

Thursday, May 21, 2020

10:00 am - 3:00 pm

CWEA Collection System Maintenance - Grade 2 Certification Training Webinar

Learning Objective(s):

After participating in this session, attendees will be able to:

- Describe Wastewater Collection System Maintenance worker job functions, tools and equipment and practices including traffic control, confined space entry and construction and maintenance for the Wastewater Collection System Maintenance Grade 2 certification exam.
- Identify key wastewater infrastructure system components, terms, procedures and techniques related to the maintenance and troubleshooting of wastewater collection system at a beginner to journey level.
- Define, identify and apply essential terms, acronyms and procedures commonly used and performed including safety, PPE, tools, equipment, techniques, and industry and OSHA regulations to assist and prepare the participant for the Wastewater Collection System Maintenance Grade 2 certification exam.

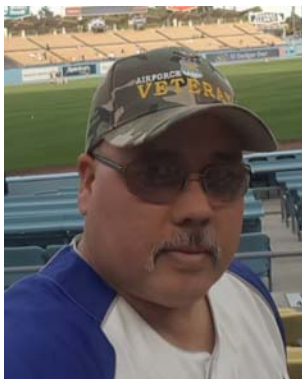
CWEA Contact Hours: 4.8 towards Collection System Maintenance certification



Introducer: Eric Van Cleave, Southern California Regional Sales Manager, SmartCover

Eric Van Cleave is the Southern California Regional Sales Manager with SmartCover Systems. He has a degree in Industrial and Manufacturing Engineering from the University of Missouri and started working for SmartCover Systems in June 2017. He previously worked in Environmental Construction and has been in Engineering Sales for the past 8 years. He is also the TCP Chair for the CWEA San Diego Section.

Moderator: Shawn Spromberg, Maintenance Supervisor of Wastewater Collections, Cucamonga Valley WD



Speaker: Alex Arguelles, Collections Lead, Inland Empire Utilities Agency

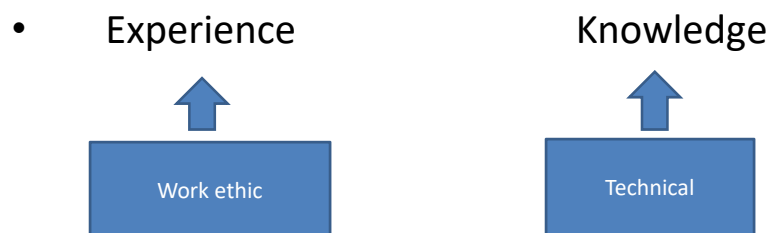
Alex Arguelles is a Collections Lead for Inland Empire Utilities Agency (IEUA). He was the former Collections supervisor and has 29+ years of collections experience, all with IEUA. Alex has been conducting CWEA Collections training courses for the past 10 years.

Collection System Maintenance Grade 1 & 2

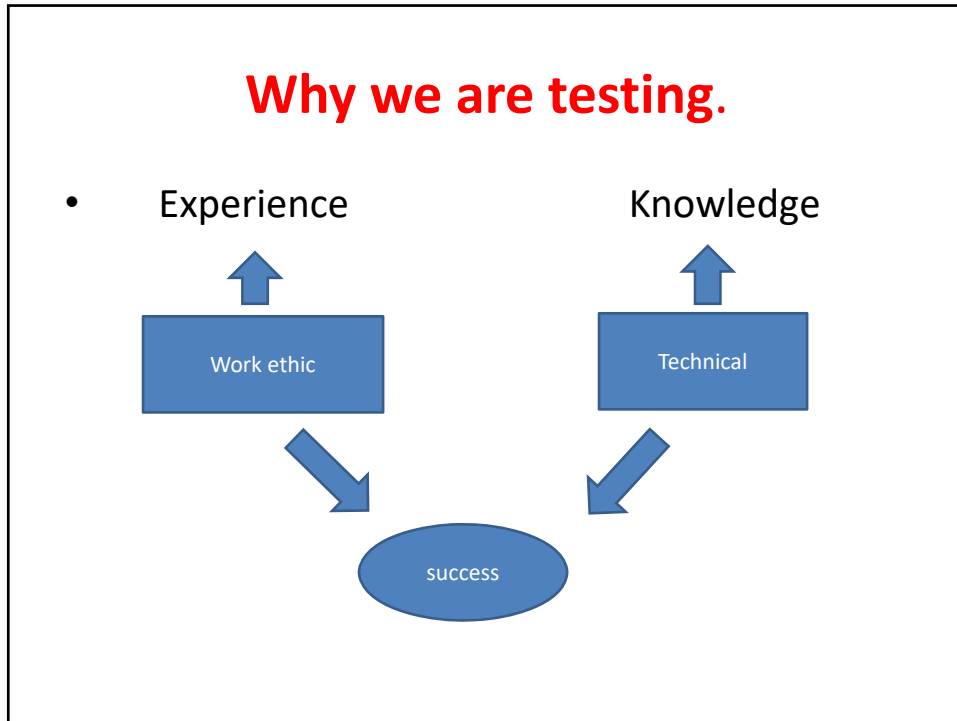
Test Preparation

1

Why we are testing.



2

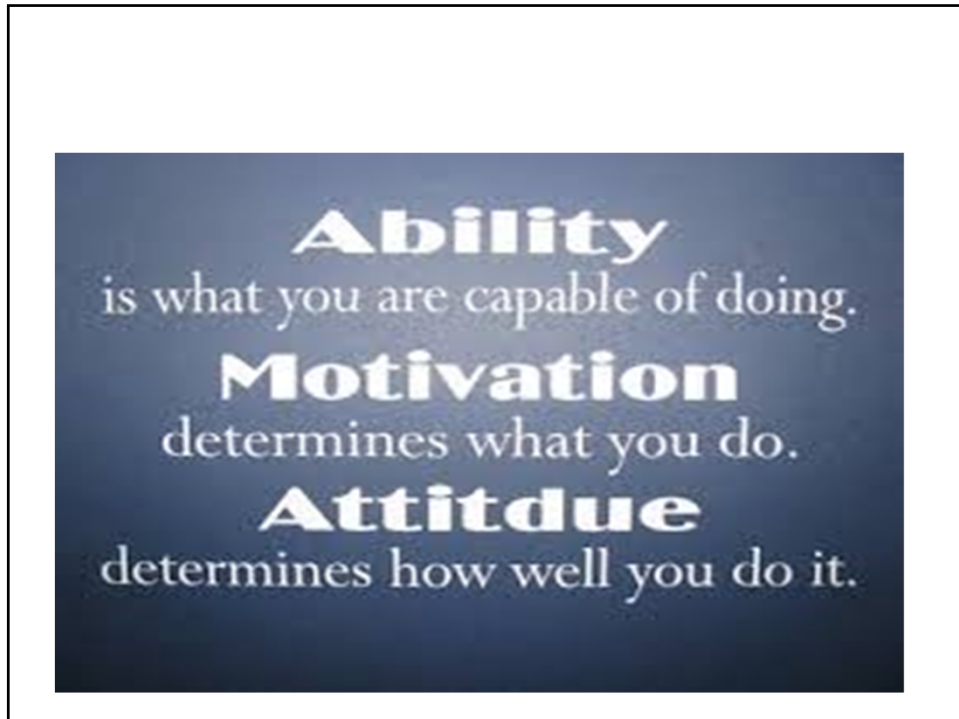


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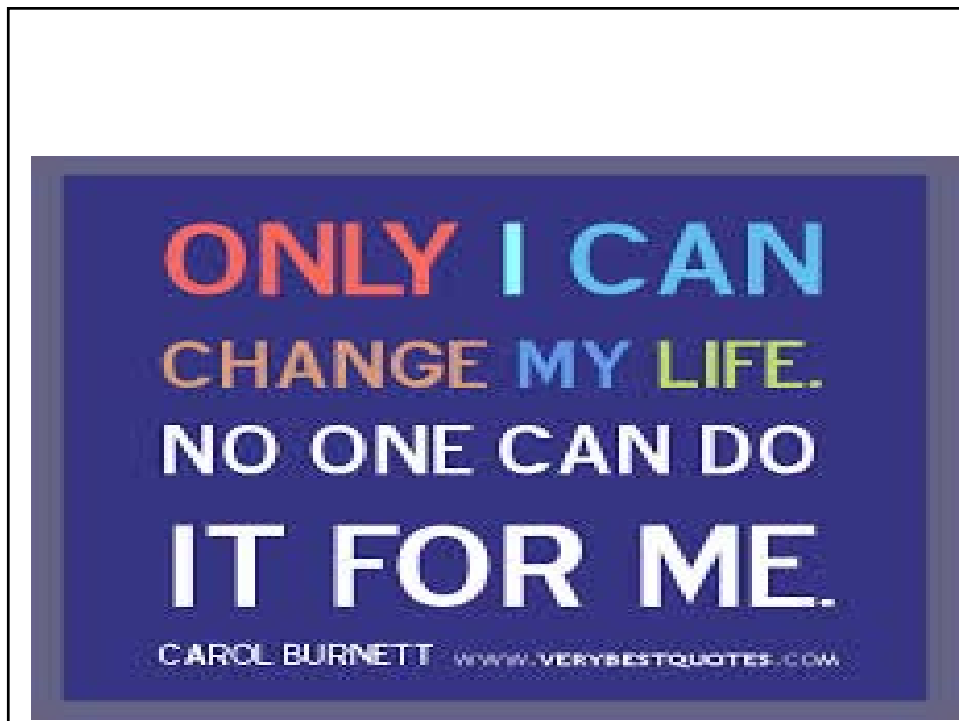
Motivation

Bathing does not last forever.....
Neither does motivation that why you should do it
daily

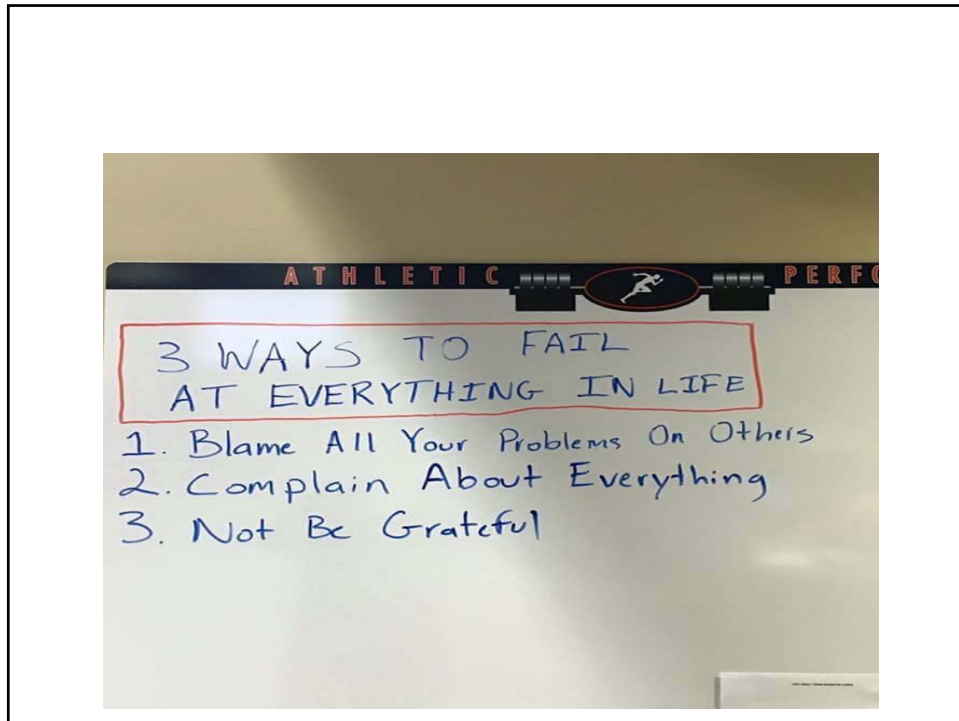
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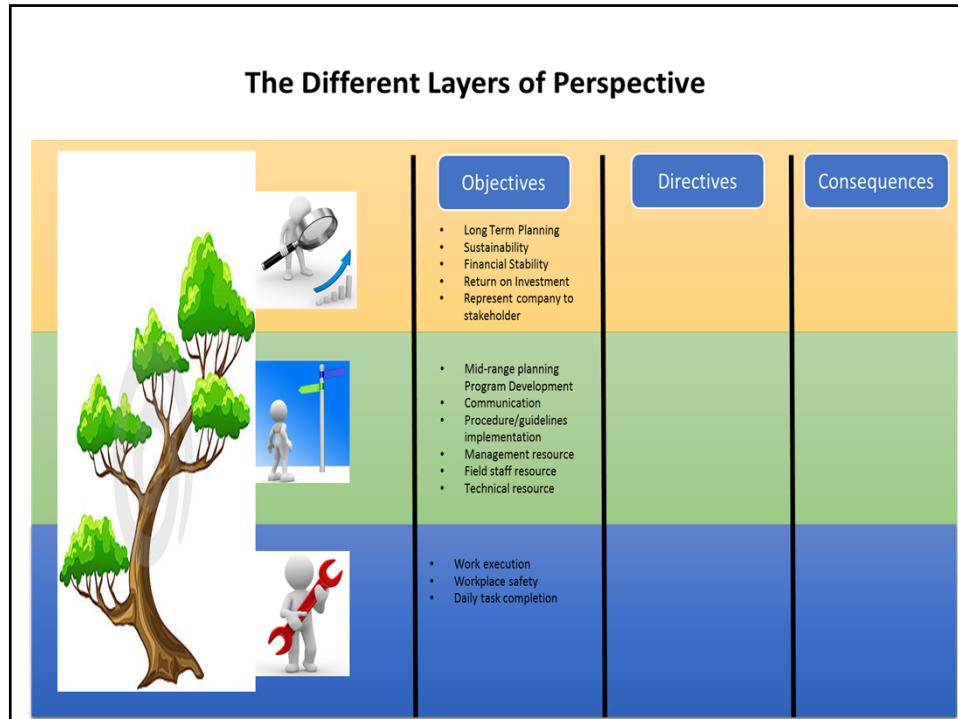
Tree of Perspective

(7 Habits of highly effective people- Stephen Covey)

Objective: Clear out a jungle

The diagram illustrates the concept of perspective. On the left, a stylized green tree with a person climbing it is shown. A blue speech bubble above the tree says "Wrong Jungle!!". To the right, another blue speech bubble says "Shut up!, we're making progress!". Below these elements is a photograph of several people in orange shirts and blue pants working to clear a dense jungle. The entire scene is set on a wooden floor.

8



9

Grades 1 / 2 Be prepared... for this and more

- Personal Protective Equipment (PPE)
- SAFETY
- Chemical Safety and M.S.D.S.
- Rigid Pipe vs. Flexible pipe
- The purpose of CCTV inspection
- Know the Tools of the Trade (**used and not used**)
- Proper Response to Sanitary Sewer Overflows (SSO's)
- Know the difference between all the spill categories.

Refer to the CWEA study Guides

10

Grades 1 / 2 Be prepared... for this and more

- Name the components of a Manhole & Submersible pump
- Types of Lift Station Pumps, Motors and Controls
- Alarm points for the Atmosphere Analyzers (**Gas Detectors**)
- Confined Space Entry team members / duties / Hazards
- Construction & Repair of Sewer Pipes and Manholes
- Trench Safety
- Different Nozzles used in Hydro Cleaning (**Tier 1/2/3**)
- End-Pieces used in Power Rodding
- Different Traffic Zones

Refer to the CWEA study Guides

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The previous list is **NOT All-Inclusive**. You are responsible to be familiar with the content of the resources listed in the study guides.

Refer to the CWEA study Guides

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ATTACHMENT A
STATE WATER RESOURCES CONTROL BOARD
ORDER NO. WQ 2013-0958-EXEC

**AMENDING MONITORING AND REPORTING PROGRAM
 FOR
 STATEWIDE GENERAL WASTE DISCHARGE REQUIREMENTS FOR
 SANITARY SEWER SYSTEMS**

This Monitoring and Reporting Program (MRP) establishes monitoring, record keeping, reporting and public notification requirements for Order 2006-0003-DWQ, "Statewide General Waste Discharge Requirements for Sanitary Sewer Systems" (SSS WDRs). This MRP shall be effective from September 9, 2013 until it is rescinded. The Executive Director may make revisions to this MRP at any time. These revisions may include a reduction or increase in the monitoring and reporting requirements. All site specific records and data developed pursuant to the SSS WDRs and this MRP shall be complete, accurate, and justified by evidence maintained by the enrollee. Failure to comply with this MRP may subject an enrollee to civil liabilities of up to \$5,000 a day per violation pursuant to Water Code section 13350; up to \$1,000 a day per violation pursuant to Water Code section 13268; or referral to the Attorney General for judicial civil enforcement. The State Water Resources Control Board (State Water Board) reserves the right to take any further enforcement action authorized by law.

A. SUMMARY OF MRP REQUIREMENTS

Table 1 – Spill Categories and Definitions

CATEGORIES	DEFINITIONS (See section A on page 3 of Order 2006-0003-DWQ for Sanitary Sewer Discharge (SSD) definition)
CATEGORY 1	Discharges of untreated or partially treated wastewater of any volume resulting from an enrollee's sanitary sewer system failure or low condition that: <ul style="list-style-type: none"> Reach surface water and/or reach a drainage channel tributary to a surface water; or Reach a Municipal Separate Storm Sewer System (MS4) and are not fully captured and returned to the sanitary sewer system or fully otherwise captured and disposed of properly. Any volume of wastewater not returned from the MS4 is considered to have reached surface water unless the storm drain system discharges to a dedicated storm water or groundwater collection system (e.g., retention or permeation ponds).
CATEGORY 2	Discharges of untreated or partially treated wastewater of 1,000 gallons or greater resulting from an enrollee's sanitary sewer system failure or low condition that do not reach surface water, a drainage channel, or a MS4 unless the entire SSD discharged to the storm drain system is fully recovered and disposed of properly.
CATEGORY 3	All other discharges of untreated or partially treated wastewater resulting from an enrollee's sanitary sewer system failure or low condition.
PRIVATE LATERAL REWAGE DISCHARGE (PLRD)	Discharges of untreated or partially treated wastewater resulting from leaks or other problems within a privately owned sewer lateral connected to the enrollee's sanitary sewer system or from other private water assets. PLRDs that the enrollee becomes aware of may be voluntarily reported to the California Integrated Water Quality System (CIWQS) Online SSD Database.

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CIWQS

The screenshot shows the website header for the California Environmental Protection Agency State Water Resources Control Board. The navigation menu includes Home, About Us, Public Notices, Board Info, Board Decisions, Water Issues, Publications/Forms, and Press Room. The main content area features the California Integrated Water Quality System (CIWQS) login interface. On the left, there is a profile for the Office of Governor Edmund G. Brown Jr. with a 'Visit his Website' link and a list of links: Cal/EPA, State and Regional Water Boards' Map, Laws/Regulations, and Plans/Policies. The login section includes fields for 'User ID:' and 'Password:', a 'Login' button, and links for 'User Registration', 'SMARTS URL', 'Forgot your password? Reset your password here', and 'Forgot your User ID? Get your User ID here'.

14

Traffic Control

15

What does the term transition area mean in Traffic Control Plans?

1. It tells traffic what is coming up ahead
2. Moves traffic out of it's normal path
3. To minimize congestion
4. To provide safe and effective work areas

16

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17

Which of the following is NOT part of a traffic control zone:

1. Buffer Space
2. Taper Zone
3. Advanced Warning Area
4. Termination Area

18

Which of the following is not part of a traffic control zone:

1. Buffer Space
2. **Taper Zone**
3. Advanced Warning Area
4. Termination Area

19

The Different Traffic Control Zones are:

1. Advanced Warning Area
2. Transition Area
3. Activity Area (Formally Buffer zone/work zone)
4. Termination Area

20

The Different Traffic Control Zones are:

Locate information MUTCD section 6C.03
Components of a Temp Traffic Control Zone

21

The main purpose of traffic control is to:

1. Control dust and air pollution
2. Keep cars and trucks out of open trenches
3. Prevent excessive speeds in construction zones
4. Provide safe and effective work areas

22

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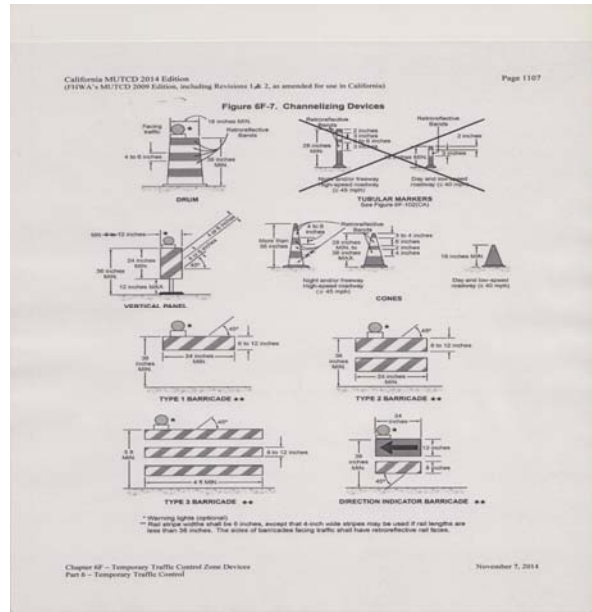
1. Control dust and air pollution
2. Keep cars and trucks out of open trenches
3. Prevent excessive speeds in construction zones
4. **Provide safe and effective work areas**

23

Cones 18 inches high, are only acceptable for use on low speed roadways during daylight hours. **Low speed is 40mph or less.** High speed cones, a minimum of 28 inches high are acceptable for use on any roadway at any time when equipped with retro reflective material. Cones can be ballasted and stabilized by using weighted bases or weighted rings.

24

Traffic cones and barricades



25

Confined Space

26

Atmospheric testing of a confined space shall continue:

1. Until hazardous sources are contained
2. Until the confined space has been completely ventilated
3. While the confined space is occupied
4. As long as the monitor of the confined space team is present

27

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2. Until the confined space has been completely ventilated
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4. As long as the monitor of the confined space team is present

28

What is the minimum crew size when a permitted confined space entry is required:

1. Five
2. Three
3. Four
4. Two (unless you have secured a Hot Work permit)

29

What is the minimum crew size when a permitted confined space entry is required:

- Five
- **Three**
- Four
- Two (unless you have secured a Hot Work permit)

30

How does sewer system confined space entry differ most from other non-permit entries?

1. Hazardous atmospheres are rarely encountered
2. Manholes are the only type of confined spaces entered
3. Only one person ever enters the confined space
4. There rarely exists any way to completely isolate the space

31

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32

Hydrogen Sulfide has a smell most similar to:

1. Dead fish
2. Petroleum products
3. Rotten eggs
4. Paint thinner

33

Hydrogen Sulfide has a smell most similar to:

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2. Petroleum products
3. **Rotten eggs**
4. Paint thinner

34

The lack of an unpleasant smell in a manhole, lift station, or other similar structure does not mean that dangerous gases are not present because:

1. Not all gases have an odor
2. All gases have some type of odor
3. Some gases heighten the sense of smell
4. Most dangerous gasses usually only have pleasant smells

35

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4. Most dangerous gasses usually only have pleasant smells

36

What is the minimum level of oxygen in air considered safe for breathing:

1. 23.9
2. 17.5
3. 20.9
4. 19.5

37

What is the minimum level of oxygen in air considered safe for breathing:

1. 23.9
2. 17.5
3. 20.9
4. **19.5**

38

Entry Team

✓ At a Minimum, the entry team shall include:

- Authorized Entrant
- Attendant
- Entry Supervisor

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Authorized Entrant

✓ The Employer shall ensure that all Authorized Entrants:

- Know the hazards that may be faced during entry
 - Mode, Signs or Symptoms, and consequences of exposure
- Properly use equipment
 - Monitoring
 - PPE
 - Ventilating
 - Communication
 - Rescue / Emergency Equipment

(Continued)

40

Authorized Entrant

✓ The Employer shall ensure that all Authorized Entrants:

- Communicate with Attendant
 - Verbal
 - Visual
- Alert Attendant when:
 - Recognize any warning sign/symptom of exposure
 - Detects a prohibited condition

(Continued)

41

Authorized Entrant

✓ The Employer shall ensure that all Authorized Entrants:

- Exit space as quickly as possible whenever:
 - An order to evacuate is given by Attendant or Entry Supervisor
 - Recognize warning sign/symptom of exposure to a dangerous situation
 - Detects a prohibited condition
 - An evacuation alarm is activated

42

Attendants

✓ The Employer shall ensure that each Attendants:

- Know the hazards that may be faced during entry
 - Mode, Signs or Symptoms, and consequences of exposure
- Is aware of possible behavioral effects of hazard exposure in Entrant

(Continued)

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Attendants

✓ The Employer shall ensure that each Attendants:

- Remains outside the permit space during entry operations, until relieved by another Attendant
- Communicates with Authorized Entrant as necessary to monitor his/her status

(Continued)

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Attendants

- ✓ The Employer shall ensure that each Attendants:
 - Monitors activities inside and outside the space to determine if it is safe for Entrants to remain in the space;

(Continued)

45

Attendants

- ✓ The Employer shall ensure that each Attendants:
 - Orders evacuation if:
 - Detects prohibited condition
 - Detects behavioral effects of exposure
 - Detects situation outside the space is unsafe
 - Attendant can't effectively perform his/her duties
 - Initiates Rescue Procedures & summons additional help if necessary

(Continued)

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Attendants

✓ The Employer shall ensure that each Attendants:

- Takes the following action when unauthorized persons approach the space:
 - Warn the persons they must stay away
 - Advise the person to exit immediately if they enter the space
 - Inform the other members of the team that persons have entered the space

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Entry Supervisor

✓ The Employer shall ensure that each Entry Supervisor:

- Know the hazards that may be faced during entry
 - Mode, Signs or Symptoms, and consequences of exposure
- Verifies, by checking that:
 - the appropriate have been made on the permit
 - All test have been conducted
 - All equipment is in place prior to entry
 - Endorses Permit

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Entry Supervisor

✓ The Employer shall ensure that each Entry Supervisor:

- Terminates the entry and cancels permit when required
- Removes unauthorized individuals who enter, or attempt to enter the permit space.
- Determines, whenever responsibilities are transferred, that entry operations remain consistent.

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Know the Hazards

- Oxygen Deficient Atmospheres
- Oxygen Enriched Atmospheres
- Flammable Atmospheres
- Toxic Atmospheres
- Temperature Extremes
- Engulfment (Overwhelm) Hazards
- Noise, Slick/Wet Surfaces, Falling Objects

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Oxygen Enriched Atmospheres

- Oxygen level above 23.5%.
- Causes flammable and combustible materials to burn violently when ignited.



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Flammable Atmospheres

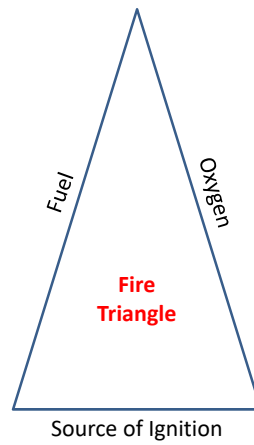
- 3 Critical Factors:
 - Oxygen content in the air.
 - Presence of a flammable gas, or vapor
 - Presence of dust (visibility of 5' or less)
- Proper air/gas mixture can lead to explosion
- Typical Ignition Sources:
 - Sparking or electric tool/smoking

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Flammable Atmospheres

Combustible

Flammable



Same Thing

53

Flammable Atmospheres

- Alarm Set Point
 - 10% LFL (Lower Flammable Limit)



54

Hydrogen Sulfide

Although the foul odor (rotten eggs) is easily detected at low concentrations, it is an unreliable warning

BECAUSE

The gas rapidly desensitizes the olfactory (sense of smell) nerves and leads to a false sense of security. In high concentrations of H_2S , a worker may collapse with little or no warning.

55

Carbon Monoxide

Is an odorless, colorless gas that may build up in a confined space.

In high concentrations of carbon monoxide, a worker may collapse with little or no warning and would be unable to aid himself.

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Testing Stratified Atmospheres

Cal-OSHA states:

When monitoring for entries involving descent into atmospheres that may be stratified, the atmosphere envelope must be tested a distance approximately 4 feet in the direction of travel and to each side.



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Testing the Atmosphere

- Methane
- Carbon Monoxide.
- Hydrogen Sulfide



Same as Air

Heavier than Air



Lighter than Air



58

Testing the Atmosphere

- Methane Lighter than Air
- Carbon Monoxide Heavier than Air
- Hydrogen Sulfide Heavier than Air

Believe it!!!

59

Chemical Safety

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SDS is an acronym which means:

1. System and Distribution Status
2. Safety Data Sheet
3. Safety Data System
4. Safety Development System

61

SDS is an acronym which means:

1. System and Distribution Status
2. **Safety Data Sheet**
3. Safety Data System
4. Safety Development System

62

Who are Safety Data Sheets for?

1. Employees
2. Employers
3. Emergency Response Personnel
4. Emergency Room Personnel

63

63

Who are Safety Data Sheets for?

- 1. Employees**
 - a) Who may be occupationally exposed to a hazard
- 2. Employers**
 - a) Who need to know the proper methods handling & use
- 3. Emergency Response Personnel**
 - a) Such as fire fighters, EMTs, police, etc.
- 4. Emergency Room Personnel**
 - a) Who need to know how to treat you – maybe save your life

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Chemical Safety

- Hazards presented by any chemical depend upon the properties of that chemical
- Each chemical presents different hazards

There are Four Classes of Hazards

65

65

Chemical Safety

Four Classes of Hazards

Flammability **Toxicity** **Reactivity**
Corrosivity

66

66

Chemical Safety – 4 Classes of Hazards

Flammability (Combustible)

- Flammable vapors mixed with air can explode
- Vapors can be toxic

Precautionary Measures include

- Enforced absence of ignition sources (this is an Engineering Control)
- Keep containers closed when not being used
- Ensure air movement is sufficient to keep the concentration low...
- Store Flammables in approved storage enclosure
- Keep fire extinguishing and spill control equipment readily available.

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Chemical Safety – 4 Classes of Hazards

Corrosivity

- Destroys living Tissue or causes permanent damage/change
- Can destroy skin tissue, underneath the skin, eyes, respiratory system – all living organisms
- Precautionary Measures include:
 - Preventing contact with skin, eyes and respiratory tract, etc.
 - Safety Goggles, full face shield, gloves known to be impervious to the corrosive material being handled.
 - Always store corrosives below eye level.
 - After handling – always wash using plenty of water – flush for 15 minutes.

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68

Chemical Safety – 4 Classes of Hazards

Toxicity

- Poisons = death, cancer and blindness.
- Chronic effects – after repeated exposures on long exposures
- Acute Effects – occur promptly after exposure

- Basically – exposure to a larger amount of a toxin is worse than exposure to a smaller amount; exposure for a longer duration is worse than exposure to a shorter duration. So, minimize exposure.

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69

Chemical Safety – 4 Classes of Hazards

Toxicity (continued)

- The routes of exposure
 - Inhalation
 - Injection
 - Absorption through skin
 - Ingestion
 - Via other body orifices
- Precautionary Measures include:
 - Barriers
 - Cleanliness – good housekeeping, thorough washing
 - avoidance
- Likely symptoms – headache, nausea, dizziness

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70

Chemical Safety – 4 Classes of Hazards

Reactivity

- Labels do not always tell ...if a chemical is self-reactive (self-explode) or if mechanically disturbed – it can explode. ..if mixed with other chemicals it will explode or become toxic...

– Examples are: Acids. Peroxides

Moral of story is to try to keep like chemicals together.

If you don't know, keep separated.

71

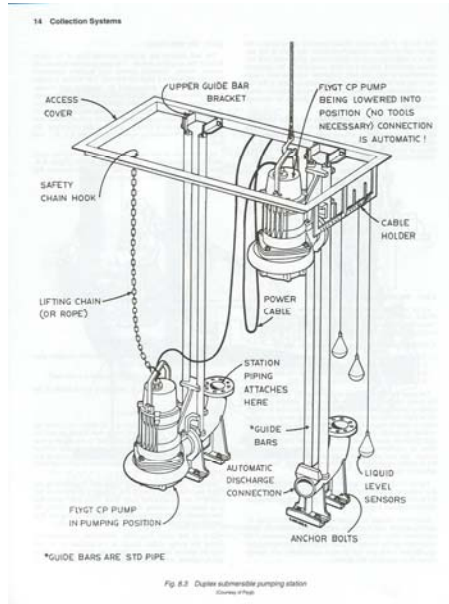
71

Lift Stations

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Lift Stations & Pumps

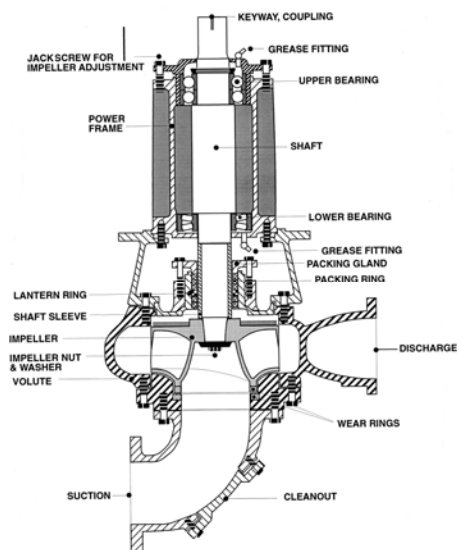
Identify and discuss the components of the illustrated lift station pumping system and their functions.



73

Lift Stations & Pumps

Identify and discuss the components of the illustrated pump.



74

Lift Stations & Pumps

What is the main purpose of gate valves in a lift station?

1. To check the pump efficiency on the pump curve
2. To function as a check valve when the check valves fail
3. To isolate the lift station from the wastewater collection system during maintenance
4. To throttle pumped flows to avoid overloading the sewer system

75

Lift Stations & Pumps

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76

Lift Stations & Pumps

What type of control device is used to stop and start pumps?

1. Dissolved air
2. Floats
3. Valves
4. Rotors

77

Lift Stations & Pumps

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2. Floats
3. Valves
4. Rotors

78

Lift Stations & Pumps

Discuss the impacts of frequent lift station pump starts and stops

- Excessive pump motor and starter wear.
- Potential surges in wastewater flow
- Increased power costs

79

Lift Stations & Pumps

What can cause frequent lift station starts and stops?

- Undersized wet well
- Excess inflow and infiltration in a wastewater collection system
- Pump start and stop control levels incorrectly set
- All of the above

80

Lift Stations & Pumps

What can cause frequent lift station starts and stops?

- Undersized wet well
- Excess inflow and infiltration in a wastewater collection system
- Pump start and stop control levels incorrectly set
- **All of the above**

81

What type of pump is primarily used in lift station wet wells applications

1. Air Ejector
2. Screw
3. Submersible
4. Piston

82

What type of pump is primarily used in lift station wet wells applications

1. Air Ejector
2. Screw
3. **Submersible**
4. Piston

83

Accumulated air in force mains is generally controlled by means of:

1. Counter compression release valves
2. Butterfly Valve
3. Air/vacuum release valves
4. Check Valves

84

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1. Counter compression release valves
2. Butterfly Valve
3. **Air/vacuum release valves**
4. Check Valves

85

If a three phase, 220 volt motor has been reinstalled and it turns backward, then you should take which action?

1. Return the motor for re-evaluation
2. Replace the ground wire
3. Reverse the connections of the motor leads (there are two)
4. Return the motor to have it re-wound in the other direction

86

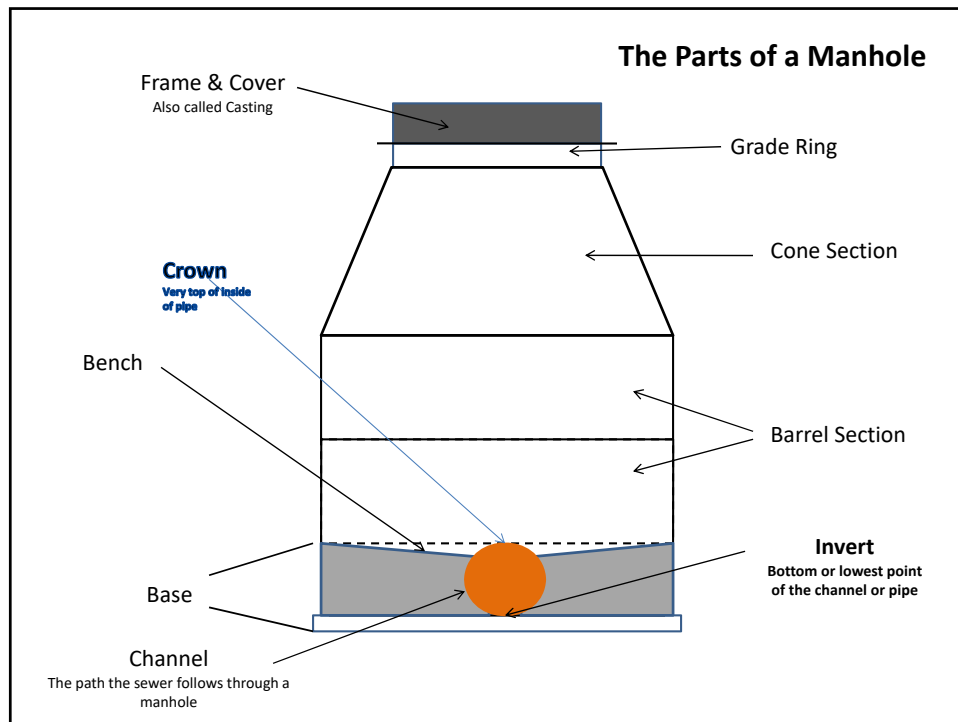
If a three phase, 220 volt motor has been reinstalled and it turns backward, then you should take which action?

1. Return the motor for re-evaluation
2. Replace the ground wire
3. **Reverse the connections of the motor leads (there are two)**
4. Return the motor to have it re-wound in the other direction

87

Manholes

88



89

A Cast-in-Place manhole base is one that:

1. Purchased from a manhole base manufacturer
2. is also called a Pre-Cast base
3. Where the concrete is poured and the base is formed in the field
4. is made of cast iron instead of concrete for extra strength

90

A Cast-in-Place manhole base is one that:

1. is purchased from a manhole base manufacturer
2. is also called a Pre-Cast base
3. the concrete is poured and the base is formed in the field
4. is made of cast iron instead of concrete for extra strength

91

Some agencies prohibit manhole steps or rungs and use ladders instead to:

1. Increase the speed of the operators entering manholes as steps are hard to navigate
2. Save on the cost of installing steps
3. Protect operators from getting their feet entangled due to slippery rungs
4. Eliminate the hazards created by the corrosion of steps

92

Some agencies prohibit manhole steps and use ladders instead to:

1. Increase the speed of the operators entering manholes
2. Save on the cost of installing steps
3. Protect operators from getting splashed if they are lowered too far
4. **Eliminate the hazards created by the corrosion of steps**

93

Pipe

94

A rigid pipe will:

1. Bend or bulge from it's original shape when subjected to a load
2. Deflect more then flexible pipe
3. Break or crack if not supported properly
4. Return to it's original shape when a load is removed

95

A rigid pipe will:

1. Bend or bulge from it's original shape when subjected to a load
2. Deflect more then flexible pipe
3. **Break or crack if not supported properly**
4. Return to it's original shape when a load is removed

96

Vitrified Clay Pipe (VCP) is considered to be:

1. A rigid pipe
2. A flexible pipe
3. A large volume pipe
4. A pressure pipe

97

Vitrified Clay Pipe (VCP) is considered to be:

1. **A rigid pipe**
2. A flexible pipe
3. A large volume pipe
4. A pressure pipe

98

So, what about Ductile Iron Pipe (DIP)?

Is it Rigid pipe or flexible pipe?

99

Ductile Iron Pipe (DIP) is considered to be

Flexible Pipe

100

Infiltration is the seepage of groundwater into a sewer system due to:

1. Cooling water discharges
2. Defective pipe joints
3. Storm sewer overflows
4. Yard drains

101

Infiltration is the seepage of groundwater into a sewer system from:

1. Cooling water discharges
2. **Defective pipe joints**
3. Storm sewer overflows
4. Yard drains

102

Tools & Equipment

103

The tool most likely to be used to verify the diameter of a newly installed line for deflection is generally called a:

1. Diameter verification sleeve
2. Sewer Scooter
3. Sewer Ball
4. Proofing tool

104

The tool most likely to be used to verify the diameter of a newly installed line for deflection is generally called a:

1. Diameter checker
2. Sewer Scooter
3. Sewer Ball



4. **Proofing tool**

105

Emergency stoppages in pipelines should not be cleared by the use of :

1. Hand Rods
2. High-Velocity cleaners
3. Bucket Machines
4. Power Rodder

106

Emergency stoppages in pipelines should not be cleared by the use of :

1. Hand Rods
2. High-Velocity cleaners
3. **Bucket Machines**
4. Power Rodder



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Tools and Equipment



Clam-type Bucket

108

Tools and Equipment



**Balling
Equipment**

109

Tools and Equipment



Multi-size Ball

110

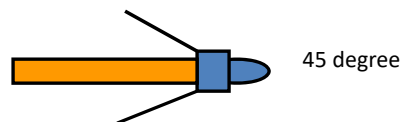
Climbing steep grades with a high-velocity cleaner (Hydro-jet) would be best suited for a nozzle with a jet angle of _____ degrees:

1. 45
2. 30
3. 180
4. 15

111

Climbing steep grades with a high-velocity cleaner (Hydro-jet) would be best suited for a nozzle with a jet angle of _____ degrees:

1. 45
2. 30
3. 180
4. **15**



112

All of the following tools are used in conjunction with power rodding operations:

1. Spinning nozzles, skids, lead hoses
2. Sewer scooter, ball, kite
3. Impeller, bucket rig
4. Guide, sand leader, double point corkscrew

113

All of the following tools are used in conjunction with power rodder operations:

1. Spinning nozzles, skids, lead hoses
2. Sewer scooter, ball, kite
3. Impeller, volute, bucket rig
4. **Guide, sand leader, double point corkscrew**

114

If the scale on your agency's system maps is

$$1" = 400'$$

and manhole 'A' is $1 \frac{1}{4}"$ from manhole 'B', what is the distance between manholes?

1. 450'
2. 475'
3. 425'
4. 500'

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116

Smoke Testing can be used for:

1. Locating Illegal Connections
2. Locating missing caps on cleanouts
3. Locating sources of infiltration
4. All of the above

117

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1. Locating Illegal Connections
2. Locating missing caps on cleanouts
3. Locating sources of infiltration
4. **All of the above**

118

Trench Safety

119

Type A soil. Cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

- (1) The soil is fissured; or
- (2) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- (3) The soil has been previously disturbed; or
- (4) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- (5) The material is subject to other factors that would require it to be classified as a less stable material.

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Type B soil:

- (1) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; or
- (2) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
- (3) Previously disturbed soils except those which would otherwise be classed as Type C soil.
- (4) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
- (5) Dry rock that is not stable; or
- (6) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

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Type C soil:

- (1) Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or
- (2) Granular soils including gravel, sand, and loamy sand; or
- (3) Submerged soil or soil from which water is freely seeping; or
- (4) Submerged rock that is not stable, or
- (5) Material in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength. The load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil. Soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

122

Definitions.

Cemented soil. A soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil. Clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical side slopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil. Soil that does not exhibit visible signs of moisture content.

Fissured. A soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil. Gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

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Layered system. Two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil. A condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic. A property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated soil. A soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

Soil classification system. A method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

Stable rock. Natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil. Soil which is underwater or is free seeping.

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Spoils

- Don't place spoils within 2 feet from edge of excavation
- Measure from nearest part of the spoil to the excavation edge
- Place spoils so rainwater runs away from the excavation
- Place spoil well away from the excavation



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Means of Egress

A stairway, ladder, or ramp must be present in excavations that are 4 or more feet deep, and w/in 25 feet of the employees



The ladder should extend 3 feet above the excavation

126

Definitions

- **Excavation** – a man-made cut, cavity, trench, or depression formed by earth removal.
- **Trench** – a narrow excavation. The depth is greater than the width, but not wider than 15 feet.
- **Shield** - a structure able to withstand a cave-in and protect employees
- **Shoring** - a structure that supports the sides of an excavation and protects against cave-ins
- **Sloping** - a technique that employs a specific angle of incline on the sides of the excavation. The angle varies based on assessment of impacting site factors.

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If you have a 100' trench, how many ladders would you need to meet the requirements for safety?

- a. 3
- b. 2
- c. 4
- d. 5

128

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- b. **2**
- c. 4
- d. 5

129

In trench excavations, protective systems are always required if the depth exceeds:

1. Four feet
1. Five feet
2. Eight Feet
3. Six Feet

130

In trench excavations, protective systems are always required if the depth exceeds:

1. Four feet
2. **Five feet**
3. Eight Feet
4. Six Feet

131

In trench excavations, protective systems are always required if the depth exceeds Five Feet and...

If the soil is unsuitable

Examples

- Excessively wet
- Loose, sandy
- Large amount of roots

132

Customer Service

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Communications & Customer Service

When a citizen wants information regarding a maintenance operation, you should:

- Always refer them to a supervisor
- Ignore them
- Tell them you are not authorized to give out information
- Give them as much factual information as you can and offer to help them further

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Communications & Customer Service

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135

Personal Protective Equipment (PPE)

136

When Must Hand Protection be Provided?

If any of the following is possible:

- Burns
- Bruises
- Abrasions
- Cuts
- Punctures
- Fractures
- Amputations
- Chemical Exposures

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Hand Protection

Be sure the gloves you are wearing are the right type for the job you are doing. The gloves should be in good condition. Always check for wear, cracks, holes, damage, etc...



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Hand Protection (Sample Question)

How can jewelry such as rings be a hazard to operators?

- A. Rings and jewelry are distractions and may cause the operator to lose focus on the job at hand.
- B. Rings and jewelry could get damaged or lost and the agency would be liable for the cost to replace.
- C. Rings or jewelry are not considered a hazard to the operator.
- D. Rings or jewelry can get caught on equipment or become bent, the operator could suffer painful cuts or even the loss of a finger.

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139

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Foot Protection

- Foot injuries frequently occur when heavy objects are dropped, resulting in bruises, dislocations, fractures, or crushes
- Footwear with reinforced steel toes and deep-lugged non-slip sole are recommended for collection system operators.

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When Must Foot Protection be Provided?



When any of these are present:

- Heavy objects such as barrels or tools that might roll onto or fall on employees' feet
- Sharp objects such as nails or spikes that might pierce ordinary shoes
- Molten metal that might splash on feet
- Hot or wet surfaces
- Slippery surfaces



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Head Protection

Hard Hats are provided to prevent head injuries from falling objects, bumps against objects, machinery, or loads being moved by machinery.

There should be clearance between the harness and the hard shell. **Manufacturers Recommendations** should be adhered to. Typically, one-inch clearance is adequate.

Hardhats should be discarded when damaged.

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Head Protection (Sample Question)

Which circumstance typically does not require the use of a hardhat?

- A. Operating the vacuum on a combination Hydro-Vac unit
- B. Working inside a manhole
- C. Working near construction machinery (i.e., backhoe)
- D. Operating a overhead drill press

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Face Shield



- Full face protection
- Protects face from dusts and splashes or sprays of hazardous liquids
- Does **not** protect from impact hazards
- Wear safety glasses or goggles underneath



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Safety Glasses

Ordinary glasses do not provide the required protection

• Proper choices include:

- Prescription glasses with side shields and protective lenses
- Goggles that fit comfortably over corrective glasses w/o disturbing the glasses
- Goggles that incorporate corrective lenses mounted behind protective lenses

Goggles & Safety Glasses

- Protects eyes and area around the eyes from impact, dust, and splashes
- Some goggles fit over corrective lenses



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When must Eye Protection be Provided?

When any of these hazards are present:

- Dust and other flying particles, such as concrete dust
- Corrosive gases, vapors, and liquids
- Burns (radiant energy)



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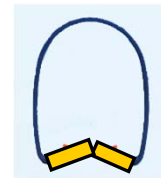
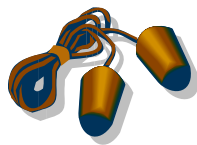
When Must Hearing Protection be Provided?

When an employee's noise exposure exceeds an 8-hour time-weighted average (TWA) sound level of 90 dBA

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Examples of Hearing Protectors



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Major Causes of Body Injuries

- Slip, trips, and falls
- Heat
- Splashes of hot metals and other hot liquids
- Impacts from tools, and materials
- Cuts
- Hazardous chemicals

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Disposable Body Protection

Tyvek Suit

For use against such **non-hazardous materials** as dirt and grime, animal waste, paints, oil and grease, lubricants or hazardous materials including: fertilizer, pesticides, asbestos, lead, chromium, mold, fiberglass and radioactive particles.



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Wear Your Colors



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