Introduction

• Motor Vehicles, Mechanized Equipment, and Marine Operations

• Module Description
  – Module will provide a general review of safety issues and generally follows regulations found in subpart O:
    • Specific definitions found in Subpart O – 1926.606
    • Construction equipment in general – 1926.600
    • Motor vehicles – 1926.601
    • Material handling equipment – 1926.602
    • Pile driving equipment – 1926.603
    • Site clearing – 1926.604
    • Marine operations and equipment – 1926.605
    • Dust Emissions and Dust Control
Introduction

• Module Objective
• General: The student will be able to recognize hazards associated with Motor Vehicles, Mechanized Equipment and Marine Operations; Rollover Protective Structures and Overhead Protection; and Signs, Signals and Barricades in construction.
• Specific: The Student Should be able to:
  • 1: Identify major hazards
  – 2: Describe types of hazards
  – 3: Protect themselves from hazards
  – 4: Recognize employer requirements to protect workers from exposure to hazards associated with Motor Vehicles, Mechanized Equipment and Marine Operations; Rollover Protective Structures and Overhead Protection; and the proper use of Signs, Signals and Barricades in construction.
Introduction

• Get Site-Specific Training!
  – This training course:
    • Provides basic occupational safety and health information.
    • Is not a substitute for knowledge of OSHA or other standards.
    • Is not a substitute for specific, hands-on training and information.
    • Should take about 60 minutes.
General Requirements

- Equipment Attention
- OSHA requires...
  - All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, must have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of the equipment.
• Tires

• A safety tire rack, cage, or equivalent ...
  – Protection must be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.
General Requirements

• Suspended Loads
• Heavy machinery, equipment, or parts thereof:
  – Which are suspended or held aloft by use of slings, hoists, or jacks must be substantially blocked or cribbed to prevent falling or shifting before employees are permitted to work under or between them.
General Requirements

• Case Study – Boom Crash

• 43-year old male construction superintendent died ...
  – Crushed under the lattice boom of a 175-ton crawler crane.
  – Victim working for construction company for 2 ½ years.
  – On this job site for one month.
  – Victim had received extensive safety training.
  – A site survey prior to the boom lowering procedure was performed.
• Case Study – Boom Crash
• Two days before the incident ...
  – Slings attached to load broke causing boom to recoil and bounce back and forth.
  – A thorough inspection of cables was not performed.
  – Boom was in the process of being lowered with no provision for supporting it.
• Victim was standing near tip of boom ...
  – Observing load (probe) when the 7/8-inch boom hoist cable broke. Boom fell straight down and pinned the superintendent under the area of the boom tip.
Case Study – Boom Crash

Assure boom hoist cable is relaxed when inspected.

- Wire rope cables should be relaxed so damage (e.g. kinking or bird-caging), can be seen.
- Crane and entire length of the cables should be inspected.

State OSHA

"A qualified person shall visually inspect the crane's controls, rigging and operating mechanism prior to the first operation on any work shift. Any unsafe conditions disclosed by the inspection must be corrected promptly. Defective components of equipment which create an imminent safety hazard shall be replaced, repaired or adjusted prior to use."
General Requirements

• Case Study – Boom Crash

• Support boom when it is lowered.
  – Employees should be protected when underneath lowered boom of a crane.
  – Protection could be afforded by supporting the crane boom to prevent its movement.
  – Had crane's boom been prevented from moving or falling, this accident most likely would not have happened.
General Requirements

• Lowering/Blocking
• Bulldozer and...
  – Scraper blades, end-loader buckets, dump bodies, and similar equipment, must be either fully lowered or blocked when being repaired or when not in use.
General Requirements

• Fatal Facts #5
  – A laborer was steam cleaning a scraper, when the 2500 pound bowl apron fell unexpectedly, catching the employee between the apron and the cutting edge of the scraper bowl. Click on the tab to open a PDF describing the accident in detail. Study the accident report before moving to the next screen.
• Fatal Fact #45
• When the drive shaft was removed...
  – A three-man crew was digging a trench for a new sewer line using a backhoe. The backhoe was very poorly maintained. Among other problems, its starter button did not work, and the safety catch on the gear shift was broken. In order to start the machine, the operator used a screwdriver to engage the starter. When the gear shift engaged, the vehicle lurched forward, running over the victim.
General Requirements

• Fatal Fact #45
• OSHA issued two serious citations to the employer:
  – Train employees to recognize and avoid unsafe conditions associated with their work.
  – Identify equipment which does not meet OSHA requirements by tagging it or locking the controls to render them inoperable or by physically removing the defective equipment from the worksite.
General Requirements

• Controls/Parking

• Controls and parking requirements.
  – Controls must be in a neutral position, with motors stopped and brakes set, unless work being performed requires otherwise.
  – Whenever equipment is parked, parking brake must be set.
  – Equipment parked on inclines must have the wheels chocked and the parking brake set.
General Requirements

• Batteries
• Use, care and charging of all batteries..
  – Conform to requirements of Subpart K.
  – Requirements for:
    • Ventilation
    • Floor construction
    • Personal protective equipment (e.g. face shields, aprons, rubber gloves)
    • Facilities for quick drenching of the eyes and body
    • Facilities provided for flushing and neutralizing spilled electrolyte
    • Fire protection.
General Requirements

- Battery Charging
- Battery charging...
  - Installations located in areas designated for that purpose.
  - Charging apparatus must be protected from damage by trucks.
  - When batteries being charged, vent caps must be kept in place to avoid electrolyte spray.
  - Vent caps must be maintained in functioning condition.
General Requirements

• Cab Glass
• All cab glass...
  – Must be safety glass, or equivalent, that introduces no visible distortion affecting the safe operation of any machine or equipment.
General Requirements

• Case Study

• Takes more than safety glass.
  – A 30 year-old public works employee died when struck by a tree trunk that crashed through window of excavator he was operating.
  – A 3-man crew was attempting to clear debris.
  – As operator lifted tree off ground, it slipped off excavator bucket, broke through front windshield, and pushed against hand controls.
General Requirements

• Case Study

• Takes more than safety glass.
  – Since cab of excavator was rotated, the track control levers essentially worked in reverse.
  – The tree trunk pushed against the controls, causing excavator to move forward against the tree trunk.
  – Victim was pushed from the operator's seat into the rear window.
General Requirements

• Case Study

• Investigators recommendations:
  – # 1: The manufacturer's instructions should be followed when using the excavator to lift heavy objects.
  – # 2: Employer should conduct a job hazard analysis; policies and training should be implemented based upon the findings of the evaluation.
General Requirements - B

- Power Lines/Transmitters
- All equipment...
  - Comply with 1926.550(a)(15) when working in vicinity of power lines or energized transmitters.
  - Critical to become familiar with the specific clearances when working near power lines or energized transmitters.
  - Thousands have been electrocuted and thousands seriously burned.
General Requirements - B

- Case Study - Two Deaths
- 20-year-old male truck driver/70-year-old employer electrocuted.
  - Boom of a truck-mounted crane contacted a 7,200-volt conductor of an overhead power line.
  - Incident occurred while driver was unloading concrete blocks at a residential construction site.
• Case Study - Two Deaths
• Backed truck up steeply sloped driveway under a power line at the site and was using the crane to unload a cube of concrete blocks.
• Company president and a masonry contractor watched as driver operated crane by a handheld remote-control unit.
• Tip of crane boom contacted overhead power line and completed a path to ground through the truck, remote control unit, and driver.
• Company president attempted to render assistance, contacted truck, completing a path to ground through his body. He died on the scene.
• Truck driver later died as a result of electrical burns.
• Power Lines/Transmitters
  – Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines must be operated near power lines only in accordance with OSHA’s strict requirements by maintaining safe clearances.
• Power Lines/Transmitters
• Lines rated 50 kV. or below...
   – Minimum clearance between lines and any part of crane or load must be 10 feet;
• Lines rated over 50 kV....
   – Minimum clearance between lines and any part of crane or load must be 10 feet plus 0.4 inch for each 1 kV. over 50 kV., or twice length of line insulator, but never less than 10 feet.

Safety Tip: IN TRANSIT WITH NO LOAD AND BOOM LOWERED, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV, and 10 feet for voltages over 50 kV, up to and including 345 kV, and 16 feet for voltages up to and including 750 kV;
• Observer

• A person...
  – Must be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means;
• Electrical Lines
• Electrical distribution/transmission lines.
  – Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes.
  – Use of such devices must meet 29 CFR, 1926.550, OSHA’s Cranes and Derrick requirements.
• Consider All Wires Energized

• Any overhead wire...
  – Must be considered to be an energized line UNLESS and UNTIL the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.
General Requirements - B

• Work Near Transmitter Towers
• Prior to work near transmitter towers...
  – Where an electrical charge can be induced in equipment/materials, transmitter de-energized/tests to determine if electrical charge is induced on crane.
  Precautions:
  • Equipment must be provided with an electrical ground directly to the upper rotating structure supporting boom; and
  • Ground jumper cables must be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters.
  • Crews provided with nonconductive poles having alligator clips/other similar protection to attach ground cable to load.
• Fire Prevention
• Combustible/Flammables
  – Combustible and flammable materials must be removed from the immediate area prior to operations.
  – Combustible liquids have...
    • Flash points at or above 100oF (Diesel fuel).
  – Flammable liquids have...
    • “Flash points” below 100oF, and are more dangerous than combustible liquids, since they may be ignited at room temperature (Gasoline).
General Requirements – B

• Rail Cars
• Rolling railroad cars.
  – Derail and/or bumper blocks must be provided on spur railroad tracks where a rolling car could contact other cars being worked, enter a building, work or traffic area.
Motor Vehicles

• Coverage

• OSHA’s regulation 1926.601(a) covers...
  – Motor vehicles that operate within an off-highway jobsite, not open to public traffic.
  – Do not apply to materials handling equipment such as earthmoving equipment: scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, and similar equipment.
Motor Vehicles

• Brakes/Lights

• Motor vehicles must:
  – Have a service brake system, an emergency brake system, and a parking brake system maintained in operable condition.
  – Be equipped with an adequate audible warning device at the operator's station and in an operable condition.
Motor Vehicles

• Lights

• With respect to lights:
  – Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles in use must be equipped with at least two headlights and two taillights in operable condition.
  – All vehicles must have brake lights in operable condition regardless of light conditions.
Motor Vehicles

• Rear View

• No employer must use...
  – Any motor vehicle equipment having an obstructed view to the rear unless:
    • The vehicle has a reverse signal alarm audible above the surrounding noise level, OR
    • The vehicle is backed up only when an observer signals that it is safe to do so.
Motor Vehicles

- Case Study – Rear View
- 40 year-old construction laborer killed ...
  - When backed over by a rubber tire dozer.
  - Victim employed with the company for six years and had worked at the site for seven days
  - Task was part of his normal work duties.
  - Written safety program in place.
  - Safety meetings were held weekly.

Training: Training was accomplished mostly through on-the-job-training (OJT). Training records were kept.
Motor Vehicles

• Case Study – Rear View

• Victim gave instructions ...
  – To dozer operator to back up and away from the housing pad to make room for the scraper.
  – He then walked over to end of housing pad to give directions / re-set grade stakes.
  – Dozer operator and victim lost sight of each other while moving in reverse.
• Case Study – Rear View
• Dozer backed over the victim as he was setting the grade stakes.
• Accident investigation recommendations:
  – Ensure communication systems are adequate.
  – Heavy equipment operators should not back equipment when workers on foot in area unless there is a spotter.
Motor Vehicles

- Windows/Wipers
- All vehicles...
  - With cabs must be equipped with windshields and powered wipers.
  - Cracked and broken glass must be replaced.
  - Vehicles operating in areas or under conditions that cause fogging or frosting of the windshields must be equipped with operable defogging or defrosting devices.
Motor Vehicles

- Pay Load and Tools
- All haulage vehicles...
  - Whose pay load is loaded by means of cranes, power shovels, loaders, or similar equipment, must have a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.
  - Tools and material must be secured to prevent movement when transported in the same compartment with employees.
Motor Vehicles

• Seats/Belts

• Vehicles used to transport employees...
  – Must have seats firmly secured and adequate for the number of employees to be carried.
  – Seat belts and anchorages meeting the Department of Transportations, Federal Motor Vehicle Standards must be installed in all motor vehicles.

Safety Tip: Over the years, study after study has shown that seat belt use saves lives.
Motor Vehicles

• Dump Bodies
• Trucks with dump bodies
  – Must be equipped with positive means of support, permanently attached, and capable of being locked in position to prevent accidental lowering of the body while maintenance or inspection work is being done.
• Operating levers...
  – Controlling hoisting or dumping devices on haulage bodies must be equipped with a latch or other device to prevent accidental starting or tripping of mechanism.
  – Trip handles for tailgates of dump trucks must be so arranged that, in dumping, the operator will be in the clear.
Motor Vehicles

• Fenders/Mud Flaps

• All rubber-tired motor vehicle equipment...
  – Manufactured on or after May 1, 1972, must be equipped with fenders.
  – Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.
Motor Vehicles

- Vehicle Inspection
- All vehicles in use...
  - Be checked at the beginning of each shift to assure that parts, equipment, and accessories are in safe operating condition and free of damage that could cause failure while in use:
    - service brakes, including trailer brake connections; parking system (hand brake); emergency stopping system (brakes); tires; horn; steering mechanism; coupling devices; seat belts; operating controls; and safety devices.
  - Defects must be corrected before vehicle is placed in service.
  - Requirements also apply to lights, reflectors, windshield wipers, defrosters, fire extinguishers, etc.,.
Earthmoving Equipment

- Material Handling Equipment
  - Earthmoving equipment and applies to:
    - Scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, and similar equipment.
Earthmoving Equipment

• Seat Belts
• Seat belts must be provided...
  – On all covered equipment.
  – Meet requirements of Society of Automotive Engineers, Seat Belts for Construction Equipment.
  – Seat belts for agricultural and light industrial tractors meet Society of Automotive Engineers, Operator Protection for Agricultural and Light Industrial Tractors.

Safety Tip: Society of Automotive Engineers International, SAE, is a non profit organization that develops industry standards and technical information on all forms of self-propelled vehicles including automobiles, trucks and buses, off-highway equipment, aircraft, aerospace vehicles, marine, rail, and transit systems. These standards are commonly adopted by Government Agencies, such as OSHA.
Earthmoving Equipment

• Seat Belts

• Excavating and other equipment.
  – Tractors must have seat belts as required for the operators when seated in the normal seating arrangement for tractor operation, even though back-hoes, breakers, or other similar attachments are used on these machines for excavating or other work.

Safety Tip: Seat belts need not be provided for equipment which does not have roll-over protective structure (ROPS) or adequate canopy protection.
Earthmoving Equipment

- Roadways/Grades/Ramps
- No employer must move construction...
  - Equipment/vehicles upon any access roadway or grade unless access roadway or grade is constructed/maintained to accommodate safely equipment/vehicle movement.
  - Emergency access ramps and berms used must be constructed to restrain and control runaway vehicles.
Earthmoving Equipment

- Brakes
- Earthmoving equipment...
  - Have a service braking system capable of stopping and holding the equipment fully loaded, as specified in SAE documents referenced in the standard.
  - Brake systems for self-propelled rubber-tired off-highway equipment manufactured after January 1, 1972 must meet the applicable minimum performance criteria.
Earthmoving Equipment

• Fenders
• Pneumatic-tired earth-moving haulage equipment...
  – Such as trucks, scrapers, tractors, and trailing units whose maximum speed exceeds 15 miles per hour, must be equipped with fenders on all wheels to meet requirements of SAE.
  – An employer may, seek to show that the uncovered wheels present no hazard to personnel from flying materials.
Earthmoving Equipment

- ROPS
- Subpart W has 4 major sections.
  - Rollover Protective Structures; Overhead Protection
  - Minimum performance criteria for rollover protective structures for designated scrapers, loaders, dozers, graders, and crawler tractors.
  - Protective frames (roll-over protective structures, known as ROPS) for wheel-type agricultural and industrial tractors used in construction.
  - Overhead protection for operators of agricultural and industrial tractors.

Safety Tip: For more information, you are encouraged to consult the specific regulation as they are relatively complicated and focused on specific types of equipment and dates manufactured and will not be discussed as part of the module.
Earthmoving Equipment

- ROPS
- NIOSH
  - Has determined that workers who operate or work around certain heavy equipment are at risk of injury and fatality from a machine rollover or being struck by the machine or its components.
  - Recommends that injuries and deaths be prevented through wider use of rollover protective structures (ROPS) and seat belts specific equipment, training, establishing and adhering to safety plans and safe work practices, and using appropriate personal protective equipment.
• Audible Alarms
• All bidirectional machines...
  – Such as rollers, compacters, front-end loaders, bulldozers, and similar equipment, must be equipped with a horn, distinguishable from the surrounding noise level.
  – Must be operated as needed when the machine is moving in either direction.
  – Horn must be maintained in an operative condition.
Earthmoving Equipment

• Audible Alarms

• No employer must permit...
  – Earthmoving or compacting equipment which has an obstructed view to the rear to be used in reverse gear unless:
    • the equipment has in operation a reverse signal alarm distinguishable from the surrounding noise level. or
    • an employee signals that it is safe to do so.
Earthmoving Equipment

• Scissor Point

• With respect to front end loaders.
  – Scissor points on all front-end loaders, which constitute a hazard to the operator during normal operation, must be guarded.
Earthmoving Equipment

• Lifting/Hauling Equipment

• Lift trucks, stackers, etc., ...
  – Have rated capacity clearly posted on the vehicle.
  – When auxiliary removable counterweights provided by manufacturer, corresponding alternate rated capacities also clearly visible on vehicle.
  – Ratings must not be exceeded.
Earthmoving Equipment

• Lifting/Hauling Equipment

• Additionally...
  – No modifications or additions which affect capacity or safe operation of equipment must be made without manufacturer's written approval.
  – If modifications or changes made, capacity, operation, and maintenance instruction plates, tags, or decals must be changed accordingly.
  – In no case must the original safety factor of the equipment be reduced.
Earthmoving Equipment

- Lifting and More
- If a load is lifted...
  - By two or more trucks working in unison, proportion of total load carried by any one truck must not exceed its capacity.
  - Steering/spinner knobs must not be attached to the steering wheel unless steering mechanism is of type that prevents road reactions from causing steering hand-wheel to spin.

Safety Tip: The steering knob must be mounted within the periphery of the wheel.
Earthmoving Equipment

• Industrial Trucks
• Overhead Guards...
  – Must meet certain configuration and structural requirements and applicable requirements for the design, construction, stability, inspection, testing, maintenance, and operation of industrial trucks. In addition, unauthorized personnel not permitted to ride on powered industrial trucks.
  – A safe place to ride must be provided where riding of trucks is authorized.
Earthmoving Equipment

• Controls

• When a truck is equipped ...
  – With vertical only, or vertical and horizontal controls elevatable with the lifting carriage or forks for lifting personnel, the following is needed:
    • Use of a safety platform firmly secured to the lifting carriage and/or forks.
    • Means must be provided whereby personnel on the platform can shut off power to the truck.
    • Protection from falling objects as required by the operating conditions must be provided.
Earthmoving Equipment

• Powered Industrial Trucks

• Training Program Implementation
  – Trainees may operate a powered industrial truck only:
    • Under direct supervision of a person who has the knowledge, training, and experience to train operators and evaluate their competence
    • Where the training operation does not endanger the trainee/other employees

Safety Tip: OSHA specifies that the requirements applicable to construction work are identical to those set forth at §1910.178(l) for general industry.
Earthmoving Equipment

• Training Program

• Employer must ensure:
  – Each operator is competent to safely operate a forklift or powered industrial truck, as demonstrated by successful completion of training and evaluation.
  – Training must consist of:
    – Formal instruction
    – Practical training
    – Evaluation of operator performance in the workplace
Earthmoving Equipment

• Refresher Training and Evaluation
  – Refresher training must be completed after:
    • An unsafe operation
    • Accident or near-miss
    • Different equipment is introduced
    • Workplace conditions change
Earthmoving Equipment

- Refresher Training and Evaluation
  - Each powered industrial truck operator performance must be evaluated:
    - After initial training
    - After refresher training
    - At least once every three years
Earthmoving Equipment

• Weather
- Operating heavy equipment ...
  – In poor weather can be inherently dangerous.
  – Work may occur in nearly every type of climate and weather condition.
  – Accidents generally can be avoided by observing proper operating procedures and safety practices.
  – Construction equipment operators can expect to be cold in the winter and hot in the summer, and often get dirty, greasy, muddy, or dusty.
Earthmoving Equipment

• Snow and Ice
• All equipment operators ...
  – Especially trainees should be trained to safely operate heavy equipment in snow and ice conditions which can be especially hazardous, especially when working on or near slopes.
Earthmoving Equipment

In The Drink

• Recently In the oil sand mines of Alberta Canada ...
  – D-11 dozer operator and 40 ton machine slid into a settling pond......
  – These events are not uncommon.
  – Operator, who was uninjured, escaped through the back window.

Conclusions: It is critical to know the terrain that will be worked upon and all operators must be thoroughly trained and experienced in the kind of terrain they will be operating. Also, it is critical to have and use the right kind of equipment for the terrain and task at hand.
Pile Driving

• Pile Driving Equipment
  – Boilers and piping systems part of, or used with, pile driving equipment must meet requirements of American Society of Mechanical Engineers, Power Boilers.
  – Pressure vessels part of, or used with, pile driving equipment must meet the applicable requirements of the American Society of Mechanical Engineers, Pressure Vessels.
Pile Driving

• Protections

• Overhead and stop blocks.
  – Overhead protection, which will not obscure vision of operator, which meets OSHA requirements must be provided. Protection equivalent of 2-inch planking or other solid material of equivalent strength.
  – Stop blocks provided for leads to prevent hammer from being raised against head block.
Pile Driving

• Protections
• A blocking device...
  – Capable of safely supporting weight of hammer, provided for placement in leads under the hammer at all times while employees are working under hammer.
  – Guards provided across top of head block to prevent cable from jumping out of sheaves.
Pile Driving

– Leads

– When leads must be inclined...

  • In driving of batter piles, provisions must be made to stabilize leads.
  
  • Fixed leads provided with ladder, and adequate rings, or similar attachment points, so that the loft worker may engage his fall protection equipment to the leads.
  
  • If leads are provided with loft platform(s), platform(s) must be protected by standard guardrails.
Pile Driving

• Steam Hose

• Steam hose leading to a steam hammer...
  – Or jet pipe must be securely attached to the hammer with an adequate length of at least 1/4-inch diameter chain or cable to prevent whipping in the event the joint at the hammer is broken.
  – Air hammer hoses must be provided with the same protection as required for steam lines.
Pile Driving

• More General Requirements
• Safety chains, or equivalent means...
  – Provided for each hose connection to prevent the line from thrashing around in case the coupling disconnection.
  – Steam line controls must consist of two shutoff valves, one of which must be a quick-acting lever type within easy reach of hammer operator.
  – Guys, outriggers, thru-stouts, or counterbalances must be provided as necessary to maintain stability of pile driver rigs.
Pile Driving

• Safe Work Practices

• Engineers and winch-men...
  – Must accept signals only from the designated signalmen.
  – All employees must be kept clear when piling is being hoisted into the leads.
  – When piles are being driven in an excavated pit, the walls of pit must be sloped to angle of repose or sheet-piled and braced.
Pile Driving

- Safe Work Practices
- When steel tube piles are being "blown out", employees must be kept well beyond the range of falling materials.
- When it is necessary to cut off the tops of driven piles, pile driving operations must be suspended except where the cutting operations are located at least twice the length of the longest pile from the driver.
- When driving jacked piles, all access pits must be provided with ladders and bulkheaded curbs to prevent material from falling into the pit.
Site Clearing

• Site Clearing

• General requirements
  – Employees engaged in site clearing must be protected from hazards of irritant and toxic plants and suitably instructed in the first aid treatment available.
  – Consider insects, feral animals and even homeless people in urban populations.

Safety Tip: Employers should consider the use of service organizations and response agencies such as the local police to potentially assist them in site clearing activities.
Site Clearing

- Rollover Guards
- Equipment used in site clearing operations...
  - Equipped with rollover guards meeting OSHA requirements.
  - Rider-operated equipment must be equipped with an overhead and rear canopy guard:
    - Overhead covering on this canopy structure must be of not less than 1/8-inch steel plate or 1/4-inch woven wire mesh with openings no greater than 1 inch, or equivalent, and
    - Opening in rear of canopy structure must be covered with not less than 1/4-inch woven wire mesh with openings no greater than 1 inch.
Definitions

Signs: The warnings of hazard, temporarily or permanently affixed or placed, at locations where hazards exist.

Signals: Moving signs, provided by workers, such as flaggers, or by devices, such as flashing lights, to warn of possible or existing hazards.

Barricades: OSHA defines a barricade simply as an obstruction to deter the passage of persons or vehicles. A device that delineates and warns of a boundary that is not to be crossed.

Tags: Temporary signs, usually attached to a piece of equipment or part of a structure, to warn of existing or immediate hazards.
Signs, Signals and Barricades

Signs

- **Danger**: Danger signs must be used only where an immediate hazard exists. Also, Danger signs must have red as the predominating color for the upper panel; black outline on the borders; and a white lower panel for additional sign wording. An example is Danger High Voltage.
- **Caution**: Caution signs must be used only to warn against potential hazards or to caution against unsafe practices. Caution signs must have yellow as the predominating color; black upper panel and borders: yellow lettering of "caution" on the black panel; and the lower yellow panel for additional sign wording. Black lettering must be used for additional wording. An example would be “Authorized Personnel Only”.
- **Exit**: Exit signs, when required, must be lettered in legible red letters, not less than 6 inches high, on a white field and the principal stroke of the letters must be at least ¾ inch in width.
- **Directional**: Directional signs, other than specified automotive traffic signs, must be white with a black panel and a white directional symbol. Any additional wording on the sign must be black letters on the white background.
- **Safety Instruction**: Safety instruction signs, when used, must be white with green upper panel with white letters to convey the principal message. Any additional wording on the sign must be black letters on the white background. Safety instruction signs are available for many different types and topics of information. An example would be “No Smoking”.
• Signs
• Highway, road, street, bridge, tunnel, utility, ...
  – Other workers for highway infrastructure are exposed to hazards from outside and inside the work zone.
  – Falls, electrical, struck-by, and caught between are common hazards.
  – Guidance for set-up of work zone signs, barricades, flagging, etc. found in DOT’s "Manual on Uniform Traffic Control Devices (MUTCD)."
• Signals
• Crane and Hoist Signals
• Regulations ...
• Found in applicable ANSI standards and must be referred to with respect to required crane and hoist signals.
• Find out more by going to www.ANSI.org.
Barricades

- Must conform to Part VI of the Manual on Uniform Traffic Control Devices.
- A barricade is a portable or fixed device having from one to three rails with appropriate markings.
- Barricades consist of three types: Type I, Type II, or Type III.
Signs, Signals and Barricades

- Accident Prevention Tags
- Must be used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc.
- They must not be used in place of, or as a substitute for, accident prevention.
Marine Operations

Definitions

- Apron: The area along the waterfront edge of the pier or wharf.
- Bulwark: The side of a ship above the upper deck.
- Coaming: The raised frame, as around a hatchway in the deck, to keep out water.
- Jacobs Ladder: A marine ladder of rope or chain with wooden or metal rungs. The Jacobs ladder is used primarily as an aid in boarding a ship.
- Rail: A light structure serving as a guard at the outer edge of a ship's deck.
- Long-shoring Operations: The loading, unloading, moving, or handling of construction materials, equipment and supplies, etc. into, in, on, or out of any vessel from a fixed structure or shore-to-vessel, vessel-to-shore or fixed structure or vessel-to-vessel.
Marine Operations

• Marine Operations and Equipment
  – Material handling operations must be performed in conformance with applicable requirements of Part 1918, "Safety and Health Regulations for Long-shoring".
Marine Operations

- Access to Barges
- OSHA requires:
  - Ramps for access of vehicles to or between barges must be of adequate strength, provided with side boards, well maintained, and properly secured.

Safety Tip: Unless employees can step safely to or from the wharf, float, barge, or river towboat, either a ramp, or a safe walkway, must be provided.
Marine Operations

• Access to Barges
• Jacob's ladders...
  – Must be of the double rung or flat tread type.
  – Must be well maintained and properly secured.
  – Must either hang without slack from its lashings or be pulled up entirely.

Safety Tip: Originally, the Jacob's Ladder was a network of line leading to the skysail on wooden ships. The name alludes to the biblical Jacob, reputed to have dreamed that he climbed a ladder to the sky. Anyone who has ever tried climbing a Jacob's Ladder can appreciate the allusion. It does seem that the climb is long enough to take one into the next world.
Marine Operations

• Access to Barges
• Means of Access
  – When upper end of the means of access rests on or is flush with the top of bulwark, substantial steps properly secured and equipped with at least one substantial hand rail approximately 33 inches in height, must be provided between top of bulwark and the deck.
  – Obstructions must not be laid on or across the gangway.
  – Adequately illuminated for its full length.

Safety Tip: Unless the structure makes it impossible, the means of access must be so located that the load will not pass over employees.
Marine Operations

- Working Surfaces of Barges
- Employees not permitted ...
  - To walk along the sides of covered lighters or barges with coamings more than 5 feet high, unless there is a 3-foot clear walkway, or a grab rail, or a taut handline is provided.
  - Decks and other working surfaces must be maintained in a safe condition.
  - Employees not permitted to pass fore and aft, over, or around deck-loads, unless there is a safe passage.
  - If necessary to stand at outboard or inboard edge of deck-load where less than 24 inches of bulwark, rail, coaming, or other protection exists, all employees must be provided with a suitable means of protection against falling from the deck-load.
Marine Operations

- Working Surfaces of Barges
- First-aid and lifesaving equipment.
  - Provisions for rendering first aid and medical assistance must be in accordance with Subpart D.
  - In vicinity of each barge in use, at least one U.S. Coast Guard-approved 30-inch life-ring with not less than 90 feet of line attached, and at least one portable or permanent ladder which will reach the top of the apron to the surface of the water.
  - If the equipment is not available at the pier, must be furnished during the time working the barge.

Safety Tip: Employees walking or working on the unguarded decks of barges must be protected with U.S. Coast Guard-approved work vests or buoyant vests.
Marine Operations

- Commercial Diving
- Commercial diving operations ...
  - Subject to Subpart T of Part 1910, 1910.401-1910.441.
  - For more information relative to commercial diving operations, you may consider reviewing Subpart T.
Employer Responsibilities

- Employer Responsibilities
- The employer must:
  - 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.
  - Instruct each employee to recognize and avoid unsafe conditions applicable to his work environment.
  - Must provide equipment, including personal protective equipment, that is appropriate for the job and in good repair.
• Additional selected employer responsibilities related to this module include:
  – No employer shall use any motor vehicle equipment having an obstructed view to the rear unless:
    • The vehicle has a reverse signal alarm audible above the surrounding noise level or:
    • The vehicle is backed up only when an observer signals that it is safe to do so.
  – No employer shall move or cause to be moved construction equipment or vehicles upon any access roadway or grade unless the access roadway or grade is constructed and maintained to accommodate safely the movement of the equipment and vehicles involved.
  – Every emergency access ramp and berm used by an employer shall be constructed to restrain and control runaway vehicles.
Summary

- Summary
  - Construction equipment in general
  - Motor vehicles
  - Material handling equipment
  - Pile driving equipment
  - Site clearing
  - Marine operations and equipment
- Additional information:
  - federal and state OSHA offices
  - OSHA’s website at www.osha.gov
  - Subpart O, 29CFR Part 1926
Summary

• You Should be Able to
  – Identify major hazards associated with Motor Vehicles, Mechanized Equipment and Marine Operations; Rollover Protective Structures and Overhead Protection; and the proper use of Signs, Signals and Barricades in construction.
  – Describe types of hazards associated with Motor Vehicles, Mechanized Equipment and Marine Operations; Rollover Protective Structures and Overhead Protection; and the proper use of Signs, Signals and Barricades in construction.
  – Protect yourself from hazards associated with Motor Vehicles, Mechanized Equipment and Marine Operations; Rollover Protective Structures and Overhead Protection; and the proper use of Signs, Signals and Barricades in construction.
  – Recognize employer requirements to protect workers from exposure to hazards associated with Motor Vehicles, Mechanized Equipment and Marine Operations; Rollover Protective Structures and Overhead Protection; and the proper use of Signs, Signals and Barricades in construction.