WEST VIRGINIA

SECRETARY OF STATE

KEN HECHLER

ADMINISTRATIVE LAW DIVISION

Form #5

FILED

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OFFICE OF THE SECRETARY OF STATE

NOTICE OF AGENCY ADOPTION OF A PROCEDURAL OR INTERPRETIVE RULE OR A LEGISLATIVE RULE EXEMPT FROM LEGISLATIVE REVIEW

AGENCY: WV Board of Coal Mine Health and Safety TITLE NUMBER: 36

CITE AUTHORITY: WV Code 22-6-4

RULE TYPE: PROCEDURAL YES INTERPRETIVE _____

EXEMPT LEGISLATIVE RULE YES
CITE STATUTE(s) GRANTING EXEMPTION FROM LEGISLATIVE REVIEW

West Virginia Code 22-6-4

AMENDMENT TO AN EXISTING RULE: YES XX, NO ___

IF YES, SERIES NUMBER OF RULE BEING AMENDED: 23

TITLE OF RULE BEING AMENDED: Rules and Regulations Governing Surface Construction Operations within the Coal Mining Industry within the State of West Virginia

IF NO, SERIES NUMBER OF NEW RULE BEING ADOPTED: _____

TITLE OF RULE BEING ADOPTED: _____

THE ABOVE RULE IS HEREBY ADOPTED AND FILED WITH THE SECRETARY OF STATE. THE EFFECTIVE DATE OF THIS RULE IS April 1, 1995

Ronald L. Harris

23.80

APPENDIX B

FISCAL NOTE FOR PROPOSED RULES

Rule Title: 36-23 Rules and Regulations Governing Surface Construction Operations Within the Coal Mining Industry Within the State of West Virginia

Type of Rule: ____Legislative ____Interpretive __xx__Procedural

Agency Board of Coal Mine Health and Safety

Address 1615 Washington St., E.

Charleston, WV 25311

1. Effect of Proposed Rule N/A

	ANNUAL		FISCAL YEAR		
	INCREASE	DECREASE	CURRENT	NEXT	THEREAFTER
ESTIMATED TOTAL COST	$ N/A	$	$	$	$
PERSONAL SERVICES	N/A				
CURRENT EXPENSE	N/A				
REPAIRS & ALTERATIONS	N/A				
EQUIPMENT	N/A				
OTHER	N/A				

2. Explanation of above estimates:

N/A

3. Objectives of these rules:

These rules were promulgated by the Board as a result of a multiple mine mine fatality. The objective of these rules is to prevent a re-occurrence of this type fatality.

Rule Title: 36-23 Rules and Regulations Governing Surface Construction Operations within the Coal Mining Industry ~~within the State of~~ WV

4. Explanation of Overall Economic Impact of Proposed Rule.

A. Economic Impact on State Government.

N/A

B. Economic Impact on Political Subdivisions; Specific Industries; Specific groups of Citizens.

N/A

C. Economic Impact on Citizens/Public at Large.

N/A

Date: January 9, 1995

Signature of Agency Head or Authorized Representative

Ronald L. Harris

Summary

In March 1992 there was a methane gas explosion which fatally injured four workers at a northern West Virginia Mine. The explosion occurred while the workers were attempting to seal an air shaft at the mine. The company had employed contractors to come onto the mine property and perform the sealing of the air shaft. Of the four fatalities, one involved an employee of the company and the other three were employees of the contractor.

After reviewing the fatal accident the Board voted to promulgate these new rules and regulations with the intention of preventing a re-occurrence of this type of fatal mining accident.

36 CSR 23
LEGISLATIVE RULES
BOARD OF COAL MINE HEALTH AND SAFETY

SERIES 23
RULES AND REGULATIONS GOVERNING
SURFACE
CONSTRUCTION OPERATIONS WITHIN COAL
MINING INDUSTRY
WITHIN THE STATE OF WEST VIRGINIA

§36-23-1. General.

1.1. Scope - Rules and regulations governing surface construction operations within coal mining industry within the State of West Virginia.

1.2. Authority -- WV Code §22-4-6

1.3. Filing Date -- January 9, 1995

1.4. Effective Date -- April 1, 1995

§36-23-2. Effect of Regulations.

2.1. These rules and regulations shall have the effect of law and violations shall be deemed a violation of law and so cited with the same effect as law. All provisions of Article 1A, Chapter 22A of the Code relative to enforcement are applicable to the enforcement of these rules and regulations.

§36-23-3. Definitions.

Unless the context in which used clearly requires a different meaning, the following definitions shall apply to these rules and regulations.

3.1. Accident. -- The term "Accident" shall mean any explosion, ignition, fire, or inundation, or injury to, or death of any person at the surface construction project.

3.2. Agent. -- The term "Agent" means any person charged with the responsibility for the operation of all or a part of a surface construction project or the supervision of the employees at the surface construction project.

3.3. "ANSI" -- Means the American National Standards Institute.

3.4. Approved. -- The term "Approved" shall mean in strict compliance with the mining law, or in the absence of law, accepted by a recognized standardizing body or organization whose approval is generally recognized as authoritative on the subject.

3.5. Authorized person. -- Means a person assigned by the employer to perform a specific type of duty or duties or to be at a specific location or locations at the job site.

3.6. Board of Appeals. -- The term "Board of Appeals" shall mean as provided for in Section 1 of Chapter 22, Article 5, of the Code.

3.7. Competent person. -- Means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

3.8. Construction work. -- Means the building, rebuilding, alteration, or demolition of any facility or addition to existing facility at a surface mine or surface area of an underground mine, including painting, decoration or restoration associated with such work, and the excavation of land connected therewith, but excluding shaft and slope sinking and work performed on the surface incidental to shaft or slope sinking.

3.9. Defect. -- Means any characteristic or condition which tends to weaken or reduce the strength of a tool, object, or structure of which it is a part.

3.10. Department -- The term "Department" shall mean the ~~State Department of Mines~~Office of Miners' Health, Safety and Training provided for in Section 2 of Chapter 2A, Article 1A of the Code.

3.11. Designated person. -- Means "Authorized Person" as defined in paragraph 3.5 of this section.

3.12. ~~Director of the department of energy.~~Director of Office of Miners' Health, Safety and Training -- The term ~~"Director of the Department of Energy"~~"Director of Office of Miners' Health, Safety and Training" shall mean the director of ~~The Department of Energy~~Office of Miners' Health, Safety and Training provided for in Section 3 of Chapter 22A, Article 1A, of the Code. ~~and is synonymous with the term "Chief of the Department of Energy."~~

3.13. Employee. -- Means a person employed by the employer at a surface construction project.

3.14. Employer. -- Means an operator which employs employees at a surface construction project.

3.15. Foreman. -- The term "Foreman" shall mean a person whom the employer or superintendent shall place in charge of employees at a construction project.

3.16. Hazardous substance. -- Means a substance which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful, is likely to cause death or injury.

3.17. Imminent danger. -- The term "Imminent Danger" means the existence of any condition or practice at a surface construction project which could reasonably be expected to cause death or serious physical harm before such condition or practice can be abated.

3.18. Mine. -- The term "Mine" includes the shafts, slopes, drifts or inclines connected with, or intended in the future to be connected with, excavations penetrating coal seams or strata, which excavations are ventilated by one general air current or divisions thereof, and connected by one general system of mine haulage over which coal may be delivered to one (1) or more points outside the mine, and the surface structures or equipment connected or associated therewith which contribute directly or indirectly to the mining, preparation or handling of coal, or construction thereof.

3.19. Mine Inspector. -- The term "Mine Inspector" shall mean a state mine inspector provided for in Section 7 of Chapter 22A, Article 1A, of the Code.

3.20. Mine inspectors' examining board. -- The term "Mine Inspectors' Examining Board" shall mean the mine inspectors' examining board provided for in Section 1 of Chapter 22, Article 11, of the Code.

3.21. Operator. -- The term "Operator" shall mean any firm, corporation, partnership or individual operating any coal mine or part thereof, or engaged in the construction of any facility associated with a coal mine.

3.22. Production Operator. -- Shall mean any owner, lessee, or other person who operates, controls, or supervises a coal mine.

3.23. Qualified. -- Means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work or the project.

3.24. SAE. -- Means Society of Automative Engineers.

3.25. Safety factor. -- Means the ratio of the ultimate breaking strength of a member or piece of material or equipment to the actual working stress or safe load when in use.

3.26. Shall. -- Means mandatory.

3.27. Should. -- Means recommended.

3.28. Suitable. -- Means that which fits and has the qualities or qualifications to meet a given purpose, occasion, condition, function, or circumstances.

3.29. Superintendent. -- The term "Superintendent" shall mean the person in charge of a surface construction project.

3.30. Supervisor. -- The term "Supervisor" shall mean a superintendent, foreman, assistant foreman, or any person specifically designated by the employer to supervise work or employees and who is acting pursuant to such specific designation and instructions.

3.31. Surface construction worker. -- The term "Surface Construction Worker" means "Employee" as defined in paragraph 3.13. of this section.

3.32. Surface construction project. -- The term "Surface Construction Project" shall mean any construction work being performed on the surface of any underground coal mine or surface coal mine by an employer, but shall not include any work performed on the surface incidental to shaft or slope sinking.

§36-23-4. General Accident Prevention.

4.1. The employer shall initiate programs which provide for frequent and regular inspections of surface construction project sites, materials, and equipment, by competent persons designated by the employer.

4.2. The use of any machine, tool, material or equipment which is not in compliance with any applicable requirement of this part is prohibited. Such machine, tool, material, or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

4.3. The employer shall permit only qualified employees to operate equipment and machinery.

§36-23-5. Housekeeping.

5.1. During the course of construction, alteration or repairs, form and scrap lumber with protruding nails, and all other debris shall be kept cleared from work areas, passageways, and stairs, in and around buildings or other structures.

5.2. Combustible scrap and debris shall be removed at regular intervals during the course of construction. Safe means shall be provided to facilitate such removal.

5.3. Containers shall be provided for the collection and separation of waste, trash, oily and used rags, and other refuse. Containers used for garbage and other oily, flammable, or hazardous wastes, such as caustics or acids, shall be equipped with covers. Garbage and other wastes shall be disposed of at frequent and regular intervals.

§36-23-6. Pressure Vessels.

6.1. Current and valid certification by an insurance company or regulatory authority shall be deemed as acceptable evidence of safe installation, inspection, and testing of pressure vessels provided by the employer.

§36-23-7. Employment of Certified Supervisor. The employer shall designate at least one (1) certified construction supervisor for each surface construction project at each specific mine where the employer employs ten (10) or more employees or at least one (1) competent person is designated for each surface construction project to perform the duties required of the certified construction foreman at each site employing less than ten (10) persons.

§36-23-8. Construction Supervisor Certification.

8.1. Construction supervisor certification shall be issued to an applicant upon verification that the applicant has three (3) or more years experience in surface construction work. Information relating to work experience shall be sworn to by the applicant and verified by the employer, or employers, for which the work was performed.

8.2. All supervisors who are or have been employed as such on construction work on or prior to the effective date of these regulations shall be granted certification upon request of the employer, or employers, for which the work was performed.

8.3. Any person holding construction supervisor certification issued by any other state may act in the capacity of a certified supervisor at any surface construction project in

this State for a period not to exceed ninety (90) days.

§36-23-9. Duties of Certified Supervisor or Competent Person.

9.1. The supervisor or competent person shall examine within the first four (4) hours of a working shift, the working places of a construction project for unsafe working conditions, and make sure appropriate action is taken to either correct, or prevent exposure of employees to, unsafe conditions.

9.2. The results of such examination shall be recorded in a prescribed book approved by the Director. ~~of the Department of Energy.~~ The supervisor or competent person shall make sure that reasonable action is taken to abate the violation of any rule or regulation which comes to his attention, provided nothing herein shall prevent an employer from contesting an alleged violation. The production operator will receive written documentation of the results of the examination required in 9.1 within 24 hours of the end of each shift. The documentation will show when the examination was made, conditions found and action taken. All records as prescribed herein shall be open for inspection by interested persons and maintained for at least one year.

9.3. The supervisor or competent person shall make sure that all notices required by a rule or regulation are properly posted, and that a copy of the rules and regulations promulgated by the Coal Mine Health and Safety Board are available at the project.

9.4. The supervisor or competent person shall make sure that new employees are warned about hazards inherent to the type of work they will perform, and instructed in safety procedures.

9.5. The supervisor or competent person shall make sure that procedures are followed that assure all first aid supplies and equipment are adequately maintained.

9.6. The supervisor or competent person shall make sure that procedures are implemented to keep unauthorized persons off the surface construction project site.

9.7. The employer may designate one (1) or more certified supervisors to perform any of the duties specified in this Section.

9.8. At each construction operation there shall be a bulletin board at some conspicuous place on the construction site, in such a manner that notices, orders, and decisions required by Chapter 22A of the West Virginia Code or Regulation to be posted on the bulletin board may be posed thereon, be easily visible to all persons desiring to read them, and be protected against damage by weather and against unauthorized removal.

§36-23-10. First Aid Requirements.

10.1. First aid and medical attention. First aid services and provisions for medical care shall be made available by the employer for every employee covered by these regulations.

10.2. Medical services and first aid.

(a) The employer shall insure the availability of medical personnel for advice and consultation on matters of occupational health.

(b) Provisions shall be made prior to commencement of the project for prompt medical attention in case of serious injury.

(c) Each surface construction operator shall maintain at each work site a fully equipped first aid station.

The first aid equipment required to be maintained shall include at least the following:

(1) One (1) 36 unit first aid kit

(2) One (1) broken-backboard

(3) One(1) stretcher or stretcher basked

(4) Two (2) cloth blankets

(d) All first aid supplies required to be maintained under this section shall be stored in suitable sanitary, dust-tight, moisture-proof containers and such supplies shall be accessible to the construction workers.

(e) No first-aid material shall be removed or diverted without authorization, except in case of accident in or about the mine.

(f) Proper equipment for prompt transportation of the injured person to a physician or hospital, or a communication system for contacting necessary ambulance service, shall be provided, at all times.

(g) The telephone numbers of physicians, hospitals, or ambulances shall be conspicuously posted.

10.3. First aid training of surface construction employees. Each surface construction operator shall provide every new employee within six (6) months of the date of his employment with the opportunity for first-aid training as prescribed by the

director unless such employee has previously received such training. Each employee shall be required to take refresher first-aid training of not less than five (5) hours within each twenty-four (24) months of employment. The employee shall be paid regular wages, or overtime pay if applicable, for all periods of first-aid training.

10.4. Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

10.5.

(a) Emergency communications requirements. Each operator of a construction project shall maintain a communication system for use in an emergency.

The emergency communication system required to be maintained in these regulations may be established by telephone or radio transmission or by any other means of prompt approved communications to any facility which has available the means of communications with the person or persons providing emergency medical assistance or transportation.

(b) Arrangements for emergency medical assistance and transportation for injured persons; posting requirements. While employees are on duty each operator of a construction project shall have made arrangements with a licensed physician, medical service, medical clinic or hospital to provide medical assistance for any person injured at any construction project.

While employees are on duty each operator shall have made arrangements with an ambulance service, or otherwise provided for emergency transportation for any person injured at a construction project.

Each operator shall immediately after making arrangements required under the provisions of these rules and regulations, or immediately after any changes of such agreement post at appropriate places at the construction project the name, titles, and addresses, and telephone numbers of all persons or services correctly available under such arrangements to provide medical assistance and transportation at the construction project.

§36-23-11. Sanitation.

11.1. Potable water.

(a) An adequate supply of potable water shall be provided in all place of employment.

(b) Portable containers used to dispense drinking water shall be capable of being tightly closed, and equipped with a tap. Water shall not be dipped from containers.

(c) Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purposes.

(d) The common drinking cup is prohibited.

(e) Where single service cups (to be used but once) are supplied, both sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

(f) Nonpotable water.

(1) Outlets for nonpotable water, such as water for industrial or firefighting purposes only, shall be identified clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.

(g) There shall be no cross connection, open or potential, between a system furnishing potable water and a system furnishing nonpotable water.

(h) "Potable Water" means water which meets the quality standards prescribed in the United States Public Health Service Drinking Water Standards, or water which is approved for drinking purposes by the State or local authority having jurisdiction.

11.2. Sanitary toilet facilities.

(a) At least one (1) sanitary toilet shall be provided where ten (10) or less construction workers use each such toilet facilities.

(b) Where ten (10) or more construction workers use such toilet facilities, sufficient toilets shall be furnished to provide approximately (1) sanitary toilet for each ten (10) construction workers.

(c) Where thirty (30) or more construction workers use toilet facilities, one (1) urinal may be substituted for one (1) flush toilet; however, where such substitutions are made, they shall not reduce the number of toilets below a ratio of two (2) toilets to one (1) urinal.

(d) An adequate supply of toilet paper shall be provided with each toilet.

§36-23-12. Illumination.

12.1. General. Construction areas, ramps, runways, corridors, offices, shops, and storage areas shall be adequately illuminated.

§36-23-13. Personal Protective and Life Saving Equipment.

13.1. The employer is responsible for requiring the wearing of appropriate personal protective equipment in all operations where there is an exposure to hazardous conditions or where this part indicates the need for using such equipment to reduce the hazards to the employees.

13.2. Design. All personal protective equipment shall be of safe design and construction for the work to be performed.

13.3. Head protection. Employees working in and around surface construction operations shall be protected by protective helmets.

13.4. Safety-toed shoes shall be worn by all persons in and around a surface construction operations.

§36-23-14. Eye and Face Protection.

14.1. General. Employees shall be provided with eye and face protection equipment when machines or operations present potential eye or face injury from physical, chemical, or radiation agents.

§36-23-15. Respiratory Protection.

15.1.

(a) Respirators shall be provided by the employer when such equipment is necessary to protect the health of an employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employee shall use the provided respiratory protection in accordance with instruction and training received.

(b) Where practicable, the respirators should be assigned to individual workers for their exclusive use.

§36-23-16. Safety Belts, Lifelines, and Lanyards.

16.1. Lifelines, safety belts, and lanyards shall be used only for employee safeguarding. Any lifeline, safety belt, or lanyard actually subjected to in-service loading, as distinguished from static load testing, shall be immediately removed from service and shall not be used again for employee

safeguarding.

16.2. Lifelines shall be secured above the point of operation to an anchorage or structural member capable of supporting a minimum dead weight of five thousand four hundred (5,400) pounds. Separate lifelines shall be used to protect each employee.

16.3. Lifelines used on rock-scaling operations, or in areas where the lifeline may be subjected to cutting or abrasion, shall be a minimum of seven-eights (7/8) inch wire core manila rope. For all other lifeline applications, a minimum of three quarter inch (3/4") manila or equivalent, with a minimum breaking strength of five thousand four hundred (5,400) pounds, shall be used.

16.4. Safety belt lanyard shall be a minimum of one half inch (1/2") nylon, or equivalent, with a maximum length for a fall of no greater than six (6) feet. The rope shall have a nominal breaking strength of five thousand four hundred (5,400) pounds.

16.5. All safety belts and lanyard hardware shall be drop forged or pressed steel, cadmium plated in accordance with Type 1, Class B plating specified in Federal specification QQ-P-416. Surface shall be smooth and free of sharp edges.

16.6. All safety belt and lanyard hardware, except rivets, shall be capable of withstanding a tensile loading of four thousand (4,000) pounds without cracking, breaking, or taking a permanent deformation.

16.7. Safety protection to prevent an employee from falling shall be provided at all times where the potential fall distance exceeds fifteen (15) feet, and safety belts shall not be used where they are impractical or would pose a safety hazard to the employee.

§36-23-17. Safety Nets.

17.1. Safety nets shall be provided when work places are more than twenty-five (25) feet above the ground or water surface where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts are impractical.

17.2. Where safety net protection is required by this part, operations shall not be undertaken until the net is in place and has been tested.

17.3.

(a) Nets shall extend eight (8) feet beyond the edge of

the work surface where employees are exposed and shall be installed as close under the work surface as practical but in no case more than twenty-five (25) feet below such work surface. Nets shall be hung with sufficient clearance to prevent user's contract with the surfaces or structures below. Such clearances shall be determined by impact load testing.

(b) It is intended that only one (1) level of nets be required for bridge construction.

17.4. The mesh size of nets shall not exceed six (6) inches by six (6) inches. All new nets shall meet accepted performance standards of seventeen thousand five hundred (17,500) foot-pounds minimum impact resistance as determined and certified by the manufactures, and shall bear a label of proof test. Edge ropes shall provide a minimum breaking strength of five thousand (5,000) pounds.

17.5. Forged steel safety hooks or shackels shall be used to fasten the net to its supports.

17.6. Connections between net panels shall develop the full strength of the net.

§36-23-18. Working Over or Near Water.

18.1. Employees working over or near water, where the danger of drowning exists, shall be provided with United States Coast Guard approved life jackets or buoyant work vests.

18.2. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.

18.3. Ring buoys with at least ninety (90) feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed two hundred (200) feet.

18.4. At least one (1) lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water.

§36-23-19. Definitions Applicable to This Subject.

19.1. "Lanyard" means a rope, suitable for supporting one (1) person. One (1) end is fastened to a safety belt or harness and the other end is secured to a substantial object or a safety line.

19.2. "Lifeline" means a rope, suitable for supporting one (1) person, to which a lanyard or safety belt (or harness) is

attached.

19.3. "Safety Belt" means a device, usually worn around the waist, which, by reason of its attachment to a lanyard and lifeline or a structure, will prevent a worker from falling.

§36-23-20. Fire Protection.

20.1. General requirements.

(a) The employer shall be responsible for the development of a fire protection program to be followed throughout all phases of the construction program and demolition work, and he shall provide the firefighting equipment to extinguish the fire hazard that may occur. As fire hazards occur, there shall be no delay in providing the necessary equipment.

(b) Access to all available firefighting equipment shall be maintained at all times.

(c) All firefighting equipment, provided by the employer, shall be conspicuously located.

(d) All firefighting equipment shall be periodically inspected and maintained in operating condition. Defective equipment shall be immediately replaced.

(e) Fire drills and demonstrations of various types of available firefighting equipment shall be held for employees at least every six (6) months.

§36-23-21. Portable Firefighting Equipment.

21.1. Fire extinguishers and small hose lines.

(a) A fire extinguisher, rated not less than 2A, shall be provided for each three thousand (3,000) square feet of the protected building area, or major fraction thereof. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed one hundred (100) feet.

(b) A one half (1/2) inch diameter garden-type hose line, not to exceed one hundred (100) feet in length and equipped with a nozzle, may be substituted for a 2A-rated fire extinguisher, providing it is capable of discharging a minimum of five (5) gallons per minute with a minimum hose stream range of thirty (30) feet horizontally. The garden-type hose lines shall be mounted on conventional racks or reels. The number and location of hose racks or reels shall be such that at least one (1) hose stream can be applied to all points in the area.

(c) One (1) or more fire extinguishers, rated not less

than 2A, shall be provided on each floor. In multi-story buildings, at least one (1) fire extinguisher shall be located adjacent to stairway.

(d) A fire extinguisher, rated not less than 10B, shall be provided within fifty (50) feet of wherever more than five (5) gallons of flammable or combustible liquids or five (5) pounds of flammable gas are being used on the job site. This requirement does not apply to the integral fuel tanks of motor vehicles.

(e) Carbon tetrachloride and other toxic vaporizing liquid fire extinguishers are prohibited.

(f) Portable fire extinguishers shall be inspected at least every six (6) months and maintained in accordance with maintenance and use of portable fire extinguishers NFPA No. 10A-1970.

(g) Fire extinguisher which have been listed or approved by a nationally recognized testing laboratory, shall be used to meet the requirements of this subpart.

(h) Table 1 shall be used as a guide for selecting the appropriate portable fire extinguishers.

21.2. Fire hose and connections.

(a) One hundred (100) feet, or less, of one and one-half (1 1/2) inch hose, with a nozzle capable of discharging water at twenty-five (25) gallons per minute, may be substituted for a fire extinguisher rated not more than 2A in the designated area provided that the hose line can reach all points in the area.

(b) If fire hose connections are not compatible with local firefighting equipment, the contractor shall provide adapters, or equivalent, to permit connections.

(c) During demolition involving combustible materials, charged hose lines, supplied by hydrants, water tank trucks with pumps, or equivalent, shall be made available.

§36-23-22. Fire Prevention.

22.1. Ignition hazards.

(a) Electrical wiring and equipment for light, heat, or power purposes shall be installed in compliance with the National Electric Code, NFPA 70-1971; ANSI CI-1971 (Rev. of 1968).

(b) Internal combustion engine powered equipment shall be so located that the exhausts are well away from combustible

materials. When the exhausts are piped to outside the building under construction, a clearance of at least six (6) inches shall be maintained between such piping and combustible material.

(c) Smoking shall be prohibited at or in the vicinity of operations which constitute a fire hazard, and shall be conspicuously posted: "No Smoking or Open Flame".

(d) The nozzle of air, inert gas, and steam lines or hoses, when used in the cleaning or ventilation of tanks and vessels that contain hazardous concentrations of flammable gases or vapors, shall be bonded to the tank or vessel shell. Bonding devices shall not be attached or detached in hazardous concentrations of flammable gases or vapors.

22.2. Temporary buildings.

(a) No temporary building shall be erected where it will adversely affect any means of exit.

(b) Temporary buildings, when located within another building or structure, shall be of either noncombustible construction or of combustible having a fire resistance of not less than one (1) hour.

(c) Temporary buildings, located other than inside another building and not used for the storage, handling, or use of flammable or combustible liquids, flammable gases, explosives, or blasting agents, or similar hazardous occupancies, shall be located at a distance of not less than ten (10) feet from another building or structure. Groups of temporary buildings, not exceeding two thousand (2,000) square feet in aggregate, shall, for the purposes of this part, be considered a single temporary building.

22.3. Open yard storage.

(a) Combustible materials shall be piled with due regard to the stability of piles and in no case higher than twenty (20) feet.

(b) Driveways between and around combustible storage piles shall be free from accumulation of rubbish, or other articles or materials.

(c) The entire storage site shall be kept free from accumulation of unnecessary combustible materials. Weeds and grass shall be kept down and a regular procedure provided for the periodic clean-up of the entire area.

(d) When there is a danger of an underground fire, that land shall not be used for combustible or flammable storage.

(e) Method of piling shall be solid wherever possible and in orderly and regular piles. No combustible material shall be permanently stored outdoors within ten (10) feet of a building or structure.

(f) Portable fire extinguishing equipment, suitable for the fire hazard involved, shall be provided at convenient, conspicuously accessible locations, in the yard area. Portable fire extinguishers, rated not less than 2A, shall be placed so that maximum travel distance to the nearest unit shall not exceed one hundred (100) feet.

22.4. Indoor storage.

(a) Storage shall not obstruct, or adversely affect, means of exit.

(b) All materials shall be stored, handled, and piled with due regard to their fire characteristics.

(c) Aisle space shall be maintained to safely accommodate the widest vehicle that may be used within the building for firefighting purposes.

(d) Clearance shall be maintained around lights and heating units to prevent ignition of combustible materials.

(e) A clearance of twenty-four (24) inches shall be maintained around the path of travel of fire doors unless a barricade is provided, in which case no clearance is needed. Material shall not be stored within thirty-six (36) inches of a fire door opening.

(f) When burning, cutting, or welding is performed in an area that may contain methane, an examination shall be conducted prior to, during, and after such burning, cutting, or welding by a qualified person.

§36-23-23. Flammable and Combustible Liquids.

23.1. General requirements.

(a) Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids. Approved metal safety cans shall be used for the handling and use of flammable liquids in quantities greater than one (1) gallon, except that this shall not apply to those flammable liquid materials which are highly viscid, (extremely hard to pour), which may be used and handled in original shipping containers. For quantities of one (1) gallon or less, only the original container or approved metal safety cans shall be used for storage, use, and handling of flammable liquids.

(b) Flammable or combustible liquids shall not be stored in areas used for exits, stairways, or normally used for the safe passage of people.

23.2. Indoor storage of flammable and combustible liquids.

(a) No more than twenty-five (25) gallons of flammable or combustible liquids shall be stored in a room outside of an approved storage cabinet.

(b) Quantities of flammable and combustible liquids in excess of twenty-five (25) gallons shall be stored in an acceptable or approved cabinet meeting the following requirements:

(1) Acceptable wooden storage cabinets shall be constructed in the following manner, or equivalent: The bottom, sides, and top shall be constructed of an exterior grade of plywood at least one (1) inch in thickness, which shall not break down or delaminate under standard fire test conditions.

All joints shall be rabbeted and shall be fastened in two (2) directions with flathead wood screws. When more than one (1) door is used, there shall be a rabbeted overlap of not less than one (1) inch. Steel hinges shall be mounted in such a manner as to not lose their holding capacity due to loosening or burning out of the screws when subjected to fire. Such cabinets shall be painted inside and out with fire retardant paint.

(2) Approved metal storage cabinets will be acceptable.

(3) Cabinets shall be labeled in conspicuous lettering, "Flammable--Keep Fire Away".

(c) Not more than sixty (60) gallons of flammable or one hundred twenty (120) gallons of combustible liquids shall be stored in any one (1) storage cabinet. Not more than three (3) such cabinets may be located in a single storage area. Quantities in excess of this shall be stored in an inside storage room.

(d)

(1) Inside storage rooms shall be constructed to meet the required fire-resistive rating for their use. Such construction shall comply with the test specifications set forth in Standard Methods of Fire Test of Building Construction and Material, NFPA 251-1969.

(2) Where an automatic extinguishing system is provided, the system shall be designed and installed in an approved manner. Openings to other rooms or buildings shall be provided with noncombustible liquid-tight raised sills or ramps

at least four (4) inches in height, or the floor in the storage area shall be at least four (4) inches below the surrounding floor. Openings shall be provided with approved self-closing fire doors. The room shall be liquid tight where the walls join the floor. A permissible alternate to the sill or ramp is an open-grated trench, inside of the room, which drains to a safe location. Where other portions of the building or other buildings are exposed, windows shall be protected as set forth in the Standard for Fire Door and Windows, NFPA No. 80-1970, for Class E or F openings. Wood of at least one (1) inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay, and similar installations.

(3) Materials which will react with water and create a fire hazard shall not be stored in the same room with flammable or combustible liquids.

Storage in inside storage rooms shall comply with Table 2 following:

(4) Electrical wiring and equipment located in inside storage rooms shall be approved for Class 1, Division 2, Hazardous locations for definitions of Class 1, Division 1 Hazardous locations, see 31.5.

(5) Every inside storage room shall be provided with either a gravity or a mechanical exhausting system. Such system shall commence not more than twelve (12) inches above the floor and be designed to provide for a complete change of air within the room at least six (6) times per hour. If a mechanical exhausting system is used, it shall be controlled by a switch located outside of the door. The ventilating equipment and lighting fixtures shall be operated by the same switch. An electric pilot light shall be installed adjacent to the switch if flammable liquids are dispensed within the room. Where gravity ventilation is provided, the fresh air intake, as well as the exhausting outlet from the room, shall be on the exterior of the building in which the room is located.

(6) In every inside storage room there shall be maintained one (1) clear aisle at least three (3) feet wide. Containers over thirty (30) gallons capacity shall not be stacked one (1) upon the other.

(7) Flammable and combustible liquids in excess of that permitted in inside storage rooms shall be stored outside of buildings in accordance with paragraph 23.3. of this section.

23.3. Storage outside buildings.

(a) Storage of containers (not more than sixty (60) gallons each) shall not exceed one thousand one hundred (1,100)

gallons in any one (1) pile or area. Piles or groups of containers shall be separated by a five (5) foot clearance. Piles or groups of containers shall not be nearer than twenty (20) feet to a building.

(b) Within two hundred (200) feet of each pile of containers, there shall be a twelve (12) foot wide access way to permit approach of fire control apparatus.

(c) The storage area shall be graded in a manner to divert possible spills away from buildings or other exposures, or shall be surrounded by a curb or earth dike at least twelve (12) inches high. When curbs or dikes are used, provisions shall be made for draining off accumulations of ground or rain water, or spills of flammable or combustible liquids. Drains shall terminate at a safe location and shall be accessible to operation under fire conditions.

(d) Outdoor portable tank storage:

(1) Portable tanks shall not be nearer than twenty (20) feet from any building. Two (2) or more portable tanks, grouped together, having a combined capacity in excess of two thousand two hundred (2,200) gallons, shall be separated by a five (5) foot clear area. Individual portable tanks exceeding one thousand one hundred (1,100) gallons shall be separated by a five (5) foot clear area.

(2) Within two hundred (200) feet of each portable tank, there shall be a twelve (12) foot wide access way to permit approach of fire control apparatus.

(e) Storage areas shall be kept free of weeds, debris, and other combustible material not necessary to the storage.

(f) Portable tanks, not exceeding six hundred sixty (660) gallons, shall be provided with emergency venting and other devices, as required by Chapters 3 and 4 of NFPA 30-1969, the Flammable and Combustible Liquids Code.

(g) Portable tanks, in excess of six hundred sixty (660) gallons, shall have emergency ventilating and other devices as required by Chapter 2 and 3 of the Flammable and Combustible Liquids Code, NFPA Code 30-1969.

23.4. Fire control for flammable or combustible liquid storage.

(a) At least one (1) portable fire extinguisher, having a rating of not less than 20-B units, shall be located outside of, but not more than ten (10) feet from, the door opening into any room used for storage of more than sixty (60) gallons of

flammable or combustible liquids.

(b) At least one (1) portable fire extinguisher having a rating of not less than 20-B units shall be located not less than twenty-five (25) feet, nor more than seventy-five (75) feet from any flammable liquid storage area located outside.

(c) At least one (1) portable fire extinguisher having a rating of not less than 20-B:C units shall be provided on all tank trucks or other vehicles used for transporting and/or dispensing flammable or combustible liquids.

23.5. Dispensing liquids.

(a) Areas in which flammable or combustible liquids are transferred at one (1) time, in quantities greater than five (5) gallons from one (1) tank or container to another tank or container, shall be separated from other operations by twenty-five (25) feet distance or by construction having a fire resistance of at least one (1) hour. Drainage or other means shall be provided to control spills. Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapor at or below ten (10) percent of the lower flammable limit.

(b) Transfer of flammable liquids from one (1) container to another shall be done only when containers are electrically interconnected (bonded).

(c) Flammable or combustible liquids shall be drawn from or transferred into vessels, containers, or tanks within a building or outside only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container, or portable tanks, by gravity or pump, through an approved self-closing valve. Transferring by means of air pressure of the container or portable tanks is prohibited.

(d) The dispensing units shall be protected against collision damage.

(e) Dispensing devices and nozzles for flammable liquids shall be of an approved type.

23.6. Handling liquids at point of final use.

(a) Flammable liquids shall be kept in closed containers when not actually in use.

(b) Leakage or spillage of flammable or combustible liquids shall be disposed of promptly and safely.

(c) Flammable liquids may be used only where there are

no open flames or other sources of ignition within fifty (50) feet of the operation, unless conditions warrant greater clearance.

23.7. Service and refueling areas.

(a) Flammable or combustible liquids shall be stored in approved closed containers, in tanks located underground, or in above ground portable tanks,

(b) The tank trucks shall comply with the requirements covered in the standard for tank vehicles for flammable and combustible liquids NFPA, No. 385-1966.

(c) The dispensing hose shall be an approved type.

(d) The dispensing nozzle shall be an approved automatic-closing type without a latch-open device.

(e) Underground tanks shall not be abandoned.

(f) Clearly identified and easily accessible switch(es) shall be provided at a location remote from dispensing devices to shut off the power to all dispensing devices in the event of an emergency.

(g)

(1) Heating equipment of an approved type may be installed in the lubrication or service area where there is no dispensing or transferring of flammable liquids, provided the bottom of the heating unit is at least eighteen (18) inches above the floor and is protected from physical damage.

(2) Heating equipment installed in lubrication or service areas, where flammable liquids are dispensed, shall be of an approved type for garages, and shall be installed at least eight (8) feet above the floor.

(h) There shall be no smoking or open flames in the areas used for fueling, servicing fuel systems for internal combustion engines, receiving or dispensing of flammable or combustible liquids.

(i) Conspicuous and legible signs prohibiting smoking shall be posted.

(j) The motors of all equipment being fueled shall be shut off during the fueling operation.

(k) Each service or fueling area shall be provided with at least one (1) fire extinguisher having a rating of not less than 20-B:C located so that an extinguisher will be within

seventy-five (75) feet of each pump, dispenser, underground fill pipe opening, and lubrication or service area.

§36-23-24. Temporary Heating Devices.

24.1.

(a) Ventilation.

(1) Fresh air shall be supplied in sufficient quantities to maintain the health and safety of workmen. Where natural means of fresh air supply is inadequate, mechanical ventilation shall be provided.

(2) When heaters are used in confined spaces, special care shall be taken to provide sufficient ventilation in order to ensure proper combustion, maintain the health and safety of workmen, and limit temperature rise in the area.

(b) Clearance and mounting.

(1) Temporary heating devices shall be installed to provide clearance to combustible material not less than the amount shown in Table 3, may be installed in accordance with their approval.

(2) Temporary heating devices, which are listed for installation with lesser clearances than specified in Table 3, may be installed in accordance with their approval.

(3) Heaters not suitable for use on wood floors shall not be set directly upon them or other combustible materials. When such heaters are used, they shall rest on suitable heat insulating material or at least one (1) inch concrete, or equivalent. The insulating material shall extend beyond the heater two (2) feet or more in all directions.

(4) Heaters used in the vicinity of combustible tarpaulins, canvas, or similar coverings shall be located at least ten (10) feet from the coverings.

The coverings shall be securely fastened to prevent ignition or upsetting of the heater due to wind action on the covering or other material.

(c) Stability. Heaters, when in use, shall be set horizontally level, unless otherwise permitted by the manufacturer's markings.

(d) Solid fuel salamanders. Solid fuel salamanders are prohibited in buildings and on scaffolds.

(e) Oil-fired heaters.

(1) Flammable liquid-fired heaters shall be equipped with a primary safety control to stop the flow of fuel in the event of flame failure. Barometric or gravity oil feed shall not be considered a primary safety control.

(2) Heaters designed for barometric or gravity oil feed shall be used only with the integral tanks.

(3) Heaters specifically designed and approved for use with separate supply tanks may be directly connected for gravity feed, or an automatic pump, from a supply tank.

24.2. Definitions applicable to this subpart.

(a) "Approved" for the purpose of this subpart, means equipment that has been listed or approved by a nationally recognized testing laboratory such as Factory Mutual Engineering Corporation, or Underwriters Laboratories Incorporated, or federal agencies such as Bureau of Mines, or United States Coast Guard, which issues approvals for such equipment.

(b) "Closed Container" means a container so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures.

(c) "Combustible Liquids" means any liquid having a flash point at or above one hundred forty degrees (140 degrees) F. (sixty (60) degrees C.), and below two hundred (200) degrees F. (ninety three point four (93.4) degrees C.).

(d) "Combustion" means any chemical process that involves oxidation sufficient to produce light or heat.

(e) "Fire Resistance" means so resistant to fire that, for specified time and under conditions of a standard heat intensity, it will not fall structurally and will not permit the side away from the fire to become hotter than a specified temperature. For purposes of this part, fire resistance shall be determined by the standard Methods of Fire Tests of Building Construction and Materials, NFPA 251-1969.

(f) "Flammable" means capable of being easily ignited, burning intensely, or having a rapid rate of flame spread.

(g) "Flammable Liquids" means any liquid having a flash point below one hundred forty (140) degrees F. and having a vapor pressure not exceeding forty (40) pounds per square inch (absolute) at one hundred (100) degrees F.

(h) "Flash Point" of the liquid means the temperature at which it gives off vapor sufficient to form an ignitable

mixture with the air near the surface of the liquid or within the vessel used as determined by appropriate test procedure and apparatus as specified below.

(1) The flash point of liquids having a viscosity less than forty-five (45) Saybolt Universal Second at one hundred (100) degrees F. (thirty seven point eight (37.8) degrees C.) and a flash point below one hundred seventy-five (175) degrees F. (seventy nine point four (79.4) degrees C.) shall be determined in accordance with the standard method of Test for Flash Point by the Tage Closed Tester, ASTM D-56-69.

(2) The flash point of liquids having a viscosity of forty-five Saybolt Universal Second(s) or more than one hundred seventy-five (175) degrees F. (seventy nine point four (79.4) degrees C.) or higher shall be determined in accordance with the standard method of test for Flash Point by the Pensky Martens Closed Tester, ASTM D-93-69.

(i) "Portable tank" means a closed container having a liquid capacity more than sixty (60) United States gallons, and not intended for fixed installation.

(j) "Safety Can" means an approved metal container, of not more than five (5) gallons capacity, having a flash-arresting screen, spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.

(k) "Vapor Pressure" means the pressure, measured in pounds per square inch (absolute), exerted by a volatile liquid, as determined by the standard method of test for Vapor Pressure of Petroleum Products (Reid Method). (ASTM D-323-58.)

§36-23-25. Accident Prevention Signs and Tags.

25.1. General. Signs and symbols required by this subpart shall be visible at all times when work is being performed, and shall be removed or covered promptly when the hazards no longer exist.

25.2. Danger signs.

(a) Danger signs (See Table 4) shall be used only where an immediate hazard exists.

(b) Danger signs shall have read as the predominating color for the upper panel; black outline on the borders; and a white lower panel for additional sign wording.

25.3. Caution signs.

(a) Caution signs (See Table 5) shall be used only to warn against potential hazards or to caution against unsafe practices.

(b) Caution signs shall 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 shall be used for additional wording.

25.4. Exit signs. Exit signs, when required, shall be lettered in legible red letters, not less than six (6) inches high, on a white field and the principal stroke of the letters shall be at least three fourths (3/4) inch in width.

25.5. Safety instruction signs. Safety instruction signs, when used, shall be white with green upper panel with white letters to convey the principal message. Any additional wording on the signs shall be black letters on the white background.

25.6. Directional signs. Directional signs, other than automotive traffic signs specified in paragraph 25.7. of this section, shall be white with a black panel and a white directional symbol. Any additional wording on the sign shall be black letters on the white background.

25.7. Traffic signs.

(1) Construction areas shall be posted with legible traffic signs at points of hazard.

(2) All traffic control signs or devices used for protection of construction workmen shall conform to American National Standards Institute, D6.1-1971, Manual on Uniform Traffic Control Devices for Streets and Highways.

25.8. Accident prevention tags.

(a) Accident prevention tags shall be used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc. They shall not be used in place of, or as a substitute for, accident prevention signs.

(b) Specifications for accident prevention tags similar to those in Table 6 shall apply.

(c) Additional Rules American National Standards Institute (ANSI) 235.1-1968, Specifications for Accident Prevention Tags, contain rules which are additional to the rules prescribed in this section. The employer shall comply with ANSI 235.1-1968 and 235.2-1968 with respect to rules not specifically prescribed in this subpart.

(d) Machinery, equipment (including machine equipment,) tools and any other device found to be creating an imminent hazard shall be removed from service and properly tagged. Such machine, equipment, tool or other device shall not be operated and the tag shall not be removed until the defective condition is corrected.

§36-23-26. Signaling.

26.1. Flagmen.

(a)

(1) When operations are such that signs, signals, and barricades do not provide the necessary protection on or adjacent to a highway or street, flagmen or other appropriate traffic controls shall be provided.

(2) Signaling directions by flagmen shall conform to American National Standards Institute D6.1-1971, Manual on Uniform Traffic Control Devices for Streets and Highways.

(b) Hand signaling by flagmen shall be by use of red flags at least thirteen (13) inches square or sign paddles, and in periods of darkness, red lights.

(c) Flagmen shall be provided with and shall wear a red or orange warning garment while flagging. Warning garments worn at night shall be of reflectorized material.

26.2. Barricades. Barricades for protection of employees shall conform to the portions of these regulations. Definitions applicable to this section.

(a) "Barricade" means an obstruction to deter the passage of persons or vehicles.

(b) "Signs" are the warnings of hazard, temporarily or permanently affixed or placed, at locations where hazards exist.

(c) "Tags" are temporary signs, usually attached to a piece of equipment or part of a structure, to warn of existing or immediate hazards.

§36-23-27. General Requirements for Storage.

27.1. General.

(a) All materials stored in tiers shall be stacked, racked, blocked, interlocked or otherwise secured to prevent sliding, falling or collapse.

(b) Maximum safe load limits of floors within buildings

and structures, in pounds per square foot, shall be conspicuously posted in all storage areas, except for the floor or slab on grade. Maximum safe loads shall not be exceeded.

(c) Aisles and passageways shall be kept clear to provide for the free and safe movement of material handling equipment or employees. Such areas shall be kept in good repair.

(d) When a difference in road or working levels exits, means such as ramps, blocking, or grading shall be used to ensure the safe movement of vehicles between the two (2) levels.

27.2. Material storage.

(a) Material stored inside buildings under construction shall not be placed within six (6) feet of any hoistway or inside floor openings, not within ten (10) feet of an exterior wall which does not extend above the top of the material stored.

(b) Employees required to work on stored material in silos, hoppers, tanks, and similar storage areas shall be equipped with lifelines and safety belts meeting the requirements of Sections 13 -19 of these regulations.

(c) Noncompatible materials shall be segregated in storage.

(d) Bagged materials shall be stacked by stepping back the layers and cross-keying the bags at least every ten (10) bags high.

(e) Materials shall not be stored on scaffolds or runways in excess of supplies needed for immediate operations.

(f) Brick stacks shall not be more than seven (7) feet in height. When a loose brick stack reaches a height of four (4) feet, it shall be tapered back two (2) inches in every foot of height above the four (4) foot level.

(g) When masonry blocks are stacked higher than six (6) feet, the stack shall be tapered back one-half (1/2) block per tier above the six (6) foot level.

(h) Lumber:

(1) Used lumber shall have all nails withdrawn before stacking.

(2) Lumber shall be stacked on level and solidly supported sills.

(3) Lumber shall be so stacked as to be stable and

self-supporting.

(4) Lumber piles shall not exceed twenty (20) feet in height provided that lumber to be handled manually shall not be stacked more than sixteen (16) feet high.

(i) Structural steel, poles, pipe, bar stock, and other cylindrical materials, unless racked, shall be stacked and blocked so as to prevent spreading or tilting.

(j) Handling materials, general: Housekeeping. Storage areas shall be kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage. Vegetation control will be exercised when necessary.

§36-23-28. Rigging Equipment for Material Handling.

28.1. General.

(a) Rigging equipment for material handling shall be inspected by a competent person prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service.

(b) Rigging equipment shall not be loaded in excess of its recommended safe working load, as prescribed in Tables 7 through 26 in Section 29 of these regulations.

(c) Rigging equipment, when not in use, shall be removed from the immediate work area so as not to present a hazard to employees.

(d) Special custom design grabs, hooks, clamps, or other lifting accessories, for such units as modular panels, prefabricated structures and similar materials, shall be marked to indicate the safe working loads and shall be proof-tested prior to use to one hundred twenty-five percent (125%) of their rated load.

(e) Special containers shall be used to hoist small materials such as, bolts, rivets, tools, etc. and such containers shall be capable of safely supporting intended loads, such container shall not be over-filled to allow spillage while being hoisted.

28.2. Alloy steel chains.

(a) Welded alloy steel chain slings shall have permanently affixed durable identification stating size, grade, rated capacity, and sling manufacturer.

(b) Hooks, rings, oblong links, pear-shaped links,

welded or mechanical coupling links, or other attachments, when used with alloy steel chains, shall have a rated capacity at least equal to that of the chain.

(c) Job or shop hooks and links, or makeshift fasteners, formed from bolts, rods, etc., or other such attachments shall not be used.

(d) Rated capacity (working load limit) for alloy steel chain slings shall conform to the values shown in Table 7.

(e) Whenever wear at any point of any chain link exceeds that shown in Table 8, the assembly shall be removed from service.

28.3. Wire rope.

(a) Tables 9 through 20 shall be used to determine the safe working loads of various sizes and classifications of improved plow steel wire rope slings with various types of terminals. For sizes, classifications, and grades not included in these tables, the safe working load recommended by the manufacturer for specific, identifiable products shall be followed, provided that a safety factor of not less than five (5) is maintained.

(b) Protruding ends of strands in splices on slings and bridles shall be covered or blunted.

(c) Wire rope shall not be secured by knots, except on haul back lines on scrapers.

(d) The following limitations shall apply to the use of wire ropes:

(1) An eye splice made in any wire rope shall have not less than three (3) full tucks. However, this requirement shall not operate to preclude the use of another form of splice or connection which can be shown to be as efficient and which is not otherwise prohibited.

(2) Except for eye splices in the ends of wires and for endless rope slings, each wire rope used in hoisting or lowering, or in pulling loads, shall consist of one (1) continuous piece without knot or splice.

(3) Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire rope clips or knots.

(4) Wire rope shall not be used if, in any length of eight (8) diameters, the total number of visible broken wires exceeds ten (10) percent of the total number of wires, or if the

rope shows other signs of excessible wear, corrosion, or defect.

(e) When U-bolt wire rope clips are used to form eyes, Table 26 shall be used to determine the number and packing of clips.

(1) When used for eye splices, the U-bolt shall be applied so that the "U" section is in contact with the dead end of the rope.

28.4. Natural rope, and synthetic fiber.

(a) General. When using natural or synthetic fiber rope slings, Tables 21, 22, 23 and 24 shall apply.

(b) All splices in rope slings provided by the employer shall be made in accordance with fiber rope manufacturers recommendations.

(1) In manila rope, eye splices shall contain at least three (3) full tucks, and short splices shall contain at least six (6) full tucks (three (3) on each side of the centerline of the splice).

(2) In laid synthetic fiber rope, eye splices shall contain at least four (4) full tucks, and short splices shall contain at least eight (8) full tucks (four (4) on each side of the centerline of the splice).

(3) Strand end tails shall not be trimmed short (flush with the surface of the rope) immediately adjacent to the full tucks. This precaution applies to both eye and short splices and all types of fiber rope. For fiber ropes under one (1) inch diameter, the tails shall project at least six (6) rope diameters beyond the last full tuck. For fiber ropes one (1) inch diameter and larger, the tails shall project at least six (6) inches beyond the last full tuck. In applications where the projecting tails may be objectionable, the tails shall be tapered and spliced into the body of the rope using at least two (2) additional tucks (which will require a trial length of approximately six (6) rope diameters beyond the last full tuck).

(4) Knots shall not be used in lieu of splices.

28.5. Synthetic webbing (nylon, polyester, and polypropylene).

(a) The employer shall have each synthetic web sling marked or coded to show:

(1) Name or trademark of manufacturer;

(2) Rated capacities for the type of hitch;

(3) Type of material.

(b) Rated capacity shall not be exceeded.

28.6. Shackles and hooks.

(a) Table 25 shall be used to determine the safe working loads of various sizes of shackles, except that higher safe working loads are permissible when recommended by the manufacturer for specific identifiable products, provided that a safety factor of not less than five (5) is maintained.

(b) The manufacturer's recommendations shall be followed in determining the safe working loads of the various sizes and types of specific and identifiable hooks. All hooks for which no applicable manufacturer's recommendations are available shall be tested to twice the intended safe working load before they are initially put into use. The employer shall maintain a record of the dates and results of such tests.

(c) Inspections.

(1) In addition to the inspection required of this section, a thorough periodic inspection of alloy steel chain slings in use shall be made on a regular basis, to be determined on the basis of:

(i) Frequency of sling use;
(ii) Severity of service conditions;
(iii) Nature of lifts being made; and
(iv) Experience gained on the service life of slings used in similar circumstances. Such inspection shall in no event be at intervals greater than once every twelve (12) months.

(2) The employer shall make and maintain a record of the most recent month in which each alloy steel chain sling was thoroughly inspected, and shall make such record available for examination. Chains shall not be used to rig load to be hoisted. This does not prevent the use of chain fill on chain hoists for test purposes.

(d) Safe operating practices. Whenever any sling is used, the following practices shall be observed.

(1) Slings shall not be shortened with knots or bolts or other make-shift devices.

(2) Sling legs shall not be kinked.

(3) Slings used in a basket hitch shall have the loads balanced to prevent slippage.

(4) Slings shall be padded or protected from the sharp edges of their loads.

(5) Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.

(6) Shock loading is prohibited.

(7) A sling shall not be pulled from under a load when the load is resting on the sling.

(e) Minimum sling lengths.

(1) Cable laid and six (6) x nineteen (19) and six (6) x thirty-seven (37) slings shall have a minimum clear length of wire rope ten (10) times the component rope diameter between splices, sleeves or end fittings.

(2) Braided slings shall have a minimum clear length of wire rope forty (40) times the component rope diameter between the loops or end fittings.

(3) Cable laid grommets, strands laid grommets and endless slings shall have a minimum circumferential length of ninety-six (96) times their body diameter.

Safe operating temperatures. Fiber core wire rope slings of all grades shall be permanently removed from service if they are exposed to temperatures in excess of two hundred degrees (200) F. When nonfiber core wire rope slings of any grade are used at temperatures above four hundred degrees (400) F. or below sixty degrees (60) F., recommendations of the sling manufacturer regarding use at that temperature shall be followed.

End attachments.

(i) Welding of end attachments, except covers to thimbles, shall be performed prior to the assembly of the sling.

(ii) All welded end attachments shall not be used unless proof tested by the manufacture or equivalent entity at twice their rated capacity prior to initial use. The employer shall retain a certificate of the proof test, and make it available for examination.

(f) Natural and synthetic fiber type slings.

(1) Safe operating temperatures. Natural and synthetic fiber rope slings, except wet frozen slings, may be

used in a temperature rated from minus twenty degrees (20) to plus one hundred eighty degrees (180) F. without decreasing the working load limit. For operations providing this temperature range and for set frozen slings, the sling manufacturer's recommendations shall be followed.

(2) Splicing. Spliced fiber rope hoists shall not be used unless they have been spliced in accordance with the following minimum requirements and in accordance with any additional recommendations of the manufacturer:

(i) Fiber rope slings shall have a minimum clear length of rope between eye splices equal to ten (10) times the rope diameter.

(ii) Clamps not designed specifically for fiber ropes shall not be used for splicing.

(3) End attachments. Fiber rope slings shall not be used if end attachments in contact with rope have sharp edges or projections.

(4) Removal from service. Natural and synthetic fiber rope sling shall be immediately removed from service if any of the following conditions are present:

(i) Abnormal wear;
(ii) Powdered fiber between strands;
(iii) Broken or cut fibers;
(iv) Variations in the size or roundness of strands;
(v) Discoloration or rotting;
(vi) Distortion of hardware in the sling.

(5) Webbing. Synthetic webbing shall be of uniform thickness and width and salvage edges shall not be split from the webbing's width.

(6) Fittings. Fittings shall be:

(i) Of a minimum breaking strength equal to that of the sling; and

(ii) Free of all sharp edges that could in any way damage the webbing.

(7) Attachment of end fittings to webbing and formation of eyes.

Stitching shall be the only method used to attach end fittings to webbing and to form eyes. The thread shall be in an even pattern and contain a sufficient number of stitches to develop the full breaking strength of the sling.

(8) Environmental conditions. When synthetic web slings

are used, the following precautions shall be taken:

(i) Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolics are present.

(ii) Polyester and polypropylene webslings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

(iii) Web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

(9) Safe operating temperatures. Synthetic web slings of polyester and nylon shall not be used at temperatures in excess of one hundred eighty degrees (180) F. Polypropylene web slings shall not be used in temperatures in excess of two hundred degrees (200) F.

(10) Removal from service. Synthetic web slings shall be immediately removed from service if any of the following conditions are present:

(i) Acid or caustic burns;
(ii) Melting or charring of any part of the sling surface;
(iii) Snags, punctures, tears or cuts;
(iv) Broken or worn stitches; or
(v) Distortion of fittings.

(11) Scope. This section applies to slings used in conjunction with other material handling equipment for the movement of material by hoisting, in employments covered by this part. The types of slings covered are those made from alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope (conventional three (3) strand construction), and synthetic web (nylon, polyester, and polypropylene).

§36-23-29. Disposal of Waste Material.

29.1. The area where materials are dropped more than twenty (20) feet to any point lying outside the exterior walls of the building, shall be adequately restricted.

29.2. When debris is dropped through holes in the floor without the use of chutes, the area onto which the material is dropped shall be completely enclosed with barricades not less than forty-two (42) inches high and not less than six (6) feet back from the projected edge of the opening above. Signs warning of the hazard of falling materials shall be posted at each level. Removal shall not be permitted in this lower area until debris handling ceases above.

29.3. All scrap lumber, waste material, and rubbish shall be removed from the immediate work area as the work progresses.

29.4. Disposal of waste material or debris by burning shall comply with local fire regulations.

29.5. All solvent waste, oil rags, and flammable liquids shall be kept in fire resistant covered containers until removed from work site.

§36-23-30. Tools-Hand and Power.

30.1. General requirements.

(a) Condition of tools. All hand and power tools and similar equipment, whether furnished by the employer or by the employee, shall be maintained in a safe condition. All such tools shall be inspected prior to each use and any defective tools shall be removed from service.

(b) Guarding.

(1) When power operated tools are designed to accommodate guards, they shall be equipped with such guards when in use.

(2) Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating or moving parts or equipment shall be guarded if such parts are exposed to contact by employees or otherwise create a hazard. Guarding shall meet the requirements as set forth in ANSI B15.1-1953 (R1958), Safety Code for Mechanical Power Transmission Apparatus.

(c) Personal protective equipment. Employees using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases shall be provided with the particular personal protective equipment necessary to protect them from the hazard. All personal protective equipment shall meet the requirements and be maintained according to Sections 10-19 of these regulations.

(d) Switches.

All hand-held powered platen sanders, grinders with wheels two (2) inches diameter or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws, and jigsaws with blade shanks one-fourth (1/4) of an inch wide or less may be equipped with only a positive "On-Off" control.

All hand-held powered drills, tappers, fastener drivers, horizontal, vertical, and angle grinders with wheels greater than

two (2) inches in diameter, disc sanders, belt sanders, reciprocating saws, saber saws, and other similar operating powered tools shall be equipped with a momentary contact "On-Off" control and may have a lock-on control provided that turn off can be accomplished by a single motion of the same finger or fingers that turn it on.

All hand-held powered tools, such as circular saws, chain saws, and percussion tools without positive accessory holding means, shall be equipped with a constant pressure switch that will shut off the power when the pressure is released.

Exception: This paragraph does not apply to concrete vibrators, concrete breakers, powered tampers, jackhammers, rock drills, and similar hand operated power tools.

30.2. General requirements for all machines.

(a) Point of operation is the area on a machine where work is actually performed upon the material being processed.

(1) The point of operation of machines whose operation exposes an employee to injury, shall be guarded. The guarding device shall be in conformity with any appropriate standards therefore, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.

(2) Special handtools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding required by this section, but can only be used to supplement protection provided.

(3) The following are some of the machines which usually require point of operation guarding:

(i) Guillotine cutters
(ii) Shears
(iii) Alligator shears
(iv) Power presses
(v) Milling machines
(vi) Power saws
(vii) Jointers
(viii) Portable power tools
(ix) Forming rolls and calendars

(b) Exposure of blades. When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half (1/2) inch.

(c) Anchoring fixed machinery. Machines designed for a fixed location shall be securely anchored to prevent walking or moving.

30.3. Handtools.

(a) Employers shall not issue or permit the use of unsafe handtools.

(b) Wrenches, including adjustable, pipe, end, and socket wrenches shall not be used when jaws are sprung to the point that slippage occurs.

(c) Impact tools, such as drift pins, wedges, and chisels, shall be kept free of mushroomed heads.

(d) The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool.

30.4. Power-operated tools.

(a) Electric power-operated tools.

(1) Electric power operated tools shall either be of the approved double-insulated type or grounded in accordance with this part.

(2) The use of electric cords for hoisting or lowering tools shall not be permitted.

(b) Pneumatic power tools.

(1) Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tools from becoming accidentally disconnected.

(2) Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.

(3) All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than one hundred (100) p.s.i. pressure at the tool shall have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.

(4) Compressed air shall not be used for cleaning purposes except where reduced to less than thirty (30) p.s.i. and then only with effective chip guarding and personal protective equipment which meets the requirements of this part. The thirty (30) p.s.i. requirement does not apply for concrete form, mill

scale and similar cleaning purposes.

(5) The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.

(6) The use of hoses for hoisting or lowering tools shall not be permitted.

(7) All hoses exceeding one-half (1/2) inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

(8) Airless spray guns of the type which atomize paints and fluids at high pressures (one thousand (1,000) pounds or more per square inch) shall be equipped with automatic or visible manual safety devices which will prevent pulling of the trigger to prevent release of the paint or fluid until the safety device is manually released.

(9) In lieu of the above, a diffuser nut which will prevent high pressure, high velocity release, while the nozzle tip is removed, plus a nozzle tip guard which will prevent the tip from coming into contact with the operator, or other equivalent protection, shall be provided.

(c) Fuel powered tools.

(1) All fuel powered tools shall be stopped while being refueled, serviced, or maintained, and fuel shall be transported, handled, and stored in accordance with this section.

(2) When fuel powered tools are used in enclosed spaces, the applicable requirements for concentrations of toxic gases and use of personal protective equipment shall apply.

(d) Hydraulic power tools.

(1) The fluid used in hydraulic powered tools shall be fire-resistant fluids and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.

(2) The manufacturer's safe operating pressures for hoses, valves, pipes, filters, and other fittings shall not be exceeded.

(e) Powder-actuated tools.

(1) Only employees who have been trained in the operation and the safety hazards of the particular tools in use shall be allowed to operate a powder-actuated tool.

(2) The tool shall be tested each day before loading to see that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.

(3) Any tool found not in proper working order, or that develops a defect during use, shall be immediately removed from service and not used until properly repaired.

(4) Personal protective equipment shall be in accordance with subsections of this part.

(5) Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employees. Hands shall be kept clear of the open barrel end.

(6) Loaded tools shall not be left unattended.

(7) Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed title, surface-hardened steel, glass block, live rock, face brick, or hollow tile.

(8) Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side.

(9) No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.

(10) Tools shall not be used in an explosive or flammable atmosphere.

(11) All tools shall be used with the correct shield, guard, or attachment recommended by the manufacturer.

(12) Powder-actuated tools used by employees shall meet all other applicable requirements of the American National Standards Institute A10.3-1970, Safety Requirements for Explosive-Actuated Fastening Tools.

30.5. Other portable tools and equipment. Abrasive blast cleaning nozzles. The blast cleaning nozzles shall be equipped with an operating valve which must be held open manually. A support shall be provided on which the nozzle may be mounted when it is not in use.

30.6. Abrasive wheels and tools.

(a) Power. All grinding machines shall be supplied with

sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation.

(b) Guarding. Grinding machines shall be equipped with safety guards in conformance with the requirements of ANSI B7.1-1970, Safety Code for the use, care and protection of abrasive wheels, and Sections 10, 11, and 12 of these regulations.

(c) Use of abrasive wheels.

(1) Floor stand and bench mounted abrasive wheels, used for external grinding, shall be provided with safety guards (protection bonds). The maximum angular exposure of the grinding wheel periphery and sides shall be not more than ninety (90) degrees, except that when work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed one hundred twenty-five (125) degrees. In either case, the exposure shall begin not more than sixty-five (65) degrees above the horizontal plane of the spindle. Safety guards shall be strong enough to withstand the effect of a bursting wheel.

(2) Floor and bench-mounted grinders shall be provided with work rests which are rigidly supported and readily adjustable. Such work rests shall be kept at a distance not to exceed one-eighth (1/8) inch from the surface of the wheel.

(3) Cup type wheels used for external grinding shall be protected by either a revolving cup guard or a band type guard in accordance with the provisions of the ANSI B7.1-1970, Safety Code for the use, care, and protection of abrasive wheels. All other portable abrasive wheels used for external grinding, shall be provided with safety guards (protection hoods) meeting the requirements of subparagraph (5) of this paragraph, except as follows:

(i) When the work location makes it impossible, a wheel equipped with safety flanges, as described in subparagraph six (6) of this paragraph, shall be used;

(ii) When wheels two (2) inches or less in diameter which are securely mounted on the end of a steel mandrel are used.

(4) Portable abrasive wheels used for internal grinding shall be provided with safety flanges (protection flanges) meeting the requirements of subparagraph six (6) of this paragraph, except as follows:

(i) When wheels two (2) inches or less in diameter which are securely mounted on the end of a steel mandrel are used;

(ii) If the wheel is entirely within the work being ground while in use.

(5) When safety guards are required, they shall be so mounted as to maintain proper alignment with the wheel, and the guard and its fastenings shall be of sufficient strength to retain fragments of the wheel in case of accidental breakage. The maximum angular exposure of the grinding exposure of the grinding wheel periphery and sides shall not exceed one hundred eighty (180) degrees.

(6) When safety flanges are required, they shall be used only with wheels designed to fit the flanges. Only safety flanges, of a type and design and properly assembled so as to ensure that the pieces of the wheel will be retained in case of accidental breakage, shall be used.

(7) All abrasive wheels shall be closely inspected and ring-tested before mounting to ensure that they are free from cracks or defects.

(8) Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place.

(9) All employees using abrasive wheels shall be protected by eye protection equipment in accordance with the requirements of this part, except when adequate eye protection is afforded by eye shields which are permanently attached to the bench or floor stand.

(d) Other requirements. All abrasive wheels and tools used by employees shall meet other applicable requirements of ANSI B7.1-1970, Safety Code for the use, care and protection of abrasive wheels.

30.7. Woodworking tools.

(a) Disconnect switches. All fixed power driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the off position.

(b) Speeds. The operating speed shall be etched or otherwise permanently marked on all circular saws over twenty (20) inches in diameter or operating at over ten thousand (10,000) peripheral feet per minute. Any saw so marked shall not be operated at a speed other than that marked on the blade. When a marked saw is retensioned for a different speed, the marking shall be corrected to show the new speed.

(c) Self-feed. Automatic feeding devices shall be installed on machines whenever the nature of the work will permit. Feeder

attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points.

(d) Guarding. All portable, power-driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for level cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

(e) Personal protective equipment. All personal protective equipment provided for use shall conform to this part.

(f) Other requirements. All woodworking tools and machinery shall meet other applicable requirements of ANSI, 01.1-1961, Safety Code for woodworking machinery.

30.8. Jacks -lever and ratchet, screw, and hydraulic.

(a) General requirements.

(1) The manufacturer's rated capacity shall be legibly marked on all jacks and shall not be exceeded.

(2) All jacks shall have a positive stop to prevent overtravel.

(b) Lift slab construction.

(1) Hydraulic jacks used in lift slab construction shall have a safety device which will cause the jacks to support the load in any position in the event of jack malfunctions.

(2) If lift slabs are automatically controlled, a device shall be installed which will stop the operation when the one-half (1/2) inch leveling tolerance is exceeded.

(c) Blocking. When it is necessary to provide a firm foundation, the base of the jack shall be blocked or cribbed. Where there is a possibility of slippage of the metal cap of the jack, a wood block shall be placed between the cap and the load.

30.9. Other portable tools and equipment.

(a) Jacks. Operation and maintenance.

(1) After the load has been raised, it shall be cribbed, blocked, or otherwise secured at once.

(2) Hydraulic jacks exposed to freezing temperatures shall be supplied with an adequate antifreeze liquid.

(3) All jacks shall be properly lubricated at regular intervals. The lubricating instructions of the manufacturer should be followed, and only lubricants recommended by him should be used.

(4) Each jack shall be thoroughly inspected at times which depend upon the service conditions. Inspections shall be not less frequent than the following:

(i) For constant or intermittent use at one (1) locality, once every six (6) months.

(ii) For jacks sent out of shop for special work, when sent out and when returned.

(iii) For a jack subjected to abnormal load or shock, immediately before and immediately thereafter.

(5) Repair or replacement parts shall be examined for possible defects.

(6) Jacks which are out of order shall be tagged accordingly, and shall not be used until repairs are made.

§36-23-31. Gas Welding and Cutting.

31.1. Gas welding and cutting.

(a) Transporting, moving, and storing compressed gas cylinders.

(1) Valve protection caps shall be in place and secured.

(2) When cylinders are hoisted, they shall be secured on a cradle, slingboard, or pallet. They shall not be hoisted or transported by means of magnets or chocker slings.

(3) Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dropped, struck, or permitted to strike each other violently.

(4) When cylinders are transported by powered vehicles, they shall be secured in a vertical position.

(5) Valve protection caps shall not be used for lifting cylinders from one (1) vertical position to another. Bars shall not be used under valves or valve protection caps to pry cylinders loose when frozen. Warm, not boiling, water shall be used to thaw cylinders loose.

(6) Unless cylinders are firmly secured on a special carrier on vehicle intended for this purpose, regulators shall be removed and valve protection caps put in place before cylinders are moved.

(7) A suitable cylinder truck, chain, or other steadying device shall be used to keep cylinders from being knocked over while in use.

(8) When work is finished, when cylinders are empty, or when cylinders are moved at any time, the cylinder valve shall be closed.

(9) Compressed gas cylinders shall be secured in an upright position at all times, except if necessary, for short periods of time while cylinders are actually being hoisted or carried.

(b) Placing cylinders.

(1) Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them. When this is impractical, fire-resistant shields shall be provided.

(2) Cylinders shall be placed where they cannot become part of an electrical circuit. Electrodes shall not be struck against a cylinder to strike an arc.

(3) Fuel gas cylinders shall be placed with valve end up whenever they are in use. They shall not be placed in a location where they would be subject to open flame, hot metal, or other sources of artificial heat.

(4) Cylinders containing oxygen or acetylene or other fuel gas shall not be taken into confined spaces.

(c) Treatment of cylinders.

(1) Cylinders, whether full or empty, shall not be used as rollers or supports.

(2) No person other than the gas supplier shall attempt to mix gases in a cylinder. No one except the owner of the cylinder or person authorized by him, shall refill a cylinder. No one shall use a cylinder's contents for purposes other than those intended by the supplier.

(3) No damaged or defective cylinder shall be used.

(d) Use of fuel gas. The employer shall thoroughly instruct employees in the safe use of fuel gas, as follows:

(1) Before a regulator to a cylinder valve is connected, the valve shall be opened slightly and closed immediately. (This action is generally termed "Cracking" and is intended to clear the valve of dust or dirt that might otherwise enter the regulator.) The person cracking the valve shall stand to one side of the outlet, not in front of it. The valve of a fuel gas cylinder shall not be cracked where the gas would reach welding work, sparks, flame, or other possible sources of ignition.

(2) The cylinder valve shall always be opened slowly to prevent damage to the regulator. For quick closing, valves on fuel gas cylinders shall not be opened more than one and one-half (1 1/2) turns. When a special wrench is required, it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be shut off quickly in case of an emergency. In the case of manifolded or coupled cylinders, at least one (1) such wrench shall always be available for immediate use. Nothing shall be placed on top of a fuel gas cylinder, when in use, which may damage the safety device or interfere with the quick closing of the valve.

(3) Fuel gas shall not be used from cylinders through torches or other devices which are equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.

(4) Before a regulator is removed from a cylinder valve, the cylinder valve shall always be closed and the gas released from the regulator.

(5) If, when the valve on a fuel gas cylinder is opened, there is found to be a leak around the valve stem, the valve shall be closed and the gland nut tightened. If this action does not stop the leak, the use of the cylinder shall be discontinued, and it shall be properly tagged and removed from the work area. In the event that fuel gas should leak from the cylinder valve, rather than from the valve stem, and the gas cannot be shut off, the cylinder shall be properly tagged and removed from the work area. If a regulator attached to a cylinder valve will effectively stop a leak through the valve seat, the cylinder need not be removed from the work area.

(6) If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the work area.

(e) Fuel gas and oxygen manifolds.

(1) Fuel gas and oxygen manifolds shall bear the name of the substance they contain in letters at least one (1) inch high which shall be either painted on the manifold or on a sign permanently attached to it.

(2) Fuel gas and oxygen manifolds shall be placed in safe, well ventilated, and accessible locations. They shall not be located within enclosed spaces.

(3) Manifold hose connections, including both ends of the supply hose that lead to the manifold, shall be such that the hose cannot be interchanged between fuel gas and oxygen manifolds and supply header connections. Adapters shall not be used to permit the interchange of hose. Hose connections shall be kept free of grease and oil.

(4) When not in use, manifold and header hose connections shall be capped.

(5) Nothing shall be placed on top of a manifold, when in use, which will damage the manifold or interfere with the quick closing of the valves.

(f) Hose.

(1) Fuel gas hose and oxygen hose shall be easily distinguishable from each other. The contrast may be made by different colors or by surface characteristics readily distinguishable by the sense of touch. Oxygen and fuel gas hoses shall not be interchangeable. A single hose having more than one (1) passage shall not be used.

(2) When parallel sections of oxygen and fuel gas hose are taped together not more than four (4) inches out of twelve (12) inches shall be covered by tape.

(3) All hose in use, carrying acetylene, oxygen, natural or manufactured fuel gas, or any gas or substance which may ignite or enter into combustion, or be in any way harmful to employees, shall be inspected at the beginning of each working shift. Defective hose, or hose in doubtful condition, shall not be used.

(4) Hose which has been subject to flashback, or which shows evidence of severe wear or damage, shall be tested to twice the normal pressure to which it is subject, but in no case less than three hundred (300) p.s.i. Defective hose, or hose in doubtful condition, shall not be used.

(5) Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a straight pull without rotary motion.

(6) Boxes used for the storage of gas hose shall be ventilated.

(7) Hoses, cables, and other equipment shall be kept

clear of passageways, ladders and stairs.

(g) Torches.

(1) Clogged torch tip openings shall be cleaned with suitable cleaning wires, drills, or other devices designed for such purposes.

(2) Torches in use shall be inspected at the beginning of each working shift for leaking shutoff valves, hose couplings, and tip connections. Defective torches shall not be used.

(3) Torches shall be lighted by friction lighters or other approved devices, and not by matches or from hot work.

(h) Regulators and gauges. Oxygen and fuel gas pressure regulators, including their related gauges, shall be in proper working order while in use.

(i) Oil and grease hazards. Oxygen cylinders and fittings shall be kept away from oil or grease. Cylinders, cylinder caps and valves, couplings, regulators, hose, and apparatus shall be kept free from oil or greasy substances and shall not be handled with oily hands or gloves. Oxygen shall not be directed at oily surfaces, greasy clothes, or within a fuel oil or other storage tank or vessel.

(j) For additional details not covered in this section, applicable
technical portions of American National Standards Institute Z49.1-1967, Safety in Welding and Cutting, shall apply.

31.2. Arc welding and cutting.

(a) Manual electrode holders.

(1) Only manual electrode holders which are specifically designed for arc welding and cutting, and are of a capacity capable of safely handling the maximum rated current required by the electrodes, shall be used.

(2) Any current-carrying parts passing through the portion of the holder which the arc welder or cutter grips in his hand, and the outer surfaces of the jaws of the holder, shall be fully insulated against the maximum voltage encountered to ground.

(b) Welding cables and connectors.

(1) All arc welding and cutting cables shall be of the completely insulated, flexible type, capable of handling the maximum current requirements of the work in progress, taking into

account the duty cycle under which the arc welder or cutter is working.

(2) Only cable free from repair or splices for a minimum distance of ten (10) feet from the cable end to which the electrode holder is connected shall be used, except that cables with standard insulated connectors or with splices whose insulating quality is equal to that of the cable are permitted.

(3) When it becomes necessary to connect or splice lengths of cable one (1) to another, substantial insulated connectors of a capacity at least equivalent to that of the cable shall be used. If connections are effected by means of cable lugs, they shall be securely fastened together to give good electrical contact, and the exposed metal parts of the lugs shall be completely insulated.

(4) Cables in need of repair shall not be used. When a cable other than the cable lead referred to in subparagraph (2) of this paragraph, becomes worn to the extent of exposing bare conductors, the portion thus exposed shall be protected by means of rubber and friction tape or other equivalent insulation.

(c) Ground returns and machine grounding.

(1) A ground return cable shall have a safe current carrying capacity equal to or exceeding the specified maximum output capacity of the arc welding or cutting unit which it services. When a single ground return cable services more than one (1) unit, its safe current-carrying capacity shall equal or exceed the total specified maximum output capacities of all the units which it services.

(2) Pipelines containing gases or flammable liquids, or conduits containing electrical circuits, shall not be used as a ground return. For welding on natural gas pipelines, the technical portions of regulations issued by the Department of Transportation, Office of Pipeline Safety, 49 CFR Part 192, minimum federal safety standards for Gas Pipelines shall apply.

(3) When a structure or pipeline is employed as a ground return circuit, it shall be determined that the required electrical contact exists at all joints. The generation of an arc, sparks, or heat at any point shall cause rejection of the structures as a ground circuit.

(4) When a structure or pipeline is continuously employed as a ground return circuit, all joints shall be bonded, and periodic inspections shall be conducted to ensure that no condition of electrolysis or fire hazard exists by virtue of such use.

(5) The frames of all arc welding and cutting machines shall be grounded either through a third wire in the cable containing the circuit conductor or through a separate wire which is grounded at the source of the current. Grounding circuits, other than by means of a structure, shall be checked to ensure that the circuit between the ground and the grounded power conductor has resistance low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current.

(6) All ground connections shall be inspected to ensure that they are mechanically strong and electrically adequate for the required current.

(d) Operating instructions. Employers shall instruct employees in the safe means of arc welding and cutting as follows:

(1) When electrode holders are to be left unattended, the electrodes shall be removed and the holders shall be so placed or protected that they cannot make electrical contact with employees or conducting objects.

(2) Hot electrode holders shall not be dipped in water; to do so may expose the arc welder or cutter to electric shock.

(3) When the arc welder or cutter has occasion to leave his work or to stop work for any appreciable length of time, or when the arc welding or cutting machine is to be moved, the power supply switch to the equipment shall be opened.

(4) Any faulty or defective equipment shall be reported to the supervisor, and shall be removed from service if an imminent hazard exists.

(5) Other requirements, as outlined in Article 630, National Electrical Code NFPA 70-1971; ANSI C1-1971 (Rev. of 1968), Electric Welders, shall be used when applicable.

(e) Shielding. When practicable, all arc welding and cutting operations shall be shielded by noncombustible or flameproof screens which will protect employees and other persons working in the vicinity from the direct rays of the arc.

31.3. Fire prevention.

(a) When practical, objects to be welded, cut or heated shall be moved to a designated safe location or, if the objects to be welded, cut or heated cannot be readily moved, all movable fire hazards in the vicinity shall be taken to a safe place, or otherwise protected.

(b) If the object to be welded, cut, or heated cannot be moved and if all the fire hazards cannot be removed, positive means shall be taken to confine the heat, sparks, and slag, and to protect the immovable fire hazards from them.

(c) No welding, cutting, or heating shall be done where the application of flammable paints, or the presence of other flammable compounds, or heavy dust concentrations creates a hazard.

(d) Suitable fire extinguishing equipment shall be immediately available in the work area and shall be maintained in a state of readiness for instant use.

(e) When the welding, cutting, or heating operation is such that normal fire prevention precautions are not sufficient, additional personnel shall be assigned to guard against fire while the actual welding, cutting, or heating operation is being performed, and for a sufficient period of time after completion of the work to ensure that no possibility of fire exists. Such personnel shall be instructed as to the specific anticipated fire hazards and how the fire-fighting equipment provided is to be used.

(f) When welding, cutting, or heating is performed on walls, floors, and ceilings, since direct penetration of sparks or heat transfer may introduce a fire hazard to an adjacent area, the same precautions shall be taken on the opposite side as are taken on the side on which the welding is being performed.

(g) In areas that may contain methane gas, an examination for gas shall be conducted with permissible flame safety lamps or other approved detectors before and during welding.

(h) For the elimination of possible fire in enclosed spaces as a result of gas escaping through leaking or improperly closed torch shall be positively shut off at some point outside the enclosed space whenever the torch is not to be used or whenever the torch is left unattended for a substantial period of time, such as during the lunch period. Overnight and at the change of shifts, the torch and hose shall be removed from the confined space. Open end fuel gas and oxygen hoses shall be immediately removed from enclosed spaces when they are disconnected from the torch or other gas-consuming device.

(i) Except when the contents are being removed or transferred, drums, pails, and other containers, which contain or have contained flammable liquids, shall be kept closed. Empty containers shall be removed to a safe area apart from hot work operations or open flames.

(j) Drums, containers, or hollow structures which have

contained toxic or flammable substances shall, before welding, cutting, or heating is undertaken on them, either be filled with water or thoroughly cleaned of such substances and ventilated and tested. For welding, cutting, and heating on steel pipelines containing natural gas, the pertinent portions of regulations issued by the Department of Transportation, Office of Pipeline Safety, 49CFR Part 192, minimum federal safety standards for Gas Pipelines shall apply.

31.4. Ventilation and protection in welding, cutting and heating.

(a) Mechanical ventilation. For purposes of this section, mechanical ventilation shall meet the following requirements:

(1) Mechanical ventilation shall consist of either general mechanical ventilation systems or local exhaust systems.

(2) General mechanical ventilation shall be of sufficient capacity and so arranged as to produce the number of air changes necessary to maintain welding fuels and smoke within safe limits, as defined in this part.

(3) Local exhaust ventilation shall consist of freely movable hoods intended to be placed by the welder or burner as close as practicable to the work. This system shall be of sufficient capacity and so arranged as to remove fumes and smoke at the source and keep the concentration of them in the breathing zone within safe limits as defined in this part.

(4) Contaminated air exhausted from a working space shall be discharged into the open air or otherwise clear of the source of intake air.

(5) All air replacing that withdrawn shall be clean and respirable.

(6) Oxygen shall not be used for ventilation purposes, comfort cooling, blowing dust from clothing, or for cleaning the work area.

(b) Welding, cutting, and heating in confined spaces.

(1) Except as provided in subparagraph (2) of this paragraph, and paragraph (c)(2) of this section, either general mechanical or local exhaust ventilation meeting the requirements of paragraph (a) of this section shall be provided whenever welding, cutting, or heating is performed in a confined space.

(2) When sufficient ventilation cannot be obtained without blocking the means of access, employees in the confined space shall be protected by air line respirators in accordance

with the requirements of this part, and an employee on the outside of such a confined space shall be assigned to maintain communication with those working within it and to aid them in an emergency.

(c) Welding, cutting, or heating of metals of toxic significance.

(1) Welding, cutting, or heating in any enclosed spaces involving the metals specified in this subparagraph shall be performed with either general mechanical or local exhaust ventilation meeting the requirements of paragraph (i) of this section:

(i) Zinc-bearing base or filler metals or metals coated with zinc-bearing materials;
(ii) Lead base metals;
(iii) Cadmium-bearing filler materials;
(iv) Chromium-bearing metals or metals coated with chromium-bearing materials.

(2) Welding, cutting, or heating in any enclosed spaces involving the metals specified in this subparagraph shall be performed with local exhaust ventilation in accordance with the requirements of paragraph (a) of this section, or employees shall be protected by air line respirators in accordance with the requirements of this part:

(i) Metals containing lead, other than as an impurity, or metal coated with lead-bearing materials;
(ii) Cadmium-bearing or cadmium-coated base metals;
(iii) Metals coated with mercury-bearing materials;
(iv) Beryllium-containing base of filler metals. Because of its high toxicity, work involving beryllium shall be done with both local exhaust ventilation and air line respirators.

(3) Employees performing such operations in the open air shall be protected by filter-type respirators in accordance with the requirements of this section, except that employees performing such operations on beryllium-containing base or filler metals shall be protected by air line respirators in accordance with the requirements of this part.

(4) Other employees exposed to the same atmosphere as the welders or burners shall be protected in the same manner as the welder or burner.

(d) Inert-gas metal-arc welding.

(1) Since the inert-gas metal-arc welding process involves the production of ultra-violet radiation of intensities of five (5) to thirty (30) times that produced during shielded metal-arc welding, the decomposition of chlorinated solvents by ultra-violet rays, and the liberation of toxic fumes and gases, employees shall not be permitted to engage in or be exposed to the process until the following special precautions have been taken:

(i) The use of chlorinated solvents shall be kept at least two hundred (200) feet, unless shielded, from the exposed arc, and surfaces prepared with chlorinated solvents shall be thoroughly dry before welding is permitted on such surfaces.

(ii) Employees in the area not protected from the arc by screening shall be protected by filter lenses. When two (2) or more welders are exposed to each other's arc, filter lens goggles of a suitable type shall be worn under welding helmets. Hand shields to protect the welder against flashes and radiant energy shall be used when either the helmet is lifted or the shield is removed.

(iii) Welders and other employees who are exposed to radiation shall be suitably protected so that the skin is covered completely to prevent burns and other damage by ultra-violet rays. Welding helmets and hand shield shall be free of leaks and openings, and free of highly reflective surfaces.

(iv) When inert-gas metal-arc welding is being performed on stainless steel, the requirements of paragraph (c)(2) of this section shall be met to protect against dangerous concentrations of nitrogen dioxide.

(e) General welding, cutting, and heating.

(1) Welding, cutting, and heating, not involving conditions or materials described in paragraph (b), (c), or (d) of this section, may normally be done without mechanical ventilation or respiratory protective equipment, but where, because of unusual physical or atmospheric conditions, an unsafe accumulation of contaminants exists, suitable mechanical ventilation or respiratory protective equipment shall be provided.

(2) Employees performing any type of welding, cutting, or heating shall be protected by suitable eye protective equipment.

31.5. Welding, cutting, and heating in way of preservative coatings.

(a) Before welding, cutting, or heating is commenced on any surface covered by a preservative coating whose flammability is not known, a test shall be made by a competent person to

determine its flammability. Preservative coatings shall be considered to be highly flammable when scraping burn with extreme rapidity.

(b) Precautions shall be taken to prevent ignition of highly flammable hardened preservative coatings. When coatings are determined to be highly flammable, they shall be stripped from the area to be heated to prevent ignition.

(c) Protection against toxic preservative coatings.

(1) In enclosed spaces, all surfaces covered with toxic preservatives shall be stripped of all toxic coatings for a distance of at least four (4) inches from the area of heat application, or the employees shall be protected by air line respirators.

(2) In the open air, employees shall be protected by a respirator.

(d) The preservative coatings shall be removed a sufficient distance from the area to be heated to ensure that the temperature of the unstripped metal will not be appreciably raised. Artificial cooling of the metal surrounding the heating area may be used to limit the size of the area required to be cleaned.

§36-23-32. Electrical.

All persons performing electrical work at construction projects shall be certified by the State Fire Marshall or by the Department of Mines.

32.1. General Requirements.

(a) All electrical work, installation, and wire capacities shall be in accordance with the pertinent provisions of the National Electrical Code, NFPA 70-1971; ANSI C1-1971 (Rev. of C1-1968) unless otherwise provided by these regulations.

(b) Applicability. These regulations apply only to electrical installations and used on the job site, both temporary and permanent. For power distribution and transmission lines, refer to subpart V of OSHA Safety and Health Regulations for Construction.

(c) Protection of employees.

(1) No employer shall permit an employee to work in such proximity to any part of an electric power circuit that he may contact the same in the course of his work unless the employee is protected against electric shock by deenergizing the

circuit and grounding it or by guarding it by effective insulation or other means. In work areas where the exact location of underground electric power lines is unknown, workmen using jackhammers, bars, or other hand tools which may contact a line shall be provided with insulated protective gloves.

(2) Before work is begun, the employer shall ascertain by inquiry or direct observation, or by instruments, whether any part of an electric power circuit, exposed, or concealed, is so located that the performance of the work may bring any person, tool, or machine into physical or electrical contact therewith. The employer shall post and maintain proper warning signs where such a circuit exists. He shall advise his employees of the location of such lines, the hazards involved and the protective measures to be taken.

(d) Passageways and open spaces. Suitable barriers or other means shall be provided to ensure that work space for electrical equipment will not be used as a passageway during periods when energized parts of electrical equipment are used.

(e) Work space around equipment. Sufficient space shall be provided and maintained in the area of electrical equipment to permit ready and safe operation and maintenance of such equipment. When parts are exposed, the minimum clearance for the work space shall be not less than six and one-quarter (6 1/4) feet high, nor less than a radius of three (3) feet wide, and there shall be clearance sufficient to permit at least ninety degrees (90) opening of all doors or hinged panels. All working clearances shall be maintained in accordance with article 110-16, National Electrical Code, NFPA 70-1971; ANSI CI-1971 (Rev. of CI-1968).

(f) Load ratings. In existing installation no changes in circuit protection shall be made to increase the load in excess of load rating of the circuit wiring, as specified in National Electrical Code, NFPA 70-1971; ANSI CI-1971 (Rev. of CI-1968) (Article 310.)

(g) Lockout and tagging of circuits.

(1) Equipment or circuits that are deenergized shall be rendered inoperative and have tags attached at all points where such equipment or circuits can be energized.

(2) Tags shall be placed to identify plainly the equipment or circuits being worked on.

(h) Ground-fault protection.

(1) General. Notwithstanding any other provision of this part, the requirements in Section 210-7 of the 1971 National

Electrical Code (NFPA 70-1971; ANSI CI-1971), that all fifteen (15-) and twenty (20-) amphere receptacle outlets on single-phase circuits for construction sites have approved ground-fault circuit protection for personnel does not apply. In lieu thereof, the employer shall use either ground-fault circuit interrupters or an assured equipment grounding conductor program to protect employees on construction sites. These requirements are in addition to any other requirements for equipment grounding conductors.

(2) Ground-fault circuit interrupters. All one hundred twenty (120) volt, single-phase, fifteen (15-) and twenty (20-) amphere receptacle outlets on construction sites, which are not a part of the permanent wiring of the building or structure and which are in use by employees, shall have approved ground-fault circuit interrupters for personnel protection. Receptacles on a two (2-) wire, single-phase portable or vehicle-mounted generator rated not more than five (5)kw, where the circuit conductors of the generator are insulated from the generator frame and all other grounded surfaces, need not be protected with ground-fault circuit interrupters.

(3) Assured equipment grounding conductor program. The employer shall establish and implement an assured equipment grounding conductor program on construction sites covering all cord sets, receptacles which are not a part of the permanent wiring of the building or structure, and equipment connected by cord and plug which are available for use or used by employees. This program shall comply with the following minimum requirements:

(i) A written description of the program, including the specific procedures adopted by the employer, shall be available at the job site for inspection and copying by the Director and any affected employee.

(ii) The employer shall designate one (1) or more competent persons to implement the program.

(iii) Each cord set, attachment cap, plug and receptacle of cord sets, and any equipment connected by cord and plug except cord sets and receptacles which are fixed and not exposed to damage, shall be visually inspected before each day's use for external defects, such as deformed or missing pins or insulation damage, and for indication of possible internal damage. Equipment found damaged or defective may not be used until repaired.

(iv) The following tests shall be performed on all cord sets, receptacles which are not a part of the permanent wiring of the building or structure, and cord and plug-connected equipment required to be grounded:

(a) All equipment grounding conductors shall be

tested for continuity and shall be electrically continuous.

(b) Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductor. The equipment grounding conductor shall be connected to its proper terminal.

(v) All required tests shall be performed:

(a) Before first use;

(b) Before equipment is returned to service following any repairs;

(c) Before equipment is used after any incident which can be reasonably suspected to have caused damage (for example, when a cord set is run over); and

(d) At intervals not to exceed three (3) months, except that cord sets and receptacles which are fixed and not exposed to damage shall be tested at intervals not exceeding six (6) months.

(vi) The employer may not make available or permit the use by employees of any equipment which has not met the requirements of this section.

(vii) Tests performed as required in this paragraph shall be recorded in a book approved by the Department of Mines. This test record shall identify each receptacle, cord set, and cord-and plug-connected equipment that passed the test, and shall indicate the last date it was tested or the interval for which it was tested. This record shall be kept by means of logs, color coding, or other effective means, and shall be maintained until replaced by a more current record. The record shall be made available on the job site for inspection by any affected employee.

32.2. Grounding and bonding.

(a) Portable and/or cord plug-connected equipment.

(1) The noncurrent-carrying metal parts of portable and/or plug-connected equipment shall be grounded.

(2) Portable tools and appliances protected by an approved system of double insulation, or its equivalent, need not be grounded. Where such an approved system is employed, the equipment shall be distinctively marked.

(b) Fixed equipment. Exposed noncurrent-carrying metal parts of fixed electrical equipment, including motors, generators, frames and tracks of electrically operated cranes, electrically driven machinery, etc., shall be grounded.

(c) Effective grounding. The path from circuits, equipment, structures, and conduit or enclosures to ground shall

be permanent and continuous; have ample carrying capacity to conduct safely the current liable to be imposed on it; and have impedance sufficiently low to limit the potential above ground and to result in the operation of the overcurrent devices in the circuit.

(d) Ground resistance. Driven rod electrodes shall, where practicable, have a resistance to ground not to exceed twenty-five (25) ohms where the resistance is not as low as 25 ohms, two (2) or more electrodes connected in parallel shall be used.

(e) Testing of grounds. Grounding circuits shall be checked to ensure that the circuit between the ground and the grounded power conductor has a resistance which is low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current.

(f) Extension cords. Extension cords used with portable electric tools and appliances shall be of the three (3)-wire type.

(g) Bonding. Conductors used for bonding and grounding stationary and movable equipment shall be of ample size to carry the anticipated current.

When attaching bonding and grounding clamps or clips, a secure and positive metal-to-metal contact shall be made. Such attachments shall be made before closures are opened and material movements are started and shall not be broken until after material movements are stopped and closures are made.

(h) Temporary wiring. All temporary wiring shall be effectively grounded in accordance with the National Electrical Code, NFPA 70-1971; ANSI CI-1971 (Rev. of CI-1968), Articles 305 and 310.

(i) Construction site. Precautions shall be taken to make any necessary open wiring inaccessible to unauthorized personnel.

(j) Temporary lighting. Temporary lights shall be equipped with guards to prevent accidental contact with the bulb, except that guards are not required when the construction of the reflector is such that the bulb is deeply recessed.

Temporary lights shall be equipped with heavy duty electric cords with connections and insulation maintained in safe condition. Temporary lights shall not be suspended by their electric cords unless cords and lights are designed for this means of suspension. Splices shall have insulation equal to that of the cable.

Working spaces, walkways, and similar locations shall be kept clear of cords so as not to create a hazard to employees.

Portable electric lighting used in moist and/or other hazardous locations, as for example, drums, tanks, and vessels shall be operated at a maximum of twelve (12) volts.

32.3. Equipment installation and maintenance.

(a) Flexible cable and cords.

(1) Receptacles for attachment plugs shall be of approved, concealed contact type with a contact for extending ground continuity and shall be so designed and constructed that the plug may be pulled out without leaving any live parts exposed to accidental contact.

(2) Where different voltages, frequencies, or types of current (a.c. or d.c.) are to be supplied by portable cords, receptacles shall be of such design that attachment plugs used on such circuits are not interchangeable.

(3) Attachment plugs or other connectors supplying equipment at more than three hundred (300) volts shall be of the skirted type or otherwise so designed that arcs will be confined.

(4) Attachment plugs for use in work areas shall be so constructed that they will endure rough use and be equipped with a suitable cord grip to prevent strain on the terminal screws.

(5) Flexible cord shall be used only in continuous lengths without splice, except suitable molded or vulcanized splices may be used where properly made, and the insulation shall be equal to the cable being spliced and wire connections soldered.

(6) Trailing cables shall be protected from damage.

(7) Splices in trailing cable shall be mechanically strong components and insulated to retain the mechanical and dielectric strength of the original cable.

(8) Cable passing through work areas shall be covered or elevated to protect it from damage which would create a hazard to employees.

(9) Handlamps of the portable type shall be of the molded composition or other type approved for the purpose. Brass-shell, paper-lined lampholders shall not be used. Handlamps shall be equipped with a handle and a substantial guard over the bulb and attached to the lampholder or the handle.

(10) Worn or frayed electric cables shall not be used.

(11) Extension cords shall be protected against accidental damage as may be caused by traffic, sharp corners, or projections and pinching in doors or elsewhere.

(12) Extension cords shall not be fastened with staples, hung from nails, or suspended by wire.

(b) Overcurrent protection.

(1) Overcurrent protection shall be provided by fuses or circuit breakers for each feeder and branch circuit, and shall be based on the current-carrying capacity of the conductors supplied and the power load being used.

(2) No overcurrent devices shall be placed in any permanently grounded conductor, except where the overcurrent device simultaneously opens all conductors of the circuit or for motor running protection.

(3) When fuses are installed or removed with one (1) or both terminals energized, special tools insulated for the voltage shall be used.

(c) Switches, circuit breakers, and disconnecting means.

(1) Each disconnecting means for motors and appliances, and each service feeder or branch circuit at the point where it originates, shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident.

(2) Disconnecting means shall be located or shielded so that employees will not be injured.

(3) Boxes for disconnecting means shall be securely and rigidly fastened to the surface upon which they are mounted and fitted with covers.

(4) Boxes and disconnecting means installed in damp or wet locations shall be waterproof to the extent that water does not enter or accumulate.

(d) Transformers.

(1) Energized transformers and other related electrically energized equipment over one hundred fifty (150) volts to ground shall be protected so as to prevent accidental contact with any person. Protection shall be provided by individual integrated housing or by an enclosure, such as an electrical substation fence, which accommodates a group of such

equipment. Metallic enclosures shall be grounded.

(2) Access to energized equipment covered by subparagraph (1) of this paragraph shall be secured by lock or other fasteners requiring the use of tools to open them.

(3) Signs indicating danger and prohibiting unauthorized access shall be conspicuously displayed on the housing or other enclosure around the equipment.

(4) Transformers mounted on utility poles at a height of more than twelve (12) feet from the ground are exempt from the requirements of this paragraph.

(e) Welding and cutting equipment. Welding and cutting equipment shall meet the requirements specified in Sections 20 and 31 of these regulations.

32.4. Battery rooms and battery charging.

(a) General requirements.

(1) Batteries of the nonseal type shall be located in enclosures with outside vents or in well ventilated rooms, so arranged as to prevent the escape of fumes, gases, or electrolyte spray into other areas.

(2) Ventilation shall be provided to ensure diffusion to the gases from the battery to prevent the accumulation of an explosive mixture.

(3) Racks and trays shall be substantial and treated to be resistant to the electrolyte.

(4) Floors shall be of acid resistant construction or be protected from acid accumulations.

(5) Face shields, aprons, and rubber gloves shall be provided for workmen handling acids or batteries.

(6) Facilities for quick drenching of the eyes and body shall be provided within twenty-five (25) feet of the work area for emergency use.

(7) Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of fumes from gassing batteries.

(b) Charging.

(1) Battery charging installations shall be located in areas designated for that purpose.

(2) When charging batteries, the vent caps shall be kept in place to avoid electrolyte spray. Care shall be taken to assure that vent caps are functioning.

32.5. Hazardous locations.

(a) General. For the purpose of this section, hazardous locations are defined as follows:

(1) Class 1 Locations: Class 1 Locations are those in which flammable gases or vapors are or may be present in quantities sufficient to produce explosive or ignitable mixtures.

(2) Class 2 Locations: Class 2 Locations are those which are hazardous because of the presence of combustible dust.

(3) Class 3 Locations: Class 3 Locations are those which are hazardous because of the presence of easily ignitable fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in air in quantities sufficient to produce ignitable mixtures.

(4) See the National Electrical Code, NFPA 70-1971; ANSI CI-1971 (Rev. of CI-1968) for further definitions of Divisions 1 and 2 for each class.

(b) All components and utilization equipment used in a hazardous location shall be chosen from among those listed by a nationally recognized testing laboratory, such as Underwriters Laboratories, Inc., or Factory Mutual Engineering Corporation, except custom-made components and utilization equipment.

(c) Equipment approved for a specific hazardous location shall not be installed or intermixed with equipment approved for another specific hazardous location.

(d) Employer shall ensure that all wiring components and utilization equipment are maintained as vapor, dust, or fiber tight as contemplated by their approvals. There shall be no loose or missing screws, gaskets, threaded connections, or other impairments to this tight condition.

32.6. Definitions applicable to this subpart.

(a) The definition of "Approved" as set forth in this section shall apply.

(b) "Bonding Jumper" a conductor to assure the required electrical conductivity between metal parts required to be

electrically connected.

(c) "Branch Circuits" that portion of a wiring system extending beyond the final overcurrent device protecting the circuit. (A device not approved for branch circuit protection, such as thermal cutout or motor overload protective device, is not considered as the overcurrent device protecting the circuit.)

(d) "Circuit Breaker" a device designed to open and close a circuit by manual means, an to open the circuit automatically on a predetermined overload of current, without injury to itself when properly applied within its rating.

(e) "Exposed" (as applied to live parts) means that a live part can be inadvertently touched or approached nearer than a safe distance by a person. This term applies to parts not suitably guarded, isolated, or insulated.

(f) "Ground" a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and earth, or to some conducting body which serves in place of the earth.

(g) "Grounded" connected to earth or to some conducting body which serves in place of the earth.

(h) "Hazard" is considered to include casualty, fire, and shock when applicable.

(i) "Isolated" means not readily accessible to person unless special means of access are used.

(j) "Raceway" any channel for loosely holding wires or cable in interior work which is designed expressly and used solely for this purpose. Raceways may be of metal, wood, or insulating material, and the term includes wood and metal moldings consisting of a backing and capping, and also metal ducts into which wires are to be pulled.

(k) "Shock Hazard" considered to exist at an accessible part in a circuit between the part and ground, or other accessible parts if the potential is more than forty-two and four-tenths (42.4) volts peak and the current through a one thousand five hundred (1,500)-ohm load is more than five (5) milliampheres.

(l) "Weatherproof" so constructed or protected that exposure to the weather shall not interfere with successful operation.

§36-23-33. Ladders and Scaffolding.

33.1. Ladders.

(a) General requirements.

(1) Except where either permanent or temporary stairways or suitable ramps or runways are provided, ladders described in this subpart shall be used to give safe access to all elevations. All ladders shall be inspected by a competent person before each use. Ladders with defects shall be removed from service.

(2) The use of ladders with broken or missing rungs or steps, broken or split side rails, or other faulty or defective construction is prohibited.

When ladders with such defects are discovered, they shall be immediately withdrawn from service. Inspection of metal ladders shall include checking for corrosion of interiors or open end hollow rungs.

(3) Manufactured portable wood ladders provided by the employer shall be in accordance with the provisions of the ANSI A14.1-1968, Safety Code for portable wood ladders.

(4) Portable metal ladders shall be of strength equivalent to that of wood ladders. Manufactured portable metal ladders provided by the employer shall be in accordance with the provisions of the ANSI, A14.2-1956, Safety Code for portable metal ladders.

(5) Fixed ladders shall be in accordance with the provisions of the American National Standards Institute A14.3-1956, Safety Code for fixed ladders.

(6) Portable ladder feet shall be placed on a substantial base, and the area around the top and bottom of the ladder shall be kept clear.

(7) Portable ladders shall be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is about one-quarter of the working length of the ladder (the length along the ladder between the foot and the top support.) Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds.

(8) Ladders shall not be placed in passageways, doorways, driveways, or any location where they may be displaced by activities being conducted on any work, unless protected by barricades or guards.

(9) The side rails shall extend not less than thirty-six (36) inches above the landing. When this is not practical, grab rails, which provide a secure grip for an

employee moving to or from the point of access, shall be installed.

(10) Portable ladders in use shall be tied, blocked, or otherwise secured to prevent their being displaced.

(11) Portable metal ladders shall not be used for electrical work or where they may contact electrical conductors.

(b) Job-made ladders.

(1) Job-made ladders shall be constructed for intended use. If a ladder is to provide the only means of access or exit from a working area for twenty-five (25) or more employees, or simultaneous two (2)-way traffic is expected, a double cleat ladder shall be installed.

(2) Double cleat ladders shall not exceed twenty-four (24) feet in length.

(3) Single cleat ladders shall not exceed thirty (30) feet in length between supports (base and top landing). If ladders are to connect different landings, or if the length required exceeds this maximum length, two (2) or more separate ladders shall be used, offset with a platform between each ladder. Guardrails and toeboards shall be erected on exposed sides of the platforms.

(4) The width of single cleat ladders shall be at least fifteen (15) inches, but not more than twenty (20) inches, between rails at the top.

(5) Side rails shall be parallel or flared top to bottom by not more than one-quarter (1/4) of an inch for each two (2) feet of length.

(6) Wood side rails of ladders having cleats shall be not less than one and one-half (1 1/2) inches thick and three and one-half (3 1/2) inches deep (two (2) inches x four (4) inches nominal) when made of Group 2 or Group 3 woods (see Table 27) may be used in the same cross-section of dimensions for cleat ladders up to twenty (20) feet in length.

(7) It is preferable that side rails be continuous. If splicing is necessary to attain the required length, however, the splice must develop the full strength of a continuous side rail of the same length.

(8) Two (2) inch x four (4) inch lumber shall be used for side rails of single cleat ladders up to sixteen (16) feet long; three (3) inch x six (6) inch lumber shall be used for single cleat ladders from sixteen (16) to thirty (30) feet in

length.

(9) Two (2) inch x four (4) inch lumber shall be used for side and middle rails of double cleat ladders up to twelve (12) feet in length; two (2) inch x six (6) inch lumber four double cleat ladders from twelve (12) to twenty-four (24) feet in length.

(10) Wood cleats shall have the following minimum dimensions when made of Group 1 woods, (see Table 28):

(11) Cleats may be made of species of any other group of wood (see Table 27) provided equal or greater strength is maintained.

(12) Cleats shall be inset into the edges of the side rails one-half (1/2) inch, or filler blocks shall be used on the rails between the cleats. The cleats shall be secured to each rail with three (3) ten (10)d common wire nails or other fasteners of equivalent strength. Cleats shall be uniformly spaced, twelve (12) inches top-to-top.

33.2. Scaffolding.

(a) General requirements.

(1) Scaffolds shall be erected in accordance with requirements of this section. All scaffolding shall be inspected prior to each use and scaffolding found defective of improper type or not properly constructed will not be used until corrected. Scaffolding shall be inspected for dry rot, cracks or other defects prior to construction of a scaffold. Scaffold planks shall be inspected as to the above mentioned. Defective planks shall be removed from service.

(2) The footing or anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Unstable objects such as barrels, boxes, loose brick, or concrete blocks, shall not be used to support scaffolds or planks.

(3) No scaffold shall be erected, moved, dismantled, or altered except under the supervision of competent persons.

(4) Guardrails and toeboards shall be installed on all open sides and ends of platforms more than ten (10) feet above the ground or floor, except needle beam scaffolds and floats. Scaffolds four (4) feet to ten (10) feet in height, having a minimum horizontal dimension in either direction of less than forty-five (45) inches, shall have standard guardrails installed on all open sides and ends of the platform.

(5) Guardrails shall be two (2) inches x four (4) inches, or the equivalent, approximately forty-two (42) inches high, with a midrail, when required. Supports shall be at intervals not to exceed eight (8) feet. Toeboards shall be a minimum of four (4) inches in height.

(6) Where persons are required to work or pass under the scaffold, scaffolds shall be provided with a screen between the toeboard and the guardrail, extending along the entire opening, consisting of the No. 18 gauge wire, one and one-half (1 1/2) inch mesh, or the equivalent.

(7) Scaffolds and their components shall be capable of supporting without failure at least four (4) times the maximum intended load.

(8) Any scaffold including accessories such as braces, brackets, trusses, screw legs, ladders, etc., damaged or weakened from any cause shall be immediately repaired or replaced.

(9) All load-carrying timber members of scaffold framing shall be a minimum of one thousand five hundred (1,500) fiber construction grade lumber. All dimensions are nominal sizes, except that where rough sizes are noted, only rough or undressed lumber of the size specified will satisfy minimum requirements.

(10) All planking shall be scaffold grades, or equivalent, as recognized by approved grading rules for the species of wood used. The maximum permissible spans for two (2-) x ten (10)-inch or wider planks shall be as shown in Table 29:

(11) The maximum permissible span for one and one-quarter (1 1/4) inch x nine (9) inch or wider plank of full thickness shall be four (4) feet with medium duty loading of fifty (50) p.s.f.

(12) All planking or platforms shall be overlapped (minimum twelve (12) inches), or secured from movement.

(13) An access ladder or equivalent safe access shall be provided.

(14) Scaffold planks shall extend over their end supports not less than six (6) inches nor more than twelve (12) inches.

(15) The poles, legs, or uprights of scaffolds shall be plumb, and securely and rigidly braced to prevent swaying and displacement.

(16) Overhead protection shall be provided for men on

a scaffold exposed to overhead hazards.

(17) Slippery conditions on scaffolds shall be eliminated as soon as possible after they occur.

(18) No welding, burning, riveting, or open flame work shall be performed on any staging suspended means of fiber or synthetic rope. Only treated or protected fiber or synthetic ropes shall be used for or near any work involving the use of corrosive substances or chemicals.

(19) Wire, synthetic, or fiber rope used for scaffold suspension shall be capable of supporting at least six (6) times the rated load.

(20) The use of shore or lean-to scaffolds is prohibited.

(21) Lumber sizes, when used in this subpart, refer to nominal sizes except where otherwise stated.

(b) Wood pole scaffolds.

(1) Scaffold poles shall bear on a foundation of sufficient size and strength to spread the load from the pole over a sufficient area to prevent settlement. All poles shall be set plumb.

(2) Where wood poles are spliced, the ends shall be squared and the upper section shall rest squarely on the lower section. Wood splice plates shall be provided on at least two (2) adjacent sides and shall be not less than four (4) feet in length, overlapping the abutted ends equally, and have the same width and not less than the cross sectional area of the pole. Splice plates or other materials of equivalent strength may be used.

(3) Independent pole scaffolds shall be set as near to the wall of the building as practicable.

(4) All pole scaffolds shall be securely guyed or tied to the building or structure. Where the height or length exceeds twenty-five (25) feet, the scaffold shall be secured at intervals not greater than twenty-five (25) feet vertically and horizontally.

(5) Putlogs or bearers shall be set with their greater dimension vertical, long enough to project over the ledgers of the inner and outer rows of poles at least three (3) inches for proper support.

(6) Every wooden putlog on single pole scaffolds shall

be reinforced with three-sixteenths (3/16) inch x two (2) inch steel strip, or equivalent, secured to its lower edge throughout its entire length.

(7) Ledgers shall be long enough to extend over two (2) pole spaces. Ledgers shall not be spliced between the poles. Ledgers shall be reinforced by bearing blocks securely nailed to the side of the pole to form a support for the ledger.

(8) Diagonal bracing shall be provided to prevent the poles from moving in a direction parallel with the wall of the building, or from buckling.

(9) Cross bracing shall be provided between the inner and outer sets of poles in independent pole scaffolds. The free ends of pole scaffolds shall be cross braced.

(10) Full diagonal face bracing shall be erected across the entire face of pole scaffolds in both directions. The braces shall be spliced at the poles. The inner row of poles on medium and heavy duty scaffolds shall be braced in a similar manner.

(11) Platform plank shall be laid with their edges close together so the platform will be tight with no spaces through which tools or fragments of material can fall.

(12) Where planking is lapped, each plank shall lap its end supports at least twelve (12) inches. Where the ends of planks abut each other to form a flush floor, the butt joint shall be at the centerline of a pole. The abutted ends shall rest on separate bearers. Intermediate beams shall be provided where necessary to prevent dislodgement of plants due to deflection, and the ends shall be secured to prevent their dislodgement.

(13) When a scaffold materially changes its direction, the platform planks shall be laid to prevent tipping. The planks that meet the corner putlog at an angle shall be laid first, extending over the diagonally placed putlog far enough to have a good safe bearing, but not far enough to involve any danger from tipping. The planking running in the opposite direction at an angle shall be laid so as to extend over and rest on the first layer of planking.

(14) When moving platforms to the next level, the old platform shall be left undisturbed until the new putlogs or bearers have been set in place, ready to receive the platform planks.

(15) Guardrails, made of lumber not less than two (2) inches x four (4) inches (or other material providing equivalent protection), approximately forty-two (42) inches high, with a

midrail of one (1) inch x six (6) inch lumber (or other material providing equivalent protection), and toeboards, shall be installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section, when required.

(16) All wood pole scaffolds sixty (60) feet or less in height shall be constructed and erected in accordance with Table 30 through 36. If they are over sixty (60) feet in height, they shall be designed by a qualified engineer competent in this field, and it shall be constructed and erected in accordance with such design.

(c) Tube and coupler scaffolds.

(1) A light duty tube and coupler scaffold shall have all posts, bearers, runners, and bracing of nominal two (2) inch O. D. steel tubing. The posts shall be spaced no more than six (6) feet apart by ten (10) feet along the length of the scaffold. Other structural metals when used must be designed to carry an equivalent load. No dissimilar metals shall be used together.

(2) A medium duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal two (2) inch O. D. steel tubing. Posts spaced not more than five (5) feet apart by eight (8) feet along the length of the scaffold shall have bearers of nominal two (2) inch O. D. steel tubing.

Other structural metals, when used, must be designed to carry an equivalent load. No dissimilar metals shall be used together.

(3) A heavy duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal two (2) inch O. D. steel tubing, with the posts spaced not more than six (6) feet x six (6) feet six (6) inches. Other structural metals, when used, must be designed to carry an equivalent load. No dissimilar metals shall be used together.

(4) Tube and coupler scaffolds shall be limited in heights and working levels to those permitted in Tables 36, 37 and 38. Drawings and specifications of all tube and coupler scaffolds above the limitations in Tables 36, 37 and 38 shall be designed by a qualified engineer competent in this field.

(5) All tube and coupler scaffolds shall be constructed and erected to support four (4) times the maximum intended loads, as set forth in Tables 36, 37 and 38, or as set forth in the specifications by a licensed professional engineer competent in this field.

(6) Posts shall be accurately spaced, erected on suitable bases, and maintained plumb.

(7) Runners shall be erected along the length of the scaffold, located on both the inside and the outside posts at even height. Runners shall be interlocked to form continuous lengths and coupled to each post. The bottom runners shall be located as close to the base as possible. Runners shall be placed not more than six (6) feet six (6) inches on centers.

(8) Bearers shall be installed transversely between posts and shall be securely coupled to the posts bearing on the runner coupler. When coupled directly to the runners, the coupler must be kept as close to the posts as possible.

(9) Bearers shall be at least four (4) inches but not more than twelve (12) inches longer than the post spacing or runner spacing.

(10) Cross bracing shall be installed across the width of the scaffold at least every third set of posts horizontally and every fourth runner vertically. Such bracing shall extend diagonally from the inner and outer runners upward to the next outer and inner runners.

(11) Longitudinal diagonal bracing on the inner and outer rows of poles shall be installed at approximately a forty-five (45) degree angle from near the base of the first outer post upward to the extreme top of the scaffold. Where the longitudinal length of the scaffold permits, such bracing shall be duplicated beginning at every fifth post. In a similar manner, longitudinal diagonal bracing shall also be installed from the last post extending back and upward toward the first post. Where conditions preclude the attachment of this bracing to the posts, it may be attached to the runners.

(12) The entire scaffold shall be tied to and securely braced against the building at intervals not to exceed thirty (30) feet horizontally and twenty-six (26) feet vertically.

(13) Guardrails, made of lumber not less than two (2) inches x four (4) inches (or other material providing equivalent protection), approximately forty-two (42) inches high, with a midrail of one (1) inch x six (6) inch lumber (or other material providing equivalent protection), and toeboard shall be installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(d) Tubular welded frame scaffolds.

(1) Metal tubular frame scaffolds including accessories such as braces, brackets, trusses, screw legs, ladders, etc., shall be designed, constructed, and erected to safely support four (4) times the maximum rated load.

(2) Spacing of panels or frames shall be consistent with the loads imposed.

(3) Scaffolds shall be properly braced by cross bracing or diagonal braces, or both, for securing vertical members together laterally, and the cross braces shall be of such length as will automatically square and align vertical members so that the erected scaffold is always plumb, square, and rigid. All brace connections shall be made secure.

(4) Scaffold legs shall be set on adjustable bases or plain bases placed on mud sills or other foundations adequate to support the maximum rated load.

(5) The frames shall be placed one (1) on top of the other with coupling or stacking pins to provide proper vertical alignment of the legs.

(6) Where uplift may occur, panels shall be locked together vertically by pins or other equivalent suitable means.

(7) To prevent movement, the scaffold shall be secured to the building or structure at intervals not to exceed thirty (30) feet horizontally and twenty-six (26) feet vertically.

(8) Maximum permissible spans or planking shall be in conformity with paragraph (a)(10) of this section.

(9) Drawings and specifications for all frame scaffolds over one hundred twenty-five (125) feet in height above the base plates shall be designed by a registered professional engineer.

(10) Guardrails made of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), and approximately forty-two (42) inches high, with a midrail of one (1) inch x six (6) inch lumber (or other material providing equivalent protection), and toeboards, shall be installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(e) Manually propelled mobile scaffolds.

(1) When free-standing mobile scaffold towers are used, the height shall not exceed four (4) times the minimum base

dimension.

(2) Casters shall be properly designed for strength and dimensions to support four (4) times the maximum intended load. All casters shall be provided with a positive locking device to hold the scaffold in position.

(3) Scaffolds shall be properly braced by cross bracing and horizontal bracing conforming with paragraph (d)(3) of this section.

(4) Platforms shall be tightly planked for the full width of the scaffold except for necessary entrance opening. Platforms shall be secured in place.

(5) A ladder or stairway shall be provided for proper access and exit and shall be affixed or built into the scaffold and so located that when in use it will not have a tendency to tip the scaffold. A landing platform must be provided at intervals not to exceed thirty-five (35) feet.

(6) The force necessary to move the mobile scaffold shall be applied near or as close to the base as practicable and provision shall be made to stabilize the tower during movement from one (1) location to another. Scaffolds shall only be moved on level floors, free of obstructions and openings.

(7) The employer shall not allow employees to ride on manually propelled scaffolds unless the following conditions exist:

(i) The floor or surface is within three (3) degrees of level, and free from pits, holes, or obstructions;

(ii) The minimum dimension of the scaffold base when ready for rolling, is at least one-half (1/2) the height. Outriggers, if used, shall be installed on both sides of staging;

(iii) The wheels are equipped with rubber or similar resilient tires;

(iv) All tools and materials are secured or removed from the platform before the mobile scaffold is moved.

(8) Scaffolds in use by any person shall rest upon a suitable footing and shall stand plumb. The casters or wheels shall be locked to prevent any movement.

(9) Mobile scaffolds constructed of metal members shall also conform to applicable provisions of paragraphs (b), (c), or (d) of this section, depending on the material of which they are constructed.

(10) Guardrails of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), approximately forty-two (42) inches high, with a midrail of one (1) inch x six (6) inch lumber (or other material providing equivalent protection), and toeboards, shall be installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(f) Outrigger scaffolds.

(1) Outrigger beams shall extend not more than six (6) feet beyond the face of the building. The inboard end of outrigger beams, measured from the fulcrum point to anchorage point, shall be not less than one and one-half (1 1/2) time the outboard end in length. The beams shall rest on edge, the sides shall be plumb, and the edges shall be horizontal. The fulcrum point of the beam shall rest on a secure bearing at least six (6) inches in each horizontal dimension. The beam shall be secured in place against movement and shall be securely braced at the fulcrum point against tipping.

(2) The inboard ends of outrigger beams shall be securely anchored either by means of struts bearing against sills in contact with the overhead beams or ceiling, or by means of tension members secured to the floor joints underfoot, or by both if necessary. The inboard ends of outrigger beams shall be secured against tipping and the entire supporting structure shall be securely braced in both directions to prevent any horizontal movement.

(3) Unless outrigger scaffolds are designed by a registered professional engineer competent in this field, they shall be constructed and erected in accordance with Table 39. Outrigger scaffolds, designed by a registered professional engineer, shall be constructed and erected in accordance with such design.

(4) Planking shall be laid tight and shall extend to within three (3) inches of the building wall. Planking shall be secured to the beams.

(5) Guardrails made of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), approximately forty-two (42) inches high, with a midrail of one (1) inch x six (6) inch lumber (or other material providing equivalent protection), and toeboards, shall be installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(h) Masons' adjustable multiple-point suspension scaffolds.

(1) The scaffold shall be capable of sustaining a working load of fifty (50) pounds per square foot and shall not be loaded in excess of that figure.

(2) The scaffold shall be provided with hoisting machines that meet the requirements of underwriters laboratories of factory mutual engineering corporation.

(3) The platform shall be supported by wire ropes, capable of supporting at least six (6) times the intended load, suspended from overhead outrigger beams.

(4) The scaffold outrigger beams shall consist of structural metal securely fastened or anchored to the frame or floor system of the building or structure.

(5) Each outrigger beam shall be equivalent in strength to at least a standard seven (7) inch, fifteen and three-tenths (15.3) lb. steel I-beam, at least fifteen (15) feet long, and shall not project more than six (6) feet six (6) inch beyond the bearing point.

(6) Where the overhand exceeds six (6) feet six (6) inches, outrigger beams shall be composed of stronger beams or multiple beams and be installed under the supervision of a competent person.

(7) All outrigger beams shall be set and maintained with their webs in a vertical position.

(8) A stop bolt shall be placed at each end of every outrigger beam.

(9) The outrigger beam shall rest on suitable wood bearing blocks.

(10) The free end of the suspension wire ropes shall be equipped with proper size thimbles and secured by splicing or other equivalent means. The running ends shall be securely attached to the hoisting drum and at least four (4) turns of wire rope shall at all times remain on the drum. The use of fiber rope is prohibited.

(11) Where a single outrigger beam is used, the steel shackles or clevises with which the wire ropes are attached to the outrigger beams shall be placed directly over the hoisting drums.

(12) The scaffold platform shall be equivalent in strength to at least two (2) inches planking. (For maximum

planking spans, see paragraph (a)(11) of this section.)

(13) When employees are at work on the scaffold and an overhead hazard exists, overhead protection shall be provided on the scaffold, not more than nine (9) feet above the platform, consisting of two (2) inch planking, or material of equivalent strength, laid tight, and extending not less than the width of the scaffold.

(14) Each scaffold shall be installed or relocated under the supervision of a competent person.

(15) Guardrails made of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), approximately forty-two (42) inches high, with a midrail, and toeboards, shall be installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(i) (Swinging scaffolds) Two (2) point suspension.

(1) Two (2) point suspension scaffold platforms shall be not less than twenty (20) inches nor more than thirty-six (36) inches wide overall. The platform shall be securely fastened to the hangers by U-bolts or by other equivalent means.

(2) The hangers of two (2) point suspension scaffolds shall be made of mild steel, or other equivalent materials, having a cross-sectional area capable of sustaining four (4) times the maximum rated load, and shall be designed with a support for guardrail, intermediate rail, and toeboard.

(3) When hoisting machines are used on two (2) point suspension scaffolds, such machines shall be of a design tested and approved by Underwriters Laboratories of Factory Mutual Engineering Corporation.

(4) The roof irons or hooks shall be of mild steel, or other equivalent material, of proper size and design, securely installed and anchored. Tiebacks of three-quarter (3/4) inch manila rope, or the equivalent, shall serve as a secondary means of anchorage, installed at right angles to the face of the building, whenever possible, and secured to a structurally sound portion of the building.

(5) Two-point suspension scaffolds shall be suspended by wire, synthetic or fiber ropes capable of supporting at least six (6) times the rated load. All other components shall be

capable of supporting at least four (4) times the rated load.

(6) The sheaves of all blocks, consisting of at least one (1) double and one (1) single block, shall fit the size and type of rope used.

(7) All wire ropes, fiber and synthetic ropes, slings, hangers, platforms, and other supporting parts shall be inspected before every installation. Periodic inspections shall be made while the scaffold is in use.

(8) On suspension scaffolds designed for a working load of five hundred (500) pounds, no more than two (2) men shall be permitted to work at one time. On suspension scaffolds with a working load of seven hundred fifty (750) pounds, no more than three (3) men shall be permitted to work at one time. Each employee shall be protected by an approved safety life belt attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines which will safely suspend the employee in case of a fall. In order to keep the lifeline continuously attached, with a minimum of slack, to a fixed structure, the attachment point of the lifeline shall be appropriately changed as the work progresses.

(9) Two (2) point suspension scaffolds shall be securely lashed to the building or structure to prevent them from swaying. Window cleaners' anchors shall not be used for this purpose.

(10) The platform of every two (2) point suspension scaffold shall be one of the following types:

(i) Ladder-type platforms. The side stringer shall be of clear straight-grained spruce or materials of equivalent strength and durability. The rungs shall be of straight-grained oak, ash, or hickory, at least one and one-eighth (1 1/8) inch in diameter, with seven-eighths (7/8) inch. The stringers shall be tied together with tie rods not less than one-quarter (1/4) inch in diameter, passing through the stringers and riveted up tight against washers on both ends. The flooring strips shall be spaced not more than five-eighths (5/8) inch apart except at the side rails where the space may be one (1) inch. Ladder-type platforms shall be constructed in accordance with Table 40.

(ii) Plank-type platforms. Plank-type platforms shall be composed of not less than nominal two (2) inch x ten (10) inch unspliced planks, properly cleated together on the underside, starting six (6) inches from each end; intervals in between shall not exceed four (4) feet. The plank-type platform shall not extend beyond the hangers more than twelve (12) inches.

A bar or other effective means shall be securely fastened to the platform at each end to prevent its slipping off the hanger. The span between hangers for plank-type platforms shall not exceed eight (8) feet.

(iii) Beam-type platforms. Beam platforms shall have side stringers of lumber not less than two (2) inch x six (6) inch set on edge. The span between hangers shall not exceed twelve (12) feet when beam platforms are used. The flooring shall be supported on two (2) inch x six (6) inch cross beams, laid flat and set into the upper edge of the stringers with a snug fit, at intervals of not more than four (4) feet, securely nailed in place. The flooring shall be of one (2) inch x six (6) inch material properly nailed. Floor board shall not be spaced more than one-half (1/2) inch apart.

(iv) Light metal-type platforms, when used, shall be tested and listed according to Underwriters Laboratories of Factory Mutual Engineering Corporation.

(11) Guardrails made of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), approximately forty-two (42) inches high, with a midrail, and toeboards, shall be installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(j) Stone setters' adjustable multiple-point suspension scaffolds.

(1) The scaffold shall be capable of sustaining a working load of twenty-five (25) pounds per square foot and shall not be used for storage of stone or other heavy materials.

(2) When used, the hoisting machine and its supports shall be of a type tested and listed by Underwriters Laboratories of Factory Mutual Engineering Corporation.

(3) The platform shall be securely fastened to the hangers of U-bolts or other equivalent means. (For materials and spans, see subdivision (ii) of paragraph (i)(10), plank-type platforms, and Table 40 of this section.)

(4) The scaffold unit shall be suspended from metal outriggers, from brackets, wire rope slings, or iron hooks.

(5) Outriggers, when used, shall be set with their webs in a vertical position, securely anchored to the building or structure and provided with stop bolts at each end.

(6) The scaffold shall be supported by wire rope capable of supporting at least six (6) times the rated load. All other components shall be capable of supporting at least four (4) times the rated load.

(7) The free ends of the suspension wire ropes shall be equipped with proper size thimbles, secured by splicing or other equivalent means. The running ends shall be securely attached to the hoisting drum and at least four (4) turns of wire rope shall remain at the drum at all times.

(8) When two (2) or more scaffolds are used on a building or structure, they shall not be bridged one to the other, but shall be maintained at even height with the platforms abutting closely.

(9) Guardrails made of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), approximately forty-two (42) inches high, with a midrail, and toeboards, shall be installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(k) Single-point adjustable suspension scaffolds.

(1) The scaffolding, including power units or manually operated winches, shall be of a type tested and listed by Underwriters Laboratories of Factory Mutual Engineering Corporation.

(2) The power units may be either electrically or air motor driven.

(3) All power-operated gears and brakes shall be enclosed.

(4) In addition to the normal operating brake, all power-driven units shall have an emergency brake which engages automatically when the normal speed of descent is exceeded.

(5) The hoisting machines, cables, and equipment shall be regularly serviced and inspected.

(6) The units may be combined to form a two (2) point suspension scaffold. Such scaffold shall then comply with paragraph (i) of this section.

(7) The supporting cable shall be vertical for its entire length, and the basket shall not be swayed nor the cable fixed to any intermediate points to change the original path of

travel.

(8) Suspension methods shall conform to applicable provisions of paragraphs (h) and (i) of this section.

(9) Guards, midrails, and toeboards shall completely enclose the cage or basket. Guardrails shall be no less than two (2) inch x four (4) inch or the equivalent, approximately forty-two (42) inches above the platform. Midrails shall be one (1) inch x six (6) inch or the equivalent, installed equidistant between the guardrail and platform. Toeboards shall be a minimum of four (4) inches in height.

(10) For additional details not covered in this paragraph, applicable technical portions of American National Standards Institute A120.1-1970, power operated devices for exterior building maintenance powered platforms, shall be used.

(l) Boatswain's chairs.

(1) The chair seat shall not be less than twelve (12) inch x twenty-four (24) inch, and one (1) inch thickness. The seat shall be reinforced on the underside by cleats securely fastened to prevent the board from splitting.

(2) The two (2) fiber rope seat slings shall be of five-eighths (5/8) inch diameter, reeved through the four (4) seat holes so as to cross each other on the underside of the seat.

(3) Seat slings shall be of at least three-eighths (3/8) inch wire rope when an employee is conducting a heat-producing process, such as gas or arc welding.

(4) The employee shall be protected by a safety belt and lifeline.

The attachment point of the lifeline to the structure shall be appropriately changed as the work progresses.

(5) The tackle shall consist of correct size ball bearing or brushed blocks and properly spliced five-eighths (5/8) inch diameter first-grade manila rope, or equivalent.

(6) The roof irons, hoods, or the object to which the tackle is anchored, shall be securely installed. Tiebacks, when used, shall be installed at right angles to the face of the building and securely fastened.

(m) Carpenters' bracket scaffolds.

(1) The brackets shall consist of a triangular wood

frame not less than two (2) inch x three (3) inch in cross section, or of metal of equivalent strength. Each member shall be properly fitted and securely joined.

(2) Each bracket shall be attached to the structure by means of one (1) of the following:

(i) A bolt, no less than five-eighths (5/8) inches in diameter, which shall extend through to the inside of the building wall;

(ii) A metal stud attachment device;

(iii) Welding to steel tanks;

(iv) Hooking over a well-secured and adequately strong supporting member.

(3) The brackets shall be spaced no more than eight (8) feet apart.

(4) No more than two (2) employees shall occupy any given eight (8) feet of a bracket scaffold at any time. Tools and materials shall not exceed seventy-five (75) pounds in addition to the occupancy.

(5) The platform shall consist of not less than two (2) inch x ten (10) inch nominal size planks extending nor more than twelve (12) inches or less than six (6) inches beyond each end support.

(6) Guardrails made of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), approximately forty-two (42) inches high, with a midrail, of one (1) inch x six (6) inch lumber (or other material providing equivalent protection), and toeboards, shall be installed at all open sides and ends of all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(n) Bricklayers' square scaffolds.

(1) The square shall not exceed five (5) feet in width and five (5) feet in height.

(2) Members shall be not less than those specified in Table 41.

(3) The squares shall be reinforced on both sides of each corner with one (1) inch x six (6) inch gusset pieces. They shall also have diagonal braces one (1) inch x eight (8) inch on

both sides running from center to center of each member, or other means to secure equivalent strength and rigidity.

(4) The squares shall be set not more than five (5) feet apart for medium duty scaffolds, and not more than eight (8) feet apart for light duty scaffolds. Bracing, one (1) inch x eight (8) inch, extending from the bottom of each square to the top of the next square, shall be provided on both front and rear sides of the scaffold.

(5) Platform planks shall be at least two (2) inch x ten (10) inch nominal size. The ends of the planks shall overlap the bearers of the squares and each plank shall be supported by not less than three (3) squares.

(6) Bricklayers' square scaffolds shall not exceed three (3) tiers in height and shall be so constructed and arranged that one (1) square shall rest directly above the other. The upper tiers shall stand on a continuous row of planks laid across the next lower tier and be nailed down or otherwise secured to prevent displacement.

(7) Scaffolds shall be level and set upon a firm foundation.

(o) Horse scaffolds.

(1) Horse scaffolds shall not be constructed or arranged more than two (2) tiers or ten (10) feet in height.

(2) The members of the horses shall be not less than those specified in Table 42.

(3) Horses shall be spaced not more than five (5) feet for medium duty and not more than eight (8) feet for light duty.

(4) When arranged in tiers, each horse shall be placed directly over the horse in the tier below.

(5) On all scaffolds arranged in tiers, the legs shall be nailed down or otherwise secured to the planks to prevent displacement or thrust and each tier shall be substantially cross braced.

(6) Horses or parts which have become weak or defective shall not be used.

(7) Guardrails made of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), approximately forty-two (42) inches high, with a midrail, of one (1) inch x six (6) inch lumber (or other material providing equivalent protection), and toeboards, shall be

installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section when required.

(p) Needle beam scaffold.

(1) Wood needle beams shall be not less than four (4) inch x five (5) inch in size, with the greater dimension placed in a vertical direction. Metal beams or the equivalent, conforming to paragraphs (a)(8) and (10) of this section, may be used and shall not be altered or moved horizontally while they are in use.

(2) Ropes or hangers shall be provided for supports. The span between supports on the needle beam shall not exceed ten (10) feet for four (4) inch x six (6) inch timbers. Rope supports shall be equivalent in strength to one (1) inch diameter first-grade manila rope.

(3) The ropes shall be attached to the needle beams by a scaffold hitch or a properly made eye splice. The loose end of the rope shall be tied by a bowline knot or by a round turn and a half hitch.

(4) The scaffold hitch shall be arranged so as to prevent the needle beam from rolling or becoming otherwise displaced.

(5) The platform span between the needle beams shall not exceed eight (8) feet when using two (2) inch scaffold plank. For spans greater than eight (8) feet, platforms shall be designed based on design requirements for the special span. The overhang of each end of the platform planks shall be not less than six (6) inches and not more than twelve (12) inches.

(6) When needle beam scaffolds are used, the planks shall be secured against slipping.

(7) All unattached tools, bolts, and nuts used on needle beam scaffolds shall be kept in suitable containers, properly secured.

(8) One (1) end of a needle beam scaffold may be supported by a permanent structural member conforming to paragraphs (a)(8) and (10) of this section.

(9) Each employee working on a needle beam scaffold shall be protected by a safety belt and lifeline.

(q) Plasterers', decorators', and large area scaffolds.

(1) Plasterers', lathers', and ceiling workers' inside scaffolds shall be constructed in accordance with the general requirements set forth for independent wood pole scaffolds. (See paragraph (b) and Tables 33, 34 and 39 of this section.)

(2) All platform planks shall be laid with the edges close together.

(3) When independent pole scaffold platforms are erected in sections, such sections shall be provided with connecting runways equipped with substantial guardrails.

(4) Guardrails made of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), approximately forty-two (42) inches high, with a midrail of one (1) inch x six (6) inch lumber (or other material providing equivalent protection), and toeboards, shall be installed on all open sides and ends of all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(r) Interior hung scaffolds.

(1) An interior hung scaffold shall be hung or suspended from the roof structure or ceiling beams.

(2) The suspending wire or fiber rope shall be capable of supporting at least six (6) times the rated load. The rope shall be wrapped at least twice around the supporting members and twice around the bearers of the scaffold, with each end of the wire rope secured by at least three (3) standard wire-rope clips properly installed.

(3) For hanging wood scaffolds, the following minimum nominal size material shall be used:

(i) Supporting bearers two (2) inch x ten (10) inch on edge;

(ii) Planking two (2) inch x ten (10) inch, with maximum span seven (7) feet for heavy duty and ten (10) feet for light duty or medium duty.

(4) Steel tube and coupler members may be used for hanging scaffolds with both types of scaffold designed to sustain a uniform distributed working load up to heavy duty scaffold loads with a safety factor of four (4).

(5) Guardrails made of lumber, not less than two (2) inch x four (4) inch (or other material providing equivalent protection), approximately forty-two (42) inches high, with a

midrail of one (1) inch x six (6) inch lumber (or other material providing equivalent protection), and toeboards, shall be installed at all open sides and ends on all scaffolds more than ten (10) feet above the ground or floor. Toeboards shall be a minimum of four (4) inches in height. Wire mesh shall be installed in accordance with paragraph (a)(6) of this section.

(s) Ladder jack scaffolds.

(1) All ladder jack scaffolds shall be limited to light duty and shall not exceed a height of twenty (20) feet above the floor or ground.

(2) All ladders used in connection with ladder jack scaffolds shall be heavy-duty ladders and shall be designed and constructed in accordance with American National Standards Institute A14.1-1968 Safety Code for portable wood ladders, and A14.2-1968, Safety Code for portable metal ladders. Cleated ladders shall not be used for this purpose.

(3) The ladder jack shall be so designed and constructed that it will bear on the side rails in addition to the ladder rungs, or if bearing on rungs only, the bearing area shall be at least ten (10) inches on each rung.

(4) Ladders used in conjunction with ladder jacks shall be so placed, fastened, held, or equipped with devices so as to prevent slipping.

(5) The wood platform planks shall be not less than two (2) inch nominal in thickness. Both metal and wood platform planks shall overlap the bearing surface not less than twelve (12) inches. The span between supports for wood shall not exceed eight (8) feet. Platform width shall be not less than eighteen (18) inches.

(6) Not more than two (2) employees shall occupy any given eight (8) feet of any ladder jack scaffold at any one (1) time.

(t) Window jack scaffolds.

(1) Window jack scaffolds shall be used only for the purpose of working at the window opening through which the jack is placed.

(2) Window jacks shall not be used to support planks placed between one (1) window jack and another or for other elements of scaffolding.

(3) Window jack scaffolds shall be provided with guardrails unless safety belts with lifelines are attached and

provided for employee.

(4) Not more than one (1) employee shall occupy a window jack scaffold at any one (1) time.

(u) Roofing brackets.

(1) Roofing brackets shall be constructed to fit the pitch of the roof.

(2) Brackets shall be secured in place by nailing in addition to the pointed metal projections. When it is impractical to nail brackets, rope supports shall be used. When rope supports are used, they shall consist of first grade manila of at least three-quarter (3/4) inch diameter, or equivalent.

(3) A catch platform shall be installed below the working area of roofs more than sixteen (16) feet from the ground to eaves with a slope greater than four (4) inch in twelve (12) inch without a parapet. In width, the platform shall extend two (2) feet beyond the protection of the eaves and shall be provided with a guardrail, midrail, and toeboard. This provision shall not apply where employees engaged in work upon such roofs are protected by a safety belt attached to a lifeline.

(v) Crawling board or chicken ladders.

(1) Crawling board shall be not less than ten (10) inch wide and one (1) inch thick, having cleats one (1) inch x one and one-half (1 1/2) inch the Cleats shall be equal in length to the width of the board and spaced at equal intervals not to exceed twenty-four (24) inches. Nails shall be driven through and clinched on the underside. The crawling board shall extend from the ridge pole to the eaves when used in connection with roof construction, repair, or maintenance.

(2) A firmly fastened lifeline of at least three-quarter (3/4) inch diameter rope, or equivalent, shall be strung beside each crawling board for a handhold.

(3) Crawling boards shall be secured to the roof by means of adequate ridge hooks or other effective means.

(w) Form scaffolds.

(1) Form scaffolds shall be constructed of wood or other suitable materials, such as steel or aluminum members of known strength characteristics.

All scaffolds shall be designed and erected with a minimum safety factor of four (4), computed on the basis of the maximum rated load.

(2) All scaffold planking shall be a minimum of two (2) inch x ten (10) inch nominal scaffold grade, as recognized and approved grading rules for the species of lumber used, or equivalent material. Maximum permissible spans shall not exceed eight (8) feet on centers for two (2) inch x ten (10) inch nominal planking. Scaffold planks shall be either nailed or bolted to the ledgers or of such length that they overlap the ledgers at least six (6) inches. Unsupported projecting ends of scaffolding planks shall be limited to a maximum overhang of twelve (12) inches.

(3) Scaffolds shall not be loaded in excess of the working load for which they were designed.

(4) Figure-four (4) form scaffolds:

(i) Figure-four (4) scaffolds are intended for light duty and shall not be used to support loads exceeding twenty-five (25) pounds per square foot unless specifically designed for heavier loading. For minimum design criteria, see Table 43.

(ii) Figure-four (4) form scaffold frames shall be spaced not more than eight (8) feet on centers and constructed from sound lumber, as follows:

The outrigger ledger shall consist of two (2) pieces of one (1) inch x six (6) inch or heavier material nailed on opposite sides of the vertical form support. Ledgers shall project not more than three (3) feet six (6) inches from the outside of the form support and shall be substantially braced and secured to prevent tipping or turning. The knee or angle brace shall intersect the ledger at least three (3) feet from the form at an angle of approximately forty-five degrees (45), and the lower end shall be nailed to a vertical support. The platform shall consist of two (2) or more two (2) inch x ten (10) inch planks, which shall be of such length that they extend at least six (6) inches beyond ledgers at each end unless secured to the ledgers. When planks are secured to the ledgers (nailed or bolted) a wood filler strip shall be used between the ledgers. Unsupported projecting ends of planks shall be limited to an overhang of twelve (12) inches.

(5) Metal bracket form scaffolds:

(i) Metal brackets or scaffold jacks which are an integral part of the form shall be securely bolted or welded to the form. Folding type brackets shall be either bolted or secured with a locking-type pin when extended for use.

(ii) "Clip-On" or "Hook-Over" brackets may be used, provided the form walers are bolted to the form or secured

by snap ties or shea-volt extending through the form and securely anchored.

(iii) Metal brackets shall be spaced not more than eight (8) feet on centers.

(iv) Scaffold planks shall be either bolted to the metal brackets or of such length that they overlap the brackets at each end by at least six (6) inches.

Unsupported projecting ends of scaffold planks shall be limited to a maximum overhang of twelve (12) inches.

(v) Metal bracket form scaffolds shall be equipped with wood guardrails, intermediate rails, toeboards, and scaffold planks meeting the minimum dimensions shown in Table 44. (Metal may be substituted for wood, providing it affords equivalent or greater design strength.)

(6) Wooden bracket form scaffolds:

(i) Wooden bracket form scaffolds shall be an integral part of the form panel. The minimum design criteria set forth herein and in Table 45 cover scaffolding intended for light duty and shall not be used to support loads exceeding twenty-five (25) pounds per square foot, unless specifically designed for heavier loading.

(ii) Scaffold planks shall be either nailed or bolted to the ledgers or of such length that they overlap the ledgers at each end by at least six (6) inches. Unsupported projecting ends of scaffold planks shall be limited to a maximum overhang of twelve (12) inches.

(iii) Guardrails and toeboards shall be installed on all open sides and ends of platforms and scaffolding over ten (10) feet above the floor or ground.

Guardrails shall be made of lumber two (2) inch x four (4) inch nominal dimension (or other material providing equivalent protection), approximately forty-two (42) inches high, supported at intervals not to exceed eight (8) feet. Guardrails shall be equipped with midrails constructed of one (1) inch x six (6) inch nominal lumber (or other material providing equivalent protection). Toeboard shall extend not less than four (4) inches above the scaffold plank.

(x) Pump jack scaffolds.

(1) Pump jack scaffolds shall:

(i) Not carry a working load exceeding five hundred (500) pounds; and

(ii) Be capable of supporting without failure at least four (4) times the maximum load.

(iii) The manufacture components shall not be loaded in excess of the manufacturer's recommended limits.

(2) Pump jack brackets, braces, and accessories shall be fabricated from metal plates and angles. Each pump jack bracket shall have two (2) positive gripping mechanisms to prevent any failure or slippage.

(3) The platform bracket shall be fully decked and the planking secured. Planking, or equivalent, shall conform with paragraph (a) of this section.

(4)

(i) When wood scaffold planks are used as platforms, poles used for pump jacks shall not be spaced more than ten (10) feet center to center. When fabricated platforms are used that fully comply with all other provisions of this paragraph (x), pole spacing may exceed ten (10) feet center to center.

(ii) Poles shall not exceed thirty (30) feet in height.

(iii) Poles shall be secured to the work wall by rigid triangular bracing, or equivalent, at the bottom, top, and other points as necessary, to provide a maximum vertical spacing of not more than ten (10) feet between braces. Each brace shall be capable of supporting a minimum of two hundred twenty-five (225) pounds tension or compression.

(iv) For the pump jack bracket to pass bracing already installed, an extra brace shall be used approximately four (4) feet above the one (1) to be passed until the original brace is reinstalled.

(5) All poles shall bear on mud sills or other adequate firm foundations.

(6) Pole lumber shall be two (2) two (2) x four's (4), of Douglas Fir, or equivalent, straight-grained, clear, free of cross-grain, shakes, large loose or dead knots, and other defects which might impair strength.

(7) When poles are constructed of two (2) continuous lengths, they shall be two (2) by fours (4), spiked together with the seam parallel to the bracket, and with ten (10)d common nails, no more than twelve (12) inches center to center, staggered uniformly from opposite outside edges.

(8) If two (2) by fours (4) are spliced to make up the pole, the splices shall be so constructed as to develop the full strength of the member.

(9) A ladder shall be provided for access to the platform during use.

(10) Not more than two (2) persons shall be permitted at one (1) time upon a pump jack scaffold between any two (2) supports.

(11) Pump jack scaffolds shall be provided with standard guardrails as defined in Section 32 of these regulations, but no guardrail is required when safety belts with lifelines are provided for employees.

(12) When a work bench is used at an approximate height of forty-two (42) inches, the top guardrail may be eliminated, if the work bench is fully decked, the planking secured, and is capable of withstanding two hundred (200) pounds pressure in any direction.

(13) Employees shall not be permitted to use a work bench as a scaffold platform.

33.3. Manually propelled mobile ladder stands and scaffolds (towers).

(a) General requirements.

(1) Application. This section is intended to prescribe rules and requirements for the design, construction, and use of mobile work platforms (including ladder stands but not including aerial ladders) and rolling (mobile) scaffolds (towers). This standard is promulgated to aid in providing for the safety of life, limb, and property, by establishing minimum standards for structural design requirements and for the use of mobile work platforms and towers.

(2) Working loads.

(i) Work platforms and scaffolds shall be capable of carrying the design load under varying circumstances depending upon the conditions of use.
Therefore, all parts and appurtenances necessary for their safe and efficient utilization must be integral parts of the design.

(ii) Specific design and construction requirements are not a part of this section because of the wide variety of materials and design possibilities. However, the design shall be such as to produce a mobile ladder stand or

scaffold that will safely sustain the specified loads. The material selected shall be of sufficient strength to meet the test requirements and shall be protected against corrosion or deterioration.

(A) The design working load of ladder stands shall be calculated on the basis of one (1) or more two hundred (200)-pound persons with fifty (50) pounds of equipment each.

(B) The design load of all scaffolds shall be calculated on the basis of:

Light -- Designed and constructed to carry a working load of twenty-five (25) pounds per square foot.

Medium -- Designed and constructed to carry a working load of fifty (50) pounds per square foot.

Heavy -- Designed and constructed to carry a working load of seventy-five (75) pounds per square foot.

All ladder stands and scaffolds shall be capable of supporting at least four (4) times the design working load.

(iii) The materials used in mobile ladder stands and scaffolds shall be of standard manufacture and conform to standard specifications of strength, dimensions, and weights, and shall be selected to safely support the design working load.

(iv) Nails, bolts, or other fasteners used in the construction of ladders, scaffolds, and towers shall be of adequate size and in sufficient numbers at each connection to develop the designed strength of the unit. Nails shall be driven full length. (All nails should be immediately withdrawn from dismantled lumber.)

(v) All exposed surfaces shall be free from sharp edges, burrs or other safety hazards.

(3) Work levels.

(i) The maximum work level height shall not exceed four (4) times the minimum or least base dimensions of any mobile ladder stand or scaffold.

Where the basic mobile unit does not meet this requirement, suitable outrigger frames shall be employed to achieve this least base dimension, or provisions shall be made to guy or brace the unit against tipping.

(ii) The minimum platform width for any work level shall not be less than twenty (20) for mobile scaffolds (towers). Ladder stands shall have a minimum step width of sixteen (16) inches.

(iii) The supporting structure for the work level

shall be rigidly braced, using adequate cross bracing or diagonal bracing with rigid platforms at each work level.

(iv) The steps of ladder stands shall be fabricated from slip resistant treads.

(v) The work level platform of scaffolds (towers) shall be of wood, aluminum, or plywood planking, steel or expanded metal, for the full width of the scaffold, except for necessary openings. Work platforms shall be secured in place. All planking shall be two (2) inch (nominal) scaffold grade minimum one thousand five hundred (1,500) feet (stress grade) construction grade lumber or equivalent.

(vi) All scaffold work levels ten (10) feet or higher above the ground or floor shall have a standard (four (4) inch nominal) toeboard.

(vii) All work levels ten (10) feet or higher above the ground or floor shall have a guardrail of two (2) inch x four (4) inch nominal or the equivalent installed no less than thirty-six (36) inches or more than forty-two (42) inches high, with a midrail, when required, of one (1) inch x four (4) inches nominal lumber or equivalent.

(viii) A climbing ladder or stairway shall be provided for proper access and egress, and shall be affixed or built into the scaffold and so located that its use will not have a tendency to tip the scaffold. A landing platform shall be provided at intervals not to exceed thirty (30) feet.

(4) Wheels or casters.

(i) Wheels or casters shall be properly designed for strength and dimensions to support four (4) times the design working load.

(ii) All scaffold casters shall be provided with a positive wheel and/or swivel lock to prevent movement. Ladder stands shall have at least two (2) of the four (4) casters and shall be of the seivel type.

(iii) Where leveling of the elevated work platform is required, screw jacks or other suitable means for adjusting the height shall be provided in the base section of each mobile unit.

(b) Mobile tubular welded sectional folding scaffolds.

(1) General. Units including sectional stairway and sectional ladder scaffolds shall be designed to comply with the requirements of paragraph (a) of this section.

(2) Stairway. An integral set of pivoting and hinged folding diagonal and horizontal braces and a detachable work platform shall be incorporated into the structure of each sectional folding stairway scaffold.

(3) Bracing. An integral set of pivoting and hinged folding diagonal and horizontal braces and a detachable work platform shall be incorporated into the structure of each sectional folding ladder scaffold.

(4) Sectional folding stairway scaffolds. Sectional folding stairway scaffolds shall be designed as medium duty scaffolds except for high clearance.

These special base sections shall be designed as light duty scaffolds. When upper sectional folding stairway scaffolds are used with a special high clearance base, the load capacity of the entire scaffold shall be reduced accordingly. The width of a sectional folding stairway scaffold shall not exceed four and one-half (4 1/2) feet. The maximum length of a sectional folding stairway scaffold shall not exceed six (6) feet.

(5) Sectional folding ladder scaffolds. Sectional folding ladder scaffolds shall be designed as light duty scaffolds including special base (open end) sections which are designed for high clearance. For certain special applications the six (6) foot long unit, eight (8) foot six (6) inch for an eight (8) foot unit or a ten (10) foot six (6) inch for a ten (10) foot long unit.

(6) End frames. The end frames of sectional ladder and stairway scaffolds shall be designed so the the horizontal bearers provide supports for multiple planking levels.

(7) Erection. Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding fifty (50) feet in height above the base, unless such structure is approved in writing by a licensed professional engineer, or erected in accordance with instructions furnished by the manufacturer.

33.4. Definitions applicable to this subpart.

(a) "Ladders"

(1) "Cleats" ladder crosspieces of rectangular cross section placed on edge on which a person may step in ascending or descending.

(2) "Single Cleat Ladder" one which consists of a pair of side rails, usually parallel, but with flared side rails permissible, connected together with cleats that are joined to the side rails at regular intervals.

(3) "Double Cleat Ladder" one that is similar to a single cleat latter, but is wider, with an additional center rail which will allow for two (2) way traffic for workmen in ascending and descending.

(b) "Scaffolding"

(1) "Bearer" a horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.

(2) "Boatswain's Chair" a seat supported by slings attached to a suspended rope, designed to accommodate one (1) workman in a sitting position.

(3) "Brace" a tie that holds one (1) scaffold member in a fixed position with respect to another member.

(4) "Bricklayers' Square Scaffold" a scaffold composed of framed wood squares which support a platform, limited to light and medium duty.

(5) "Carpenters' Bracket Scaffold" a scaffold consisting of wood or metal brackets supporting a platform.

(6) "Coupler" a device for locking together the component parts of a tubular metal scaffold. (The material used for the couplers shall be of a structural type, such as drop-forged steel, malleable iron, or structural grade aluminum.)

(7) "Crawling Board or Chicken Ladder" a plank with cleats spaced and secured at equal intervals, for use by a worker on roofs, not designed to carry any material.

(8) "Double Pole or Independent Pole Scaffold" A scaffold supported form the base by a double row of uprights, independent of support from the walls and constructed of uprights, ledgers, horizontal platform bearers, and diagonal bracing.

(9) "Float or Ship Scaffold" A scaffold hung from overhead supports by means of ropes and consisting of substantial platform having diagonal bracing underneath, resting upon and securely fastened to two (2) parallel plank bearers at right angles to the span.

(10) "Guardrail" a rail secured to uprights and erected along the exposed sides and ends of platforms.

(11) "Heavy Duty Scaffold" a scaffold designed and constructed to carry a working load not to exceed seventy-five (75) pounds per square foot.

(12) "Horse Scaffold" a scaffold for light or medium duty, composed of horses supporting a work platform.

(13) "Interior Hung Scaffold" a scaffold suspended from the ceiling or roof structure.

(14) "Ladder jack Scaffold" a light duty scaffold supported by brackets attached to ladders.

(15) "Ledgers (Stringers)" a horizontal scaffold member which extends from post to post and which supports the putlogs or bearers forming a tie between the posts.

(16) "Light Duty Scaffold" a scaffold designed and constructed to carry a working load not to exceed twenty-five (25) pounds per square foot.

(17) "Manually Propelled Mobile Scaffold" a portable rolling scaffold supported by casters.

(18) "Masons' Adjustable Multiple-Point Suspension Scaffold" A scaffold having a continuous platform supported by bearers suspended by wire rope from overhead supports, so arranged and operated as to permit the raising or lowering of the platform to desired working positions.

(19) "Maximum Rated Load" the total of all loads including the working load, the weight of the scaffold, and such other loads as may be reasonably anticipated.

(20) "Medium Duty Scaffold" a scaffold designed and constructed to carry a working load not to exceed fifty (50) pounds per square foot.

(21) "Midrail" a rail approximately midway between the guardrail and platform, secured to the uprights erected along the exposed sides and ends of platforms.

(22) "Needle Beam Scaffold" a light duty scaffold consisting of needle beams supporting a platform.

(23) "Outrigger Scaffold" a scaffold supported by outriggers or thrustouts projecting beyond the wall or face of the building or structure, the inboard ends of which are secured inside of such building or structure.

(24) "Putlog" a scaffold member upon which the platform rests.

(25) "Roofing or Bearer Bracket" a bracket used in slope roof construction, having provisions for fastening to the roof or supported by ropes fastened over the ridge and secured to

some suitable object.

(26) "Runner" the lengthwise horizontal bracing or bearing members or both.

(27) "Scaffold" any temporary elevated platform and its supporting structure used for supporting workmen or materials, or both.

(28) "Single-Point Adjustable Suspension Scaffold" a manually or power-operated unit designed for light duty use, supported by a single wire rope from an overhead support so arranged and operated as to permit the raising or lowering of platform to desired working positions.

(29) "Single-Pole Scaffold" platforms resting on putlogs or cross beams, the outside ends of which are supported on ledgers secured to a single row of posts or uprights, and the inner ends of which are supported on or in a wall.

(30) "Stone Setters' Adjustable Multiple-Point Suspension Scaffold" a swinging type scaffold having a platform supported by hangers suspended at four (4) points so as to permit the raising or lowering of the platform to the desired working position by the use of hoisting machines.

(31) "Toeboard" a barrier secured along the sides and ends of a platform to guard against the falling of material.

(32) "Tube and Coupler Scaffold" an assembly consisting of tubing which serves as posts, bearers, braces, ties, and runners, a base supporting the posts and special couplers which serve to connect the uprights and to join the various members.

(33) "Tubular Welded Frame Scaffold" a sectional panel or frame metal scaffold substantially built up of prefabricated welded sections which consists of posts and horizontal bearer with intermediate members.

(34) "Two-Point Suspension Scaffold (Swinging Scaffold)" a scaffold, the platform of which is supported by hangers (stirrups) at two (2) points, suspended from overhead supports so as to permit the raising or lowering of the platform to the desired working position by tackle or hoisting machines.

(35) "Window Jack Scaffold" a scaffold, the platform of which is supported by a bracket of jack which projects through a window opening.

(36) "Working Load" load imposed by men, materials, and equipment.

(37) "Ladder Stand" a mobile fixed size self-supporting ladder consisting of a wide flat tread ladder in the form of stairs. The assembly may include handrails.

33.5. Guardrails, handrails, and covers.

(a) General provisions. This subpart shall apply to temporary or emergency conditions where there is danger of employees or materials falling through floor, roof, or wall openings or from stairways, or runways.

(b) Guarding of floor openings and floor holes.

(1) Floor openings shall be guarded by a standard riling and toeboards or cover, as specified in paragraph (f) of this section. In general, the railing shall be provided on all exposed sides, except at entrances to stairways.

(2) Ladderway floor openings or platforms shall be guarded by standard railings with standard toeboards on all exposed sides, except at entrances to opening, with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.

(3) Hatchways and chute floor openings shall be guarded by one (1) of the following:

(i) Hinged covers of standard strength and construction and a standard railing with only one (1) exposed side. When the opening is not in use, the cover shall be closed or the exposed side shall be guarded at both top and intermediate positions by removable standard railings;

(ii) A removable standard railing with toeboard on not more than two (2) sides of the opening and fixed standard railings with toeboards on all other exposed sides. The removable railing shall be kept in place when the opening is not in use and should preferably be hinged or otherwise mounted so as to be conveniently replaceable.

(4) Wherever there is danger of falling through a skylight opening, it shall be guarded by a fixed standard railing on all exposed sides or a cover capable of sustaining the weight of a two hundred (200) pound person.

(5) Pits and trap-door floor openings shall be guarded by floor opening covers of standard strength and construction. While the cover is not in place, the pit or trap openings shall be protected on all exposed sides by removable standard railings.

(6) Manhole floor openings shall be guarded by standard covers which need not be hinged in place. While the

cover is not in place, the manhole opening shall be protected by standard railings.

(7) Temporary floor openings shall have standard railings.

(8) Floor holes, into which persons can accidentally walk, shall be guarded by either a standard railing with standard toeboard on all exposed sides, or a floor hole cover of standard strength and construction that is secured against accidental displacement. While the cover is not in place, the floor hole shall be protected by a standard railing.

(9) Where doors or gates open directly on a stairway, a platform shall be provided, and the swing of the door shall not reduce the effective width of the platform to less than twenty (20) inches.

(c) Guarding of wall openings.

(1) Wall openings, from which there is a drop of more than four (4) feet, and the bottom of the opening is less than three (3) feet above the working surface, shall be guarded as follows:

(i) When the height and placement of the opening in relation to the working surface is such that either a standard rail or intermediate rail will effectively reduce the danger of falling, one (1) or both shall be provided;

(ii) The bottom of a wall opening, which is less than four (4) inches above the working surface, regardless of width, shall be protected by a standard toeboard or an enclosing screen either of solid construction or as specified in paragraph (f)(7)(ii) of this section.

(2) An extension platform outside a wall opening onto which materials can be hoisted for handling shall have side rails or equivalent guards of standard specifications. One (1) side of an extension platform may have removable railings in order to facilitate handling materials.

(3) When a chute is attached to an opening, the provisions of paragraph (c)(1) of this section shall apply, except that a toeboard is not required.

(d) Guarding of open-sided floors, platforms, and runways.

(1) Every open-sided floor or platform six (6) feet or more above adjacent floor or ground level shall be guarded by a standard railing, or the equivalent, as specified in paragraph (f)(1) of this section, all open sides, except where there is

entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a standard toeboard wherever, beneath the open sides, persons can pass, or there is moving machinery, or there is equipment with which falling materials could create a hazard.

(2) Runways shall be guarded by a standard railing, or the equivalent as specified in paragraph (f) of this section, on all open sides, four (4) feet or more above the floor or ground level. Wherever tools, machine parts, or materials are likely to be used on the runway, a toeboard shall also be provided on each exposed side.

(3) Runways used exclusively for special purposes may have the railing on one (1) side omitted where operating condition necessitate such omission, providing the falling hazard is minimized by using a runway not less then eighteen (18) inches wide.

(4) Where employees entering upon runways become thereby exposed to machinery, electrical equipment, or other danger not a falling hazard, additional guarding shall be provided.

(5) Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, and similar hazards shall be guarded with a standard railing and toeboard.

Stairway railings and guards.

(1) Every flight of stairs having four (4) or more risers shall be equipped with standard stair railings or standard handrails as specified below, the width of the stair to be measured clear of all obstructions except handrails:

(i) On stairways less than forty-four (44) inches wide having both sides enclosed, at least one (1) handrail, preferably on the right side descending;

(ii) On stairways less than forty-four (44) inches wide having one (1) side open, at least one (1) stair railing on the open side;

(iii) On stairways less than forty-four (44) inches wide having both sides open, one (1) stair railing on each side;

(iv) On stairways more than forty-four (44) inches wide but less than eighty-eight (88) inches wide, one (1) handrail on each enclosed side, and one (1) intermediate stair railing located approximately midway of the width;

(v) On stairways eighty-eight (88) or more inches wide, one (1) handrail on each enclosed side, one (1) stair railing on each open side, and one (1) intermediate stair railing located approximately midway of the width.

(2) Winding stairs shall be equipped with a handrail offset to prevent walking on all portions of the treads having width less than six (6) inches.

(f) Standard specifications.

(1) A standard railing shall consist of top rail, intermediate rail, toeboard and posts, and shall have a vertical height of approximately forty-two (42) inches from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be halfway between the top rail in the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard. Minimum requirements for standard railings under various types of construction are specified in the following paragraphs:

(i) For wood railings, the posts shall be of at least two (2) inch x four (4) inch stock spaced not to exceed eight (8) feet; the top rail shall be of at least two (2) inch x four (4) inch stock; the intermediate rail shall be of at least one (1) inch x six (6) inch stock.

(ii) For pipe steel railings, post and top and intermediate railings shall be at least one and one-half (1 1/2) inches nominal diameter with posts spaced not more than eight (8) feet on centers.

(iii) For structural steel railings, posts and top and intermediate rails shall be of two (2) inch x two (2) inch by three-eights (3/8)inch angles or other metal shapes of equivalent bending strength, with posts spaced not more than eight (8) feet on centers.

(iv) The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least two hundred (200) pounds applied in any direction at any point on the top rail, with a minimum of deflection.

(v) Railings receiving heavy stresses from employees trucking or handling materials shall be provided additional strength by the use of heavier stock, closer spacing of posts, bracing, or by other means.

(vi) Other types, sizes, and arrangements of railing construction are acceptable, provided they meet the following conditions:

(a) A smooth-surfaced top rail at a height above the floor, platform, runway, or ramp level of approximately forty-two (42) inches;

(b) A strength to withstand at least the minimum requirement of two hundred (200) pounds top rail pressure with a minimum of deflection;

(c) Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent at least to that afforded by a standard intermediate rail;

(d) Elimination of overhang of rail ends unless such overhang does not constitute a hazard.

(2) A stair railing shall be of construction similar to a standard railing, but the vertical height shall be not more than thirty-four (34) inches nor less than thirty (30) inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

(3)

(i) A standard toeboard shall be four (4) inches minimum in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and have not more than one-quarter (1/4) inch clearance above the floor level. It may be made of any substantial material, either solid, or with openings not over one (1) inch in greatest dimension.

(ii) Where material is piled to such height that a standard toeboard does not provide protection, paneling or screening from floor to intermediate rail or to top rail shall be provided.

(4)

(i) A standard handrail shall be of construction similar to a standard railing except that it is mounted on a wall or partition, and does not include an intermediate rail. It shall have a smooth surface along the top and both sides of the handrail. The handrail shall have an adequate handhold for any one (1) grasping it to avoid falling. Ends of the handrail shall be constructed so as not to constitute a projection hazard.

(ii) The height of handrails shall be not more than thirty-four (34) inches nor less than thirty (30) inches

from upper surface of handrail to surface of tread, in line with face of riser or to surface of ramp.

(iii) All handrails and railing shall be provided with a clearance of approximately three (3) inches between the handrail or railing and any other object.

(5) Floor opening covers shall be of any material that meets the following strength requirements:

(i) Conduits, trenches, and manhole covers and their supports, when located in roadways, and vehicular aisles, shall be designed to carry a truck rear-axle load of at least two (2) times the maximum intended load.

(ii) The floor opening cover shall be capable of supporting the maximum intended load and so installed as to prevent accidental displacement.

(6) Skylight openings that create a falling hazard shall be guarded with a standard railing, or covered in accordance with paragraph (5)(ii) of this paragraph.

(7) Wall opening protection shall meet the following requirements:

(i) Barriers shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least two hundred (200) pounds applied in any direction (except upward), with a minimum of deflection at any point on the top rail or corresponding member.

(ii) Screens shall be of such construction and mounting that they are capable of withstanding a load of at least two hundred (200) pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grill work with openings not more than four (4) inch wide with length unrestricted.

33.6. Guarding floor and wall openings and holes.

(a) Wall hole. An opening less than thirty (30) inches but more than one (1) inch high, of unrestricted width, in any wall or partition; such as a ventilation hole or drainage scuper.

(b) Where there is a hazard of materials falling through a wall hole and the lower edge of the near side of the hole is less than four (4) inches above the floor, and the far side of the hole more than five (5) feet above the next lower level, the hole shall be protected by a standard toeboard, or an enclosing screen either of solid construction or as specified in this section.

33.7. Stairways.

(a) On all structures, two (2) or more floors (twenty (20) feet or over) in height, stairways, ladders, or ramps shall be provided for employees during the construction period.

(b) Stairway railings and guardrails shall meet the requirements of Section 33.5., paragraphs (e) and (f) of these regulations.

(c) All parts of stairways shall be free of hazardous projections, such as protruding nails.

(d) Debris, and other loose materials, shall not be allowed on or under stairways.

(e) Slippery conditions on stairways shall be eliminated as soon as possible after they occur.

(f) Permanent steel or other metal stairways, and landings with hollow pan-type treads that are to be filled with concrete or other materials, when used during construction, shall be filled to the level of the nosing with solid material. The requirement shall not apply during the period of actual construction of the stairways themselves.

(g) Wooden treads for temporary service shall be full width.

(h) Metal landings shall be secured in place before filling.

(i) Temporary stairs shall have a landing not less than thirty (30) inches in the direction of travel at every twelve (12) feet of vertical rise.

(j) Stairs shall be installed at angles to the horizontal between thirty (30) degrees and fifty (50) degrees.

(k) Rise height and tread width shall be uniform throughout any flight of stairs including any foundation structure used as one (1) or more treads of the stairs.

(l) All stairs shall be lighted in accordance with this section.

(m) Spiral stairways shall not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway.

33.8. Definitions applicable to this subject.

(a) "Floor Hole" an opening measuring less than twelve (12) inches but more than one (1) inch in its least dimension in any floor, roof, or platform through which materials but not persons may fall, such as belt hold, pipe opening, or slot opening.

(b) "Floor Opening" an opening measuring twelve (12) inches or more in its least dimension in any floor, roof, or platform through which persons may fall.

(c) "Handrail" a bar or pipe supported on brackets from a wall or partition, as on a stariway or ramp, to furnish persons with a handhold in case of tripping.

(d) "Nose, Nosing" that portion of a tread projecting beyond the face of the riser immediately below.

(e) "Platform" a working space for persons, elevated above the surrounding floor or ground, such as a balcony or platform for the operation of machinery and equipment.

(f) "Runway" a passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings.

(g) "Rise" the vertical distance from the top of a tread to the top of the next higher tread.

(h) "Stair Platform" an extended step or landing breaking a continuous run of stairs.

(i) "Stair Railing" a vertical barrier erected along exposed sides of a stariway to prevent falls of persons.

(j) "Stairs, Stairways" a series of steps leading from one (1) level or floor to another, or leading to platforms, pits, boiler rooms, crossovers, or around machinery, tanks, and other equipment that are used more or less continuously or routinely by employees or only occasionally by specific individuals. For the purpose of this subpart, a series of steps and landings having three (3) or more rises constitutes stairs or stairway.

(k) "Standard Railing" a vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of persons.

(l) "Standard Strength and Construction" any construction of railings, covers, or other guards that meets the requirements of this subpart.

(m) "Toeboard" a vertical barrier at floor level erected along exposed edges of a floor opening, platform, runway, or ramp to prevent falls of materials.

(n) "Tread Width" the horizontal distance from front to back of tread, including nosing, when used.

(o) "Wall Opening" an opening at least thirty (30) inches high and
eighteen (18) inches wide, in any wall or partition, through which persons may fall, such as a yardarm doorway or chute opening.

§36-23-34. Cranes, Derricks, Hoists, Elevators, and Conveyors.

34.1. Cranes and derricks.

(a) General requirements.

(1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks.

When manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.

(2) Rated load capacities, and recommended operating speeds, special hazard warnings, or instruction, shall be conspicuously posted on all equipment. Instructions or warnings shall be visible to the operator while he is at his control station.

(3) Hand signals to crane and derrick operators shall be those prescribed by the applicable ANSI standard for the type of crane in use. An illustration of the signals shall be posted at the job site.

(4) The employer shall designate a competent person who shall inspect all machinery and equipment each shift prior to each use, and during use, to make sure it is in safe operating condition. Any deficiencies shall be repaired, or defective parts replaced, before continued use.

(5) A thorough, annual inspection of the hoisting machinery shall be made by a competent person, or by a private agency recognized by the United States Department of Labor. The employer shall maintain a record of the time and dates and results of each inspection for each hoisting machine and piece of equipment.

(6) Wire rope shall be taken out of service when any of the following conditions exist:

(i) In running ropes, six (6) randomly distributed broken wires or three (3) broken wires in one (1) lay;

(ii) Wear of one-third (1/3) the original diameter of outside individual wires. Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure;

(iii) Evidence of any heat damage from any cause;

(iv) Reductions from nominal diameter of more than one-sixty-fourth (1/64) inch for diameters up to and including five-sixteenths (5/16) inch, one-thirty-two (1/32) inches for diameters three-eights (3/8) inch to and including one-half (1/2) inch, three-sixty-fourths (3/64) inch, for diameters nine-sixteenths (9/16) inch to and including three-fourths (3/4) inch, one-sixteenths (1/16) inch for diameters seven-eights (7/8) inch to one and one-eights (1 1/8) inches inclusive, three-thirty-two (3/32) inch for diameters one and one-quarter (1 1/4) to one and one-half (1 1/2) inches inclusive;

(v) In standing ropes, more than two (2) broken wires in one (1) lay in sections beyond end connections or more than one (1) broken wire at an end connection.

(vi) Wire rope safety factors shall be in accordance with American National Standards Institute B30.5-1968 or SAE J959-1966.

(7) Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or other moving parts or equipment shall be guarded if such parts are exposed to contact by employees or otherwise create a hazard. Guarding shall meet the requirements of the American National Standards Institute B15.1-1958 Rev. Safety code for Mechanical Power Transmission Apparatus.

(8) Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, shall be barricaded in such a manner as to prevent an employee from being struck or crushed by the crane.

(9) All exhaust pipes shall be guarded or insulated in areas where contact by employees is possible in the performance of normal duties.

(10) Whenever internal combustion engine powered equipment exhausts in enclosed spaces, tests shall be made and recorded to see that employees are not exposed to unsafe

concentrations of toxic gases or oxygen deficient atmospheres.

(11) All windows in cabs shall be of safety glass, or equivalent, that introduces no visible distortion that will interfere with the safe operation of the machine.

(12)

(i) Where necessary for rigging or service requirements, a ladder, or steps, shall be provided to give access to a cab roof.

(ii) Guardrails, handholds, and steps shall be provided on cranes for each access to the car and cab, conforming the ANSI B30.5.

(iii) Platforms and walkways shall have anti-skid surfaces.

(13) Fuel tank filler pipe shall be located in such a position, or protected in such a manner, as not to allow spill or overflow to run onto the engine, exhaust, or electrical equipment of any machine being fueled.

(i) An accessible fire extinguisher of 5BC rating, or higher, shall be available at all operator stations or cabs of equipment.

(ii) All fuels shall be transported, stored, and handled to meet the rules of Subpart F of this part. When fuel is transported by vehicles on public highways Department of Transportation rules contained in 49 CFR Parts 177 and 393 concerning such vehicular transportation are considered applicable.

(14) Except where electrical distribution and transmission lines have been deenergized 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 shall be operated proximate to power lines only in accordance with the following:

(i) For lines rated fifty (50)kV. or below, minimum clearance between the lines and any part of the crane or load shall be ten (10) feet;

(ii) For lines rated over fifty (50)kV., minimum clearance between the lines and any part of the crane or load shall be ten (10) feet plus four-tenths (0.4) inch for each one (1)kV. over fifty (50)kV., or twice the length of the line insulator, but never less than ten (10) feet;

(iii) In transit with no load and boom lowered, the equipment clearance shall be a minimum of four (4) feet for voltages, less than forty (40)kV., up to and including three hundred forty-five (345)kV. and sixteen (16) feet for voltages up to and including seven hundred fifty (750)kV;

(iv) A person shall 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;

(v) Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the requirements of any other regulation of this part even if such device is required by law or regulation.

(vi) Any overhead wire shall 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;

(vii) Prior to work near transmitter towers where an electric charge can be induced in the equipment or materials begin handled, the transmitter shall be deenergized or tests shall be made to determine if electrical charge is induced on the crane. The following precautions shall be taken when necessary to dissipate induced voltages:

(a) The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom;

(b) Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load; and

(c) Combustible and flammable materials shall be removed from the immediate area prior to operation.

(15) No modifications or additions which affect the capacity or safe operation of the equipment shall be made by the employer without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation and maintenance instruction plates, tags, or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

(16) The employer shall comply with Power Crane and

Shovel Association Mobile Hydraulic Crane Standard No. 2.

(17) Sideboom cranes mounted on wheel or crawler tractors shall meet the requirements of SAE J743-1964.

(b) Crawler, locomotive and truck cranes.

(1) All jibs shall have positive stops to prevent their movement of more than five (5) degrees above the straight line of the jib and boom on conventional type crane booms. The use of cable type belly slings does not constitute compliance with this rule.

(2) All crawler, truck or locomotive cranes in use shall meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in the ANSI B30.5-1968, Safety Code for Crawler Locomotives and Truck Cranes.

(c) Hammerhead tower cranes.

(1) Adequate clearance shall be maintained between moving and rotating structures of the crane and fixed objects to allow the passage of employees without harm.

(2) Employees required to perform duties on the horizontal boom of hammerhead tower cranes shall be protected against falling by guardrails or by safety belts and lanyards attached to lifelines in conformance with this section.

(3) Buffers shall be provided at both ends of travel of the trolley.

(4) Cranes mounted on rail tracks shall be equipped with limit switches limiting the travel of the crane on the track and stops or buffers at each end of the tracks.

(5) All hammerhead tower cranes in use shall meet the applicable requirements for design, construction, installation, testing, maintenance, inspection and operation as prescribed by the manufacturer.

(d) Overhead and gantry cranes.

(1) The rated load of the crane shall be plainly marked on each side of the crane, and if the crane has more than one (1) hoisting unit, each hoist shall have its rated load marked on it or its load block, and this marking shall be clearly legible from the ground or floor.

(2) Bridge trucks shall be equipped with sweeps which

extend below the top of the rail and project in front of the truck wheels.

(3) Except for floor-operated cranes, a gong or other effective audible warning signal shall be provided for each crane equipped with a power traveling mechanism.

(4) All overhead and gantry cranes in use shall meet the applicable requirements for design, construction, installation, inspection, testing, maintenance, inspection, and operation as prescribed in the ANSI B30.2-1967, Safety Code for overhead and gantry cranes.

(e) Derricks. All derricks in use shall meet the applicable requirements for design, construction, installation, inspection, testing, maintenance, and operations as prescribed in ANSI B30.6-1969, Safety Code for derricks.

34.2. Material hoists, personnel hoists, and elevators.

(a) General requirements.

(1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a professional engineer competent in the field.

(2) Rated load capacities, recommended operating speeds, and special hazard warnings or instructions shall be posted on cars and platforms.

(3) Wire rope shall be removed from service when any of the following conditions exists:

(i) In hoisting ropes, six (6) randomly broken wires in one (1) rope lay or three (3) broken wires in one (1) strand in one (1) rope lay;

(ii) Abrasion, scrubbing, flattening, or peening, causing loss of more than one-third (1/3) on the original diameter of the outside wires;

(iii) Evidence of any heat damage resulting from a torch or any damage caused by contact with electrical wires;

(iv) Reduction from nominal diameter of more than three-sixty-fourths (3/64) inch for diameters up to and including three-fourths (3/4) inch; one-sixteenth (1/16) inch for diameters seven-eights (7/8) to one and one-eights (1 1/8) inches; and three-thirty-seconds (3/32) inch for diameters one

and one-quarter (1 1/4) to one and one-half (1 1/2).

(4) Hoisting ropes shall be installed in accordance with the wire rope manufacturer's recommendations.

(5) The installation of live booms on hoists is prohibited.

(6) The use of endless belt-type man-lifts on construction shall be prohibited.

(b) Material hoists.

(1)

(i) Operating rules shall be established and posted at the operator's station of the hoist. Such rules shall include signal system and allowable line speed for various loads. rules and notices shall be posted on a car frame or crosshead in a conspicuous location, including the statement "No riders Allowed."

(ii) No person shall be allowed to ride on material hoists except for the purposes of inspection and maintenance.

(2) All entrances of the hoistways shall be protected by substantial gates or bars which shall guard the full width of the landing entrance. All hoistway entrance bars and gates shall be painted with diagonal contrasting colors, such as black and yellow stripes.

(i) Bars shall be not less than two (2) inch x four (4) inch wooden bars or the equivalent, located two (2) feet from the hoistway line. Bars shall be located not less than thirty-six (36) inches nor more than forty-two (42) inches above the floor.

(ii) Gates or bars protecting the entrances to hoistways shall be equipped with a latching device.

(3) Overhead protective covering of two (2) inch planking. Three-quarter (3/4) inch plywood or other solid material of equivalent strength, shall be provided on the top of every material hoist cage or platform.

(4) The operator's station of a hoisting machine shall be provided with overhead protection equivalent to tight planking not less than two (2) inches thick. The support for the overhead protection shall be of equal strength.

(5) Hoist towers may be used with or without an

enclosure on all sides. However, whichever alternative is chosen, the following applicable conditions shall be met:

(i) When a hoist tower is enclosed, it shall be enclosed on all sides for its entire height with a screen enclosure of one-half (1/2) inch mesh, No. 18 United States gauge wire or equivalent, except for landing access.

(ii) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with one-half (1/2) inch mesh, No. 14 United States gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading. A six (6) foot high enclosure shall be provided on the unused sides of the hoist tower at ground level.

(6) Car arresting devices shall be installed to function in case of rope failure.

(7) All material hoist towers shall be designed by a licensed professional engineer.

(8) All material hoists shall conform to the requirements of ANSI A10.5-1969, Safety Requirements for material hoists.

(c) Personnel hoists.

(1) Hoist towers outside the structure shall be enclosed for the full height of the side or sides used for entrance and exit to the structure. At the lowest landing, the enclosure on the sides not used for exit or entrance to the structure shall be enclosed to a height of at least ten (10) feet. Other sides of the tower adjacent to floors or scaffold platforms shall be enclosed to a height of ten (10) feet above the level of such floors or scaffolds.

(2) Towers inside of structures shall be enclosed on all four (4) sides throughout the full height.

(3) Towers shall be anchored to the structure at intervals not exceeding twenty-five (25) feet. In addition to tie-ins, a series of guys shall be installed. Where tie-ins are not practical the tower shall be anchored by means of guys made of wire rope at least one-half (1/2) inch in diameter, securely fastened to anchorage to ensure stability.

(4) Hoistway doors or gates shall be not less than six (6) foot six (6) inches high and shall be provided with mechanical locks which cannot be operated from the landing side, and shall be accessible only to persons on the

car.

(5) Cars shall be permanently enclosed on all sides and the top, except sides used for entrance and exit which have car gates or doors.

(6) A door or gate shall be provided at each entrance to the car which shall protect the full width and height of the car entrance opening.

(7) Overhead protective covering of two (2) inch planking. Three-quarter (3/4) inch plywood or other solid material or equivalent strength shall be provided on the top of every personnel hoist.

(8) Doors or gates shall be provided with electric contacts which do not allow movement of the hoist when door or gate is open.

(9) Safeties shall be capable of stopping and holding the car and rated load when traveling at governor tripping speed.

(10) Cars shall be provided with a capacity and data plate secured in a conspicuous place on the car or crosshead.

(11) Internal combustion engines shall not be permitted for direct drive.

(12) Normal and final terminal stopping devices shall be provided.

(13) An emergency stop switch shall be provided in the car and marked "Stop".

(14) Ropes.

(i) The minimum number of hoisting ropes shall be three (3) for traction hoists and two (2) for drum-type hoists.

(ii) The minimum diameter of hoisting and counterweight wire ropes shall be one-half (1/2) inch.

(iii) Safety factors: (See Table 46).

(15) Following assembly and erection of hoists and before being put in service, an inspection and tests of all functions and safety devices shall be made under the supervision of a competent person. A similar inspection and test is required following major alteration of an existing installation. All hoists shall be inspected and tested at not more than three (3) month intervals. Records shall be maintained and kept on file for

the duration of the job.

(16) All personnel hoists used by employees shall be constructed of materials and components which meet the specifications for materials, construction, safety devices, assembly, and structural integrity as stated in the ANSI A10.4-1963; Safety Requirements for Workmen's Hoists. The requirements of this subparagraph (16) do not apply to cantilever type personnel hoists.

(17)

(i) Personnel hoists used in bridge tower construction shall be approved by a registered professional engineer and erected under the supervision of a qualified engineer competent in this field.

(ii) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with three-quarter (3/4) inch mesh of No. 14 United States gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading.

(iii) These hoists shall be inspected and maintained on a weekly basis. Whenever the hoisting equipment is exposed to winds exceeding thirty-five (35) miles per hour it shall be inspected and put in operable condition before reuse.

(iv) Wire rope shall be taken out of service when any of the following conditions exist:

(a) In running ropes, six (6) randomly distributed broken wires
in one (1) lay or three (3) broken wires in one (1) strand in one (1) lay;

(b) Wear of one-third (1/3) the original diameter of outside individual wires. Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure;

(c) Evidence of any heat damage from any cause;

(d) Reductions from nominal diameter of more than three-sixty-fourths (3/64) inch for diameters to and including three-quarter (3/4) inch, one and one-sixteenth (1 1/16) inch for diameters seven-eights (7/8) inch to one and one-eights (1 1/8) inch inclusive, three-thirty-seconds (3/32) inch for diameters one and one-quarter (1 1/4) to one and one-half (1 1/2) inch inclusive;

(e) In standing ropes, more than two (2) broken wires in one (1) lay in sections beyond end connections or more than one (1) broken wire at end connection.

(f) Permanent elevators under the care of the employer and used by employees for work covered by this regulation, shall comply with the requirements of ANSI A17.1-1965 with addenda A17.1a-1967,A17.1b-1968, A16.1c-1969, A16.1d-1976, and inspected in accordance with A16.2-1960 with addenda A16.2a-1965, A17.2b-1967.

34.3. Base-mounted drum hoists.

(a) General requirements.

(1) Exposed moving parts such as gears, projecting screws, setscrews, chain, cables, chain sprockets, and reciprocating or rotating parts, which constitute a hazard, shall be guarded.

(2) All controls used during the normal operation cycle shall be located within easy reach of the operator's station.

(3) Electric motor operated hoists shall be provided with:

(i) A device to disconnect all motors from the line upon power failure and not permit any motor to be restarted until the controller handle is brought to the "Off" position;

(ii) Where applicable, an overspeed preventive device;

(iii) A means whereby remotely operated hoists stop when any control is ineffective.

(4) All base-mounted drum hoists in use shall meet the applicable requirements for design, construction, installation, testing, inspection, maintenance and operations, as prescribed by the manufacturer.

34.4. Overhead hoists.

(1) The safe working load of the overhead hoist, as determined by the manufacture, shall be indicated on the hoist, and this safe working load shall not be exceeded.

(2) The supporting structure to which the hoist is

attached shall have a safe working load equal to that of the hoist.

(3) The support shall be arranged so as to provide for free movement of the hoist and shall not restrict the hoist from lining itself up with the load.

(4) The hoist shall be installed only in locations that will permit the operator to stand clear of the load at all times.

(5) Air hoists shall be connected to an air supply of sufficient capacity and pressure to safely operate the hoist. All air hoses supplying air shall be positively connected to prevent their becoming disconnected during use.

(6) All overhead hoists in use shall meet the applicable requirements for construction, design, installation, testing, inspection, maintenance and operation, as prescribed by the manufacturer.

34.5. Conveyors.

(a) General requirements.

(1) Means for stopping the motor or engine shall be provided at the operator's station. Conveyor systems shall be equipped with an audible warning signal to be sounded immediately before starting up the conveyor.

(2) If the operator's station is at a remote point, similar provisions for stopping the motor or engine shall be provided at the motor or engine location.

(3) Emergency stop switches shall be arranged so that the conveyor cannot be started again until the actuating stop switch has been reset to running or "On" position.

(4) Screw conveyors shall be guarded to prevent employee contact with turning flights.

(5) Where a conveyor passes over work areas, aisles, or thoroughfares, suitable guards shall be provided to protect employees required to work below the conveyors.

(6) All crossovers, aisles and passageways shall be conspicuously marked by suitable signs, as required in these rules and regulations.

(7) Conveyors shall be locked out or otherwise rendered inoperable and tagged out with a "Do Not Operate" tag during repairs and when operation is hazardous to employees

performing maintenance work.

(8) All conveyors in use shall meet the applicable requirements for design, construction, inspection, testing, maintenance and operation, as prescribed in the ANSI B20.1-1957, Safety Code for conveyors, cableways and related equipment.

34.6. Aerial lifts.

(a) General requirements.

(1) Unless otherwise provided in this section, aerial lifts acquired for use on or after the effective date of this section shall be designed and constructed in conformance with the applicable requirements of the American National Standard for vehicle mounted elevating and rotating work platforms; ANSI A92.2-1969, including appendix. Aerial lifts acquired before the effective date of this section, which do not meet the requirements of ANSI A92.2-1969, may not be used after January 1, 1976, unless they shall have been modified so as to conform with the applicable design and construction requirements of ANSI A92.2-1969. Aerial lifts include the following types of vehicle-mounted aerial devices used to elevate personnel to job sites above the ground:

(i) Extensible boom platform;

(ii) Aerial ladders;

(iii) Articulating boom platforms;

(iv) Vertical towers; and

(v) A combination of any of the above.

Aerial equipment may be made of metal, wood, fiberglass reinforced plastic, or other material; may be powered or manually operated; and are deemed to be aerial lifts whether or not they are capable of rotating about a substantially vertical axis.

(2) Aerial lifts may be "Field Modified" for uses other than those intended by the manufacturer provided the modification has been certified in writing by the manufacturer or by any other equivalent entity, such as a nationally recognized testing laboratory to be in conformity with all applicable provisions of ANSI A92.2-1969 and this section, and to be at least as safe as the equipment was before modifications.

(b) Specific requirements.

(1) Ladder trucks and tower trucks. Aerial ladders

shall be secured in the lower traveling position by the locking device on top of the truck cab, and the manually operated device at the base of the ladder before the truck is moved for highway travel.

(2) Extensible and articulating boom platforms.

(i) Lift controls shall be tested each day prior to use to determine that such controls are in safe working condition;

(ii) Only authorized persons shall operate an aerial lift;

(iii) Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted;

(iv) Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position;

(v) A body belt shall be worn and a lanyard attached to the boom or basket when working from aerial lift;

(vi) Boom and basket load limits specified by the manufacturer shall not be exceeded;

(vii) The brakes shall be set and when outriggers are used, they shall be positioned on pads or a solid surface. Wheel chocks shall be installed before using an aerial lift on an incline, provided they can be safely installed;

(viii) An aerial lift truck shall not be moved when the boom is elevated in a working position with men in the basket, except for equipment which is specifically designed for this type of operation in accordance with the provisions of subparagraphs (1) and (2) of paragraph (a) of this subsection;

(ix) Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platforms within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to their function. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency;

(x) Climbers shall not be worn while performing

work from an aerial lift;

(xi) The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value; and

(xii) Before moving an aerial lift for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position except as provided in subdivision (viii) of this subparagraph.

(3) Electrical tests. All electrical tests shall conform to the requirements of ANSI A92.2-1969, Section 5. However, equivalent D.C. voltage tests may be used in lieu of the A.C. voltage specified in A92.2-1969, D.C. voltage tests which are approved by the equipment manufacturer or equivalent entity shall be considered an equivalent test for the purpose of this subparagraph.

(4) Bursting safety factor. The provisions of the American National Standards Institute, Standard ANSI A92.2-1969, Section 4.9, Bursting Safety Factor shall apply to all critical hydraulic and pneumatic components are those in which a failure would result in a free fall or free rotation of the boom. All noncritical components shall have a bursting safety factor of at least two (2) to one (1).

(5) Welding standards. All welding shall conform to the following standards as applicable:

(i) Standard qualification procedure, AWS B3.0-41;

(ii) Recommended practices for automotive welding design, AWS D8.4-61;

(iii) Standard qualifications of welding procedures and welders for piping and tubing, AWS D10.9-69; and

(iv) Specifications for welding highway and railway bridges, AWS D2.0-69.

§36-23-35. Motor Vehicles, Mechanized Equipment, and Marine Operations.

35.1. Equipment.

(a) General requirements.

(1) All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, shall have appropriate lights or

reflectors or barricades equipped with appropriate light or reflectors, to identify the location of the equipment.

(2) A safety tire rack, cage, or equivalent protection shall be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

(3)

(i) Heavy machinery, or parts thereof, which are suspended or held aloft by use of slings, hoists, or jacks shall be substantially blocked or cribbed to prevent falling or shifting before employees are permitted to work under or between them. Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment, shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise.

(ii) Whenever the equipment is parked, the parking brake shall be set. Equipment parked on the line shall have the wheels chocked and the parking brake set.

(4) The use, care and charging of all batteries shall conform to the requirements of this section.

(5) All cab glass shall be safety glass, or equivalent, that introduces no visible distortion affecting the safe operation of any machine.

(6) All equipment covered by this subpart shall comply with the requirements of these regulations when working or being moved in the vicinity of power lines or energized transmitters.

35.2. Handling materials -- general. -- Rolling railroad cars. Derail and/or bumper blocks shall be provided on spur railroad tracks where a rolling car could contact other cars being worked, enter a building, work or traffic area.

35.3. Air receivers.

(a) General requirements.

(1) Application. This section applies to compressed air receivers, and other equipment used in providing and utilizing compressed air for performing operation such as cleaning, drilling, hoisting and chipping. On the other hand, however, this section does not deal with the special problems created when men work in compressed air as in tunnels and caissons. This section is not intended to apply to compressed air machinery and equipment used on transportation vehicles such as

steam railroad cars, electric railway cars, and automotive equipment.

(2) New and existing equipment.

(i) All new air receivers installed after the effective date of these regulations shall be constructed in accordance with the 1968 edition of the A.S.M.E. Boiler and Pressure Vessel Code, Section VIII.

(ii) All safety valves used shall be constructed, installed and maintained in accordance with the A.S.M.E. Boiler and Pressure Vessel Code, Section VIII, 1968 Edition.

(b) Installation and equipment requirements.

(1) Installation. Air receivers shall be so installed that all drains, handholes, and manholes therein are easily accessible. Air receivers should be supported with sufficient clearance to permit a complete external inspection and to avoid corrosion of external surfaces. Under no circumstances shall an air receiver be buried underground or located in an inaccessible place. The receiver should be located as close to the compressor or aftercooler as is possible in order to keep the discharge pipe short.

(2) Drains and traps. A drain pipe and valve shall be installed at the lowest point of every air receiver to provide for the removal of accumulated oil and water. The drain valve on the air receiver shall be opened and the receiver completely drained frequently and at such intervals as to prevent the accumulation of excessive amounts of liquid in the receiver.

(3) Gauges and valves.

(i) Every air receiver shall be equipped with an indicating pressure gauge (so located as to be readily visible) and one (1) or more spring-loaded safety valves. The total relieving capacity of such safety valves shall be such as to prevent pressure in the receiver from exceeding the maximum allowable working pressure of the receiver by more than ten (10) percent.

(ii) No valve of any type shall be placed between the air receiver and its safety valve or valves.

(iii) Safety appliances, such as safety valves, indicating devices and controlling devices, shall be constructed, located and installed so that they cannot be readily rendered inoperative by any means, including the elements.

(iv) All safety valves shall be tested frequently

and at regular intervals to determine whether they are in good operating condition.

35.4. Motor vehicles.

(a) Coverage. Motor vehicles as covered by this part are those vehicles that operate within an off-highway jobsite, not open to public traffic. The requirements of this subsection do not apply to equipment for which rules are prescribed in these rules and regulations.

(b) General requirements.

(1) All vehicles shall have a service brake system, an emergency brake system, and a parking brake system. These systems may use common components and shall be maintained in operable condition.

(2)

(i) Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with at least two (2) headlights and two (2) taillights in operable condition.

(ii) All vehicles, or combination of vehicles, shall have brake lights in operable condition regardless of light conditions.

(3) All vehicles shall be equipped with an adequate audible warning device at the operator's station and in an operable condition.

(4) No employer shall use any motor vehicle equipment having an obstructed view to the real unless:

(i) The vehicle has a reverse signal alarm audible above the surrounding noise level; or
(ii) The vehicle is backed up only when an observer signals that it is safe to do so.

(5) All vehicles with cabs shall be equipped with windshields and powered wipers. Cracked and broken glass shall be replaced. Vehicles operating in areas or under conditions that cause fogging or frosting of the windshields shall be equipped with operable defogging or defrosting devices.

(6) All haulage vehicles, whose pay load is loaded by means of cranes, power shovels, loaders, or similar equipment, shall have a cob shield and/or canopy adequate to protect the operator from shifting or falling materials.

(7) Tools and material shall be secured to prevent movement when transported in the same compartment with employees.

(8) Vehicles used to transport employees shall have seats firmly secured and adequate for the number of employees to be carried.

(9) Seat belts and anchorages meeting the requirements of 49 CFR Part 571 (Department of Transportation, Federal Motor Vehicle Safety Standards) shall be installed in all motor vehicles.

(10) Trucks with dump bodies shall 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.

(11) Operating levers controlling hoisting or dumping devices on haulage bodies shall be equipped with a latch or other device which will prevent accidental starting or tripping the mechanism.

(12) Trip handles for tailgates of dump trucks shall be so arranged that, in dumping, the operator will be in the clear.

(13)

(i) All rubber-tired motor vehicles shall be equipped with fenders.

(ii) Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.

(14) All vehicles in use shall be checked at the beginning of each shift to assure that the following parts, equipment, and accessories are in safe operating condition, and free of apparent 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. All defects shall be corrected before the vehicle is placed in service. These requirements also apply to equipment such as lights, reflectors, windshield wipers, defrosters, fire extinguishers, etc., where such equipment is necessary.

35.5. Material handling equipment.

(a) Earthmoving equipment; general.

(1) These rules apply to the following types of earthmoving equipment; scrapers, loaders, crawler or wheel

tractors, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, and similar equipment. The promulgation of specific rules for compactors and rubber-tired"Skid-Steer" equipment is reserved pending consideration of standards currently being developed.

(2) Seat belts.

(i) Seat belts shall be provided on all equipment covered by this section, and shall meet the requirements of the Society of Automotive Engineers J386-1969. Seat belts for Agricultural and Light Industrial Tractors shall meet the seat belt requirements of Society of Automotive Engineers J333A-1970: Operator protection for agricultural and light industrial tractors.

(ii) Seat belts need not be provided for equipment which is designed only for stand up operation.

(3) Access roadways and grades.

(i) 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.

(ii) Every emergency access ramp and berm used by an employer shall be constructed to restrain and control runaway vehicles.

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

(4) Brakes. All earthmoving equipment mentioned in 35.5.(a) shall have a service braking system capable of stopping and holding the equipment fully loaded, as specified in Society of Automotive Engineers SAE-J237, Loader Dozer-1971, J236, Graders-1971, and J319b, Scrapers-1971. Brake systems for self-propelled rubber-tiredoff-highway equipment manufactured after January 1, 1972 shall meet the applicable minimum performance criterial set forth in the following Society of Automotive Engineers Recommended Practices:

Self-propelled scrapers ..... SAE J319b-1971
Self-propelled graders ..... SAE J236-1971
Trucks and wagons ..... SAE J166-1971
Front end loaders and dozers ....SAE

(5) Fenders. Pneumatic-tired earthmoving haulage equipment (trucks, scrapers, tractors and trailing units) whose maximum speed exceeds fifteen (15) miles per hour, shall be equipped with fenders on all wheels to meet the requirements of Society of Automotive Engineers SAE J321-A-1970, fenders for pneumatic-tired earthmoving haulage equipment.

(6) Rollover protective structures (ROPS). See subpart W of this part for requirements for rollover protective structures and overhead protection.

(7) Specific effective dates -- brakes and fenders.

(i) Equipment mentioned in subparagraphs (4) and (5) of the paragraph, and manufactured after January 1, 1972, which is used by an employer after that date, shall comply with the applicable rules prescribed therein concerning brakes and fenders. Employers may request variations from the applicable brakes and fender standards required by this subpart. Employers wishing to seek variations from the applicable brakes and fenders rules may submit any requests for variations after the publication of this document. Any statements intending to meet the requirements should specify how the variation would protect the safety of the employees by providing for any compensating restrictions on the operations of equipment.

(8) Audible alarms.

(i) All bi-directional machines, such as rollers, compactors, front-end loaders, bulldozers, and similar equipment, shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction. The horn shall be maintained in an operative condition.

(ii) No employer shall 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. Where equipment is operated in close proximity to employees, a signal man shall be designated to direct the operation of the equipment.

(9) Scissor points. Scissor points on all front-end loaders, which constitute a hazard to the operator during normal operation, shall be guarded.

(b) Excavating and other equipment.

(1) Tractors covered in paragraph (a) of this section

shall 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.

(2) For the purposes of this subpart, the nomenclatures and descriptions for measurement of dimensions of machinery and attachments shall be as described in the Society of Automotive Engineers 1970 handbook, pages one thousand eighty-eight (1088) through one thousand one hundred three (1103).

(3) The safety requirements, ratios, or limitations applicable to machines or attachment usage covered in power crane and shovel associations standards No. 1 and No. 2 of 1968, and No. 3 of 1969, shall be complied with, and shall apply to cranes, machines, and attachments under this section.

(c) Lifting and hauling equipment (other than equipment covered under this part).

(1) Industrial trucks shall meet the following requirements:

(i) Lift trucks, stakers, etc., shall have the rated capacity clearly posted on the vehicle so as to be clearly visible to the operator. When auxiliary removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also shall be clearly shown on the vehicle. These ratings shall not be exceeded.

(ii) No modifications or additions which affect the capacity or safe operation of the equipment shall be made without the manufacturer's written approval. If such notifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

(iii) If a load is lifted by two (2) or more trucks working in unison, the proportion of the total load carried by any one (1) truck shall not exceed its capacity.

(iv) Steering or spinner knobs shall not be attached to the steering wheel unless the steering mechanism is of a type that prevents road reactions from causing the steering handwheel to spin. The steering knob shall be mounted within the periphery of the wheel.

(v) All high lift rider industrial trucks shall be equipped with overhead guards which meet the configuration and structural requirements as defined in paragraph 421 of American

National Standards Institute B56.1-1969, safety standards for powered industrial trucks.

(vi) All industrial trucks in use shall meet the applicable requirements of design, construction, stability, inspection, testing, maintenance, and operation as defined in American National Standards Institute B56.1-1969, safety standards for powered industrial trucks.

35.6. Pile driving equipment.

(a) General requirements.

(1) Boilers and piping systems which are a part of, or used with, pile driving equipment shall meet the applicable requirements of the American Society of Mechanical Engineers, Power boilers (Section 1).

(2) All pressure vessels which are a part of, or used with, pile driving equipment shall meet the applicable requirements of the American Society of Mechanical Engineers, Pressure Vessels (Section 8).

(3) Overhead protection, which will not obscure the vision of the operator and which meets the requirements of these regulations, shall be provided. Protection shall be the equivalent of two (2) inch planking or other solid material of equivalent strength.

(4) Stop blocks shall be provided for the leads to prevent the hammer from being raised against the head block.

(5) A blocking device, capable of safely supporting the weight of the hammer, shall be provided for placement in the leads under the hammer at all times while employees are working under the hammer.

(6) Guards shall be provided across the top of the head block to prevent the cable from jumping out of the sheaves.

(7) When the leads must be inclined in the driving of batter piles, provisions shall be made to stabilize the leads.

(8) Fixed leads shall be provided with ladder, and adequate rings, or similar attachment points, so that the loft worker may engage his safety belt lanyard to the leads. If the leads are provided with loft platform(s), such platform(s) shall be protected by standard guardrails.

(9) Steam hose leading to a steam hammer or jet pipe shall be securely attached to the hammer with an adequate length of at least one-quarter (1/4) inch diameter chain or cable to

prevent whipping in the event the hoist at the hammer is broken. Air hammer hoses shall be provided with the same protection as required for steam lines.

(10) Safety chains, or equivalent means, shall be provided for each hose connection to prevent the line from thrashing around in case the coupling becomes disconnected.

(11) Steam line controls shall consist of two (2) shutoff valves, one (1) of which shall be a quick-acting lever type within easy reach of the hammer operator.

(12) Guys, outriggers, thrustouts, or counter-balances shall be provided as necessary to maintain stability of pile driver rigs.

(b) Pile driving from barges and floats. Barges or floats supporting pile driving operations shall meet the applicable requirements of these regulations.

(c) Pile driving equipment.

(1) Engineers and winchmen shall accept signals only from the designated signalmen.

(2) All employees shall be kept clear when piling is being hoisted into the leads.

(3) When piles are being driven in an excavated pit, the walls of the pit shall be sloped to the angle of repose or sheet-piled and braced.

(4) When steel tube piles are being "Blown Out", employees shall be kept well beyond the range of falling materials.

(5) When it is necessary to cut off the tops of driven piles, pile driving operations shall be suspended except where the cutting operations are located at least twice the length of the longest pile from the driver.

(6) When driving jacked piles, all access pits shall be provided with ladders and bulkheaded curbs to prevent material from falling into the pit.

§36-23-36. Excavations, Trenching, and Shoring.

36.1. General protection requirements.

(a) Walkways, runways, and sidewalks shall be kept clear of excavated material or other obstructions and no sidewalks shall be undermined unless shored to carry a minimum live load of one hundred and twenty-five (125) pounds per square foot.

(b) If planks are used for raised walkways, runways, or sidewalks, they shall be laid parallel to the length of the walk and fastened together against displacement.

(c) Planks shall be uniform in thickness and all exposed ends shall be provided with beveled cleats to prevent tripping.

(d) Raised walkways, runways, and sidewalks shall be provided with plank steps on strong stringers. Ramps, used in lieu of steps, shall be provided with cleats to insure a safe walking surface.

(e) All employees shall be provided with and protected with personal protective equipment for the protection of the head, eyes, respiratory organs, hands, feet and other parts of the body.

(f) Employees exposed to vehicular traffic shall be provided with and shall be instructed to wear warning vests marked with or made of reflectorized or high visibility material.

(g) Employees subjected to hazardous dusts, gases, fumes, mists, or atmospheres deficient in oxygen, shall be provided with and protected with approved respiratory protection.

(h) No person shall be permitted under loads handled by power shovels, derricks, or hoists. to avoid any spillage employees shall be required to stand away from any vehicle being loaded.

(i) Daily inspections of excavations shall be made at the beginning of and periodically during each shift by a certified and competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until the necessary precautions have been taken to safeguard the employees.

36.2. Specific excavation requirements.

(a) Prior to opening and excavation, effort shall be made to determine whether underground installations; i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.

(b) Trees, boulders, and other surface encumbrances, located so as to create a hazard to employees involved in

excavation work or in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.

(c) The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground, or some other equivalent means.

(d) Excavations shall be inspected by a competent and certified person after every rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.

(e) The determination of the angle of repose and design of the supporting system shall be based on careful evaluation of pertinent factors such as :

Depth or cut; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying material, or stored material; and vibration from equipment, blasting, traffic, or other sources.

(f) supporting systems; i.e., piling, cribbing, shoring, etc., shall be designed by a qualified person and meet accepted engineering requirements. When tie rods are used to restrain the top of the sheeting or other retaining systems, the rods shall be securely anchored well back of the angle of repose. When tight sheeting or sheet piling is used, full loading due to groundwater table shall be assumed, unless prevented by weep holes or drains or other means. Additional stringers, ties, and bracing shall be provided to allow for any necessary temporary removal of individual supports.

(g) All slopes shall be excavated to at least the angle of repose except for areas where solid rock allows for line drilling or presplitting.

(h) the angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas where erosion, deep frost action, and slide planes appear.

(i)

(1) In excavations which employees may be required to enter, excavated or other material shall effectively be stored and retained at least two (2) feet or more from the edge of the excavation.

(2) As an alternative to the clearance prescribed in subparagraph (1) of this paragraph, the employer may use

effective barriers or other retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the excavation.

(j) Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing, or other equally effective means. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.

(k) Support systems shall be planned and designed by a qualified person when excavation is in excess of twenty (20) feet in depth, adjacent to structures or improvements, or subject to vibration or ground water.

(l) Materials used for sheeting, sheet piling, cribbing, bracing, shoring, and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions.

(m) Special precautions shall be taken in sloping or shoring the sides of excavations adjacent to a previously back-filled excavation or a fill, particularly when the separation is less than the depth of the excavation. Particular attention also shall be paid to joints and seams of material comprising a face and the slope of such seams and joints.

(n) Except in hard rock, excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted, unless the wall is underpinned and all other precautions taken to insure the stability of the adjacent walls for the protection of employees involved in excavation work or in the vicinity thereof.

(o) If the stability of adjoining buildings or walls is endangered by excavations, shoring, bracing, or underpinning shall be provided as necessary to insure their safety. Such shoring, bracing, or underpinning shall be inspected daily or more often, as conditions warrant, by a competent person and the protection effectively maintained.

(p) Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in an excavation.

(q) It is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.

(r) Blasting and the use of explosives shall be performed in accordance with these rules and regulations.

(s) When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs or barricades shall be installed. If possible, the grade should be away from the excavation.

(t) Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be back-filled.

(u) If possible, dust conditions shall be kept to a minimum by the use of water, salt, calcium chloride, oil, or other means.

(v) In locations where oxygen deficiency or gaseous conditions are possible, air in the excavation shall be tested, immediately prior to working entering such area; at least every two (2) hours and as often as necessary to protect the safety of the workers. Controls, as set forth in these regulations, shall be established to assure acceptable atmospheric conditions. When flammable gases are present, adequate ventilation shall be provided or sources of ignition shall be eliminated. Attended emergency rescue equipment, such as breathing apparatus, a safety harness and line, basket stretcher, etc., shall be readily available where adverse atmospheric conditions may exist or develop in an excavation.

(w) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

(x) Where ramps are used for employees or equipment, they shall be designed and constructed by qualified persons in accordance with accepted engineering requirements.

(y) All ladders used on excavation operations shall be in accordance with the requirements of these regulations.

36.3. Specific trenching requirements.

(a) Banks more than five (5) feet high shall be shored, laid back to a stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Refer to Table 47 as a guide in sloping of banks. Trenches less than five (5) feet in depth shall also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.

(b) Sides of trenches is unstable or soft material, five

(5) feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. See Tables 47 and 48.

(c) Sides of trenches in hard or compact soil, including embankments,
shall be shored or otherwise supported when the trench is more than five (5) feet in depth and eight (8) feet or more in length. In lieu of shoring, the sides of the trench above the five (5) foot level may be sloped to preclude collapse, but shall not be steeper than a one (1) foot rise to each one-half (1/2) foot horizontal. When the outside diameter of a pipe is greater than six (6) feet, a bench of four (4) foot minimum shall be provided at the toe of the sloped portion.

(d) Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.

(e) Additional precautions by way of shoring and bracing shall be taken to prevent slides or caveins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.

(f) Employees entering bell-bottom pier holes shall be protected by the installation of a removable-type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier hole which is above the bell. A lifeline, suitable for instant rescue and securely fastened to a shoulder harness, shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.

(g)

(1) Minimum requirements for trench timbering shall be in accordance with Table 48.

(2) Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stress in excess of values given by the following formula:

$S = 1300 - 20L/D$
Maximum ratio $L/D = 50$

Where:

L = Length, unsupported, in inches
D = Least side of the timber, in inches
S = Allowable stress in pounds per square inch of cross-section

(h) When employees are required to be in trenches four (4) feet deep or more, an adequate means of exit, such as a ladder or steps, shall be provided and located so as to require no more than twenty-five (25) feet of lateral travel.

(i) Bracing or shoring of trenches shall be carried along with the excavation.

(j) Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.

(k) Portable trench boxes or sliding trench shield may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench.

(l) Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.

36.4. Definitions applicable to this subsection.

(a) "Accepted Engineering Requirements (or Practice)" Those requirements or practices which are compatible with standards required by a registered architect, a registered professional engineer, or other duly licensed or recognized authority.

(b) "Angle of Repose" the greatest angle above the horizontal plane at which a material will lie without sliding.

(c) "Bank" A mass of soil rising above a digging level.

(d) "Belled Excavation" A part of a shaft or footing excavation, usually near the bottom and bell-shaped; i.d., an enlargement of the cross section above.

(e) "Braces (Trench)" The horizontal members of the shoring system whose ends bear against the uprights or stringers.

(f) "Excavation" Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by

earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.

(g) "Faces" See paragraph (k) of this section.

(h) "hard compact Soil" All earth materials not classified as running or unstable.

(i) "Kickouts" Accidental release or failure of a shore or brace.

(j) "Sheet Pile" A pile, or sheeting, that may form one (1) of a continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.

(k) "sides," "Walls," or "Faces" The vertical or inclined earth surfaces formed as a result of excavation work.

(l) "Slope" The angle with the horizontal at which a particular earth material will stand indefinitely without movement.

(m) "Stringers (Wales)" the horizontal members of a shoring system whose sides beat against the uprights or earth.

(n) "Trench" A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than fifteen (15) feet.

(o) "Trench Jack" Screw or hydraulic type jacks used as cross bracing in a trench shoring system.

(p) "Trench Shield" A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.

(q) "Unstable Soil" Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.

(r) "Uprights" The vertical members of a shoring system.

(s) "Wales" See paragraph (m) of this section.

(t) "Walls" See paragraph (k) of this section.

§36-23-37. Concrete, Concrete forms, and Shoring.

37.1. General provisions.

(a) General. -- All equipment and materials used in concrete construction and masonry work shall meet the applicable requirements for design, construction, inspection, testing, maintenance and operations, as prescribed in ANSI A10.9-1970, safety requirements for concrete construction and masonry work.

(b) Reinforcing steel.

(1) Employees working more than six (6) feet above any adjacent working surfaces, placing and tying reinforcing steel in walls, piers, columns, etc., shall be provided with a safetybelt, or equivalent device.

(2) Employees shall not be permitted to work above vertically protruding reinforcing steel unless it has been protected to eliminate the hazard of impalement.

(3) Guying: Reinforcing steel for walls, piers, columns, and similar vertical structures shall be guyed and supported to prevent collapse.

(4) Wiremesh rolls: Wire mesh rolls shall be secured at each end to prevent dangerous recoiling action.

(c) Bulk concrete handling. Bulk storage bins, containers, or silos shall have conical or tapered bottoms with mechanical or pneumatic means of starting the flow of material.

(d) Concrete placement.

(1) Concrete mixers. Concrete mixers equipped with one (1) yard or larger loading skips shall be equipped with a mechanical device to clear the skip of material.

(2) Guardrails. Mixers of one (1) year capacity or greater shall be equipped with protective guardrails installed on each side of the skip.

(3) Bull floats. Handles on bull floats, used where they may contact energized electrical conductors, shall be constructed of nonconductive material, or insulated with nonconductive sheath whose electrical and mechancial characteristics provide the equivalent protection of a handle constructed of nonconductive material.

(4) Powered concrete trowels. Powered and rotating-type concrete troweling machines that are manually

guided shall be equipped with a control switch that will automatically shut off the power whenever the operator removes his hands from the equipment handles.

(5) Concrete buggies. Handles of buggies shall not extend beyond the wheels on either side of the buggy. Installation of knuckle guards on buggy handles is recommended.

(6) Pumpcrete systems. Pumpcrete or similar systems using discharge pipes shall be provided with pipe supports designed for one hundred (100) percent overload. compressed air hose in such systems shall be provided with positive fail safe joint connectors to prevent separation of sections when pressurized.

(7) Concrete buckets.

(i) Concrete buckets equipped with hydraulic or pneumatically operated gates shall have positive safety latches or similar safety devices installed to prevent aggregate and loose material from accumulating on the top and sides of the bucket.

(ii) Riding of concrete buckets for any purpose shall be prohibited, and vibrator crews and all other persons shall be kept out from under concrete buckets suspended from cranes or cableways.

(8) When discharging on a slope, the wheels of a ready-mix trucks shall be blocked and the brakes set to prevent movement.

(9) Nozzlement applying a cement, sand, and water mixture through a pneumatic hose shall be required to wear protective head and face equipment.

(e) Vertical shoring.

(1) General requirements.

(i) When temporary storage of reinforcing roads, material, or equipment on top of formwork becomes necessary, these areas shall be strengthened to meet the intended loads.

(ii) the sills or shoring shall be sound, rigid, and capable of carrying the maximum intended load.

(iii) All shoring equipment shall be inspected prior to erection to determine that it is as specified in the shoring layout. Any equipment found to be damaged shall not be used for shoring.

(iv) Erected shoring equipment shall be inspected

immediately prior to, during, and immediately after the placement of concrete. Any shoring equipment that is found to be damaged or weakened shall be immediately reinforced or reshored.

(v) Reshoring shall be provided when necessary to safely support slabs and beams after stripping, or where such members are subjected to super-imposed loads due to construction work done.

(2) Tubular welded frame shoring.

(i) Metal tubular frames used for shoring shall not be loaded beyond the safe working load recommended by the manufacturer.

(ii) All locking devices on frames and braces shall be in good working order; coupling pins shall align the frame or panel legs; pivoted cross bracers shall have their center pivot in place; and all components shall be in a condition similar to that of original manufacturer.

(iii) When checking the erected shoring frames with the shoring layout, the spacing between towers and cross brace spacing shall not exceed that shown on the layout, and all locking devices shall be in the closed position.

(iv) Devices for attaching the external lateral stability bracing shall be securely fastened to the legs of the shoring frames.

(v) All baseplates, shore heads, extension devices, or adjustment screws shall be in firm contact with the footing sill and the form.

37.2. Forms and shoring.

(a) General provisions.

(1) Formwork and shoring shall be designed, erected, supported, braced, and maintained so that it will safely support all vertical and lateral loads that may be imposed upon it during placement of concrete

(2) Drawings or plans showing the jack layout, formwork, shoring, working decks, and scaffolding, shall be available at the jobsite.

(3) Stripped forms and shoring shall be removed and stockpiled promptly after stripping, in all areas in which persons are required to work or pass. Protruding nails, wire ties, and other form accessories not necessary to subsequent work shall be pulled, cut, or other means taken to eliminate the

hazard.

(4) Imposition of any construction loads on the partially completed structure shall not be permitted unless such loading has been considered in the design and approved by the engineer-architect.

(b) Vertical slip forms.

(1) The steel rods or pipe on which the jacks climb or by which the forms are lifted shall be specifically designed for the purpose. Such rods shall be adequately braced where not encased in concrete.

(2) Jacks and vertical supports shall be positioned in such a manner that the vertical loads are distributed equally and do not exceed the capacity of the jacks.

(3) The jacks or other lifting devices shall be provided with mechanical dogs or other automatic holding devices to provide protection in case of failure of the power supply or the lifting mechanism.

(4) Lifting shall proceed steadily and uniformly and shall not exceed the predetermined safe rate of lift.

(5) Lateral and diagonal bracing of the forms shall be provided to prevent excessive distortion of the structure during the jacking operation.

(6) During jacking operations, the form structure shall be maintained in line and plumb.

(7) All vertical lift forms shall be provided with scaffolding or work platforms completely encircling the area of placement.

(c) Tube and coupler shoring.

(1) Couplers (clamps) shall not be used if they are deformed, broken, or have defective or missing threads on bolts, or other defects.

(2) The material used for the couplers (clamps) shall be of a structural type such as drop-forged steel, malleable iron, or structural grade aluminum. Gray cast iron shall not be used.

(3) When checking the erected shoring towers with the shoring layout, the spacing between posts shall not exceed that shown on the layout, and all interlocking of tubular members and tightness of couples shall be checked.

(4) All baseplates, shore heads, extension devices, or adjustment screws shall be in firm contact with the footing sill and the formmaterial and shall be snug against the posts.

(d) Single post shores.

(1) For stability, single post shores shall be horizontally braced in both the longitudinal and transverse directions, and diagonal bracing shall also be installed. Such bracing shall be installed as the shores are being erected.

(2) All baseplates or shore heads of single post shores shall be in firm contact with the footing sill and the form materials.

(3) Whenever single post shores are used in more than one (1) tier, the layout shall be designed and inspected by structural engineer.

(4) When formwork is at an angle, or sloping, or when the surfaces shored is sloping, the shoring shall be designed for such loading.

(5) Adjustment of single post shores to raise formwork shall not be made after concrete is in place.

(6) Fabricated single post shores shall not be used if heavily rusted, bent, dented, rewelded, or having broken weldments or other defects. If they contain timber, they shall not be used if the timber is split, cut, has sections removed, is rotted, or otherwise structurally damaged.

(7) All timber and adjusting devices to be used for adjustable timber single post shores shall be inspected before erection.

(8) Timber shall not be used if it is split, cut, has sections removed, is rotted, or is otherwise structurally damaged.

(9) Adjusting devices shall not be used if heavily rusted, bent, dented, rewelded, or having broken weldments or other defects.

(10) All nails used to secure bracing or adjustable timber single post shores shall be driven home and the point of the nail bent over if possible.

37.3. Definitions applicable to this subsection.

(a) "Bull Float" A tool used to spread out and smooth the concrete.

(b) "Formwork" or Falsework" The total system of support for freshly placed concrete, including the mold sheathing which contacts the concrete as well as all supporting members, hardware, and necessary bracing.

(c) "Guy" A line that steadies a high piece or structure by pulling against an off-center load.

(d) "Shore" A supporting member that resists a compressive force imposed by a load.

(e) "Vertical Slip Forms" forms which are jacked vertically and continuously during placing of the concrete.

§36-23-38. Steel Erection.

38.1. Flooring requirements.

(a) Permanent flooring--skeleton steel construction in tiered buildings.

(1) The permanent floors shall be installed as the erection of structural members progresses, and there shall be not more than eight (8) stories between the erection floor and the uppermost permanent floor, except where the structural integrity is maintained as a result of the design.

(2) At no time shall there be more than four (4) floors or forty-eight (48) feet of unfinished bolting or welding above the foundation or uppermost permanently secured floor.

(b) Temporary flooring. Skeleton steel construction in tiered buildings.

(1)

(i) The derrick or erection floor shall be solidly planked or decked over its entire surface except for access openings. Planking or decking of equivalent strength, shall be of proper thickness to carry the working load. Planking shall be not less than two (2) inches thick full size undressed, and shall be laid tight and secured to prevent movement.

(ii) On buildings or structures not adaptable to temporary floors, and where scaffolds are not used, safety nets shall be installed and maintained whenever the potential fall distance exceeds two (2) stories or thirty (30) feet. The nests shall be hung with sufficient clearance to prevent contacts with the surface of structures below.

(iii) Floor periphery--safety railing. A safety railing of one-half (1/2) inch wire rope or equal shall be

installed approximately forty-two (42) inches high, around the periphery of all temporary-planked or temporary metal-decked floors of tier buildings and other structural steel assembly.

(2)

(i) Where skeleton steel erection is being done, a tightly planked and substantial floor shall be maintained within two (2) stories or thirty (30) feet, whichever is less, below and directly under that portion of each tier of beams on which any work is being performed, except when gathering and stacking temporary floor planks on a lower floor, in preparation for transferring such planks for use on an upper floor. Where such a floor is not practicable, paragraph (b)(1)(ii) of this section applies.

(ii) When gathering and stacking temporary floor planks, the planks shall be removed successively, working toward the last panel of the temporary floor so that the work is always done from the planked floor.

(iii) When gathering and stacking temporary floor planks from the last panel, the employees assigned to such work shall be protected by safety belts with safety lines attached to a catenary line or other substantial anchorage.

(c) Flooring. Other construction.

(1) In the erection of a building having double wood floor construction, the rough flooring shall be completed as the building progresses, including the tier below the one on which floor hoists are being installed.

(2) For single wood floor or other flooring systems, the floor immediately below the story where the floor hoists are being installed shall be kept planked or decked over.

38.2. Structural steel assembly.

(a) During the final placing of solid web structural members, the load shall not be released from the hoisting line until the members are secured with not less than two (2) bolts, or the equivalent at each connection and drawn of wrench tight.

(b) Open web steel hoists shall not be placed on any structural steel framework unless such framework is safely bolted or welded.

(c)

(1) In steel framing, where bar hoists are utilized, and columns are not framed in at least two (2) directions with

structural steel members, a bar hoist shall be field-bolted at columns to provide lateral stability during construction.

(2) Where longspan hoists or trusses, forty (40) feet or longer, are used, a center row of bolted bridging shall be installed to provide lateral stability during construction prior to slacking of hoisting line.

(3) No load shall be placed on open web steel hoists until these security requirements are met.

38.3. Bolting, riveting, fitting-up, and plumbing-up.

(a) General requirements.

(1) Containers shall be provided for storing or carrying rivets, bolts, and drift pins, and secured against accidental displacement when aloft.

(2) Pneumatic hand tools shall be disconnected from the power source, and pressure in hose lines shall be released, before any adjustments or repairs are made.

(3) Air line hose sections shall be tied together except when quick disconnect couplers are used to join sections.

(4) Eye protection shall be provided in accordance with these regulations.

(b) Bolting.

(1) When bolts or drift pins are being knocked out, means shall be provided to keep them from falling.

(2) Impact wrenches shall be provided with a locking device for retaining the socket.

(c) Riveting.

(1) Riveting shall not be done in the vicinity of combustible material unless precautions are taken to prevent fire.

(2) When rivet heads are knocked off, or backed out, means shall be provided to keep them from falling.

(3) A safety wire shall be properly installed on the snap and on the handle of the pneumatic riveting hammer and shall be used at all times. The wire size shall be not less than No. 9 (B & S gauge), leaving the handle and annealed No. 14 on the snap, or equivalent.

(d) Plumbing-up.

(1) Connections of the equipment used in plumbing-up shall be properly secured.

(2) The turnbuckles shall be secured to prevent unwinding while under stress.

(3) Plumbing-up guys related equipment shall be placed so that employees can get at the connection points.

(4) Plumbing-up guys shall be removed only under the supervision of a competent person.

(e) Wood planking shall be of proper thickness to carry the working load, but shall be not less than two (2) inches thick full size undressed, exterior grade plywood, at least three-quarter (3/4) inch thick, or equivalent material.

(f) Metal decking of sufficient strength shall be laid tight and secured to prevent movement.

(g) Planks shall overlap the bearing on each end by a minimum of twelve (12) inches.

(h) Wire mesh, exterior plywood, or equivalent, shall be used around columns where planks do not fit tightly.

(i) Provisions shall be made to secure temporary flooring against displacement.

(j) All unused openings in floors, temporary or permanent, shall be completely planked over or guarded.

(k) Employees shall be provided with safety belts when they are working on float scaffolds.

§36-23-39. Demolition.

39.1. Preparatory operations.

(a) Prior to permitting employees to start demolition operations, an engineering survey shall be made by a competent person of the structure to determine the condition of the framing, floors, and walls, and possibility of unplanned collapse of any portion of the structure. Any adjacent structure where employees may be exposed shall also be similarly checked. The employer shall have in writing evidence that such a survey has been performed.

(b) When employees are required to work within a structure to be demolished which has been damaged by fire, flood, explosion, or other cause, the walls or floor shall be shored or

braced.

(c) All electric, gas, water, steam, sewer and other service lines shall be shut off, capped, or otherwise controlled, outside the building line before demolition work is started. In each case, any utility company which is involved shall be notified in advance.

(d) if it is necessary to maintain any power, water or other utilities during the demolition, such lines shall be temporarily relocated, as necessary, and protected.

(e) It shall also be determined if any type of hazardous chemicals, gases, explosives, flammable materials, or similarly dangerous substances have been used in any pipes, tanks, or other equipment on the property. When the presence of any such substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

(f) Where a hazard exists from fragmentation of glass, such hazards shall be removed.

(g) Where a hazard exists to employees falling through wall openings, the opening shall be protected to a height of approximately forty-two (42) inches.

(h) When debris is dropped through holes in the floor without the use of chutes, the area onto which the material is dropped shall be completely enclosed with barricades not less than forty-two (42) inches high and not less than six (6) feet back from the projected edge of the opening above. Signs, warning of the hazard of falling materials shall be posted at each level and all areas shall be guarded against entry. Removal shall not be permitted in this lower area until debris handling ceases above.

(i) All floor openings, not used as material drops, shall be covered over with material substantial enough to support the weight of any load which may be imposed. such material shall be properly secured to prevent its accidental movement.

(j) Except for the cutting of holes in floors for chutes, holes through which to drop materials, preparation of storage space, and similar necessary preparatory work, the demolition of exterior walls and floor construction shall begin at the top of the structure and proceed downward. Each story of exterior wall and floor construction shall be removed and dropped into the storage space before commencing the removal of exterior walls and floors in the story next below.

(k) Employee entrances to multi-story structures being

demolished shall be completely protected by sidewalk sheds or canopies, or both, providing protection from the face of the building for a minimum of eight (8) feet. All such canopies shall be at least two (2) feet wider than the building entrances or openings (one (1) foot wider on each side thereof), and shall be capable of sustaining a load of one hundred fifty (150) pounds per square foot.

39.2. Stairs, passageways, and ladders.

(a) Only those stairways, passageways, and ladders, designated as means of access to the structure of a building, shall be used. Other access ways shall be entirely closed at all times.

(b) All stairs, passageways, ladders and incidental equipment thereto, which are covered by this section shall be periodically inspected during each shift and maintained in a clean safe condition.

(c) In a multi-story building, when a stairwell is being used, it shall be properly illuminated by either natural or artificial means, and completely and substantially covered over at a point not less than two (2) floors below the floor on which work is being performed, and access to the floor where the work is in progress shall be through a properly lighted, protected, and separate passageway.

39.2. Chutes.

(a) No material shall be dropped to any point lying outside the exterior walls of the structure unless the area is effectively protected.

(b) All material chutes, or sections thereof, at an angle of more than forty-five (45) degrees from the horizontal, shall be entirely enclosed, except for openings equipped with closures at or about floor level for the insertion of materials. The openings shall not exceed forty-eight (48) inches in height measured along the wall of the chute. At all stories below the top floor, such openings shall be kept closed when not in use.

(c) A substantial gate shall be installed in each chute at or near the discharge end. A competent employee shall be assigned to control the operation
of the gate, and the backing and loading of trucks.

(d) When operations are not in progress, the area surrounding the discharge end of the chute shall be securely closed off.

(e) Any chute opening, into which workmen dump debris,

shall be protected by a substantial guardrail approximately forty-two (42) inches above the floor or other surface on which the men stand to dump the material. Any space between the chute and the edge of openings in the floors through which it passes shall be solidly covered over.

(f) Where the material is dumped from mechanical equipment or wheelbarrows a securely attached toeboard or bumper, not less than four (4) inches thick and six (6) inches high, shall be provided at each chute opening.

(g) Chutes shall be designed and constructed of such strength as to eliminate failure due to impact of materials or debris loaded therein.

39.4. Removal of materials through floor openings. Any openings cut in a floor for the disposal of materials shall be no larger in size than twenty-five (25) percent of the aggregate of the total floor area, unless the lateral supports of the removed flooring remain in place. Floors weakened or otherwise made unsafe by demolition operations shall be shored to carry safely the intended imposed load from demolition operations.

39.5. Removal of walls, masonry sections, and chimneys.

(a) masonry walls, or other sections of masonry, shall not be permitted to fall upon the floors of the building in such masses as to exceed the safe carrying capacities of the floors.

(b) No wall section, which is more than one (1) story in height, shall be permitted to stand alone without lateral bracing, unless such wall was originally designed and constructed to stand without such lateral support, and is in a condition safe enough to be self-supporting. All walls shall be left in a stable condition at the end of each shift.

(c) Employees shall not be permitted to work on the top of a wall when weather conditions constitute a hazard.

(d) Structural or load-supporting members on any floor shall not be cut or removed until all stories above such a floor have been demolished and removed. This provision shall not prohibit the cutting of floor beams for the disposal of materials or for the installation of equipment, provided that the requirements of Section 39.4 and 39.6 of these regulations are complied with.

(e) Floor openings within ten (10) feet of any wall being demolished shall be planked solid, except when employees are kept out of the area below.

(f) In buildings of "Skeleton-Steel" construction, the steel framing may be left in place during the demolition of masonry. Where this is done, all steel beams, girders, and similar structural supports shall be cleared of all loose material as the masonry demolition progresses downward.

(g) Walkways or ladders shall be provided to enable employees to safely reach or leave any scaffold or wall.

(h) Walls, which serve as retaining walls to support earth or adjoining structures, shall not be demolished until such earth has been properly braced or adjoining structures have been properly underpinned.

(i) Walls which are to serve as retaining walls against which debris will be piled, shall not be so used unless capable of safely supporting the imposed load.

39.6. Manual removal of floors.

(a) Openings cut in a floor shall extend the full span of the arch between supports.

(b) Before demolishing any floor arch, debris and other material shall be removed from such arch and other adjacent floor area. Planks not less than two (2) inches x ten (10) inches in cross section, full size undressed, shall be provided for, and shall be used by employees to stand on while breaking down floor arches between beams. Such planks shall be so located as to provide a safe support for the workmen should the arch between the beams collapse. the open space between planks shall not exceed sixteen (16) inches.

(c) Safe walkways, not less than eighteen (18) inches wide, formed of planks not less than two (2) inches thick if wood, or of equivalent strength if metal, shall be provided and used by workmen when necessary to enable them to reach any point without walking upon exposed beams.

(d) Stringers of ample strength shall be installed to support the flooring planks, and the ends of such stringers shall be supported by floor beams or girders, and not be floor arches alone.

(e) Planks shall be laid together over solid bearings with the ends overlapping at least one (1) foot.

(f) When floor arches are being removed, employees shall not be allowed in the area directly underneath, and such an area shall be barricaded to prevent access to it.

(g) Demolition of floor arches shall not be started until

they, and the surrounding floor area for a distance of twenty (20) feet, have been cleared of debris and any other necessary materials.

39.7. Removal of walls, floors, and material with equipment.

(a) Mechanical equipment shall not be used on floors or working surfaces unless such floors or surfaces are of sufficient strength to support the imposed load.

39.11. Selective demolition by explosives.

Selective demolition by explosives shall be conducted in accordance with Section 40 of these regulations.

§36-23-40. Blasting and The Use of Explosives.

40.1. General provisions.

(a) After the effective date of the certified surface blasters rules and regulations, all persons performing blasting operations on construction projects shall be certified. The employer shall permit only authorized and qualified persons to handle and use explosives.

(b) Smoking, firearms, matches, open flame lamps, and other fires, flame or heat producing devices and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported or used.

(c) No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.

(d) All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The employer shall maintain an inventory and use records of all explosives. Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.

(e) No explosives or blasting agents shall be abandoned.

(f) No fire shall be fought where the fire is in imminent danger of contact with explosives. All employees shall be removed to a safe area and the fire area guarded against intruders.

(g) Original containers, or Class 2 magazine, shall be

used for taking detonators and other explosives from storage magazines to the blasting area.

(h) When blasting is done in congested areas or in proximity to a structure, railway, or highway, or any other installation that may be damaged, the blaster shall take special precautions in the loading, delaying, initiation, and confinement of each blast with mats or other methods so as to control the throw of fragments, and thus prevent bodily injury to employees.

(i) Employees authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including, but not limited to visual and audible warning signals, flags, or barricades, to ensure employee safety.

(j) Insofar as possible, blasting operations above ground shall be conducted between sunup and sundown.

(k) Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent power lines, dust storms, or other sources of extraneous electricity. These precautions shall include:

(1) Detonators shall be short-circuited in holes which have been primed and shunted until wired into the blasting circuit;

(2) The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm;

(3)

(i) The prominent display of adequate signs, warning against the use of mobile radio transmitters, on all roads within one thousand (1,000) feet of blasting operations. Whenever adherence to the one thousand (1,000) foot distance would create an operational handicap, a competent person shall be consulted to evaluate the particular situation, and alternative provisions may be made which are adequately designed to prevent any premature firing of electric blasting caps. A description of any such alternatives shall be reduced to writing and shall be certified as meeting the purposes of this subdivision by the competent person consulted. The description shall be maintained at the construction site during the duration of the work and shall be available for inspection by representatives of the Secretary of Labor.

(ii) Specimens of signs which would meet the requirements of subdivision (i) of this subparagraph (3) are the following (See Table 49):

(4) Ensuring that mobile radio transmitters which are less than one hundred (100) feet away from electric blasting caps, in other than original containers shall be deenergized and effectively locked.

(5) Compliance with the recommendations of the Institute of the Makers of Explosives with regard to blasting in the vicinity of radio transmitters as stipulated in radio frequency energy-a potential hazard in the use of electric blasting caps, IME publication No. 20, March, 1971.

(l) Empty boxes and paper and fiber packing materials, which have previously contained high explosives, shall not be used again for any purpose, but shall be destroyed by burning at an approved location.

(m) Explosives, blasting agents, and blasting supplies that are obviously deteriorated or damaged shall not be used.

(n) Delivery and issue of explosives shall only be made by and to authorized persons and into authorized magazines or approved temporary storage or handling areas.

(o) Blasting operations in the proximity of overhead power lines, communication lines, utility services, or other services and structures shall not be carried on until the operators and/or owners have been notified and measures for safe control have been taken.

(p) The use of black powder shall be prohibited.

(q) All loading and firing shall be directed and directly supervised by a competent persons thorough experienced in this field.

(r) All blasts shall be fired electrically with an electric blasting machine or properly designed electric power source, except as provided in paragraphs (a) and (p) of Section 40.8 of these regulations.

40.2. Explosives and blasting agents.

(a) Buildings used for the mixing of blasting agents shall conform to the requirements of this section.

(b) Buildings shall be of noncombustible construction or sheet metal on wood studs.

(c) Floors in a mixing plant shall be of concrete or other nonabsorbent materials.

(d) All fuel oil storage facilities shall be separated

from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building.

(e) The building shall be well ventilated.

(f) Heating units which do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be provided exclusively from units located outside the mixing building.

(g) All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a fire wall. The exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant.

(h) Buildings used for the mixing of water gels shall conform to the requirements of this subdivision.

(i) Buildings shall be of noncombustible construction or sheet metal on wood stubs.

(j) Floors in a mixing plant shall be of concrete or of other nonabsorbent materials.

(k) Where fuel oil is used all fuel oil storage facilities shall be separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building.

(l) The building shall be well ventilated.

(m) Heating units that do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be provided exclusively from units located outside of the mixing building.

(n) All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a fire wall. the exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant.

40.3. Blaster qualifications.

(a) A blaster shall be able to understand and given written and oral orders.

(b) A blaster shall be in good physical condition and not

be addicted to narcotics, intoxicants, or similar types of drugs.

(c) A blaster shall be qualified, by training, knowledge, and experience, in the field of transporting, storing, handling, and use of explosives, and have a working knowledge of State and local laws and regulations which pertain to explosives.

(d) Blasters shall be required to furnish satisfactory evidence of competency in handling explosives and performing in a safe manner the type of blasting that will be required.

(e) The blaster shall be knowledgeable and competent in the use of each type of blasting method used.

40.4. Surface transportation of explosives.

(a) Transportation of explosives shall meet the provisions of the department of transportation's regulations contained in 14 CFR Part 103, air transportation; 46 CFR Parts 146-149, water carriers; 49 CFR Parts 171-179, highways and railways; 49 CFR Part 180, pipelines; and 49 CFR Parts 390-397, motor carriers. Motor vehicles or conveyances transporting explosives shall only be driven by, and be in charge of, a licensed driver who is physically fit. He shall be familiar with the local, State, and federal regulations governing the transportation of explosives.

(b) No person shall smoke, or carry matches or any other flame-producing device, nor shall firearms or loaded cartridges be carried while in or near a motor vehicle or conveyance transporting explosives.

(c) 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.

(d) Vehicles used for transporting explosives shall be strong enough to carry the load without difficulty, and shall be in good mechanical condition.

(e) When explosives are transported by a vehicle with an open body, a Class 2 magazine or original manufacturer's container shall be securely mounted on the bed to contain the cargo.

(f) All vehicles used for the transportation of explosives shall have tight floors and any exposed spark-producing metal on the inside of the body shall be covered with wood, or other nonsparking material, to prevent contact with containers of explosives.

(g) Every motor vehicle or conveyance used for transporting explosives shall be marked or placarded on both sides, the front, and the rear with the work "Explosives" in red letters, not less than four (4) inches in height, in white background. In addition to such marking or placarding, the motor vehicle or conveyance may display, in such a manner that it will be readily visible from all directions, a red flag eighteen (18) inches x thirty (30) inches, with the word "Explosives" painted, stamped, or sewed thereon, in white letters, at least six (6) inches in height.

(h) Each vehicle used for transportation of explosives shall be equipped with a fully charged fire extinguisher, in good condition. An approved extinguisher of not less than ten (10) ABC rating will meet the minimum requirement. The driver shall be trained in the use of the extinguisher on his vehicle.

(i) Motor vehicles or conveyances carrying explosives, blasting agents, or blasting supplies, shall not be taken inside a garage or shop for repairs or servicing.

(j) No motor vehicle transporting explosives shall be left unattended.

40.5. Storage of explosives and blasting agents.

(a) Explosives and related materials shall be stored in approved facilities required under the applicable provisions of the internal revenue service regulations contained in 26 CFR 181, commerce in explosives.

(b) Blasting caps, electric blasting caps, detonating primers, and primed cartridges shall not be stored in the same magazine with other explosives or blasting agents.

(c) Smoking and open flames shall not be permitted within fifty (50) feet of explosives and detonator storage magazines.

40.6. Loading of explosives or blasting agents.

(a) Procedures that permit safe and efficient loading shall be established before loading is started.

(b) All drill holes shall be sufficiently large to admit freely the
insertion of the cartridges of explosives.

(c) Tamping shall be done only with wood rods or plastic tamping poles without exposed metal parts, but nonsparking metal connectors may be used for jointed poles. Violent tamping shall be avoided. The primer shall never be tamped.

(d) No holes shall be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives and detonators shall be immediately returned to an authorized magazine.

(e) Drilling shall not be started until all remaining butts of old holes are examined for unexploded charges, and if any are found, they shall be refired before work proceeds.

(f) No person shall be allowed to deepen drill holes which have contained explosives or blasting agents.

(g) No explosives or blasting agents shall be left unattended at the blast site.

(h) machines and all tools not used for loading explosives into bore holes shall be removed from the immediate location of holes before explosives are delivered. Equipment shall not be operated within fifty (50) feet of loaded holes.

(i) No activity of any nature other than that which is required for loading holes with explosives shall be permitted in a blast area.

(j) Power lines and portable electric cables for equipment being used shall be kept a safe distance from explosives or blasting agents being loaded into drill holes. Cables in the proximity of the blast area shall be deenergized and locked out by the blaster.

(k) Holes shall be checked prior to loading to determine depth and conditions. Where a hole has been loaded with explosives but the explosives have failed to detonate, there shall be no drilling within fifty (50) feet of the hole.

(l) When loading a long line of holes with more than one (1) loading crew, the crews shall be separated by practical distance consistent with efficient operation and supervision of crews.

(m) No explosives shall be loaded or used underground in the presence of combustible gases or combustible dusts.

(n) No explosives other than those in fume Class 1 shall be used; however, explosives complying with the requirements of fume Class 2 and fume Class 3 may be used if adequate ventilation has been provided.

(o) All blast holes in openwork shall be stemmed to the collar or to a point which will confine the charge.

(p) Warning signs, indicating a blast area, shall be

maintained at all approaches to the blast area. The warning sign lettering shall be not less than four (4) inches in height on a contrasting background.

(q) A bore hole shall never be sprung when it is adjacent to or near a hole that is loaded. Flashlight batteries shall not be used for springing holes.

(r) Drill holes which have been sprung or chambered, and which are not water filled, shall be allowed to cool before explosives are loaded.

(s) No loaded holes shall be left unattended or unprotected.

(t) The blaster shall keep an accurate, up-to-date record of explosives, blasting agents, and blasting supplies used in a blast and shall keep an accurate running inventory of all explosives and blasting agents stored on the operation.

40.7. Explosives and blasting agents.

(a) Semiconductive hose. Semiconductive hose a hose with an electrical resistance high enough to limit flow of stray electric currents to safe levels, yet not so high as to prevent drainage of static electric charges to ground; hose of not more than two (2) megohms resistance over its length and of not less than five thousand (5,000) ohms per floor meets the requirements.

(b) When loading blasting agents pneumatically over electric blasting caps, semiconductive delivery hose shall be used and the equipment shall be bonded and grounded.

40.8. Initiation of explosive charges--electric blasting.

(a) Electric blasting caps shall not be used where sources of extraneous electricity make the use of electric blasting caps dangerous. Blasting cap leg wires shall be kept short-circuited (shunted) until they are connected into the circuit for firing.

(b) Before adopting any system of electrical firing, the blaster shall conduct a thorough survey for extraneous currents, and all dangerous currents shall be eliminated before any holes are loaded.

(c) In any single blast using electric blasting caps, all caps shall be of the same style or function, and of the same manufacture.

(d) Electric blasting shall be carried out by using blasting circuits or power circuits in accordance with the

electric blasting cap manufacturer's recommendations, or an approved contractor or his designated representative.

(e) When firing a circuit of electric blasting caps, care must be exercised to ensure that an adequate quantity of delivered current is available, in accordance with the manufacturer's recommendations.

(f) Connecting wires and lead wires shall be insulated single solid wires of sufficient current-carrying capacity.

(g) Bus wires shall be solid single wires of sufficient current-carrying capacity.

(h) When firing electrically, the insulation on all firing lines shall be adequate and in good condition.

(i) A power circuit used for firing electric blasting caps shall not be grounded.

(j) When firing from a power circuit, the firing switch shall be locked in the open or "Off" position at all times, except when firing. It shall be so designed that the firing lines to the cap circuit are automatically short-circuited when the switch is in the "Off" position. Keys to this switch shall be entrusted only to the blaster.

(k) Blasting machines shall be in good condition and the efficiency of the machine shall be tested periodically to make certain that it can deliver power at its rated capacity.

(l) When firing with blasting machines, the connections shall be made as recommended by the manufacturer of the electric blasting caps used.

(m) the number of electric blasting caps connected to a blasting machine shall not be in excess of its rated capacity. furthermore, in primary blasting, a series circuit shall contain no more caps than the limits recommended by the manufacturer of the electric blasting caps in use.

(n) The blaster shall be in charge of the blasting machines, and no other person shall connect the leading wires to the machine.

(o) Blasters, when testing circuits to charged holes, shall use only blasting galvanometers equipped with a silver chloride cell especially designed for this purpose.

(p) Whenever the possibility exists that a leading line or blasting wire might be thrown over a live power line by the force of an explosion, care shall be taken to see that the total

length of wires are kept too short to hit the lines, or that the wires are securely anchored to the ground. If neither of these requirements can be satisfied, a nonelectric system shall be used.

(q) In electrical firing, only the man making leading wire connections shall fire the shot. All connections shall be made from the bore hole back to the source of firing current, and the leading wires shall remain shorted and not be connected to the blasting machine or other source of current until the charge is to be fired.

(r) After firing an electric blast from a blasting machine, the leading wires shall be immediately disconnected from the machine and short-circuited.

40.9. Use of safety fuse.

(a) 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.

(b) The handling of a fuse on nails or other projections which will cause a sharp bend to be formed in the fuse is prohibited.

(c) Before capping safety fuse, a short length shall be cut from the end of the supply reel so as to assure a fresh cut end in each blasting cap.

(d) Only a cap crimper of approved design shall be used for attaching blasting caps to safety fuse. Crimpers shall be kept in good repair and accessible for use.

(e) No unused cap or short capped fuse shall be placed in any hole to be blasted; such unused detonators shall be removed from the working place and destroyed.

(f) No fuse shall be capped, or primers made up, in any magazine or near any possible source of ignition.

(g) No one shall be permitted to carry detonators or primers of any kind on his person.

(h) The minimum length of safety fuse to be used in blasting shall be as required by state law, but shall not be less than thirty (30) inches.

(i) At least two (2) men shall be present when multiple cap and fuse blasting is done by hand lighting methods.

(j) Not more than twelve (12) fuses shall be lighted by each blaster when hand lighting devices are used. However, when two (2) or more safety fuses in a group are lighted as one (1) by means of igniter cord, or other similar fuse-lighting devices, they may be considered as one (1) fuse.

(k) The so-called "Drop Fuse" method of dropping or pushing a primer or any explosive with a lighted fuse attached is forbidden.

(l) Cap and fuse shall not be used for firing mudcap charges unless charges are separated sufficiently to prevent one (1) charge from dislodging other shots in the blast.

(m) When blasting with safety fuses, consideration shall be given to the length and burning rate of the fuse. Sufficient time, with a margin of safety, shall always be provided for the blaster to reach a place of safety.

40.10. Use of detonating cord.

(a) 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.

(b) Detonating cord shall be handled and used with the same respect and care given other explosives.

(c) The line of detonating cord extending out of a bore hole or from a charge shall be cut from supply spool before loading the remainder of the bore hole or placing additional charges.

(d) Detonating cord shall be handled and used with care to avoid damaging or severing the cord during and after loading and hooking up.

(e) Detonating cord connections shall be competent and positive in accordance with approved and recommended methods. Knot-type or other cord-to-cord connections shall be made only with detonating cord, in which the explosive cord is dry.

(f) All detonating cord trunk lines and branch lines shall be free of loops, sharp kinks, or angles that direct the cord back toward the oncoming line of detonation.

(g) All detonating cord connections shall be inspected before firing the blast.

(h) When detonating cord millisecond-delay connectors or short-interval-delay electric blasting caps are used with detonating cord, the practice shall conform strictly to

the manufacturer's recommendations.

(i) When connecting a blasting cap or an electric blasting cap to detonating cord, the cap shall be taped or otherwise attached securely along the side or the end of the detonating cord, with the end of the cap containing the explosive charge pointed in the direction in which the detonation is to proceed.

(j) Detonators for firing the trunk line shall not be brought to the loading area nor attached to the detonating cord until everything else is in readiness for the blast.

40.11. Firing the blast.

(a) A code of blasting signals shall be posted on one 91) or more conspicuous places at the operation, and all employees shall be required to familiarize themselves with the code and conform to it. Danger signs shall be placed at suitable locations.

(b) Before a blast is fired, a loud warning signal shall be given by the certified blaster in charge, who has made certain that all surplus explosives are in a safe place and all employees, vehicles, and equipment are at a safe distance, or under sufficient cover.

(c) Flagmen shall be safely stationed on highways which pass through the danger zone so as to stop traffic during blasting operations.

(d) It shall be the duty of the blaster to fix the time of blasting.

(e) Before firing an underground blast, warning shall be given, and all possible entries into the blasting area, and any entrances to any working place where a drift, raise, or other opening is about to hole through, shall be carefully guarded. The blaster shall make sure that all employees are out of the blast area before firing a blast.

U-1
Warning Signal - A 1-1 minute series of long blasts 5 minutes prior to blast signal.

Blast Signal - A series of short blasts 1 minute prior to the shot.

All Clear Signal - A pro-

longed blast following the inspection of blast area.

40.12. Inspection after blasting.

(a) Immediately after the blast has been fired, the firing line shall be disconnected from the blasting machine, or where power switches are used, they shall be locked open or in the off position.

(b) Sufficient time shall be allowed, not less than fifteen (15) minutes in tunnels, for the smoke and fumes to leave the blasted area before returning to the shot. An inspection of the area and the surrounding rubble shall be made by the certified blaster to determine if all charges have been exploded before employees are allowed to return to the operation, and in tunnels, after the muck pile has been wetted down.

40.13. Misfires.

(a) If a misfire is found, the blaster shall provide proper safeguards for excluding all employees from the danger zone.

(b) No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.

(c) No attempt shall be made to extract explosives from any charged or misfired hole; a new primer shall be put in and the hole reblasted. If misfiring of the misfired hole presents a hazard, the explosives may be removed by washing out with water, or, where the misfire is under water, blown out with air.

(d) If there are any misfires while using cap and fuse, all employees shall remain away from the charge for at least one (1) hour. Misfires shall be handled under the direction of the person in charge of the blasting. All wires shall be carefully traced and a search made for unexploded charges.

(e) No drilling, digging, or picking shall be permitted until all missed holes have been detonated or the authorized representative has approved that work can proceed.

40.14. Definitions applicable to this subsection.

(a) "Approved Storage Facility" a facility for the storage of explosive material conforming to the requirements of this subpart and covered by a license or permit.

(b) "Blast Area" the area in which explosive loading and

blasting operations are being conducted.

(c) "Blaster" the person or persons authorized to use explosives for blasting purposes and meeting the qualifications in these rules and regulations.

(d) "Blasting Agent" a blasting agent is any material or mixture consisting of a fuel and oxidizer used for blasting, but not classified an explosive and in which none of the ingredients is classified as an explosive provided the furnished (mixed) product cannot be detonated with a No. 8 test blasting cap when confined. A common blasting agent presently in use is a mixture of ammonia nitrate (NH4 N03) and carbonaceous combustibles, such as fuel oil or coal, and may either be procured, premixed and packaged from
explosive companies or mixed in the field.

(e) "Blasting Cap" a metallic tube closed at one (1) end, containing a charge of one (1) or more detonating compounds, and designed for and capable of detonation from the sparks or flame from a safety fuse inserted and crimped into the open end.

(f) "Block Holing" the breaking of boulders or blasting agents by firing a charge of explosives that has been loaded in a drill hole.

(g) "Conveyance" any unit for transporting explosives or blasting agents, including but not limited to trucks, trailers, rail cars, barges and vessels.

(h) "Detonating Cord" a flexible cord containing a center core of high explosives which when detonated, will have sufficient strength to detonate other cap-sensitive explosives with which it is in contact.

(i) "Detonator" blasting caps, electric blasting caps, delay electric blasting caps, and nonelectric delay blasting caps.

(j) "Electric Blasting Cap" a blasting cap designed for and capable of detonation by means of an electric current.

(k) "Electric Blasting Circuitry"

(1) Bus wire. An expandable wire, used in parallel or series, in parallel circuits, to which are connected the leg wires of electric blasting caps.

(2) Connecting wire. An insulated expendable wire used between electric blasting caps and the leading wires or between the bus wire and the leading wires.

(3) Leading wire. An insulated wire used between the electric power source and the electric blasting cap circuit.

(4) Permanent blasting wire. A permanently mounted insulated wire used between the electric power source and the electric blasting circuit.

(l) "Electric Delay Blasting Caps" caps designed to detonate at a predetermined period of time after energy is applied to the ignition system.

(m) "Explosives"

(1) Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion; that is, with substantially instantaneous release of gas and heat.

(2) All material which is classified as Class A, Class B, and Class C explosives by the West Virginia department of mines.

(3) Classification of explosives by the West Virginia department of mines is as follows:

Class A explosives. Possessing detonating hazard, such as dynamite, nitroglycerin, picric acid, lead azide, fulminate of mercury, black powder, blasting caps, and detonating primers.

Class B explosives. Possessing flammable hazard, such as propellent explosives, including some smokeless propellants.

Class C explosives. Include certain types of manufactured articles which contain Class A or Class B explosives, or both, as components, but in restricted quantities.

(n) "Fuse Lighters" special devices for the purpose of igniting safety fuse.

(o) "Magazine" any building or structure, other than an explosives manufacturing building, used for the storage of explosives.

(p) "Misfire" an explosive charge which failed to detonate.

(q) "Mud-capping" (sometimes known as bulldozing, adobe blasting, or adobying). The blasting of boulders by placing a quantity of explosives in a drill hole.

(r) "Nonelectric Delay Blasting Cap" a blasting cap with an integral delay element in conjunction with and capable of being detonated by a detonation impulse or signal from miniaturized detonating cord.

(s) Primary Blasting" the blasting operation by which the original rock formation is dislodged from its natural location.

(t) "Primer" a cartridge or container of explosives into which a detonator or detonating cord is inserted or attached.

(u) "Safety Fuse" a flexible cord containing an integral burning medium by which fire is conveyed at a continuous and uniform rate for the purpose of firing blasting caps.

(v) "Secondary Blasting" the reduction of oversize material by the use of explosives to the dimension required for handling, including mud-capping and blockholding.

(w) "Stemming" a suitable inert incombustible material or device used to confine or separate explosives in a drill hole, or to cover explosives in mud-capping.

(x) "Springing" the creation of a pocket in the bottom of a drill hole by the use of a moderate quantity of explosives in order that larger quantities of explosives may be inserted therein.

(y) "Water Gels, or Slurry Explosives" a wide variety of materials used for blasting. They all contain substantial proportions of water and high proporations of ammonium nitrate, some of which is in solution in the water.

Two (2) broad classes of water gels are:

(1) those which are sensitized by a material classed as a explosive, such as TNT or smokeless powder; and

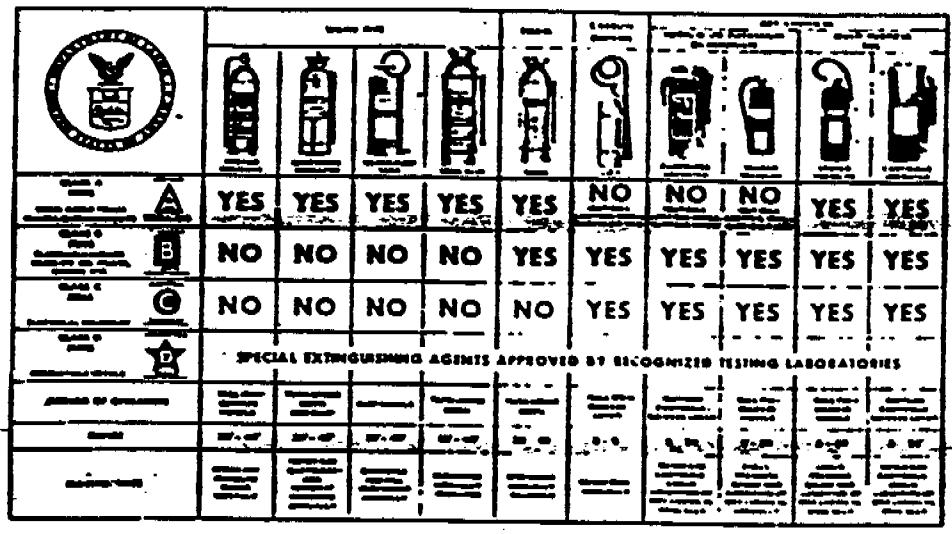
(2) those which contain no ingredient classified as an explosive; these are sensitized with metals such as aluminum or with other fuels. Water gels may be premixed at an explosive plant or mixed at the site immediately before delivery into the bore hole.

§36-23-41. Rollover Protective Structures; Overhead Protection.

41.1. Rollover protective structures (ROPS) for material handling equipment. All such equipment shall be equipped with rollover protective structures which meet the minimum performance standards prescribed in MSHA Safety and Health Regulations for Construction, 1926.1000.

Table 1

FIRE EXTINGUISHERS DATA



A	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES
B	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
C	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
D	SPECIAL EXTINGUISHING AGENTS APPROVED BY RECOGNIZED TESTING LABORATORIES									

Table 2

Fire protection provided	Fire resistance	Maximum Size	Total allowable quantities gals./sq.ft./floor area
Yes	2 hrs	500 sq. ft.	10
No	2 hrs	500 sq. ft.	4
Yes	1 hr	150 sq. ft.	5
No	1 hr	150 sq. ft.	2

Table 3

Heating appliances	Minimum clearance, (inches) Sides	Rear	Chimney connector
Room heater, circulating type	12	12	18
Room heater, radiant type	36	36	18

Table 4

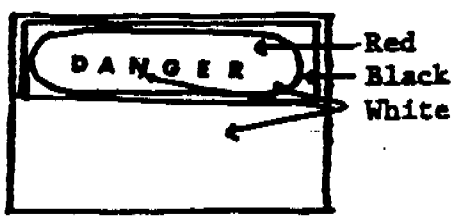


Table 5

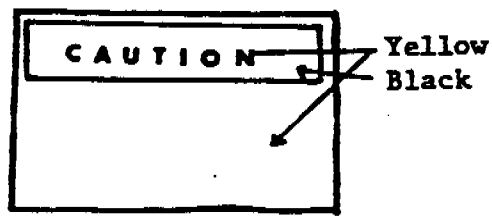
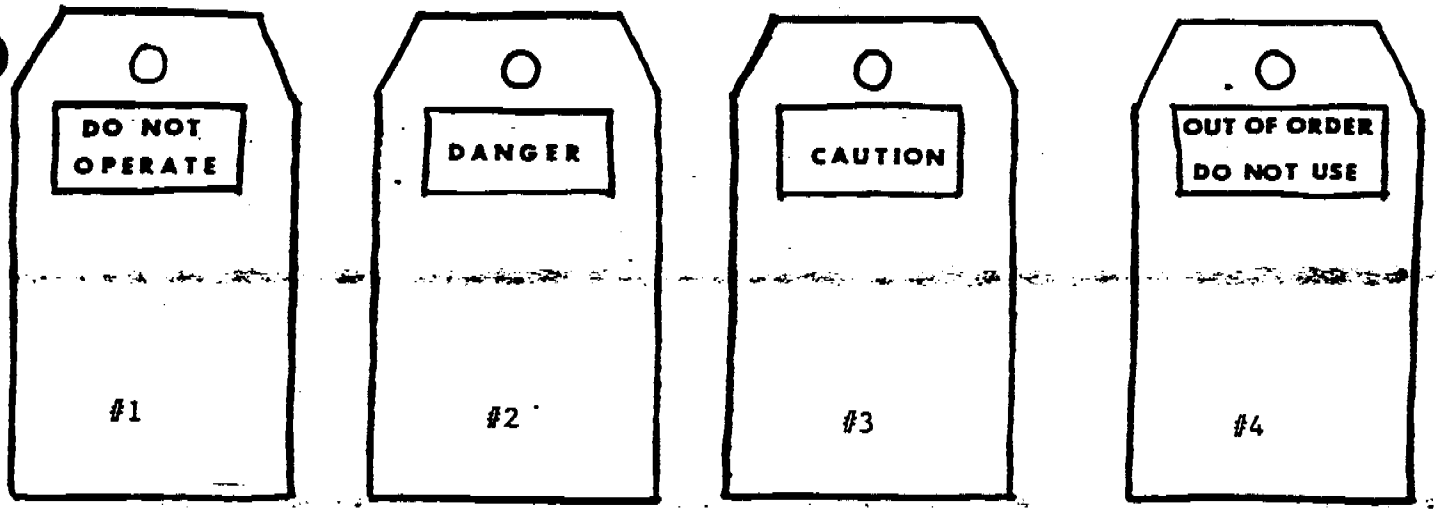


Table 6



White tag/white letters on red square

White tag/white letters on red oval with a black square

Yellow tag/yellow letters on a black background

White tag/white letters on black background

	Basic Stock (Background)	Safety Colors Ink	Copy Specification (Letters)
#1	White	Red	DO NOT OPERATE
#2	White	Black/Red	DANGER
#3	Yellow	Black	CAUTION
#4	White	Black	OUT OF ORDER DO NOT USE

Table 7

RATED CAPACITY (WORKING LOAD LIMIT), FOR ALLOY STEEL CHAIN SLINGS*
RATED CAPACITY (WORKING LOAD LIMIT), POUNDS

Chain Size, Inches	Single Branch Sling — 90 degree Loading	Double Sling Vertical Angle (1) 30 degree / 45 degree / 60 degree — Horizontal Angle (2) 60 degree / 45 degree / 30 degree			Triple and Quadruple Sling Vertical Angle (1) 30 degree / 45 degree / 60 degree — Horizontal Angle (2) 60 degree / 45 degree / 30 degree		
1/4	3,250	5,550	4,550	3,250	8,400	6,600	4,900
3/8	6,600	11,400	9,300	6,600	17,000	14,000	9,900
1/2	11,250	19,900	15,900	11,250	29,000	24,000	17,000
5/8	16,500	28,500	23,300	16,500	43,000	35,000	24,500
3/4	23,000	39,800	32,500	23,000	59,500	48,500	34,500
7/8	28,750	49,600	40,600	28,750	74,500	61,000	43,000
1	38,750	67,100	54,800	38,750	101,000	82,000	58,000
1-1/8	44,500	77,000	63,000	44,500	115,500	94,500	66,500
1-1/4	57,500	99,500	81,000	57,500	149,000	121,500	85,000
1-3/8	67,000	116,000	94,000	67,000	174,000	141,000	100,500
1-1/2	80,000	138,000	112,500	80,000	207,000	169,000	119,500
1-3/4	100,000	172,000	140,000	100,000	258,000	210,000	150,000

(1) Rating of multileg slings adjusted for angle of loading measured as the included angle between the inclined leg and the vertical.

(2) Rating of multileg slings adjusted for angle of loading between the inclined leg and the horizontal plane of the load.

*Other grades of proof tested steel chain include Proof Coil, BBB Coil and Hi-Test Chain. These grades are not recommended for overhead lifting and therefore are not

Table 8

MAXIMUM ALLOWABLE WEAR AT ANY POINT OF LINK

Chain size (inches)	Maximum allowable wear (inch)	Chain size (inches)	Maximum allowable wear (inch)
¼	1/32	1	5/32
5/16	5/64	1 1/8	3/16
3/8	3/32	1 1/4	7/32
7/16	7/64	1 3/8	1/4
1/2	1/16	1 1/2	9/32
5/8	5/64	1 5/8	5/16
3/4	3/32	1 3/4	11/32

Table 9

RATED CAPACITIES FOR SINGLE LEG SLINGS

6 × 19 and 6 × 37 Classification Improved Plow Steel Grade Rope with Fiber Core (FC)

Rope Dia (Inches)	Rope Constr.	Rated Capacities, Tons (2,000 lb.) Vertical HT	Vertical MS	Vertical S	Choker HT	Choker MS	Choker S	Vertical Basket* HT	Vertical Basket* MS	Vertical Basket* S
1/4	6 × 19	0.49	0.51	0.55	0.37	0.38	0.41	0.99	1.0	1.1
5/16	6 × 19	0.76	0.79	0.85	0.57	0.59	0.64	1.5	1.6	1.7
3/8	6 × 19	1.1	1.1	1.2	0.80	0.85	0.91	2.1	2.2	2.4
7/16	6 × 19	1.4	1.5	1.6	1.1	1.1	1.2	2.9	3.0	3.3
1/2	6 × 19	1.8	2.0	2.1	1.4	1.5	1.6	3.7	3.9	4.3
9/16	6 × 19	2.3	2.5	2.7	1.7	1.9	2.0	4.6	5.0	5.4
5/8	6 × 19	2.8	3.1	3.3	2.1	2.3	2.5	5.6	6.2	6.7
3/4	6 × 19	3.9	4.4	4.8	2.9	3.3	3.6	7.8	8.8	9.5
7/8	6 × 19	5.1	5.9	6.4	3.9	4.5	4.8	10.0	12.0	13.0
1	6 × 19	6.7	7.7	8.4	5.0	5.8	6.3	13.0	15.0	17.0
1 1/8	6 × 19	8.4	9.5	10.0	6.3	7.1	7.9	17.0	19.0	21.0
1 1/4	6 × 37	9.8	11.0	12.0	7.4	8.3	9.2	20.0	22.0	25.0
1 3/8	6 × 37	12.0	13.0	15.0	8.9	10.0	11.0	24.0	27.0	30.0
1 1/2	6 × 37	14.0	16.0	17.0	10.0	12.0	13.0	28.0	32.0	35.0
1 5/8	6 × 37	16.0	18.0	21.0	12.0	14.0	15.0	33.0	37.0	41.0
1 3/4	6 × 37	19.0	21.0	24.0	14.0	16.0	18.0	38.0	43.0	48.0
2	6 × 37	25.0	28.0	31.0	18.0	21.0	23.0	49.0	55.0	62.0

*These values only apply when the D/d ratio for HT slings is 10 or greater, and for MS and S Slings is 20 or greater where:

D Diameter of curvature around which the body of the sling is bent.

d Diameter of rope.

HT Hand Tucked Splice and Hidden Tuck Splice. For hidden tuck splice (IWRC) use values in HT columns.

MS Mechanical Splice.

S Swaged or Zinc Poured Socket.

Table 10

Rated Capacities for Single Leg Slings
6 x 19 and 6 x 37 Classification Improved Plow Steel Grade Rope With Independent Wire Rope Core (IWRC)

Rope Dia. (Inches)	Constr.	Rated Capacities, Tons (2,000 lb.) Vertical HT	Vertical MS	Vertical S	Choker HT	Choker MS	Choker S	Vertical Basket* HT	Vertical Basket* MS	Vertical Basket* S
½	6 x 19	0.53	0.56	0.59	0.40	0.42	0.44	1.0	1.1	1.2
9/16	6 x 19	0.81	0.87	0.92	0.61	0.65	0.69	1.6	1.7	1.8
⅝	6 x 19	1.1	1.2	1.3	0.86	0.93	0.98	2.3	2.5	2.6
11/16	6 x 19	1.5	1.7	1.8	1.2	1.3	1.3	3.1	3.4	3.5
¾	6 x 19	2.0	2.2	2.3	1.5	1.6	1.7	3.9	4.4	4.6
13/16	6 x 19	2.5	2.7	2.9	1.8	2.1	2.2	4.9	5.5	5.8
⅞	6 x 19	3.0	3.4	3.6	2.2	2.5	2.7	6.0	6.8	7.2
15/16	6 x 19	4.2	4.9	5.1	3.1	3.6	3.8	8.4	9.7	10.0
1	6 x 19	5.5	6.6	6.9	4.1	4.9	5.2	11.0	13.0	14.0
1	6 x 19	7.2	8.5	9.0	5.4	6.4	6.7	14.0	17.0	18.0
1¼	6 x 19	9.0	10.0	11.0	6.8	7.8	8.5	18.0	21.0	23.0
1⅛	6 x 37	10.0	12.0	13.0	7.9	9.2	9.9	21.0	24.0	26.0
1⅜	6 x 37	13.0	15.0	16.0	9.6	11.0	12.0	25.0	29.0	32.0
1½	6 x 37	15.0	17.0	19.0	11.0	13.0	14.0	30.0	35.0	38.0
1⅝	6 x 37	18.0	20.0	22.0	13.0	15.0	17.0	35.0	41.0	44.0
1¾	6 x 37	20.0	24.0	26.0	15.0	18.0	19.0	41.0	47.0	51.0
2	6 x 37	26.0	30.0	33.0	20.0	23.0	25.0	53.0	61.0	66.0

*These values only apply when the D/d ratio for HT slings is 10 or greater, and for MS and S Slings is 20 or greater where:

D Diameter of curvature around which the body of the sling is bent.
d Diameter of rope.

HT Hand Tucked Splice: For hidden tuck splice (IWRC) use Table H 3 values in HT column.
MS Mechanical Splice.
S Swaged or Zinc Poured Socket.

Table 11

Rated Capacities for Single Leg Slings
Cable Laid Rope Mechanical Splice Only
7 x 7 x 7 and 7 x 7 x 19 Constructions Galvanized Aircraft Grade Rope
7 x 6 x 19 IWRC Construction Improved Plow Steel Grade Rope

Rope Dia. (Inches)	Constr.	Rated Capacities, Tons (2,000 lb) Vertical	Choker	Vert. Basket*
⅜	7 x 7 x 7	0.50	0.38	1.0
½	7 x 7 x 7	1.1	0.81	2.2
⅝	7 x 7 x 7	1.8	1.4	3.7
¾	7 x 7 x 7	2.8	2.1	5.5
⅞	7 x 7 x 7	3.8	2.9	7.8
⅜	7 x 7 x 19	2.9	2.2	5.8
½	7 x 7 x 19	4.1	3.0	8.1
⅝	7 x 7 x 19	5.4	4.0	11.0
1	7 x 7 x 19	6.9	5.1	14.0
1⅛	7 x 7 x 19	8.2	6.2	16.0
1¼	7 x 7 x 19	9.9	7.4	20.0
⅜	7 x 6 x 19 IWRC	3.8	2.8	7.6
½	7 x 6 x 19 IWRC	5.0	3.8	10.0
1	7 x 6 x 19 IWRC	6.4	4.8	13.0
1⅛	7 x 6 x 19 IWRC	7.7	5.8	15.0
1¼	7 x 6 x 19 IWRC	9.2	6.9	18.0
1⅜	7 x 6 x 19 IWRC	10.0	7.5	20.0
1½	7 x 6 x 19 IWRC	11.0	8.2	22.0
1⅝	7 x 6 x 19 IWRC	13.0	9.6	26.0

*These values only apply when the D/d ratio in 10 or greater where:
D = Diameter of curvature around which the body of the sling is bent.
d = Diameter of rope.

Table 12

RATED CAPACITIES FOR SINGLE LEG SLINGS
8-PART AND 6-PART BRAIDED ROPE
6 x 7 AND 6 x 19 CONSTRUCTION IMPROVED PLOW STEEL GRADE ROPE
7 x 7 CONSTRUCTION GALVANIZED AIRCRAFT GRADE ROPE

Component Ropes		Rated Capacities, Tons (2,000 lb)					
		Vertical		Choker		Basket Vertical to 30 degrees*	
Diameter (Inches)	Constr	8-Part	6-Part	8-Part	6-Part	8-Part	6-Part
3/32	6 x 7	0.42	0.32	0.32	0.24	0.74	0.55
1/8	6 x 7	0.76	0.57	0.57	0.42	1.3	0.98
3/16	6 x 7	1.7	1.3	1.3	0.94	2.9	2.2
3/32	7 x 7	0.51	0.39	0.38	0.29	0.89	0.67
1/8	7 x 7	0.95	0.71	0.71	0.53	1.6	1.2
3/16	7 x 7	2.1	1.5	1.5	1.2	3.6	2.7
3/16	6 x 19	1.7	1.3	1.3	0.98	3.0	2.2
1/4	6 x 19	3.1	2.3	2.3	1.7	5.3	4.0
5/16	6 x 19	4.8	3.6	3.6	2.7	8.3	6.2
3/8	6 x 19	6.8	5.1	5.1	3.8	12.0	8.9
7/16	6 x 19	9.3	6.9	6.9	5.2	16.0	12.0
1/2	6 x 19	12.0	9.0	9.0	6.7	21.0	15.0
9/16	6 x 19	15.0	11.0	11.0	8.5	26.0	20.0
5/8	6 x 19	19.0	14.0	14.0	10.0	32.0	24.0
3/4	6 x 19	27.0	20.0	20.0	15.0	46.0	35.0
7/8	6 x 19	36.0	27.0	27.0	20.0	62.0	47.0
1	6 x 19	47.0	35.0	35.0	26.0	81.0	61.0

*These values only apply when the D/d ratio is 25 or greater where:
D = Diameter of curvature around which the body of the sling is bent.
d = Diameter of component rope.

Table 13

RATED CAPACITIES FOR 2-LEG & 3-LEG BRIDLE SLINGS
6 x 19 AND 6 x 37 CLASSIFICATION IMPROVED PLOW STEEL CONSTRUCTION
WITH FIBER CORE (FC)

Rope		Rated Capacities, Tons (2,000 lb)											
		2-Leg Bridle Slings						3-Leg Bridle Slings					
		Vert 30 degrees Horz 60 degrees		45 degree Angle		Vert 60 degrees Horz 30 degrees		Vert 30 degrees Horz 60 degrees		45 degree Angle		Vert 60 degrees Horz 30 degrees	
Dia (Inches)	Constr	MT	MS	MT	MS	MT	MS	MT	MS	MT	MS	MT	MS
1/4	6 x 19	0.85	0.88	0.70	0.72	0.49	0.51	1.3	1.3	1.0	1.1	0.74	0.7
5/16	6 x 19	1.3	1.4	1.1	1.1	0.76	0.79	2.0	2.0	1.6	1.7	1.1	1.2
3/8	6 x 19	1.8	1.9	1.5	1.6	1.1	1.1	2.8	2.9	2.3	2.4	1.6	1.7
7/16	6 x 19	2.5	2.6	2.0	2.2	1.4	1.5	3.7	4.0	3.0	3.2	2.1	2.3
1/2	6 x 19	3.2	3.4	2.6	2.8	1.8	2.0	4.8	5.1	3.9	4.2	2.8	3.0
9/16	6 x 19	4.0	4.3	3.2	3.5	2.3	2.5	6.0	6.5	4.9	5.3	3.4	3.7
5/8	6 x 19	4.8	5.3	4.0	4.4	2.8	3.1	7.3	8.0	5.9	6.5	4.2	4.6
3/4	6 x 19	6.8	7.6	5.5	6.2	3.9	4.4	10.0	11.0	8.3	9.3	5.8	6.6
7/8	6 x 19	8.9	10.0	7.3	8.4	5.1	5.9	13.0	15.0	11.0	13.0	7.7	8.8
1	6 x 19	11.0	13.0	9.4	11.0	6.7	7.7	17.0	20.0	14.0	16.0	10.0	11.0
1-1/8	6 x 19	14.0	16.0	12.0	13.0	8.4	9.5	22.0	24.0	18.0	20.0	13.0	14.0
1-1/4	6 x 37	17.0	19.0	14.0	16.0	9.8	11.0	25.0	29.0	21.0	23.0	15.0	17.0
1-3/8	6 x 37	20.0	23.0	17.0	19.0	12.0	13.0	31.0	35.0	25.0	28.0	18.0	20.0
1-1/2	6 x 37	24.0	27.0	20.0	22.0	14.0	16.0	36.0	41.0	30.0	33.0	21.0	24.0
1-5/8	6 x 37	28.0	32.0	23.0	26.0	16.0	18.0	43.0	48.0	35.0	39.0	25.0	28.0
1-3/4	6 x 37	33.0	37.0	27.0	30.0	19.0	21.0	49.0	56.0	40.0	45.0	28.0	32.0
2	6 x 37	43.0	48.0	35.0	39.0	25.0	28.0	64.0	72.0	52.0	59.0	37.0	41.0

MT = Hand Tucked Splice.
MS = Mechanical Splice

Table 14

RATED CAPACITIES FOR 2-LEG & 3-LEG BRIDLE SLINGS
6 x 19 and 6 x 37 CLASSIFICATION IMPROVED PLOW STEEL GRADE ROPE
WITH INDEPENDENT WIRE ROPE CORE (IWRC)

Rope		Rated Capacities, Tons (2,000 lb)											
		2-Leg Bridle Sling						3-Leg Bridle Sling					
Dia (Inches)	Constr	Vert 30 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree		Vert 30 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree	
		HT	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT	MS
1/4	6 x 19	0.92	0.97	0.75	0.79	0.53	0.56	1.4	1.4	1.1	1.2	0.79	0.84
5/16	6 x 19	1.4	1.5	1.1	1.2	1.01	0.87	2.1	2.3	1.7	1.8	1.2	1.3
3/8	6 x 19	2.0	2.1	1.6	1.8	1.1	1.2	3.0	3.2	2.4	2.6	1.7	1.9
7/16	6 x 19	2.7	2.9	2.2	2.4	1.5	1.7	4.0	4.4	3.3	3.6	2.3	2.5
1/2	6 x 19	3.4	3.8	2.8	3.1	2.0	2.2	5.1	5.7	4.2	4.6	3.0	3.3
9/16	6 x 19	4.3	4.8	3.5	3.9	2.5	2.7	6.4	7.1	5.2	5.8	3.7	4.1
5/8	6 x 19	5.2	5.9	4.2	4.8	3.0	3.4	7.8	8.8	6.4	7.2	4.5	5.1
3/4	6 x 19	7.3	8.4	5.9	6.9	4.2	4.9	11.0	13.0	8.9	10.0	6.3	7.3
7/8	6 x 19	9.6	11.0	7.8	9.3	5.5	6.6	14.0	17.0	12.0	14.0	8.3	9.9
1	6 x 19	12.0	15.0	10.0	12.0	7.2	8.5	19.0	22.0	15.0	18.0	11.0	13.0
1-1/8	6 x 19	16.0	18.0	13.0	15.0	9.0	10.0	23.0	27.0	19.0	22.0	13.0	16.0
1-1/4	6 x 37	18.0	21.0	15.0	17.0	10.0	12.0	27.0	32.0	22.0	26.0	16.0	18.0
1-3/8	6 x 37	22.0	25.0	18.0	21.0	13.0	15.0	33.0	38.0	27.0	31.0	19.0	22.0
1-1/2	6 x 37	26.0	30.0	21.0	25.0	15.0	17.0	39.0	45.0	32.0	37.0	23.0	26.0
1-5/8	6 x 37	31.0	35.0	25.0	29.0	18.0	20.0	46.0	53.0	38.0	43.0	27.0	31.0
1-3/4	6 x 37	35.0	41.0	29.0	33.0	20.0	24.0	53.0	61.0	43.0	50.0	31.0	35.0
2	6 x 37	46.0	53.0	37.0	43.0	26.0	30.0	68.0	79.0	56.0	65.0	40.0	46.0

HT = Hand Tucked Splice
MS = Mechanical Splice

Table 15

RATED CAPACITIES FOR 2-LEG & 3-LEG BRIDLE SLINGS
CABLE LAID ROPE – MECHANICAL SPLICE ONLY
7 x 7 x 7 AND 7 x 7 x 19 CONSTRUCTIONS GALVANIZED AIRCRAFT GRADE ROPE
7 x 6 x 19 IWRC CONSTRUCTION IMPROVED PLOW STEEL GRADE ROPE

Rope		Rated Capacities, Tons (2,000 lb)					
		2-Leg Bridle Sling			3-Leg Bridle Sling		
Dia (Inches)	Constr	Vert 30 deg Horz 60 deg	45 degree Angle	Vert 60 deg Horz 30 deg	Vert 30 deg Horz 60 deg	45 degree Angle	Vert 60 deg Horz 30 deg
1/4	7 x 7 x 7	0.87	0.71	0.50	1.3	1.1	0.75
3/8	7 x 7 x 7	1.9	1.5	1.1	2.8	2.3	1.6
1/2	7 x 7 x 7	3.2	2.6	1.8	4.8	3.9	2.8
5/8	7 x 7 x 7	4.8	3.9	2.8	7.2	5.9	4.2
3/4	7 x 7 x 7	6.6	5.4	3.8	9.9	8.1	5.7
5/8	7 x 7 x 19	5.0	4.1	2.9	7.5	6.1	4.3
3/4	7 x 7 x 19	7.0	5.7	4.1	10.0	8.6	6.1
7/8	7 x 7 x 19	9.3	7.6	5.4	14.0	11.0	8.1
1	7 x 7 x 19	12.0	9.7	6.9	18.0	14.0	10.0
1-1/8	7 x 7 x 19	14.0	12.0	8.2	21.0	17.0	12.0
1-1/4	7 x 7 x 19	17.0	14.0	9.9	26.0	21.0	15.0
3/4	7x6x19 IWRC	6.6	5.4	3.8	9.9	8.0	5.7
7/8	7x6x19 IWRC	8.7	7.1	5.0	13.0	11.0	7.5
1	7x6x19 IWRC	11.0	9.0	6.4	17.0	13.0	9.6
1-1/8	7x6x19 IWRC	13.0	11.0	7.7	20.0	16.0	11.0
1-1/4	7x6x19 IWRC	16.0	13.0	9.2	24.0	20.0	14.0
1-5/16	7x6x19 IWRC	17.0	14.0	10.0	26.0	21.0	15.0
1-3/8	7x6x19 IWRC	19.0	15.0	11.0	28.0	23.0	16.0
1-1/2	7x6x19 IWRC	22.0	18.0	13.0	33.0	27.0	19.0

Table 16

RATED CAPACITIES FOR 2-LEG AND 3-LEG BRIDLE SLINGS
8-PART AND 6-PART BRAIDED ROPE
6 x 7 AND 6 x 19 CONSTRUCTION IMPROVED PLOW STEEL GRADE ROPE
7 x 7 CONSTRUCTION GALVANIZED AIRCRAFT GRADE ROPE

Component Rope		Rated Capacities, Tons (2,000 lb)											
		2-Leg Bridle Slings						3-Leg Bridle Slings					
		Vert 90 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree		Vert 90 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree	
Dia (Inches)	Const	8-Part	6-Part	8-Part	6-Part	8-Part	6-Part	8-Part	6-Part	8-Part	6-Part	8-Part	6-Part
3/32	6 x 7	0.74	0.55	0.60	0.45	0.42	0.32	1.1	0.83	0.90	0.68	0.64	0.48
1/8	6 x 7	1.3	0.98	1.1	0.80	0.76	0.57	2.0	1.5	1.6	1.2	1.1	0.85
3/16	6 x 7	2.9	2.2	2.4	1.8	1.7	1.3	4.4	3.3	3.6	2.7	2.5	1.9
3/32	7 x 7	0.89	0.67	0.72	0.55	0.51	0.39	1.3	1.0	1.1	0.82	0.77	0.58
1/8	7 x 7	1.6	1.2	1.3	1.0	0.95	0.71	2.5	1.8	2.0	1.5	1.4	1.1
3/16	7 x 7	3.6	2.7	2.9	2.2	2.1	1.5	5.4	4.0	4.4	3.3	3.1	2.3
3/16	6 x 19	3.0	2.2	2.4	1.8	1.7	1.3	4.5	3.4	3.7	2.8	2.6	1.9
1/4	6 x 19	5.3	4.0	4.3	3.2	3.1	2.3	8.0	6.0	6.5	4.9	4.6	3.4
5/16	6 x 19	8.3	6.2	6.7	5.0	4.8	3.6	12.0	9.3	10.0	7.6	7.1	5.4
3/8	6 x 19	12.0	8.9	9.7	7.2	6.8	5.1	18.0	13.0	14.0	11.0	10.0	7.7
7/16	6 x 19	16.0	12.0	13.0	9.8	9.3	6.9	24.0	18.0	20.0	15.0	14.0	10.0
1/2	6 x 19	21.0	15.0	17.0	13.0	12.0	9.0	31.0	23.0	27.0	19.0	18.0	13.0
9/16	6 x 19	26.0	20.0	21.0	16.0	15.0	11.0	39.0	29.0	32.0	24.0	23.0	17.0
5/8	6 x 19	32.0	24.0	26.0	20.0	19.0	14.0	48.0	36.0	40.0	30.0	28.0	21.0
3/4	6 x 19	46.0	35.0	38.0	28.0	27.0	20.0	69.0	52.0	56.0	42.0	40.0	30.0
7/8	6 x 19	62.0	47.0	51.0	38.0	36.0	27.0	94.0	70.0	76.0	57.0	54.0	40.0
1	6 x 19	81.0	61.0	66.0	50.0	47.0	35.0	122.0	91.0	99.0	74.0	70.0	53.0

Table 17

RATED CAPACITIES FOR STRAND LAID GROMMET – HAND TUCKED
IMPROVED PLOW STEEL GRADE ROPE

ROPE BODY		RATED CAPACITIES, TONS (2,000 lb)		
Dia (Inches)	Const	Vertical	Choker	Vertical Basket*
1/4	7 x 19	0.55	0.44	1.7
5/16	7 x 19	1.3	1.0	2.6
3/8	7 x 19	1.9	1.4	3.8
7/16	7 x 19	2.6	1.9	5.2
1/2	7 x 19	3.3	2.5	6.7
9/16	7 x 19	4.2	3.1	8.4
5/8	7 x 19	5.2	3.9	10.00
3/4	7 x 19	7.4	5.6	15.0
7/8	7 x 19	10.0	7.5	20.0
1	7 x 19	13.0	9.7	26.0
1-1/8	7 x 19	16.0	12.0	32.0
1-1/4	7 x 37	18.0	14.0	37.0
1-3/8	7 x 37	22.0	16.0	44.0
1-1/2	7 x 37	26.0	19.0	52.0

* These values only apply when the D/d ratio is 5 or greater where:
D = Diameter of curvature around which rope is bent.
d = Diameter of rope body.

Table 18

RATED CAPACITIES FOR CABLE LAID GRUMMET – HAND TUCKED
7 x 6 x 7 AND 7 x 6 x 19 CONSTRUCTIONS IMPROVED PLOW STEEL GRADE ROPE
7 x 7 x 7 CONSTRUCTION GALVANIZED AIRCRAFT GRADE ROPE

CABLE BODY		RATED CAPACITIES, TONS (2,000 lb)		
Dia (inches)	Constr	Vertical	Choker	Vertical Basket*
3/8	7 x 6 x 7	1.3	0.95	2.5
9/16	7 x 6 x 7	2.8	2.1	5.6
5/8	7 x 6 x 7	3.8	2.8	7.6
3/8	7 x 7 x 7	1.6	1.2	3.2
9/16	7 x 7 x 7	3.5	2.6	6.9
5/8	7 x 7 x 7	4.5	3.4	9.0
5/8	7 x 6 x 19	3.9	3.0	7.9
3/4	7 x 6 x 19	5.1	3.8	10.0
13/16	7 x 6 x 19	7.0	5.2	14.0
1-1/8	7 x 6 x 19	11.0	8.4	22.0
1-5/16	7 x 6 x 19	15.0	11.0	30.0
1-1/2	7 x 6 x 19	19.0	14.0	39.0
1-11/16	7 x 6 x 19	24.0	18.0	49.0
1-7/8	7 x 6 x 19	30.0	22.0	60.0
2-1/4	7 x 6 x 19	42.0	31.0	84.0
2-5/8	7 x 6 x 19	56.0	42.0	112.0

* These values only apply when the D/d ratio is 5 or greater where:
D = Diameter of curvature around which cable body is bent.
d = Diameter of cable body.

Table 19

RATED CAPACITIES FOR STRAND LAID ENDLESS SWAGED MECHANICAL JOINT
IMPROVED PLOW STEEL GRADE ROPE

ROPE BODY		RATED CAPACITIES, TONS (2,000 lb)		
Dia (inches)	Constr	Vertical	Choker	Vertical Basket*
1/4	6 x 19 IWRC	0.92	0.69	1.8
3/8	6 x 19 IWRC	2.0	1.5	4.1
1/2	6 x 19 IWRC	3.6	2.7	7.2
5/8	6 x 19 IWRC	5.6	4.2	11.0
3/4	6 x 19 IWRC	8.0	6.0	16.0
7/8	6 x 19 IWRC	11.0	8.1	21.0
1	6 x 19 IWRC	14.0	10.0	28.0
1-1/8	6 x 19 IWRC	18.0	13.0	35.0
1-1/4	6 x 37 IWRC	21.0	15.0	41.0
1-3/8	6 x 37 IWRC	25.0	19.0	50.0
1-1/2	6 x 37 IWRC	29.0	22.0	59.0

* These values only apply when the D/d ratio is 5 or greater where:
D = Diameter of curvature around which rope is bent.
d = Diameter of rope body.

Table 20

RATED CAPACITIES FOR CABLE LAID ENDLESS SLINGS-MECHANICAL JOINT
7 x 7 x 7 AND 7 x 7 x 19 CONSTRUCTIONS GALVANIZED AIRCRAFT GRADE ROPE
7 x 6 x 19 IWRC CONSTRUCTION IMPROVED PLOW STEEL GRADE ROPE

CABLE BODY		RATED CAPACITIES, TONS (2,000 lb)		
Dia (Inches)	Constr	Vertical	Choker	Vertical Basket*
1/4	7 x 7 x 7	0.83	0.62	1.6
3/8	7 x 7 x 7	1.8	1.3	3.5
1/2	7 x 7 x 7	3.0	2.3	6.1
5/8	7 x 7 x 7	4.5	3.4	9.1
3/4	7 x 7 x 7	6.3	4.7	12.0
5/8	7 x 7 x 19	4.7	3.5	9.5
3/4	7 x 7 x 19	6.7	5.0	13.0
7/8	7 x 7 x 19	8.9	6.6	18.0
1	7 x 7 x 19	11.0	8.5	22.0
1-1/8	7 x 7 x 19	14.0	10.0	28.0
1-1/4	7 x 7 x 19	17.0	12.0	33.0
3/4	7 x 6 x 19 IWRC	6.2	4.7	12.0
7/8	7 x 6 x 19 IWRC	8.3	6.2	16.0
1	7 x 6 x 19 IWRC	10.0	7.9	21.0
1-1/8	7 x 6 x 19 IWRC	13.0	9.7	26.0
1-1/4	7 x 6 x 19 IWRC	16.0	12.0	31.0
1-3/8	7 x 6 x 19 IWRC	18.0	14.0	37.0
1-1/2	7 x 6 x 19 IWRC	22.0	16.0	41.0

* These values only apply when the D/d value is 5 or greater where:
D = Diameter of curvature around which cable body is bent.
d = Diameter of cable body.

Table 21

MANILA ROPE SLINGS

ROPE DIAMETER Nominal In Inches	Nominal Weight Per 100 ft In Pounds	Minimum Breaking Strength In Pounds	RATED CAPACITY IN POUNDS (Safety Factor = 5)									
			EYE AND EYE SLING					ENDLESS SLING				
			VERTICAL HITCH	CHOKER HITCH	BASKET HITCH			VERTICAL HITCH	CHOKER HITCH	BASKET HITCH		
					Angle of Rope to Horizontal					Angle of Rope to Horizontal		
					90 deg	60 deg	45 deg	30 deg			90 deg	60 deg	45 deg	30 deg
					Angle of Rope to Vertical						Angle of Rope to Vertical			
					0 deg	30 deg	45 deg	60 deg			0 deg	30 deg	45 deg	60 deg
1/2	7.5	2,400	250	250	1,200	900	750	550	950	500	2,000	1,700	1,400	1,000
9/16	10.4	3,050	350	350	1,400	1,200	1,000	700	1,200	600	2,500	2,200	1,800	1,300
5/8	13.3	4,400	450	450	1,800	1,500	1,300	900	1,400	800	3,200	2,700	2,300	1,600
3/4	18.7	5,400	550	550	2,200	1,900	1,500	1,100	2,000	950	3,900	3,400	2,800	2,000
13/16	23.5	6,900	670	670	2,600	2,300	1,800	1,300	2,300	1,200	4,700	4,100	3,300	2,300
7/8	22.5	7,200	750	750	3,100	2,700	2,200	1,500	2,600	1,400	5,500	4,800	3,900	2,700
15/16	31.3	10,500	1,100	1,100	4,200	3,600	3,000	2,100	3,800	1,900	7,600	6,600	5,400	3,800
1 1/8	36.0	12,000	1,200	1,200	4,800	4,200	3,400	2,400	4,300	2,200	8,600	7,500	6,100	4,300
1 1/4	41.7	13,500	1,400	1,400	5,400	4,700	3,800	2,700	4,900	2,400	9,700	8,400	6,900	4,900
1 3/16	47.9	15,000	1,500	1,500	6,000	5,200	4,300	3,000	5,400	2,700	11,000	9,400	7,700	5,400
1 1/2	59.9	18,500	1,850	1,850	7,400	6,400	5,200	3,700	6,700	3,300	13,500	11,500	9,400	6,700
1 5/8	74.6	22,500	2,300	2,300	9,000	7,800	6,400	4,500	8,100	4,100	16,000	14,000	11,500	8,000
1 3/4	89.3	26,500	2,700	2,700	10,500	9,200	7,500	5,300	9,500	4,800	19,000	16,500	13,500	9,500
2	107.5	31,000	3,100	3,100	12,500	10,500	8,800	6,200	11,000	5,600	22,500	19,500	16,000	11,000
2 1/8	125.0	36,000	3,600	3,600	14,500	12,500	10,000	7,200	13,000	6,500	26,000	22,500	18,500	13,000
2 1/4	146.0	41,000	4,100	4,100	16,500	14,000	11,500	8,200	15,000	7,400	29,500	25,500	21,000	15,000
2 1/2	166.7	46,500	4,700	4,700	18,500	16,000	13,000	9,300	16,500	8,400	33,500	29,000	23,500	16,500
2 5/8	190.8	52,000	5,200	5,200	21,000	18,000	14,500	10,500	18,500	9,500	37,500	32,500	26,500	18,500

Table 22

NYLON ROPE SLINGS

ROPE DIAMETER Nominal In Inches	Nominal Weight Per 100 ft In Pounds	Minimum Breaking Strength In Pounds	RATED CAPACITY IN POUNDS (Safety Factor = 5)									
			EYE AND EYE SLING						ENDLESS SLING			
			VERTICAL HITCH	CHOKER HITCH	BASKET HITCH				VERTICAL HITCH	CHOKER HITCH	BASKET HITCH	
					Angle of Rope to Horizontal						Angle of Rope to Horizontal	
					90 deg	60 deg	45 deg	30 deg			90 deg	60 deg
					Angle of Rope to Vertical						Angle of Rope to Vertical	
					0 deg	30 deg	45 deg	60 deg			0 deg	30 deg
3/8	5.5	6,080	700	350	1,400	1,200	950	700	1,200	600	2,400	2,100
9/16	8.3	7,600	850	400	1,700	1,500	1,200	850	1,500	750	3,000	2,600
5/8	10.5	9,880	1,100	550	2,200	1,900	1,600	1,100	2,000	1,000	4,000	3,400
3/4	14.5	13,490	1,500	750	3,000	2,600	2,100	1,500	2,700	1,400	5,400	4,700
13/16	17.0	16,150	1,800	900	3,600	3,100	2,600	1,800	3,200	1,600	6,400	5,600
7/8	20.0	19,000	2,100	1,100	4,200	3,700	3,000	2,100	3,800	1,900	7,600	6,600
1	26.0	23,750	2,600	1,300	5,300	4,600	3,700	2,600	4,800	2,400	9,500	8,200
1 1/16	29.0	27,360	3,000	1,500	6,100	5,300	4,300	3,000	5,500	2,700	11,000	9,500
1 1/8	34.0	31,350	3,500	1,700	7,000	6,000	5,000	3,500	6,300	3,100	12,500	11,000
1 1/4	40.0	35,625	4,000	2,000	7,900	6,900	5,600	4,000	7,100	3,600	14,500	12,500
1 5/16	43.0	40,850	4,500	2,300	9,100	7,900	6,400	4,500	8,200	4,100	16,500	14,000
1 1/2	55.0	50,350	5,600	2,800	11,000	9,700	7,900	5,600	10,000	5,000	20,000	17,500
1 5/8	68.0	61,750	6,900	3,400	13,500	12,000	9,700	6,900	12,500	6,200	24,500	21,500
1 3/4	83.0	74,100	8,200	4,100	16,500	14,500	11,500	8,200	15,000	7,400	29,500	27,500
2	95.0	87,400	9,700	4,900	19,500	17,000	13,500	9,700	17,500	8,700	35,000	30,500
2 1/8	109.0	100,700	11,000	5,600	22,500	19,500	16,000	11,000	20,000	10,000	40,500	35,000
2 1/4	129.0	118,750	13,000	6,600	26,500	23,000	18,500	13,000	24,000	12,000	47,500	41,000
2 1/2	149.0	132,000	15,000	7,400	29,500	25,500	21,000	15,000	26,500	13,500	53,000	46,000
2 5/8	168.0	133,900	17,100	8,400	34,000	29,500	24,000	17,000	31,000	15,500	61,500	53,500

ROPE DIAMETER Nominal In Inches	BASKET HITCH			
	Angle of Rope to Horizontal			
	45 deg	30 deg		
	Angle of Rope to Vertical			
	45 deg	60 deg		
3/8	1,700	1,200		
9/16	2,200	1,700		
5/8	2,800	2,200		
3/4	3,800	2,700		
13/16	4,600	3,200		
7/8	5,400	3,800		
1	6,700	4,800		
1 1/16	7,700	5,500		
1 1/8	8,900	6,300		
1 1/4	11,000	7,900		
1 5/16	12,000	8,200		
1 1/2	14,000	10,000		
1 5/8	17,500	12,500		
1 3/4	21,500	15,000		
2	24,500	17,500		
2 1/8	28,500	20,000		
2 1/4	33,500	24,000		
2 1/2	37,500	26,500		
2 5/8	43,500	31,000		

Table 23

POLYESTER ROPE SLINGS

ROPE DIAMETER Nominal In Inches	Nominal Weight Per 100 ft In Pounds	Minimum Breaking Strength In Pounds	RATED CAPACITY IN POUNDS (Safety Factor = 5)									
			EYE AND EYE SLING						ENDLESS SLING			
			VERTICAL HITCH	CHOKER HITCH	BASKET HITCH				VERTICAL HITCH	CHOKER HITCH	BASKET HITCH	
					Angle of Rope to Horizontal						Angle of Rope to Horizontal	
					90 deg	60 deg	45 deg	30 deg			90 deg	60 deg
					Angle of Rope to Vertical						Angle of Rope to Vertical	
					0 deg	30 deg	45 deg	60 deg			0 deg	30 deg
1/2	8.8	6,080	700	350	1,400	1,200	950	700	1,200	600	2,400	2,100
9/16	10.2	7,600	850	400	1,700	1,500	1,200	850	1,500	750	3,000	2,600
5/8	13.0	9,500	1,100	550	2,100	1,800	1,500	1,100	1,900	950	3,800	3,300
3/4	17.5	11,875	1,300	650	2,600	2,300	1,900	1,300	2,400	1,200	4,800	4,100
13/16	21.0	14,725	1,600	800	3,300	2,800	2,300	1,600	2,900	1,500	5,900	5,100
7/8	23.0	17,100	1,900	950	3,800	3,300	2,700	1,900	3,400	1,700	6,800	5,900
1	30.5	20,900	2,300	1,200	4,600	4,000	3,300	2,300	4,200	2,100	8,400	7,300
1 1/16	34.5	24,225	2,700	1,300	5,400	4,700	3,800	2,700	4,800	2,400	9,700	8,400
1 1/8	40.0	28,025	3,100	1,600	6,200	5,400	4,400	3,100	5,600	2,800	11,000	9,700
1 1/4	46.5	31,540	3,500	1,800	7,000	6,100	5,000	3,500	6,300	3,200	12,500	11,000
1 5/16	52.5	35,625	4,000	2,000	7,900	6,900	5,600	4,000	7,200	3,600	14,500	12,500
1 1/2	66.5	44,460	4,900	2,500	9,900	8,600	7,000	4,900	8,900	4,400	18,000	15,500
1 5/8	82.0	54,150	6,000	3,000	12,000	10,400	8,500	6,000	11,000	5,400	21,500	19,000
1 3/4	98.0	64,410	7,200	3,600	14,500	12,500	10,000	7,200	13,000	6,400	26,000	22,500
2	118.0	76,000	8,400	4,200	17,000	14,500	12,000	8,400	15,000	7,600	30,500	26,500
2 1/8	135.0	87,400	9,700	4,900	19,500	17,000	13,500	9,700	17,500	8,700	35,000	30,500
2 1/4	157.0	101,650	11,500	5,700	22,500	19,500	16,000	11,500	20,500	10,000	40,500	35,000
2 1/2	181.0	115,900	13,000	6,400	26,000	22,500	18,000	13,000	23,000	11,500	46,500	40,000
2 5/8	205.0	130,150	14,500	7,200	29,000	25,000	20,500	14,500	26,000	13,000	52,000	45,000

ROPE DIAMETER Nominal In Inches	BASKET HITCH			
	Angle of Rope to Horizontal			
	45 deg	30 deg		
	Angle of Rope to Vertical			
	45 deg	60 deg		
1/2	1,700	1,200		
9/16	2,200	1,700		
5/8	2,700	2,100		
3/4	3,400	2,400		
13/16	4,200	2,900		
7/8	4,800	3,400		
1	7,200	5,000		
1 1/16	8,200	6,000		
1 1/8	9,700	7,000		
1 1/4	11,000	8,000		
1 5/16	12,500	9,000		
1 1/2	15,500	11,000		
1 5/8	19,000	13,500		
1 3/4	22,500	16,000		
2	26,500	18,500		
2 1/8	30,500	21,500		
2 1/4	35,000	25,000		
2 1/2	40,000	28,000		
2 5/8	45,500	32,500		

Table 24

POLYPROPYLENE ROPE SLINGS

ROPE DIAMETER Nominal In Inches	Nominal Weight Per 100 ft In Pounds	Minimum Breaking Strength In Pounds	RATED CAPACITY IN POUNDS (Safety Factor = 6)											
			EYE AND EYE SLING						ENDLESS SLING					
			VERTICAL HITCH	CHOKER HITCH	BASKET HITCH				VERTICAL HITCH	CHOKER HITCH	BASKET HITCH			
					Angle of Rope to Horizontal						Angle of Rope to Horizontal			
					90 deg	60 deg	45 deg	30 deg			90 deg	60 deg	45 deg	30 deg
					Angle of Rope to Vertical						Angle of Rope to Vertical			
					0 deg	30 deg	45 deg	60 deg			0 deg	30 deg	45 deg	60 deg
1/2	4.7	3,990	650	350	1,300	1,200	950	650	1,200	600	2,400	2,100	1,700	1,200
9/16	6.1	4,845	800	400	1,600	1,400	1,100	850	1,500	750	2,900	2,500	2,100	1,500
5/8	7.5	5,890	1,000	500	2,000	1,700	1,400	1,000	1,800	900	3,500	3,100	2,500	1,800
3/4	10.7	8,075	1,300	700	2,700	2,300	1,900	1,300	2,400	1,200	4,900	4,200	3,400	2,400
13/16	12.7	9,405	1,600	800	3,100	2,700	2,200	1,600	2,800	1,400	5,600	4,900	4,000	2,800
7/8	15.0	10,925	1,800	900	3,600	3,200	2,600	1,800	3,300	1,600	6,600	5,700	4,600	3,300
1	18.0	13,300	2,200	1,100	4,400	3,800	3,100	2,200	4,000	2,000	8,000	6,900	5,600	4,000
1 1/16	20.4	15,200	2,500	1,300	5,100	4,400	3,600	2,500	4,600	2,300	9,100	7,900	6,500	4,600
1 1/8	23.7	17,385	2,900	1,500	5,800	5,000	4,100	2,900	5,200	2,600	10,500	9,000	7,400	5,200
1 1/4	27.0	19,950	3,300	1,700	6,700	5,800	4,700	3,300	6,000	3,000	12,000	10,500	8,500	6,000
1 3/16	30.5	22,325	3,700	1,900	7,400	6,400	5,300	3,700	6,700	3,400	13,500	11,500	9,500	6,700
1 1/2	38.5	28,215	4,700	2,400	9,400	8,100	6,700	4,700	8,500	4,200	17,000	14,500	12,000	8,500
1 5/8	47.5	34,200	5,700	2,900	11,500	9,900	8,100	5,700	10,500	5,100	20,500	18,000	14,500	10,500
1 3/4	57.0	40,850	6,800	3,400	13,500	12,000	9,600	6,800	12,500	6,100	24,500	21,000	17,500	12,500
2	69.0	49,400	8,200	4,100	16,500	14,300	11,500	8,200	15,000	7,400	29,500	25,500	21,000	15,000
2 1/8	80.0	57,950	9,700	4,800	19,500	16,500	13,500	9,700	17,500	8,700	35,000	30,100	24,500	17,500
2 1/4	92.0	65,550	11,000	5,500	22,000	19,000	15,500	11,000	19,500	9,900	39,500	34,000	28,000	19,500
2 1/2	107.0	76,000	12,500	6,300	25,500	22,000	18,000	12,500	23,000	11,500	45,500	39,500	32,500	23,000
2 5/8	120.0	85,500	14,300	7,100	28,500	24,500	20,000	14,500	25,500	13,000	52,500	44,500	36,500	25,500

Table 25

SAFE WORKING LOADS FOR SHACKLES

(In tons of 2000 pounds)

Material size (inches)	Pin diameter (inches)	Safe working load
½	½	1.6
⅝	⅝	2.2
¾	¾	3.2
⅞	1	4.3
1	1¼	5.8
1¼	1¼	6.7
1⅜	1½	8.2
1½	1¾	10.0
1¾	1¾	11.9
1¾	2	16.2
2	2¼	21.2

Table 26

NUMBER AND SPACING OF U-BOLT WIRE ROPE CLIPS

Improved plow steel, rope diameter inches	Number of clips		Minimum spacing (inches)
	Drop forged	Other material	
½	3	4	3
⅝	3	4	3½
¾	4	5	4½
⅞	4	5	5½
1	5	6	6
1¼	6	6	6½
1½	6	7	7½
1¾	7	7	8½
2	7	8	9

Table 27

AVERAGE DENSITIES OF VARIOUS SPECIES OF WOOD FOR USE IN LAMINATES

Species	Density (lbs./ft.³)
GROUP 1	
White ash	41
Beech	43
Birch	44
Rock elm	43
Hickory	50
Locust	47
Hard maple	43
Red maple	38
Red oak	43
White oak	46
Pecan	46
Persimmon	50
GROUP 2	
Douglas fir (coast region)	34
Western larch	38
Southern yellow pine	37
GROUP 3	
Red alder	28
Oregon ash	38
Pumpkin ash	37
Alaska cedar	31
Port Orford cedar	30
Cucumber	34
Cypress	32
Soft elm	36
Douglas fir (Rocky Mountain type)	30
Noble fir	27
Gum	34
West Coast hemlock	30
Magnolia	35
Oregon maple	34
Norway pine	31
Poplar	28
Redwood	25
Eastern spruce	28
Sitka spruce	28
Sycamore	35
Tamarack	37
Tupelo	35
GROUP 4	
Aspen	27
Basswood	25
Buckeye	28
Butternut	27
Incense cedar	25
Western red cedar	23
Black cottonwood	24
White fir	26
Hackberry	37
Eastern hemlock	28
Holly	30
Soft maple	32
Lodgepole pine	29
Idaho white pine	25
Northern white pine	25
Ponderosa pine	28
Sugar pine	25

Table 28

Length of clear (inches)	Thickness (inches)	Width (inches)
Up to and including 20	¾	3
Over 20 and up to and including 30	¾	3½

Table 29

Material	Full thickness undressed lumber	Nominal thickness lumber[1]
Working load (p.s.f.)	25	50
Permissible span (ft.)	10	8

[1] Nominal thickness lumber not recommended for heavy duty use.

Table 30

- MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE POLE SCAFFOLDS, LIGHT DUTY

	Maximum height of scaffold	
	20 ft.	60 ft.
Uniformly distributed load	Not to exceed 25 p.s.f.	
Poles or uprights	2x4 in.	4x4 in.
Pole spacing (longitudinal)	6 ft. 0 in.	10 ft. 0 in.
Maximum width of scaffold	5 ft. 0 in.	5 ft. 0 in.
Bearers or putlogs to 3 ft. 0 in. width	2x4 in.	2x4 in.
Bearers or putlogs to 5 ft. 0 in. width	2x6 in. or 3x4 in.	2x6 in. or 3x4 in. (rough).
Ledgers	1x4 in.	1¼x9 in.
Planking	1¼x9 in. (rough)	2x10 in.
Vertical spacing of horizontal members	7 ft. 0 in.	9 ft. 0 in.
Bracing, horizontal and diagonal	1x4 in.	1x4 in.
Tie-ins	1x4 in.	1x4 in.
Toeboards	4 in. high (minimum).	4 in. high (minimum).
Guardrail	2x4 in.	2x4 in.

All members except planking are used on edge.

Table 31

-MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE POLE SCAFFOLDS—MEDIUM DUTY

Uniformly distributed load	Not to exceed 50 p.s.f.
Maximum height of scaffold.	60 ft.
Poles or uprights	4x4 in.
Pole spacing (longitudinal)	5 ft. 0 in.
Maximum width of scaffold	5 ft. 0 in.
Bearers or putlogs	2x10 in. or 3x4 in.
Spacing of bearers or putlogs.	6 ft. 0 in.
Ledgers	2x10 in.
Vertical spacing of horizontal members.	7 ft. 0 in.
Bracing, horizontal	1x6 in. or 1¼x4 in.
Bracing, diagonal	1x4 in.
Tie-ins	1x4 in.
Planking	2x10 in.
Toeboards	4-in. high (minimum).
Guardrail	2x4 in.

All members except planking are used on edge.

Table 32

-MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE POLE SCAFFOLDS—HEAVY DUTY

Uniformly distributed load	Not to exceed 75 p.s.f.
Maximum height of scaffold.	60 ft.
Poles or uprights	4x6 in.
Pole spacing (longitudinal)	6 ft. 0 in.
Maximum width of scaffold	5 ft. 0 in.
Bearers or putlogs	2x10 in. or 3x5 in.
Spacing of bearers or putlog.	6 ft. 0 in.
Ledgers	2x10 in.
Vertical spacing of horizontal members.	6 ft. 6 in.
Bracing, horizontal and diagonal.	2x4 in.
Tie-ins	1x4 in.
Planking	2x10 in.
Toeboards	4-in. high (minimum).
Guardrail	2x4 in.

All members except planking are used on edge.

Table 33

—MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF INDEPENDENT POLE SCAFFOLDS—LIGHT DUTY

	Maximum height of scaffold	
	20 ft.	60 ft.
Uniformly distributed load	Not to exceed 25 p.s.f.	
Poles or uprights	2x4 in.	4x4 in.
Pole spacing (longitudinal)	6 ft. 0 in.	10 ft. 0 in.
Pole spacing (crosswise)	6 ft. 0 in.	10 ft. 0 in.
Ledgers	1¼x4 in.	1¼x9 in.
Bearers to 3 ft. 0 in. span	2x4 in.	2x4 in.
Bearers to 10 ft. 0 in. span	2x6 in. or 3x4 in.	2x10 (rough) or 3x8 in.
Planking	1¼x9 in.	2x10 in.
Vertical spacing of horizontal members	7 ft. 0 in.	7 ft. 0 in.
Bracing, horizontal and diagonal	1x4 in.	1x4 in.
Tie-ins	1x4 in.	1x4 in.
Toeboards	4 in. high	4 in. high (minimum)
Guardrail	2x4 in.	2x4 in.

All members except planking are used on edge.

Table 34

—Minimum Nominal Size and Maximum Spacing of Members of Independent Pole Scaffolds—Medium Duty

Uniformly distributed load	Not to exceed 50 p.s.f.
Maximum height of scaffold	60 ft.
Poles or uprights	4x4 in.
Pole spacing (longitudinal)	8 ft. 0 in.
Pole spacing (transverse)	8 ft. 0 in.
Ledgers	2x10 in.
Vertical spacing of horizontal members	6 ft. 0 in.
Spacing of bearers	8 ft. 0 in.
Bearers	2x10 in.
Bracing, horizontal	1x6 in or 1x4 in.
Bracing, diagonal	1x4 in
Tie ins	1x4 in
Planking	2x10 in.

—Minimum Nominal Size and Maximum Spacing of Members of Independent Pole Scaffolds—Medium Duty—Continued

Toeboards	4-in. high (minimum).
Guardrail	2x4 in.

All members except planking are used on edge.

—Minimum Nominal Size and Maximum Spacing of Members of Independent Pole Scaffolds—Heavy Duty

Uniformly distributed load	Not to exceed 75 p.s.f.
Maximum height of scaffold	60 ft.
Poles or uprights	4x4 in.
Pole spacing (longitudinal)	6 ft. 0 in.
Pole spacing (transverse)	8 ft. 0 in.
Ledgers	2x10 in.

Table 35

—Minimum Nominal Size and Maximum Spacing of Members of Independent Pole Scaffolds—Heavy Duty Continued

Vertical spacing of horizontal members	6 ft. 0 in.
Bearers	2x10 in. (rough)
Bracing, horizontal and diagonal	2x4 in.
Tie-ins	1x4 in.
Planking	2x10 in.
Toeboards	4-in. high (minimum).
Guardrail	2x4 in.

All members except planking are used on edge.

Table 36

—Tube and Coupler Scaffolds—Light Duty

Uniformly distributed load	Not to exceed 25 p.s.f.
Post spacing (longitudinal)	10 ft. 0 in.
Post spacing (transverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	8	125 ft.
2	4	125 ft.
3	0	91 ft. 0 in.

Table 37

—Tube and Coupler Scaffolds—Medium Duty

Uniformly distributed load	Not to exceed 50 p.s.f.
Post spacing (longitudinal)	8 ft. 0 in.
Post spacing (transverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	6	125 ft.
2	0	75 ft. 0 in.

Table 38

—Tube and Coupler Scaffolds—Heavy Duty

Uniformly distributed load	Not to exceed 75 p.s.f.
Post spacing (longitudinal)	6 ft. 6 in.
Post spacing (transverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	6	125 ft.

Table 39

—Minimum Nominal Size and Maximum Spacing of Members of Outrigger Scaffolds

Maximum scaffold load	Light duty 25 p.s.f.	Medium duty 50 p.s.f.
Outrigger size	2 x 10 in.	3 x 10 in.
Maximum outrigger spacing	10 ft. 0 in.	6 ft. 0 in.
Planking	2 x 10 in.	2 x 10 in.
Guardrail	2 x 4 in.	2 x 4 in.
Guardrail uprights	2 x 4 in.	2 x 4 in.
Toeboards	4 in. (minimum).	4 in. (minimum).

Table 40

—Schedule for Ladder-Type Platforms

	Length of platform (feet)				
	12	14 and 16	18 and 20	22 and 24	28 and 30
Side Stringers, minimum cross section (finished size):					
At ends (inches)	1½ x 2½	1½ x 2½	1½ x 3	1½ x 3	1½ x 3½
At middle (inches)	1½ x 3½	1½ x 3½	1½ x 4	1½ x 4½	1½ x 5
Reinforcing strip (minimum)	A ¼ x ⅞-inch steel reinforcing strip or its equivalent shall be attached to the side or underside, full length.				
Rungs	Rungs shall be 1⅛-inches minimum diameter with at least ⅜-inch diameter tenons, and the maximum spacing shall be 12 inches center to center.				
Tie rods:					
Number (minimum)	3	4	4	5	6
Diameter (minimum)	⅜ in.	⅜ in.	⅜ in.	⅜ in.	⅜ in.
Flooring, minimum finished size (inches)	⅞ x 2½	⅞ x 2½	⅞ x 2½	⅞ x 2½	⅞ x 2½

Table 41

—Minimum Dimensions for Bricklayers' Square Scaffold Members

Members	Dimensions
Braces or horizontal members	2 x 6 in.
Legs	3 x 6 in.
Braces at corners	1 x 6 in.
Braces diagonally from center	1 x 6 in.

Table 42

—Minimum Dimensions for Horse Scaffold Members

Members	Dimensions
Horizontal members or bearers	2 x 4 in.
Legs	1½ x 4½ in.
Longitudinal brace between legs	1 x 6 in.
Gusset brace at top of legs	1 x 8 in.
Half diagonal braces	1½ x 4½ in.

Table 43

—Minimum Design Criteria for Pipe-Frame Tube Scaffolds

Members	Dimensions
Uprights	2 x 4 in. or 2 x 6 in.
Outriggers ledgers (two)	1 x 6 in.
Braces	1 x 6 in.
Guardrails	2 x 4 in.
Guardrail height	Approximately 42 in.
Intermediate guardrails	1 x 6 in.
Toeboards	4 in. (minimum).
Maximum length of ledgers	3 ft. 6 in. (unsupported).
Planking	2 x 10 in.
Upright spacing	8 ft. 0 in. (on centers).

Table 44

-Minimum Design Criteria for Metal Bracket Pipe Scaffolds

Members	Dimensions
Uprights	2 x 4 in.
Guardrails	2 x 4 in.
Guardrail height	Approximately 42 in.
Intermediate guardrails	1 x 6 in.
Toeboards	4 in. (minimum).
Planking	2 x 9 in.

Table 45

-Minimum Design Criteria for Wooden Bracket Pipe Scaffolds

Members	Dimensions
Uprights	2 x 4 in. or 2 x 6 in.
Support ledgers	2 x 6 in.
Maximum midfield width	8 ft. 6 in.
Braces	1 x 6 in.
Guardrails	2 x 4 in.
Guardrail height	Approximately 42 in.
Intermediate guardrails	1 x 6 in.
Toeboards	4 in. (minimum).
Upright spacing	8 ft. 6 in. (on

Table 46

Minimum Factors of Safety for Suspension Wire Ropes

Rope speed in feet per minute:	Minimum factor of safety
50	7.60
75	7.75
100	7.95
125	8.10
150	8.25
175	8.40
200	8.60
225	8.75
250	8.90
300	9.20
350	9.50
400	9.75
450	10.00
500	10.25
550	10.45
600	10.70

Table 47

APPROXIMATE ANGLE OF REPOSE
FOR SLOPING OF SIDES OF EXCAVATIONS

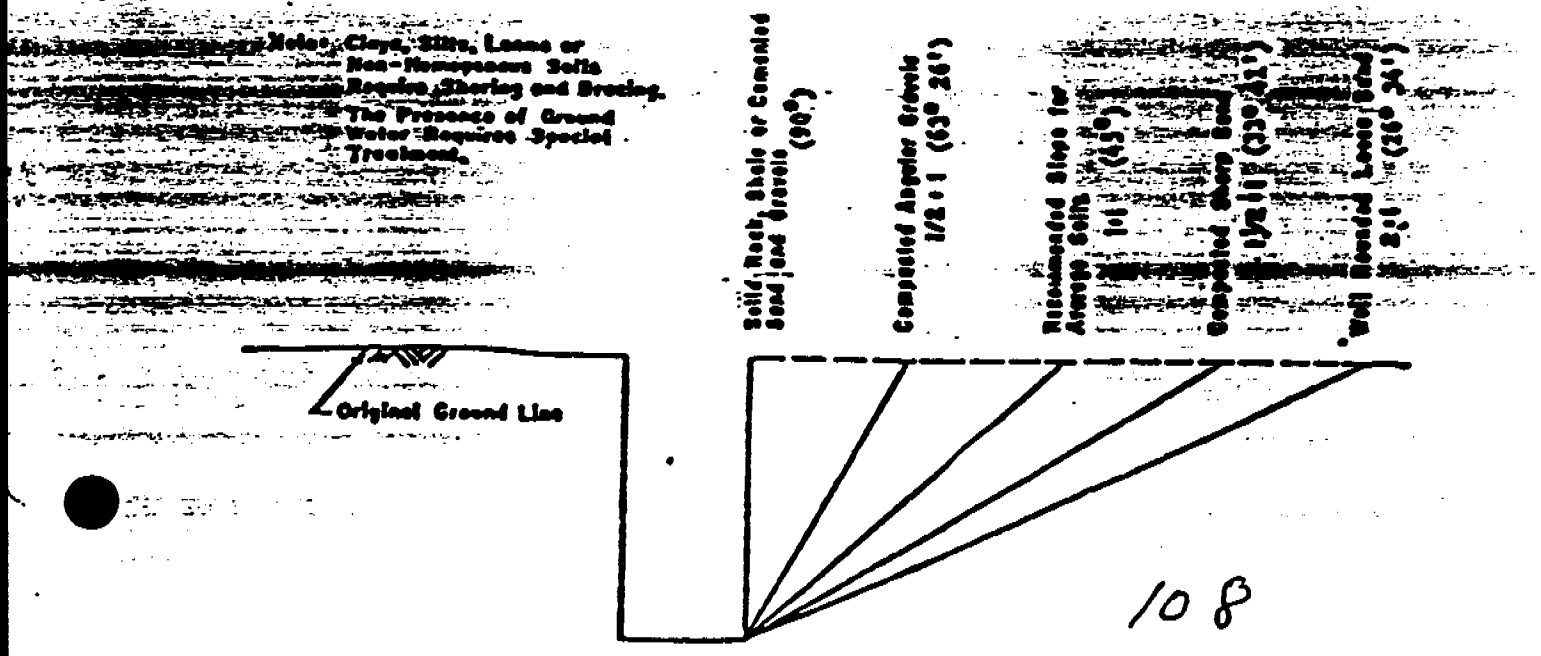


Table 48

Size and spacing of members

Depth of trench	Kind or condition of earth	Uprights: Minimum dimension	Uprights: Maximum spacing	Stringers: Minimum dimension	Stringers: Maximum spacing	Cross braces[1]: Width of trench: Up to 8 feet	8 to 6 feet	6 to 9 feet	9 to 12 feet	12 to 15 feet	Maximum spacing: Vertical	Maximum spacing: Horizontal
Feet		Inches	Feet	Inches	Feet	Inches	Inches	Inches	Inches	Inches	Feet	Feet
5 to 10	Hard, compact	2x4 or 2x6	4	4x6	4	2x6	4x6	4x6	6x6	6x6	4	6
	Likely to crack	2x4 or 2x6	3	4x6	4	2x6	4x6	4x6	6x6	6x6	4	6
	Soft, sandy, or filled	2x4 or 2x6	Close sheeting	4x6	4	4x4	4x6	6x6	6x6	8x8	4	6
	Hydrostatic pressure	2x4 or 2x6	Close sheeting	6x8	4	4x4	4x6	6x6	6x6	8x8	4	6
10 to 15	Hard	2x4 or 2x6	4	4x6	4	4x4	4x6	6x6	6x6	6x8	4	6
	Likely to crack	2x4 or 2x6	2	4x6	4	4x4	4x6	6x6	6x8	8x8	4	6
	Soft, sandy, or filled	2x4 or 2x6	Close sheeting	6x6	4	4x6	6x6	6x6	8x8	8x10	4	6
	Hydrostatic pressure	2x6	Close sheeting	8x10	4	4x6	6x6	6x8	8x8	8x10	4	6
15 to 20	All kinds or conditions	3x6	Close sheeting	4x12	4	4x12	6x8	8x8	8x10	10x10	4	6
Over 20	All kinds or conditions	3x6	Close sheeting	6x8	4	4x12	8x8	8x10	10x10	10x12	4	6

[1] Trench jacks may be used in lieu of, or in combination with, cross braces.
Sheeting is not required in solid rock, hard shale, or hard clay.
Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

Table 49

About 48" x 48"

About 42" x 36"

KEN HECHLER
Secretary of State

MARY P. RATLIFF
Deputy Secretary of State

A. RENEE COE
Deputy Secretary of State

CATHERINE FREROTTE
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Director, Administrative Law

DONALD R. WILKES
Director, Corporations

(Plus all the volunteer help we can get)

FAX: (304) 558-0900

TO: Ron Harris

AGENCY: Coal Mine Health & Safety

FROM: JUDY COOPER, DIRECTOR, ADMINISTRATIVE LAW DIVISION

DATE: May 9, 1995

THE ATTACHED RULE FILED BY YOUR AGENCY HAS BEEN ENTERED INTO OUR COMPUTER SYSTEM. PLEASE REVIEW, PROOF AND RETURN IT WITH ANY CORRECTIONS. IF THERE ARE NO CORRECTIONS, PLEASE SIGN THIS MEMO AND RETURN IT TO THIS OFFICE. YOU WILL BE SENT A FINAL VERSION OF THE RULE FOR YOUR RECORDS.

PLEASE RETURN EITHER THE CORRECTED RULE OR THIS FORM WITHIN TEN (10) WORKING DAYS OF THE DATE YOU RECEIVED THIS REQUEST. CALL IF YOU HAVE ANY QUESTIONS.

SERIES: 23 TITLE: 36 Coal Mine Health & Safety

* THE ATTACHED RULE HAS BEEN REVIEWED AND IS CORRECT.

SIGNED: _____

TITLE OF PERSON SIGNING: _____

DATE: _____

****

* THE ATTACHED RULE HAS BEEN REVIEWED AND NEEDS CORRECTING. THE CORRECTIONS HAVE BEEN MARKED.

SIGNED: Ronald L. Harris

TITLE OF PERSON SIGNING: Administrator - Board of Coal Mine Health & Safety

DATE: May 15, 1995

NOTE: IF YOU ARE NOT THE PERSON WHO HANDLES THIS RULE, PLEASE FORWARD TO THE CORRECT PERSON.