PLAINTIFF'S EXHIBIT
WRG-865

Zonolite Division

W. R. Grace & Co.

GENERAL SAFETY STANDARDS

15161239

These safety rules are taken from safety standards established by state, federal and company safety departments.

The standards have been augmented with detailed rules to cover this operation. Only the applicable standards have been included in these rules. These rules equal or exceed the established standards.

No attempt is made to cover all details of every hazard. This detail would result in a volume that would hinder rather than aid the cause of accident prevention.

It is the duty of any employer to provide reasonably safe and healthful working conditions for his employees and to do everything reasonably necessary to protect their life, health and safety. Concurrently, it is the duty of every employee to co-operate to the fullest with his employer and to perform his work in a reasonably safe manner, recognizing hazards and avoiding and preventing accidents wherever possible.

Therefore, it is the intention of these rules not to penalize either the employer or employees with unduly voluminous restrictions but to encourage increasing attention to the elimination of industrial hazards through providing a basic framework of safety policy and practice which may be considered to be a minimum acceptable standard, and which can be augmented by the operators of specific functions as circumstances may require.

It is the intention of the Zonolite Division to augment the established minimum safety standards of the various agencies with reasonably detailed safety rules covering the specific hazards peculiar to this operation.

06615791

I. ACCIDENT PREVENTION PROGRAM

A. Safety Bulletin Boards

1. A safety bulletin board, or boards, for safety bulletins only shall be provided at each mine, mill, smelter, quarry or pit.

B. Safety Training and Instructions

1. When an employee is first engaged or transferred to a different job, the employer shall furnish instructions concerning general safety practices and any unusual hazards related to the job.

C. Safety Organization

1. Every mine, mill, smelter, quarry or pit, no matter how large or small, shall establish a definite, effective and constantly functioning safety organization which shall meet at regular intervals, discuss all operating conditions, and make every effort to reduce injuries and to increase safety. In the event of a fatality, the safety committee men on duty shall be called to the scene at once.
2. Every employer and employee shall constantly work toward the elimination of dangerous or hazardous conditions and practices and constantly strive to make every working place safe.

D. Safety Rules for Employees

1. Company safety manuals or other written instructions should be adopted and published.
2. Where practicable, new employees should be furnished with a copy of the safety publications.

II. SAFETY INSPECTIONS

A. Daily Inspections of All Working Areas

1. A daily inspection shall be made of every part of the operation where an employee is working or required to be in the course of his duties. Two inspections per day are recommended. Such inspections shall be made by a qualified shift boss, foreman, or other official who must be at least twenty-one years of age and able to speak, read and write the English
2. The employer or his designated representative shall note any unsafe conditions and such conditions shall be remedied or repaired without undue delay.

15161241

B. Monthly Inspections of All Working Areas, Structures and Equipment Including Emergency Escape Exits

1. At least once each month the safety organization shall provide for safety inspection of all working areas, structures, and equipment, including emergency escape exits.
2. Any unsafe conditions shall be reported to the management and shall be corrected without undue delay.

C. Records

1. Written reports shall be kept on monthly inspections, emergency escapeway inspections, and safety committee inspections. Such reports should be signed and retained on file for at least one year.

III. PREPARATION FOR EMERGENCIES

A. First Aid Training

1. Whenever possible and practical, a certain number of employees, depending upon the size of the operation, shall be trained in first aid. All employees, shall be encouraged to take first aid training. At least 10% of the employees on a given operation shall be required to take first aid training from a qualified instructor of the U. S. Bureau of Mines.

B. Supplies and Equipment for Care of Injured.

1. Stretchers with full complement of splints, blankets and bandages, as recommended by the U. S. Bureau of Mines, shall be kept at each operating mine, mill, smelter, quarry or pit. These must be maintained and readily available at all times.
2. Adequate and suitably equipped first aid kits shall be available to all general working areas and departments.
3. When available an ambulance shall be used for transporting all injured employees.

IV. FIRE PREVENTION

A. Fire Fighting Equipment

1. Every employer of any mine, mill, smelter, quarry or pit where there appear any hazards from fire shall provide sufficient fire protection, including either water supply with adequate pressure, fire plugs, hose and nozzles, or approved-type chemical extin-

guishers, automatic chemical or water extinguishers, any or all of which shall be properly located to provide for the safety of all employees. Fire plugs or hydrants with wrenches or keys securelyattached and readily accessible shall be placed away from buildings so that a fire will not render them useless.

2. Where water lines are available, nozzles, adapters and hoses which will fit water lines must be kept available at all times.
3. Approved-type fire extinguishers shall be available on all operation stations of mines, on all floors of buildings, at all major electrical installations such as motor generator sets, charging panels and large transformer stations, and at any location where unusual fire hazard exists.
4. Chemical fire fighting apparatus or hand extinguishers shall be of a type as recommended by the manufacturer and approved by the Fire Underwriters Association for the purpose intended, and shall be carefully inspected at regular intervals; a record of such inspection or recharge shall be kept on a tag attached to the apparatus or extinguisher.
5. All fire fighting apparatus and equipment shall be under the supervision of one or more competent employees, as may be necessary and so designated by the employer, and such authorized employees shall be responsible for the good working condition of all fire fighting apparatus and equipment.
6. Fire fighting apparatus or equipment of any kind shall not be molested, removed or blocked from ready access by any employee or other person or persons.
7. Spaces containing hydrants, fire hoses, or fire extinguishers shall be conveniently located, well marked for immediate recognition, and kept clear and free at all times.
8. A fire alarm system adequate to give warning of fire to all employees in surface operations should be installed and kept in good working condition.

B. Use of Heating Devices

1. Heating equipment must be installed in such a manner that fire cannot be caused even if overheating

occurs. Suitable spark arrestors must be installed wherever needed.

2. Electric or flame welding or flame cutting must not be done except where adequate protection against fire has been provided.

C. Fire Prevention and Control, General

1. Smoking is prohibited in or near powder and fuse magazines.
2. Smoking or the use of unprotected lights or flames shall be prohibited any place where there is danger of igniting explosives, oil, gasoline, fumes, dust, gases, or other highly combustible materials.
3. At all places where gasoline, distillate, oil, explosives, or other highly flammable materials are stored, only approved safety lights will be used.
4. All electrical equipment which might communicate fire to adjacent flammable material shall be of a type which will confine heat and flames within the equipment, or it should be located and installed so that flammable material will not be exposed. This standard does not apply to conduit wiring or to approved, enclosed, externally operable switches.
5. Readily flammable rubbish, trash, or oily and greasy rags shall be kept in covered metal containers until such materials can be taken away for disposal.
6. Flammable trash and rubbish, flammable dust, drippings from oil or gasoline drums, and such other similar fire hazards shall not be allowed to accumulate, but shall be disposed of regularly in a safe manner.
7. Fire shall be reported to the employer or supervisor in charge immediately, and every attempt shall be made to keep it from getting beyond control.
8. Streams of water are not to be used on oil or electrical fires unless hoses with fog nozzles are provided.

V. GENERAL SAFETY PRECAUTIONS

A. Solitary Employment:

1. In work locations where cries cannot be heard, solitary employees must be in communication with other employees at least once each hour.

15161244

06615795

2. Solitary employment is prohibited while removing accumulations of gas, while wearing permissible oxygen-breathing equipment, or while wearing hose masks.

B. General Safety Precautions (Applicable to Mining, Quarrying, Milling and Smelting Operations)

1. Every reasonable precaution shall be taken to insure the safety of employees in all cases, whether or not provided for in this code.
2. Some responsible person in authority shall be on duty whenever men are working underground.
3. Employees shall be warned when others are working above or below them so that they will not be injured by falling materials, tools, or rock.
4. Every person underground, or in hazardous areas above ground, shall wear approved-type safety hat or cap.
5. Every employee underground, or in hazardous areas above ground, shall wear approved-type safety boots or safety shoes.
6. No person believed to be under the influence of intoxicating liquor shall be permitted to enter any mine, mill, smelter, building, or other premises connected with the operation, and no one shall carry or use intoxicating liquor in any mine or other working place.
7. All spikes, nails, or other sharp objects which protrude and may cause injury shall be bent down or removed.
8. All traffic-ways, walk-ways, crossovers, stairways, and other means of getting to and from working places shall be kept free of obstructions or other hazards to travel and where necessary shall be equipped with hand rails and guard rails properly maintained. Such walk-ways, crossovers, etc. shall be provided where necessary for safe conduct of operations.
9. All hazardous machinery, tools, or belts shall be adequately safe-guarded to prevent employees being caught in and harmed by such machinery. When safeguards are removed in the course of maintenance work, such guards shall be replaced upon completion of work.

15161245

10. Electrical installations of all kinds shall be adequately safeguarded where possible to prevent harm to employees from electrical shock. When work is performed in the immediate vicinity of high tension electrical apparatus or wires, suitable precautions shall be taken to safeguard the personnel involved.
11. When working on any piece of motor-driven machinery, the control switch must first be locked out and tagged.
12. Employees should not walk or attempt to work under working booms and buckets, or under any suspended loads of hoisting or traveling cranes.
13. Employees shall not attempt to take samples or do other similar work on moving cars or vehicles.
14. Operators must be certain all persons are in the clear before starting machinery.
15. When using a water hose, employees shall not turn water on any electrical equipment. (Water is a conductor of electricity.)
16. Acid or alkali burns shall be washed immediately and freely with clean fresh water; all employees shall know the location of safety showers and fresh water outlets.
17. Employees shall not enter bins, hoppers, fan or bag houses, acid storage tanks, pump tanks, towers, coke filters, or mist precipitators unless wearing a safety belt with rope attached and, then, only when a second person is present. Where necessary, lockout switches or ground chains shall be used.
18. Employees will not change settings or tamper with valves, dampers, gates, or switches, unless instructed to do so by authorized personnel.
19. Shavings, drillings, sawdust, and similar waste created in the operation of lathes, drill presses, saws and similar machines shall be cleaned from the work and working areas by brush, broom, low pressure compressed air, or other similar and non-dispersal means. High pressure compressed air blowing of such waste shall not be permitted.
20. When it is necessary to do maintenance work on tracks, or passage-ways, suitable warning signs or signals

shall be employed.

21. When the work requires throwing or dropping of material from elevated locations such as buildings, scaffolds, or platforms, the impact area shall be suitably located and marked.
22. Wherever possible, electric arc welding shall be suitably screened from other workmen.
23. When electrical work must be done on energized electrical circuits, proper protective equipment shall be employed, including rubber gloves, insulated or non-conducting tools, and other appropriate insulation, and such work shall not be done without the approval of management.
24. All exposed industrial gas lines shall be suitably identified.

C. General Housekeeping in all Working and Storage Areas

1. Rubbish of all kinds shall be removed as soon as possible from all working and storage areas both on surface and underground. Combustible rubbish shall not be allowed to remain in a mine, building, shop or other place, but shall be disposed of in a safe manner.
2. All oily rags or waste shall be deposited in covered metal receptacles and shall not be allowed to accumulate.
3. Working and storage areas, wherever located, shall be kept clean, orderly, and free of accumulation of materials which could create hazards to safe operation.
4. Tools, machines, ropes, cables, ladders, and other appurtenances to the work shall be kept in their proper places and not allowed to obstruct either traffic or working areas.

VI. MINING EQUIPMENT

A. Drilling Operation - General

1. Drilling machines shall be in good condition. The drill chucks shall be the proper size to keep the drills secured therein.
2. It is strictly prohibited for any employee to drill in or deepen any hole which contains or may have con-

tained explosives.

3. Rock drilling operations shall be performed from a safe floor, platform or staging which will provide a secure support for both the drilling machine and the operator.

VII. HAULAGE EQUIPMENT AND PRACTICES

A. Conveyors

1. All belt conveyor head pulleys, tail pulleys, single tension pulleys, and deep take-up pulleys shall be adequately guarded.
2. All head and tail pulley sprockets or other transmission equipment on portable incline conveyors shall be completely guarded at all times.
3. If a conveyor runs in a trough within three (3) feet above the floor level or just below floor level, it shall either be completely covered with a substantial lid, or enclosed by a railing, and provided with necessary guard cross-overs.
4. Cross-overs shall be provided where it is necessary to pass over exposed chain, belt, bucket, screw or roller conveyors. Such cross-overs shall be bridges or runways, properly equipped with standard railings and toe boards, and shall have a fixed ladder, ramp, or stairway as a safe means of exit.
5. Conveyors which pass over areas which are occupied or used by employees shall be guarded so as to prevent the material handled from falling on or causing injury to employees or other persons.
6. No 'riding' shall be permitted on a conveyor at any time, unless it is specifically designed to convey passengers or the operator.
7. Whenever it is necessary or required that employees must travel in the course of an operating conveyor, safe passageway shall be provided at all times.
8. Conveyor tunnels or conveyor sheds shall be sufficiently large to allow safe transit alongside the conveyor or safe access for maintenance purposes.
9. Passageways adjacent to conveyors shall be kept as free of conveyor spillage as practical, and means

shall be taken to minimize the spillage.

10. Conveyor rollers shall not be adjusted or greased while the conveyor is in operation, unless such roller adjustments and grease cups are sufficiently far from the belt to be non-hazardous to the employee who is greasing or adjusting.
11. Maintenance work should not be done while the conveyor is in operation. If it is necessary to operate the conveyor while servicing it, special safety precautions shall be taken.
12. When a maintenance man stops the conveyor for servicing, he shall lock out the starting device so that no one but the man working on the conveyor can restart it.
13. Before restarting a conveyor which has stopped due to an overload, an inspection shall be made and the stoppage cleared before starting.
14. The starting device shall be locked out before any attempt is made to remove the cause of an overload.
15. No overload and/or safety device shall be removed from the conveyor. Provisions should be made to prevent anyone, excepting a competent authorized person, from adjusting or tampering with such devices.
16. All personnel working on or near a conveyor shall be instructed in the location and operation of all stopping devices.
17. Provisions for emergency stopping of conveyors shall be made at intervals of not less than two hundred (200) feet along the conveyor. Continous means of emergency stopping is recommended where practicable.
18. All equipment that starts or stops automatically shall have signs attached that state 'Automatic Start' (compressors, pumps, etc.)

VIII. PROTECTION AGAINST DUST, FUMES, MISTS, VAPORS, GASES

A. Surface Plants

1. The requirements of this section shall apply to all

surface operations, including mills, concentrators, smelters, converters, refineries and others connected with ore dressing, reduction, and refining operations.

2. The equipment, material, or process producing dusts, fumes, mists, vapors or gases in quantities and under conditions which produce harmful effects shall be changed in such manner as to eliminate said harmful products, unless the employer elects to control such hazards under other provisions of these orders.
3. Whenever harmful dusts, fumes, mists, vapors, or gases exist, or are produced in the course of operations, in quantities giving rise to harmful exposure of employees, and prevention or elimination of such hazards is not practicable, such hazards shall be controlled by the application of general ventilation, local exhaust ventilation, or other effective means such as pressure ventilation.
4. (a) When it is impracticable to remove harmful dusts, fumes. mists, vapors, or gases at their source, the employer shall provide, and the employee exposed to such hazards shall use, approved respiratory protective equipment.
   NOTE: Approval of equipment by the Industrial Accident Board will, in all cases, be based on standards at least equivalent to those of the U.S. Bureau of Mines.
   (b) The use of respiratory equipment shall, in general, be regarded as emergency protection against occasional and/or relatively brief exposure.
   EXCEPTION: Continuous use of respiratory protective equipment may be required for sandblasters, shake-out men and others working where adequate protection by other means is impracticable.
5. It shall be the duty of each work supervisor to instruct all employees under his supervision concerning hazards of poisonous or toxic substances associated with their work and prescribed safety precautions to be taken.

IX. SANITATION

A. Drinking Water

1. Water suitable for drinking shall be made available to all employees during working hours. This may be accomplished by piping to fountains or by other sanitary means.
2. Common drinking vessels are prohibited.

B. Dry Closets or Water Closets

1. At any location where ordinary sewerage is not available, an adequate number of dry or water closets shall be provided at convenient locations on the working levels or in the surface operations. Ready means of access shall be provided to each closet.
2. Means shall be provided for removing the contents of closets and for cleansing. Contents shall be removed often enough to prevent closets from becoming offensive.
3. Each closet shall be provided with a suitable disinfectant or deodorant, either in the closet or to be sprinkled on the contents thereof.
4. All employees shall be required to use closets provided.

C. General Sanitation

1. All relief, working, and eating areas, either on surface or underground, shall be maintained in a reasonable sanitary condition.

D. Illumination

1. Adequate illumination shall be provided in all working and relief areas, either through fixed lighting or portable lights worn or carried by the employees.

X. ENGINES - FUEL BURNING AND INTERNAL COMBUSTION

A. Refueling Operation

1. The engine shall be shut off during fueling operations.
2. Precautions shall be taken to prevent spilling during fueling operations. Spilled fuel shall be cleaned up and removed promptly.
3. The use of compressed air to force fuel from a container is prohibited.
4. No fire, smoking, open lights, or other source of ignition shall be permitted near fueling operations.

15161251

X. STRIPPING AND DRILLING OVERBURDEN

A. Stripping Overburden

1. Stripping shall be performed in a safe manner. Excessive pit slopes shall be avoided to prevent slides and caves. Particular ground conditions will dictate the maximum pit slopes and the necessity of protective berms. All slopes will be properly trimmed of loose material.
2. Scaling-down men shall be provided with safety belts where necessary.

B. Drilling Overburden

1. Where churn drills or vertical rotary drills are used, the drillers shall not work under suspended tools. When collaring holes, inspecting, or during any operation where tools are removed from the hole, the tools shall be lowered to the platform.
2. Drilling equipment shall be inspected periodically, and any defects shall be corrected promptly.

XII. HAULAGE - SURFACE AND PIT

A. Automotive Equipment and Operation

1. Trucks shall be inspected daily and maintained in safe operating conditions.
2. Trucks shall be handled carefully and kept under control at all times. They shall be provided with efficient lighting systems and warning devices.
3. Other than the operator, no person shall ride on a truck unless authorized by the management.
4. No person shall be permitted to ride on the running board of any truck.
5. (a) Standard traffic rules and signals shall be formulated and shall be followed.
   (b) Truck drivers shall have a valid Chauffeur's license.
6. Truck drivers shall sound a warning signal when approaching other operating equipment and shall not attempt to pass such equipment until they receive the proper signal from the operator. Where conditions prevent an exchange of signals between truck drivers and operators of other equipment, a flagman shall be on duty to give signals.

15161252

7. Truck roads shall be maintained in good condition.
8. Road width shall be sufficient to provide adequate clearance for safe passing of trucks, or definite turn-outs and waiting points shall be designated.
9. During dry weather, main haulage roads shall be sprinkled or other methods of allaying dust shall be used. During icy or slippery weather, sand, fine cinders, or other effective material shall be used on ramps, intersections, and grades.
10. When trucks are traveling in the same direction, the drivers shall maintain safe distances between trucks.
11. Where trucks congregate at dumping or loading points, the trucks shall be spaced at least 30 feet apart, except when actually loading or unloading.
12. Truck roads, wherever possible, leading from a pit to the surface shall be arranged to provide one-way traffic, particularly if the road is on a steep grade. If this is not practicable, the road shall be wide enough to accommodate free passage of trucks at all points, or definite turn-outs and waiting points shall be designated.
13. No person shall be permitted to work on the chassis of a dump truck with the body in a raised position until after the truck body has been securely blocked in position. The mechanical hoist mechanism shall not be depended upon to hold the truck body in a raised position.
14. A substantial bumping block or other suitable means to limit the travel of a backing truck shall be provided at all places where a rear-dump truck discharges its load, unless the load is being dumped for spreading, or unless a dump spotter is employed.
15. A truck shall not be operated in reverse unless the driver has a clear view of the area behind the truck, or unless a person is assigned to direct the movement of the truck. Warning signals shall be given before backing trucks.
16. Employees are prohibited from operating mobile or vehicle equipment which has faulty brakes or defective steering mechanisms.

B. Mechanical Shovels, Cranes, Tractors

1. Mechanical Shovels

(a) All cables and sheaves shall be inspected regularly and shall be replaced when necessary.

(b) When repairs are being made or oiling and greasing are being done, the master clutch shall be disengaged.

(c) Do not work with operator's side of machine to the unshot bank.

(d) Move machine from bank for service or repair.

(e) When not in use all shovel dippers shall be left on a substantial support or on the ground.

(f) An operator must not leave the cab when the master clutch is engaged.

(g) Serviceman shall never work on or around machine without making sure the operator knows where the serviceman is working.

2. Tractors

(a) All crawler type tractors not having cabs but having power winches behind the operator shall have a steel protector plate of adequate strength installed behind the operator's seat.

(b) No riding shall be permitted on blades or arms of dozers nor in or on the buckets of payloaders.

(c) All tractors having cabs for the operators shall have the door latches and hinges in good working order at all times.

(d) When working under slippery conditions, track-type tractors shall be equipped with proper safety lugs.

(e) Any tractor which is equipped with hoisting cables shall have such cables and sheaves inspected at regular intervals and replacements made when necessary.

3. General

(a) When any of the afore-mentioned equipment is being refueled with any liquid fuel, the motor shall be stopped and no smoking permitted during refueling.

(b) All operators of afore-mentioned equipment shall be required to pass an eyesight and hearing examination and shall be required to pass an annual eyesight and hearing examination as provided by the employer.

(c) Only personnel authorized by the employer or his designated representative shall be allowed on any of the afore-mentioned equipment.
(d) Seat belts shall be used at all times by drivers and passengers on all machines equipped with belts.

XIII. ELECTRICITY - SURFACE AND PIT

A. Transmission Lines
1. Only standardized poles, crossarms, and materials shall be used in the construction of transmission lines.
2. Crossarms shall be made of clear, straight-grained wood, having a cross section of not less than $3\frac{1}{2}$" x 4" and pin drilling in accordance with the electrical construction regulations of the National Electrical Code.
3. There shall be an unobstructed climbing space maintained on all poles to insure a safe ascent of personnel through wires, connections, and attachments.

B. Transformer Stations
1. Adequate protection and disconnecting means shall be provided on the primary side of power and distribution transformers.
2. Transformers shall be of a type and design suitable for the location in which they are to be installed.
3. Oil filled transformers shall be installed in fire-resistant locations and, unless in overhead positions, shall be protected by fences or otherwise protected to remove likelihood of dangerous contact by persons or objects.
4. In all cases these enclosures or guards shall be grounded.

C. Substations, Electrically Operated Pumps, and Compressors
1. In all substations, ample working spaces shall be provided and maintained around all electrical equipment.
2. Control devices shall comply with National Electrical Manufacturer's Association standards.
3. All motors driving pumps or compressors shall be controlled by a starter having a rating not less than that of the motor which it controls.

D. Power Circuits
   1. Conductors shall be suitable for the location, current requirements, and voltage of the circuit to which they are applied.
   2. Suitable control and protective devices shall be inserted in all feeders and branch circuits and shall be readily accessible and as close as possible to the point of supply.

E. Grounding
   1. Where necessary, all forms of electrical apparatus shall be effectively grounded.

F. Circuit Breakers, Switches and Switchboards
   1. All circuit breakers, switches and switchboards shall comply with National Electrical Manufacturers Association standards.

XIV. SAFEGUARDS FOR MECHANICAL EQUIPMENT SURFACE AND PIT

A. Shops and Other Equipment
   1. Every fly-wheel, geared-wheel, bull-wheel, pulley or belt and every opening through which any wheel or belt operates shall be enclosed with a substantial railings, screen, or casing, unless situated in such a manner or location as to prevent any perso: coming into accidental contact therewith.
   2. Every key, bolt, set-screw, and every part of any wheel or other revolving machinery which projects unevenly from the surface shall be covered, unless situated in such a manner or location as to prevent any person coming into accidental contact therewith.
   3. Every power-driven grinding wheel shall be provid - ed with a hooded guard of sufficient strength to withstand the shock of a bursting wheel. This guard shall be adjusted close to the wheel and extended forward over the top of the wheel to a point at least thirty (30) degrees beyond a vertical line drawn through the center of the wheel. Grinding wheels shall be equipped with eyeshields unless goggles are worn by the operators.

B. Stripping and Loading Equipment
   1. All exposed gears shall be guarded and all projecting set screws on moving parts shall be removed,

counter sunk, or protected by a solid collar.

2. All projecting keys in shafting, where exposed, shall be cut off or guarded, and all key seats in ends of shafts, where exposed, shall be filed flush or guarded. All safety devices shall be in good working condition and shall be used at all times.
3. Trucks and graders shall not be operated unless the footbrakes, emergency brakes, tie rods, and steering arms are in safe operating conditions.

XV. MISCELLANEOUS HAZARDS - SURFACE AND PIT

A. Lighting

1. Lights on trucks, graders, bulldozers, and shovels shall be required for night-time operation.
2. Stripping, loading, and drilling equipment shall be well illuminated when artificial light is needed. Tractors shall be equipped with adequate headlights.

B. Protective Clothing

1. Safety hats shall be worn at all times by all employees within the pit location and by all employees engaged in surface work outside of shops.
2. Safety shoes shall be worn by all employees who are subject to the hazards of foot injuries.
3. Safety glasses shall be worn by all employees who are subject to the hazards of eye injuries.
4. Persons engaged in dangerous proximity to moving machinery shall not wear or be allowed to wear loose outer clothing.
5. Welders and helpers shall use proper shields or goggles to protect their eyes.
6. Protective gloves shall be worn when material which may injure the hands is handled, but gloves with gauntlet cuffs shall not be worn around moving machinery.
7. Men exposed to dust, fume, and mist-inhalation hazards shall wear permissible respiratory equipment. If the employee is exposed in excess of one (1) hour per shift, other control measures should be used.

C. Welding

1. Protective shields shall be used by welders to prevent eye injury to other workmen in the area when in exposed areas.

15161257

D. Containers

1. Any container used to transport or store dangerous or poisonous solids, powders, or liquids shall be properly covered and labeled.

E. Mobile Equipment

1. All mobile equipment shall be equipped with such standard safety equipment as may be required for the type of service involved, i.e., lights, warning signals, fire extinguishers, first aid kits, and effective means of ventilation to remove carbon monoxide or other poisonous gases when equipment is operated in enclosed areas.

XVI. QUARRIES

A General

1. This section shall apply to and be observed in all quarries.
2. In addition to the regulations appearing in this section, all other pertinent regulations appearing in this code shall apply to quarries.

B. Blasting

1. After blasting, the manager, foreman, or blaster shall see that all loose material resulting from the blast is either taken down or otherwise made safe; and no person shall pass or work on the floor of the quarry in the vicinity of the blasting operations until the quarry-face is made safe and so pronounced by the manager, foreman, or blaster.

C. Undermining

1. Where clay, sand, gravel, or other unconsolidated material is being worked or removed, undermining shall not be allowed, and the height of the vertical working-face shall be kept to a safe limit. Work can be done in benches or at an angle of safety.

D. Quarry Face Height

1. If the inspector is of the opinion that the face of a quarry is too high, he may order that the face shall be worked in benches.

E. Safety Ropes and Safety Belts

1. Where men have to work or climb on the face of a quarry above the floor or bench level, the owner, agent, or manager shall provide all necessary safety ropes and safety belts and shall see that the em-

ployees use such safety equipment when necessary.

XVII. EXPLOSIVES

NOTE: 'Explosives' means a mixture of chemical compounds which is capable of producing an explosion by its own energy. This includes all dynamites, ammonium nitrate when mixed with a hydrocarbon, etc.

A. Storage of Explosives, General

1. Except while being transported or while in the custody of a common carrier or dealer, pending delivery to a consignee, all explosives shall be kept or stored in magazines provided for that purpose alone, and under conditions which provide the greatest safety.
2. Underground workings may be used as a main storage magazine when:
   a. no person is employed therein
   b. the doors are fireproof
   c. the doors at all times are kept closed and fastened, except when necessarily opened by persons lawfully entitled to enter the magazine for the purpose of storing or removing explosives.
   d. at each magazine entrance a sign shall be placed, with the words, 'MAGAZINE - EXPLOSIVES - DANGEROUS' painted legibly in red letters on a white background.
3. Storage magazines shall be so arranged that rough handling of explosives will be unnecessary and so that boxes or cartons of dynamite or powder may be securely piled without crowding.
4. In storing explosives, boxes and cartons shall be stored so that the cartridges of dynamite lie horizontally.
5. Explosives magazines must be kept fastened at all times except when putting in or removing explosives, and they also must be kept clean, with no debris or rubbish of any kind allowed to accumulate in or near them.
6. Explosives shall not be stored with calcium carbide,

oil, fuses, caps, or any flammable material, and any such material must be stored at least fifty (50) feet from any explosives.

7. Dynamite, black powder, and ammonium nitrate shall not be stored in the same magazine.
8. Floors of magazines shall be of non-sparking material, and there shall be no other openings to magazines except entrance doors and ventilators.
9. Except at an explosives manufacturing plant, no employee or other person shall possess, keep, or store any explosive which is not completely enclosed and encased in a tight wooden, fiber, or paper container.
10. Matches, lighters, fire, or open lights of any type shall never be taken into any powder magazine; electric wires used therein shall be in conduit; all lights shall be in explosion-proof globes; the switches for such lights shall be outside of the magazines.
11. When the magazine is not in use, the lights shall be turned off.
12. Where the magazine is not wired with approved electric lights, only flashlights, electric lanterns, or electric cap lamps shall be permitted within the magazine.
13. All electric wires in any magazine shall be protected by fuses and enclosed in conduit, and no line of wiring whall be within five (5) feet of the explosives stored therein.
14. Before any alterations are made in any part of an explosives magazine, all explosives shall be carefully removed and the magazine thoroughly washed out, and all tools used for making such alterations or repairs shall be of wood or other non-sparking material.
15. In any mining camp or mining town or location where there is no law governing the storage of explosives, the American Table of Distances shall apply.
16. Blasting caps, detonators, or other detonating or fulminating caps shall be kept or stored in a magazine which meets the construction requirements of this article. They shall not be kept or stored in any magazine with other explosives.

17. Detonating fuse shall be stored in a magazine. It shall not be stored with detonators, but may be stored with other explosives.
18. Igniter cord shall be stored in a clean, dry, cool location. Because of its sensitivity to impact and friction, it shall not be stored with detonators or other explosives.
19. Capped safety fuse shall not be stored in an explosive magazine, but may be stored in a magazine with other detonators.
20. When explosives are removed from a magazine, those which have been longest in the magazine shall be taken first. All primers and capped fuses shall be used as soon as is reasonably possible after making.
21. No person under the age of eighteen (18) years shall be permitted in any explosives magazine or shall be permitted to use, handle or transport explosives at any mine.

B. Surface Storage

1. Surface powder magazines shall be constructed of materials such as brick, soft rock, cinder block, or wood packed with sawdust and reasonably bullet-proof, and doors shall be of two (2) inch wood, covered with three-eighths (3/8) inch steel plate.
2. Surface magazines shall have a sign or signs, posted at a distance of fifty (50) feet from magazines with the words 'MAGAZINE - EXPLOSIVES - DANGEROUS' with legible letters in red on a white background not less than six (6) inches high. The face of such sign shall be posted so no bullet fired at the sign could possibly hit the explosives magazine.
3. All magazines shall be provided with adequate ventilation, but shall have no openings except for entrance and ventilation. All vents must be effectively screened in such a manner as to prevent the entrance of persons, sparks, fire or rodents through the same.
4. Grass, brush, and combustible rubbish shall be kept cleaned away from surface magazines for a distance of not less than fifty (50) feet.

15161261

C. Transportation of Explosives

1. Surface

(a) Any vehicle transporting explosives shall display upon the front, each side, and the rear of the exterior of such vehicle a sign upon which shall appear the word 'EXPLOSIVES' in letters not less than eight (8) inches in height upon a background of sharply contrasting color.

(b) Detonators and capped fuses, if they are carried in the same vehicle, shall be in a separate compartment from the other explosives with at least twenty-five (25) inches of air space between the two (2) compartments.

(c) Vehicles used for transportation of explosives shall be substantially constructed, shall be in good working order, and shall have tight beds to prevent explosives from falling from vehicles. The end and sides of vehicles shall be high enough to prevent containers from falling off.

(d) No person, except the vehicle operator, helpers, and powder man, shall ride on vehicles transporting explosives.

(e) The transfer of explosives from surface storage places shall be so arranged that no undue delay will occur between the time the explosives leave the surface storage place and the time they are properly stored or distributed near the working place.

D. Use and Handling of Explosives

1. Only competent, authorized persons shall be in immediate charge of blastings.
2. There shall be no smoking, open lights, or fires of any kind in or near any area where explosives are being handled. No source of ignition except necessary means to light fuses or to fire electric detonators shall be permitted in an area containing loaded holes.
3. Only non-sparking tools shall be used to prepare primers, explosives, or to open explosives containers.
4. Paper cartons, sawdust and other rubbish from explosives containers shall be removed to a safe place and be safely disposed of as soon as possible.
5. Explosives shall not be placed or left within five (5)

feet of any electric light circuit or electric power circuit except during transportation.

6. All detonators, detonating fuse, igniter cord, and explosives remaining after loading operations are completed shall be promptly returned to their proper magazines.
7. Detonators, high explosives, or any blasting powder shall not be stored in a residence, home or other human habitation, or be left where children or others can obtain them.
8. Explosives shall never be left in any open or unguarded, damp, or wet place but must be kept clean, cool, and dry and shall under no circumstances be left uncovered where they would become subject to prolonged exposure to the direct rays of the sun.
9. No explosives which have deteriorated by prolonged or improper storage shall be used.
10. Explosives which have become deteriorated, damaged, or unfit for use shall be destroyed by qualified persons experienced in this work.
11. The use of black powder in quarries, open excavation, or pits is not recommended and should be used only when some other type of explosive will not do the work satisfactorily.
12. No employee or other person shall be allowed to handle or assist in the handling of explosives in any way unless experienced in this work or until he has received instructions from a competent employee authorized by the employer to give such instructions.
13. No employee or other person shall remove explosives from any explosives magazine without authorization from the supervisor.
14. No employee or other person shall take away from any excavation, mine, or quarry any blasting caps, fuses, capped fuses, or explosives without written permission from the employer.
15. Tamping poles shall be made of wood or other approved non-sparking materials.
16. The end of the tamping pole shall be kept squared and shall be of such size that the pole will not by-pass the cartridges in the hole.

17. Wooden tamping poles shall have no metal parts other than non-ferrous metal ferrules for extending the length of the poles.
18. Mechanical tamping devices shall be so constructed that no metal parts will enter the bore hole unless such parts are so effectively insulated that no metal can come in contact with the explosives being tamped.
19. Machines and tools not used for loading explosives into bore holes shall be removed to a safe location before explosives are delivered.
20. Loading operations shall be carried on with the smallest practical number of persons present, and no one but authorized personnel shall be allowed in the blast area.
21. The amount of explosives taken into a blast area shall not exceed the amount estimated by the blaster as necessary for the blast.
22. When necessary, bore holes shall be blown or washed out before loading.
23. Detonators shall be of no less strength than No. 6.
24. The detonator shall be encased in the explosive when inserted into the drill holes, unless a safety primer is used. The primer cartridge shall be placed in the bottom of the hole to avoid leaving unexploded powder in the bore hole.
25. When loading explosives in bore holes, tamping shall be by pressure or light blows only and never by excessive ramming. Explosives shall not be removed from their original paper cartridges.
26. It shall be the duty of the employer or his representative to fix the time of blasting.
27. Persons preparing to fire shots shall make sure that all persons are out of the blast area before lighting the fuses or firing the shots and shall cause warning to be given in every direction, and all entrances to the blast area shall be guarded.
28. There shall be no activity of any kind which would create a definite hazard to explosives which have been placed or are being placed for blasting.
29. After each blast the face shall be examined for missed holes. If any are found or are suspected to exist, they shall be reported to the person in charge.

15161264

30. In case of a misfire, the face shall be made safe by one (1) of the following means:
    (a) Where practical, a new primer shall be inserted in the hole and the hole reblasted.
    (b) Where the hole cannot be reblasted, the stemming and explosives may be washed out with water or removed with a non-sparking pigtail.
31. No drillings shall be done in a bootleg hole.
32. In secondary blasting, all approaches must be guarded and warning signals sounded. Explosives shall not be removed from their paper cartridges in preparing for such blasting.
33. Where shots are to be fired in such close proximity that one shot may displace another, the firing shall be done by use of detonating fuse or instantaneous electric blasting caps.

C. Electric Blasting

1. Electric firing may be done with batteries, blasting machines, or light or power circuits.
2. When firing with blasting machines or batteries, the connections shall be made in series or a combination connection recommended by the manufacturer.
3. When firing with light or power current, the connection may be made in series, parallel, or in a combination of series and parallel.
4. The following procedure shall be followed in making electric blasting connections:
    (a) Connect detonator wires
    (b) Connect detonator wires to temporary lead wires.
    (c) Connect temporary lead wires to enclosed knife switch near the face.
    (d) Fire holes from the blasting switch.
    At no time, nor under any condition or circumstance, shall this manner of hook-up be reversed or otherwise changed.
5. At the location where the shot firing is to be controlled there shall be installed in the blasting circuit an approved, enclosed, externally-operated double-pole switch with the hand lever so arranged that it can be locked in the 'off' position. Near each face which is to be blasted, there shall be an enclosed

knife switch installed between the blasting circuit and the face, and all switches shall be installed in safe locations and guarded from any flying rocks.

6. Blasting cables shall be well insulated and shall be short circuited at the blasting end until ready to attach to the blasting unit, and they shall be staggered as to length, distinctively marked, and kept well separated until attached to detonator leg wires.
7. At all times blasting cables must be kept clear of power wires, pipe lines, tracks, and other sources of active or stray electric currents.
8. Lead wires from portable blasting devices or approved-type battery blasters shall not be smaller than No. 14 insulated wire, and connecting wires shall not be smaller than No. 20 wire, both American wire gauge.
9. That part of a blast circuit leading from the firing switch to the blasting area shall not be grounded, and it shall be provided with a bar for short circuiting lead wires when the switch is in the 'off' position.
10. When blasting from a power circuit, the switch shall be properly fused and grounded.
11. All electric detonators must have leg wires twisted together or shunted until the holes have been charged to avoid any possibility of premature explosion.
12. The ends of lead wires, after being brought to the face, must be touched together before they are connected to the shooting wires to make certain that the wires contain no stray current. (Any current in the wires will be indicated by a spark).
13. All electric power shall be cut off from the equipment at the face where electric blasting is to be done before explosives are taken there, during charging, and between charging and firing of shots.
14. For blasting holes in open pits and quarries, prima cord is sometimes recommended as being less hazardous than electric blasting.
15. No electric blasting or operations for electric blasting in quarries or other surface blasting shall knowingly be done during electrical storms. All employees and equipment must be removed from the im-

15161266

mediate vicinity before the leg wires are connected to the lead wires.

16. A galvanometer especially designed for blasting work shall be used for testing circuits.
17. Permanent blasting lines, safety switches, and blasting switches shall be maintained by competent men who are familiar with blasting requirements.

15161267