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expressly in the handling of such explosives, detonating cord or detonators.

(e) Explosives and detonators shall be transported in separate vehicles unless separated by 4 inches of hardwood or the equivalent.

(f) Explosives or detonators shall be transported promptly without undue delays in transit.

(g) Explosives or detonators shall be transported at times and over routes that expose a minimum number of persons.

(h) Only the necessary attendants shall ride on or in vehicles containing explosives or detonators.

(i) Vehicles shall be attended, whenever practical and possible, while loaded with explosives or detonators.

(j) When vehicles containing explosives or detonators are parked, the brakes shall be set, the motive power shut off, and the vehicles shall be blocked securely against rolling.

(k) Vehicles containing explosives or detonators shall not be taken to a repair garage or shop for any purpose.

§ 77.1303 Explosives, handling and use.

(a) Persons who use or handle explosives or detonators shall be experienced men who understand the hazards involved; trainees shall do such work only under the supervision of and in the immediate presence of experienced men.

(b) Blasting operations shall be under the direct control of authorized persons.

(c) Substantial nonconductive closed containers shall be used to carry explosives, other than blasting agents to the blasting site.

(d) Damaged or deteriorated explosives or detonators shall be destroyed in a safe manner.

(e) Where electric blasting is to be performed, electric circuits to equipment in the immediate area to be blasted shall be deenergized before explosives or detonators are brought into the area; the power shall not be turned on again until after the shots are fired.

(f) Explosives shall be kept separated from detonators until charging is started.

(g) Areas in which charged holes are awaiting firing shall be guarded, or

barricaded and posted, or flagged against unauthorized entry.

(h) Ample warning shall be given before blasts are fired. All persons shall be cleared and removed from the blasting area unless suitable blasting shelters are provided to protect men endangered by concussion or flyrock from blasting.

(i) Lead wires and blasting lines shall not be strung across power conductors, pipelines, railroad tracks, or within 20 feet of bare powerlines. They shall be protected from sources of static or other electrical contact.

(j) For the protection of underground workers, special precautions shall be taken when blasting in close proximity to underground operations, and no blasting shall be done that would be hazardous to persons working underground.

(k) Holes shall not be drilled where there is danger of intersecting a charged or misfired hole.

(l) Only wooden or other nonsparking implements shall be used to punch holes in an explosive cartridge.

(m) Tamping poles shall be blunt and squared at one end and made of wood, nonsparking material, or of special plastic acceptable to the Mine Safety and Health Administration.

(n) Delay connectors for firing detonating cord shall be treated and handled with the same safety precautions as blasting caps and electric detonators.

(o) Capped primers shall be made up at the time of charging and as close to the blasting site as conditions allow.

(p) A capped primer shall be prepared so that the detonator is contained securely and is completely embedded within the explosive cartridge.

(q) No tamping shall be done directly on a capped primer.

(r) Detonating cord shall not be used if it has been kinked, bent, or otherwise handled in such a manner that the train of detonation may be interrupted.

(s) Fuse shall not be used if it has been kinked, bent sharply, or handled roughly in such a manner that the train of deflagration may be interrupted.

(t) Blasting caps shall be crimped to fuses only with implements designed for that specific purpose.

(u) When firing from 1 to 15 blast-holes with safety fuse ignited individually using hand-held lighters, the fuses shall be of such lengths to provide the minimum burning time specified in the following table for a particular size round:

Number of holes in a round	Minimum burning time, minutes
1	2
2 to 5	2 ² / ₃
6 to 10	3 ¹ / ₃
11 to 15	5

In no case shall any 40-second-per-foot safety fuse less than 36 inches long or any 30-second-per-foot safety fuse less than 48 inches long be used.

(v) The burning rate of the safety fuse in use at any time shall be measured, posted in conspicuous locations, and brought to the attention of all men concerned with blasting.

(w) Electric detonators of different brands shall not be used in the same round.

(x) Adequate priming shall be employed to guard against misfires, increased toxic fumes, and poor performance.

(y) Except when being tested with a blasting galvanometer:

(1) Electric detonators shall be kept shunted until they are being connected to the blasting line or wired into a blasting round.

(2) Wired rounds shall be kept shunted until they are being connected to the blasting line.

(3) Blasting lines shall be kept shunted until immediately before blasting.

(z) Completely wired rounds shall be tested with a blasting galvanometer before connections are made to the blasting line.

(aa) Permanent blasting lines shall be properly supported, insulated, and kept in good repair.

(bb) At least a 5-foot airgap shall be provided between the blasting circuit and the power circuit.

(cc) When instantaneous blasting is performed, the double-trunkline or loop system shall be used in detonating-cord blasting.

(dd) When instantaneous blasting is performed, trunklines, in multiple-row blasts, shall make one or more com-

plete loops, with crossties between loops at intervals of not over 200 feet.

(ee) All detonating cord knots shall be tight and all connections shall be kept at right angles to the trunklines.

(ff) Power sources shall be suitable for the number of electrical detonators to be fired and for the type of circuits used.

(gg) Electric circuits from the blasting switches to the blast area shall not be grounded.

(hh) Safety switches and blasting switches shall be labeled, encased in boxes, and arranged so that the covers of the boxes cannot be closed with the switches in the through-circuit or firing position.

(ii) Blasting switches shall be locked in the open position, except when closed to fire the blast. Lead wires shall not be connected to the blasting switch until the shot is ready to be fired.

(jj) The key or other control to an electrical firing device shall be entrusted only to the person designated to fire the round or rounds.

(kk) If branch circuits are used when blasts are fired from power circuits, safety switches located at safe distances from the blast areas shall be provided in addition to the main blasting switch.

(ll) Misfires shall be reported to the proper supervisor and shall be disposed of safely before any other work is performed in that blasting area.

(mm) When safety fuse has been used, men shall not return to misfired holes for at least 30 minutes.

(nn) When electric blasting caps have been used, men shall not return to misfired holes for at least 15 minutes.

(oo) If explosives are suspected of burning in a hole, all persons in the endangered area shall move to a safe location and no one should return to the hole until the danger has passed, but in no case within 1 hour.

(pp) Blasted areas shall be examined for undetonated explosives after each blast and undetonated explosives found shall be disposed of safely.

(qq) Blasted areas shall not be reentered by any person after firing until such time as concentrations of smoke, dust, or fumes have been reduced to safe limits.

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(rr) In secondary blasting, if more than one shot is to be fired at one time, blasting shall be done electrically or with detonating cord.

(ss) Unused explosives and detonators shall be moved to a safe location as soon as charging operations are completed.

(tt) When electric detonators are used, charging shall be stopped immediately when the presence of static electricity or stray currents is detected; the condition shall be remedied before charging is resumed.

(uu) When electric detonators are used, charging shall be suspended and men withdrawn to a safe location upon the approach of an electrical storm.

§ 77.1304 Blasting agents; special provisions.

(a) Sensitized ammonium nitrate blasting agents, and the components thereof prior to mixing, shall be mixed and stored in accordance with the recommendations in Bureau of Mines Information Circular 8179, "Safety Recommendations for Sensitized Ammonium Nitrate Blasting Agents," or subsequent revisions.

(b) Where pneumatic loading is employed, before any type of blasting operation using blasting agents is put into effect, an evaluation of the potential hazard of static electricity shall be made. Adequate steps, including the grounding and bonding of the conductive parts of pneumatic loading equipment, shall be taken to eliminate the hazard of static electricity before blasting agent use is commenced.

(c) Pneumatic loading equipment shall not be grounded to waterlines, airlines, rails, or the permanent electrical grounding systems.

(d) Hoses used in connection with pneumatic loading machines shall be of the semiconductive type, having a total resistance low enough to permit the dissipation of static electricity and high enough to limit the flow of stray electric currents to a safe level. Wire-countered hose shall not be used because of the potential hazard from stray electric currents.

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Subpart O—Personnel Hoisting

§ 77.1400 Personnel hoists and elevators.

Except as provided in § 77.1430, the sections in this Subpart O apply only to hoists and elevators, together with their appurtenances, that are used for hoisting persons.

(Sec. 101, Federal Mine Safety and Health Act of 1977, Pub. L. 91-173 as amended by Pub. L. 95-164, 91 Stat. 1291 (30 U.S.C. 811))

[48 FR 53241, Nov. 25, 1983]

§ 77.1401 Automatic controls and brakes.

Hoists and elevators shall be equipped with overspeed, overwind, and automatic stop controls and with brakes capable of stopping the elevator when fully loaded.

§ 77.1402 Rated capacity.

Hoists and elevators shall have rated capacities consistent with the loads handled.

(Sec. 101, Federal Mine Safety and Health Act of 1977, Pub. L. 91-173 as amended by Pub. L. 95-164, 91 Stat. 1291 (30 U.S.C. 811))

[48 FR 53241, Nov. 25, 1983]

§ 77.1402-1 Maximum load; posting.

The operator shall designate the maximum number of men permitted to ride on each hoist or elevator at one time; this limit shall be posted on each elevator and on each landing.

[36 FR 9364, May 22, 1971. Redesignated at 48 FR 53241, Nov. 25, 1983]

§ 77.1403 Daily examination of hoisting equipment.

Hoists and elevators shall be examined daily and such examinations shall include, but not be limited to, the following:

(a) *Elevators.* (1) A visual examination of the ropes for wear, broken wires, and corrosion, especially at excessive strain points such as near the attachments and where the rope rests on the sheaves;

(2) An examination of the elevator for loose, missing or defective parts;