBGT
- Cold—temperature range from -60°F to 50°F with windspeed from 5 mph to 40 mph

■ Physiologic tolerance limits

Objective 1

14

- While OSHA does not regulate temperature extremes in the workplace, ACGIH recommends threshold limit values for both cold and heat stress.
- WBGT—wet bulb globe temperature takes into account radiative effects of heat and wind speeds
- Cold temperatures will also contribute to ergonomic hazards.

Control Measures—Temperature Extremes

- **Cold stress—adequate insulating dry clothing, gloves and warming rest breaks**
- **Heat stress—acclimatization, water supplementation, special clothing, cooling vests and rest breaks in cool areas**

Objective 2

15

- The cold stress TLVs are intended to protect workers from hypothermia. The objective is to prevent the deep body temperature from falling below 96.8°F and to protect all parts of the body with emphasis on the hands, feet and head from cold injury. Both temperature and wind speed are considered.
- Heat stress is the combination of factors (air temperature, humidity, radiant heat exchange, air movement and work load) which constitute the total heat load imposed on the body. Symptoms of heat stress include:
 - cramps - spasms of the voluntary muscles usually occurring after heavy sweating and at the end of the work shift
 - exhaustion - profuse sweating, weakness, rapid pulse, nausea and headache. The skin is cool, pale and clammy.
 - stroke - sweating is diminished or absent. The skin is hot, dry and flushed. Increased body temperature may lead to convulsions, coma and death. Medical care is urgently needed.
- Control measures for heat stress include decreasing work loads, providing adequate rest in a cool area, providing sufficient (one cup every 15 to 20 minutes) cool (50 to 60° F) water.

Evaluating Ergonomic Hazards

- Layout of work area
- Improper tools
- Mechanical vibration
- Poor posture
- Repetitive motion

Objective 1

16

- Ergonomic hazards refer to workplace conditions that pose a biomechanical stress to the worker. These conditions include faulty work station layout, improper tools, excessive tool vibration, job design problems, line speed, posture and repetition.
- In recent years, there has been a significant increase in the reporting of cumulative trauma disorders (CTDs) and other work related disorders related to ergonomic hazards. CTDs account for nearly half of the occupational illnesses reported in the annual BLS survey. As a result of this, OSHA has developed guidelines on ergonomics program management to assist employers in meeting their responsibilities under the OSHA Act. Ergonomics hazards may be cited under the General Duty Clause.
- OSHA's "Ergonomics Program Management Guidelines for Meatpacking Plants", includes the following elements, which can be applied to other industries:
 - management commitment and employee involvement
 - worksite analysis
 - hazard prevention and control
 - medical management
 - training and education
- Cumulative trauma disorders include:
 - back injuries
 - carpal tunnel syndrome
 - DeQuervain's disease
 - trigger finger
- Video cameras are being used more and more often to evaluate ergonomic risk factors.
- Ergonomic hazards related to computer use and office work stations will be discussed in more detail in the office safety section.

Controlling Ergonomic Hazards

- **engineering—work station and tool design**
- **administrative—decreasing production rates, job rotation, modify line speeds, staffing, employee training and practice**
- **PPE—properly fitting gloves and protection against cold**

Objective 2

17

- Work station design should accomodate the individual.
- Work methods should be designed to reduce static, extreme and awkward postures, repetitive motion and excessive force.
- Tools and handles should be selected to eliminate or minimize chronic muscle contraction, tool vibration, excessive grippping, pinching and pressing.
- Work practice controls include proper work techniques with training and practice time for employees. Modify line speeds, staffing at the position, type, size, weight or temperature of the product handled.
- PPE includes properly fitting gloves and protection against cold. It does not include braces, splints, back belts.
- Administrative controls include decreasing production rates, limiting overtime, providing rest pauses, increasing the number of employees and using job rotation.

Bloodborne Hazards

■ Diseases caused by pathogenic bloodborne microorganisms:

- AIDS
- hepatitis B
- tuberculosis
- malaria
- syphilis
- brucellosis

Objective 1

18

- The rapid adoption of OSHA's bloodborne pathogen standard, 1910.1030, in 1992 occurred out of concern among hospital and emergency workers regarding increased incidences of these diseases, primarily AIDS and hepatitis; AIDS because it is always fatal and hepatitis because it is so contagious.
- The standard applies to employers with employees who have potential exposures to human blood and other human body fluids. Employers are required to prepare a written Exposure Control Plan which lists all job classifications and tasks in which exposures may occur.
- The standard does not cover Good Samaritan acts by co-workers.

Control of Bloodborne Pathogens

- **Infection control**
- **training**
- **universal precautions**
- **housekeeping**
- **personal protective equipment**
- **personal hygiene**
- **vaccinations**

Objective 2

19

- **Control measures ensure that these common workplace transmission routes do not occur:**
 - **needle sticks**
 - **sharps**
 - **maintenance and cleaning of centrifuges**
 - **blood splashing**
- **They may also include:**
 - **mechanical recapping devices for "sharps"**
 - **proper disposal methods**
 - **medical surveillance**
 - **autoclaves**
 - **biological safety cabinets**

Summary

Physical Hazards

- **Noise**
- **Non-ionizing radiation**
- **Temperature extremes**
- **Ergonomics**
- **Bloodborne pathogens**

OFFICE SAFETY AND HEALTH

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to recognize, evaluate and control hazards inherent to office space.

ENABLING OBJECTIVES

1. List three examples of principal causes of job-related injuries and illnesses in offices.
2. Explain methods to evaluate and control three of the potential office health and safety hazards discussed in this section.

REFERENCES

1. 29 CFR 1910

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes.
Overhead projector/viewer assembly
VCR/TV

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Office Safety and Health

Terminal Objective

The purpose of this section is to enable the supervisor to recognize, evaluate and control hazards inherent to office space.

Enabling Objectives

- 1. List three examples of principal causes of job-related injuries and illnesses in offices.**
- 2. Explain methods to evaluate and control three of the potential office health and safety hazards discussed in this section.**

Office Hazards

- Electrical
- Handling of materials or equipment
- Fire and egress
 - Falls
- Ergonomics
 - Video Display Terminals
- Indoor air quality

Objective 1

4

- More than 30 million people in the U.S. work in office settings. About 100,000 of these workers will suffer work-related injuries each year. Most of these are minor; however, it should be noted that 1 of every 22 worker's compensation claims is the result of an office injury. In addition, approximately 300 to 400 deaths of office workers per year are job-related. The cost of these injuries and deaths is more than 100 million dollars
- Although the majority of office injuries are minor, they have a definite impact on stress and productivity.

Electrical Hazards

- frayed electrical cords
- exposed wiring
- prongs missing from electrical plugs

Objective 1

5

- Electrical violations are the most common safety violations found in office environments.
- Every piece of electrical equipment (ie., computers, fans, lamps, copiers, electric typewriters) is a potential source of electrical shock.
- Exposed wires can cause shock and should be immediately disconnected
- show examples of hazards using slides
- More specific information on electrical hazards has been discussed already.

Material Handling and Storage Hazards

- **unsafe stacking of supplies**
- **twisting while lifting**
- **top-heavy bookcases and file cabinets**
- **lifting too heavy a load**

Objective 1

6

- About 25% of all occupational injuries are related to the handling and storage of materials. These injuries are not limited to the warehouse, but come from all operations, including the office. Such injuries are not limited to backstrains, but can occur to the legs, feet (by dropping heavy objects), fingers, hands, eyes. Common injuries are strains, sprains, fractures and bruises.
- You can see here that office hazards may be similar to hazards encountered in industrial settings. Information on material handling has also been discussed previously in this class.
- Common potential hazard examples listed on slide:

Ergonomics

- **Ergonomic hazards arise from any position requiring repetitive motion or poor posture**
- **VDTs**
 - Eye Strain
 - Musculoskeletal Strain

Objective 2

7

- Neither workers, not machines, nor workplaces exist apart from each other. To accomplish work, all come together and injuries and illnesses sometimes result from their interactions. The study of these interactions is ergonomics. Ergonomics controls involve redesigning the workplace to fit the worker rather than contorting the worker to fit the workplace.
- The primary ergonomic hazard found in offices is video display terminals, their keyboards and work stations.
- Carpal tunnel syndrome, related to extensive use of VDT keyboards, has overtaken dermatitis as the number one occupational illness.
- Hundreds of millions of VDTs are in use in the workplace.
- VDTs are time saving devices, but with increased production, certain physical complaints and other concerns have arisen.
- Before purchasing furniture for workers, the tasks performed by the workers should be analyzed, so that appropriate equipment can be purchased. Employees should receive training in use of the furniture and equipment.
- VDTs are not harmful to vision however discomfort may occur

Radiation and VDT Use

■ Types of Radiation Emitted from VDTs

- Ultraviolet
- Radio-frequency
- Infrared
- X-ray
- Ultrasound

Objective 2

8

- Ionizing radiation is given off in very low amounts by the cathode ray tube of VDT terminals - less than most TV sets, and most is contained by the glass screen.
- The phosphorous coating on the back of the VDT screen gives off visible and possibly ultra-violet rays as well as infra-red light. Again, most of these rays are contained by the glass screen.
- The horizontal deflection system, which moves the pulsating electron beam from the cathode ray tube back and forth across the screen, gives off low-frequency radio waves.
- All types of radiation emitted are well below current exposure standards. Emissions of ultraviolet and infrared waves are less than 1/100 of the allowable limits. X-ray and radio wave emissions are less than 1/10 of the allowable limit. The concern lies with pulsed VLF and ELF radiation (very low frequency and extra low frequency non ionizing radiation). The issue is currently being addressed.
- Although claims that VDT use may cause miscarriages or birth defects have been heard, there is no evidence that the rate of miscarriage is statistically significant. Since even a remote possibility of harmful health effects is serious, NIOSH plans a major epidemiological study of VDT safety and health problems

Stress and VDT Use

- **Methods of monitoring employee performance**
- **Inadequate employee training**
- **Job security issues**
- **Lack of worker participation in planning for VDT use**

Objective 2

9

- Automated systems which monitor employee performance are extremely stressful, as are incentives for higher production.

Indoor Air Quality

- Temperature and humidity
- Carbon dioxide
- Formaldehyde
- Ozone
- Total Suspended Particulate
- Volatile Organic Compounds
- Carbon Monoxide

Objective 2

10

- In any indoor air quality investigation, CO₂, temperature and humidity are generally the first three parameters which are measured.
- Other sources of employee complaints may be:
 - Formaldehyde - an irritant which may "offgas" from building materials or be emitted during smoking. Can cause eye, nose or throat irritation.
 - Ozone - may be emitted from improperly maintained photocopy machines
 - Total suspended particulate - levels may be high in areas where a great deal of paper is handled such as mail rooms or photocopy areas
 - Volatile Organic Compounds - may be emitted from building and furniture materials, maintenance, cleaning, cooking, or smoking. They can also come from outdoor pollution sources
 - Carbon Monoxide - a combustion by-product which could be present in higher than recommended levels if automobiles are left running near the air intake of the ventilation system, or gasoline powered engines are used indoors for floor cleaning or some other purpose

Evaluation of Office Hazards

- Good housekeeping?
- Exit lights visible and operational?
- Emergency egress unobstructed?
- Electrical outlets appropriately placed and protected?
- Electrical circuits not overloaded?
- Adequate lighting?

Objective 2

11

- Again, a checklist may come in handy to assist you in evaluating potential hazards in your office areas. These are not complete lists. Some other common deficiencies to look for in offices include:
 - proper storage of books and papers
 - emergency lighting operational and properly positioned
 - fire extinguishers adequate
 - uneven walking surfaces clearly indicated
 - extension cords covered when crossing walking areas
 - protruding objects eliminated or guarded
- Evaluation also includes determining how serious the hazard potential is. Accurate evaluation of hazards is the key to prioritizing those hazards, and taking actions to control them. DOE defines hazard categories as follows:
 - Category 1=hazard may cause death, serious injury, serious occupational illness or major loss of property
 - Category 2=hazard may cause minor injury, minor illness or minor property loss
 - Category 3=hazard will not result in death, injury, illness or property loss
- Office hazards are generally category 3; however, if you have many cases of carpal tunnel syndrome among clerical staff, then this could be considered category 1.

Evaluation of IAQ

■ Temperature

- Winter: 68-76°F is recommended
- Summer: 73-79°F is recommended

■ Humidity

- Comfort Range: 20-60% (40% is optimum)

Objective 2

12

- **Temperature:** Even if the temperature is well within the comfort range, some employees may be uncomfortable due to localized drafts. Sometimes an employee may be seated directly below a diffuser which has a relatively high downward airflow. The air velocity, rather than the temperature could make the employee uncomfortable. In this case, reducing the airflow to the diffuser, using a different type of diffuser, or relocating the employee's desk could alleviate the problem.
- **Humidity:** Below 20% employees complain of dryness, particularly in throat and nose. A relative humidity above 60% tends to encourage microbial growth (bacteria and fungi), another potential indoor air contaminant.

Evaluation of IAQ

■ Carbon Dioxide

- <600 ppm - Usually few complaints of discomfort at this level
- 600-1,000 ppm - Occasional complaints of headache, drowsiness, stuffiness, eye and throat irritation
- >1,000 ppm - Frequent complaints of symptoms listed above

Objective 2

13

- HVAC system measurements can be taken to determine how much air is being brought into the work area, but it gets rather complicated. Much of the office air is actually recirculated, and the amount of recirculated air is often dependent on the outside temperature. An easier way to determine the adequacy of fresh outside air is to take CO₂ measurements. CO₂ is a by-product of human respiration, and tends to accumulate in a workspace if the supply of fresh, outside air is inadequate. Many studies have been performed to establish correlations with CO₂ levels and employee satisfaction with indoor air quality. The following has been found:
 - Define "ppm" as parts of contaminant (CO₂) per million parts of air

Control of Electral Hazards

- **Repair or replace faulty equipment**
- **Machinery should be Underwriters Listed**
- **Properly ground all equipment**
- **Provide permanent covers or conduits for electrical cords**

Objective 2

14

- **Live parts of electrical equipment operating at 50+ volts must be guarded against contact with cabinets or enclosures - 1910.303(g)(2)**
- **Outlets should accomodate 3-wire grounding plugs**
- **UL listed machinery includes coffee makers, lamps, radios, microwave ovens, etc.**

Control of Storage Hazards

- **Anchor file cabinets and bookcases and use safety stops on drawers**
 - Bolt file cabinets together
 - Open only one file cabinet drawer at a time
- **Chairs should be sturdy and widebased, with secure casters and not used as stepladders!**

Objective 2

15

- When setting up new file cabinets, store heavy items in the bottom drawer. Bolt file cabinets together to prevent tipping over.
- A common office hazard is a file cabinet with only the top drawer full. There are numerous accounts of employees who opened the top drawer of a file cabinet, only to have the entire cabinet fall forward, injuring them.
- When opening file cabinet drawers, open one drawer at a time, slowly and carefully. Keep drawers closed when not in use.
- Avoid spring loaded typing desks. They can snap out unexpectedly, causing injury.
- Stack boxes/objects with heavy items on the bottom in even rows
- Avoid top-heavy file cabinets
- Repair sharp edges or points on furniture
- Stored materials should not create a tripping hazard

Control of Equipment Hazards

- **Secure creeping machinery**
- **Maintain photocopy machines on a regular basis**
- **Use office fans with a substantial base**

Objective 2

10

- **Improperly maintained photocopy machines have been found to emit ozone, therefore it is important to perform regular maintenance on these machines.**
- **Use only guarded office fans -1910.212(a)(5)**
- **Place machinery away from edges of desks or tables**

Control of Fall Hazards

- **Use good housekeeping procedures**
- **Skid-resistant coating especially on stairs**
- **Floors should be free of defective tiles or boards**
- **Repair or replace floor mats with curled edges or tears**

Objective 2

17

- **Spills are one of the major causes of falls in office settings.**
- **Prevent spills - use a tray or carton to carry beverages. When spills occur, wipe up immediately**
- **Good housekeeping is a must in areas where food is served or consumed, including snack areas with vending machines**
- **Use slip-resistant floor wax**
- **Electrical cords may be tripping hazards and should be kept under desks or along baseboards. If cords must cross walking areas, they should be taped to the floor or covered with a plastic runner. Extension cords should be eliminated wherever possible.**

Control of Lighting Hazards

- **Do not face employees toward windows, unshaded lamps, or other sources of glare.**
- **Walls should not reflect light**
- **In VDT areas, lighting should not exceed 50 footcandles (or 500 lux)**

Objective 2

18

- Where VDTs are used, avoiding glare is important. Also, less lighting is required when working with a VDT screen, since higher light levels tend to cause screen glare and reflection. This can lead to eye strain. If additional light is needed to see other papers at the workstation, a small desk lamp can be added.
- Do not place the VDT screen towards the window, which causes screen glare and reflection.

Control of VDT Hazards

■ To reduce eye strain during VDT use:

- Look away from your work periodically, focusing on distant objects for a few seconds
- Alternate VDT work with other tasks
- Remember to blink
- Use indirect lighting to control glare

Objective 2

19

- Eye Strain: VDT's are not harmful to vision; however if you use your eyes constantly on any task, discomfort may occur.
- Workers should have a comprehensive vision test before starting VDT work.
- NIOSH recommends a 15 minute break every 2 hours to reduce eye and muscle fatigue. NIOSH recommends, " Continuous work with VDTs should be interrupted periodically by rest breaks or other work activities that do not produce visual fatigue or muscular tension. As a minimum, a break should be taken after two hours of continuous VDT work, and breaks should be more frequent as visual, mental, and muscular burdens increase."
- Lighting is an important factor in VDT related eye strain. Direct lighting has traditionally been used in office settings, but is not optimal for VDT use, because it is too bright and creates glare. NIOSH recommends lighting levels of 500 to 700 lux, depending on how the work area is used. The lighting should be indirect to cut down on glare.

Control of VDT Hazards

■ **To reduce the incidence of muscle strain or fatigue:**

- Use chairs with adjustable height, backrest, and tension
- Use independently adjustable screens and keyboards
- Flexible workstation
- Alternate VDT and non-VDT tasks
- Educate workers in VDT equipment and furniture use

Objective 2

20

- Backaches and neckaches are common complaints of VDT users. Using furniture which is ergonomically sound will help to alleviate these problems. Alternating VDT and non-VDT tasks will also help.
- Educating workers in proper adjustment of chairs, screens, keyboards is just as important as providing each worker with the correct furniture and equipment. Management should take the time to show workers how to correctly adjust the furniture and equipment to suit their needs.

Control of IAQ Hazards

- **Ensure adequate fresh air supply**
- **Eliminate or control contaminant sources: chemical and microbial**
- **Continue to monitor employee complaints and symptoms**

Objective 2

21

- The American Society of Heating, Refrigerating and Air-conditioning Engineers recommends 20 cfm/person of fresh outside air anytime the building is occupied. This is based on an occupancy rate of 7 persons per 1000 square feet

Summary

- Common Injuries
- Health Hazards

CONFINED SPACE HAZARDS

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to recognize, evaluate, and control confined space hazards in the workplace.

ENABLING OBJECTIVES

1. Identify and define a confined space.
2. List the components of a safety program for confined space operations.
3. List the components of a permit.
4. List training requirements for confined space operations.

REFERENCES

1. National Safety Council, *Accident Prevention Manual for Industrial Operations*, 9th Edition, National Safety Council, Chicago, Illinois .
2. Office of the Federal Register, 29 CFR 1910, Permit Required Confined Spaces; Notice of Proposed Rulemaking, U.S. Government Printing Office, Washington, DC 20402-9328.
3. ANSI Z117.1-1977

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes.

Slide Manual with Instructor Notes.

Overhead projector/viewer assembly

Slide Projector and Slides showing confined spaces

VCR/TV

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operated for the U.S. Department of
Energy by Battelle Memorial Institute.

**1910.146 Permit
Required Confined
Spaces—A Final
Standard
January 14, 1993**

Terminal Objective

The purpose of this section is to enable the supervisor to recognize, evaluate, and control confined space hazards in the workplace.

Enabling Objectives

- 1. Identify and define a confined space.**
- 2. List the components of a safety program for confined space operations.**

Enabling Objectives

- 3. List the components of a permit.**
- 4. List training requirements for confined space operations.**

Confined Space Hazards

Permit Required Confined Space

Signed	January 6, 1993
Published	January 14, 1993
Effective Date	April 15, 1993

Page 1

5

Permit Required Confined Space

■ 1910.146(b) Confined means a space that:

- is large enough so that an employee can enter and work
- has limited means for entry or exit
- is not designed for continuous occupancy

Objective 1

8

• Examples of Confined Spaces

- Utility vaults
- Tunnels
- "Man" holes
- Silos
- Open tanks
- Ductworks
- Ditches and excavations

Characteristics of a Permit Required Confined Space

- Contains or has potential for hazardous atmosphere
- Contains the potential for engulfment
- Has a configuration such that an entrant could be trapped or asphyxiated
- Contains any other recognized serious Safety or Health Hazard

Confined Space Entry

■ 1910.146(b)

- Passing through an opening into a permit required confined space
- Entry has occurred as soon as any part of entrants' body breaks the plane of opening into the space

Hazardous Atmosphere

■ 1910.146(b)

- May expose employees to risk of death or incapacitation
- May impair ability of self rescue

Objective 1

Hazardous Atmosphere

■ 1910.146(b)

- Flammable gas, vapor or mist in excess of 10% of its LEL
- Combustible dust at or above LEL
- Oxygen below 19.5% or above 23.5%
- Airborne concentrations with potential to exceed PELs
- Any IDLH condition

Objective 1

10

- Combustible gas meters are designed to detect common flammable gases or vapors, but they cannot detect the presence of combustible dusts. Combustible dusts, such as metal or grain dusts can be nearly explosive in there danger, but only at very high concentrations. OSHA has therefore proposed a new standard for combustible dusts. The standard is based on visibility impairment of dusts. If you can not see farther than five feet than there is a potentially explosive condition and you must leave the space.
- Confined spaces are so dangerous because many of the hazards are not obvious. Chemicals such as carbon monoxide and carbon dioxide are odorless. Flammable or explosive chemicals may not seem to be at dangerous levels. Also, olfactory fatigue can lead to danger. After a while the odor "goes away" or you don't seem to mind it. Finally, one of the first symptoms of chemical overexposure is loss of judgement and light headedness. Unlike normal working accidents, confined space accidents all too often are fatal, multiple and sudden, occurring within minutes.

General Requirements 1910.146(c)

- (1) Hazard Identification**
- (2) Hazard control**
- (3) Permit system**
- (4) Employee Information**
- (5) Prevention of unauthorized entry**

Objective 1

11

- What is "entry"? Entry occurs as soon as any part of the body breaks the plane of the confined space.
- The purpose of the permit system is:
 - To ensure adherence to SOPs
 - To notify everyone involved
 - To prevent unnecessary entries
- Supervisors and other officials must sign off on each entry and be personally accountable.
- Permit form should have a checklist with provision for signing off on each of the above items as it is shown to be completed
- Permit gives notice to others--other shifts, contractors, maintenance

General Requirements

- (6) Employee training
- (7) Equipment
- (8) Rescue
- (9) Protection from external hazards
- (10) Duty to other employers

General Requirements

(10) Contractor/Multi-Employer Coordination

- Identified hazards
- Precautions and procedures
- Coordinate entry operations
- Debrief at conclusion of entry operations

Objective 2

1910.146(d) Permit Required Confined Space Program

- **Prevent unauthorized entry**
- **Identify and evaluate hazards prior to entry**
- **Develop and implement procedures and practices for SAFE permit entry operations**

Permit Required Confined Space Program

- **Testing/monitoring equipment and procedures**
- **Rescue services and communication**
- **Rescue equipment provided**
- **Communication equipment and procedures**
- **PPE**

Objective 2

Permit Required Confined Space Program

- **Lighting**
- **Barriers; shields for traffic/pedestrians**
- **Provisions for safe entry; exit**
- **Any other necessary equipment**

Permit Required Confined Space Program

■ **Shall include the following information:**

- Hazards of the space
- Isolation measures
- Acceptable environmental conditions
- Hazard Controls
 - LOTO
 - Flushing lines or vessels
 - Ventilating or inerting

Objective 2

Permit Required Confined Space Program

■ Testing before entry is authorized

- Use direct reading equipment
- Oxygen FIRST
- Combustibles, gases and vapors
- Toxics, gases and vapors

Permit Required Confined Space Program

- Attendants required for entry
- Develop and implement permit system that includes
 - preparation
 - issuance
 - use
 - cancellation
- Annual program review

Continued

1910.146(f) Confined Space Entry Permits

- **Identity of the permit space**
- **Duration of permit**
- **Purpose and date of entry**
- **Authorized entrants and eligible attendants (by name)**
- **Name and authorizing signature**

OSHA-10-1

20

- **Unless the individual who authorized an entry assumes direct charge of the entry for its duration, employers who intend to authorize entry in a permit space shall also include the following information:**
 - **Signature and Name to ensure legible accountability.**
Don't sign until all permit precautions have been taken.
Permit should be cancelled upon completion of work
 - **A permit may be valid for up to one year, so long as all conditions under which the permit was issued are maintained**

Confined Space Entry Permits

- Hazards of space
- Hazard control measures
- Acceptable entry conditions
- Test results

Confined Space Entry Permits

- **Rescue and emergency services**
- **PPE required**
- **Other necessary information**
- **Other permit information (Hot work, LOTO)**

1910.146(g) Training and Duties of Entrants

- Before assignment
- Before change in duties
- Whenever operations change
- Whenever deviations from procedures occur
- Inadequacies in program are noted

Objective 4

Training and Duties of Entrants

- **Establish employee proficiency**
- **Employer certification**

Objective 4

Training and Duties of Entrants

- (1) Hazard recognition
- (2) Communication
- (3) Personal Protective Equipment (PPE)
- (4) Self-Rescue

Objective 4

25

- Hazard recognition includes:
 - Know the potential hazards
 - Recognize signs and symptoms of exposure
 - Understand the consequences of exposure
- Communication includes:
 - Entrants must maintain contact with attendant
 - Notify attendants if evacuating
- Entrants must evacuate when:
 - detects prohibited condition
 - Ordered by attendant
 - Automated alarm is activated
 - Entrant perceives danger

Training and Duties of Attendants

■ Attendants shall:

- Remain outside permit space at all times during entry operations
- Maintain an accurate count of all persons in the space
- Receive training
 - Hazard recognition
 - Monitor activities for safety

Objective 4

Attendant Communication

- **Maintain effective and continuous contact**
- **Immediate evacuation shall be ensured when attendant:**
 - Observes a prohibited condition
 - Detects behavioral effects of exposure
 - Detects an uncontrolled hazard in the permit space

Objective 4

1910.146(j) Duties of Entry Supervisors

- Know hazards
- Inspect permit before signing
- Ensure entry operations follow permit
- Deal with unauthorized entry
- Cancel permit if conditions warrant
- Removes unauthorized individuals

Objective 4

28

1910.146(k) Rescue and Emergency Services

- **DON'T BECOME ANOTHER VICTIM!!**
- **60% of all fatalities are rescuers!**
- **Notify emergency personnel**
- **Use rescue equipment provided**

Rescue and Emergency Services

- **All employers with employees entering permit required confined spaces must provide for rescue**

Rescue and Emergency Services

■ Rescue Service

- Trained for assigned duties
- Properly equipped
- Annual practice rescues

Rescue and Emergency Services

■ Membership Qualifications:

- all trained in basic first aid and CPR
- at least one member with current first aid and CPR certification

Rescue and Emergency Services

- Retrieval systems or methods required
- Chest or full body harnesses with retrieval line
- Wristlets authorized in limited situations
- Retrieval line attached to mechanical device or fixed point outside space
- Mechanical device required for spaces deeper than 5 feet

Objective 4

Summary

- Definition
- Safety Program
- Permits
- Training

LOCKOUT/TAGOUT

TERMINAL OBJECTIVE

The purpose of this section is to introduce the supervisor to the OSHA regulations concerning LOTO.

ENABLING OBJECTIVES

1. Describe four hazardous energy sources and evaluate the type of hazard each poses.
2. List and explain three OSHA requirements for an effective energy control program.
3. Discuss the limitations of tags and explain why tags alone provide inadequate worker protection from hazardous energy sources.

REFERENCES

1. 29 CFR 1910
2. DOE Order 5480.19, Chapter 9

DURATION

One-half hour

INSTRUCTOR MATERIALS

AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100

Silver Spring, Maryland 20910

301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

3 of 6

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Lockout/Tagout

Terminal Objective

The purpose of this section is to introduce the supervisor to the OSHA regulations concerning LOTO.

Enabling Objectives

- 1. Describe four hazardous energy sources and evaluate the type of hazard each poses.**
- 2. List and explain three OSHA requirements for an effective energy control program.**
- 3. Discuss the limitations of tags and explain why tags alone provide inadequate worker protection from hazardous energy sources.**

Recognition of Hazardous Energy Sources

- High pressure gases
- High pressure fluids
 - Hydraulic fluids under pressure
- High pressure steam
 - Steam or compressed air

Objective 1

4

- Stored energy from fly wheels, cams dead weight or stock can suddenly and unexpectedly shift. This stored energy can be residual energy within the machine that was not fully expended as the mechanisms came to a stop. Examples of residual energy include: 1. springs that are still under tension or compression, 2. Residual Pressure (either high pressure or a vacuum) from gases or liquids.

Recognition of Hazardous Energy Sources

- **Vacuum sources**
- **Energy stored in springs**
- **Electrical power**
- **Potential energy from suspended parts or stock**

Objective 1

5

- Unexpected movement in a turned off machine can come from remaining potential energy. Potential energy is due to an object's height. As a machine rolls to a stop, all its parts do not come to rest at the lowest point. This potential energy can suddenly be converted to mechanical energy or movement. The result may be a serious or fatal crushing injury or amputation.
- Wedges, chocks or blocks are just some of the restraining devices that can be used to restrain a piece of equipment or secure stock or material while performing maintenance or service work on a machine. Care shall be taken in the design and implementation of any restraining system to ensure that it is fully adequate for the job and not just providing a false sense of security.
- Accidents have occurred because an employee was just passing by and turned on a machine without thinking.
- Just turning off the switch is not good enough for two more reasons involving electrical wiring: 1. There could be a frayed cord or other problem causing a short-circuit and the machine could become activated even though the machine's switch was turned off. 2. Also, it is possible that while working on the machine a worker could inadvertently short across the switch with a screw driver or other metal tool and start the machine without flipping the switch, just like hot-wiring a car without turning on the ignition switch

Lockout/Tagout
**Recognition of Hazardous Energy
Sources**

■ **Identify residual energy**

- mechanical
- hydraulic
- compressed air

Objective 1

6

- Stored energy may be mechanical, hydraulic or air.
- Since evaluation and control of hazardous energy sources will be the same regardless of the source, discussed evaluation and control measures will apply to all sources

Evaluation of Energy Source Hazards

- Is all machinery locked-out during cleaning, servicing, adjusting or setting up operations?
- Is all stored energy released before lockout?
- Are all equipment control valve handles provided with a means for locking-out?

Objective 1

7

- A checklist which includes the following may be useful:
 - Where the power disconnecting means for equipment does not also disconnect the electrical control circuit:
 - are the appropriate electrical enclosures identified?
 - is means provided to assure the control circuit can also be disconnected and locked-out?

Evaluation of Energy Source Hazards

- **Identify any or all employees who may work on locked-out equipment**
- **Determine whether all equipment or lines can be shut down, locked-out and/or tagged**

- If equipment or power lines cannot be locked-out, an energy control program with a tagout system must be established in accordance with 1910.147 (c)(2).

Control of Hazardous Energy Sources

- **Each energy source shall be isolated and locked out**
 - Locks
 - Blank flanges
 - Chains or cables
- **Authorized employees only**
- **Each involved employee shall lock**
- **Locks shall prevent reactivation**

Objective 1

9

- Actual lockout devices shall be applied to secure the energy sources in their isolated position
- Each and every employee that is involved in servicing or repairing the machine shall apply their own individual lock. Otherwise, it happened that operators thought everyone was all clear and started up the equipment, with disastrous results.
- By far most energy devices are designed to be locked out. The few devices that aren't, can often be easily modified to accept a lock, for instance by welding on a hasp.
- Locks can be color coded to identify the department or craft, and should be marked or tagged to identify whose lock it is.
- 1910.147(d)

Control of Hazardous Energy Sources

- **Energy control programs must be established**
- **Standard operating procedures include the following:**
 - Machine or equipment isolation
 - Orderly shutdown by authorized employee only

Objective 2

10

- Lock-out of control circuits instead of main power disconnects should be prohibited.
- Energy control programs must be established, 1910.147(c)
- The authorized employee is required to give prior notice to any other employees who may be affected by the shutdown. Affected employees shall also be notified at the completion of the lockout. This notice and coordination is especially important for process lines.

Control Measures

- **Review all steps in control program**
- **Visual inspection**
- **Attempt start-up**
- **Test circuit**

Objective 2

11

- Before beginning work on the locked equipment, the authorized employee shall review the steps taken and verify that the proper procedures have been followed regarding Shutdown, Isolation, Lockout and Residual energy control.
- 1910.147(d)

Testing of Control Program

Required sequence:

1. Clear the area of tools, material and personnel
2. Remove lockout devices in proper manner
3. Energize and conduct testing
4. Deenergize and follow proper LOTO procedures
5. Continue with service work

Objective 2

12

- It may be necessary to test or position a machine or component, 1910.147(c)(4)

Control Measure—Release from Lockout

- **The employer may remove a lock only if they have:**
 - Verified that the employee who applied the lockout device is not on site
 - Made all reasonable efforts to contact the employee

Objective 2

13

- Prior to re-energizing the main power switch, employees should push the control circuit stop button.
- Employees should have individually keyed personal safety locks and should be required to personally control key use.
- Employers may only remove another's lockout device if they have specific, documented procedures and training that provide equivalent safety as having that employee remove their own device, 1910.147(e).

Control Program Requirements—Tagout

- legible and understandable
- shall identify who applied it
- shall be able to withstand their environment
- shall be securely attached
- cannot be removed except by the authorized employee who attached it
- shall include proper warning

Objective 3

14

• 1910.147(c)(5)

Control Program—Tagout

■ Limitations of tags

- Can become illegible from liquids or corrosives
- Can become dislodged or removed

Objective 3
15

- Is the locking-out of control circuits instead of locking out main power disconnects prohibited?
- Accident prevention signs and tags should also be used in accordance with 1910.145.

Required Control Measures

■ Locks required unless "full employee protection" can be demonstrated

- Tagout procedures:
 - shall provide equivalent safety as lockout devices
 - may require additional measures such as removal of an isolating circuit element, or removal of valve handle(s)

Objective 3
16

- Some safety magazines and newsletters that have discussed this new lockout/tagout rule have given the erroneous impression that OSHA "prefers" locks over tags but does not actually require physical lockout devices. This is entirely void of verisimilitude.
- If an employer intends to dispense with locks and rely on tags for hazardous energy control, then OSHA requires that employer to demonstrate that their tagout program and procedures provide "full employee protection" equivalent to a lockout program. The employer may also be required to take extra steps to isolate hazardous energy sources since they aren't being secured with locks. So employers would be better off just to develop a good lockout program in the first place.
- 1910.147(c)(1) and (5)

Control Measures—Training

■ **Before a shutdown of equipment, authorized employees shall know:**

- Type and magnitude of energy
- Hazards involved
- Means of control

Objective 2

17

- 1910.147(c)(7)

Control Measures—Training

- **Authorized employee training:**
 - Hazardous energy recognition
 - Energy isolation and control methods
- **Affected employee training:**
 - The purpose of the energy control procedure
- **Retraining:**
 - Change in job assignments, equipment or process
 - Change in energy control procedures

Objective 2
18

- This standard distinguishes between three employee groups:
 - 1. Authorized employees who will be performing LOTO procedures and need special training
 - 2. Affected employees work nearby a LOTO procedure and need to know what's going on and how to stay out of the way. An affected employee may also be having LOTO work done on their machine but in that case is not directly involved.
 - 3. Other employees are those working in an area where LOTO work may occur. They need to know the about the LOTO program and shall be drilled on the importance of staying away from locked out/ tagged out equipment.
- Other employee training:
 - Hands off!
- Retraining is required whenever changes occur resulting in new hazards or new LOTO procedures.
- The employer shall certify that employee training has been accomplished and is being kept up to date. The training certificate shall include the employee's name and dates of training.
- Certification of training required
- Retraining is also required whenever inspections or other information reveal program inadequacies
- 1910.147(c)(7)

Summary

- Hazardous Energy Sources
- Control Program
- Tags

MATERIAL HANDLING & STORAGE

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to recognize material handling and storage hazards in the workplace.

ENABLING OBJECTIVES

1. Identify general hazards associated with material handling and storage.
2. State the major contributing causes of back and other injuries resulting from material handling hazards, and control mechanisms.
3. Identify general hazards associated with powered movement of material to storage areas.
4. Apply appropriate corrective actions to eliminate material handling and storage hazards.

REFERENCES

1. 29 CFR 1910, Subpart N
2. 29 CFR 1926

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes.
Overhead projector/viewer assembly
VCR/TV

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operated for the U.S. Department of
Energy by Battelle Memorial Institute

Material Handling & Storage

Terminal Objective

The purpose of this section is to enable the supervisor to recognize material handling and storage hazards in the workplace.

Enabling Objectives

- 1. Identify general hazards associated with material handling and storage.**
- 2. State the major contributing causes of back and other injuries resulting from material handling hazards, and control mechanisms.**

Enabling Objectives

- 3. Identify general hazards associated with powered movement of material to storage areas.**
- 4. Apply appropriate corrective actions to eliminate material handling and storage hazards.**

Back Injuries

■ Contributing Factors

- Weight/bulkiness of objects
- Improper lifting
- Failure to use available equipment/assistance
- Poor job design

Associated Injuries

- **Hand/Foot Injuries**
- **Sprains/Strains**
- **Fractures and Bruises**
- **Cuts and Lacerations**

Material Handling & Storage

1910.176 (b)

- **Storage of material shall
not create a hazard**

**Subpart D—Walking/Working
Surfaces**

- 1. General housekeeping**
- 2. Aisles and passageways**
- 3. Floor holes and openings**
- 4. Floor loading**
- 5. Ladders/scaffolds**

Subpart E—Means of Egress

- **Unobstructed Access**
- **Furnishings/Decorations**
- **Headroom**
- **Exit Identification**

Subpart F—Powered Platforms, Manlifts and Vehicle-Mounted Work Platforms

- **Inspections**
- **Loading Limits**
- **Material and Tool Storage**

Subpart G—Occupational Health and Environmental Control

- Walkways near spray finishing
- Storage of combustibles
- Access to eyewash/showers
- Ionizing radiation

Subpart H—Liquefied Hydrogen

- Approved containers
- Properly labeled
- Posted "No Smoking"
- Located away from ignition sources
- Proper location
- Fire resistant storage

Subpart H—Oxygen (Bulk)

- **Outdoor or noncombustible storage rooms**
- **No asphalt floors**
- **Separated from congested areas**
- **Properly labeled**
- **No ignition sources**
- **Posted "No Smoking"**

Subpart H—Flammable and Combustible Liquids

- **Portable Container Storage**
- **Only approved containers**
- **Maximum 60 gallons Class I in
storage cabinet**
- **Storage cabinet design**
- **Storage cabinets properly labeled**

Portable Container Storage

- Prohibited in offices
- Quantities limited per fire area
- Extinguishers required

Flammable/Combustible Liquids

■ Control of Ignition Sources

- Open flames and smoking
- Water reactive materials
- Electrical
- Adjacent equipment
- Chemical reactions
- Bonding/grounding
- Hot work

Subpart H—Spray Finishing

- **No storage within 3' of paint booth**
- **Maximum one day supply in work area**
- **Approved containers**
- **Residue removed**

Subpart H—Hazardous Waste Operation: Emergency Response (HAZWOPER)

■ Emergency Response

- Written plan
- Minimize potentials for spills/leaks
- Training for affected workers
- Response exercises

Subpart J—General Environmental Controls

- Housekeeping
- Waste Disposal
- Vermin Control

Subpart L—Fire Protection

- **Proper Fire Extinguisher Selection**
- **Unobstructed access for Alarms, Extinguishers, Hoses, etc.**

Subpart N—Material Handling & Storage

- Adequate aisles and passageways
- Secure storage
- Good housekeeping
- Proper clearance
- Guarding of pits/openings

Subpart N—Servicing Multi-Piece and Single Piece Rim Wheels

- **Trained Employees**
- **Restraining Devices**
- **Acceptable Wheel Components**

Subpart N—Powered Industrial Trucks

- Only Approved Trucks
- Modifications Not Allowed without Manufacturers Approval
- Trained Employees
- Proper Fuel Handling
- Battery Charging Provisions

Subpart N—Powered Industrial Trucks

- Safe operation at all times
- Stunt driving prohibited
- Brakes set when not in use
- Overhead protection for driver
- Secure dockboards/bridge plates

Subpart N—Powered Industrial Trucks Loading

- Only stable loads
- Within rated capacity
- Use care when tilting load

Subpart N—Cranes and Hoists

- **Daily Inspections**
- **Within Rated Capacity**
- **Trained Operators**
- **Hook and Rope
Selection/Inspection**

Subpart N—Slings

- **Daily Inspections**
- **Within Rated Capacity**
- **Damaged Slings Removed
from Service**

Subpart Z—Toxic and Hazardous Substances

■ OSHA Expanded Standards

- Asbestos
- Arsenic
- Lead
- Benzene
- Formaldehyde

Summary

- Major Hazards
- Back Injuries
- Transport
- Control

MACHINE SAFEGUARDS

TERMINAL OBJECTIVES

Given concepts and techniques of machine safeguarding, apply the safety requirements for general machine guarding.

ENABLING OBJECTIVES

1. List the hazards of machinery.
2. List the basic areas of machines that require safeguarding
3. Describe methods of machine safeguarding

REFERENCES

1. National Safety Council, 1985, *Supervisor's Safety Manual*, 6th Edition, National Safety Council, Chicago, Illinois.
2. Office of the Federal Register, "Subpart O, Machinery and Machine Guarding" Code of Federal Regulations, 29 CFR 1910, U.S. Government Printing Office, Washington DC 20402-9328.
3. U.S. Department of Labor, Occupational Safety and Health Administration, OSHA 3067, *Concepts and Techniques of Machine Safeguarding*, 1992 U.S. Government Printing Office, Washington DC 20402-9328.

DURATION

Two hours

INSTRUCTOR MATERIALS

Course manual with instructor notes.

Overhead projector/viewer assembly

Slide projector and slides showing machine guarding, Slide Manual with Instructor Notes

VCR/TV

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Machine Safeguards

Terminal Objective

Given concepts and techniques of machine safeguarding, apply the safety requirements for general machine guarding.

Enabling Objectives

- 1. List the hazards of machinery.**
- 2. List the basic areas of machines that require safeguarding**
- 3. Describe methods of machine safeguarding**

General Requirements

■ **Machine guards shall protect the operator and others nearby from hazards created by:**

- Points of Operation
- Nip Points
- Rotating Parts
- Flying Chips
- Sparks

Objective 1

4

- We will be discussing Subpart O in this section of the manual. Machine guarding was cited heavily in the Tiger Team inspections at all sites. One of the reasons for this is there are many older machines at many sites which were not originally equipped with guards meeting OSHA regulations.
- Show the examples of points of operation, nip points, rotating parts, in the following inserts (Inserts 1 & 2, Figures 2, 3 & 4).

General Requirements

■ Machine guards must:

- Be physically attached to the machine when possible
- Conform to specific standard when applicable, i.e., woodworking, abrasive wheels, etc.
- Be designed to keep operator from having any body part in the "danger zone" during operation when not covered by standard

Objective 3
5

- 1. Many types of machines have their own standards.
 - Woodworking machines - vertical standard, only applies to woodworking machinery and not metal working machinery.
 - Abrasive wheels
 - Cooperage Machinery
 - Mechanical Power presses
- 2. Each section or type of machinery have their own definitions section. These definitions apply to the machinery in that section and may be different than definitions for the same words or phrases in other sections.
- 3. Frequent Violations
 - 29 CFR 1910.212 (b) - Anchoring fixed machinery.

Hazard Recognition Mechanical

■ Motion Hazards

- Rotating
- Reciprocating
- Transversing

Objective 1
6

- Examples of rotating, reciprocating, and transverse motions are shown in the following inserts.
- 1. Rotating Motions - Smooth shafts can catch clothing and protruding objects can cause injury ,i.e. collars, couplings, protruding screws and shaft keys(Insert 3, Figure 1).
- 2. Rotating parts can create in running nip points
- 3. Reciprocating parts can strike a worker or catch a worker between the moving part and a stationary object(Insert 4, Figure 5).
- 4. Transversing Motion - continuous motion - worker may be struck by moving objects or the motion may create a sheer or nip point (Insert 4, Figure 6).

Hazard Recognition Mechanical

■ Actions

- Cutting - sheers, lathes, milling
- Punching - power presses
- Shearing
- Bending - press break

Objective 1

7

- 1. Cutting - Point of Operation Hazard - sheers, lathes and milling machines. Also, flying chip hazard - milling/machining operation, metal working machines, wood working machines.(Insert 5, Figure 7)
- 2. Punch - Point of Operation Hazard - power press operations - inserting/holding/removing stock.(Insert 6, Figure 8)
- 3. Shearing - similar to cutting - Point of Operation Hazard - inserting/holding/removing stock(Insert 6, Figure 9).
- 4. Bending - break press - Point of Operation Hazards - inserting/holding/removing stock(Insert 6, Figure 10).

Hazard Recognition Non-Mechanical

■ Other Hazards Associated with Machinery

- Electricity
- Hydraulic/High Pressure Systems
- Noise
- Chemical Contaminants Used with the Machine
- Housekeeping

Objective 3

8

- 1. Electricity - most machines use electrical power. Can be especially dangerous around wet operations.
- 2. Hydraulic/High Pressure Systems - hazard of stored energy released when operator is in danger zone. Also, failed system, sudden pressure release.
- 3. Noise - Machinery may create sufficient noise to institute a hearing protection program.
- 4. Chemical Hazards - many machines use hazardous materials with the machine. Certain cutting oils may be hazardous. Air contaminant survey should be performed by Industrial Hygienist.

Hazard Control

■ Machine Guards Must:

- Prevent Contact
- Be Secure
- Protect machine from falling objects
- Create no new hazards
- Create no interference & allow safe lubrication

Chapter 1
9

- 1. Prevent Contact - prevent workers' hands, arms and bodies from being in danger zone while machine is operating. Good safeguarding eliminates need for operator entry into danger zone.
- 2. Secure - Guard must be secure and not easily removed or altered.
- 3. Protect Machine from Falling Objects - Guards should protect moving machine parts from falling objects. Objects that fall into machine may become projectiles.
- 4. Create No New Hazard - The guard should not create a hazard itself. Common hazards associated with guards are nip and shear points. Also, guards must be "finished" and free from sharp edges or protrusions that could cause cuts.
- 5. Create No Interference and Allow Safe Lubrication - Guard must create no interference to the easy operation of the machine. Guards that make operation or lubrication of the machine exceedingly difficult are often overridden by operator.

Hazard Control Methods of Safeguarding

■ Five Categories of Safeguards

- Guards - Physical Barrier
- Power Devices
- Location and Distance
- Feeding/Ejecting Methods
- Miscellaneous - Protective shields and awareness barriers

Chapter 1
10

- 1. Guard - Physical barrier preventing worker's body in danger zone.
- 2. Devices - Prevents machine operation under certain conditions (i.e., when operator is in danger zone).
- 3. Location and Distance - Isolating machine from worker population.
- 4. Feeding/ejecting methods - Auto feed and ejection of machine reduces operator entrance to danger zone.
- 5. Miscellaneous - Protective shields and awareness barriers.

Hazard Control Methods of Safeguarding

■ Guards

- Fixed Guards
- Interlock
- Adjustable
- Self adjusting

Course 3

11

- removable or openable guard that disables machine when not in place.
- adjusted by operator to accommodate differing stock sizes. Requires increased operator training and awareness (i.e. band saws).
- requires no operator action to adjust. Will accommodate variable stock sizes (i.e., radial arm saw, table saw).

Hazard Control Methods of Safeguarding

■ Devices

- Pull Back Devices
- Restraining Devices
- Presence Sensing Devices
- Safety Controls - Electromechanical, Trips
- Gates

Chapter 1
12

- 1. Pullback - removes operators hands from danger zone before machine cycles(Inserts 7 & 8, Figures 36, 37 & 38).
- 2. Restraint - restrains operator's hands so they may not be placed in the danger zone. Usually requires the use of feeding/removing tools(Insert 9, Figure 39).
- 3. Presence sensing devices.
 - Photo electric - Electronic eye - beam broken = machine off(Insert 10, Figure 32).
 - Radiofrequency - senses change in capacitance around sensors indicating the presence of the operator(Insert 11, Figure 34).
- 4. Electromechanical - contact bar or wire that disables machine with operator contact(Insert 11, Figure 35).
- 5. Safety trips -
 - - Bars, wires or other contact mechanism that disable machine when operator contacts the device. Protection for operator during slip or fall(Insert 12, Figure 41).
 - - Two Handed controls - requires both operator's hands to initiate machine cycle(Insert 13, Figure 45).
- 6. Gates - sliding or opening barriers designed to be opened between cycles. Most effective when interlocked (i.e., injection molding machines).

Hazard Control Methods of Safeguarding

■ Location and Distance

■ Feeding/Ejecting Methods

- Automatic/Semi-automatic Feed
- Automatic/Semi-automatic Ejection
- Robots

- 1. Location/Distance - Machine guarded by isolation or distance. Must ensure area is secure.
- 2. Feeding/Ejection Methods
 - Auto/Semi-auto Feeding - Removes need for operator hands in danger zone. Power feed, gravity feed, manual mechanical feed(Insert 14, Figures 51 & 52).
 - Auto/Semi-auto Ejection - Removes need for operator to reach into danger zone to retrieve finished parts. Air ejection, gravity ejection, mechanical ejection.
 - Robots - Automated feed, positioning and ejection greatly increases operator safety and eliminates need for operator in danger zone.

Hazard Control Methods of Safeguarding

■ Miscellaneous Aids

- Awareness Barriers
- Miscellaneous Protective Shields
- Hand Feeding Tools and Holding Fixtures

Chapter 3
14

- 1. **Awareness Barriers** - does not provide physical protection from hazards - serves only as a reminder.
- 2. **Miscellaneous Protective Shields** - protect operator from flying parts or chips (i.e., lathes, bench grinders).
- 3. **Hand Feeding Tools and Holding Fixtures** - Provides operator a method of placing, holding and retrieving stock without placing body part in danger zone (Insert 15, Figure 67).

Summary

■ Guards Should

- Require little or no operator action for protection.
- Provide safeguarding without unnecessary interference.
- Be difficult to override.

Extracted from

Concepts and Techniques of Machine Safeguarding

U.S. Department of Labor
Occupational Safety and Health Administration
1980 (Reprinted 1981)

OSHA 3067

Complete publication available from:
Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

Mechanical Hazards

The point of operation: that point where work is performed on the material, such as cutting, shaping, boring, or forming of stock.

Power transmission apparatus: all components of the mechanical system which transmit energy to the part of the machine performing the work. These components include flywheels, pulleys, belts, connecting rods, couplings, cams, spindles, chains, cranks, and gears.

Other moving parts: all parts of the machine which move while the machine is working. These can include reciprocating, rotating, and transverse moving parts, as well as feed mechanisms and auxiliary parts of the machine.

Types of Motion

Rotating

Collars, couplings, cams, clutches, flywheels, shaft ends, spindles, and horizontal or vertical shafting are some examples of common rotating mechanisms which may be hazardous. The danger-increases when bolts, nicks, abrasions, and projecting keys or set screws are exposed on rotating parts, as shown in Figure 1.

In-running nip point hazards are caused by the rotating parts on machinery. These parts may be contact (producing a nip point) or in close proximity to each other.

Reciprocating

Reciprocating motions may be hazardous because, during the back-and-forth or up-and-down motion, a worker may be struck by or caught between a moving and a stationary part.

Transverse Motion

Transverse motion (movement in a straight, continuous line) creates a hazard because a worker may be struck or caught in a pinch or shear point by the moving part.

TRANSVERSE MOTION OF BELT

Actions

Cutting Action

Cutting action involves rotating, reciprocating, or transverse motion. The danger of cutting action exists at the point of operation where finger, head, and arm injuries can occur and where flying chips or scrap material can strike the eyes or face. Such hazards are present at the point of operation in cutting wood, metal, or other materials. Typical examples of mechanisms involving cutting hazards include bandsaws, circular saws, boring or drilling machines, turning machines (lathes), or milling machines.

Bending Action

Bending Action results when power is applied to a slide in order to draw or stamp metal or other materials, and a hazard occurs at the point of operation where stock is inserted, held, and withdrawn.

Equipment that uses bending action includes power presses, press brakes, and tubing benders.

Bending

Punching Action

Punching action results when power is applied to a slide (ram) for the purpose of blanking, drawing, or stamping metal or other materials. The danger of this type of action occurs at the point of operation where stock is inserted, held, and withdrawn by hand.

Typical machinery used for punching operation are power presses and iron workers.

Shearing Action

Shearing action involves applying power to a slide or knife in order to trim or shear metal or other materials. A hazard occurs at the point of operation where stock is actually inserted, held, and withdrawn.

Typical examples of machinery used for shearing operations are mechanically, hydraulically, or pneumatically powered shears.

Shearing

Guards

Fixed

As its name implies, a fixed guard is a permanent part of the machine.

Fixed Guard on a Power Press

Self-Adjusting

The openings of these barriers are determined by the movement of the stock.

Self-adjusting guard on a jointer

Self-adjusting guard on a jointer

GUARDS

Method	Safeguarding Action	Advantages	Limitations
Fixed	Provides a barrier	<p>Can be constructed to suit many specific applications.</p> <p>In-plant construction is often possible</p> <p>Can provide maximum maintenance.</p> <p>Can be suitable to high production, repetitive operations.</p>	<p>May interfere with visibility</p> <p>Can be limited to specific operations.</p> <p>Machine adjustment and repair often require its removal, thereby necessitating other means of protection for maintenance personnel.</p>
Interlocked	Shuts off or disengages power and prevents starting of machine when guard is open; should require the machine to be stopped before the worker can reach into the danger area.	<p>Can provide maximum protection.</p> <p>Allows access to machine for removing jams without time-consuming removal of</p>	<p>Requires careful adjustment and maintenance.</p> <p>May be easy to disengage</p>
Adjustable	Provides a barrier which may be adjusted to facilitate a variety of production operations	<p>Can be constructed to suit many specific applications.</p> <p>Can be adjusted to admit varying sizes of stock.</p>	<p>Hands may enter danger area—protection may not be complete at all times.</p> <p>May require frequent maintenance and/or adjustment.</p> <p>The guard may be made ineffective by the operator.</p> <p>May interfere with visibility</p>
Self-adjusting	Provides a barrier which moves according to the size of the stock entering danger area.	Off-the-shelf guards are often commercially available.	<p>Does not always provide maximum protection.</p> <p>May interfere with visibility.</p> <p>May require frequent maintenance and adjustment.</p>

Gate

A gate is a movable barrier which protects the operator at the point of operation before the machine cycle can be started. Gates are, in many instances, designed to be operated with each machine cycle.

Shown below is a gate on a power press. If the gate is not permitted to descend to the fully closed position, the press will not function.

Power press with gate

DEVICES

Method	Safeguarding Action	Advantages	Limitations
Photoelectric (optical)	<p>Machine will not start cycling when the light field is interrupted.</p> <p>When the light field is broken by any part of the operator's body during the cycling process, immediate machine braking is activated.</p>	Can allow freer movement for operator	<p>Does not protect against mechanical failure.</p> <p>May require frequent alignment and calibration.</p> <p>Excessive vibration may cause lamp filament damage and premature burnout.</p> <p>Limited to machines that can be stopped.</p>
Radio-frequency (capacitance)	<p>Machine cycling will not start when the capacitance field is interrupted.</p> <p>When the capacitance field is disturbed by any part of the operator's body during the cycling process, immediate machine braking is activated.</p>	Can allow freer movement for operator.	<p>Does not protect against mechanical failure.</p> <p>Antennae sensitivity must be properly adjusted.</p> <p>Limited to machines that can be stopped.</p>
Electro-mechanical	<p>Contact bar or probe travels a predetermined distance between the operator and the danger area.</p> <p>Interruption of this movement prevents the starting of machine cycle.</p>	Can allow access at the point of operation	Contact bar or probe must be properly adjusted for each application this adjustment must be maintained properly.
Pullback	As the machine begins to cycle, the operator's hands are pulled out of the danger area.	Eliminates the need for auxiliary barriers or other	<p>Limits movement of operator.</p> <p>May obstruct work-space around operator.</p> <p>Adjustments must be made for specific operations and for each individual.</p> <p>Requires frequent inspections and regular maintenance.</p> <p>Requires close supervision of operator's use of the equipment.</p>

DEVICES (continued)

Method	Safeguarding Action	Advantages	Limitations
Restraint (holdback)	Prevents the operator from reaching into the danger area.	Little risk of mechanical failure.	<p>Limits movements of operator.</p> <p>May obstruct work space.</p> <p>Adjustments must be made for specific operations and each individual.</p> <p>Requires close supervision of the operator's use of the equipment.</p>
Safety trip controls: <i>Pressure-sensitive body bar</i> <i>Safety tripod</i> <i>Safety tripwire</i>	Stop machine when tripped.	Simplicity of use.	<p>All controls must be manually activated.</p> <p>May be difficult to activate controls because of their location.</p> <p>Only protects the operator.</p> <p>May require special fixtures to hold work.</p> <p>May require a machine brake.</p>
Two-Hand Control	Concurrent use of both hands is required, preventing the operator from entering the danger area.	<p>Operator's hands are at a predetermined location.</p> <p>Operator's hands are free to pick up a new part after first half of cycle is completed.</p>	<p>Requires a partial cycle machine with a brake.</p> <p>Some two-hand controls can be rendered unsafe by holding with arm or blocking, thereby permitting one-hand operation.</p> <p>Protects only the operator.</p>
Two-Hand Trip	Concurrent use of two hands on separate controls prevents hands from being in danger area when machine cycle starts.	<p>Operator's hands are away from danger area.</p> <p>Can be adapted to multiple operations.</p> <p>No obstruction to hand feeding.</p> <p>Does not require adjustment for each operation.</p>	<p>Operator may try to reach into danger area after tripping machine.</p> <p>Some trips can be rendered unsafe by holding with arm or blocking, thereby permitting one-hand operation.</p> <p>Protects only the operator.</p> <p>May require special features.</p>

DEVICES (continued)

Method	Safeguarding Action	Advantages	Limitations
<i>Gate</i>	Provides a barrier between danger area and operator or other personnel.	Can prevent reaching into or walking into the danger area.	May require frequent inspection and regular maintenance. May interfere with operator's ability to see the work.

Safeguarding by Location/Distance

The examples mentioned below are a few of the numerous applications of the principle of safeguarding by location/distance. A thorough hazard analysis of each machine and particular situation is absolutely essential before attempting this safeguarding technique.

To safeguard a machine by location, the machine or its dangerous moving parts must be so positioned that hazardous areas are not accessible or do not present a hazard to a worker during the normal operation of the machine. This may be accomplished by locating a machine so that a plant design feature, such as a wall, protects the worker and other personnel. Additionally, enclosure walls or fences can restrict access to machines. Another possible solution is to have dangerous parts located high enough to be out of the normal reach of any worker.

The feeding process can be safeguarded by location if a safe distance can be maintained to protect the workers hands. The dimensions of the stock being worked on may provide adequate safety. For instance, if the stock is several feet long and only one end of the stock is being worked on, the operator may be able to hold the opposite end while the work is being performed. An example would be a single-end punching machine. However, depending upon the machine, protection might still be required for other personnel.

The positioning of the operator's control station provides another potential approach to safeguarding by location. Operator controls may be located at a safe distance from the machine if there is no reason for the operator to tend it.

Feeding and Ejection Methods to Improve Operator Safety

Many feeding and ejection methods do not require the operator to place his or her hands in the danger area. In some cases, no operator involvement is necessary after the machine is set up. In other situations, operators can manually feed the stock with the assistance of a feeding mechanism. Properly designed ejection methods do not require any operator involvement after the machine starts to function.

Some feeding and ejection methods may even create hazards themselves. For instance, a robot may eliminate the need for an operator to be near the machine but may create a new hazard itself by the movement of its arm.

Using these feeding and ejection methods does not eliminate the need for guards and devices. Guards and devices must be used wherever they are necessary and possible in order to provide protection from exposure to hazards.

Danger Areas

The figures below show a type of robot in operation, the danger areas it can create, and an example of the kind of task (feeding a press) it can perform.

FEEDING AND EJECTION METHODS

Method	Safeguarding Action	Advantages	Limitations
Automatic Feed	Stock is fed from rolls, indexed by machine mechanism, etc.	Eliminates the need for operator involvement in the danger area.	Other guards are also required for operator protection—usually fixed barrier guards. Requires frequent maintenance. May not be adaptable to stock variation.
Semi-automatic Feed	Stock is fed by chutes, movable dies, dial feed, plungers, or sliding bolster.		
Automatic Ejection	Work pieces are ejected by air or mechanical means		May create a hazard of blowing chips or debris. Size of stock limit the use of this method. Air ejection may present a noise hazard.
Semi-automatic Ejection	Workpieces are ejected by mechanical means which are initiated by the operator.	Operator does not have to enter danger area to remove finished work.	Other guards are required for operator protection. May not be adaptable to stock variation.
Robots	They perform work usually done by operator.	Operator does not have to enter danger area. Are suitable for operations where high stress factors are present, such as heat and noise.	Can create hazards themselves Require maximum maintenance. Are suitable only to specific operations.

HAND & PORTABLE POWER TOOLS

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to associate the hazards and proper control measures in the use of hand and portable power tools.

ENABLING OBJECTIVES

1. Define the employer's responsibility for hand and portable power tools used on the work site.
2. Give typical examples of equipment and tool uses.
3. Identify potential safety hazards associated with hand and portable power tools, including improper tool selection and/or use.
4. Identify control and corrective action for tool hazards in the workplace.

REFERENCES

1. National Safety Council, 1985, *Supervisor's Safety Manual*, 6th Edition., National Safety Council, Chicago, Illinois.
2. Office of the Federal Register. "Subpart P, Hand and Portable Power Tools", *Code of Federal Regulations*, 29 CFR 1910. U.S. Government Printing Office, Washington, DC 20402-9328
3. OSHA 3067, Concepts and Techniques of Machine Safeguarding, 1981, U.S. Government Printing Office, Washington, DC 20402-9328.

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes.

Slide Manual with instructor notes.

Overhead projector/viewer assembly.

Slide projector

Video: "Power and Hand Tool Safety" by Tel-A-Train Time, 21 minutes

VCR/TV

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operated for the U.S. Department of
Energy by Battelle Memorial Institute.

Hand and Portable Power Tools

Terminal Objective

The purpose of this section is to enable the supervisor to associate the hazards and proper control measures in the use of hand and portable power tools.

Enabling Objectives

- 1. Define the employer's responsibility for hand and portable power tools used on the work site.**
- 2. Give typical examples of equipment and tool uses.**

Enabling Objectives

- 3. Identify potential safety hazards associated with hand and portable power tools, including improper tool selection and/or use.**
- 4. Identify control and corrective action for tool hazards in the workplace.**

1910.241(a)

Explosive—Actuated Fastening Tool Terms

Objective 1
6

- (1) Hammer-operated-low velocity
- (2) High-velocity
- (3) Low-velocity

Hand and Portable Power Tools

1910.241(b)

Abrasive Wheel

Terms

Objective 1
6

- (1) Mounted wheels
- (4) Portable grinding
- (6) Safety guard

1910.241(d) Jack Terms

OSHA 1910.241(d)
7

- (1) Jack—definitions
- (2) Rating—maximum working load

Hand and Portable Power Tools

1910.242

General Requirements

OSHA 1910.242
1

- (a) Employer/Employee responsibilities
- (b) Compressed air, 30 psi, cleaning purposes

Hand and Portable Power Tools

1910.243

Guarding of Portable Power Tools

OSHA 1
9

1910.243(a)(1)

Portable Circular Saws

OSHA 10

- (1) When are guards required

1910.243(a)(2)

Switches and Controls

Page 1
11

- i—constant pressure switches or constant pressure throttle
- iii—lock-ons premitted if turnoff can be accomplished by single motion
- (iii)(b) Saber, scroll and jib saws

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4 of 6

Hand and Portable Power Tools

1910.243(a)(3) Portable Belt Sanding Machines

Objective 3
12

- Nip point guards

1910.243(a)4,5 Cracked Saws, Grounding

Objective 3
13

- Remove from service
- Comply with Subpart S

1910.243(b)

Pneumatic Power Tools and Hose

Objective 3
14

- (1) Tool retainer
- (2) Airhose

1910.243(c)

Portable Abrasive Wheels

Objective 3
15

- (1) General requirements
- (2) Cup wheels
- (3) Vertical portable grinders
- (4) Other portable grinders
- (5) Mounting and inspection
- (6) Excluded machinery

Hand and Portable Power Tools

1910.243(d)

Explosive Actuated Fastening Tools

Objective 3
16

- (1) General
- (2) Inspection
- (4) Operating requirements

1910.243(e) Power Lawnmowers

Objective 3
17

- (1) General
- (2) Walk-behind and riding
- (3) Walk-behind rotary
- (4) Riding rotary

Hand and Portable Power Tools

1910.244
Other Portable Tools
and Equipment

OSHA 1
18

1910.244(a)

Jacks

Objective 4
19

- (1) Loading and marking
- (2) Operation and maintenance

1910.244(b)

Abrasive Blast Cleaning Nozzles

Objective 4
20

- Must be held open manually

Summary

1. Define the employer's responsibility for hand and portable power tools used on the work site.
2. Give typical examples of equipment and tool uses.

Summary

3. Identify potential safety hazards associated with hand and portable power tools, including improper tool selection and/or use.
4. Identify control and corrective action for tool hazards in the workplace.

WELDING AND COMPRESSED GASES

TERMINAL OBJECTIVE

The purpose of this section is to acquaint the participant with regulations covering welding operations. The following standards are included: 29 CFR 1910.252 through .255 (Subpart Q)

ENABLING OBJECTIVES

1. Given a situation involving the use of arc welding equipment or oxy-fuel cutting equipment, apply correct standards from 29 CFR 1910, Subpart Q to determine if the situation is in compliance with appropriate regulations.
2. Identify three types of health hazards associated with welding processes.
3. State and explain three requirements or precautions concerning fire hazards during welding processes per 29 CFR 1010.252(a).
4. State and explain three conditions which could affect the need for mechanical ventilation during welding operations per 29 CFR. 1910.252(a).
5. Identify three types of personal protective equipment required for the operator during welding operations per 29 CFR 1010.252(a).

REFERENCES

1. U.S. Department of Labor. date. *29 CFR 1910, General Safety and Health Standards*.
2. National Safety Council. 1988. *Accident Prevention Manual for Industrial Operations*, 9th edition.
3. National Fire Protection Agency. 1977. *Cutting and Welding Processes*. NFPA 51B-1977.
4. Mathews, L.G. 1981. *Fire Protection Handbook*, "Welding and Cutting". National Fire Protection Association.
5. National Electric Manufacturer's Association. date. *Requirements for Electric Arc Welding Apparatus*.
6. American Welding Society, Inc. 1983. *Safety in Welding and Cutting*. ANSI Z49.1-1983.
7. American Welding Society, Inc. *Terms and Definitions*. A3.0
8. American Welding Society, Inc. *Welding Handbook*, Vol. 1, 8th edition.

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes

Overhead projector/viewer assembly

Videotape: *Welding Safety—Securing the Work Zone* from Coastal Videos (16 minutes long)

Pacific Northwest Laboratory is
operated for the U.S. Department of
Energy by Battelle Memorial Institute.

Welding and Compressed Gases

Terminal Objective

The purpose of this section is to acquaint the participant with regulations covering welding operations. The following standards are included: 29 CFR 1910.252 through .255 (Subpart Q).

Enabling Objectives

- 1. Given a situation involving the use of arc welding equipment or oxy-fuel cutting equipment, apply correct standards from 29 CFR 1910, Subpart Q to determine if the situation is in compliance with appropriate regulations.**
- 2. Identify three types of health hazards associated with welding processes.**

Enabling Objectives

3. State and explain three requirements or precautions concerning fire hazards during welding processes per 29 CFR 1010.252(a).
4. State and explain three conditions which could affect the need for mechanical ventilation during welding operations per 29 CFR 1910.252(a).
5. Identify three types of personal protective equipment required for the operator during welding operations per 29 CFR 1010.252(a).

Introduction to Welding Processes

■ Arc welding includes:

- SMAW (Shielded Metal Arc Welding)=Stick Welding
- GMAW (Gas Metal Arc Welding)=MIG Welding
- GTAW (Gas Tungsten Arc Welding)=TIG Welding

Objective 1

5

- There are over 80 different kinds of welding processes and over 700,000 welders in the United States. Welding applications can be found in almost every manufacturing industry.
- Stick Welding is the most common form of welding. The welding rod (or electrode) is consumed during the process. Shielding is provided by rod coatings which form a gaseous flow that protects the arc from air.
- The second most common type of welding is gas metal arc welding. A wire electrode (usually the same composition as the base metal) is fed continuously from a spool. Shielding is provided by an inert gas fed into the electrode holder. Argon and helium are used for nonferrous metals. Carbon dioxide is used for steel.
- In gas tungsten arc welding, an arc is created between the base metal and a nonconsumable tungsten electrode. A filler metal in the form of a rod is fed into the arc. Shielding is provided by an inert gas. GTAW is expensive and slow, but provides high quality welds on thinner materials than other processes may burn through.

Introduction to Welding Processes

■ Oxyfuel Gas Welding or Cutting

- Usually the fuel used is acetylene
- Hydrogen, propane or methane may also be used.

■ Resistance welding

- Uses resistance of electric current

Objective 1

6

- Oxyacetylene welding is inexpensive and easily portable. However, the flame heats a wider area than arc welding and may weaken base metals.
- Resistance welding uses resistance of electric current to generate enough heat to cause localized fusion of the base metals.
- Resistance welding operations (for example, seam welding) are often automated.

Welding Safety Hazards

- Compressed gases
- Fire
- Electrical shock
- Confined spaces

Objective 1

7

- Fire prevention mainly involves separating or shielding welding processes from combustible materials.

Compressed Gas Cylinder Hazards

■ Compressed gases:

- are stores of potential energy
- may be flammable, i.e. acetylene
- may present other fire hazards, i.e. oxygen
- may be toxic, i.e. chlorine
- may be asphyxiants, i.e. nitrogen

Objective 1

8

- This is the definition of a compressed gas used by the American Welding Society. 29 CFR1910.251 refers to AWS definitions.
- A gas or mixture of gases having, in a container, an absolute pressure exceeding:
 - 40 psi at 70°F.; or
 - 104 psi at 130°F.
- A liquid having a vapor pressure exceeding 40 psi at 100°F as determined by ASTM
- Oxygen presents an explosion hazard because it is an oxidizer.
- Have class look up Subparts H, M, and Q for compressed gas standards.
- Compressed gas cylinders may be pressurized up to 2200 psi and can explode if they are overheated, knocked over or if valve is knocked off.

Welding Health Hazards

- **Fumes**
- **Gases**
- **Radiation**
 - Ultraviolet (UV)
 - Infrared (IR)
- **Noise**

Continued

9

- **Definition of fume:** particle formed after condensation of vaporized metal.
- Welding temperatures are well above the boiling points of most metals commonly used. (i.e.; arc's >6000 °F)
- As much as 2% of the electrode consumed can be generated as fume.
- "Welding Fume Fever" is caused by inhalation of zinc oxide fumes (created by welding on galvanized tin). It occurs anywhere from 4 to 12 hours after exposure and is characterized by fever and shaking chills. Other metals that may cause this response include copper and to a lesser extent, magnesium.
- Chronic inhalation of metal fumes can also cause a build up of particulate matter in the lungs called pneumoconiosis. Different kinds of metals cause distinct types of pneumoconioses. For example, iron causes siderosis; tin causes stannosis, beryllium causes berylliosis.
- PELs for cadmium, chromium, lead, or other highly toxic metals may be exceeded even though total welding fume is below the PEL of 5 mg/m³. Of these, cadmium may be the most dangerous due to severe acute toxicity on the respiratory system. There are no signs of irritation during exposure and initial symptoms may mimic welding fume fever. However, lung irritation is more severe than during metal fume fever and death by pulmonary edema may occur. Cadmium is usually generated from welding on plated metals.
- **GASES** Ozone is generated by argon shielded arc welding on aluminum, stainless steel, and some exotic metal bases (i.e.; titanium). It is a strong respiratory irritant that penetrates into the deepest regions of the lung.
- Phosgene is generated when chlorinated cleaning solvents break down under heat or radiation. It is another severe respiratory irritant but it affects the nasal passages and upper respiratory tract.
- Fluorine gas is generated by rods coated with a fluoride flux.

Evaluating Welding Hazards

■ Air monitoring

- Welding fumes: total particulate, chromium, nickel, iron
- Gases: CO, NO_x, O₃, F₂
- Decomposition of chlorinated hydrocarbons

■ Sound level measurements

Overview 2

10

- Discuss or show personal air sampling pumps and filters. Airborne levels for total fume may be as high as 10 mg/m³ while specific metal fume concentrations may range from 2 micrograms (nickel) to 20 micrograms (chromium) to 2000 micrograms (iron).
- Chromium and nickel (both carcinogens) are generated during welding on stainless steel and inconel.
- Fumes are more likely to be generated from "stick", TIG, MIG and plasma arc welding than from submerged, resistance or gas welding.
- Fluorides are most likely from low hydrogen welding.
- Ozone is highest during MIG and plasma welding.
- Co and NO_x are highest during plasma and gas welding.
- Decomposition of chlorinated hydrocarbons (phosgene) is most likely during TIG, MIG and plasma.
- Radiant energy (UV) is worst from TIG, MIG and plasma.
- Noise is worst during plasma arc welding and cutting.

Control Measures

■ Management responsibilities:

- Establish safe areas and procedures for welding
- Designate an individual responsible for authorizing welding areas
- Provide training for supervisors & welders
- Advise contractors of fire hazards

Objective 3

11

- 1910.252(a)(2)(xiii)

Supervisor's Responsibilities

■ Supervisors shall:

- Ensure the safe handling and use of welding or cutting equipment.
- Ensure that fire hazards are controlled and that authorization is obtained
- Ensure that equipment is properly labeled

Objective 3
12

- Welding equipment must be labelled with warnings or identified through standard color coding.: Gauges on regulators shall be marked "USE NO OIL"; hoses shall be color coded in generally recognizable colors; red for acetylene, green for oxygen, and black for inert gases.
- Supervisors must consult with the Safety organization whenever new or non-standard welding operations involve toxic substances such as fluorine compounds, zinc, lead, beryllium, cadmium, mercury or stainless steel. Use of degreasers may also warrant an evaluation by safety.
- 1910.252(a)(2)(xiv)

Operator's Responsibilities

■ Welders must:

- Be aware of all requirements concerning fire prevention and use of PPE and ventilation
- Flag defective equipment such as leaking or creeping gauges
- Use proper grounding procedures and equipment for arc welding

Objective 3

13

- Many of these requirements are not listed specifically in the CFR but are listed in NFPA 51B or in welding safety handbooks published by the American Welding Society (AWS).
- Oxygen must never be used to ventilate a confined space or dust off clothing
- All valves, gauges, and connections must be checked by welders for leaks before welding.
- Welders must:
 - Handle regulators carefully
 - Never oil a regulator

Compressed Gas Safety Control Measures

- **Cylinders and containers shall:**
 - be legibly marked to identify contents
 - have valve protection caps
- **Protective caps shall always be in place and hand tight, except when the cylinder is in use**
- **Empty cylinders shall have their valves closed**

Objective 3

14

- OSHA regulates compressed gases in 1910.101, which references the Compressed Gas Association Pamphlet P-1.
- Valve protection caps are required for cylinders if over 30 lbs. water weight capacity
- If a cylinder is missing its label or complete identification, it must not be used
- A Material Safety Data Sheet must be available for each type of compressed gas used or stored on site
- Cylinders should be inspected for corrosion, distortion, cracks, or defects
- 1910.253(b) regulates the use of cylinders for oxygen fuel-gas welding and cutting

Compressed Gas Cylinder Safe Operation

- A pressure reducing regulator shall always be used when withdrawing gas from a cylinder
- The regulator used with a gas cylinder shall be used only for the gas and pressure given on the label
- Connection threads of the regulator and cylinder shall be inspected
- Safety valves shall be tested frequently

Objective 3
15

- Cylinder valves shall:
 - Be kept clean and free of dirt or oil
 - Always be opened slowly
 - Never be forced open by wrench or hammer
 - Note: If the valve can't be opened by hand, return the cylinder to the supplier
- Be closed before the regulator is removed
- Tampering is not allowed with:
 - Numbers and markings stamped into the cylinder
 - Safety devices on valves
- Empty cylinders must:
 - Be marked "MT" or " Empty"
- 1910.253(b)(5) addresses operating procedures for cylinders

Compressed Gas Equipment Safe Operation

■ Hose and hose connectors

- When parallel lengths of oxygen and acetylene hose are taped together, no more than 4 of every 12 inches may be covered by tape.
- Hose showing leaks, burns, or signs of wear shall be repaired or replaced

Objective 3

16

- Hoses cannot be easily inspected if they are covered with too much tape. Also, tape may break down hose integrity. This is the reason for this OSHA requirement.
- 1910.253(e)(5)(ii) and (v)

Compressed Gas Cylinder Safe Handling

■ Cylinders shall not:

- Be dropped, struck or handled roughly
- Be lifted using the protection cap, a magnet, sling, or ropes.
- Be used as rollers or supports- even if empty

■ Unsecured cylinders shall not be left unattended

Objective 3
17

- Acetylene is stored with a filler material to help bind it and keep pockets of pure acetylene from forming. The cylinder must be kept upright! It is preferable to keep other cylinders upright, but not essential in all circumstances.
- Suitable hand-trucks must have:
 - adequate weight capacity
 - a saddle to cradle the cylinder
 - a chain to secure the cylinder
 - a set of rear support wheels
- 1910.253(b)(5)

Compressed Gas Cylinder Safe Storage

■ Cylinders shall be stored:

- In dry, well-ventilated, well-protected areas at least 20 feet from highly combustible materials
- At temperatures $\geq -20^{\circ}\text{F.}$ or $\leq 130^{\circ}\text{F.}$

■ Compressed gas cylinders should not be taken into confined spaces

Directive 3
18

- Cylinders shall not be stored in lockers or other unventilated enclosures
- Cylinders shall be stored:
 - Away from radiators and other sources of heat
 - In areas protected from passing or falling objects, vehicle or pedestrian traffic or subject to tampering
 - Away from elevators, stairs, or gangways
- Outside storage should not be in direct sunlight or should have roofs for shade. Heat from concrete, asphalt pads, storage on south or west sides of structures may result in overheating of cylinders.
- 1910.253(b)(2) and (3)

Fire Prevention and Protection

■ Basic precautions:

- Welding is prohibited unless the process can be separated from fire hazards by:
 - Moving the welding process
 - Moving the fire hazards (min. of 35')
 - Using guards to confine heat, sparks, and slag

Objective 1

19

- These OSHA standards are based on NFPA standard 51B "Standard for Fire Protection for Cutting and Welding Processes".
- "Fire hazards" are not defined in the welding section. However, it is intended to include all flammable and combustible liquids as well as wood shavings, baled cotton, explosive dust atmospheres, etc. 1910.252 (b)(iv) requires a 35 feet clean area (free of combustibles). 35 feet refers to the HORIZONTAL distance.
- 1910.252 (b)(iii)

Fire and Explosion Control Measures

- A separate room is necessary if more than 2,000 ft³ of fuel gas is to be stored in one area
- Oxygen cylinders shall not be stored near highly combustible materials, such as oil or grease—
1910.253(b)(4)
- Incompatible gases shall be separated by a fire wall or by 20 feet

Objective 1

20

• 1910.253(b)(4)

Fire Prevention and Protection

■ Special precautions (for guarding of fire hazards)

- A "Hot Work Permit" shall be obtained
- Combustible floors, walls shall be guarded
- Fire extinguishers shall be available

Objective 3
21

- If all fire hazards cannot be removed, OSHA regulations require that the area be inspected by a person responsible for authorization of welding operations. The inspection shall identify all fire hazards and designate necessary precautions such as adequate guards. A written authorization, such as a HOT WORK PERMIT is highly recommended.

- 1910.252(b)(ii) and (iii)

Fire Prevention and Protection

- A fire watch shall be posted when:
 - Appreciable combustible material is
 - Within 35 feet of the operation, or
 - More than 35 feet from the welding, but easily ignitable by sparks
 - Wall or floor openings within 35 feet expose combustible material
 - Combustibles are present on the opposite side of the wall being heated

Objective 1
22

- Welding is prohibited:
 - In areas not authorized by permit
 - In sprinklered buildings with impaired sprinkler systems
 - In the presence of explosive atmospheres
 - Near storage areas for readily ignitable materials
- Other fire prevention measures include:
 - Cleaning and venting used drums, barrels, or tanks prior to hot work
 - Disconnecting or blanking any pipes connected to tanks
- 1920.952(a)(2)(iii)

Electrical Hazards Control

■ Electrical safety requirements

- Ground connections shall be checked
- The current carrying capacity of the power supply conductors shall not be less than the rated primary current of the welding machine
- All AC and DC machines shall be connected with the same polarity

Chapter 1
23

- Ground connections shall be checked to assure they are mechanically strong and electrically adequate
- AC machines shall also be connected to the same phase of the supply circuit
- These requirements for welders are in addition to all the welders responsibilities listed earlier. Those listed here are specific to arc welding operations.
- Arc welding operators shall ensure that electrode holders cannot make electrical contact with persons, conducting objects, fuel or compressed gas cylinders
- 1910.254 and .253 (grounding for arc-welding and resistance welding)

Electrical Hazards Control

- **Electrode holders, welding torches, cables, or tools must never be placed on the cylinder**
- **Shielding gas cylinders used during arc welding must never be grounded**

OSHA 309

24

- No cylinder shall be placed where it could become part of an electric current. The following may result in cylinders becoming part of a current and causing electric shock to the welder.
- 1910.253(b)(5)(ii) and (J)

Controlling Welding Air Contaminants

1. Provide ventilation
2. Modify the process
3. Train the welder
4. Use personal protective equipment

Objective 1

25

- Modifying the process might include changing the base metal or flux used.
- Training for welders could include plans to set up the work area for best natural ventilation, methods to reduce generation of fumes, how to use local ventilation effectively, etc.
- The need for ventilation depends on:
 - The dimensions of the work area
 - The number of welders
 - The potential evolution of hazardous fumes, gases, or dusts
- 1910.252(c)

Health Protection and Ventilation

- **Mechanical ventilation is required for welding:**
 - In a space <10,000 cubic ft per welder
 - Ceiling height is <16 ft
 - In a confined space or poorly ventilated area
- **Mechanical ventilation shall provide $\geq 2,000$ cfm per welder unless local exhaust ventilation is used**

Objective 4

25

- Welding is often performed with no mechanical ventilation. This is acceptable only when the work space is sufficient to dilute contaminants by natural ventilation. For example, welding outdoors.
- In this case, mechanical ventilation is just supply air. Local exhaust ventilation is discussed next.
- 1910.252(c)(2)

Health Protection and Ventilation

■ Local exhaust hoods and booths

- Movable hoods shall have a capture velocity ≥ 100 fpm when at the farthest point from welding
- Minimum airflow velocities at other distances are shown in a table in this section of the code
- Fixed enclosures (i.e.; welding tables) shall also provide ≥ 100 fpm

Objective 4
27

- Have the students look up the minimum airflows at different distances from the hood. It's listed under 1910.252(c)(3)(ii)

Confined Space Ventilation

■ Ventilation in confined spaces

- If exhaust ventilation is not adequate, airline or SCBA respirators are required
- An outside helper is required when air supply respirators are required inside a confined space

Objective 4

28

- Detailed regulations concerning ventilation and work in confined spaces exist for the following compounds:
 - Fluorine compounds, Zinc, Lead, Beryllium, Cadmium, Mercury, Chlorinated Solvents used for degreasing, and Stainless Steel
- 1910.252(c)(4)

Health Protection

- **Flame-proof screens shall be used to protect other workers in adjacent areas from welding radiation**
- **Welding screens shall:**
 - Not inhibit ventilation
 - Be mounted at least two feet above the floor

Objective 4

29

- Welding screens are required by 1910.252(c)(1)(ii) to prevent flash burns for employees in adjacent areas to the welding operation.

Personal Protective Equipment

■ Eye protection

- Helmets are required for arc welding
- Goggles are required for gas welding
- Lenses shall meet ANSI Z87.1
- Lenses shall identify the shade number

Objective 1

30

- ANSI Z87.1-1989 "Standard Practice for Occupational and Educational Eye and Face Protection". This is THE standard used for eye and face protection.
- Have them look up the Table showing which shade number is recommended for different welding operations. It's under 1910.252(b)(2)(ii)(H).
- Fall protection must be used when welders are working at heights

Personal Protective Equipment

■ Welders must wear:

- Gauntlet-type leather gloves
- Apron or jacket
- Leather boots with leggings

■ Respirators may be necessary when:

- Welding in confined spaces
- Fumes or gases are not adequately ventilated

Objective 5
31

- 1910.252(b)(3) in the Welding section simply refers the reader to 1910.132 concerning Personal Protective Equipment without supplying any detailed information. The type of protective clothing worn is left to the welder or supervisor to decide. The recommendations listed here have been gathered from AWS documents.

Summary

- Subpart Q
- Health Hazards
- Precautions
- Ventilation
- PPE

ELECTRICAL HAZARDS

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to recognize, evaluate, and control electrical hazards in the work environment.

ENABLING OBJECTIVES

1. Recognize the adverse physical hazards of electrical shock, including ventricular fibrillation, pain, burns, and death.
2. Recognize common electrical hazards and violations in the workplace.
3. Learn proper evaluation techniques to locate the top most violated electrical OSHA regulations.
4. Explain control measures for electrical hazards including:
 - . insulation and circuit guarding
 - . lockout /tagout procedures
 - . training
 - . grounding; and
 - . the purpose and use of a ground fault circuit interrupter.

REFERENCES

1. Supervisor's Safety Manual, 6th ed., National Safety Council, Chapter 13, Electrical Safety.
2. Office of the Federal Register. "Subpart S, Electrical" *Code of Federal Regulations*, 29 CFR 1910, U.S. Government Printing Office, Washington, DC 20402-9328.

DURATION

Two hours

INSTRUCTOR MATERIALS

Course manual with instructor notes.
Overhead projector/viewer assembly
Slide projector and slides showing electrical violations
VCR/TV
Videotape on electrical safety

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operated for the U.S. Department of
Energy by Battelle Memorial Institute

Electrical Hazards

Terminal Objective

The purpose of this section is to enable the supervisor to recognize, evaluate, and control electrical hazards in the work environment.

Enabling Objectives

- 1. Recognize the adverse physical hazards of electrical shock, including ventricular fibrillation, pain, burns, and death.**
- 2. Recognize common electrical hazards and violations in the workplace.**
- 3. Learn proper evaluation techniques to locate the top most violated electrical OSHA regulations.**

Enabling Objectives

4. Explain control measures for electrical hazards including:

- insulation and circuit guarding
- lockout /tagout procedures
- training
- grounding; and
- the purpose and use of a ground fault circuit interrupter.

Electrical Hazards

Electrical Hazard

Worker becomes part of Live Circuit

=

Electrical Hazard

Electrical Hazards

■ Direct

- electrocution
- burns

■ Indirect

- falls
- fire
- explosion
- falling objects

Electrical Injuries are Dependent Upon

- **Current and voltage**
- **Path**
- **Time**

Electrical Injuries

AMPERES

Causes of Electrical Hazards

- **Exposure to live parts**
- **Improper installation**
- **Improper equipment use**
- **Poor/inadequate maintenance**

Exposure to Live Parts

- **Exposed wiring**
- **Exposed contacts**
- **Missing parts/Protectors**
- **Failure to LOTO**

Improper Installation

Reversed Polarity
The Hot and the Neutral are Reversed
The current path reversed. If switch is off
most of the circuit inside tool remains
energized

Improper Installation

■ Hazardous locations

- wet locations
- flammable environment
- explosive environment

Improper Installation

Overcurrent Devices

■ Fuses/Circuit Breakers

- usually 15-20 Amp minimum
- protect structure
- not adequate for employee protection

Electrical Hazards

Ground Fault Circuit Interrupters (GFCI)

- **Protect people**
- **Help prevent electrocution**

Electrical Hazards

Ground Fault Circuit Interrupters (GFCI)

- **Interrupt power supply**
- **Continually monitor current**
- **Detects current leakage**
- **No substitute for safe operations**

Electrical Hazards

Ground Fault Circuit Interrupters (GFCI)

Electrical Hazards

Ground Fault Circuit Interrupters (GFCI)

Ground Fault Circuit Interrupters (GFCI)

- **Required for**
 - construction sites
- **Residential applications**
 - outdoor circuits
 - bathrooms
 - garage
 - within 15 feet of pool/spa

Ground Fault Circuit Interrupters (GFCI)

- **Strongly recommended**
 - within 3 feet of any water source
 - any circuit within spray of liquids

Electrical Hazards

**Most
Common
OSHA
Electrical
Violations**

1910.304(f)(4)

- **Grounding path permanent and continuous**

Electrical Hazards

1910.303(g)(2)(I)

- **Exposure to live electrical parts**

1910.305(b)(1)

- **Conductors entering boxes/cabinets protected from abrasion**
- **Unused cabinet openings effectively closed**

Electrical Hazards

1910.305(b)(2)

- **Covers for pull boxes,
junction boxes, outlet
boxes**

1910.305(g)(1)(III)

■ Use of flexible cords

- as substitute for fixed wiring
- through holes in ceilings/floors/walls
- through doorways
- concealed behind ceilings/walls/floors

Electrical Hazards

1910.303(f)

- **Disconnecting means legibly marked**

Electrical Hazards

1910.305(g)(2)(III)

- **Flexible cords connected
with strain relief**

Electrical Hazards

1910.333(b)(2)(I)

- Written lockout/tagout program

Electrical Hazards

1910.304(f)(5)(v)

- **Grounding of cord and plug equipment**

Electrical Hazards

1910.303(b)(2)

- **Use of equipment in accordance with listing/labeling**

ELECTRICAL HAZARDS

1910.304(a)(2)

■ **Reverse Polarity**

Summary

- Shock
- Electrical deficiencies

CHEMICAL HAZARDS

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to recognize, evaluate and control chemical hazards in the workplace.

ENABLING OBJECTIVES

1. Explain the terms which describe physical properties of chemicals and explain their importance in recognizing potential hazards.
2. State three routes of chemical entry into the body.
3. Define different types of contaminants, some of their associated health effects, and contaminant causes.
4. Explain the following terms which determine the degree of effect a chemical exposure has on the body:
 - concentration
 - dose
 - TLV
 - PEL
 - time weighted average
5. Define the following terms related to health effects:
 - acute
 - chronic
 - allergic sensitization
6. Be able to locate the OSHA regulated carcinogens standards.

REFERENCES

1. 29 CFR 1910 Subpart Z
2. National Safety Council, 3rd ed. 1988. *Occupational Safety and Health Services*.
3. National Safety Council, 6th ed. 1985. *Supervisor's Safety Manual*.
4. NIOSH. 1990. *Pocket Guide To Chemical Hazards*
5. American Conference of Governmental Industrial Hygienists, 6th ed. 1991. *Documentation of TLVs*.

DURATION

One and 1/2 hours

INSTRUCTOR MATERIALS

Course manual with instructor notes.
Overhead projector/viewer assembly
Chemical Safety Slides with Slide Manual
Asbestos Sample
VCR/TV

Battelle

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operated for the U.S. Department of
Energy by Battelle Memorial Institute.

Chemical Hazards

Terminal Objective

The purpose of this section is to enable the supervisor to recognize, evaluate and control chemical hazards in the workplace.

Enabling Objectives

- 1. Explain the terms which describe physical properties of chemicals and their importance in recognizing potential hazards.**
- 2. State three routes of chemical entry into the body.**
- 3. Define different types of contaminants, some of their associated health effects, and contaminant causes.**

Enabling Objectives

4. Explain the following terms which determine the degree of effect and chemical exposure has on the body:

- concentration
- dose
- TLV
- PEL
- time-weighted average

Enabling Objectives

- 5. Define the following terms related to health effects**
 - acute
 - chronic
 - allergic sensitization
- 6. Apply the foregoing chemical definitions and concepts in a class exercise.**
- 7. Be able to locate the OSHA regulated carcinogens standards.**

Chemical Hazards

**Toxins — Poisons
Toxicology — Study of Poisons**

Objective 1

6

Toxic Effects of Chemicals

■ **Severity is dependent upon:**

- Route of exposure
- Time exposed
- Concentration of Toxin
- Exposure Conditions
- Condition of Individual

Objective 3

Dose Response

- **As the chemical dose increases**
 - the probability of negative effects (response) increases
 - the severity of negative effects (response) increases

Routes of Entry

- Inhalation
- Ingestion
- Absorption
- Injection
- Contact

Objective 2

Contact

- Chemicals directly affect skin through contact.
- Acids/Bases—Chemical/Thermal burns
- Solvents—Remove fats/oils from skin

Absorption

- Chemicals "soak" through skin
- Hydrocarbons (benzene, toluene, turpentine)
- Halogenated hydrocarbons (chlordan, lindane, carbon tetrachloride)
- Organic amines (cyanides, aniline, parathion)
- Non-organics (hydrofluoric acid, mercury)

Ingestion

- **Chemicals introduced directly by**
 - eating, drinking, smoking in contaminated areas
- **Frequently a result of poor hygiene**

Injection

- Direct entry due to penetration of skin by contaminated materials
 - Broken glass
 - Sharp edges

AIM

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Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

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5 of 6

Inhalation

- **Primary source of occupational chemical exposure**
- **Direct effect on pulmonary system (silica, asbestos, chlorine)**
- **Pathway to other systems (solvents, pesticides, heavy metals)**

Type of Response

■ Acute

- Rapid onset of symptoms
- Frequently due to large single exposure (pesticides)

■ Chronic

- Long delay between exposure and symptoms
- Long-term, low-level exposure (asbestos, lead, solvents)

Chemical Effect Categories

- Irritants
- Anesthetics
- Asphyxiants
- Special Toxins

Irritants

■ Primary

- Effect contact site (acids, bases)
- Severity may cause self-protection (ammonia)

■ Secondary

- Systemic effects (phosgene)
- Water solubility effects site of damage (chlorine)

Objective 1.3

Anesthetics

- Affects central nervous system
- Narcotic action
- Wide range of effects from dizziness to death
- Common industrial exposure (acetylene, acetone, alcohol, toluene, gasoline)

Asphyxiants

■ Simple

- Displace oxygen (argon, nitrogen, carbon dioxide)

■ Chemical

- Interfere with the body's ability to utilize oxygen (carbon monoxide, cyanide, hydrogen sulfide)

Special Toxins

■ Sensitizers

- Cause allergic reaction (epoxies, isocyanates)

■ Teratogens

- Cause deformities in unborn children after conception (thalidomide)

■ Mutagens

- Cause changes in genetic structures (radiation)

Exposure Indices

- **ACGIH TLV**
 - Threshold Limit Values
- **OSHA PEL**
 - Permissible Exposure Limit

Exposure Indices—PEL/TLV Types

■ TWA

- Time-weighted average
- Usually full-shift exposure averages
- Basis of most standards

Exposure Indices—STEL

■ Short-Term Exposure Limits

- 15-Minute Maximum Exposure
- No more than 4 STEL exposure excursions per day
- At least one hour between STEL exposures

Objective 4

Exposure Indices

■ Ceiling Limits

- Limits that are never to be exceeded

■ Skin notation

- Chemical that have significant exposure potential through dermal exposure.

Measurement Units

■ PPM

- Parts per million
- Gases, vapors

■ mg/m³

- Milligrams per cubic meter
- Dusts, fumes

■ F/cc

- Fibers per cubic centimeter
- Asbestos

PPM

- 1%
 - 10,000 ppm
- Highest OSHA PEL
 - 5,000 ppm (0.5%)
- Many OSHA PELs are less than 1 ppm (benzene, chlorine, TDI)

Application of PELs to Sampling Data

Concentration
MEK (ppm)

Normal Eight-Hour Work Shift

Objective 4 27

Odor Thresholds

- Not reliable indicator of exposure level
- Chemical may cause olfactory fatigue
- Chemical may be odorless
- Difference in individual ability to smell

Chemical Hazards

Odor Thresholds

Chemical	Odor Threshold (ppm)	PEL (ppm)
Ammonia	.32-5	35 (STEL)
Toluene	.7-40	100
Methyl Alcohol	53-5900	200
Benzene	4.6	1
Carbon Monoxide	Odorless	35

Objective 3

29

Exposure Measurement

■ Area/Environmental

- General exposure information
- Does NOT measure individual exposures
- Easy to conduct
- Difficult to correlate with actual employee exposures

Exposure Measurements

■ Personal Monitoring

- Basis of PEL/TLV indices
- Account for individual work habits
- Accurately measure specific exposures

Objective 4

31

Exposure Measurement Equipment

■ Direct Reading

- Instant results
- Equipment accuracy can vary significantly (detector tubes vs. electronic)
- MAY be suitable for personal monitoring depending on application
- Excellent for initial evaluations

Exposure Measurement Equipment

■ Indirect Sampling

- Normally requires APPROVED laboratory support
- Must wait for sample results
- Increased accuracy
- Most common sampling protocols for compliance evaluations

Exposure Measurement Equipment

- **Chemical Dosimeters (organics, formaldehyde)**
- **Personal Sampling Pumps (with charcoal tubes, silica gel, filters, etc.)**
- **Electronic equipment with recording devices**

OSHA Standards

■ 1910.1000

- Table 21
- Table 22
- Table 23

OSHA Standards

■ OSHA Expanded Standards

- 26 chemical specific standards
- Action levels
- Medical surveillance
- Training
- Other special provisions

Objective 1

OSHA Standards

Most Common Expanded Standards

Asbestos	1910.1001
Inorganic Arsenic	1910.1018
Lead	1910.1025
Benzene	1910.1028
Formaldehyde	1910.1048

Chemical Hazards

Summary

- Terms
- Entry
- Health Effects

HAZARD COMMUNICATION

TERMINAL OBJECTIVE

The purpose of this section is to familiarize the supervisor with one of OSHA's most significant standards regarding workplace environmental hazards, the Hazard Communication Standard, 29 CFR 1900.1200.

ENABLING OBJECTIVES

1. Explain the purpose of the Hazard Communication Standard.
2. List the elements of a hazard communication program.
3. List three items that must be included on the label for a hazardous chemical.
4. List four of the elements that must be included on a Material Safety Data Sheet.
5. Explain three requirements of hazard communication training.

REFERENCES

1. Occupational safety and Health Series, National Safety Council, 3rd ed., 1988.
2. Supervisor's Safety Manual, National Safety Council, 6th ed., 1985.
3. 29 CFR 1910.1200, "Hazard Communication".

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes.
Overhead projector/viewer assembly
VCR/TV

Pacific Northwest Laboratory is
operated for the U.S. Department of
Energy by Battelle Memorial Institute.

Hazard Communication

Terminal Objective

The purpose of this section is to familiarize the supervisor with one of OSHA's most significant standards regarding workplace environmental hazards, the Hazard Communication Standard, 29 CFR 1900.1200.

Enabling Objectives

- 1. Explain the purpose and scope of the Hazard Communication Standard.**
- 2. List the elements of a hazard communication program.**
- 3. List three items that must be included on the label for a hazardous chemical.**

Enabling Objectives

- 4. List four of the elements that must be included on a Material Safety Data Sheet.**
- 5. Explain three requirements of hazard communication training.**

OSHA 1910.1200

■ **Standard**

■ **Purpose: Communication flow**

- chemical manufacturers
- importers
- distributors
- employers

objective 1

5

- The purpose of the hazard communication standard is to ensure that all chemicals are comprehensively evaluated for potential hazards and that information concerning hazards and appropriate protective measures is communicated to employees.
- This standard is also known as the "Right to Know" standard, giving workers the right to know about the hazards of chemicals they are working with.

Definition of a Hazardous Chemical

- Hazardous chemical means any chemical which is a physical or a health hazard
- A health hazard exists if at least one valid statistically significant study has found an acute or chronic health effect

OSHA 100-100-1

6

- Health hazard includes: carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, hematopoietic toxins. Appendix A of the standard provides further definitions and explanations of the scope of health hazards covered by this section and Appendix B describes the criteria to be used to determine whether or not a chemical is to be considered hazardous for purposes of this standard.
- Chemicals listed in 29 CFR 1910.1000, Air contaminants tables and in the latest edition of the ACGIH TLV booklet are considered hazardous. Note that this is one of the few standards which actually references the "latest edition", 29 CFR 1910.1200(d)(3)(ii).
- Mixtures containing >0.1% of a carcinogen are considered to be carcinogenic. Mixtures containing <0.1% of a carcinogen may be considered a carcinogen if the carcinogenic component may be released at concentrations greater than its PEL or TLV. This can happen, for example, cadmium is used as a corrosion inhibitor in some paints at levels less than 0.1% however air monitoring has resulted in levels above PELs.

Standard

- **Applicability**
- **Not applicable to:**
 - non-chemical hazards
 - hazardous waste
 - tobacco
 - wood
 - personal articles
 - labeling on pesticides
 - drugs
 - liquor

Objective 1

7

- Most of the exempted materials are covered by other government agencies.
- The standard is also not applicable to consumer products used in the same quantities as an average consumer would use them.

Requirements of the Standard

- Hazard determination
- Labelling
- Material Safety Data Sheets (MSDS)
- Information and training

Responsibility of the Manufacturer

- **Hazard Determination**
- **Preparing MSDS**
- **Labeling**
- **Training**

chapter 1

9

- Only chemical manufacturers and importers are required to perform hazard determinations; their procedures must be documented.
- If your department reformulates or mixes and repackages chemicals, then you as the employer are responsible for preparing Material Safety Data Sheets.

Responsibility of the Employer

- **Developing a written program**
- **Compiling a chemical inventory**
- **Labeling containers**
- **Distributing MSDS**
- **Training employees about hazards and protective measures**

objective 1

10

- The Hazard Communication Standard was first promulgated in 1983 and only applied to the manufacturing sector. The Supreme Court ordered the regulation to be expanded. Finally by February 1990, all provisions of the standard applied to all employers.
- Executive orders now make the standard fully applicable to federal employees as well.

Responsibility of the Employer

■ Develop and maintain written program

objective 1

11

- The written program must be developed whether the employer generates the hazard or the hazard is generated by other employers. Compliance officers will review the written program with special emphasis on:
 - who's responsible for labelling? what do labels look like?
 - how are MSDS maintained? who is responsible for their upkeep?
 - training format? who conducts training?
- The written program must also describe how employees will be informed about the hazards of emergency, maintenance and other non-routine tasks.
- The standard also emphasizes the importance of informing sub-contractor employees about hazards specific to your workplace, 1910.1200(c)(2). This is important at DOE and other multi-employer worksites.

Responsibility of the Employer

■ Compile a Chemical Inventory

Objective 1

12

- Important for traceability and disposal

Labeling

- Identity of hazardous chemical(s)
- Appropriate hazard warnings
- Name and address of chemical manufacturer, importer or other responsible party

objective 3
13

- Labels leaving the manufacturer must have all three items listed here. Secondary containers within a facility only need the first two items. Secondary containers for immediate use by one person only need not be labeled (1910.1200(f)(7)), however, it is good management practice.
- There is some controversy regarding the use of the HMIS system for labeling. The OSHA interpretation of what constitutes an appropriate hazard warning is listing a target organ.

Material Safety Data Sheet

- Sent with first shipment
- Updated as needed
- One for each hazardous chemical used
- Accessible to employees in work areas

Objective 4
14

- MSDS must be written in English and must be updated within 3 months of new scientific information.
- When OSHA first began requiring MSDS in 1986, they did not specify what information should be included or how it should be ordered. After a few years they specified what information should be included, but did not specify a standardized format. Now OSHA has a recommended format and is taking proposals for a standardized format to make MSDS more "user friendly".
- Included here is an example of a blank MSDS format which lists all OSHA required information. Go over with class.
- MSDS identifies:
 - chemical name(s)
 - chemical characteristics
 - physical characteristics
 - health and physical hazards
 - exposure limits, precautions
 - first aid procedures, controls
- MSDS must be made available to employees within same workshift as request
- Have the class look at examples of complete MSDS:
 - Gasoline-good example of mixture with various health hazards including carcinogen (benzene).
 - Methanol-pure chemical
 - Automatic transmission fluid-mixture
 - Crystal Clear-good example of solvent mixture used for cleaning. Potential carcinogen includes methylene chloride.

Employee Training

■ **Employers must provide employees with the following information:**

- the requirements of the standard
- any operations in their work area where hazardous chemicals are present
- the location and availability of the written program, the chemical inventory and the MSDS file

Objective 8
15

- Inadequate employee information and training programs are among the most frequently cited OSHA standards.

Material Safety Data Sheet
May be used to comply with
OSHA's Hazard Communication Standard,
CFR 1910.1200. Standard must be
sited for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name

Emergency Telephone Number

Address (Number, Street, City, State, and ZIP Code)

Telephone Number for Information

Date Prepared

Signature of Preparer (optional)

Section II -- Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
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Section III -- Physical/Chemical Characteristics

Boiling Point

Specific Gravity (H₂O = 1)

Vapor Pressure (mm Hg)

Melting Point

Vapor Density (AIR = 1)

Evaporation Rate
(Butyl Acetate = 1)

Solubility in Water

Appearance and Odor

Section IV -- Fire and Explosion Hazard Data

Flash Point (Method Used)

Flammable Limits

LEL

UEL

Extinguishing Media

Special Fire Fighting Procedures

Usual Fire and Explosion Hazards

(Reproduce locally)

OSHA 174, Sept. 1985

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable		

Incompatibility (Materials to Avoid)

Hazardous Decomposition or Byproducts

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? Skin? Ingestion?

Health Hazards (Acute and Chronic)

Carcinogenicity: NTP? IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure

Medical Conditions
Generally Aggravated by Exposure

Emergency and First Aid Procedures

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled

Waste Disposal Method

Precautions to Be Taken in Handling and Storing

Other Precautions

Section VIII — Control Measures

Respiratory Protection (Specify Type)

Ventilation	Local Exhaust	Special
	Mechanical (General)	Other

Protective Gloves Eye Protection

Other Protective Clothing or Equipment

Work/Hygienic Practices

Material Safety Data Sheet
May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)
Gasoline

Note: Blank spaces are not permitted if any item is not applicable or no information is available. The space must be marked to indicate this.

Section I

Manufacturer's Name
Some Oil Company

Emergency Telephone Number
914-555-3400 x214

Address (Number, Street, City, State, and ZIP Code)
100 Industrial Drive

Telephone Number for Information
914-555-3400 x570

Some City, TX 99999

Date Prepared
11/20/87

Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (Total wt)
Blend of Carbon 6 - Carbon 10 Aliphatic/paraffinic hydrocarbons		900 mg/m ³		
BENZENE	1 ppm	10 ppm	0.8-2.0	
Organic Lead Compounds			varies	
Toluene	200 ppm	100 ppm		
Xylene	100 ppm	100 ppm		
Unleaded premium gasoline		300 ppm/500 ppm	SHORT TERM EXPOSURE LIMIT	

Section III — Physical/Chemical Characteristics

Boiling Point	90-210°F	Specific Gravity (H ₂ O = 1)	0.72-0.76
Vapor Pressure (mm Hg)	400	Melting Point	N/A
Vapor Density (AIR = 1)	3-4	Evaporation Rate (Butyl Acetate = 1)	1
Solubility in Water	Insoluble		
Appearance and Color	Pink liquid, aromatic odor		

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	40°F (tag closed)	Flammable Limits	LEL	UEL
			1.4	7.6
Extinguishing Media	Dry chemical, Carbon Dioxide, Foam, water fog (product will float and can be re-ignited on surface of water).			
Special Fire Fighting Procedures	CO ₂ storage drums with water mist. Evacuate area. Prevent run-off from entering water supply. Do not enter confined space without appropriate protective equipment.			
Unusual Fire and Explosion Hazards	Water may be ineffective on gasoline fires. Extremely flammable. Vapor accumulation could flash and/or explode.			

(Reproduce locally)

OSHA 174 Sept 1985

GASOLINE

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid Prevent vapor accumulation.
	Stable	X	Heat, open flame, sparks and strong oxidizing agents.
Incompatibility (Materials to Avoid)			
Oxidizers, acids, bases			
Hazardous Decomposition or By-products			
Carbon Dioxide, Carbon Monoxide and other unidentified organic compounds.			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	

Section VI — Health Hazard Data

Route(s) of Entry	Inhalation?	Skin?	Ingestion?
	YES	YES	YES
Health Hazards (Acute and Chronic) ACUTE: Irritation of eyes, nose and throat. May cause drunkenness if exposure is massive. Harmful or fatal if swallowed. CHRONIC: Vomiting, diarrhea, insomnia, headache, dizziness, anemia, muscle and nerve damage. Aplastic anemia and leukemia may be caused by Benzene content. Gasoline containing more than 0.1% Benzene must be labeled warning of the Benzene toxicity. Prolonged or repeated skin contact causes dermatitis.			
Carcinogenem	NTP?	IARC Monographs?	OSHA Regulated?
	YES (Benzene 0.1%)	YES (Benzene 0.1%)	YES (Benzene 0.1%)

Signs and Symptoms of Exposure

Irritation of eyes, nose, throat, nausea, vomiting, diarrhea, insomnia, headache, giddiness, dizziness.

Medical Conditions

Generally Aggravated by Exposure Nerve disease; eye, skin and respiratory disorders; impaired liver or kidney function.

Emergency and First Aid Procedures Remove overcome victim from the exposure. Begin artificial respiration, get medical attention. If skin and eyes are involved, flush with water immediately and for at least 15 minutes. Ingestion - do not induce vomiting.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Materials Released or Spilled Dike spill, soak up small spills with absorbent material. Eliminate all ignition sources. Remove leaking containers to detached area.

Runoff may create fire or explosion hazard in sewer system. For major spills, get upwind and notify local emergency personnel.

Waste Disposal Method

May be incinerated. Produce recovery or recycling recommended. Absorbent should be disposed of and as an ignitable hazardous waste.

Precautions to Be Taken in Handling and Storing Store away from heat, sparks and open flames. Keep away from oxidizers, acids, bases. Drums may be grounded and bonded and equipped with self closing valves.

Other Precautions Gasoline may contain organic lead compounds. These will significantly increase the toxicity of gasoline. Lead poisoning has been the cause of death when gasoline was ingested. Do not siphon by mouth.

Section VIII — Control Measures

Respiratory Protection (Specify Type)

Organic Vapor.

Ventilation	Local Exhaust General Ventilation. Use explosion proof ventilation to prevent.	Special	N/A
	Mechanical (General) YES, explosion-proof.	Other	N/A

Protective Gloves

Impermeable

Eye Protection

Splash proof chemical safety goggles.

Other Protective Clothing or Equipment Use in well ventilated area away from ignition sources. Wash with soap and water after handling.

Work/Hygiene Practices

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and LBL)
Methanol Wood Alcohol

Note: Blank spaces are not permitted. If any item is not applicable, the word "None" must be entered in the space provided.

Section I

Manufacturer's Name
A Chemical Company

Emergency Telephone Number
215-555-6500

Address (Number, Street, City, State, and ZIP Code)
1500 Beacon Street

Telephone Number for Information
215-555-1207

Some City, NJ 09999

Date Prepared
11/09/85

Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	Ex (optional)
Methanol (Wood alcohol; wood naphtha)	200 ppm	200 ppm		1000

Section III — Physical/Chemical Characteristics

Boiling Point	64.5°C	Specific Gravity (H ₂ O = 1)	0.7924
Vapor Pressure (mm Hg) @ 20°C	97.30	Melting Point	-97.6°C
Vapor Density (AIR = 1)	1.1	Evaporation Rate (Butyl Acetate = 1)	5.9
Solubility in Water	Complete		

Appearance and Odor

Clear, colorless, liquid with an alcohol odor.

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used) 11°C (52°F) (Closed cup)	Flammable Limits	LEL 6.0%	UEL 36%
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Extinguishing Media

Dry chemical, foam, carbon dioxide, water fog.

Special Fire Fighting Procedures: Use water spray to keep exposed containers cool. Water spray may be used to disperse liquid and dilute to nonflammable mixture. Do not enter confined fire space without full bunker gear, including a positive pressure NIOSH-approved self-contained breathing apparatus.

Unusual Fire and Explosion Hazards

Fire exposed containers will explode. Vapors are heavier than air and may travel a considerable distance to an ignition source and flashback.

(Reproduce locally)

OSHA 174 Sect. 1615

Section V — Reactivity Data

Stability	1-3-200	Conditions to Avoid	Heat, sparks, open flame, contact with strong oxidizers
Incompatibility with other substances	Oxidizers, Active Metals such as Aluminum and Zinc.		
Hazardous Decomposition Products	(Combustion) Carbon Dioxide, Carbon Monoxide, Aldehydes and unidentified organic compounds.		
Hazardous Polymerization	Not Observed	Conditions to Avoid	N/A
Other Hazardous Reactions	None		

Section VI — Health Hazard Data

Routes of Entry	Inhalation	Skin	Ingestion
	YES	YES	YES
Health Hazards Associated with Exposure	Acute: Drowsiness, drunkenness, headache, eye irritation and visual disturbances leading to blindness, coughing, shortness of breath and respiratory tract irritation. In extreme cases can result in collapse and death. Eye irritation may occur. CHRONIC: Prolonged and repeated skin contact can result in dermatitis. Will be absorbed through the intact skin. Prolonged or repeated overexposure by all routes can result in damage to the central nervous system, liver, kidneys and eyes, blindness and death.		
Carcinogenicity	NIH	IARC Monographs	OSHA Required
	NO	NO	NO
Reproductive Effects	A 1985 publication reported teratogenicity in rats inhaling 10% v/v for 7 hours per day during gestation with little maternal toxicity (Fund. Appl. Tox. 1, 1985).		
Signs and Symptoms of Exposure	Irritation to nose, throat, respiratory tract and eyes. Headache, dizziness, nausea and in urinary output; edema; loss of appetite; jaundice; fatigue.		
Medical Comments	Generally Aggravated by Exposure: Impaired liver and kidney functions; eye disease; skin and respiratory disorders.		
Emergency and First Aid Procedures	Ingestion: Induce vomiting; Inhalation: If overcome by exposure, move the victim immediately to fresh air and provide oxygen if breathing difficulties. Keep warm and quiet. Administer artificial respiration if not breathing. Get medical attention. For eye and skin contact, flush with water for 15 minutes.		

Section VII — Precautions for Safe Handling and Use

Steps to be taken in case of a spill or leak: Like the spill, eliminate sources of ignition. For large spills, evacuate hazard area. Soak up spill with absorbent material and place in non-leaking containers. Do not flush into drains. Use only provided equipment to prevent sparking. Wear appropriate protective clothing and equipment. Suppress vapor cloud with water fog.

Waste Disposal Method: May be incinerated or disposed of as a hazardous waste in an approved land fill. Refer to latest EPA or state regulations regarding proper disposal.

Precautions to be taken in handling and storing: Store in tightly closed vented containers away from heat, flame, sparks and oxidizing agents. Ground and Bond when dispensing. Use non-sparking to Extinguish pilot lights and other sources of ignition until all vapors are gone.

Other Precautions: Do not reuse contaminated clothing or shoes until cleaned.

Section VIII — Control Measures

Respiratory Protection: Supply Type	
Air supplied only.	
Ventilation	Local Exhaust: Explosion-proof ventilation should be used to control vapor accumulation.
	Special: Explosion-proof ventilation.
	Other: N/A
Protective Goggles	Eye Protection: Splash proof safety glasses or goggles as appropriate.
Other Protective Clothing or Equipment	Chemical protective aprons, boots, and face shield as necessary when splashing may occur.

When working with this liquid avoid repeated or repeated contact with skin. Do not use air purifying respirators. Methanol has poor warning properties and cartridges will often become saturated through time.

Material Safety Data Sheet
May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standards must be
consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and LBL)
Automatic Transmission Fluid

Note: Blank spaces are not permitted. If any item is not applicable or no information is available, the space must be marked as "None".

Section I

Manufacturer's Name
Some Chemical Company
Address (Number, Street, City, State and ZIP Code)
P.O. Box 3758
Anytown, OK 74000

Emergency Telephone Number
318-555-5214
Telephone Number for Information
318-555-5000
Date Prepared
2/26/86
Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Refined Oils (Oil Mist) 100 mg/m ³ 5 mg/m ³ (STEEL)			87-957	
Anti-Oxidant			3-125	
Dye and Additives			< 1.0%	

Section III — Physical/Chemical Characteristics

Boiling Point (327°C)	620°F	Specific Gravity (H ₂ O = 1)	0.87
Vapor Pressure (mm Hg)	0.7	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water:

Negligible

Appearance and Odor:

Red oily liquid, slight oily odor

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used) 202°C (395°F) (CCC)	Flammable Limits	LEL N/A	UEL N/A
--	------------------	------------	------------

Extinguishing Media: Carbon Dioxide, dry chemical, foam or water fog. Do not use direct stream of water - product will float and can be reignited on surface of water.

Special Fire Fighting Procedures: Do not enter confined fire space without full bunker gear, including a positive pressure MOCB - approved self-contained breathing apparatus.

Unusual Fire and Explosion Hazards:

Water used to extinguish may cause frothing.

Burning liquid will float on water.

(Reproduce locally)

OSHA 174 Sept 1985

Automated Transmission Fluid

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	Heat, open flames, oxidizing materials
Incompatibility (Materials to Avoid)			
Strong oxidizer			
Hazardous Decomposition or Byproducts			
Combustion may result in a complex mixture of airborne solids, liquids and gases. Carbon monoxide and other hydrocarbon gases may be produced.			
Hazardous Polymerization	Not Obs.		Conditions to Avoid
	Will Not Occur	X	None

Section VI — Health Hazard Data

Routes of Entry	Inhalation?	Skin?	Ingestion?
	YES	NO	YES
Health Hazards (Acute and Chronic)			
Vapors and mists may cause drowsiness, dizziness, headache, nausea, and respiratory tract irritation. Skin irritation may occur. Ingestion may cause stomach irritation and diarrhea. CHRONIC: Repeated contact with skin may cause drying, cracking, and dermatitis.			
Carcinogenicity	NTP?	IARC Monographs?	OSHA Regulated?
	NO	NO	NO

Signs and Symptoms of Exposure

Drowsiness, headache, nausea, respiratory tract irritation, skin irritation.

Medical Conditions

Generally Aggravated by Exposure: Personnel with pre-existing skin or respiratory disorders should avoid contact with this product.

Emergency and First Aid Procedures: Remove overcome victim to fresh air and provide oxygen if breathing is difficult. Begin artificial respiration if not breathing. Flush eyes and skin with water for 15 minutes or more. Do not induce vomiting. Get medical attention.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled

Wipe spill. Soak up on absorbent material and dispose of properly. Flush area with water to remove trace residues. Remove latex spill with vacuum trucks or pump to storage salvage vessels.

Waste Disposal Methods

Disposal is in accordance with EPA and state and local rules.

Precautions to Be Taken in Handling and Storing

Keep away from extreme heat and open flame.

Other Precautions

May burn although not readily ignitable.

Section VIII — Control Measures

Respiratory Protection (Specify Type)

Not normally needed.

Ventilation	Local Exhaust	Special
	Not normally needed.	N/A
	Mechanical (General)	Other

Protective Goggles: Chemical resistant goggles to minimize eye protection. Use safety goggles. Minimize skin contact. Oil proof for employee use, NITRILE.

Other Protective Clothing or Equipment: Protective clothing as required to minimize skin contact. Should include full body suit. Use full protective clothing for organic vapors.

Work Hygiene Practices: Minimize skin contact. Wash hands with plenty of soap and water after. Remove oil-soaked clothing and launder before re-use. Properly dispose of contaminated leather articles, including shoes, that cannot be decontaminated.

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard
9 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Labeled and List)
CRYSTAL CLEAR

Note: Data spaces are not permitted if information is not applicable or no
information is available. The space must be marked "None".

Section I

Manufacturer's Name

AAA Chemicals

Emergency Telephone Number

215-555-2456

Address (Number, Street, City, State, and ZIP Code)

100 A Street

Telephone Number for Information

215-555-2400

Anycown, NJ 99999

Date Prepared

6/12/85

Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Name(s))	OSHA PEL	ACGIH TLV	OSHA PEL Recommended	% (optional)
Toluene	500 ppm	100 ppm		30
Methylene Chloride	500 ppm	100 ppm		25
Hexane	500 ppm	50 ppm		19
Propane	1000 ppm	N/A		10
Aromatic Naphtha (Stoddard Solvent)	500 ppm	100 ppm		2.0

Note: Propane functions as an aerosol propellant.

Section III — Physical/Chemical Characteristics

Boiling Point	120°F	Specific Gravity (H ₂ O = 1)	0.96
Vapor Pressure (mm Hg)	N/A	Melting Point	N/A
Vapor Density (Air = 1)	> 1	Evaporation Rate (Butyl Acetate = 1)	> 1

Solubility in Water

Insoluble

Appearance and Odor

Clear liquid with sweet, aromatic odor

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	> 100°F (For propellant)	Flammable Limits	LEL	UEL
		N/A		

Extinguishing Media

Carbon Dioxide, Foam, Dry chemical

Special Fire Fighting Procedures

The contents are under pressure. When exposed to high temperature they will explode.

In case of fire, keep exposed containers cool.

Unusual Fire and Explosion Hazards

Contents are classified as "Extremely Flammable." They can be ignited readily.

NOTE: Fire Data is given for Propane, the most fire hazardous ingredient.

(Reproduce locally)

OSHA 174 Sept. 1985

CRYSTAL 1111A

Section V — Reactivity Data

Stability	Unstable	Conditions to Avoid
	Base	Elevated (120°F) Temperature
Incompatibility (Materials to Avoid): Keep away from all corrosives and active metal. ALUMINUM, MAGNESIUM, Strong Oxidizers.		
Hazardous Decomposition or Biological Degradation Products: Carbon Monoxide; Carbon Dioxide; Phosgene; Hydrogen Chloride.		
Hazardous Polymerization	Yes, Under	Conditions to Avoid
	Will Not Occur	N/A

Section VI — Health Hazard Data

Routes of Entry	Inhalation?	Eye?	Ingestion?
	YES	YES	NO
Health Hazards (Acute and Chronic): Central Nervous System Depressant - Symptoms include: dizziness, disorientation, confusion. CHRONIC: Liver & kidney damage will result from long term overexposure. Symptoms of this effect will not be seen until years of exposure have existed.			
Carcinogenicity	NTP?	IARC Monographs?	OSHA Regulated?
	YES	NO	NO

Signs and Symptoms of Exposure

Worker may appear drunk or confused; headache; nausea; skin-dry and irritated.

Eyes - burning and irritation.

Medical Conditions

Generally Aggravated by Exposure: Liver, kidney, conditions and ethanol dependency, respiratory tract conditions.

Emergency and First Aid Procedures

Remove the victim to fresh air if you can without harm to yourself. Begin CPR if breathing has stopped. For skin contact, wash with warm water. For eye contact, flush with water for at least 15 minutes.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled

Remove source of ignition. Soak up with absorbent material, and place in closed container. Ventilate area and place in closed container.

Waste Disposal Methods

Dispose of as hazardous wastes in accordance with state and federal regulations.

Precautions to Be Taken in Handling and Storing

Do not store above 120°F. Excessive heat will cause containers to burst suddenly and violently. Combustion products are highly toxic.

Other Precautions

Vapors tend to collect in low areas.

Section VIII — Control Measures

Respiratory Protection (Specify Type)

Use self-contained breathing apparatus if vapor conc. above TLV.

Ventilation	Local Exhaust: Not normally required when vapors conc. less than TLV.	Special
	Mechanical General: Will often be adequate	Other
		N/A

Protective Gloves

Nitrile or butyl rubber

Eye Protection

Goggles

Other Protective Clothing or Equipment

Not normally required for aerosol usage

Work/Hygiene Practices

N/A

Employee Training

■ **Employers must provide employees with the following information:**

- the requirements of the standard
- any operations in their work area where hazardous chemicals are present
- the location and availability of the written program, the chemical inventory and the MSDS file

OSHA 1910.120(g)

15

- Inadequate employee information and training programs are among the most frequently cited OSHA standards.

Employee Training

- methods used to detect the presence or release of the hazardous chemical
- physical and health hazards of chemicals in their work area
- protective measures, including work practices, emergency procedures, personal protective equipment

objective 8

16

- Compliance officers will actually interview and "quiz" employees to determine if training is adequate. Site specific training is extremely important. A lot of employers will provide basic training and neglect site specific hazards.

Hazard Communication

- **29 CFR 1900.1200**
- **Purpose**
- **Requirements**
- **Importance of site specific training**

- Some companies are preparing task specific Hazard Communication Information Sheets, which are like MSDS for processes or areas.

INJURY AND ILLNESS RECORDKEEPING

TERMINAL OBJECTIVE

The purpose of this section is to provide the supervisor with an overview of OSHA and DOE injury and illness recordkeeping and reporting system.

ENABLING OBJECTIVES

1. Explain why recordkeeping is required.
2. List the terms and categories in recordkeeping.
3. List the factors used to determine recordability.
4. List the forms, posting and reporting requirements for recordkeeping.

REFERENCES

1. 29CFR1904 Occupational Safety and Health Standards, US Department of Labor
2. 29CFR160 Basic Program Elements for Federal Employee Occupational Safety and Health Programs

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes
Overhead projector/viewer assembly
VCR/TV

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operated for the U.S. Department of
Energy by Battelle Memorial Institute.

Injury & Illness Recordkeeping

Terminal Objective

The purpose of this section is to provide the supervisor with an overview of OSHA and DOE injury and illness recordkeeping and reporting system.

Enabling Objectives

- 1. Explain why recordkeeping is required.**
- 2. List the terms and categories used in recordkeeping.**
- 3. List the factors used to determine recordability.**
- 4. List the forms, posting and reporting requirements for recordkeeping.**

OSHA Requirements

- **Recordkeeping is required to assist in the prevention of accidents and illnesses.**

Objective 1

4

- The regulations in this part were promulgated with the DHHS and cover private sector employees.
- 29 CFR 1904.2 (a) was the third most frequently cited standard in FY 1989; this is failure to comply with the recordkeeping and reporting requirements by completing the OSHA 200 log.

Recognition—Injury Defined

■ Injury (traumatic)

- A wound or other condition of the body caused by external force, including stress or strain. The injury is identifiable as to time and place of occurrence and member or function of the body affected, and is caused by a specific event or incident or series of events or incidents within a single day or work shift.

Objective 1

5

- Back cases are classified as injuries because they are usually triggered by an instantaneous event. Even if the specific event cannot be pinpointed, back cases are considered injuries.
- New workers are at much higher risk of injury than experienced workers. Most injuries occur among employees with less than one year on the job.

Recognition—Illness defined

■ Illness/disease (occupational)

- A physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time.

Objective 1

6

- An occupational illness or disease is any reported condition which does not meet the definition of injury.
- Hearing loss may be either an injury or illness depending upon the type of event or exposure which caused the loss. If it resulted from or was aggravated by an instantaneous exposure, it is considered an injury and is recordable only if it involves medical treatment, loss of consciousness, restriction of work or motion. If the loss is from chronic exposure to noise, then it is an illness; all job-related illnesses are recordable.
- A fatality is death resulting from an injury or illness.
- Lost time case means a nonfatal traumatic injury that causes any loss of time from work beyond the day or shift it occurred; or a nonfatal illness/disease that causes disability at any time.
- Catastrophe is an accident resulting in five or more agency and/or nonagency people being hospitalized for inpatient care.

Evaluation of Occupational Illnesses

■ Categories used by employers to classify recordable occupational illnesses on the log:

- occupational skin diseases
- dust diseases of the lung
- respiratory conditions due to toxic agents
- poisoning
- physical agents
- repeated trauma

Occupational
7

• Examples of each are:

- skin - contact dermatitis, chloracne, chrome ulcers
- pneumoconiosis - asbestosis, coal worker's pneumoconiosis, silicosis
- poisoning, or systemic effects of toxins - lead, mercury, arsenic or other metals, CO, H₂S, insecticides
- physical agents - heatstroke, sunstroke, heat exhaustion, frostbite, welding flash
- repeated trauma - noise induced hearing loss, tenosynovitis, vibration
- other - anthrax, infectious hepatitis, food poisoning
- Conditions resulting from animal bites or one time exposures, even to chemicals, are considered injuries
- Some illnesses are easy to identify, i.e dermatitis, carpal tunnel syndrome. Others are more difficult to diagnose, i.e., long-term latent illnesses, cancers.
- There were 284,000 new cases of occ disease in 1989.

Recordable Case Analysis

- 1. Establish work relationship**
- 2. Decide whether Injury or Illness**

Chapter 3

8

- If injuries and illnesses are not prevented and occur in your work area, then OSHA requires that records be kept. Analysis of this information should be performed to prevent reoccurrence.
- OSHA 101 forms or their equivalent may be used to record each individual illness or injury.
- OSHA 200 logs are maintained to summarize each year's total injury and illnesses occurrence.

Recognition—Recordable Cases Defined

- **Occupational death**
- **Nonfatal occupational illness**
- **Nonfatal occupational injuries which involve one or more of the following:**
 - loss of consciousness
 - restriction of work or motion
 - transfer to another job, or
 - medical treatment (other than first aid)

Objective 3

9

- **Examples of recordable medical treatment include:**
 - sutures
 - removal of metal embedded in eye
 - X-ray indicates fracture
 - treatment of infections or 2nd and 3rd degree burns
 - prescriptions
 - chiropractic manipulations
- **Nonrecordable first aid treatment includes:**
 - bandaids
 - flushing dirt from eye
 - negative X-rays
 - 1st degree burns
 - tetanus shots
 - non-prescription medicines
 - broken eye glasses

Summary of Recordable Incidents

- **All work-related fatalities and illnesses are recordable**
- **The following work-related injuries are recordable:**
 - loss of consciousness
 - restriction of work or motion
 - transfer to another job
 - days away other than day of injury
 - medical treatment other than first aid

Objective 3
10

- Have the class decide if the handouts of example OSHA 101 forms are recordable or nonrecordable injuries or illnesses.
- Examples of each of these forms is included with this manual. Have student refer to them during discussion.

Form OSHA-200

- The OSHA 200 log is used for recording and classifying occupational injuries and illnesses and for noting the extent of each
- The log includes 3 parts:
 - a descriptive section which identifies the employee and the injury or illness
 - a section covering the extent of the recorded injury
 - a section on the type and extent of illness

Objective 4

11

- Have the class complete an example OSHA 200 log based on the recordable injury and illness examples given here.
- Incident refers to either injury or illness.
- Former employees also have access to OSHA 200 logs

Form OSHA 200

- This form shall be completed for all employees and maintained on file for a period of at least 5 years.

Annual Summary Posting

- **Each employer shall post, or otherwise disseminate in writing to all employees, a copy of its OSHA 200 Log**
- **Copies shall be posted in a conspicuous place from February 1 to March 1**

Objective 4

13

- Every OSHA inspection includes an examination of injury and illness records. OSHA inspectors will also check to ensure that the OSHA poster is present as well as the OSHA 200 log and current citations
- Also compliance officers shall determine if applicable exposure and medical records are maintained in accordance with 1910.20.
- The Secretaries of Labor and Health and Human Services and their representatives shall also have access to all records

Reporting of Serious Accidents

- **Within 48 hours of its occurrence, the head of the agency shall report to OSHA any of the following:**
 - a fatality
 - any accident which results in the hospitalization of five or more employees
 - an occupational illness which results in death

Objective 4

14

- In addition to recording injuries and illnesses, OSHA also requires reporting of fatalities and catastrophes.
- Accidents not immediately reportable, but those which result in death within 6 months must be reported within 48 hours of the time the employer became aware of the death.

General DOE Reporting Requirements

- **OSHA rules and definitions shall govern the recording and measuring of work injury experience.**
- **Doubtful cases of occupational injury or illness classification shall be forwarded to the Operational and Environmental Safety Division for final determination.**

Summary

- Requirements
- Categories
- Recordability
- Forms

Bureau of Labor Statistics
Supplementary Record of
Occupational Injuries and Illnesses

U.S. Department of Labor

This form is required by Public Law 91-596 and must be kept in the establishment for 5 years.
Failure to maintain can result in the issuance of citations and assessment of penalties.

Case or File No.

Form Approved
OMB No. 1220-0029

Employer

1. Name

2. Mail address (No. and street, city or town, State, and zip code)

3. Location, if different from mail address

Injured or Ill Employee

4. Name (First, middle, and last)

Social Security No.

5. Home address (No. and street, city or town, State, and zip code)

6. Age

7. Sex: (Check one)

Male ☐

Female ☐

8. Occupation (Enter regular job title, not the specific activity he was performing at time of injury.)

9. Department (Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)

The Accident or Exposure to Occupational Illness

If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.

10. Place of accident or exposure (No. and street, city or town, State, and zip code)

11. Was place of accident or exposure on employer's premises?

Yes ☐

No ☐

12. What was the employee doing when injured? (Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)

13. How did the accident occur? (Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)

Occupational Injury or Occupational Illness

14. Describe the injury or illness in detail and indicate the part of body affected (E.g., amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)

15. Name the object or substance which directly injured the employee (For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.)

16. Date of injury or initial diagnosis of occupational illness

17. Did employee die? (Check one)

Yes ☐

No ☐

Other

18. Name and address of physician

19. If hospitalized, name and address of hospital

Date of report

Prepared by

Official position

SUPPLEMENTARY RECORD OF OCCUPATIONAL INJURIES AND ILLNESSES

To supplement the Log and Summary of Occupational Injuries and Illnesses (OSHA No. 200), each establishment must maintain a record of each recordable occupational injury or illness. Worker's compensation, insurance, or other reports are acceptable as records if they contain all facts listed below or are supplemented to do so. If no suitable report is made for other purposes, this form (OSHA No. 101) may be used or the necessary facts can be listed on a separate plain sheet of paper. These records must also be available in the establishment without delay and at reasonable times for examination by representatives of the Department of Labor and the Department of Health and Human Services, and States accorded jurisdiction under the Act. The records must be maintained for a period of not less than five years following the end of the calendar year to which they relate.

Such records must contain at least the following facts:

- 1) *About the employer*—name, mail address, and location if different from mail address.
- 2) *About the injured or ill employee*—name, social security number, home address, age, sex, occupation, and department.
- 3) *About the accident or exposure to occupational illness*—place of accident or exposure, whether it was on employer's premises, what the employee was doing when injured, and how the accident occurred.
- 4) *About the occupational injury or illness*—description of the injury or illness, including part of body affected, name of the object or substance which directly injured the employee, and date of injury or diagnosis of illness.
- 5) *Other*—name and address of physician; if hospitalized, name and address of hospital, date of report, and name and position of person preparing the report.

SEE DEFINITIONS ON THE BACK OF OSHA FORM 200.

**Bureau of Labor Statistics
Log and Summary of Occupational
Injuries and Illnesses**

NOTE: This form is required by Public Law 91-508 and must be kept in the establishment for 8 years. Failure to maintain and post can result in the issuance of citations and assessment of penalties. (See posting requirements on the other side of form.)

RECORDABLE CASES: You are required to record information about every occupational death, every nonfatal occupational illness, and those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid) (See definitions on the other side of form.)

Company Name
Establishment Name
Establishment Address

[illegible]

U.S. GOVERNMENT PRINTING OFFICE: 1989 241-374/08097

OSHA No. 200

For

Form Approved
OMB No 1220-0029
See OMB Disclosure
Statement on reverse

[illegible]

Val Summary Totals By _____ Title _____ Date _____

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1.

INSPECTIONS & INVESTIGATIONS

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to perform required safety inspections designed to aid in preventing accidents.

OBJECTIVES

1. State two purposes of safety inspections.
2. List four planning questions to be answered prior to conducting a safety inspection.
3. Explain how inspections are reported and corrective action is taken.

REFERENCES

1. Supervisor's Safety Manual, 6th ed., National Safety Council, Chapter 8.
2. Accident Prevention Manual for Industrial Operations, 9th ed., National Safety Council, pages 73-92.
3. OSHA Handbook for Small Businesses, OSHA 2209, U.S. Department of Labor 1990

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes.
Overhead projector/viewer assembly
VCR/TV

Pacific Northwest Laboratory is
operated for the U.S. Department of
Energy by Battelle Memorial Institute

Inspections & Investigations

Terminal Objective

The purpose of this section is to enable the supervisor to perform required safety inspections designed to aid in preventing accidents.

Enabling Objectives

- 1. State two purposes of safety inspections.**
- 2. List four planning questions to be answered prior to conducting a safety inspection.**
- 3. Explain how inspections are reported and corrective action is taken.**

Purpose of Inspections

- **Identify hazards and unsafe acts**
- **Recommend corrective actions**
- **Comply with safety and health regulations**
- **Assess the effectiveness of safety management**
- **Prevent accidents, injuries and illnesses**

Objective 1

4

- Secondary purposes for inspections include improving operations and increasing efficiency and effectiveness.
- Inspections may be conducted by the first line supervisor, the safety office or inspectors.

Planning

■ Questions:

- What processes and operations are present in the area?
- How often must operations be inspected?
- Who will conduct the inspection?
- What conditions need to be inspected?
- What health and safety standards apply?

■ Prepare or obtain checklists

Objective 2

5

- There are many checklists available to assist with inspections. Included with this section are checklists from OSHA's Handbook for Small Businesses.
- Pre-inspection procedures; before the inspection begins:
 - ask the questions listed on this slide
 - acquire all pertinent information on operations and processes in the area
 - acquire all available injury and illness information
 - prepare to protect yourself during the inspection by wearing the appropriate PPE for the area
 - ask to review written safety programs
 - review any industrial hygiene sampling results

Checklist

- Guide
- Inspection record
- On-the-spot documentation
- Assurance of complete inspection
- Aid in corrective action

Objective 2
6

- Go through some of the checklists included with this section. Ask the class which lists apply to their work areas.
- Common conditions to be observed during self-inspections include:
 - building conditions—walking/working surfaces, aisles, stairs, exits
 - housekeeping—work areas, waste disposal, leaks and spills, storage areas
 - electricity—equipment, breakers, switches, fuses, grounding
 - lighting—type, intensity, location
 - machines—points of operation, maintenance, grounding
 - personnel—training, experience, work practices, use of personal protective equipment
 - chemicals—storage, handling, amounts used, labelling
 - fire prevention—extinguishers, alarms
 - maintenance—effective use of LOTO
- Each of these has been discussed in more detail in previous sections.

Frequency

■ Determined by four factors:

- loss severity
- potential for injury
- deterioration
- history of failures

Objective 2

7

- The frequency of inspection is determined by four factors:
 - what is the loss severity potential of the problem?
 - what is the potential for injury to the employees?
 - how quickly can the item or part become unsafe?
 - what is the past history of failures? and what were the results of these failures?
- Some OSHA regulations require inspections at specific intervals; for example, manlifts, not more than 30 days {1910.68(e)(1)}.
- According to 29CFR1960, "all areas and operations of each federal workplace, including offices shall be inspected at least annually. Sufficient unannounced inspections and follow-up should be conducted by DOE to ensure the identification and abatement of hazardous conditions". If supervisors are doing their job and performing daily walk throughs of their areas, this requirement should be met.

First-Line Supervisor Inspections

■ Daily

- compliance with safety regulations
- guards and warning signs are in place
- condition of tools and machinery
- aisles and passageways are clear
- materials are properly stored
- safe work practices

Objective 2

8

- Primary safety inspections are the responsibility of first-line supervisors. Because supervisors spend most of their time in their respective departments, they should continuously monitor working conditions.
- Supervisors should consider themselves "missionaries" to sell safety awareness! This should be as important to their job as production and performance.

Purpose of Reporting

- **Timely Identification, categorization, notification and reporting**
- **Timely evaluation and implementation of corrective actions**
- **Maintenance of a central DOE operational data base**

Summary

Inspections and Investigations

- **Purpose of inspections**
- **Responsibility of supervisors**
- **Importance of checklist**
- **Types of inspections**
- **Reporting system**

Objective 3

10

- The results of an inspection should be communicated to both workers and management immediately and corrective action taken. Written reports, including name of area, date and time, specific hazards found, recommended actions and abatement dates, should follow each inspection.
- Supervisors should follow up inspection reports to ensure that not only the problems but their underlying causes have been corrected.

SELF-INSPECTION CHECK LISTS

These check lists are by no means all-inclusive. You should add to them or delete portions or items that do not apply to your operations. However, carefully consider each item as you come to it and then make your decision.

EMPLOYER POSTING

- ☐ Is the required OSHA workplace poster displayed in a prominent location where all employees are likely to see it?
- ☐ Are emergency telephone numbers posted where they can be readily found in case of emergency?
- ☐ Where employees may be exposed to any toxic substances or harmful physical agents, has appropriate information concerning employee access to medical and exposure records, and "Material Safety Data Sheets," etc., been posted or otherwise made readily available to affected employees?
- ☐ Are signs concerning "Exiting from buildings," room capacities, floor loading, exposures to x-ray, microwave, or other harmful radiation or substances posted where appropriate?
- ☐ Is the Summary of Occupational Illnesses and Injuries posted in the month of February?

RECORDKEEPING

- ☐ Are all occupational injury or illnesses, except minor injuries requiring only first aid, being recorded as required on the OSHA 200 log?
- ☐ Are employee medical records and records of employee exposure to hazardous substances or harmful physical agents up-to-date?
- ☐ Have arrangements been made to maintain required records for the legal period of time for each specific type record? (Some records must be maintained for at least 40 years.)
- ☐ Are operating permits and records up-to-date for such items as elevators, air pressure tanks, liquefied petroleum gas tanks, etc.?

SAFETY AND HEALTH PROGRAM

- ☐ Do you have an active safety and health program in operation?
- ☐ Is one person clearly responsible for the overall activities of the safety and health program?
- ☐ Do you have a safety committee or group made up of management and labor representatives that meet regularly and report in writing on its activities?
- ☐ Do you have a working procedure for handling in-house employee complaints regarding safety and health?
- ☐ Are you keeping your employees advised of the successful effort and accomplishments you and/or your safety committee have made in assuring they will have a workplace that is safe and healthful?

MEDICAL SERVICES AND FIRST AID

- ☐ Do you require each employee to have a pre-employment physical examination?
- ☐ Is there a hospital, clinic, or infirmary for medical care in proximity of your workplace?
- ☐ If medical and first aid facilities are not in proximity of your workplace, is at least one employee on each shift currently qualified to render first aid?
- ☐ Are medical personnel readily available for advice and consultation on matters of employees' health?
- ☐ Are emergency phone numbers posted?
- ☐ Are first aid kits easily accessible to each work area, with necessary supplies available, periodically inspected and replenished as needed?
- ☐ Have first aid kit supplies been approved by a physician, indicating that they are adequate for a particular area or operation?
- ☐ Are means provided for quick drenching or flushing of the eyes and body in areas where corrosive liquids or materials are handled?

WALKWAYS

- ☐ Are aisles and passageways kept clear?
- ☐ Are aisles and walkways marked as appropriate?
- ☐ Are wet surfaces covered with non-slip materials?
- ☐ Are holes in the floor, sidewalk or other walking surface repaired properly, covered or otherwise made safe?
- ☐ Is there safe clearance for walking in aisles where motorized or mechanical handling equipment is operating?
- ☐ Are materials or equipment stored in such a way that sharp projectives will not interfere with the walkway?
- ☐ Are spilled materials cleaned up immediately?
- ☐ Are changes of direction or elevations readily identifiable?
- ☐ Are aisles or walkways that pass near moving or operating machinery, welding operations or similar operations arranged so employees will not be subjected to potential hazards?
- ☐ Is adequate headroom provided for the entire length of any aisle or walkway?
- ☐ Are standard guardrails provided wherever aisle or walkway surfaces are elevated more than 30 inches above any adjacent floor or the ground?
- ☐ Are bridges provided over conveyors and similar hazards?

FLOOR AND WALL OPENINGS

- ☐ Are floor openings guarded by a cover, a guardrail, or equivalent on all sides (except at entrance to stairways or ladders)?
- ☐ Are toeboards installed around the edges of permanent floor opening (where persons may pass below the opening)?
- ☐ Are skylight screens of such construction and mounting that they will withstand a load of at least 200 pounds?
- ☐ Is the glass in the windows, doors, glass walls, etc., which are subject to human impact, of sufficient thickness and type for the condition of use?
- ☐ Are grates or similar type covers over floor openings such as floor drains, of such design that foot traffic or rolling equipment will not be affected by the grate spacing?
- ☐ Are unused portions of service pits and pits not actually in use either covered or protected by guardrails or equivalent?
- ☐ Are manhole covers, trench covers and similar covers, plus their supports designed to carry a truck rear axle load of at least 20,000 pounds when located in roadways and subject to vehicle traffic?
- ☐ Are floor or wall openings in fire resistive construction provided with doors or covers compatible with the fire rating of the structure and provided with self closing feature when appropriate?

STAIRS AND STAIRWAYS

- ☐ Are standard stair rails or handrails on all stairways having four or more risers?
- ☐ Are all stairways at least 22 inches wide?
- ☐ Do stairs have at least a 6'6" overhead clearance?
- ☐ Do stairs angle no more than 50 and no less than 30 degrees?
- ☐ Are stairs of hollow-pan type treads and landings filled to noising level with solid material?
- ☐ Are step risers on stairs uniform from top to bottom, with no riser spacing greater than 7½ inches?
- ☐ Are steps on stairs and stairways designed or provided with a surface that renders them slip resistant?
- ☐ Are stairway handrails located between 30 and 34 inches above the leading edge of stair treads?
- ☐ Do stairway handrails have at least 1½ inches of clearance between the handrails and the wall or surface they are mounted on?
- ☐ Are stairway handrails capable of withstanding a load of 200 pounds, applied in any direction?
- ☐ Where stairs or stairways exit directly into any area where vehicles may be operated, are adequate barriers and warnings provided to prevent employees stepping into the path of traffic?
- ☐ Do stairway landings have a dimension measured in the direction of travel, at least equal to the width of the stairway?
- ☐ Is the vertical distance between stairway landings limited to 12 feet or less?

ELEVATED SURFACES

- ☐ Are signs posted, when appropriate, showing the elevated surface load capacity?
- ☐ Are surfaces elevated more than 30 inches above the floor or ground provided with standard guardrails?
- ☐ Are all elevated surfaces (beneath which people or machinery could be exposed to falling objects) provided with standard 4-inch toeboards?
- ☐ Is a permanent means of access and egress provided to elevated storage and work surfaces?
- ☐ Is required headroom provided where necessary?
- ☐ Is material on elevated surfaces piled, stacked or racked in a manner to prevent it from tipping, falling, collapsing, rolling or spreading?
- ☐ Are dock boards or bridge plates used when transferring materials between docks and trucks or rail cars?

FIRE PROTECTION

- ☐ Is your local fire department well acquainted with your facilities, its location and specific hazards?
- ☐ If you have a fire alarm system, is it certified as required?
- ☐ If you have a fire alarm system, is it tested at least annually?
- ☐ If you have interior stand pipes and valves, are they inspected regularly?
- ☐ If you have outside private fire hydrants, are they flushed at least once a year and on a routine preventive maintenance schedule?
- ☐ Are fire doors and shutters in good operating condition?
- ☐ Are fire doors and shutters unobstructed and protected against obstructions, including their counterweights?
- ☐ Are fire door and shutter fusible links in place?
- ☐ Are automatic sprinkler system water control valves, air and water pressure checked weekly/periodically as required?
- ☐ Is the maintenance of automatic sprinkler systems assigned to responsible persons or to a sprinkler contractor?
- ☐ Are sprinkler heads protected by metal guards, when exposed to physical damage?
- ☐ Is proper clearance maintained below sprinkler heads?
- ☐ Are portable fire extinguishers provided in adequate number and type?
- ☐ Are fire extinguishers mounted in readily accessible locations?
- ☐ Are fire extinguishers recharged regularly and noted on the inspection tag?
- ☐ Are employees periodically instructed in the use of extinguishers and fire protection procedures?

PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING

- ☐ Are protective goggles or face shields provided and worn where there is any danger of flying particles or corrosive materials?
- ☐ Are approved safety glasses required to be worn at all times in areas where there is a risk of eye injuries such as punctures, abrasions, contusions or burns?
- ☐ Are employees who need corrective lenses (glasses or contacts) in working environments having harmful exposures, required to wear only approved safety glasses, protective goggles, or use other medically approved precautionary procedures.
- ☐ Are protective gloves, aprons, shields, or other means provided against cuts, corrosive liquids and chemicals?
- ☐ Are hard hats provided and worn where danger of falling objects exists?
- ☐ Are hard hats inspected periodically for damage to the shell and suspension system?

- ☐ Is appropriate foot protection required where there is the risk of foot injuries from hot, corrosive, poisonous substances, falling objects, crushing or penetrating actions?
- ☐ Are approved respirators provided for regular or emergency use where needed?
- ☐ Is all protective equipment maintained in a sanitary condition and ready for use?
- ☐ Do you have eye wash facilities and a quick Drench Shower within the work area where employees are exposed to injurious corrosive materials?
- ☐ Where special equipment is needed for electrical workers, is it available?
- ☐ Where lunches are eaten on the premises, are they eaten in areas where there is no exposure to toxic materials or other health hazards?
- ☐ Is protection against the effects of occupational noise exposure provided when sound levels exceed those of the OSHA noise standard?
- ☐ Are adequate work procedures, protective clothing and equipment provided and used when cleaning up spilled toxic or otherwise hazardous materials or liquids?

GENERAL WORK ENVIRONMENT

- ☐ Are all worksites clean and orderly?
- ☐ Are work surfaces kept dry or appropriate means taken to assure the surfaces are slip-resistant?
- ☐ Are all spilled materials or liquids cleaned up immediately?
- ☐ Is combustible scrap, debris and waste stored safely and removed from the worksite promptly?
- ☐ Are accumulations of combustible dust routinely removed from elevated surfaces including the overhead structure of buildings, etc.?
- ☐ Is combustible dust cleaned up with a vacuum system to prevent the dust going into suspension?
- ☐ Is metallic or conductive dust prevented from entering or accumulating on or around electrical enclosures or equipment?
- ☐ Are covered metal waste cans used for oily and paintsoaked waste?
- ☐ Are all oil and gas fired devices equipped with flame failure controls that will prevent flow of fuel if pilots or main burners are not working?
- ☐ Are paint spray booths, dip tanks, etc., cleaned regularly?
- ☐ Are the minimum number of toilets and washing facilities provided?
- ☐ Are all toilets and washing facilities clean and sanitary?
- ☐ Are all work areas adequately illuminated?
- ☐ Are pits and floor openings covered or otherwise guarded?

- ☐ Are metal ladders inspected for damage?
- ☐ Are the rungs of ladders uniformly spaced at 12 inches, center to center?

HAND TOOLS AND EQUIPMENT

- ☐ Are all tools and equipment (both company and employee-owned) used by employees at their workplace in good condition?
- ☐ Are hand tools such as chisels, punches, etc. which develop mushroomed heads during use, reconditioned or replaced as necessary?
- ☐ Are broken or fractured handles on hammers, axes and similar equipment replaced promptly?
- ☐ Are worn or bent wrenches replaced regularly?
- ☐ Are appropriate handles used on files and similar tools?
- ☐ Are employees made aware of the hazards caused by faulty or improperly used hand tools?
- ☐ Are appropriate safety glasses, face shields, etc. used while using hand tools or equipment which might produce flying materials or be subject to breakage?
- ☐ Are jacks checked periodically to assure they are in good operating condition?
- ☐ Are tool handles wedged tightly in the head of all tools?
- ☐ Are tool cutting edges kept sharp so the tool will move smoothly without binding or skipping?
- ☐ Are tools stored in dry, secure location where they won't be tampered with?
- ☐ Is eye and face protection used when driving hardened or tempered spuds or nails?

PORTABLE (POWER OPERATED) TOOLS AND EQUIPMENT

- ☐ Are grinders, saws and similar equipment provided with appropriate safety guards?
- ☐ Are power tools used with the correct shield, guard, or attachment, recommended by the manufacturer?
- ☐ Are portable circular saws equipped with guards above and below the base shoe?
- ☐ Are circular saw guards checked to assure they are not wedged up, thus leaving the lower portion of the blade unguarded?
- ☐ Are rotating or moving parts of equipment guarded to prevent physical contact?
- ☐ Are all cord-connected, electrically-operated tools and equipment effectively grounded or of the approved double insulated type?

- ☐ Are effective guards in place over belts, pulleys, chains, sprockets, on equipment such as concrete mixers, air compressors, etc.?
- ☐ Are portable fans provided with full guards or screens having openings $\frac{1}{2}$ inch or less?
- ☐ Is hoisting equipment available and used for lifting heavy objects, and are hoist ratings and characteristics appropriate for the task?
- ☐ Are ground-fault circuit interrupters provided on all temporary electrical 15 and 20 ampere circuits, used during periods of construction?
- ☐ Are pneumatic and hydraulic hoses on power-operated tools checked regularly for deterioration or damage?

ABRASIVE WHEEL EQUIPMENT-GRINDERS

- ☐ Is the work rest used and kept adjusted to within $\frac{1}{8}$ inch of the wheel?
- ☐ Is the adjustable tongue on the top side of the grinder used and kept adjusted to within $\frac{1}{4}$ inch of the wheel?
- ☐ Do side guards cover the spindle, nut, and flange and 75 percent of the wheel diameter?
- ☐ Are bench and pedestal grinders permanently mounted?
- ☐ Are goggles or face shields always worn when grinding?
- ☐ Is the maximum RPM rating of each abrasive wheel compatible with the RPM rating of the grinder motor?
- ☐ Are fixed or permanently mounted grinders connected to their electrical supply system with metallic conduit or other permanent wiring method?
- ☐ Does each grinder have an individual on and off control switch?
- ☐ Is each electrically operated grinder effectively grounded?
- ☐ Before new abrasive wheels are mounted, are they visually inspected and ring tested?
- ☐ Are dust collectors and powered exhausts provided on grinders used in operations that produce large amounts of dust?
- ☐ Are splash guards mounted on grinders that use coolant to prevent the coolant reaching employees?
- ☐ Is cleanliness maintained around grinders?

POWDER ACTUATED TOOLS

- ☐ Are employees who operate powder-actuated tools trained in their use and carry a valid operators card?
- ☐ Is each powder-actuated tool stored in its own locked container when not being used?

EXITING OR EGRESS

- ☐ Are all exits marked with an exit sign and illuminated by a reliable light source?
- ☐ Are the directions to exits, when not immediately apparent, marked with visible signs?
- ☐ Are doors, passageways or stairways, that are neither exits nor access to exits and which could be mistaken for exits, appropriately marked "NOT AN EXIT," "TO BASEMENT," "STOREROOM," etc.?
- ☐ Are exit signs provided with the word "EXIT" in lettering at least 5 inches high and the stroke of the lettering at least 1/2-inch wide?
- ☐ Are exit doors side-hinged?
- ☐ Are all exits kept free of obstructions?
- ☐ Are at least two means of egress provided from elevated platforms, pits or rooms where the absence of a second exit would increase the risk of injury from hot, poisonous, corrosive, suffocating, flammable, or explosive substances?
- ☐ Are there sufficient exits to permit prompt escape in case of emergency?
- ☐ Are special precautions taken to protect employees during construction and repair operations?
- ☐ Is the number of exits from each floor of a building and the number of exits from the building itself, appropriate for the building occupancy load?
- ☐ Are exit stairways which are required to be separated from other parts of a building, enclosed by at least 2-hour fire-resistive construction in buildings more than four stories in height, and not less than 1-hour fire-resistive construction elsewhere?
- ☐ Where ramps are used as part of required exiting from a building, is the ramp slope limited to 1 ft. vertical and 12 ft. horizontal?
- ☐ Where exiting will be through frameless glass doors, glass exit doors, storm doors, etc., are the doors fully tempered and meet the safety requirements for human impact?

EXIT DOORS

- ☐ Are doors which are required to serve as exits designed and constructed so that the way of exit travel is obvious and direct?
- ☐ Are windows which could be mistaken for exit doors, made inaccessible by means of barriers or railings?
- ☐ Are exit doors openable from the direction of exit travel without the use of a key or any special knowledge or effort when the building is occupied?
- ☐ Is a revolving, sliding or overhead door prohibited from serving as a required exit door?

- ☐ Where panic hardware is installed on a required exit door, will it allow the door to open by applying a force of 15 pounds or less in the direction of the exit traffic?
- ☐ Are doors on cold storage rooms provided with an inside release mechanism which will release the latch and open the door even if it's padlocked or otherwise locked on the outside?
- ☐ Where exit doors open directly onto any street, alley or other area where vehicles may be operated, are adequate barriers and warnings provided to prevent employees stepping into the path of traffic?
- ☐ Are doors that swing in both directions and are located between rooms where there is frequent traffic, provided with viewing panels in each door?

PORTABLE LADDERS

- ☐ Are all ladders maintained in good condition, joints between steps and side rails tight, all hardware and fittings securely attached and moveable parts operating freely without binding or undue play?
- ☐ Are non-slip safety feet provided on each ladder?
- ☐ Are non-slip safety feet provided on each metal or rung ladder?
- ☐ Are ladder rungs and steps free of grease and oil?
- ☐ Is it prohibited to place a ladder in front of doors opening toward the ladder except when the door is blocked open, locked or guarded?
- ☐ Is it prohibited to place ladders on boxes, barrels, or other unstable bases to obtain additional height?
- ☐ Are employees instructed to face the ladder when ascending or descending?
- ☐ Are employees prohibited from using ladders that are broken, missing steps, rungs, or cleats, broken side rails or other faulty equipment?
- ☐ Are employees instructed not to use the top step of ordinary stepladders as a step?
- ☐ When portable rung ladders are used to gain access to elevated platforms, roofs, etc., does the ladder always extend at least 3 feet above the elevated surface?
- ☐ Is it required that when portable rung or cleat type ladders are used, the base is so placed that slipping will not occur, or it is lashed or otherwise held in place?
- ☐ Are portable metal ladders legibly marked with signs reading "CAUTION" - Do Not Use Around Electrical Equipment" or equivalent wording?
- ☐ Are employees prohibited from using ladders as guys, braces, skids, gin poles, or for other than their intended purposes?
- ☐ Are employees instructed to only adjust extension ladders while standing at a base (not while standing on the ladder or from a position above the ladder)?

- ☐ Are employees instructed to always push the control circuit stop button prior to re-energizing the main power switch?
- ☐ Is there a means provided to identify any or all employees who are working on locked-out equipment by their locks or accompanying tags?
- ☐ Are a sufficient number of accident preventive signs or tags and safety padlocks provided for any reasonably foreseeable repair emergency?
- ☐ When machine operations, configuration or size requires the operator to leave his or her control station to install tools or perform other operations, and that part of the machine could move if accidentally activated, is such element required to be separately locked or blocked out?
- ☐ In the event that equipment or lines cannot be shut down, locked-out and tagged, is a safe job procedure established and rigidly followed?

WELDING, CUTTING AND BRAZING _____

- ☐ Are only authorized and trained personnel permitted to use welding, cutting or brazing equipment?
- ☐ Does each operator have a copy of the appropriate operating instructions and are they directed to follow them?
- ☐ Are compressed gas cylinders regularly examined for obvious signs of defects, deep rusting, or leakage?
- ☐ Is care used in handling and storage of cylinders, safety valves, relief valves, etc., to prevent damage?
- ☐ Are precautions taken to prevent the mixture of air or oxygen with flammable gases, except at a burner or in a standard torch?
- ☐ Are only approved apparatus (torches, regulators, pressure-reducing valves, acetylene generators, manifolds) used?
- ☐ Are cylinders kept away from sources of heat?
- ☐ Are the cylinders kept away from elevators, stairs, or gangways?
- ☐ Is it prohibited to use cylinders as rollers or supports?
- ☐ Are empty cylinders appropriately marked and their valves closed?
- ☐ Are signs reading: DANGER—NO SMOKING, MATCHES, OR OPENLIGHTS, or the equivalent, posted?
- ☐ Are cylinders, cylinder valves, couplings, regulators, hoses, and apparatus kept free of oily or greasy substances?
- ☐ Is care taken not to drop or strike cylinders?
- ☐ Unless secured on special trucks, are regulators removed and valve-protection caps put in place before moving cylinders?
- ☐ Do cylinders without fixed wheels have keys, handles, or non-adjustable wrenches on stem valves when in service?
- ☐ Are liquefied gases stored and shipped valve-end up with valve covers in place?

- ☐ Are provisions made to never crack a fuel-gas cylinder valve near sources of ignition?
- ☐ Before a regulator is removed, is the valve closed and gas released from the regulator?
- ☐ Is red used to identify the acetylene (and other fuel-gas) hose, green for oxygen hose, and black for inert gas and air hose?
- ☐ Are pressure-reducing regulators used only for the gas and pressures for which they are intended?
- ☐ Is open circuit (No Load) voltage of arc welding and cutting machines as low as possible and not in excess of the recommended limits?
- ☐ Under wet conditions, are automatic controls for reducing no load voltage used?
- ☐ Is grounding of the machine frame and safety ground connections of portable machines checked periodically?
- ☐ Are electrodes removed from the holders when not in use?
- ☐ Is it required that electric power to the welder be shut off when no one is in attendance?
- ☐ Is suitable fire extinguishing equipment available for immediate use?
- ☐ Is the welder forbidden to coil or loop welding electrode cable around his body?
- ☐ Are wet machines thoroughly dried and tested before being used?
- ☐ Are work and electrode lead cables frequently inspected for wear and damage, and replaced when needed?
- ☐ Do means for connecting cable lengths have adequate insulation?
- ☐ When the object to be welded cannot be moved and fire hazards cannot be removed, are shields used to confine heat, sparks, and slag?
- ☐ Are fire watchers assigned when welding or cutting is performed in locations where a serious fire might develop?
- ☐ Are combustible floors kept wet, covered by damp sand, or protected by fire-resistant shields?
- ☐ When floors are wet down, are personnel protected from possible electrical shock?
- ☐ When welding is done on metal walls, are precautions taken to protect combustibles on the other side?
- ☐ Before hot work is begun, are used drums, barrels, tanks, and other containers so thoroughly cleaned that no substances remain that could explode, ignite, or produce toxic vapors?
- ☐ Is it required that eye protection helmets, hand shields and goggles meet appropriate standards?
- ☐ Are employees exposed to the hazards created by welding, cutting, or brazing operations protected with personal protective equipment and clothing?
- ☐ Is a check made for adequate ventilation in and where welding or cutting is performed?

AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
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- ☐ Is a sign at least 7 inches by 10 inches with bold face type reading "POWDER-ACTUATED TOOL IN USE" conspicuously posted when the tool is being used?
- ☐ Are powder-actuated tools left unloaded until they are actually ready to be used?
- ☐ Are powder-actuated tools inspected for obstructions or defects each day before use?
- ☐ Do powder-actuated tool operators have and use appropriate personal protective equipment such as hard hats, safety goggles, safety shoes and ear protectors?

MACHINE GUARDING

- ☐ Is there a training program to instruct employees on safe methods of machine operation?
- ☐ Is there adequate supervision to ensure that employees are following safe machine operating procedures?
- ☐ Is there a regular program of safety inspection of machinery and equipment?
- ☐ Is all machinery and equipment kept clean and properly maintained?
- ☐ Is sufficient clearance provided around and between machines to allow for safe operations, set up and servicing, material handling and waste removal?
- ☐ Is equipment and machinery securely placed and anchored, when necessary to prevent tipping or other movement that could result in personal injury?
- ☐ Is there a power shut-off switch within reach of the operator's position at each machine?
- ☐ Can electric power to each machine be locked out for maintenance, repair, or security?
- ☐ Are the noncurrent-carrying metal parts of electrically operated machines bonded and grounded?
- ☐ Are foot-operated-switches guarded or arranged to prevent accidental actuation by personnel or falling objects?
- ☐ Are manually operated valves and switches controlling the operation of equipment and machines clearly identified and readily accessible?
- ☐ Are all emergency stop buttons colored red?
- ☐ Are all pulleys and belts that are within 7 feet of the floor or working level properly guarded?
- ☐ Are all moving chains and gears properly guarded?
- ☐ Are splash guards mounted on machines that use coolant to prevent the coolant from reaching employees?
- ☐ Are methods provided to protect the operator and other employees in the machine area from hazards created at the point of operation, ingoing nip points, rotating parts, flying chips, and sparks?
- ☐ Are machinery guards secure and so arranged that they do not offer a hazard in their use?
- ☐ If special handtools are used for placing and removing material, do they protect the operator's hands?

- ☐ Are revolving drums, barrels, and containers required to be guarded by an enclosure that is interlocked with the drive mechanism, so that revolution cannot occur unless the guard enclosures is in place, so guarded?
- ☐ Do arbors and mandrels have firm and secure bearings and are they free from play?
- ☐ Are provisions made to prevent machines from automatically starting when power is restored after a power failure or shutdown?
- ☐ Are machines constructed so as to be free from excessive vibration when the largest size tool is mounted and run at full speed?
- ☐ If machinery is cleaned with compressed air, is air pressure controlled and personal protective equipment or other safeguards utilized to protect operators and other workers from eye and body injury?
- ☐ Are fan blades protected with a guard having openings no larger than 1/2 inch, when operating within 7 feet of the floor?
- ☐ Are saws used for ripping, equipped with anti-kick back devices and spreaders?
- ☐ Are radial arm saws so arranged that the cutting head will gently return to the back of the table when released?

LOCKOUT BLOCKOUT PROCEDURES

- ☐ Is all machinery or equipment capable of movement, required to be de-energized or disengaged and blocked or locked-out during cleaning, servicing, adjusting or setting up operations, whenever required?
- ☐ Where the power disconnecting means for equipment does not also disconnect the electrical control circuit:

Are the appropriate electrical enclosures identified?

Is means provided to assure the control circuit can also be disconnected and locked-out?

- ☐ Is the locking-out of control circuits in lieu of locking-out main power disconnects prohibited?
- ☐ Are all equipment control valve handles provided with a means for locking-out?
- ☐ Does the lock-out procedure require that stored energy (mechanical, hydraulic, air, etc.) be released or blocked before equipment is locked-out for repairs?
- ☐ Are appropriate employees provided with individually keyed personal safety locks?
- ☐ Are employees required to keep personal control of their key(s) while they have safety locks in use?
- ☐ Is it required that only the employee exposed to the hazard, place or remove the safety lock?
- ☐ Is it required that employees check the safety of the lock-out by attempting a start up after making sure no one is exposed?

- ☐ Are low pressure fuel-gas cylinders checked periodically for corrosion, general distortion, cracks, or any other defect that might indicate a weakness or render it unfit for service?
- ☐ Does the periodic check of low pressure fuel-gas cylinders include a close inspection of the cylinders' bottom?

HOIST AND AUXILLIARY EQUIPMENT

- ☐ Is each overhead electric hoist equipped with a limit device to stop the hook travel at its highest and lowest point of safe travel?
- ☐ Will each hoist automatically stop and hold any load up to 125 percent of its rated load, if its actuating force is removed?
- ☐ Is the rated load of each hoist legibly marked and visible to the operator?
- ☐ Are stops provided at the safe limits of travel for trolley hoist?
- ☐ Are the controls of hoist plainly marked to indicate the direction of travel or motion?
- ☐ Is each cage-controlled hoist equipped with an effective warning device?
- ☐ Are close-fitting guards or other suitable devices installed on hoist to assure hoist ropes will be maintained in the sheave grooves?
- ☐ Are all hoist chains or ropes of sufficient length to handle the full range of movement of the application while still maintaining two full wraps on the drum at all times?
- ☐ Are nip points or contact points between hoist ropes and sheaves which are permanently located within seven feet of the floor, ground or working platform, guarded?
- ☐ Is it prohibited to use chains or rope slings that are kinked or twisted?
- ☐ Is it prohibited to use the hoist rope or chain wrapped around the load as a substitute, for a sling?
- ☐ Is the operator instructed to avoid carrying loads over people?

INDUSTRIAL TRUCKS—FORKLIFTS

- ☐ Are only employees who have been trained in the proper use of hoists allowed to operate them?
- ☐ Are only trained personnel allowed to operate industrial trucks?
- ☐ Is substantial overhead protective equipment provided on high lift rider equipment?
- ☐ Are the required lift truck operating rules posted and enforced?
- ☐ Is directional lighting provided on each industrial truck that operates in an area with less than 2 foot candles per square foot of general lighting?
- ☐ Does each industrial truck have a warning horn, whistle, gong, or other device which can be clearly heard above the normal noise in the areas where operated?

- ☐ Are the brakes on each industrial truck capable of bringing the vehicle to a complete and safe stop when fully loaded?
- ☐ Will the industrial trucks' parking brake effectively prevent the vehicle from moving when unattended?
- ☐ Are industrial trucks operating in areas where flammable gases or vapors, or combustible dust or ignitable fibers may be present in the atmosphere, approved for such locations?
- ☐ Are motorized hand and hand/rider trucks so designed that the brakes are applied, and power to the drive motor shuts off when the operator releases his or her grip on the device that controls the travel?
- ☐ Are industrial trucks with internal combustion engine, operated in buildings or enclosed areas, carefully checked to ensure such operations do not cause harmful concentration of dangerous gases or fumes?

SPRAYING OPERATIONS

- ☐ Is adequate ventilation assured before spray operations are started?
- ☐ Is mechanical ventilation provided when spraying operations is done in enclosed areas?
- ☐ When mechanical ventilation is provided during spraying operations, is it so arranged that it will not circulate the contaminated air?
- ☐ Is the spray area free of hot surfaces?
- ☐ Is the spray area at least 20 feet from flames, sparks, operating electrical motors and other ignition sources?
- ☐ Are portable lamps used to illuminate spray areas suitable for use in a hazardous location?
- ☐ Is approved respiratory equipment provided and used when appropriate during spraying operations?
- ☐ Do solvents used for cleaning have a flash point to 100°F or more?
- ☐ Are fire control sprinkler heads kept clean?
- ☐ Are "NO SMOKING" signs posted in spray areas, paint rooms, paint booths, and paint storage areas?
- ☐ Is the spray area kept clean of combustible residue?
- ☐ Are spray booths constructed of metal, masonry, or other substantial noncombustible material?
- ☐ Are spray booth floors and baffles noncombustible and easily cleaned?
- ☐ Is infrared drying apparatus kept out of the spray area during spraying operations?
- ☐ Is the spray booth completely ventilated before using the drying apparatus?
- ☐ Is the electric drying apparatus properly grounded?
- ☐ Are lighting fixtures for spray booths located outside of the booth and the interior lighted through sealed clear panels?

- ☐ When working in confined places, are environmental monitoring tests taken and means provided for quick removal of welders in case of an emergency?

COMPRESSORS AND COMPRESSED AIR

- ☐ Are compressors equipped with pressure relief valves, and pressure gauges?
- ☐ Are compressor air intakes installed and equipped so as to ensure that only clean uncontaminated air enters the compressor?
- ☐ Are air filters installed on the compressor intake?
- ☐ Are compressors operated and lubricated in accordance with the manufacturer's recommendations?
- ☐ Are safety devices on compressed air systems checked frequently?
- ☐ Before any repair work is done on the pressure system of a compressor, is the pressure bled off and the system locked-out?
- ☐ Are signs posted to warn of the automatic starting feature of the compressors?
- ☐ Is the belt drive system totally enclosed to provide protection for the front, back, top, and sides?
- ☐ Is it strictly prohibited to direct compressed air towards a person?
- ☐ Are employees prohibited from using highly compressed air for cleaning purposes?
- ☐ If compressed air is used for cleaning off clothing, is the pressure reduced to less than 10 psi?
- ☐ When using compressed air for cleaning, do employees wear protective clothing and personal protective equipment?
- ☐ Are safety chains or other suitable locking devices used at couplings of high pressure hose lines where a connection failure would create a hazard?
- ☐ Before compressed air is used to empty containers of liquid, is the safe working pressure of the container checked?
- ☐ When compressed air is used with abrasive blast cleaning equipment, is the operating valve a type that must be held open manually?
- ☐ When compressed air is used to inflate auto tires, is a clip-on chuck and an inline regulator preset to 40 psi required?
- ☐ Is it prohibited to use compressed air to clean up or move combustible dust if such action could cause the dust to be suspended in the air and cause a fire or explosion hazard?

COMPRESSORS AIR RECEIVERS

- ☐ Is every receiver equipped with a pressure gauge and with one or more automatic, spring-loaded safety valves?
- ☐ Is the total relieving capacity of the safety valve capable of preventing pressure in the receiver from exceeding the maximum allowable working pressure of the receiver by more than 10 percent?
- ☐ Is every air receiver provided with a drain pipe and valve at the lowest point for the removal of accumulated oil and water?
- ☐ Are compressed air receivers periodically drained of moisture and oil?
- ☐ Are all safety valves tested frequently and at regular intervals to determine whether they are in good operating condition?
- ☐ Is there a current operating permit used by the Division of Occupational Safety and Health?
- ☐ Is the inlet of air receivers and piping systems kept free of accumulated oil and carbonaceous materials?

COMPRESSED GAS CYLINDERS

- ☐ Are cylinders with a water weight capacity over 30 pounds, equipped with means for connecting a valve protector device, or with a collar or recess to protect the valve?
- ☐ Are cylinders legibly marked to clearly identify the gas contained?
- ☐ Are compressed gas cylinders stored in areas which are protected from external heat sources such as flame impingement, intense radiant heat, electric arcs, or high temperature lines?
- ☐ Are cylinders located or stored in areas where they will not be damaged by passing or falling objects or subjects to tampering by unauthorized persons?
- ☐ Are cylinders stored or transported in a manner to prevent them creating a hazard by tipping, falling or rolling?
- ☐ Are cylinders containing liquefied fuel gas, stored or transported in a position so that the safety relief device is always in direct contact with the vapor space in the cylinder?
- ☐ Are valve protectors always placed on cylinders when the cylinders are not in use or connected for use?
- ☐ Are all valves closed off before a cylinder is moved, when the cylinder is empty, and at the completion of each job?

- ☐ Is vacuuming with appropriate equipment used whenever possible rather than blowing or sweeping dust?
- ☐ Are grinders, saws, and other machines that produce respirable dusts vented to an industrial collector or central exhaust system?
- ☐ Are all local exhaust ventilation systems designed and operating properly such as air flow and volume necessary for the application, ducts not plugged or belts slipping?
- ☐ Is personal protective equipment provided, used and maintained wherever required?
- ☐ Are there written standard operating procedures for the selection and use of respirators where needed?
- ☐ Are restrooms and washrooms kept clean and sanitary?
- ☐ Is all water provided for drinking, washing, and cooking potable?
- ☐ Are all outlets for water not suitable for drinking clearly identified?
- ☐ Are employees' physical capacities assessed before being assigned to jobs requiring heavy work?
- ☐ Are employees instructed in the proper manner of lifting heavy objects?
- ☐ Where heat is a problem, have all fixed work areas been provided with spot cooling or air conditioning?
- ☐ Are employees screened before assignment to areas of high heat to determine if their health condition might make them more susceptible to having an adverse reaction?
- ☐ Are employees working on streets and roadways where they are exposed to the hazards of traffic, required to wear bright colored (traffic orange) warning vests?
- ☐ Are exhaust stacks and air intakes so located that contaminated air will not be recirculated within a building or other enclosed area?
- ☐ Is equipment producing ultra-violet radiation properly shielded?

FLAMMABLE AND COMBUSTIBLE MATERIALS

- ☐ Are combustible scrap, debris and waste materials (oily rags, etc.) stored in covered metal receptacles and removed from the worksite promptly?
- ☐ Is proper storage practiced to minimize the risk of fire including spontaneous combustion?
- ☐ Are approved containers and tanks used for the storage and handling of flammable and combustible liquids?
- ☐ Are all connections on drums and combustible liquid piping, vapor and liquid tight?
- ☐ Are all flammable liquids kept in closed containers when not in use (e.g. parts cleaning tanks, pans, etc.)?
- ☐ Are bulk drums of flammable liquids grounded and bonded to containers during dispensing?
- ☐ Do storage rooms for flammable and combustible liquids have explosion-proof lights?

☐ Do storage rooms for flammable and combustible liquids have mechanical or gravity ventilation?

- ☐ Is liquidified petroleum gas stored, handled, and used in accordance with safe practices and standards?
- ☐ Are no smoking signs posted on liquidified petroleum gas tanks?
- ☐ Are liquidified petroleum storage tanks guarded to prevent damage from vehicles?
- ☐ Are all solvent wastes, and flammable liquids kept in fire-resistant, covered containers until they are removed from the worksite?
- ☐ Is vacuuming used whenever possible rather than blowing or sweeping combustible dust?
- ☐ Are firm separators placed between containers of combustibles or flammables, when stacked one upon another, to assure their support and stability?
- ☐ Are fuel gas cylinders and oxygen cylinders separated by distance, fire resistant barriers, etc. while in storage?
- ☐ Are fire extinguishers selected and provided for the types of materials in areas where they are to be used?

Class A Ordinary combustible material fires.

Class B Flammable liquid, gas or grease fires.

Class C Energized-electrical equipment fires.

- ☐ Are appropriate fire extinguishers mounted within 75 feet of outside areas containing flammable liquids, and within 10 feet of any inside storage area for such materials?
- ☐ Are extinguishers free from obstructions or blockage?
- ☐ Are all extinguishers serviced, maintained and tagged at intervals not to exceed one year?
- ☐ Are all extinguishers fully charged and in their designated places?
- ☐ Where sprinkler systems are permanently installed, are the nozzle heads so directed or arranged that water will not be sprayed into operating electrical switch boards and equipment?
- ☐ Are "NO SMOKING" signs posted where appropriate in areas where flammable or combustible materials are used or stored?
- ☐ Are safety cans used for dispensing flammable or combustible liquids at a point of use?
- ☐ Are all spills of flammable or combustible liquids cleaned up promptly?
- ☐ Are storage tanks adequately vented to prevent the development of excessive vacuum or pressure as a result of filling, emptying, or atmosphere temperature changes?
- ☐ Are storage tanks equipped with emergency venting that will relieve excessive internal pressure caused by fire exposure?
- ☐ Are "NO SMOKING" rules enforced in areas involving storage and use of hazardous materials?

or ducts?

- ☐ Are belts and pulleys inside the booth fully enclosed?
- ☐ Do ducts have access doors to allow cleaning?
- ☐ Do all drying spaces have adequate ventilation?

ENTERING CONFINED SPACES

- ☐ Are confined spaces thoroughly emptied of any corrosive or hazardous substances, such as acids or caustics, before entry?
- ☐ Are all lines to a confined space, containing inert, toxic, flammable, or corrosive materials valved off and blanked or disconnected and separated before entry?
- ☐ Is it required that all impellers, agitators, or other moving equipment inside confined spaces be locked-out if they present a hazard?
- ☐ Is either natural or mechanical ventilation provided prior to confined space entry?
- ☐ Are appropriate atmospheric tests performed to check for Oxygen deficiency, toxic substances and explosive concentrations in the confined space before entry?
- ☐ Is adequate illumination provided for the work to be performed in the confined space?
- ☐ Is the atmosphere inside the confined space frequently tested or continuously monitored during conduct of work?
- ☐ Is there an assigned safety standby employee outside of the confined space, when required, whose sole responsibility is to watch the work in progress, sound an alarm if necessary, and render assistance?
- ☐ Is the standby employee appropriately trained and equipped to handle an emergency?
- ☐ Is the standby employee or other employees prohibited from entering the confined space without lifelines and respiratory equipment if there is any question as to the cause of an emergency?
- ☐ Is approved respiratory equipment required if the atmosphere inside the confined space cannot be made acceptable?
- ☐ Is all portable electrical equipment used inside confined spaces either grounded and insulated, or equipped with ground fault protection?
- ☐ Before gas welding or burning is started in a confined space, are hoses checked for leaks, compressed gas bottles forbidden inside of the confined space, torches lighted only outside of the confined area and the confined area tested for an explosive atmosphere each time before a lighted torch is to be taken into the confined space?
- ☐ If employees will be using oxygen-consuming equipment such as salamanders, torches, furnaces, etc., in a confined space, is sufficient air provided to assure combustion without reduc-

cent by volume?

- ☐ Whenever combustion-type equipment is used in a confined space, are provisions made to ensure the exhaust gases are vented outside of the enclosure?
- ☐ Is each confined space checked for decaying vegetation or animal matter which may produce methane?
- ☐ Is the confined space checked for possible industrial waste which could contain toxic properties?
- ☐ If the confined space is below the ground and near areas where motor vehicles will be operating, is it possible for vehicle exhaust or carbon monoxide to enter the space?

ENVIRONMENTAL CONTROLS

- ☐ Are all work areas properly illuminated?
- ☐ Are employees instructed in proper first aid and other emergency procedures?
- ☐ Are hazardous substances identified which may cause harm by inhalation, ingestion, skin absorption or contact?
- ☐ Are employees aware of the hazards involved with the various chemicals they may be exposed to in their work environment, such as ammonia, chlorine, epoxies, caustics, etc.?
- ☐ Is employee exposure to chemicals in the workplace kept within acceptable levels?
- ☐ Can a less harmful method or produce be used?
- ☐ Is the work area's ventilation system appropriate for the work being performed?
- ☐ Are spray painting operations done in spray rooms or booths equipped with an appropriate exhaust system?
- ☐ Is employee exposure to welding fumes controlled by ventilation, use of respirators, exposure time, or other means?
- ☐ Are welders and other workers nearby provided with flash shields during welding operations?
- ☐ If forklifts and other vehicles are used in buildings or other enclosed areas, are the carbon monoxide levels kept below maximum acceptable concentration?
- ☐ Has there been a determination that noise levels in the facilities are within acceptable levels?
- ☐ Are steps being taken to use engineering controls to reduce excessive noise levels?
- ☐ Are proper precautions being taken when handling asbestos and other fibrous materials?
- ☐ Are caution labels and signs used to warn of asbestos?
- ☐ Are wet methods used, when practicable, to prevent the emission of airborne asbestos fibers, silica dust and similar hazardous materials?

- ☐ Is there an employee training program for hazardous substances?

Does this program include:

- ☐ (1) An explanation of what an MSDS is and how to use and obtain one.
- ☐ (2) MSDA contents for each hazardous substance or class of substances.
- ☐ (3) Explanation of "Right to Know."
- ☐ (4) Identification of where an employee can see the employers written hazard communication program and where hazardous substances are present in their work areas.
- ☐ (5) The physical and health hazards of substances in the work area, and specific protective measures to be used.
- ☐ (6) Details of the hazard communication program, including how to use the labeling system and MSDS's.

ELECTRICAL

- ☐ Do you specify compliance with OSHA for all contract electrical work?
- ☐ Are all employees required to report as soon as practicable any obvious hazard to life or property observed in connection with electrical equipment or lines?
- ☐ Are employees instructed to make preliminary inspections and/or appropriate tests to determine what conditions exist before starting work on electrical equipment or lines?
- ☐ When electrical equipment or lines are to be serviced, maintained or adjusted, are necessary switches opened, locked-out and tagged whenever possible?
- ☐ Are portable electrical tools and equipment grounded or of the double insulated type?
- ☐ Are electrical appliances such as vacuum cleaners, polishers, vending machines, etc., grounded?
- ☐ Do extension cords being used have a grounding conductor?
- ☐ Are multiple plug adaptors prohibited?
- ☐ Are ground-fault circuit interrupters installed on each temporary 15 or 20 ampere, 120 volt AC circuit at locations where construction, demolition, modifications, alterations or excavations are being performed?
- ☐ Are all temporary circuits protected by suitable disconnecting switches or plug connectors at the junction with permanent wiring?
- ☐ Do you have electrical installations in hazardous dust or vapor areas? If so, do they meet the National Electrical Code (NEC) for hazardous locations?
- ☐ Is exposed wiring and cords with frayed or deteriorated insulation repaired or replaced promptly?
- ☐ Are flexible cords and cables free of splices or taps?
- ☐ Are clamps or other securing means provided on flexible cords or cables at plugs, receptacles, tools, equipment, etc., and is the cord jacket securely held in place?
- ☐ Are all cord, cable and raceway connections intact and secure?
- ☐ In wet or damp locations, are electrical tools and equipment appropriate for the use or location or otherwise protected?
- ☐ Is the location of electrical power lines and cables (overhead, underground, underfloor, other side of walls, etc.) determined before digging, drilling or similar work is begun?
- ☐ Are metal measuring tapes, ropes, handlines or similar devices with metallic thread woven into the fabric prohibited where they could come in contact with energized parts of equipment or circuit conductors?
- ☐ Is the use of metal ladders prohibited in areas where the ladder or the person using the ladder could come in contact with energized parts of equipment, fixtures or circuit conductors?
- ☐ Are all disconnecting switches and circuit breakers labeled to indicate their use or equipment served?
- ☐ Are disconnecting means always opened before fuses are replaced?
- ☐ Do all interior wiring systems include provisions for grounding metal parts of electrical raceways, equipment and enclosures?
- ☐ Are all electrical raceways and enclosures securely fastened in place?
- ☐ Are all energized parts of electrical circuits and equipment guarded against accidental contact by approved cabinets or enclosures?
- ☐ Is sufficient access and working space provided and maintained about all electrical equipment to permit ready and safe operations and maintenance?
- ☐ Are all unused openings (including conduit knockouts) in electrical enclosures and fittings closed with appropriate covers, plugs or plates?
- ☐ Are electrical enclosures such as switches, receptacles, junction boxes, etc., provided with tight-fitting covers or plates?
- ☐ Are disconnecting switches for electrical motors in excess of two horsepower, capable of opening the circuit when the motor is in a stalled condition, without exploding? (Switches must be horsepower rated equal to or in excess of the motor hp rating.)
- ☐ Is low voltage protection provided in the control device of motors driving machines or equipment which could cause probable injury from inadvertent starting?

HAZARDOUS CHEMICAL EXPOSURE

- ☐ Are employees trained in the safe handling practices of hazardous chemicals such as acids, caustics, etc.?
- ☐ Are employees aware of the potential hazards involving various chemicals stored or used in the workplace such as acids, bases, caustics, epoxies, phenols, etc.?
- ☐ Is employee exposure to chemicals kept within acceptable levels?
- ☐ Are eye wash fountains and safety showers provided in areas where corrosive chemicals are handled?
- ☐ Are all containers, such as vats, storage tanks, etc., labeled as to their contents, e.g., "CAUSTICS"?
- ☐ Are all employees required to use personal protective clothing and equipment when handling chemicals (gloves, eye protection, respirators, etc.)?
- ☐ Are flammable or toxic chemicals kept in closed containers when not in use?
- ☐ Are chemical piping systems clearly marked as to their content?
- ☐ Where corrosive liquids are frequently handled in open containers or drawn from storage vessels or pipe lines, is adequate means readily available for neutralizing or disposing of spills or overflows properly and safely?
- ☐ Have standard operating procedures been established and are they being followed when cleaning up chemical spills?
- ☐ Where needed for emergency use, are respirators stored in a convenient, clean, and sanitary location?
- ☐ Are respirators intended for emergency use adequate for the various uses for which they may be needed?
- ☐ Are employees prohibited from eating in areas where hazardous chemicals are present?
- ☐ Is personal protective equipment provided, used and maintained whenever necessary?
- ☐ Are there written standard operating procedures for the selection and use of respirators where needed?
- ☐ If you have a respirator protection program, are your employees instructed on the correct usage and limitations of the respirators? Are the respirators NIOSH approved for this particular application? Are they regularly inspected and cleaned, sanitized and maintained?
- ☐ If hazardous substances are used in your processes, do you have a medical or biological monitoring system in operation?

- ☐ Are you familiar with the Threshold Limit Values or Permissible Exposure Limits of airborne contaminants and physical agents used in your workplace?
- ☐ Have control procedures been instituted for hazardous materials, where appropriate, such as respirators, ventilation systems, handling practices, etc.?
- ☐ Whenever possible are hazardous substances handled in properly designed and exhausted booths or similar locations?
- ☐ Do you use general dilution or local exhaust ventilation systems to control dusts, vapors, gases, fumes, smoke, solvents or mists which may be generated in your workplace?
- ☐ Is ventilation equipment provided for removal of contaminants from such operations as: Production grinding, buffing, spray painting, and/or vapor degreasing, and is it operating properly?
- ☐ Do employees complain about dizziness, headaches, nausea, irritation, or other factors of discomfort when they use solvents or other chemicals?
- ☐ Is there a dermatitis problem? Do employees complain about dryness, irritation, or sensitization of the skin?
- ☐ Have you considered the use of an industrial hygienist or environmental health specialist to evaluate your operation?
- ☐ If internal combustion engines are used, is carbon monoxide kept within acceptable levels?
- ☐ Is vacuuming used, rather than blowing or sweeping dusts whenever possible for clean-up?
- ☐ Are materials which give off toxic asphyxiant, suffocating or anesthetic fumes, stored in remote or isolated locations when not in use?

HAZARDOUS SUBSTANCES COMMUNICATION

- ☐ Is there a list of hazardous substances used in your workplace?
- ☐ Is there a written hazard communication program dealing with Material Safety Data Sheets (MSDS), labeling, and employee training?
- ☐ Is each container for a hazardous substance (i.e., vats, bottles, storage tanks, etc.) labeled with product identity and a hazard warning (communication of the specific health hazards and physical hazards)?
- ☐ Is there a Material Safety Data Sheet readily available for each hazardous substance used?

MATERIAL HANDLING

- ☐ Is there safe clearance for equipment through aisles and doorways?
- ☐ Are aiseways designated, permanently marked, and kept clear to allow unhindered passage?
- ☐ Are motorized vehicles and mechanized equipment inspected daily or prior to use?
- ☐ Are vehicles shut off and brakes set prior to loading or unloading?
- ☐ Are containers of combustibles or flammables, when stacked while being moved, always separated by dunnage sufficient to provide stability?
- ☐ Are dock boards (bridge plates) used when loading or unloading operations are taking place between vehicles and docks?
- ☐ Are trucks and trailers secured from movement during loading and unloading operations?
- ☐ Are dock plates and loading ramps constructed and maintained with sufficient strength to support imposed loading?
- ☐ Are hand trucks maintained in safe operating condition?
- ☐ Are chutes equipped with sideboards of sufficient height to prevent the materials being handled from falling off?
- ☐ Are chutes and gravity roller sections firmly placed or secured to prevent displacement?
- ☐ At the delivery end of the rollers or chutes, are provisions made to brake the movement of the handled materials?
- ☐ Are pallets usually inspected before being loaded or moved?
- ☐ Are hooks with safety latches or other arrangements used when hoisting materials so that slings or load attachments won't accidentally slip off the hoist hooks?
- ☐ Are securing chains, ropes, chockers or slings adequate for the job to be performed?
- ☐ When hoisting material or equipment, are provisions made to assure no one will be passing under the suspended loads?
- ☐ Are material safety data sheets available to employees handling hazardous substances?

TRANSPORTING EMPLOYEES AND MATERIALS

- ☐ Do employees who operate vehicles on public thoroughfares have valid operator's licenses?
- ☐ When seven or more employees are regularly transported in a van, bus or truck, is the operator's license appropriate for the class of vehicle being driven?
- ☐ Is each van, bus or truck used regularly to transport employees, equipped with an adequate number of seats?
- ☐ When employees are transported by truck, are provisions provided to prevent their falling from the vehicle?

- ☐ Are vehicles used to transport employees equipped with lamps, brakes, horns, mirrors, windshields and turn signals in good repair?
- ☐ Are transport vehicles provided with handrails, steps, stirrups or similar devices, so placed and arranged that employees can safely mount or dismount?
- ☐ Are employee transport vehicles equipped at all times with at least two reflective type flares?
- ☐ Is a full charged fire extinguisher, in good condition, with at least 4 B:C rating maintained in each employee transport vehicle?
- ☐ When cutting tools or tools with sharp edges are carried in passenger compartments of employee transport vehicles, are they placed in closed boxes or containers which are secured in place?
- ☐ Are employees prohibited from riding on top of any load which can shift, topple, or otherwise become unstable?

CONTROL OF HARMFUL SUBSTANCES BY VENTILATION

- ☐ Is the volume and velocity of air in each exhaust system sufficient to gather the dusts, fumes, mists, vapors or gases to be controlled, and to convey them to a suitable point of disposal?
- ☐ Are exhaust inlets, ducts and plenums designed, constructed, and supported to prevent collapse or failure of any part of the system?
- ☐ Are clean-out ports or doors provided at intervals not to exceed 12 feet in all horizontal runs of exhaust ducts?
- ☐ Where two or more different type of operations are being controlled through the same exhaust system, will the combination of substances being controlled, constitute a fire, explosion or chemical reaction hazard in the duct?
- ☐ Is adequate makeup air provided to areas where exhaust systems are operating?
- ☐ Is the source point for makeup air located so that only clean, fresh air, which is free of contaminants, will enter the work environment?
- ☐ Where two or more ventilation systems are serving a work area, is their operation such that one will not offset the functions of the other?

SANITIZING EQUIPMENT AND CLOTHING

- ☐ Is personal protective clothing or equipment that employees are required to wear or use, of a type capable of being cleaned easily and disinfected?
- ☐ Are employees prohibited from interchanging personal protective clothing or equipment, unless it has been properly cleaned?

- ☐ Is each motor disconnecting switch or circuit breaker located within sight of the motor control device?
- ☐ Is each motor located within sight of its controller or the controller disconnecting means capable of being locked in the open position or is a separate disconnecting means installed in the circuit within sight of the motor?
- ☐ Is the controller for each motor in excess of two horsepower, rated in horsepower equal to or in excess of the rating of the motor it serves?
- ☐ Are employees who regularly work on or around energized electrical equipment or lines instructed in the cardio-pulmonary resuscitation (CPR) methods?
- ☐ Are employees prohibited from working alone on energized lines or equipment over 600 volts?

NOISE

- ☐ Are there areas in the workplace where continuous noise levels exceed 85dBA?
- ☐ Is there an ongoing preventive health program to educate employees in: safe levels of noise, exposures; effects of noise on their health; and the use of personal protection?
- ☐ Have work areas where noise levels make voice communication between employees difficult been identified and posted?
- ☐ Are noise levels being measured using a sound level meter or an octave band analyzer and records being kept?
- ☐ Have engineering controls been used to reduce excessive noise levels? Where engineering controls are determined to not be feasible, are administrative controls (i.e. worker rotation) being used to minimize individual employee exposure to noise?
- ☐ Is approved hearing protective equipment (noise attenuating devices) available to every employee working in noisy areas?
- ☐ Have you tried isolating noisy machinery from the rest of your operation?
- ☐ If you use ear protectors, are employees properly fitted and instructed in their use?
- ☐ Are employees in high noise areas given periodic audiometric testing to ensure that you have an effective hearing protection system?

FUELING

- ☐ Is it prohibited to fuel an internal combustion engine with a flammable liquid while the engine is running?
- ☐ Are fueling operations done in such a manner that likelihood of spillage will be minimal?

- ☐ When spillage occurs during fueling operations, is the spilled fuel washed away completely, evaporated, or other measures taken to control vapors before restarting the engine?
- ☐ Are fuel tank caps replaced and secured before starting the engine?
- ☐ In fueling operations, is there always metal contact between the container and the fuel tank?
- ☐ Are fueling hoses of a type designed to handle the specific type of fuel?
- ☐ Is it prohibited to handle or transfer gasoline in open containers?
- ☐ Are open lights, open flames, or sparking, or arcing equipment prohibited near fueling or transfer of fuel operations?
- ☐ Is smoking prohibited in the vicinity of fueling operations?
- ☐ Are fueling operators prohibited in building or other enclosed areas that are not specifically ventilated for this purpose?
- ☐ Where fueling or transfer of fuel is done through a gravity flow system, are the nozzles of the self-closing type?

IDENTIFICATION OF PIPING SYSTEMS

- ☐ When nonpotable water is piped through a facility, are outlets or taps posted to alert employees that it is unsafe and not to be used for drinking, washing or other personal use?
- ☐ When hazardous substances are transported through above ground piping, is each pipeline identified at points where confusion could introduce hazards to employees?
- ☐ When pipelines are identified by color painting, are all visible parts of the line so identified?
- ☐ When pipelines are identified by color painted bands or tapes, are the bands or tapes located at reasonable intervals and at each outlet, valve or connection?
- ☐ When pipelines are identified by color, is the color code posted at all locations where confusion could introduce hazards to employees?
- ☐ When the contents of pipelines are identified by name or name abbreviation, is the information readily visible on the pipe near each valve or outlet?
- ☐ When pipelines carrying hazardous substances are identified by tags, are the tags constructed of durable materials, the message carried clearly and permanently distinguishable and are tags installed at each valve or outlet?
- ☐ When pipelines are heated by electricity, steam or other external source, are suitable warning signs or tags placed at unions, valves, or other serviceable parts of the system?

- ☐ Are machines and equipment, which process, handle or apply materials that could be injurious to employees, cleaned and/or decontaminated before being overhauled or placed in storage?
- ☐ Are employees prohibited from smoking or eating in any area where contaminants that could be injurious if ingested are present?
- ☐ When employees are required to change from street clothing into protective clothing, is a clean change room with separate storage facility for street and protective clothing provided?
- ☐ Are employees required to shower and wash their hair as soon as possible after a known contact has occurred with a carcinogen?
- ☐ When equipment, materials, or other items are taken into or removed from a carcinogen regulated area, is it done in a manner that will contaminate non-regulated areas or the external environment?

TIRE INFLATION

- ☐ Where tires are mounted and/or inflated on drop center wheels, is a safe practice procedure posted and enforced?
- ☐ Where tires are mounted and/or inflated on wheels with split rims and/or retainer rings, is a safe practice procedure posted and enforced?
- ☐ Does each tire inflation hose have a clip-on chuck with at least 24 inches of hose between the chuck and an in-line hand valve and gauge?
- ☐ Does the tire inflation control valve automatically shutoff the air flow when the valve is released?
- ☐ Is a tire restraining device such as a cage, rack or other effective means used while inflating tires mounted on split rims, or rims using retainer rings?
- ☐ Are employees strictly forbidden from taking a position directly over or in front of a tire while it's being inflated?

JOB SAFETY ANALYSIS

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to use the techniques of a Job Safety Analysis (JSA) to review job methods and uncover hazards in the workplace.

ENABLING OBJECTIVES

1. Explain the purpose and scope of the JSA.
2. Explain the JSA procedure and hazard areas to be analyzed.
3. Discuss the use of JSA information in establishing controls and a safer work area, and additional safety analytical methods.
4. Perform a JSA of selected jobs in area.

REFERENCES

1. National Safety Council. 1985. *Supervisor's Safety Manual*, 6th Edition, National Safety Council, Chicago, Illinois.
2. National Safety Council. 1988. *Accident Prevention Manual for Industrial Operations*, 9th Edition, National Safety Council, Chicago, Illinois.
3. Job Safety Analysis. 1979. DOE 76-45/19, SSDC-79, EG&G, Idaho.
4. OSHA 3071, Job Hazard Analysis. 1988. U.S. Government Printing Office, Washington DC, 20402-9328.

DURATION

One hour

INSTRUCTOR MATERIALS

Course manual with instructor notes.
Overhead projector/viewer assembly

Battelle

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Job Safety Analyses

Terminal Objective

The purpose of this section is to enable the supervisor to utilize the techniques of a job safety analysis (JSA) to review job methods and uncover hazards in the workplace.

Enabling Objectives

- 1. Explain the purpose and scope of the job safety analysis.**
- 2. Explain the JSA procedure and hazard areas to be analyzed.**
- 3. Discuss the use of JSA information in establishing controls and a safer work area, and additional analytical methods.**
- 4. Perform a JSA of selected jobs in area.**

What is A Job Safety Analyses (JSA)?

- **Job Safety Analysis**
- **"Hazard Hunt"**
- **Identify and Control Hazards**
- **Prevent Accidents**

Objective 1

4

- JSA can be regarded as a "hazard hunt" conducted by the first-line supervisor and a skilled operator
- Benefits of JSA include fewer accidents and greater employee involvement in safety procedures and policies.

Selecting and Prioritizing JSA's

- Accident rate analysis
- Near misses
- High hazard area
- Old facilities
- New operations
- Change in procedure

Objective 1

5

- Accident trend analysis should dictate the first job to receive attention
- Near misses should be considered 'accidents' for the purpose of prioritizing

Selecting The JSA Team

- **Safety Specialist**
- **Area Supervisor**
- **Experienced Operator**
- **Facility Engineering Personnel (Optional)**

Objective 1

6

- A safety specialist or trained supervisor should head the JSA team.
- An experienced operator is important for explanation of variations in the process.
- Engineering personnel are important for two reasons. It exposes them to the process and their input is helpful in determining the feasibility of the controls.

Starting JSA

■ General Area Review. Look for:

- Housekeeping.
- General equipment condition.
- Hazards from surrounding operations.
- General environmental hazards.

Objective 2

7

- General environmental conditions can be just as hazardous to the operator as the process itself.

Observe the Operation

- Observe and record each step.
- Record enough detail to identify all hazards.
- Review with operator to ensure accuracy.

Objective 1
8

- The job should be broken down in enough detail to identify all the hazards.
- The recorded observations should be reviewed with the operator. Ask the operator to identify possible variations in the process. (i.e. things that were done then, but aren't normally done or things that are normally done that weren't done then.

Identify the Existing and Potential Hazards

- Physical
- Chemical
- Biological
- Ergonomic

Objective 1

9

- Occasionally a combination of several events not normally recognized as a hazard, combine to form a hazardous situation. (i.e. a chemical may not be hazardous in itself but when heated or mixed with other chemicals, it becomes hazardous.)

Types of Hazards

■ Physical

- Sharp edges on equipment or materials.
- Falling objects.
- Potential for being struck by or caught between objects.
- Loose clothing or jewelry.
- Awkward or dangerous body position.

Objective 1

10

- Look for all physical hazards including those that may not be associated with the process being reviewed. (i.e. Low hanging tool shelf - head bump)

Types of Hazards

■ **Chemical**

- Raw materials used in process
- Thermal decomposition by-products
- Oils, lubricants or cutting fluids

Objective 1

11

- Don't forget possible additive or synergistic effects of certain chemical combinations.

Types of Hazards

■ Biological

- Heat
- Cold
- Radiation

Objective 2

12

- These can not only stress the body, they can inhibit the performance of worker.
(i.e. loss of dexterity from cold, sweat making parts slippery in extreme warmth)

Types of Hazards

■ **Ergonomic**

- Lifting and material handling procedures
- Unnatural body positions

Objective 1

13

- Lifting and material handling
- Musculoskeletal stress (i.e. carpal tunnel syndrome, tendonitis, etc.)

Identify the Cause of Listed Hazards

- Inadequate machine guarding
- Poor material flow
- Equipment age and condition
- Inadequate material handling equipment
- Inherent material hazard

Objective 2

14

- There may be several causes. List all of them.

Recommend Changes or Controls

- **Elimination of hazard if possible**
- **Engineering or process changes**
- **Interlocks/Lockouts**
- **Isolation**
- **Personal protective equipment**

Objective 3

15

- Use engineering controls whenever feasible.
- Administrative controls should be recommended next.
- PPE should be used as a last resort

Frequency of JSA

- Initially as prioritized
- During a change in the process
- When developing new processes
- Periodically after initial review

Objective 3

16

- Periodic review of JSA will often identify hazards missed by the last review

Using JSA Information

- Standard Operating Procedures
- Train new operators

Objective 3

17

- The JSA creates a process "cookbook". This can be used to create formal SOPs and to train new operators.
- Changes identified during JSA can often increase efficiency by improving cycle time and product flow.

When Is It "Safe"?

**When all the risks have been
considered and are acceptable.**

Objective 3

18

- When considering hazards and determining if the process is safe, the likelihood that a given event will take place to create a hazard must be considered.

Summary

- Identify hazards
- Identify hazard cause or causes
- Eliminate or reduce hazard by controlling the cause
- Class Exercise

Objective 4

19

- It is important that JSA be used effectively. As a result of JSAs, supervisors learn more about the jobs they supervise. When a JSA is distributed, the supervisors first responsibility is to explain its contents to employees; the entire JSA should be reviewed with all employees concerned. Occasionally supervisors should observe employees to determine whether or not employees are doing the jobs in accordance with the safe job procedures.
- Class Exercise
 - Have the class break into their groups to perform this class exercise. Each group should pick one operation from their combined work areas to perform a JSA. Make sure it isn't too complex so that it can be completed in the time allotted, or the group should only do a portion of the operation. In the time remaining for this section, have the class perform their JSA, write up their JSA, and we will have the class present these.

HAZARD CONTROL

TERMINAL OBJECTIVE

The purpose of this section is to enable the supervisor to provide controls to eliminate or, at a minimum, reduce safety and health hazards. Focus on:

- engineering controls
- personal protective equipment (PPE)
- administrative controls

ENABLING OBJECTIVES

1. State three methods that are used to control health hazards.
2. Name the method that should only be used when the first two methods are not feasible or fully effective.
3. Describe two components of an effective noise control program.
4. List four types of personal protective equipment.
5. Identify respiratory hazards and determine the appropriate types of respiratory protection available for a specific hazard type.
6. State the requirements of a respiratory protection program

REFERENCES

1. Supervisor's Safety Manual, National Safety Council, 6th ed., 1985.
2. Occupational Safety and Health Series, National Safety Council, 3rd ed., 1988.

DURATION

Two hours

INSTRUCTOR MATERIALS

Course manual with instructor notes.
Overhead projector/viewer assembly
VCR/TV

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Hazard Control

Terminal Objective

The purpose of this section is to enable the supervisor to provide controls to eliminate or, at a minimum, reduce safety and health hazards.
Focus on:

- engineering controls
- personal protective equipment (PPE)
- administrative controls

Enabling Objectives

- 1. State three methods that are used to control health hazards.**
- 2. Name the method that should only be used when the first two methods are not feasible or fully effective.**
- 3. Describe two components of an effective noise control program.**

Enabling Objectives

- 4. List four types of personal protective equipment.**
- 5. Identify respiratory hazards and determine the appropriate types of respiratory protection available for a specific hazard type.**
- 6. State the requirements of a respiratory protection program**

Control Methods

- Engineering controls
- Administrative controls
- Personal Protective Equipment

Objective 1 and 2

5

- As discussed in the introductory section to this course, strategy for the control of hazards should use the control methods in the order listed (i.e., Engineering controls, administrative controls, etc.)
- PPE is used as a last resort or to protect workers while engineering controls are being designed and installed. Or, 29 CFR 1910.1000(e) states that when engineering or administrative controls are "not feasible to achieve full compliance, protective equipment or any other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed in this section" (PELs).

Engineering Controls

■ Preferred Control method

- Isolation
- Process change
- Ventilation

Engineering Controls

■ Isolation

- Operator booths
- Remote controls
- Enclosures
- Acoustical treatments

Engineering Controls

■ Process change

- Chemical substitution
- Equipment modification
- Manual vs. Mechanical
- Order of operations

Hazard Control

Engineering Controls

- **Ventilation**
 - Dilution
 - Local Exhaust

Objective 1

9

Engineering Controls

■ Dilution Ventilation

- Limiting factors
 - low toxicity
 - low contaminant volume
 - uniform contaminate evolution
 - distance between workers and contaminant

Engineering Controls

■ Dilution Ventilation

- Limiting factors (continued)
 - impractical for dust/fumes
 - requires adequate make-up air
 - placement of fan critical
 - positive pressure recommended

Engineering Controls

■ Local Exhaust Ventilation (LEV)

- Preferred for contaminant control
- Controls contaminant at point of generation

Engineering Controls

■ Local Exhaust Ventilation

- LEV system includes
 - hood
 - duct
 - air cleaning device (may be optional)
 - fan
 - exhaust stack

Engineering Controls

■ Local Exhaust Ventilation

- Advantages

- controls contaminants at source
- effective for toxic materials
- limited make-up air required

Engineering Controls

■ Local Exhaust Ventilation

- Disadvantages
 - distance to contaminant critical
 - complex system design
 - hood design critical
 - maintenance important
 - expensive

Engineering Controls

■ Local Exhaust Ventilation

- Common uses
 - spray painting
 - welding
 - open surface tanks
 - laboratory hoods

Administrative Controls

■ Material Substitution

- Eliminate unnecessary chemicals/processes
- Use less toxic materials
- Must consider other implications (fire, disposal, etc.)

Administrative Controls

■ Worker rotation

- Increases number of employees exposed
- Prohibited by some OSHA standards

Administrative Controls

- **Maintenance and Housekeeping**
 - Critical to continue effectiveness of engineering controls
 - Prevent unexpected problems that result in exposures

Training

- Proper work practices/procedures
- Specifically required by many OSHA standards

Personal Protective Equipment (PPE)

- **Least preferred method**
- **Selected based upon hazard and conditions**
- **Not a substitute for engineering and/or administrative controls**

Personal Protective Equipment

- **Required whenever use may prevent an injury or illness**

Personal Protective Equipment

■ General Provisions

- Suitable for the hazard
- Maintained in clean, sanitary condition
- Use must be enforced
- Employee trained in proper use

Personal Protective Equipment

- Selection based upon noise reduction rating (NRR)
- Combination (plugs and muffs) may be required

Personal Protective Equipment

■ Eye and Face Protection

- Flying materials
- Splash protection
- Intense light (welding, lasers)
- ANSI approved

Personal Protective Equipment

- **Gloves, aprons, encapsulating suits**
 - Selected based on hazards
 - Must consider chemical compatibility
- **Safety footwear**
 - ANSI approved

Personal Protective Equipment

■ Respiratory Protection

- Air purifying
- Supplied air

Respiratory Protection

■ Supplied Air Respirators (SAR)

- Airline respirator
- Self Contained Breathing Apparatuses (SCBA)

Supplied Air Respirators

■ Airline Respirators

- Maximum hose length 300 feet
- May be used in IDLH if equipped with emergency escape bottle
- Good for long duration activities

Supplied Air Respirators

■ Self Contained Breathing Apparatus (SCBA)

- Provide good mobility
- Can be used in IDLH if in positive pressure mode
- Provides best protection

Supplied Air Respirators

■ Air Quality

- Must meet CGA grade 'D' specifications
 - oxygen 19.5%-23.5%
 - less than 5 mg/m³ hydrocarbon
 - less than 10 ppm carbon monoxide
 - less than 1000 ppm carbon dioxide

Air Purifying Respirators

- **Remove contaminants from air**
- **DO NOT supply oxygen**

Air Purifying Respirators

- Disposables
- 1/2 mask
- Full face
- Gas mask

Air Purifying Respirators

■ Limitations

- DO NOT supply oxygen
- Can NOT be used for materials with poor warning properties
- Can NOT be used in IDLH
- Provide protection for specific contaminants

Air purifying Respirators

Color coding

Magenta	Toxic Particles
Gray	Dust/mist/fumes
Black	Organic vapors
White	Acid gases
Yellow	Organic vapor/acid gas
Green	Ammonia/Amines

Respiratory Protection Program

- **Comprehensive program
required regardless of type of
respirator provided or allowed**

Respiratory Protection Program Minimum Requirements

- 1. Written program**
- 2. Proper selection**
- 3. Training**
- 4. Regular cleaning/disinfection**
- 5. Proper storage**

Respiratory Protection Program Minimum Requirements

- 6. Routine respirator inspection**
- 7. Work area surveillance**
- 8. Supervisor evaluation**
- 9. Medical review**
- 10. Respirator approval**
- 11. Monthly inspection of emergency
use respirators**

Respiratory Protection

■ Respirator Approvals

- All parts/accessories approved as unit
- Modification voids approvals
- Approved by NIOSH/MSHA

Summary

- Engineering Controls
- Administrative Controls
- PPE

HAZARD/VIOLATION SEARCH WORKSHOP

Description of Hazard	Standard	Page
1. Some locations in warehouse where directions to exit are not apparent	<u>1910.36 (b)(5), 1910.37 (q)(1), 1910.37(q)(5)</u>	<hr/>
2. No portable fire extinguisher inspection/monitoring programs	<u>.157 (e)(3), .157 (e)(2)</u>	<hr/>
3. Fixed carbon dioxide extinguishes system not being inspected annually	<u>.160 (b)(6)</u>	<hr/>
4. Exit door blocked from outside	<u>.36 (d)(1), .36 (b)(4), .37 (k)(2)</u>	<hr/>
5. Ten inch vertical clearance between sprinklers and material below	<u>.159 (c)(10)</u>	<hr/>
6. Fire extinguishers obstructed	<u>.157 (c)(1)</u>	<hr/>
7. No eye-wash facility in battery charging area - battery acid being used	<u>.151 (c), .94 (c)(9)(vii)</u>	<hr/>
8. Eye protection required - items being used do not meet ANSI requirements	<u>.133 (a)(6), .134 (b)(3), .134 (a)(5)I</u>	<hr/>
9. Respirators required - no training program for users	<u>.134 (b)(3), .134 (e)(5)(I),(II),(III)</u>	<hr/>
10. Sandals being worn by employees loading concrete blocks on pallets	<u>.132 (a)</u>	<hr/>
11. Acid dip tank operation - no quick drench or flushing capability for body or eyes	<u>.151(c), .94 (d)(q)(vii)</u>	<hr/>
12. No eye protection being worn by employees in metal plating area exposing them to, splashing chemicals	<u>.133 (a)(i), .94 (d)(9)(v)</u>	<hr/>
13. Containers being used for storing flammable liquids - not of the approved type	<u>.106 (d)(2)(I)</u>	<hr/>

Description of Hazard	Standard	Page
14. Paint spray booth with electric motor and fan placed inside exhaust duct	<u>.107 (d)(5)</u>	
15. End attachments on a wire rope sling are cracked and deformed	<u>.184 (c)(4), .184 (f)(5)(v)</u>	
16. Welding operation being done in paint spray booth	<u>.107(c)(2), .252 (a)(2)(vi)</u>	
17. 150 gallons of Class I liquid stored in a flammable liquid storage cabinet	<u>.106 (d)(3)(I)</u>	
18. Forklift operator giving a ride to two personnel on a standard pallet mounted on forks	<u>.178 (m)(3)</u>	
19. A dry filter spray booth had a face velocity of less than 50 l.f.m	<u>.107 (b)(5)(I), .94 (c)(6)</u>	
20. Containers used to transfer flammables were not bonded to the dispensing drum	<u>.106 (e)(6)(II), .106 (h)(7)(II)(13), .107 (e)(q)</u>	
21. Employee exposed to 30 ppm of methyl bromide	<u>.1000 (c), .1000 (a)(1)</u>	
22. Stairway - 6 risers- no handrail	<u>.23 (d)(1)(I-v), .24 (h)</u>	
23. Open-sided floor - 6 foot drop - no guardrails	<u>.23 (c)(1)</u>	
24. Fixed ladder - 30 feet high with no cage guard	<u>.27 (d)(1)(II)</u>	
25. Open-sided work platform (less than 4' high) adjacent to dangerous equipment, not guarded with standard railing and toeboard	<u>.23 (c)(3)</u>	
26. Portable dockboard without any securing device to prevent slipping	<u>.178 (n)(II), .30 (a)(2)</u>	
27. Compressed gas cylinders in storage with no valve protection caps	<u>.101 (b), .253 (b)(2)(iv)</u>	

Description of Hazard	Standard	Page
28. Oxygen and fuel-gas cylinders stored together	<u>.253 (b)(4)(III), .101 (b)</u>	<u> </u>
29. The entire length of two parallel oxygen and acetylene hoses is wrapped with tape	<u>.253 (e)(5)(II)</u>	<u> </u>
30. Welding electrode cable lead damaged and frayed, exposing bare wire	<u>.254 (d)(9)(III)</u>	<u> </u>
31. There is a loose conduit feeding into a fuse box	<u>.305 (a)(1)(I), .305 (b)(1)</u>	<u> </u>
32. Hazardous chemicals leaving the workplace not properly labeled	<u>.1200 (f)(1), .1200(f)(3)</u>	<u> </u>
33. Hand-held portable electric grinder with no guard	<u>.243 (c)(3 + 4)</u>	<u> </u>
34. Hand-held electric circular saw equipped with a lock-on control switch	<u>.243 (a)(2)(I)</u>	<u> </u>
35. Hand-held circular saw being used with no lower blade guard	<u>.243 (a)(1)(I)</u>	<u> </u>
36. Material safety data sheets for each hazardous chemical not readily accessible to employees during each work shift	<u>.1200 (b)(4)(II), .1200 (g)(8)</u>	<u> </u>
37. Radial arm saw has lower portion of blade unguarded	<u>.213 (h)(1), .212 (a)(3)(II)</u>	<u> </u>
38. Work rest on bench mounted grinder has 1/2 inch space between wheel and rest	<u>.215 (a)(4)</u>	<u> </u>
39. No guarding provided to protect employees from flying chips of a metal turning lathe	<u>.212 (a)(1)</u>	<u> </u>
40. Distance between wheel periphery and adjustable tongue on bench mounted grinder was 3/8 inch	<u>.215 (b)(9)</u>	<u> </u>

**DATE
FILMED**

8 / 26 / 94

END