



EFON Environmental Finance Center
Environmental Finance Center
SOUTHWEST ENVIRONMENTAL FINANCE CENTER

Operator Certification Webinar Series
 Date: May 4, 2023
 Topic: OSHA, Health and Safety Regulations

www.efcnetwork.org
 This program is made possible under a cooperative agreement with US EPA.

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Overview

Safety is your responsibility. Be safe and make sure others are as well.

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Safety Hazards:

- Physical injury from machinery, improper lifting and slippery surfaces
- Infectious diseases
- Confined spaces
- O₂ deficiency (or enrichment)
- Toxic vapors, gases & chemicals
- Radiological hazards
- Explosive gas mixtures
- Fires
- Electrical shock
- Noise
- Traffic
- Dust
- Drowning

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Think "Avalanche Awareness"

CAUTION AVALANCHE DANGER

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Don't be the headline

Preventing fatalities with science through safety and health research **NIOSH**

Three Construction Supervisors Die from Asphyxiation in Manhole

FACE NEWS

INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and

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Lift stations:

- Confined Spaces
- Electrical Hazards
- Slippery surfaces
- Etc.

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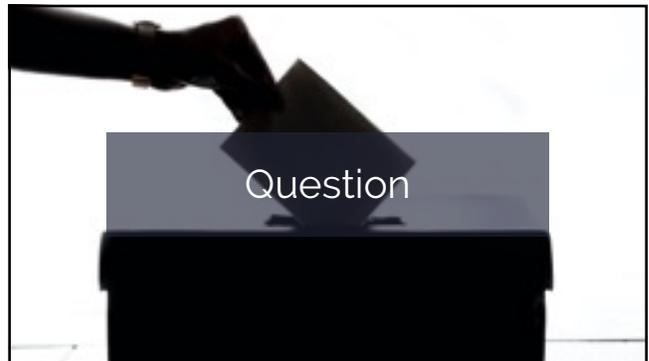
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Most utility injuries are caused by the injured employee

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"assure safe and healthy working conditions for working men and women by **setting and enforcing standards** and by **providing training, outreach, education, and assistance.**"

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22 states or territories have OSHA approved programs

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5 states and 1 territory have OSHA approved programs that cover public sector employees

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Be Aware of Your Local Occupational Safety and Health Regulations

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OSHA in New Mexico's Exam

At a minimum cover these OSHA regulated areas:

- Personal protective equipment (PPE) like steel toe boots, gloves, face shields, and goggles
- Confined space entry
- Equipment lock-out / tag-out
- Hazard chemical communication standards - Material Safety Data Sheets (MSDS)
- Excavation Safety
- Blood-borne pathogen standards

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Safety Programs
Safety is everyone's concern

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Safety Programs

- **Identify** the **causes** of accidents, illness and injuries
- **Provide** safety **training**
- **Implement** an accident **reporting system**
- **Hold supervisors responsible** for **implementing** the safety program

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Operator Safety Basics:

- Ask** about your employer's safety program, and **participate** in it
- Follow** safety **protocols and standards** when doing your job
- Use your safety equipment**, like SCBA, hardhats, goggles, gloves, and other PPE
- Report** safety **hazards** and **injuries**

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Management Safety Basics:

- Develop a **written safety statement** & establish a **safety program**
- Assign responsibilities** for injury prevention
- Appoint** a **safety officer** or coordinator
- Establish realistic safety goals** & revise them to encourage **continual improvement**
- Evaluate** safety program **results**

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Three training components

1. Safety **education** of all employees
2. Reinforced **education** in safety
3. Safety **education** in the use of tools and equipment

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Three training components

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Tailgates aren't just for parties

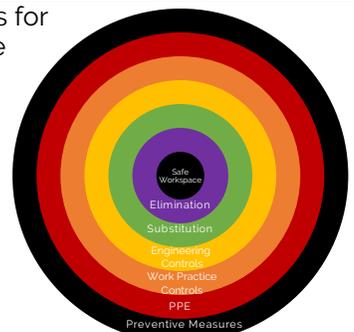


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Preventive Measures for Common Workplace Hazards

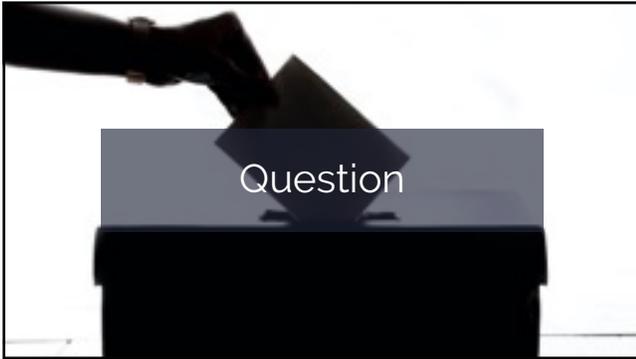
Layer Preventive measures:

- **PPE:** Safety Glasses, Hard Hats, Protective Shoes & Gloves
- **Work Practice Controls:** Safety Training Programs
- **Engineering Controls:** Railings and guards
- **Substitution:** Automatic sampling instead of manual sampling
- **Elimination:** Proper disposal of flammables, chemicals, etc.



Source: Figure 2.1. Operation of Wastewater Treatment Plants Vo 1, 6th ed, 2019

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Infectious Materials

- Many microorganisms are capable of causing illness including
 - ✓ Bacteria
 - ✓ Protozoa
 - ✓ Helminths (parasitic worms)
 - ✓ Viruses
- Talk to your safety officer about inoculation for:
 - ✓ Typhoid
 - ✓ Paratyphoid
 - ✓ Polio
 - ✓ Hepatitis A & B
 - ✓ Tetanus

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Infectious Materials

Use PPE like gloves when:

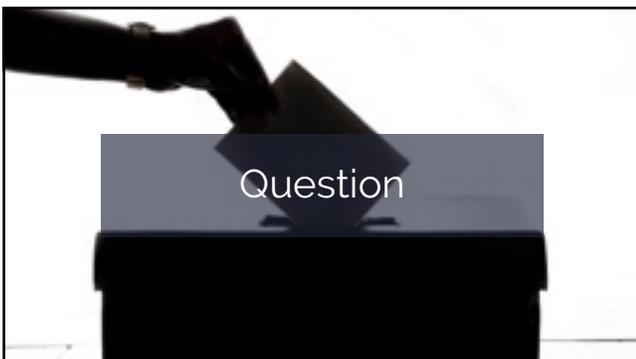
- handling hazardous samples
- you may come into contact with wastewater
- you may come into contact with sludge

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Water Safety

- Reduce slip hazards on catwalks around clarifiers and basins
- Use extra caution in wet and icy weather
- Keep handrails in good repair, replace damaged rails
- Mark and guard unsafe areas with guardrails, rope, chains or cable
- Station emergency gear near filters, tanks, basins and clarifiers, such as approved safety vests, buoys, and life poles
- Learn how to swim (but use personal floatation devices where appropriate even if you can swim)

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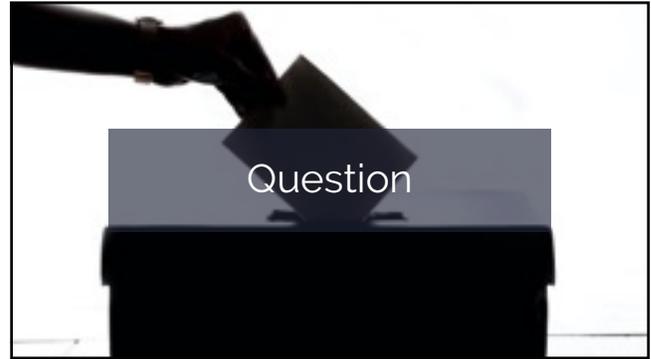
Electrical Hazards

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Transformers
Starters
Motors
Instrumentation
Control Panels



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120 volts
can kill
you, and
even 12
volts can
injure you



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Basic Safe Practices

- Do proactive maintenance to identify performance and safety issues
- Use non-conductive tools when working around electricity
- Don't use electrical equipment with worn or frayed cords
- Permanent wiring should be installed with conduit or armored cable by an electrician

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Basic Safe Practices (Cont.)

- Replace connections with worn or thinning insulation
- Ground equipment with three pronged plugs
- Be alert for overheating equipment or "tingling"
- Electrical units operated in areas exposed to flammable vapors should be explosion proof
- Work in pairs to service, repair or troubleshoot electrical equipment

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Current & Voltage

Ohms Law:

$$Current = \frac{Voltage}{Resistance}$$

Or:

$$Amps = \frac{Voltage}{Ohms}$$

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Resistance in the body

Ear-to-Ear ~ 100 Ohms

Hand-to-Foot ~ 500 Ohms

Dry Skin ~ 300,000 Ohms

Wet Skin ~ 1000 Ohms

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Resistance in the body

Ear-to-Ear ~ 100 Ohms

$$\frac{120 \text{ Volts}}{100 \text{ Ohms}} = 1.2 \text{ Amps}$$

Outcome: instant death

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Resistance in the body

Hand-to-Foot ~ 500 Ohms

$$\frac{120 \text{ Volts}}{500 \text{ Ohms}} = 240 \text{ miliAmps}$$

Outcome: Severe burns, possible death

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Resistance in the body

Dry Skin ~ 300,000 Ohms

Wet Skin ~ 1000 Ohms

Wet skin lets more current flow through the body

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Lockout and Tagout Programs



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Lockout and Tagout Basics

Notify affected employees that the lockout/tagout procedure will be used and why

Shut down equipment using normal shut down procedures

Isolate the equipment from energy sources and ensure stored energy is dissipated

Lockout and tagout the energy isolating device with the assigned individual lock and tag

Confirm the circuit is dead. Ensure energy source is disconnected after ensuring no personnel are exposed.

NOW, work can begin

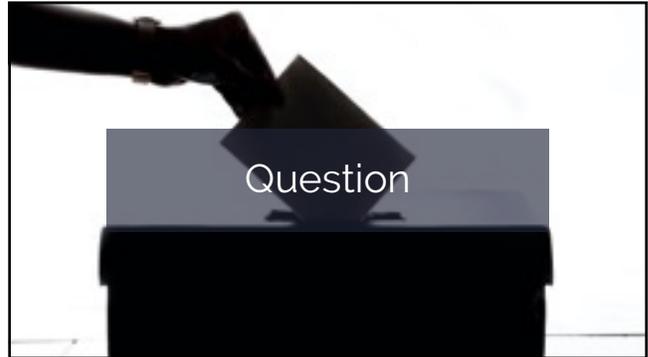
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Lockout and Tagout Basics

After work is complete, tools are removed and everything is returned to working order, ensure all employees are clear then remove lockout and tagout devices

Then notify affected employees that lockout and tagout have been removed and restore power to the equipment.

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Never remove lockout and tagout equipment that someone else installed unless your employer has specific procedures and training for removal by others.

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Hazardous chemicals
And Material Safety Data
Sheets (MSDS)

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Chemical Hazards

- Burns
- Respiratory difficulty
- Eye damage
- Rashes
- Skin Damage
- Headaches
- Death

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Acute vs Chronic Hazards

Acute: effects occur with contact and usually resolve when no longer in contact or with medical treatment.

Chronic: Long term effects that may not appear immediately or after a single exposure. May or may not be reversible.

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Common Acids

Acetic Acid (CH₃COOH) 

Hydrochloric Acid (HCl) 

Nitric Acid (HNO₃) 

Sulfuric Acid (H₂SO₄) 

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Common Bases

Hydrated Lime or Calcium Hydroxide (Ca(OH)₂)

Quicklime or Calcium Oxide (CaO)

Sodium Hydroxide or Caustic Soda (NaOH)

Hypochlorite (OCl⁻)

Sodium Carbonate or Soda Ash (Na₂CO₃)

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Other Chemicals you may encounter

Chlorine
Methane
Hydrogen Sulfide
Other gases
Alum
Activated Carbon



Chlorine Gas

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Hazard Communication

"Fire Diamond" or "Safety Square"

NFPA 704:
Standard System for Identification of Hazards of Materials for Emergency Response



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Hazard Communication

HCS Pictograms and Hazards



Hazard Communication Standard Pictogram

The Hazard Communication Standard (HCS) requires pictograms on labels to alert users of the chemical hazards to which they may be exposed. Each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). The pictogram on the label is determined by the chemical hazard classification.

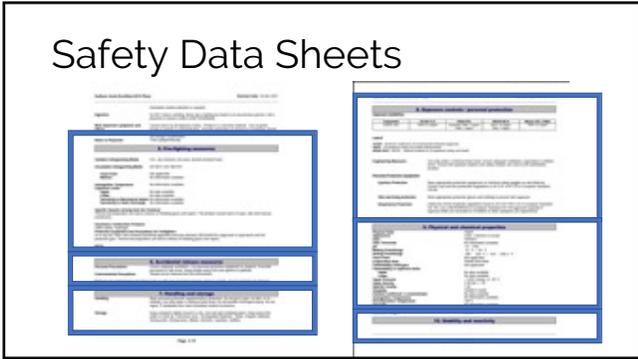
 Health Hazard <ul style="list-style-type: none"> • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Acute Toxicity 	 Flame <ul style="list-style-type: none"> • Flammable • Pyrophoric • Self-Heating • Stable (Under Pressure) • Oxidizing 	 Exclamation Mark <ul style="list-style-type: none"> • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (Hazard) • Narcotic Effects • Environment (Toxic to Aquatic Life) • Environment (Ozone Layer (Non-Membrane))
 Gas Cylinder <ul style="list-style-type: none"> • Gases Under Pressure 	 Corrosion <ul style="list-style-type: none"> • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals 	 Explosion <ul style="list-style-type: none"> • Explosive • Self-Reacting • Organic Peroxides
 Flame Over Circle <ul style="list-style-type: none"> • Oxidizers 	 Environment (Non-Membrane) <ul style="list-style-type: none"> • Aquatic Toxicity 	 Skull and Crossbones <ul style="list-style-type: none"> • Acute Toxicity (Solid or Liquid)

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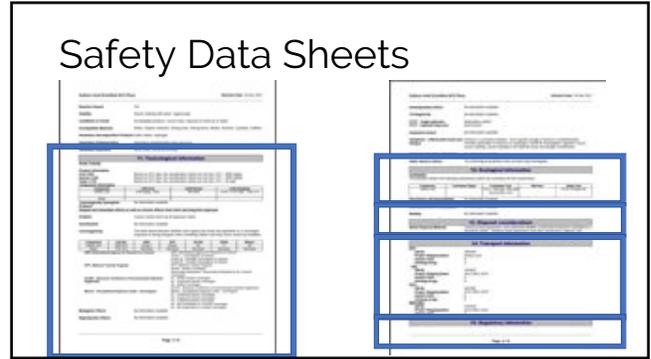
Safety Data Sheets



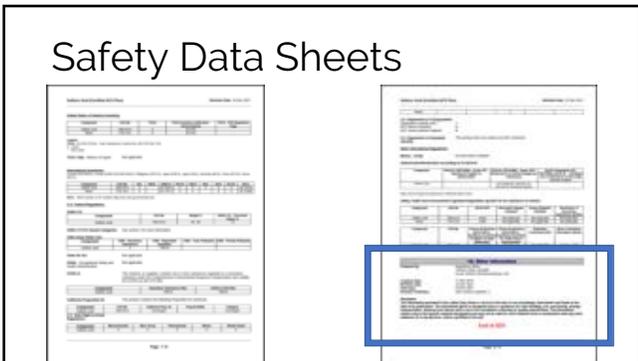
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Chlorine Exposure Effects

PPM of Air by Volume	Effect
1	Slight Symptoms after several hours' exposure
0.3 to 3.5	Detectable Oder
5	Noxiousness
15	Throat Irritation
30	Coughing
40	Dangerous from 30 min to 1 hour
1000	Death after a few deep breaths

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Know your safety equipment

Where it is, and how and when to use it, and how to maintain it

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Respirator with cartridges:
for escape purposes only.



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If O₂ level drops below **12%** you could die – there's not enough oxygen to sustain you.



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SCBA System:

Self Contained Breathing Apparatus



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SCBA System:

Require training to use properly



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Confined Spaces

- Entry is covered by OSHA Regulations
- OSHA regulations are covered under operator safety in most test guides



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Confined Spaces

Large enough and configured so that an employee can bodily enter and perform work

Has limited or restricted means for entry and exit

Is not designed for continuous occupancy

Every entry into a confined space requires a confined space entry permit

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Confined Space Hazards

Dangerous air contamination:

- Flammable
- Explosive
- Toxic

Oxygen deficient atmosphere

Oxygen enriched atmosphere (increases explosion risk)

Explosive chemical dust

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Manholes are **Confined Spaces**

- **Deadly gases can accumulate**, or oxygen can be displaced.
- Manholes require **atmospheric testing**
- Manholes require **adequate ventilation**

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Oxygen facts

Normal air is 20.9% Oxygen

Below 19.5% Oxygen a potentially dangerous condition exists

At 17% Oxygen people will experience shortness of breath

At 6% to 10% rapid loss of consciousness occurs

Below 6% death occurs in minutes

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Oxygen Deficiency Causes

Bacterial action using up available oxygen

Displacement of Oxygen by other gases

Oxidation of metals or other materials depletes Oxygen

Absorption of Oxygen into surfaces

Combustion

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Permits and Monitors



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When trenches without adequate cave in protection collapse there is usually **no warning and no time to escape.**

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OSHA requires protection if an excavation is 5 feet or more in depth.

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NMED recommends **protection** if an excavation is **4 feet or more in depth**.

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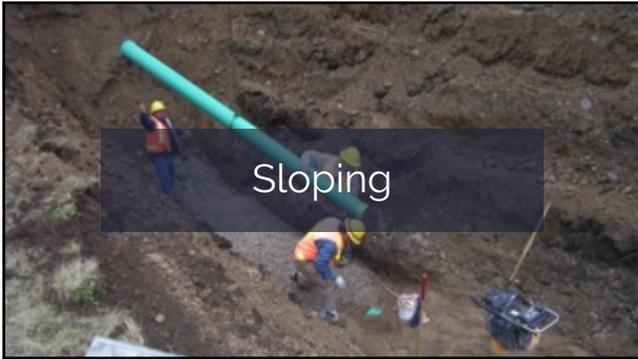
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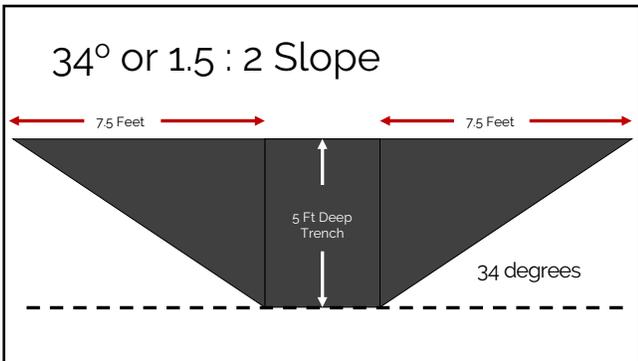
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The acceptable slope angle is **34 degrees** or
a slope of 1.5 : 1
1.5 ft across for every **1 ft vertical** on **both sides of the trench.**

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Ladders

Are required every 25 lateral feet
 They must extend at least 3 feet above the excavation wall
 Must be placed on firm ground within the trench

Image: <https://www.michigan.gov/leo/bureau/agencies/ri/riohs/topics/excavation-and-trenching>

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Don't be the headline.

Fatality Summaries	
	Worker struck by piece of frozen soil
	Worker crushed in 7 foot deep excavation collapse
	Worker buried by 10 foot deep excavation collapse
	Worker crushed by 12 foot deep excavation collapse
	Worker crushed by 8.5 foot deep trench wall collapse
	Worker crushed in 8 foot deep excavation collapse
	Worker buried in collapse of trench, varying from 15 to 22 foot deep
	Worker crushed by collapse of 6.5 foot deep trench wall
	Carpenter Dies When Eight-foot Trench Wall Collapses During Sewer Pipe Replacement

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There are a lot more hazards.
 Study available materials.
 Follow your safety program.
 Use your head.

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CONTACT INFORMATION



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