Demolition and Blasting Safety

Subparts T and U

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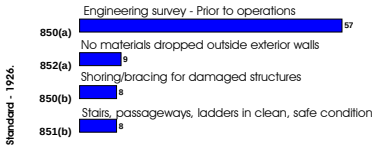
Module Objectives:

1. Complete demolition activities in a safe and efficient manner.
2. Recognize and control hazards that are associated with the demolition of a structure.
3. Recognize and control hazards that are associated with the partial demolition of a structure in preparation of remodeling or reconstruction.

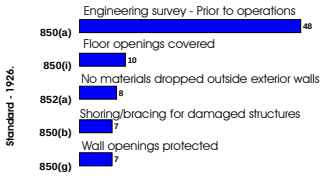
Subpart T - Demolition
(1926.850 - 860)



Number of Serious Violations - FY 2010

3

Subpart T - Demolition
(1926.850 - 860)



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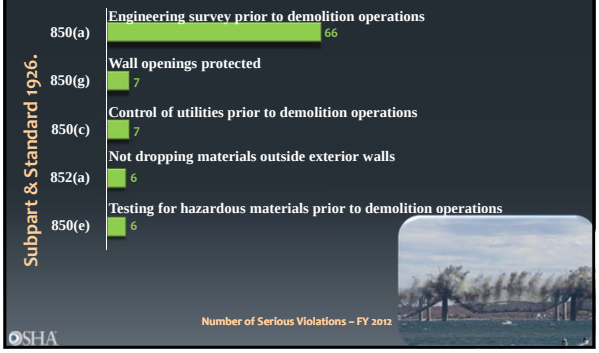
Subpart T
Demolition (1926.850 - 860)

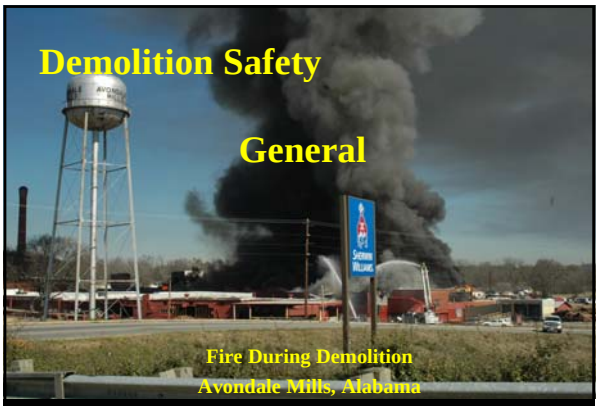


I. Introduction

A. General

Demolition Safety

General



Fire During Demolition
Avondale Mills, Alabama
June 22, 2011

Reference Material

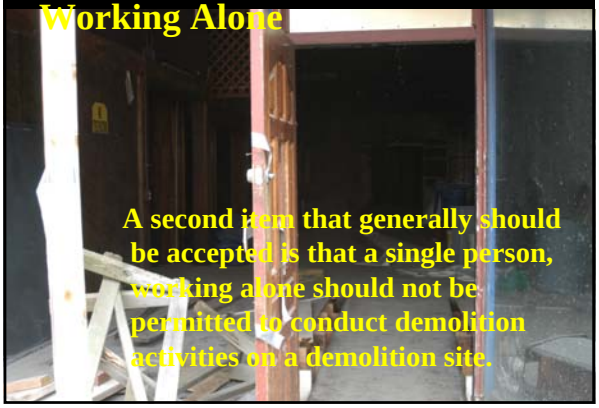
- OSHA Subpart T: Demolition
- ANSI A10.6-1983 Safety Requirements for Demolition Operations
- EM 385-1-1 USACE Safety and Health Guidelines
- NFPA 101-2009 Life Safety Code

B. ANSI A10.6-1983

Safety Requirements for Demolition Operations

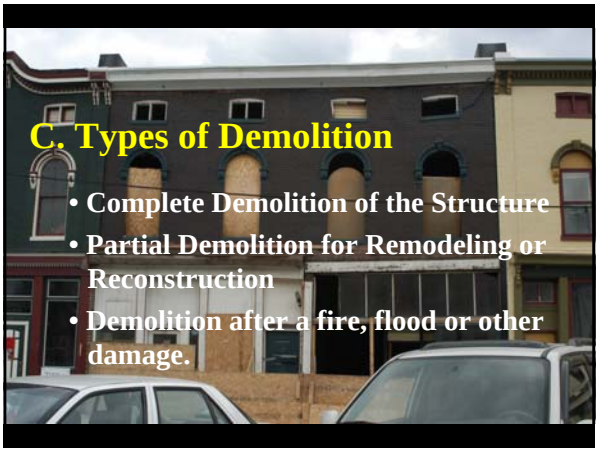
"No employee shall be permitted in any area that can be adversely affected when demolitions operations are being performed. Only those employees necessary for the performance of the operations shall be permitted in these areas."

Working Alone



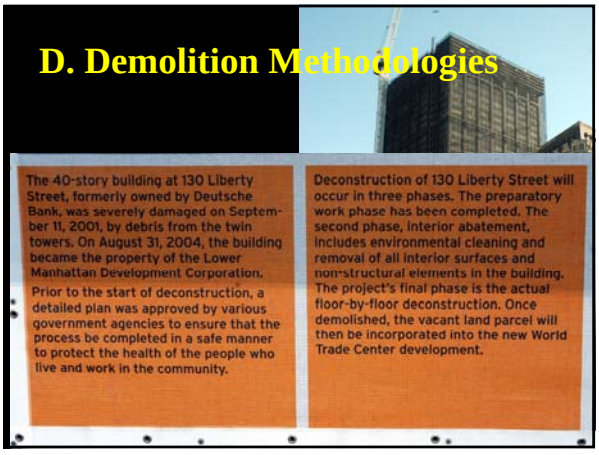
A second item that generally should be accepted is that a single person, working alone should not be permitted to conduct demolition activities on a demolition site.

C. Types of Demolition



- Complete Demolition of the Structure
- Partial Demolition for Remodeling or Reconstruction
- Demolition after a fire, flood or other damage.

D. Demolition Methodologies



The 40-story building at 130 Liberty Street, formerly owned by Deutsche Bank, was severely damaged on September 11, 2001, by debris from the twin towers. On August 31, 2004, the building became the property of the Lower Manhattan Development Corporation.

Prior to the start of deconstruction, a detailed plan was approved by various government agencies to ensure that the process be completed in a safe manner to protect the health of the people who live and work in the community.

Deconstruction of 130 Liberty Street will occur in three phases. The preparatory work phase has been completed. The second phase, interior abatement, includes environmental cleaning and removal of all interior surfaces and non-structural elements in the building. The project's final phase is the actual floor-by-floor deconstruction. Once demolished, the vacant land parcel will then be incorporated into the new World Trade Center development.

D. Demolition Methodologies

Manual

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Manual

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Manual

Combination Manual and Mechanized

D. Demolition Methodologies

Manual

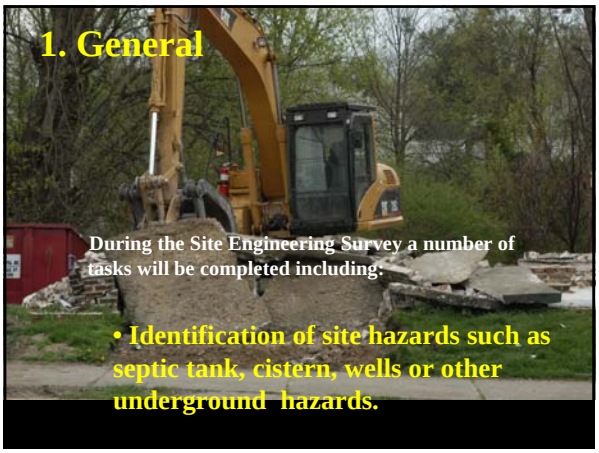
Combination Manual and Mechanized

Mechanized

II. Preparatory Operations

Engineering Survey
Identification of Utilities
Right of Ways
Above and Underground Storage Tanks

A. Engineering Survey



1. General

During the Site Engineering Survey a number of tasks will be completed including:

- Identification of site hazards such as septic tank, cistern, wells or other underground hazards.
- **Identify exposure hazards such as other structures on the site, proximity to structures off site, proximity to roads.**

1. General

During the Site Engineering Survey a number of tasks will be completed including:

- Identification of site hazards such as septic tank, cistern, wells or other underground hazards.
- Identify exposure hazards such as other structures on the site, proximity to structures off site, proximity to roads.
- **Identify methodology of securing site during demolition.**

2. Utilities and Right of Ways

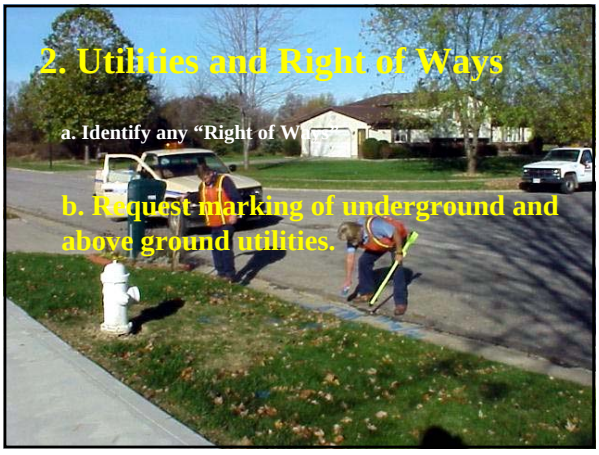
a. Identify Utilities and any "Right of ` Ways"
Examples:

- Electric Distribution
- Gas Distribution
- Phone and TV Cables
- Water and Sewer
- Pipelines

2. Utilities and Right of Ways

a. Identify all Utilities and Rights of Way.

UTILITY	COLOR
PROPOSED EXCAVATION	WHITE
ELECTRIC POWER LINES, CABLES, CONDUIT AND LIGHTING CABLES	RED
POTABLE WATER	BLUE
STEAM, CONDENSATE, GAS OR OIL, COMPRESSED AIR	YELLOW
TELECOMMUNICATIONS, ALARM OR SIGNAL LINES, CABLES OR CONDUIT	ORANGE
TEMPORARY SURVEY MARKINGS	PINK
SEWER AND STORM DRAINS	GREEN
CHILLED WATER, RECLAIMED WATER, IRRIGATION AND SLURRY LINES	PURPLE
OTHER	LIGHT BLUE



2. Utilities and Right of Ways

a. Identify any "Right of Ways"
b. Request marking of underground and above ground utilities.

c. Determine who to contact in the event of an emergency.

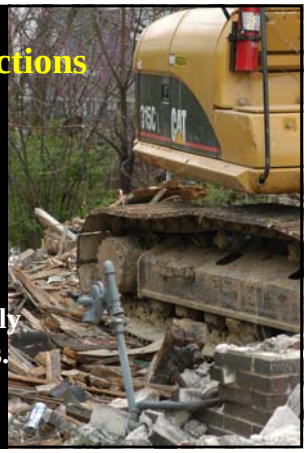
2. Right of Ways

a. Identify any "Right of Ways"
b. Request marking of underground and above ground utilities.
c. Determine who to contact in the event of an emergency.

d. Contact the Utilities and Rights of Way of the plan to demolish the structure.

e. Utility Connections

- Identify all utility connections to the structure.
- Request the utility company completely disconnect services.



Examples of requests could include:

- Electric Utilities, remove service drop at the pole.
- Gas Utilities, shut off and cap at the service line connection.
- Propane, remove the storage tank.
- Fuel Oil, remove the storage tank prior to demolition in order to prevent damage and possible environmental contamination.
- Water and Sewer, shut off and cap at the service line connection.

f. Cisterns and Septic Systems

- Mark the location of any cisterns or septic systems.
- Isolate access to cisterns or septic systems and nearby area by heavy equipment.

g. Underground and Above Ground Storage Tanks

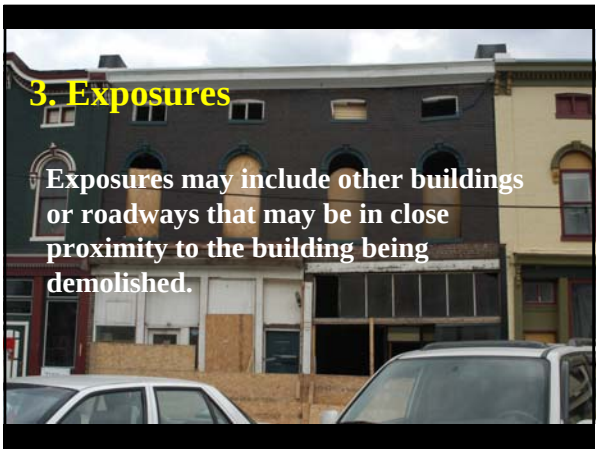
- Locations of underground and above ground storage tanks should be identified.

Sample steps to take:

- Mark the location of underground storage tanks.
- Close tank outlets, disconnect and cap lines from the tank to the structure.
- Properly collect any product that remains in the lines or tank to prevent environmental contamination.

- Remove the tank properly, or if it is to remain on site, isolate it from the demolition activities by using a fence or other appropriate means.
- If the tanks are not connected to the structure and will remain in place, then they should be isolated by using a fence or other appropriate means.

- Equipment operators and other workers should, during the daily briefing, be alerted or reminded of the tanks presence and the need to protect them from damage.



3. Exposures

Exposures may include other buildings or roadways that may be in close proximity to the building being demolished.

Exposures Include:

a. Structures

- Protect from Falling Debris
- Protect from Heavy Equipment
- Protect from Vehicles

Exposures Include:

a. Structures

b. Roadways

- Prevent debris and dust from impacting normal vehicular traffic.
- Keep heavy equipment off of roadways.

Exposures

4. Environmental Controls

Prior to the start of the demolition process, the demolition contractor should determine if environmental pollution may be an issue during demolition.

- Waterways
- Wells

4. Environmental Controls

a. Water Runoff

Proper us of barricades and other drainage control measures.

- Plastic and Straw

4. Environmental Controls

a. Water Runoff

b. Fuels

- Fuel Storage
- Dispensing and use on the site
- Containment and Cleanup

4. Environmental Controls

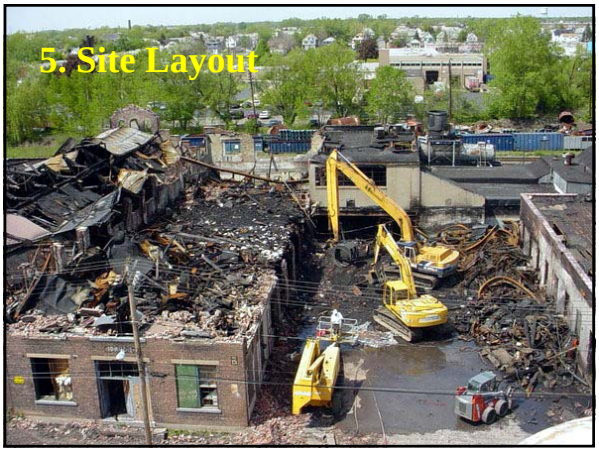
a. Water Runoff

b. Fuels

c. Other Contaminants

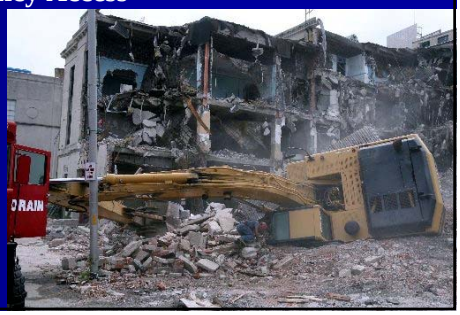
Hazardous Materials

Dust



a. Site Access

Emergency Access



5. Site Layout

Fire Protection Equipment

5. Site Layout

a. Site Access

b. Operational Zones

5. Site Layout

a. Site Access

b. Operational Zones

c. Equipment Staging

c. Equipment Staging

Staging areas should be established for Heavy Equipment and Vehicles.

1. Off loading of Heavy Equipment
2. Debris Removal
3. Fuel Storage
4. Servicing

5. Site Layout

a. Site Access
b. Operational Zones
c. Equipment Staging

d. Material Handling

5. Site Layout

a. Operational Zones
b. Equipment Staging
c. Material Handling

d. Debris Removal

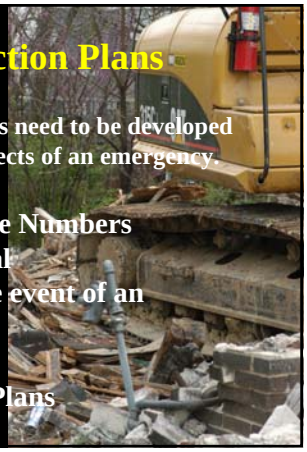
6. Demolition Site Security

Design a Site Security Plan that will protect workers and the general public.

B. Emergency Action Plans

Emergency action plans need to be developed to limit the adverse effects of an emergency.

1. Emergency Phone Numbers
2. Emergency Signal
3. What to do in the event of an emergency
4. Notification
5. Fire Prevention Plans



B. Emergency Action Plans

1. Emergency Phone Numbers

- Emergency Services 911
- Cellular Phone Issues
- Other Emergency Numbers
- EPA, OSHA, etc.

B. Emergency Action Plans

1. Emergency Phone Numbers
2. Emergency Signal

- How to notify others on site of an emergency

Continuous Air Horn Blast

B. Emergency Action Plans

1. Emergency Phone Numbers
2. Emergency Signal
3. What to do in the event of an emergency

Correct and Immediate Action
Actions may be simultaneous
Actions delegated

"Action Plan"

1. Call 911 and inform them of the situation.
2. At the same time as 911 is being contacted, evacuate or isolate the area to prevent additional injury.
3. At the same time as 911 is being contacted and the area isolated, provide medical aid within the limits of training and equipment.
4. In the event that the incident is larger than the equipment or training can handle or poses such a severe threat to personal safety, then it is best for the other site workers to evacuate the area and not allow anyone access to the site. They should evacuate to a safe distance.

B. Emergency Action Plans

1. Emergency Phone Numbers
2. Emergency Signal
3. What to do in the event of an emergency
4. Notification
   - Within the company
   - Local Agencies
   - OSHA, EPA

C. Site Demolition Plans

1. Fire Prevention Plan
2. Site Safety Plan
   - Hazard and Risk Assessment
3. Demolition Plan
   - Temporary Utility Service
   - Removal of Walls
   - Removal of Floors
   - Shoring Plan

Sample Fire Prevention Plans

Simple items, such as:

a. Elimination or control of ignition sources.

b. Electrical wiring and equipment for providing light, heat or power should be installed by a competent person and inspected on a regular basis.

c. Exhaust from internal combustion engines should be located appropriately to limit contact with combustible materials or the area where employees are working.

d. When exhausts are piped outside of the building, minimum clearances to combustible materials should be considered. See the manufacturer's recommendations for the minimum clearance.

e. Prior to refueling, internal combustion engines should be shut down and the fueling take place in a safe area. Refueling inside of a structure should in most instances not occur.

f. Sufficient fire fighting equipment, fire extinguishers or other appropriate equipment should be provided near any flammable or combustible liquid storage cabinets or areas.

g. Only approved containers, storage cabinets, or portable tanks should be used for the storage and handling of flammable or combustible liquids.

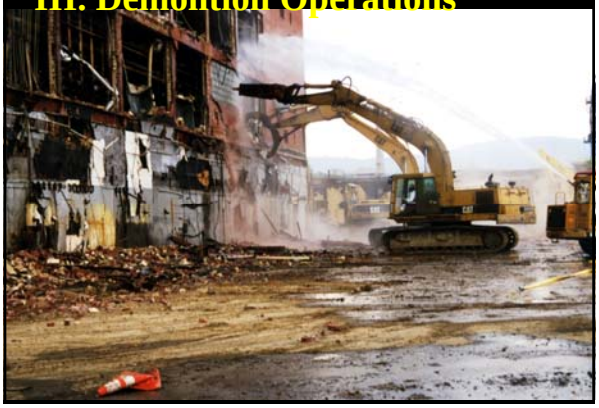
h. Heating devices should be placed where they will not likely overturn and installed in accordance with their listing, including clearance to combustible material or equipment. Temporary heating equipment, when utilized, should be maintained by competent personnel.

i. Smoking should be prohibited at or in the vicinity of hazardous operations or materials. Where smoking is permitted, safe receptacles shall be provided for the proper disposal of smoking materials.

j. Debris, equipment and other materials should not block an exit or access to an exit from the building.

k. Access to the site for emergency response teams should be provided and maintained free of obstruction caused by storage of debris or equipment.

III. Demolition Operations



A. Exits and Stairways

- Designated and Maintained Emergency Exits

Exits Marked

A. Exits and Stairways

- Designated and Maintained Emergency Exits
- Clear and Unobstructed

A. Exits and Stairways

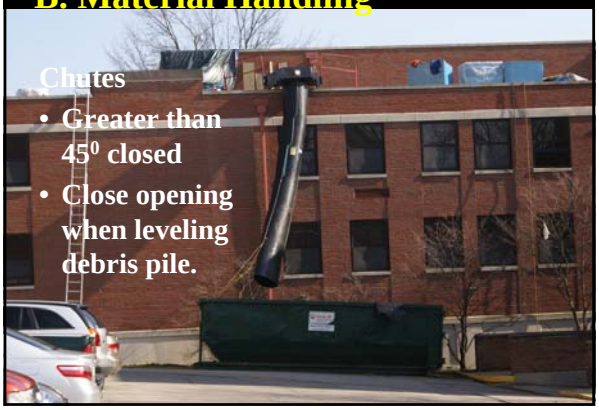
- Designated and Maintained Emergency Exits
- Clear and Unobstructed
- Lighted

B. Material Handling

Chutes

- Less then 45^0, open
- Close opening when leveling debris pile.

B. Material Handling



Chutes
- Greater than 45^0 closed
- Close opening when leveling debris pile.

B. Material Handling

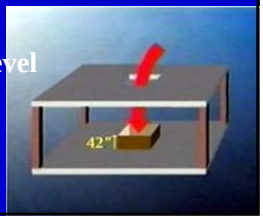
Dumpsters
- Barricade Area

•Access and Space for dumpster removal and replacement

B. Material Handling

Chutes

Holes in Floors
- Barricade six feet back from hole
- 42 inch guard rail
- Warning signs each level



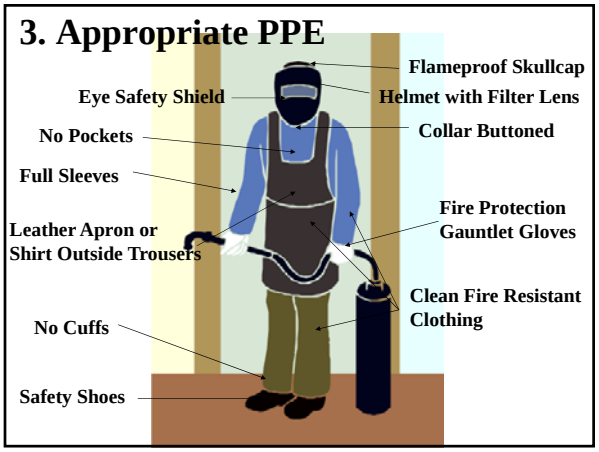
C. Cutting Operations

1. Combustible Materials Cleared

3. Fire Watch

- Properly Trained
- Fire Extinguishers Available
- Remain 30 Minutes after work completed

3. Appropriate PPE



D. Mechanized Equipment

No mechanized equipment permitted inside of a building until it is determined that the building can withstand the load and activity.

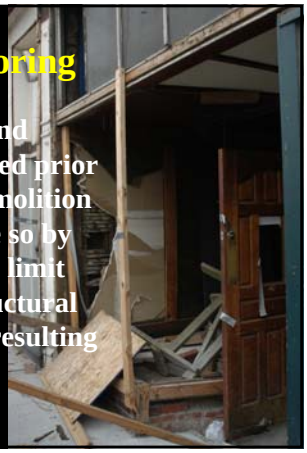
D. Removal of Walls and Floors

1. Follow Demolition Plan

2. Shore Structure as Required

Bracing and Shoring

Temporary bracing and shoring that is installed prior to and during the demolition phase should be done so by competent persons to limit the potential of a structural failure and possibly resulting in worker injury.




2. Floor Holes
Covered, Secured and Marked
unless immediately filled.


3. Protect Wall Openings


IV. Demolition of Previously
Damaged Structures

A. Events

There are a number of natural and man made events that can add hazards to demolition activities.

Examples of those events may include Explosions, Fires, Tornados, Hurricanes, Earthquakes, Floods and while fairly rare vehicle accidents that also involve a residential structure.

Subpart U: Blasting and Explosives

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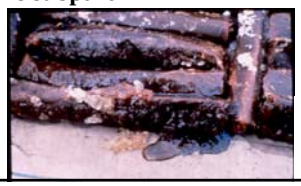
1926.900 General provisions
1926.901 Blaster qualifications
1926.902 Surface transportation of explosives
1926.903 Underground transportation of explosives
1926.904 Storage of explosives and blasting agents
1926.907 Use of safety fuse
1926.908 Use of detonating cord
1926.909 Firing the blast
1926.910 Inspection after blasting

Subpart U: Blasting and Explosives

1926.911 Misfires
1926.912 Underwater blasting
1926.913 Blasting in excavation work under compressed air
1926.914 Definitions applicable to this subpart



1926.900 General provisions

- Only authorized & qualified handle explosives
- Smoking, firearms, matches, open flames prohibited while explosives are handled, transported or used
- No explosives or blasting agents shall be abandoned.
- No fire shall be fought
- Account for *all* explosives at *all* times
- Unused explosives locked in magazine

1926.900 General provisions

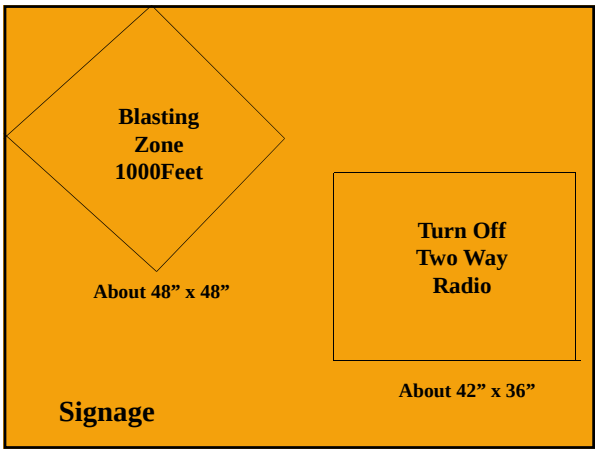
- Owner keeps record, notifies authority if lost, stolen, unauthorized magazine entry
- If blasting near structures confine throw of fragments w/ mats, protect employees

1926.900 General provisions

- Authorized employees must use precautions: visible & audible warning signals, flags, barricades etc... to ensure employee safety
- Conduct blasting between sunup and sundown
- Due precautions prevent accidental discharge of electric blasting caps: radar, lightning, radio transmitters, power lines, dust storms & any other extraneous source of electricity

1926.900 General provisions

- Suspend operations & remove personnel at the approach of an electric storm
- Warning signs: no radio transmitters within 1000 feet, if R.T's used competent person documents
- Ensure mobile transmitters less than 100 feet are off & locked



1926.900 General provisions

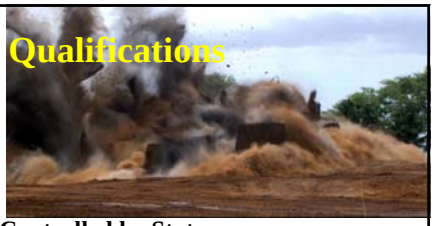
- Do not use deteriorated or damaged explosives
- Notify utility & take precautions if blasting near power lines
- <u>Use of Black Powder is prohibited</u>

1926.900 General provisions

Mixing Buildings:

- Non-combustible, or sheet metal on wood studs
- Floors in mixing plant concrete or non-adsorbent
- Fuel oil storage separate & drain away
- Mixing plant must be well ventilated
- Direct sources of heat from outside building only

Blaster Qualifications



1926.901

Licensure Controlled by State

- Can understand & give written and oral orders
- In good physical condition & not an addict
- Qualified by knowledge, training experience in transporting, handling, use of explosives & laws
- Blasters furnish evidence of competency
- Knowledge and competent in each type of blasting used

1926.902 Surface Transportation of Explosives

- Meet DOT 49CFR 146-149 & listed regulations

Surface Transportation

- Explosives, blasting agents, and blasting supplies shall not be transported with other materials or cargoes.
- Blasting caps (including electric) shall not be transported in the same vehicle with other explosives.

1926.905 Loading explosives

- Establish safe procedures before starting
- Drill holes large enough for free insertion
- Tamping only with wood rods or plastic rods
- Never tamp primer

1926.905 Loading explosives

- Load only holes to be fired in next round
- No drilling until butts of old holes are examined
- Do not deepen holes that have contained Explosives
- No unattended explosives at blasting site

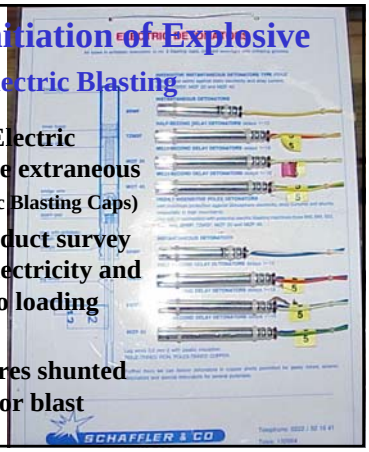
1926.905 Loading explosives

- Unnecessary machines removed from hole area before explosives are delivered
- No operation of equipment within 50 feet
- No other activity in area allowed

1926.905 Loading explosives

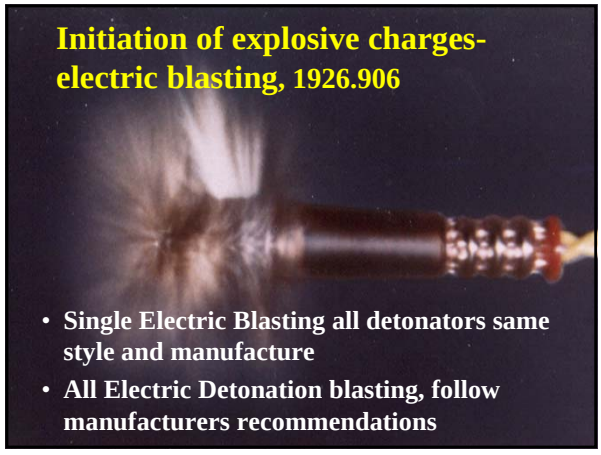
- Powerlines safe distance, cables de-energized and locked out by the blaster
- Holes checked prior to loading for depth & condition
- No drilling <u>within</u> 50 feet from undetonated holes

1926.906 Initiation of Explosive Charges: Electric Blasting



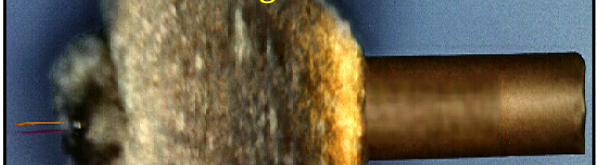
- No initiation of Electric Detonators where extraneous electricity (Electric Blasting Caps)
- Blaster must conduct survey for extraneous electricity and eliminate prior to loading holes.
- Detonator leg wires shunted until connected for blast

Initiation of explosive charges- electric blasting, 1926.906



- Single Electric Blasting all detonators same style and manufacture
- All Electric Detonation blasting, follow manufacturers recommendations

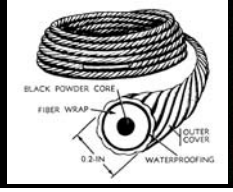
Initiation of explosive charges- electric blasting, 1926.906



- Keep blasting wires short to prevent hitting power lines or anchor
- Only the person making lead wires fires the shot
- Immediately after firing, wires are disconnected from the machine and shunted

Use of Safety Fuse, 1926.907

Safety fuse shall only be used where sources of extraneous electricity make the use of electric blasting caps dangerous. The use of a fuse that has been hammered or injured in any way shall be forbidden.



Use of detonating cord, 1926.908

Care shall be taken to select a detonating cord consistent with the type and physical condition of the bore hole and stemming and the type of explosives used.

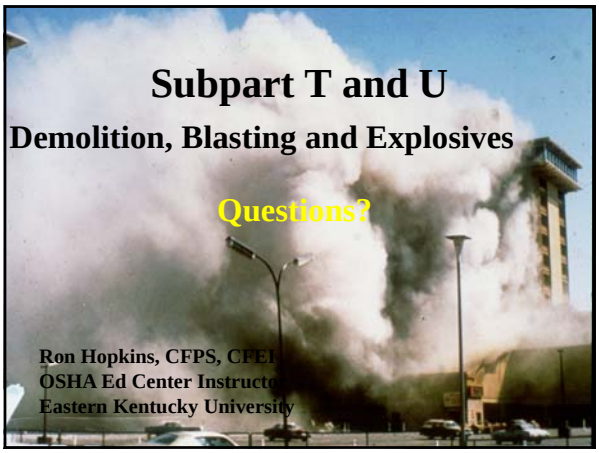
Detonating Cord, Continued

Uses - To link multiple shots, initiate boosters and shock tube, and demolition.

C. Shock Tube

Subpart U: Blasting and Explosives

1926.910 Inspection after blasting
1926.911 Misfires
1926.912 Underwater blasting
1926.913 Blasting in excavation work under compressed air
1926.914 Definitions applicable to this subpart



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