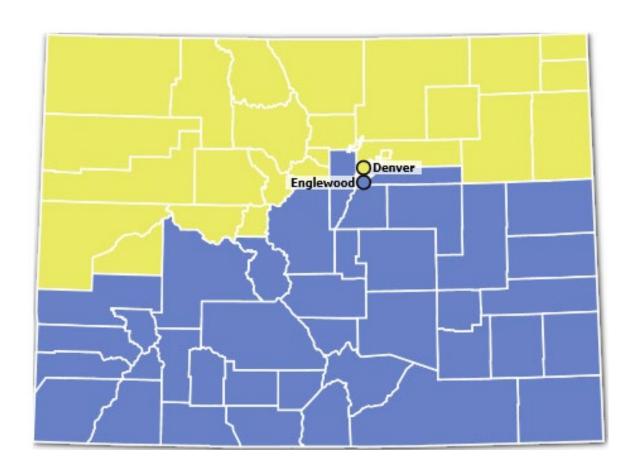
OSHA Chemical Safety and Health Standards

John Olaechea, CIH, CSP
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Colorado OSHA Offices

Denver AO 303-844-5285



Englewood AO 303-843-4500

What Can We Expect?

- Standards pertaining to chemical safety and health
- Process Safety Management
- Compliance assistance resources
- Questions



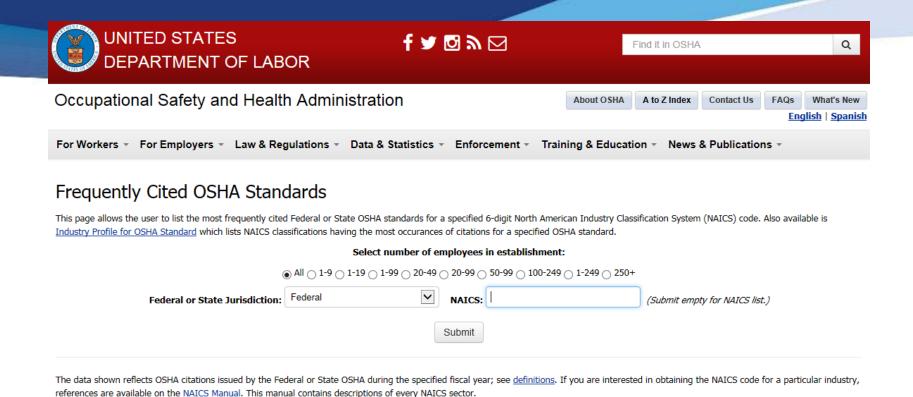
Top Ten Violations

Most frequently cited OSHA standards during FY 2019 inspections

- 1. Fall Protection General Requirements (1926.501)
- 2. Hazard Communication (1910.1200)
- 3. Scaffolding (1926.451)
- 4. Lockout/Tagout (1910.147)
- 5. Ladders (1926.1053)
- 6. Respiratory Protection (1910.134)
- 7. Powered Industrial Trucks (1910.178)
- 8. Fall Protection Training Requirements (1926.503)
- 9. Machine Guarding (1910.212)
- 10. Eye and Face Protection (1926.102)



Frequently Cited OSHA Standards







NAICS Code: 32 Manufacturing (part 2 of 3)

Listed below are the standards which were cited by **Federal OSHA** for the specified NAICS Code during the period October 2019 through September 1 rather than initial amounts. For more information, see definitions.

Standard	Citations	Inspections	Penalty	Description			
Total	3,184	882	\$11,958,497	All Standards cited for Manufacturing (part 2 of 3)			
19100147	495	285	\$2,805,255	The control of hazardous energy (lockout/tagout).			
19100134	276	121	\$333,259	Respiratory Protection.			
19101200	276	164	\$379,031	Hazard Communication.			
19100178	203	141	\$479,545	Powered industrial trucks.			
19100212	200	189	\$1,745,022	General requirements for all machines.			
19100305	109	77	\$149,933	Wiring methods, components, and equipment for general use.			
19100095	105	53	\$203,090	Occupational noise exposure.			
19100132	105	84	\$239,656	General requirements.			
19100119	103	21	\$1,383,995	Process safety management of highly hazardous chemicals.			
19101053	102	25	\$290,808	No Description Found			

NAICS Code: 325998 All Other Miscellaneous Chemical Product and Preparation Manufacturing

Listed below are the standards which were cited by **Federal OSHA** for the specified NAICS Code during the period October 2019 through September 2020. Penalties rather than initial amounts. For more information, see definitions.

Standard	Citations	Inspections	Penalty	Description
Total	88	19	\$246,773	All Standards cited for All Other Miscellaneous Chemical Product and Preparation Manufacturing
19100119	19	3	\$80,388	Process safety management of highly hazardous chemicals.
19100134	14	4	\$5,856	Respiratory Protection.
19101200	12	6	\$10,386	Hazard Communication.
19100147	8	6	\$31,017	The control of hazardous energy (lockout/tagout).
19100132	5	4	\$47,670	General requirements.
19100212	5	5	\$21,915	General requirements for all machines.
19100028	3	2	\$6,554	Duty to have fall protection and falling object protection.
19100095	3	1	\$3,500	Occupational noise exposure.
19100178	2	2	\$6,361	Powered industrial trucks.

Chemical Safety

General Industry Standards

- Subpart G: Occupational Health and Environmental Control
- Subpart H: Hazardous Materials
 - PSM, Hazwoper, flammable liquids, ammonia handling, spray finish
- Subpart I: Personal Protective Equipment
- Subpart J: General Environmental Controls (Confined Space)
- Subpart K: Medical Services/First Aid (Eyewash)
- Subpart Z: Toxic and Hazardous Substances
 - Permissible exposure limits and expanded health standar SHA® Occupational Safety and Health Administration

Personal Protective Equipment

- 29 CFR 1910 Subpart I (1910.132-140)
 - 1910.132(d) Requires a Hazard Assessment
 - Conducted by employer
 - Assessment certified in writing
 - Select PPE
 - Communicate decisions on PPE to employees



Personal Protective Equipment

- 29 CFR 1910 Subpart I (1910.132-140)
 - Eye and Face Protection
 - Respiratory Protection
 - Head Protection
 - Foot Protection
 - Hand Protection



Employers Must Provide and Pay for PPE

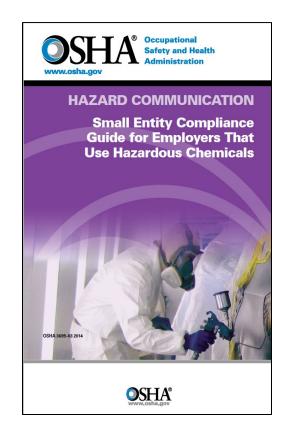




Hazard Communication

29 CFR 1910.1200 (revised in 2012 – GHS)

- Written Hazard Communication Program
- Labeling
- Safety Data Sheets
- Training requirements
 - Upon initial assignment
 - Changes
- More information:
 https://www.osha.gov/dsg/hazcom/index.html





Role of Labels

- Labels are the immediate source of information on a chemical
- New labels will have more information than current labels
- There may also be additional information (known as supplemental information) on the label that is not required the required information should be presented together on the label



Hazard Communication

SA	MPLE LABEL
CODE Product Identifier	Hazard Pictograms
Company NameStreet AddressCityStatePostal CodeCountryEmergency Phone Number	on Significant Control of the Contro
Do not only annual content annual ann	Signal Word Danger Highly flammable liquid and vapor. May cause liver and kidney damage. Precautionary Statements
Dispose of in accordance with local, regional, national, international regulations as specified. In Case of Fire: use dry chemical (BC) or Carbon Dioxide (CO ₂) fire extinguisher to extinguish.	Supplemental Information Directions for Use
First Aid If exposed call Poison Center. If on skin (or hair): Take off immediately any contaminated	Fill weight Lat Number

clothing. Rinse skin with water.

Fill weight:

Gross weight:

Expiration Date:

Lot Number:

Fill Date:

HCS Pictograms and Hazards

Health Hazard Carcinogen

- Reproductive Toxicity
- Aspiration Toxicity

Flame



- Mutagenicity
- Respiratory Sensitizer
- Target Organ Toxicity

- Pyrophorics
- Self-Heating
 - Emits Flammable Gas
 - Self-Reactives
 - Organic Peroxides

Exclamation Mark

- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity (harmful)
- Narcotic Effects
- Respiratory Tract
- Irritant
- Hazardous to Ozone Layer (Non-Mandatory)

Gas Cylinder



- Gases Under Pressure
- Skin Corrosion/
 - Burns • Eye Damage
 - Corrosive to Metals
- **Exploding Bomb** Corrosion
 - Explosives
 - Self-Reactives
 - Organic Peroxides

Flame Over Circle



Oxidizers

Environment



Aquatic Toxicity

Skull

and Crossbones



 Acute Toxicity (fatal or toxic)



Labels (Fatality from Mislabeling)

Accident Report Detail

Accident: 201573128 - Employee Is Poisoned After Drinking From Mislabeled Bottle

Accident: 201573128 Report ID: 0830500 Event Date: 08/04/2006						
Inspection Open Date SIC Establishment Name						
309005825	08/07/2006	<u>3446</u>	Pitkin Iron Corporation			

On August 4, 2006, Employee #1 was working for a firm that manufactured architectural and ornamental metalwork. He and a coworker were at a remote jobsite prepping a metal staircase for finishing. They used a product designed to give the metal a black patina, which would then be coated with a clear sealant. This was selenious acid. The product was a clear blue liquid that they transported in a bottle that had once held Gatorade. The Gatorade label was still on the bottle. The bottle was stored in the back of a pickup truck near a cooler where Employee #1 kept his lunch. Employee #1 walked away from the work area back to the truck to get a drink. He drank from the Gatorade container before he realized that it contained not Gatorade, but the selenious acid. He spat out as much as he could, but he had already swallowed some of the liquid. He was driven to an emergency room about 30 to 40 minutes away. He died about 48 hours later. This incident is still under police investigation. A second, similar poisoning occurred on August 8, 2006. It involved the spouse of a coworker in the same company who took some of the same product or a similar product home in a Gatorade bottle.

Keywords: metal shop, metal ladder, metal rail, chemical, poisoning

Employee #	Inspection	Age	Sex	Degree	Nature	Occupation
1	309005825			Fatality	Poisoning(Systemic)	Laborers, except construction

https://www.osha.gov/pls/imis/accidentsearch.accident_detail?id=201573128



Subpart Z (Toxic and Hazardous Substances)

- **•** 1910.1000
 - Permissible exposure limits (PEL) for hundreds of chemicals
 - Engineering controls required if feasible

 Note that in the absence of an established PEL, OSHA may apply other established occupation exposure limits under the general duty clause (Section 5(a)(1) of the OSH Act)



Subpart Z (Toxic and Hazardous Substances)

1910.1001 – 1910.1096 (Expanded Health Standards)

- Includes asbestos, silica, cadmium, benzene, lead
- Requires employers to take action beyond just reducing exposures below the PEL
- Often requires: exposure assessments, written programs, training, medical surveillance



Eyewash Stations

29 CFR 1910 Subpart K (1910.151(c))

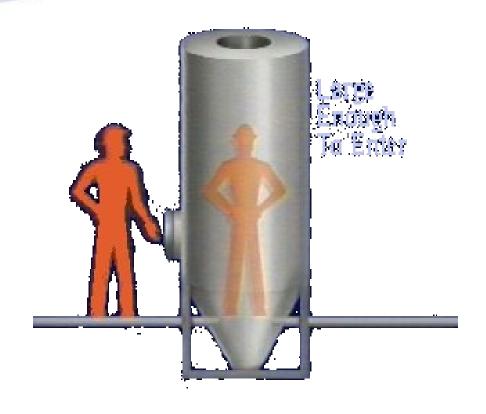
- Required for corrosive chemicals
- Should be in line with ANSI standard
 - 15 minutes of continuous flow
 - Hands free operation
 - Immediately accessible





A Confined Space is...

- Large enough for an employee to enter
- Limited or restricted means for entry/exit
- Not designed for continuous worker occupancy
 - No ventilation
 - No lighting
 - Normally holds materials, water, grain, etc





What is a Permit-Required Confined Space?

- A Confined Space WITH:
 - Hazardous or potentially hazardous atmosphere;

Engulfment hazard;

Physical Hazard;

Other serious safety or health hazard



Examples of Confined Spaces

- Crawl Spaces
- Pits
- Vaults
- Manholes
- Storage bins
- Sewers
- Tanks
- Silos
- Attics
- Shafts
- Pipelines





Confined Space Evaluation

An employer must conduct an evaluation of their site to determine if any permit-required confined spaces exist.



Will there be permit-required confined space entry?

• **No**: Employer must take effective action to prevent employees from entering the permit space.

Yes: Employer must implement a permit program or use "alternative procedures".



Written Permit Confined Space Program

- Prevent unauthorized entry
- Permits for entry
- Develop procedures for safe permit entry
- Provide necessary equipment
- Training of entrant, attendant, supervisor
- Rescue and emergency services
- Employee Participation
- More information: https://www.osha.gov/SLTC/confinedspaces/index.html



Flammable Liquids

- 29 CFR 1910 Subpart H
 - 1910.101 Compressed Gases
 - 1910.102-05 (Acetylene, Hydrogen, O2, Nitrous Oxide)
 - 1910.106 Flammable Liquids
 - 1910.107 Spray Finishing
 - 1910.111 Ammonia



HAZWOPER

- 29 CFR 1910.120 (Subpart H)
 - Clean-up operations (hazardous substances) required by government
 - Corrective action clean-up at RCRA sites
 - Voluntary clean-up at recognized uncontrolled hazardous waste sites
 - Operations involving hazardous wastes at TSD facilities
 - Emergency response operations for releases (any location)



HAZWOPER

- Written safety and health program
- Medical Surveillance
- Engineering Controls
- Monitoring
- Decontamination
- Emergency Response to Hazardous Substance Releases (sec Q)



Process Safety Management Overview





What is PSM?

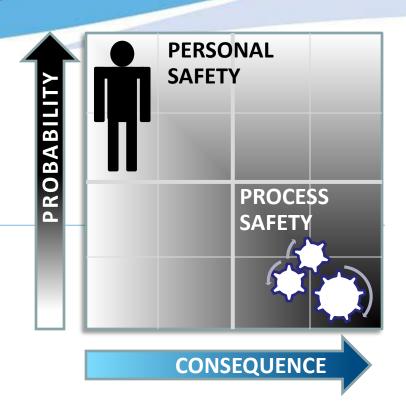
• 29 CFR 1910.119:

- Requirements for safe management of hazards associated with processes using, storing, manufacturing, or handling highly hazardous chemicals.
- Emphasizes management of hazards through comprehensive program that integrates established technologies, procedures and practices



Personal Safety vs. PSM

- PROCESS SAFETY incidents are low probability/ high consequence events.
- Conversely, PERSONAL SAFETY incidents tend to arise from higher probability/ lower consequence events.
- Process safety requires a strong MANGEMENT SYSTEMS approach to identify and control hazards.





Process Safety Management Elements

- (a) Application
- (b) Definitions
- (c) Employee Participation
- (d) Process Safety Information
- (e) Process Hazard Analysis
- (f) Operating Procedures
- (g) Training
- (h) Contractors

- (i) Pre-Startup Safety Review
- (j) Mechanical Integrity
- (k) Hot Work Permits
- (I) Management of Change
- (m) Incident Investigation
- (n) Emergency Planning and Response
- (o) Compliance Audits
- (p) Trade Secrets



What is covered?

- Processes including:
 - 10,000 pounds of flammable liquids or gasses

- Threshold quantity (TQ)of a highly hazardous chemical (HHC)
 - 130+ chemicals listed in Appendix A
 - Toxic and/or reactive chemicals



Appendix A

CHEMICAL NAME	 - - -	CAS*	1 1 1 1 1	TQ**	
Acetaldehyde	-1	75-07-0	Ī	2500	
Acrolein (2-Popenal)	-	107-02-8	I	150	
Acrylyl Chlorde	-1	814-68-6	I	250	
Allyl Chlorid	-1	107-05-1	I	1000	
Allylamine	1	107-11-9	I	1000	
Alkylaluminum	-1	Varies	I	5000	
Ammonia, Anhydrous	-1	7664-41-7	L	10000	
Ammonia solutions (greater			I		
than 44% ammonia by weight)	-	7664-41-7	I	15000	
Ammonium Perchlorate	-	7790-98-9	I	7500	
Ammonium Permanganate	-1	7787-36-2	I	7500	

What is covered?

- Example: Ammonia
 - TQ > 10,000 pounds for anhydrous (gas) ammonia
 - Mostly used in refrigeration







What isn't covered?

- Retail facilities
- Oil or gas well drilling or servicing operations
- Normally unoccupied remote facilities
- Hydrocarbon fuels used solely for workplace consumption (ie vehicle refueling)
- Flammable liquids with flash point below 100F and stored in atmospheric tanks and kept below boiling point without refrigeration

Process Safety Information (PSI)

 Employers must compile written process safety information (PSI)

Hazards of the HHCs used/produced

Technology of the process

Equipment in the process



PSI

- Process Hazards
 - Permissible exposure limits (PEL)
 - Physical data
 - Reactivity data
 - Corrosivity data
 - Thermal/chemical stability
 - Effects of mixing

» SDS may be source

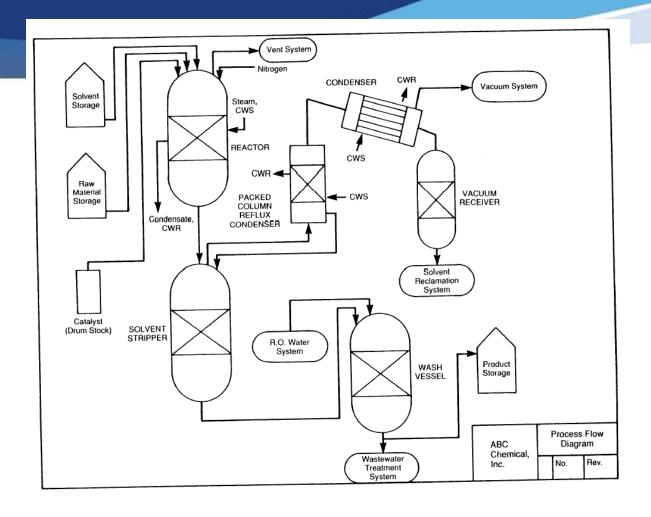


PSI

- Process Technology
 - Block flow diagram/process flow diagram
 - Process chemistry
 - Maximum intended inventory
 - Safe upper/lower limits
 - temperatures, pressures, flows, compositions, pH
 - Evaluation of consequences of deviation



Process Flow Diagram





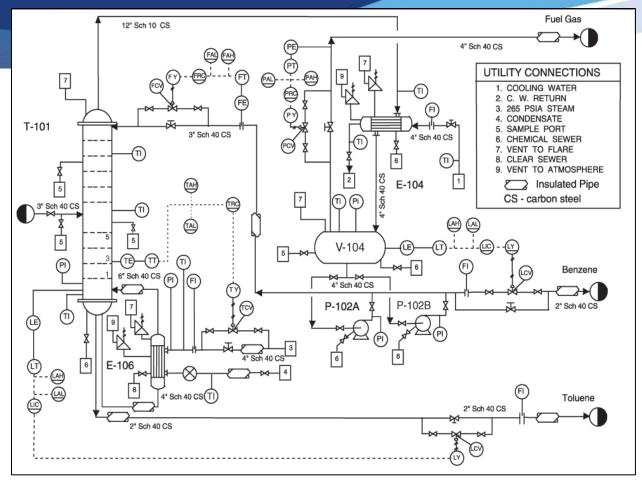
PSI

Process Equipment

- Materials of construction
- Piping and Instrumentation diagrams (P&IDs)
- Electrical classification
- Relief system design and design basis
- Ventilation system design
- Design codes and standards (ASME, API, ANSI, CGA, IIAR, etc)
- Material and energy balances (built after 1992)
- Safety systems (interlocks, detection, suppression)



Piping and Instrumentation Diagram (P&ID)





PSI

- The employer shall document that the equipment complies with Recognized and Generally Accepted Good Engineering Practices (RAGAGEP)
 - ASME, CGA, API, ANSI, IIAR, etc
 - RAGAGEP also applies to Mechanical Integrity
 - RAGAGEP is for equipment design, inspection and testing, and frequency of inspection and testing



PSI

Examples of RAGAGEP

- ASME (American Society of Mechanical Engineers)
- ANSI (American National Standards Institute)
- CGA (Compressed Gas Association)
- API (American Petroleum Institute)
- ASTM (American Society for Testing and Materials)
- IIAR (International Institute of Ammonia Refrigeration)
- Manufacturer (Operations/Maintenance manuals)
- Internal RAGAGEP



Process Hazard Analysis (PHA)

- PHA is a thorough, systematic approach for identifying, evaluating and controlling the hazards of processes involving HHCs
 - The employer must perform a PHA on all covered processes
 - The PHA format must meet the complexity of the process
 - The PHA must identify, evaluate, and control the hazards involved in the process



PHA

- PHA Methods
 - What-if
 - Checklist
 - What-if/checklist
 - Hazard and operability study (HAZOP)
 - Failure mode and effects analysis (FMEA)
 - Fault tree analysis, or
 - An appropriate equivalent methodology
 - » See OSHA publication <u>3133</u> for more information



PHA

- PHA shall address:
 - Hazards of the process
 - Prior incidents
 - Engineering and administrative controls
 - Consequences of failure of those controls
 - Facility siting
 - Human factors
- Shall be performed by a team
- Shall establish a system to address findings
- Revalidation every 5 years



Operating Procedures

- Written operating procedures for safely conducting activities in each covered process
- Covering:
 - Initial startup, normal/temporary/emergency operations, shutdowns
 - Operating limits, consequences of deviation, and steps required to correct
 - Safety/Health considerations
 - Hazards of chemicals, unique hazards, material control
 - Engineering controls, administrative controls, PPE
 - Safety systems and their functions



Operating Procedures

Must be readily available to employees

Reviewed as necessary to reflect current practices

Annual certification of review



Employee Participation

- Employers must consult with employees and their reps on the development of the elements of process safety management
- Employers shall provide employee access to all information required by the PSM standard
- Employer shall develop a written plan regarding the implementation of employee participation



Training

- Initial training in the process
 - Overview of process and ops procedures
 - Safety and health hazards
 - Emergency operations/shutdown
 - Safe work practices applicable to employee's tasks
- Refresher training at least every 3 years
- Documentation of training (must state the means by which the training was shown to be effective)



Mechanical Integrity

- Written procedures for maintaining the on-going integrity of:
 - Pressure vessels
 - Piping systems
 - Relief and vent systems and devices
 - Emergency shutdown systems
 - Controls (monitoring devices, sensors, alarms, interlocks)
 - Pumps



Mechanical Integrity

- Inspection and testing of equipment shall follow RAGAGEP
- Maintenance employees shall be trained
- Inspections shall be documented
- Equipment deficiencies shall be corrected in a safe and timely manner (ensure safe operation)



MI





Rusted and broken cable to the "snappy joe" shut off valve

Rusted cable repaired by attaching new cable to old rusted piece







Missing paint and rust on ammonia piping. No flow direction or phase markings. Color?



Broken pressure gauges



Management of Change (MOC)

- Written procedures to manage changes to process chemicals, technology, equipment, and procedures that affect a covered process
 - technical basis for proposed change
 - impact of change on safety and health
 - modifications to operating procedures
 - time period for the change
 - authorization requirements for the change
- Does not include "replacements in kind"
- Requires updated PSI, op procedures, training



The other elements...

- (a) Application
- (b) Definitions
- (c)Contractors
- (i) Pre-Startup Safety Review
- (k) Hot Work Permits

- (m) Incident Investigation
- (n) Emergency Planning and Response
- (o) Compliance Audits
- (p) Trade Secrets



Appendix C (1910.119)

- Non-mandatory Compliance Guidelines
 - Detailed description of each element of the standard
 - Plain language summary and recommendations
 - Good introduction to the standard



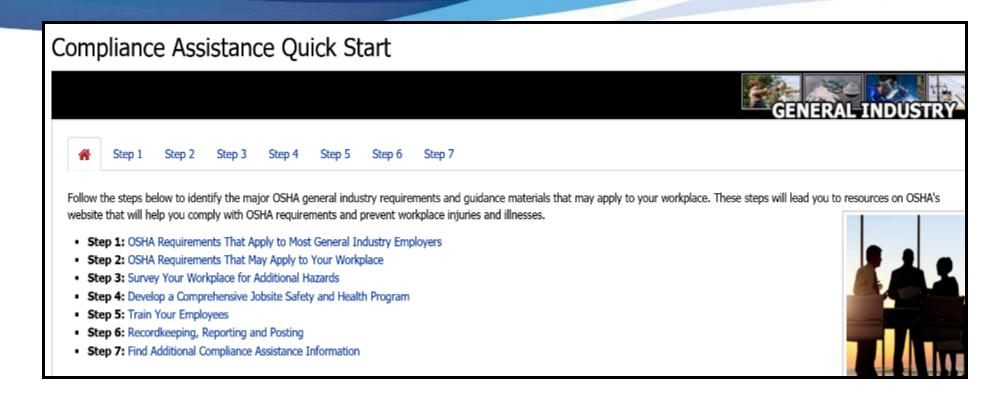
Compliance Assistance Resources

- OSHA Website (<u>www.osha.gov</u>)
 - A-Z index, regulations, publications, e-tools and advisors

- Compliance Assistance Specialists
- OSHA Consultation
- NIOSH (National Institute of Occupational Safety and Health)



Compliance Assistance Resources



https://www.osha.gov/dcsp/compliance_assistance/quickstarts/general_industry/index.html



Occupational Safety and Health Administration

English | Spanish

ABOUT OSHA * WORKERS * EMPLOYERS * REGULATIONS * ENFORCEMENT * TOPICS * NEWS & PUBLICATIONS * DATA * TRAINING *

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Directorate of Technical Support and Emergency Management / eTools, eMatrix, Expert Advisors and v-Tools

eTools, eMatrix, Expert Advisors and v-Tools

eTools and the eMatrix are "stand-alone," interactive, Web-based training tools on occupational safety and health topics. They are highly illustrated and utilize graphical menus. Some also use expert system modules, which enable the user to answer questions, and receive reliable advice on how OSHA regulations apply to their work site. Expert Advisors are based solely on expert systems and v-Tools are prevention video training tools. Selected eTools are available as downloadable files for off-line use.

Other training and reference materials are also available from the OSHA Directorate of Training and Education (DTE). In addition, OSHA also has other training videos available.

eTools

- Ammonia Refrigeration (08/2014)
- Battery Manufacturing (02/2004)
- Construction (08/2014) | Spanish (Translation Updated 02/2006)
- Electric Power Generation, Transmission, and Distribution (01/2010)
- Evacuation Plans and Procedures (09/2002)
- Eye and Face Protection (07/2002)
- Hazard Identification (07/2014)
- Hospital (02/2002)
- Lead: Secondary Lead Smelter (12/2002)
- Lockout/Tagout (09/1999)
- Logging (10/1998)
- Machine Guarding (06/2007)
- Nursing Home (10/2000)
- Oil and Gas Well Drilling and Servicing (05/2009)
- Poultry Processing (06/2001)

Ergonomics-related eTools

- Baggage Handling (09/2003)
- Beverage Delivery (01/2001)
- Computer Workstations (08/2003)
- Electrical Contractors (07/2003)
- Grocery Warehousing (01/2001)
- Printing Industry (08/2006)
- Sewing (01/2001) | Spanish (10/2001)

Expert Advisors

- Asbestos
- Cadmium Biological Monitoring Advisor
- Confined Spaces
- Electronic Health and Safety Program (eHASP)₂
- Evacuation Am I Required to have an Emergency Action Plan?

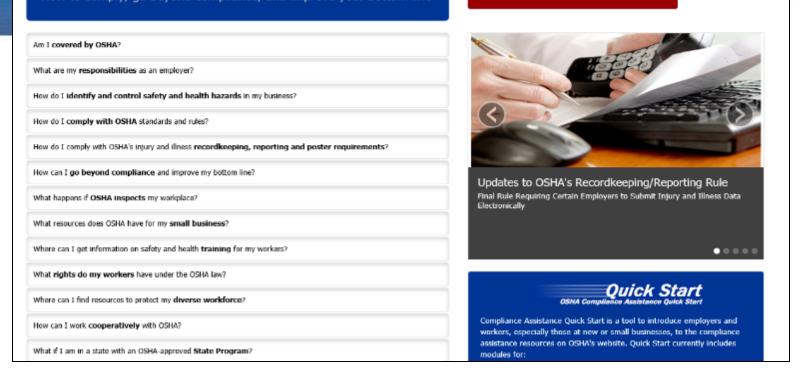
Prevention Videos (v-Tools)



Construction Hazards. The videos show how quickly workers can be injured or killed on the job and are intended to assist those in the industry to identify, reduce, and eliminate construction-related hazards. Most of the videos are 2 to 4 minutes long, presented in clear, easily accessible vocabulary, and show common construction worksite activities. The videos may be used for employer and worker training.

DISCLAIMER: Some of the Expert Advisors referenced on this page were designed several years ago and although they should function using the latest versions of Windows without problem, there may be instances where they are no longer compatible (i.e., Windows 64-bit).





https://www.osha.gov/employers/index.html

Interactive Hazard ID Safety Tool

- Helps small businesses learn how to identify workplace hazards
- Interactive features challenge users: "Can you spot all the hazards?"
- Now updated with a new healthcare scenario and two new visual inspections



osha.gov/hazfinder



OSHA Consultation

In FY 2017, responding to requests from small employers looking to create or improve their workplace safety and health programs, OSHA's On-Site Consultation Program conducted approximately 26,000 visits to small business worksites covering over 1.1 million workers across the nation.





OSHA's Consultation Directory

Find the Local Office in Your State



OSHA Consultation

- Free
- Non-enforcement
- Confidential
- On-site audits
- Training
- Sampling/Monitoring
- Program Review



http://csucvmbs.colostate.edu/academics/er hs/osha/Pages/default.aspx



OSHA Compliance Assistance

Regional Compliance
 Assistance Newsletter

 Send request to <u>olaechea.john@dol.gov</u> to subscribe





Questions?

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Disclaimer

 This information has been developed by an OSHA Compliance Assistance Specialist and is intended to assist employers, workers, and others as they strive to improve workplace health and safety. While we attempt to thoroughly address specific topics, it is not possible to include discussion of everything necessary to ensure a healthy and safe working environment in a presentation of this nature. Thus, this information must be understood as a tool for addressing workplace hazards, rather than an exhaustive statement of an employer's legal obligations, which are defined by statute, regulations, and standards. Likewise, to the extent that this information references practices or procedures that may enhance health or safety, but which are not required by a statute, regulation, or standard, it cannot, and does not, create additional legal obligations. Finally, over time, OSHA may modify rules and interpretations in light of new technology, information, or circumstances; to keep apprised of such developments, or to review information on a wide range of occupational safety and health topics, you can visit OSHA's website at www.osha.gov.

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