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MARINE CORPS EXCHANGE 0131
MARINE CORPS BASE
CAMP LEJEUNE, NC 28542-5003

IN REPLY REFER TO:

ExO 5100.1E
MCEX-12
19 Aug 87

EXCHANGE ORDER 5100.1E

From: Marine Corps Exchange Officer
To: Distribution List

Subj: EXCHANGE SAFETY REGULATIONS

Ref: (a) BO P5100.3
(b) ExO 5101.2

Encl: (1) Safety Regulations, Service Stations
(2) Safety Regulations, Food Activities
(3) Safety Regulations, Warehouse
(4) Safety Regulations, Cleaning and Pressing Shops
(5) Safety Regulations, Barber Shops
(6) Safety Regulations, Beauty Shops
(7) Safety Regulations, Property and Maintenance
(8) Safety Regulations, Cobbler Shop
(9) Safety Regulations, Vehicle Safety Seatbelts

1. Purpose. To promulgate safety regulations for Exchange activities and employees.

2. Cancellation. ExO 5100.1D

3. General

a. Reference (a), which also applies to Exchange activities located at Marine Corps Air Station, New River sets forth policies and procedures for the Base Safety Program.

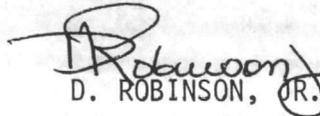
b. Reference (b) addresses the requirement for managers/supervisors to report all on the job accidents and the requirement for all managers/supervisors to report to the Non-Appropriated Personnel Office to execute the supervisors report of on the job accidents.

c. Safety must be a paramount consideration at all times. Enclosures (1) through (9) are provided to assist managers/supervisors in ensuring that work performed is always accomplished in a safe manner.

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- d. Exchange employees should always:
 - (1) Report unsafe conditions to their supervisor
 - (2) Warn others when they are in danger of being injured through unsafe procedures
 - (3) Wear proper clothing and use equipment in the prescribed manner.
 - (4) Ensure accidents are immediately reported to their supervisor
- e. Managers/supervisors are responsible for:
 - (1) Enforcement of safety regulations
 - (2) Instructing employees in safe work practices
 - (3) Immediately correcting unsafe working conditions by own action, reporting condition to Property and Maintenance or notifying the Exchange Safety Manager.
 - (4) Ensure prompt completion of supervisors accident reports

4. Action. Managers/supervisors will become familiar and comply with the provisions of this Order.


D. ROBINSON, JR.

DISTRIBUTION: "A"

Copy to: AFGE, Local 2065, P. O. Box 251, Jacksonville, NC 28540
Internal Audit Team #2, Box 136, Tarawa Terrace, NC 28543

EXCHANGE SERVICE STATIONS

1. General Housekeeping

a. Cleanliness of floors and other exposed areas of the garage, gas station or workshops shall be thoroughly inspected daily and maintained in a scrupulously clean condition. Hazards on floors such as grease, oil or loose tools shall be eliminated as quickly as possible.

b. Particular care shall be taken to maintain cleanliness in the area around the lubrication rack as well as the rack itself. At the close of business each day, clean the lubrication rack and floor.

c. Loose stones, gravel and ice shall be removed from workshops and drives. Icicles will be removed from eaves of buildings.

d. Garages and repair shops shall be well ventilated for protection against carbon monoxide gas from running engines. If the shop is not sufficiently ventilated to ensure maximum safety, the vehicle will be driven outside as soon as its engine is started.

e. Adequate illumination shall be provided and utilized for all work areas.

f. When construction work, repair work or painting of buildings is in progress, warning signs and barricades will be used to protect and inform personnel.

g. Tripping hazards will be eliminated. Man hole covers, fuel tank openings and pipe openings shall be kept covered. When open, barricades will be used to protect personnel. All tools and equipment shall be kept in their proper places when not in use and shall be positively kept out of walkways.

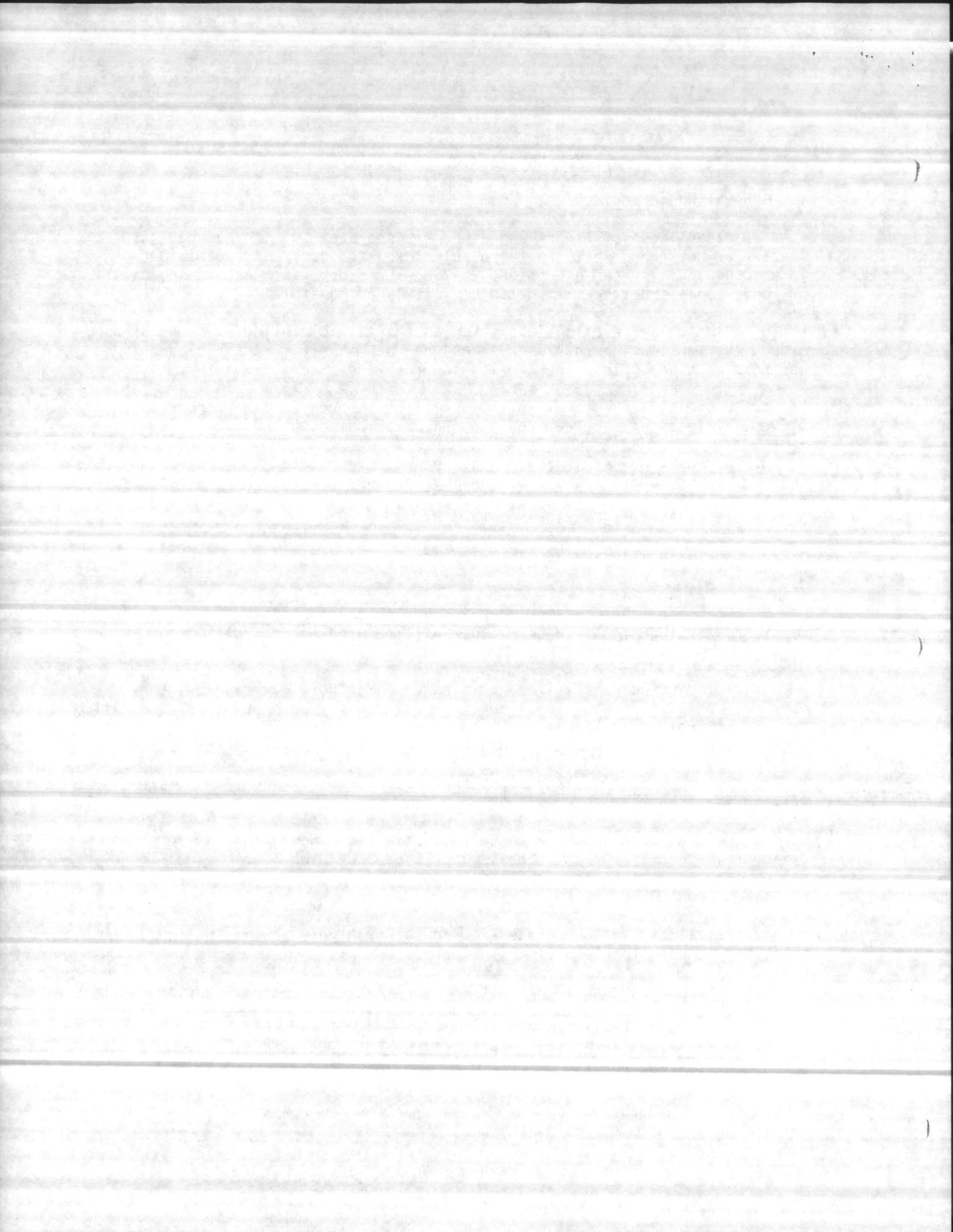
h. Overhead fixtures and signs shall be checked frequently to make certain that they are secure.

i. Welding area shall be adequately shielded. Hose from oxyacetylene cylinders, steam lines, air lines, water lines, welding leads, electric cables, and extension cords shall be kept off floors by means of trees, hooks, or troughs.

j. Gasoline, naphtha, thinners or any other highly flammable liquids shall not be used to clean floors or parts.

k. Door hardware shall be kept in good state of repair. Caution shall be exercised when opening or closing doors.

l. Defective electric equipment, fixtures, cords or switches shall not be used until repaired.



2. Protection of Personnel

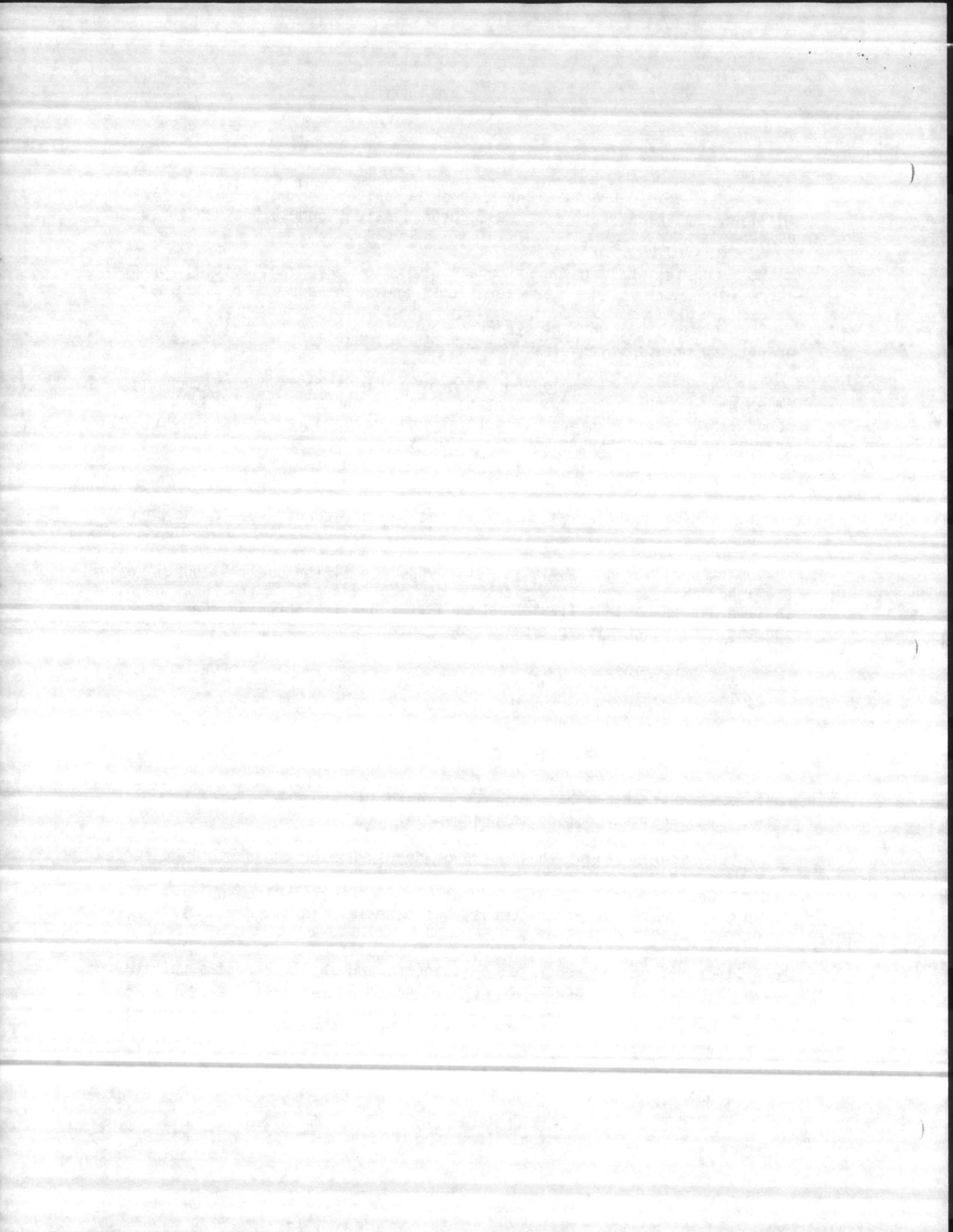
- a. Mechanics and all other shop personnel of the garage or gas station shall wear goggles, rubber gloves, aprons, safety shoes, and special gloves as needed.
- b. Goggles shall be worn for all grinding, chipping, cutting, chiseling, and welding work, or similar operations, and when using compressed air.
- c. Rings shall not be worn on fingers by workmen servicing batteries or working on motor vehicles.
- d. Neckties, extremely loose clothing; shirt tails out of trousers, bracelets, and key rings will not be worn by personnel working on or around motor vehicles or machinery. Neckties under coveralls or jackets and not free swinging may be worn.
- e. No protruding object shall be carried in the pockets of work clothes.
- f. Non-safety type matches will not be carried or used in the service or shop area.
- g. When lifting material of any type, the lifter shall stand close to the load, with feet solidly placed and slightly apart. With knees bent, he shall grasp the object firmly and then lift by straightening the legs, keeping the back as nearly verticle as possible.

3. Fire Precautions

- a. Fire-Fighting apparatus shall be kept in proper working condition and well distributed, with location conspicuously marked. Personnel will be trained in the operation of this equipment.
- b. Smoking or the carrying of lighted cigars, pipes, or cigarettes near pumps, batteries, vent pipes, or in the garage shops, except in authorized areas as posted, is prohibited.
- c. No smoking signs shall be prominently posted and strictly enforced.
- d. Covered metal containers shall be used for storing supplies of clean rags, waste, or other combustible materials in immediate use.
- e. All used waste, rags and other combustible materials shall be deposited in plainly marked covered metal containers, and shall be kept separate from those in d. above. Disposal of combustible materials will be handled with care.

4. Equipment and Tools

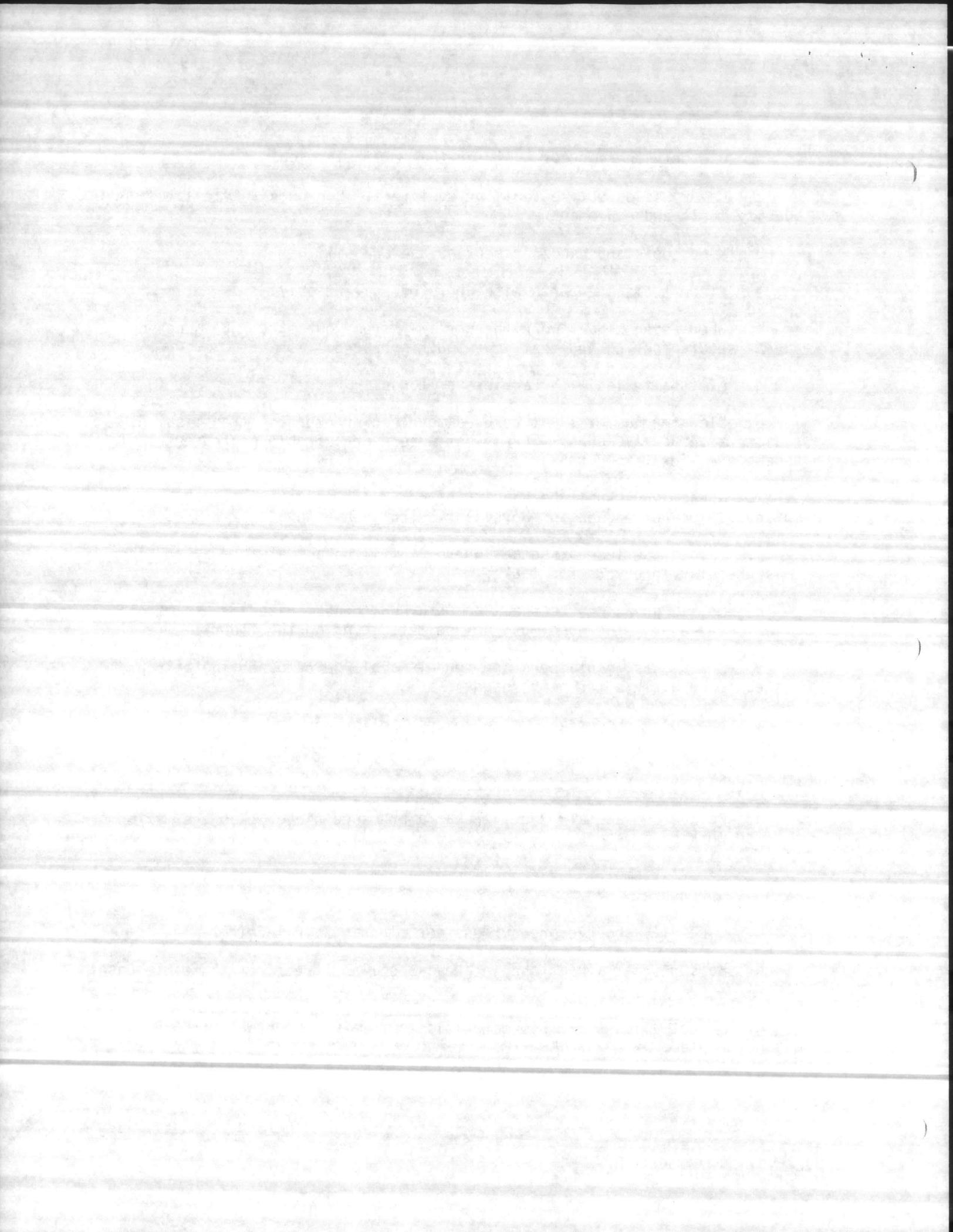
- a. Keep tools in their proper places when not in use.



- b. Use only the correct tool for the particular job.
- c. Never use defective tools or equipment. Use only serviceable, good quality tools and equipment.
- d. Keep tools and hands free of grease and oil.
- e. Clean tools and parts with approved solvent only.
- f. When using a bar, work the bar away from your face. Be sure you have a secure footing and that your body is braced.
- g. Lift batteries with carriers or tongs.
- h. Blow torches will not be used to clean crankcases, transmissions, radiators, or grease guns. Steam, hot water, or suitable degreasers shall be employed for this purpose.
- i. Grease guns shall be handled properly and used only for the purpose intended. Do not engage in "horseplay" with grease guns.
- j. Locate the lube dispenser where it will be out of the way and check it at regular intervals for leaks.
- k. Mobile grease carts shall be returned to designated areas immediately after being used. The hose must not be left lying on the floor.
- l. Drain cans, containers and funnels shall be returned to their proper places immediately after being used.
- m. Use tools properly. Do not expose fellow workers to danger by improper use.

5. Air Compressors

- a. Do not operate air receivers at a pressure higher than the maximum allowed working pressure.
- b. Never attempt to make repairs of any nature while the air receiver is under pressure.
- c. Carefully observe precautions for cleaning air receiver.
- d. Be sure that air at the intake is cool and free from flammable gases, vapors or dust.
- e. Do not allow flammable materials to remain in contact with the air discharge pipe.



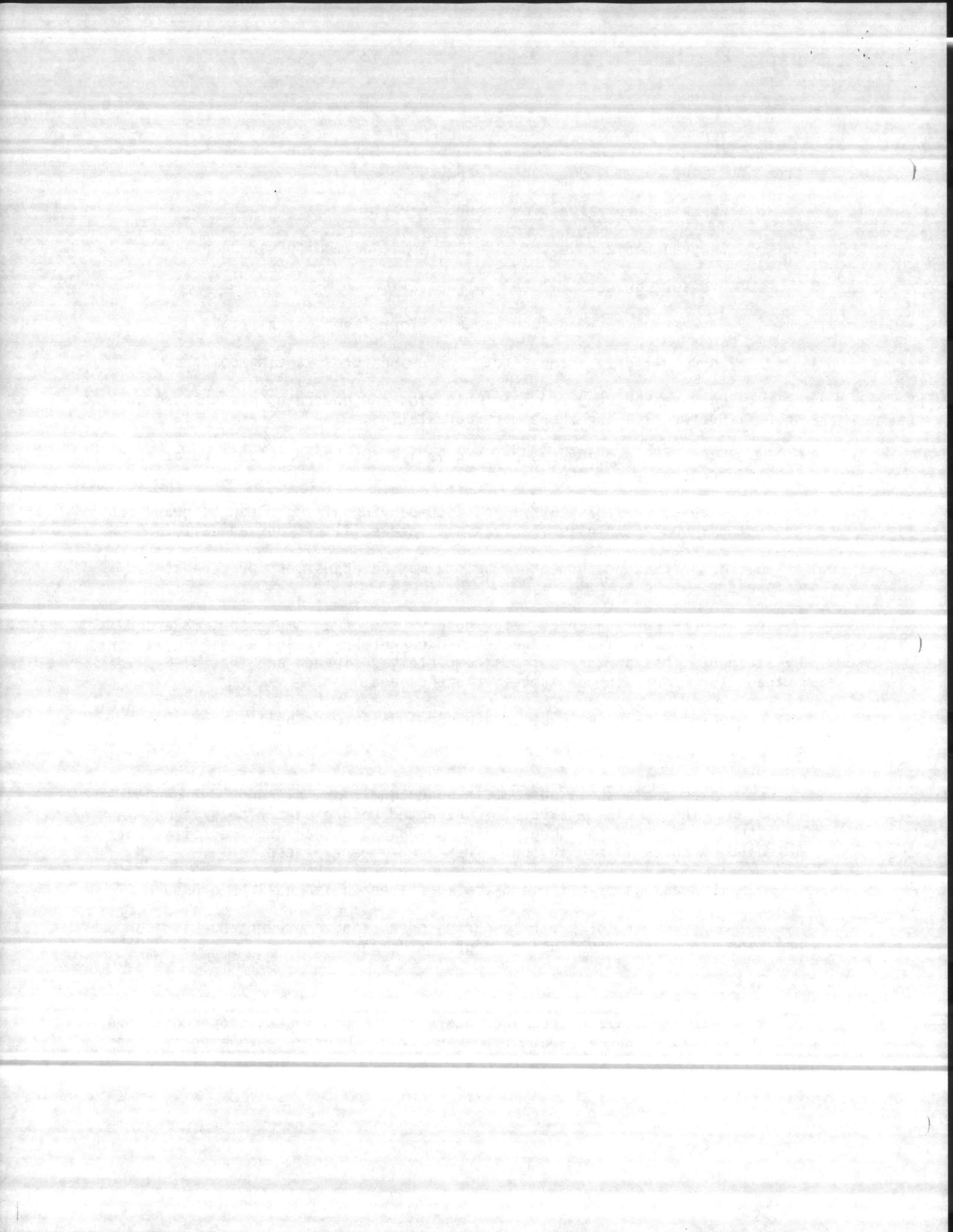
- f. Immediately secure compressor if the temperature of air discharged from any stage rises unduly or exceeds 400°F.
- g. Check safety valves for proper operation.
- h. Only authorized personnel will repair or modify air compressors.
- i. Pressure guages will be kept operative.
- j. Never kink hose to stop the air flow. Keep clamps tight.
- k. Check all valves and safety devices before starting compressor.
- l. Be sure that the control, unloading and governing devices are working properly before leaving the compressor station.
- m. Lubricate air compressors regularly. Use grade of oil recommended by the manufacturer.
- n. Keep compressor, tanks, and accompanying piping clean to guard it against oil vapor explosion. Clean air intake filters periodically.
- o. Motor must be turned off before making adjustment or repairs to compressor.
- p. Before working on or removing any part of a compressor, make sure that the compressor is disconnected and cannot be started automatically or by accident, that air pressure is completely relieved, and that all valves between the compressor and receiver are closed.
- q. Safety guards will be used around pulleys and belts.

6. Power Tools

- a. Power tools shall be kept in good condition, cleaned, oiled and repaired. They shall be carefully inspected before use. The switches must operate properly and the cords and plugs must be clean and free of defects. Patching of cords is prohibited. They are to be replaced.
- b. The casings of all electrically driven tools shall be grounded.
- c. Grasp power tools firmly during operation to prevent buckling or breaking loose, thereby causing injury or damage.

7. Hydraulic Lifts

- a. Inspect hoists at regular intervals for oil leaks, proper oil level, and lubrication. Check safety locks and legs. Never use a defective hoist.



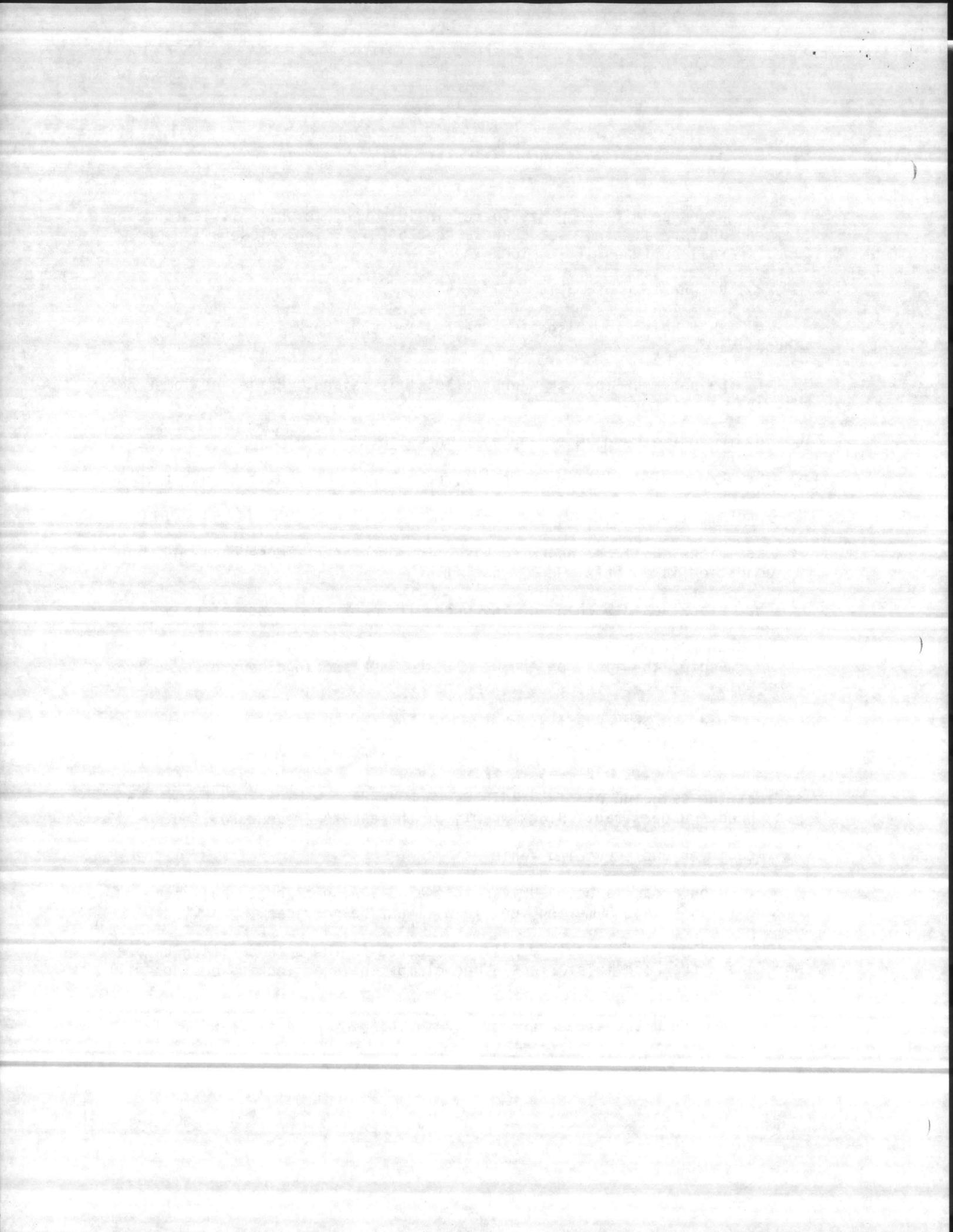
- b. Do not stand in front of a hoist while a vehicle is being guided onto it.
- c. Never permit occupants to remain in a vehicle while it is to be lifted. Before lifting, set brakes, shut off ignition, close all doors, and, on roll-on type lifts, block wheels.
- d. Balance car properly on lift.
- e. When hoist is raised, use safety leg and check safety catches for security.
- f. Do not rock the car when the hoist is raised. Raise and lower hoist slowly.
- g. Do not exceed hoist capacity in weight.
- h. Except for cleaning purposes, never raise the hoist when not in use.

8. Jacks

- a. Jacks shall be inspected visually for cracks, looseness, and wear. If condition is doubtful, don't use it.
- b. Block vehicle when working under it. Do not depend entirely on jacks.
- c. Center the jacks on the work. The jack should always be on solid footing.
- d. Use proper capacity jack for the load to be lifted. Never exceed the load capacity of a jack.
- e. Remove jack handle from the jack when under load. Place the jack so that the swinging of its handle is unobstructed. Never lean over the jack handle under load. Block wheels of the car to prevent rolling.

9. Repairing and Servicing Vehicles

- a. When a car is being driven into a garage, personnel shall stand clear of its path. A moving vehicle will not be serviced.
- b. The hood of a vehicle will be secured in the open position before work under the hood is started. Hood clamps, bars or locking devices will be used.
- c. Broken glass is dangerous. Avoid injuries by using care.



d. Release radiator caps slowly to 1st stop position to relieve pressure. Protect hands and eyes from a steaming radiator, let steam escape before removing cap. Matches shall not be used to look into radiators as an explosion may result.

e. Engines will not be started in the shop until the handbrake is set, the gearshift is in neutral, and personnel are cleared from front and rear of vehicle.

f. Vehicles equipped with automatic transmission will be checked with hand brake set and gearshift in neutral before engine is started or transmission gear is engaged to check fluid or service transmission. Front and rear of the vehicle will be clear of personnel.

g. When moving heavy parts, lifts, hoist, jack or dolly will be used.

h. Use only approved solvents for cleaning parts. Gasoline will never be used for this purpose.

i. Approved metal stands shall be used under vehicles when work is being performed under the car, on the floor. Hydraulic lifts may be used but wooden horses or blocks shall not be used.

10. Tires

a. In replacing tires, take care that rims are intact.

b. See that lock rings are properly installed and servicable. This is to be done before the tire is inflated.

c. When inflating a tire, check for defects and determine proper pressure before inflating. Use a safety cage for inflating tires removed from vehicle if possible. Tires on wheels with lock rings must be inflated in a safety cage.

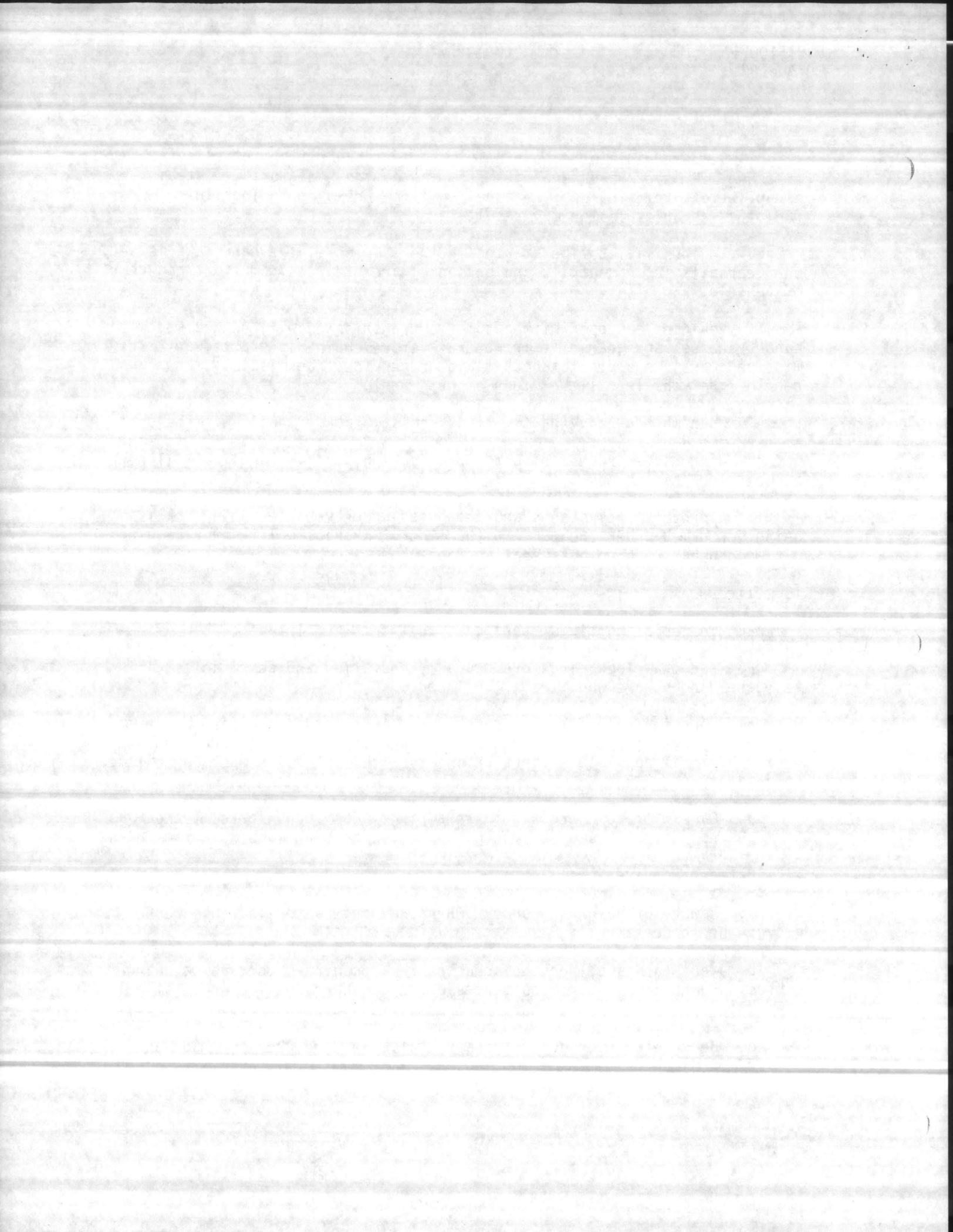
d. Care will be exercised in repairing tubes by hot patch method. Avoid burns, do not touch hot patch can or vulcanizing machine while in use.

11. Battery Service

a. Beware of burns and shocks when charging batteries. Use rubber gloves when necessary.

b. Vent caps shall be replaced before attaching or detaching charger cables. Fumes arising from batteries on the recharging line are flammable. Keep open sparks and flames away from batteries being charged.

c. Be sure charger connections to batteries are properly made and secured.



d. Care will be used in handling battery acids. When preparing electrolyte, the ACID shall always be poured INTO the water slowly.

e. Batteries will be charged only in well ventilated places.

f. When servicing batteries, avoid overfilling and splashing. Bring fluid level just above plates.

g. Remove grounded cable when working on batteries, or removing or installing electrical apparatus.

12. Fueling - Gasoline

a. Be sure that electrically operated pumps are shut off after gasoline has been dispensed.

b. Check regularly for leaks, at pipe connections, boxes, meters, pumps, hoses, and nozzles. Do not attempt to repair leaks. Secure the pump from service until an authorized repairman repairs leak. Do not make electrical repairs on pumps. Call an authorized repairman.

c. Spark proof tools only will be used when working on gasoline lines.

d. Do not create sparks around gasoline.

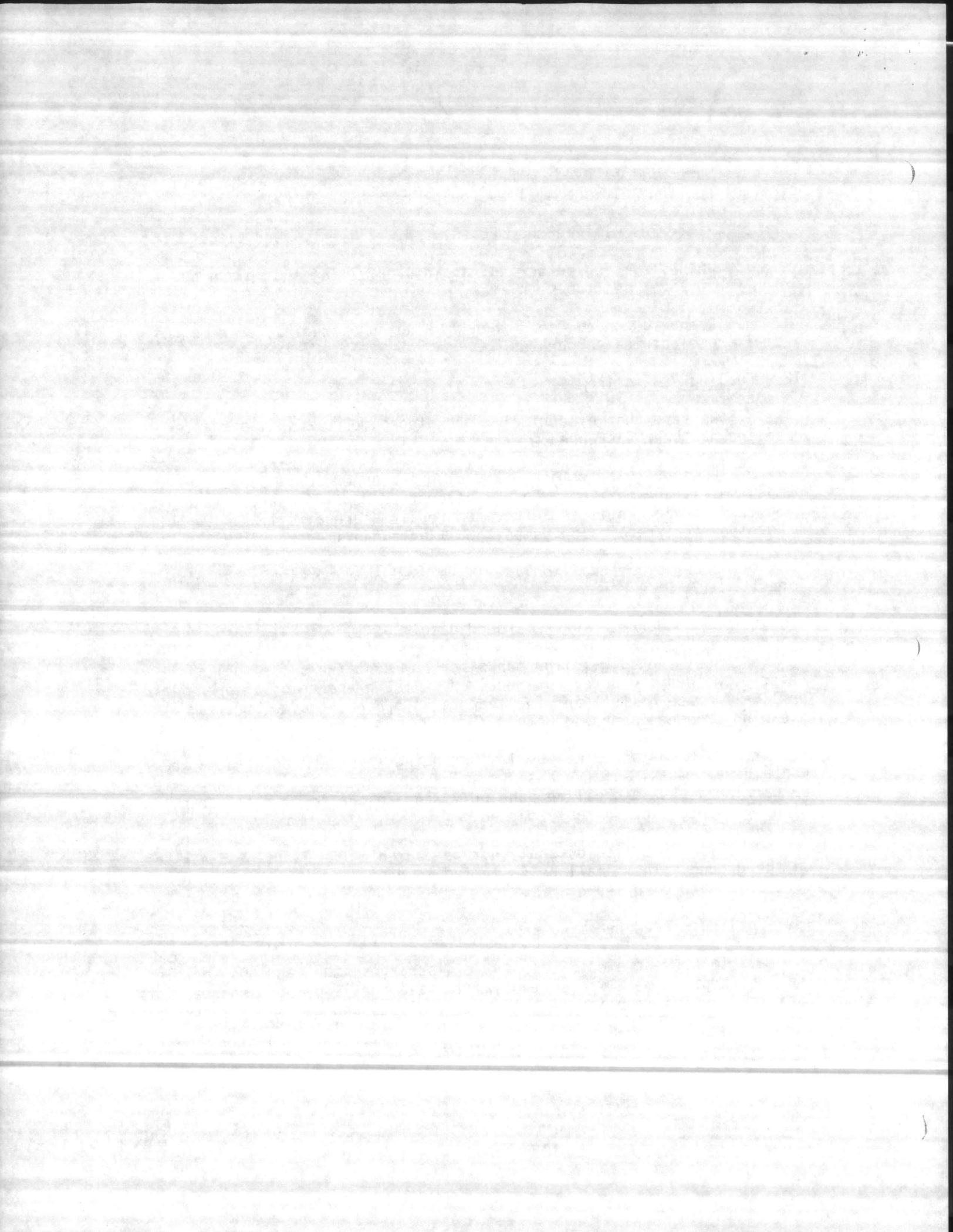
e. Fuel tanks, gasoline tanks, or any containers for fuel shall never be welded, soldered, or repaired in the presence of an open flame until all trace of fuel and fuel vapors have been removed by steam cleaning or other approved method.

f. Gasoline shall not be left standing in unlabeled or unmarked containers. Metal safety cans must always be used. If gasoline is to be carried away, it shall be done only when in the metal safety can, tightly capped, and suitably marked.

g. Flammable liquids shall not be poured into sewers or drains or on the ground. They shall be collected in designated receptacles or containers and disposed of.

13. Fueling Procedure

a. To prevent electrical static discharges, tank and hose nozzle shall be kept in metallic contact while gasoline is being dispensed into fuel tanks. This applies to all motor vehicles and gasoline trucks.



b. To minimize the effects of gasoline fumes, the face should be turned away from the fuel tank pipe while dispensing gasoline. Always drain the nozzle before removing it from the gas tank of the vehicle.

c. If the gasoline tank is located near battery terminals, extra care must be taken to avoid striking battery terminals with the hose nozzle.

d. Do not overfill gasoline tanks.

e. If fire should break out in the fuel spout during fueling, shut off nozzle, remove hose from fuel tank spout immediately, use CO2 extinguisher, dirt, sand, or wet cloth.

f. Replace gas tank caps or tank pumps after fueling.

g. Completely secure pumps before closing daily operation.

h. Turn measuring can bottom up and dry thoroughly before storing.

14. Personal Hygiene, Gasoline Handlers

a. After handling gasoline, wash hands thoroughly before eating. Change clothing immediately if soaked with gasoline, as this will prevent burns and dermatitis of the skin.

b. Gasoline soaked rags shall never be carried in the pockets.

15. Welding and Cutting (Gas)

a. Welding and cutting operations should be conducted in locations specifically designated for the purpose.

b. When welding or cutting is to be done in any location other than one specifically designated for such purposes, approval of the job and of precautions to be taken shall be obtained from the Service Manager before operations are started.

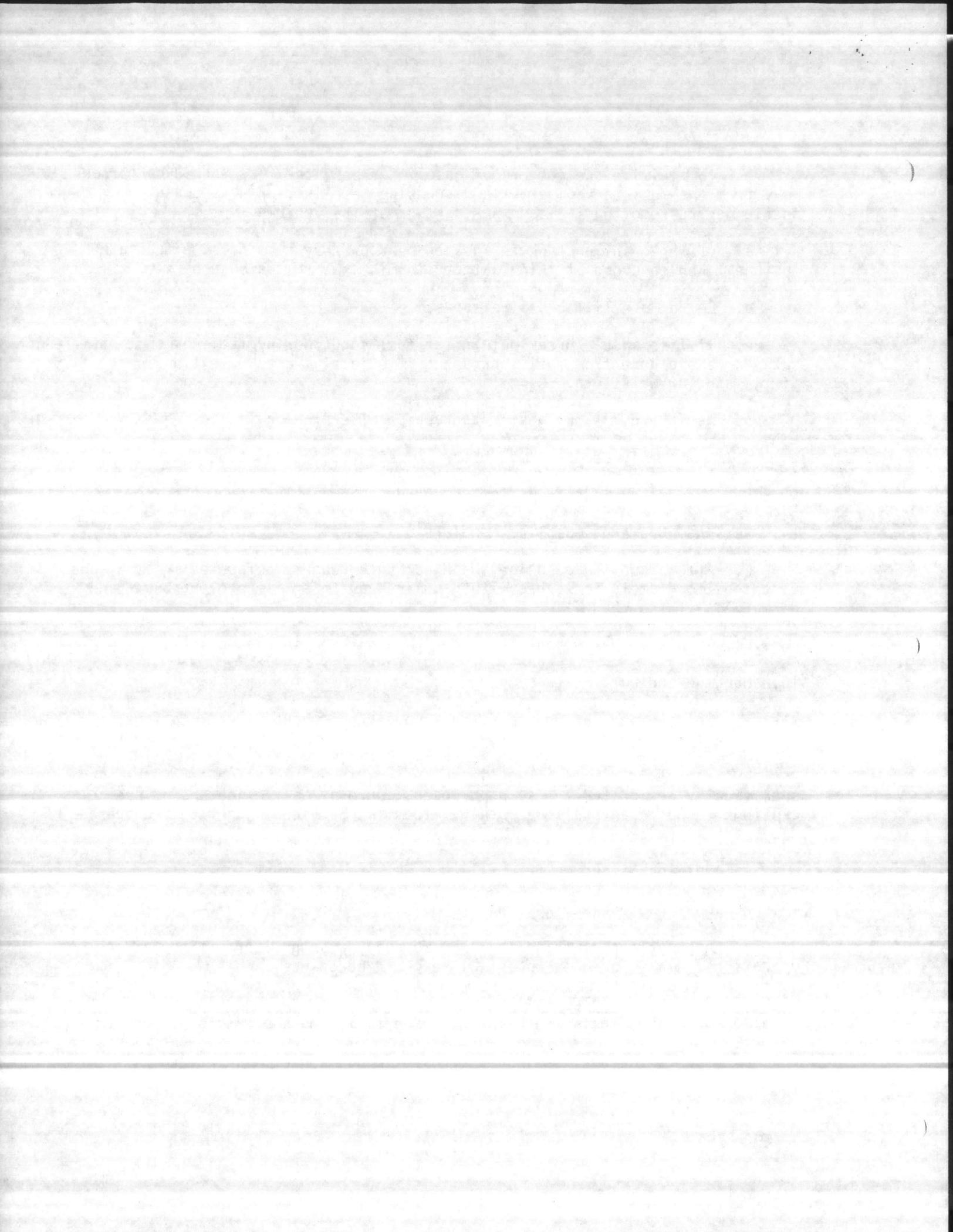
c. Only qualified welders will use welding equipment.

16. Personal Protection, Welding

a. Appropriate clothing shall be worn by personnel performing welding operations. This includes shoes, gloves, and headpieces.

b. Suitable goggles will be worn by all persons engaged in the welding operation, including helpers, inspectors, and spectators.

c. The following list should be used for guidance in selecting goggles:



SHADE OF LENS

KIND OF WORK

Clear glass in spectacle type (side shielded) or up to shade 4 in any type

Light electric spot welding or for protection from stray light from nearby welding.

No. 5 Filter

Light gas cutting and welding

No. 6 Filter

Gas cutting, medium gas welding, and arc welding up to 30 amperes.

No. 8 Filter

Heavy gas welding and arc cutting and welding, 30-75 amperes.

No. 10 Filter

Arc cutting and welding 76-200 amperes.

No. 12 Filter

Arc cutting and welding 201-400 amperes.

No. 14 Filter

Arc cutting and welding exceeding 400 amperes.

d. Helmet and goggles should not be transferred from one person to another without antiseptic cleaning.

e. Welding operations shall be shielded.

f. Do not look at welding flame or arc with naked eyes. Use goggles.

g. Respirators will be used when an operator is welding or cutting lead bearing steels, lead or cadmium bearing paint.

h. Be careful of burns from torch tips, nozzles, hot metals, splatter-
ing or areas in close proximity to welding operation.

i. Hot metal shall be marked or some other means of warning to other workers must be made.

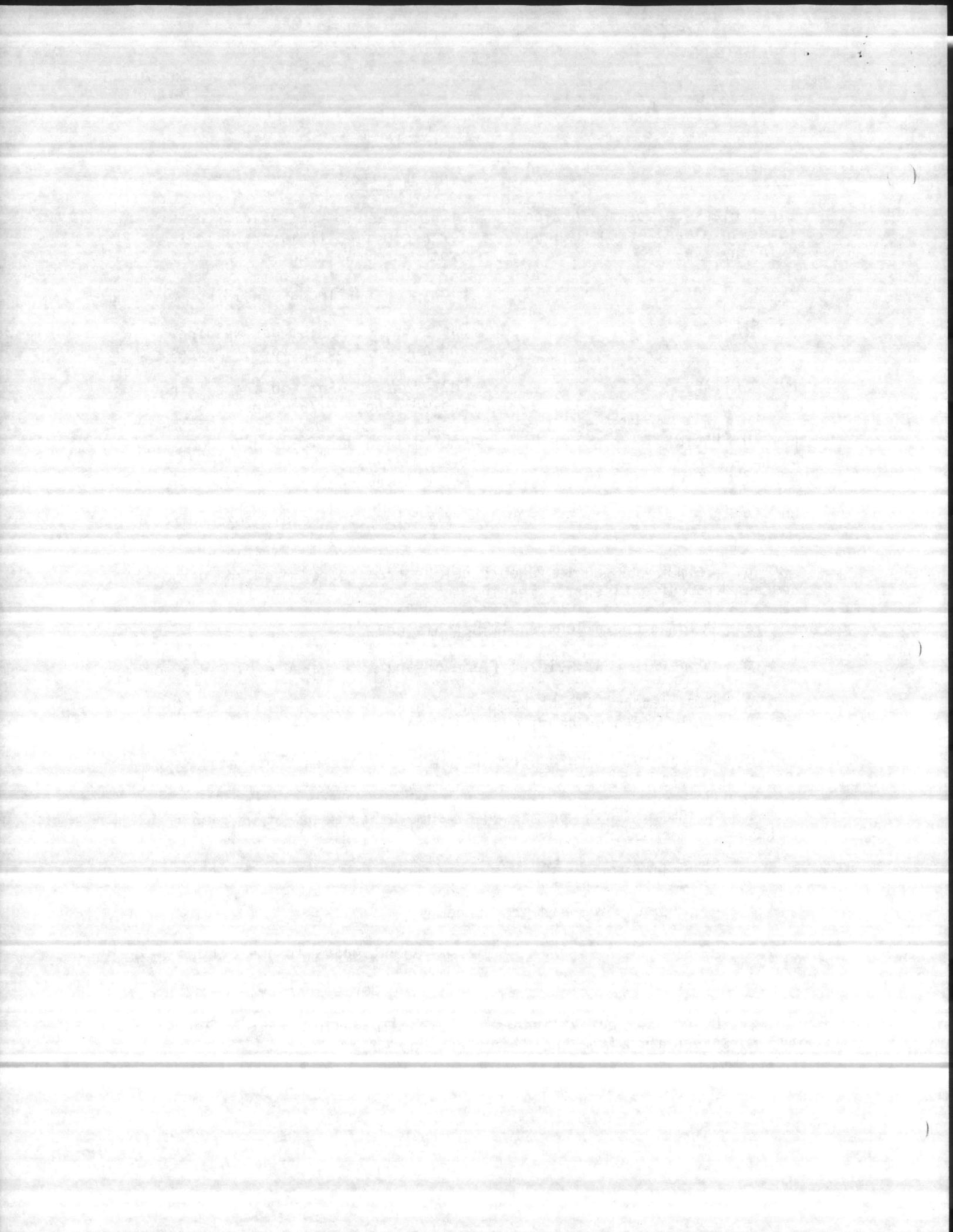
17. Gas Cylinders, General

a. Call gases by their proper names.

b. No one shall attempt to mix different gases in one cylinder.

c. Do not tamper with safety valves or devices in cylinders.

d. Do not subject cylinders to temperatures in excess of 130°F. In summer, screen them from the direct rays of sun.



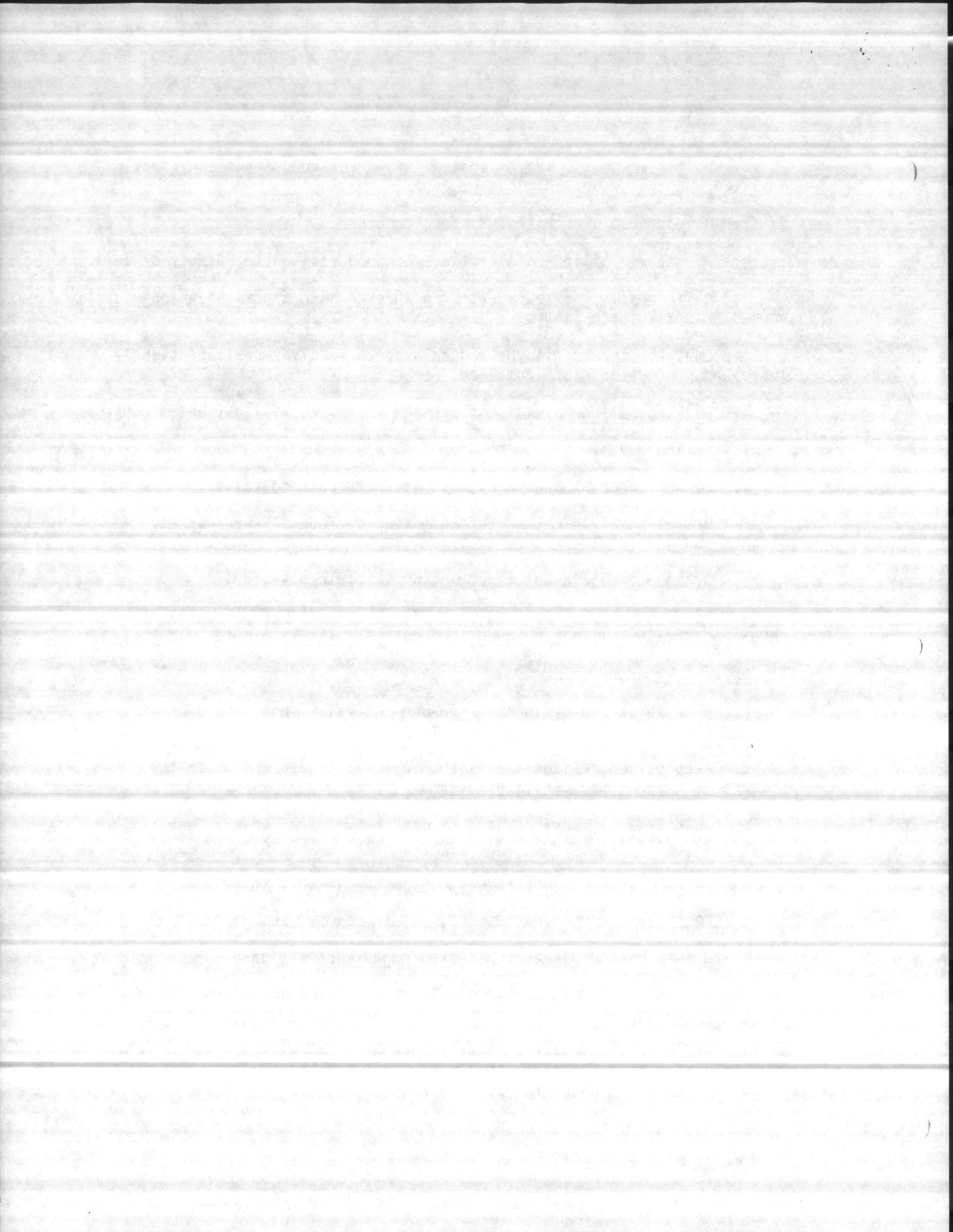
- e. Do not drag or slide cylinders. When rolled by hand they should be tilted and rolled on their bottom edge.
- f. Do not drop or strike cylinders together.
- g. Do not use cylinders as rollers or supports, whether empty or full.
- h. Cylinders may be transported in wheeled hand trucks when individually secured by metal strap clamps.
- i. Empty cylinders will be tagged as such. Valves shall be tightly closed and protection caps installed.
- j. Leaking cylinders will not be used. Repairs will not be attempted.
- k. Cylinder valves shall be opened slowly.
- l. Do not force, tamper with, or attempt repair to valves.
- m. Valves shall be closed before moving cylinders; when work is finished and when cylinders are empty.
- n. Cylinders should be stored in the verticle position.
- o. Tests for leaks shall be made with soap suds and water only. Soap containing grease will not be used. Do not use flames to detect leaks.

18. Oxygen Cylinders

- a. When an oxygen cylinder is in use the valve should be open at least one full turn, preferably all the way to prevent leakage around the valve stem.
- b. Keep oxygen cylinders away from oil and grease which, in the presence of oxygen, may burst into flame.
- c. Do not handle any part of the oxygen cylinder, valves, gauges, hose or regulator with oily hands, oily gloves, oily rags or grease materials.
- d. Do not store cylinders near highly combustibile materials.
- e. Do not use oxygen as a substitute for compressed air.
- f. Oxygen cylinders are considered empty when the gauge pressure fails below 25 p.s.i.

19. Acetylene Cylinders

- a. Store in vertical position if possible. If stored horizontally, the cylinder must be placed in the vertical position for 48 hours before use, otherwise acetone in which the acetylene is dissolved will be drawn out with the gas.



b. Open valve $\frac{1}{4}$ to $\frac{1}{2}$ turn only. This will permit an adequate flow of gas and allow the valve to be closed quickly in case of emergency.

c. Under no circumstances will acetylene gas be generated or used at a pressure in excess of 15 p.s.i. gauge pressure.

20. Pressure Regulators

a. Cylinders will not be used until an approved pressure reducing regulator is attached to the valve.

b. Before attaching regulator, crack the cylinder valve open about $\frac{1}{4}$ turn to clean dirt or dust from the valve fitting.

c. After attaching regulator, open valve slightly so that pressure gauge hand moves slowly; then open valve according to type gas being used. If pressure is suddenly released it is likely to damage the regulator and pressure gauge.

d. Oxygen regulator outlets, hose couplings, and torch valve inlets have right handed threads. Acetylene threads on the same units are left handed. (Note: Threads on acetylene cylinder valve outlets are right handed but of different pitch from the oxygen cylinder valve outlets. Do not force threads.)

e. Acetylene outlets should be pointed away from the oxygen outlets located on cylinders.

f. Modifications of regulators is prohibited.

g. Do not test oxygen gauges with oil.

h. Before removing a regulator, close the cylinder valve and release gas from the regulator.

i. Do not use regulators, pressure gauges, manifolds and related equipment which are provided for a particular gas on cylinders containing different gas.

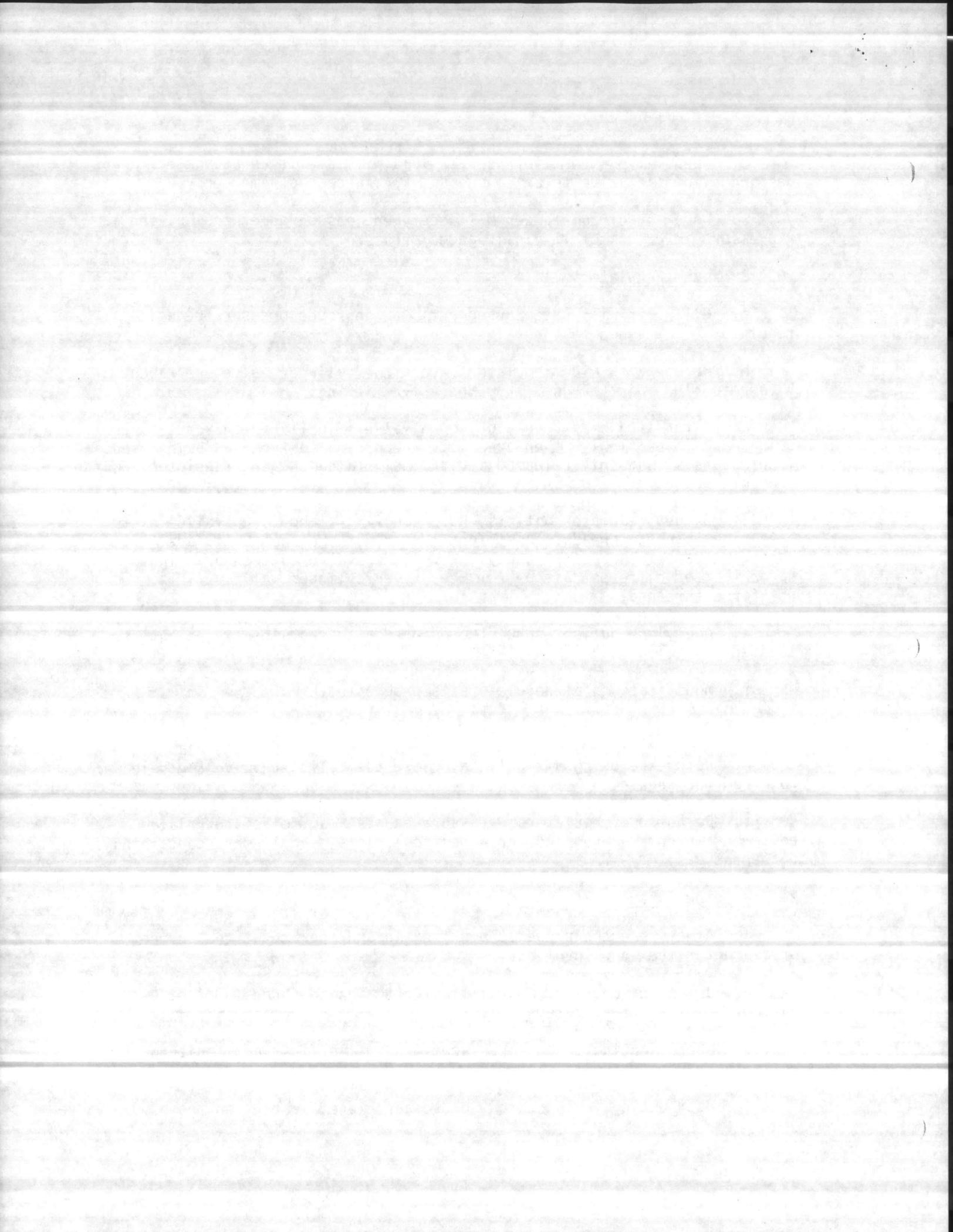
21. Welding Torch

a. Always use the proper tip or nozzle and operate at the correct pressure for the work involved.

b. Use friction type (spark) lighter to ignite torch. Do not use matches or cigarette lighters.

c. When lighting torch, open acetylene valve first and ignite gas while the oxygen valve is closed.

d. When extinguishing torch, close acetylene first, then the oxygen valve.



- e. Secure equipment when not in use as follows:
- (1) Extinguish the torch.
 - (2) Close both acetylene and oxygen cylinder valves.
 - (3) Open acetylene valve on torch to allow gas to escape. Close valve.
 - (4) Open oxygen valve on torch and allow gas to escape. Close valve.
 - (5) Close both regulators.

22. Welding Hose

- a. Acetylene hose is colored red. Oxygen hose is colored green or black.
- b. Hose shall be frequently inspected for worn spots and defective connections. Hose defective in any way shall not be used.

23. Gasoline Hazards. The hazard of handling gasoline is related to its flash point. The flash point of liquid is the lowest temperature at which it gives off vapor near the surface of the liquid or within a vessel in sufficient quantities to form flammable mixtures with air. Products which give off flammable vapors at or below 80°F, such as gasoline, solvents, and most crude oils, are the most hazardous of all petroleum products to handle.

a. Flash Points

- (1) Gasoline at minus 45°F.
- (2) Crude Oil at plus 60°F.
- (3) Lubricating Oil at plus 80°F.

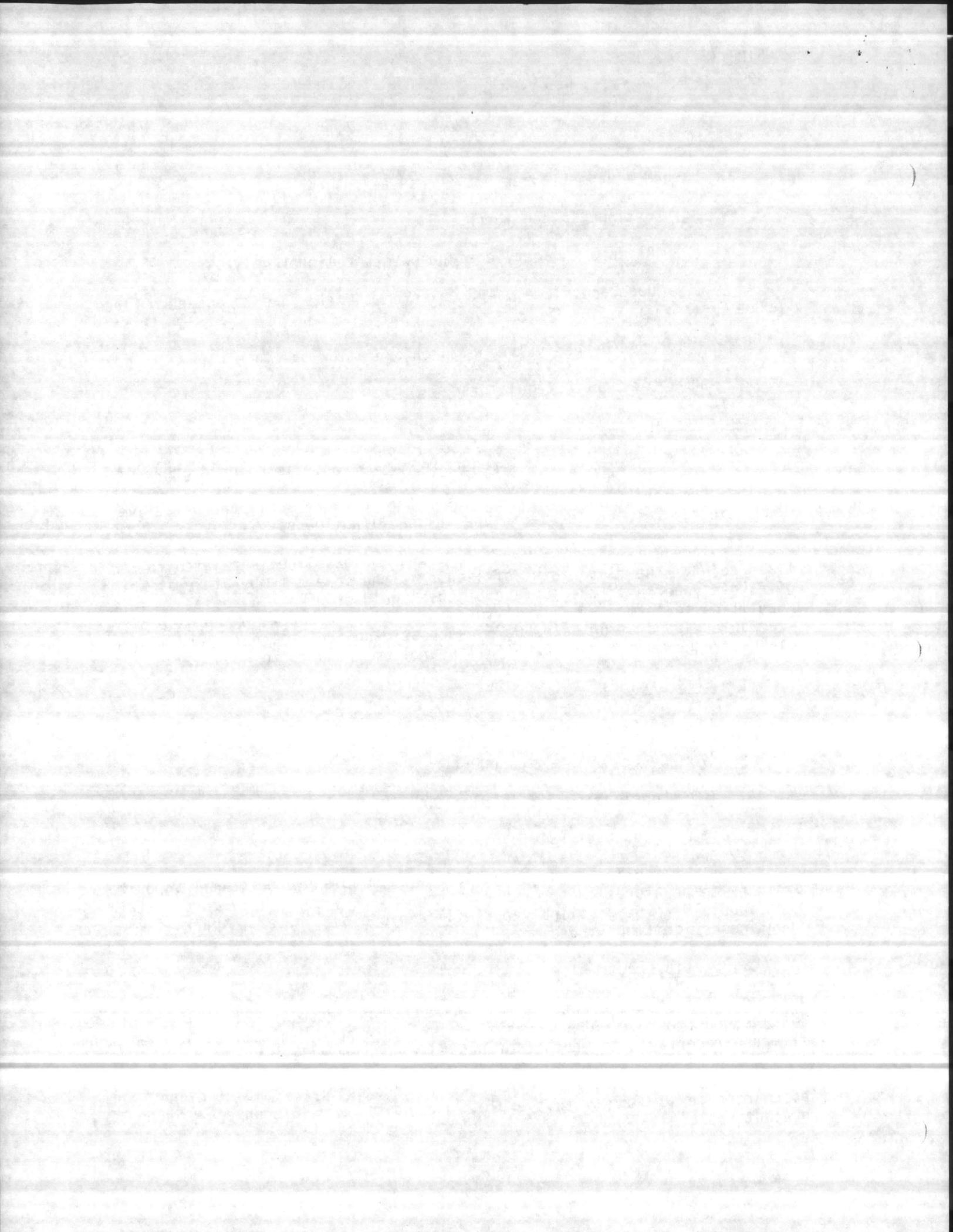
b. Combustion Factors

(1) Gasoline, a highly volatile flammable product, will vaporize at ordinary temperatures and pressures. A gasoline vapor-air mixture containing from about 1% to 6% gasoline vapor will explode or ignite if spark, flame, or spontaneous ignition is present.

c. Static Electricity

(1) Static electricity is produced when gasoline or similar flammable liquids undergo movement such as flow through a hose, agitation, or when poured from one receptacle to another or passed through a filter.

(2) Dangerous static charges are frequently accumulated and discharged in such a way that explosions and fires result unless proper precautions are taken.



(3) Moving vehicles create static electricity.

d. Static Electricity Precautions

(1) The metal nozzle at the end of the hose should be bonded to the coupling which is attached to the pump by a copper wire inside the hose. The nozzle should be held in contact with any metal tank or receptacle which is being filled with gasoline. Metallic contact will be made prior to releasing the flow of gasoline.

(2) Metal funnels placed in a container will be tightly sealed and the nozzle of the hose will be placed in metallic contact with the funnel so that a bond is made. If the funnel is loosely placed in the container, an induced charge of electricity of considerable voltage may be accumulated by the friction of fuel flowing through the metal funnel.

(3) All metal receptacles, funnels, etc. used in the handling of gasoline should be in contact with each other, or should be bonded together and grounded.

(4) Plastic clothing creates static electricity by movement and will not be worn while handling gasoline.

e. General Precautions

(1) Electrical apparatus should be inspected frequently. Conditions likely to cause sparks shall be corrected. Whenever possible, open switches and pull fuses before work is done on electrical equipment.

(2) Hammering on any part of gasoline storage or dispensing equipment containing gasoline with other than approved tools (non-sparking) is prohibited.

(3) Allow no smoking while gasoline is being dispensed.

(4) Vents containing flame arresters will be kept free of paint, soot, dirt, or lint. No smoking in the vicinity of vents is allowed.

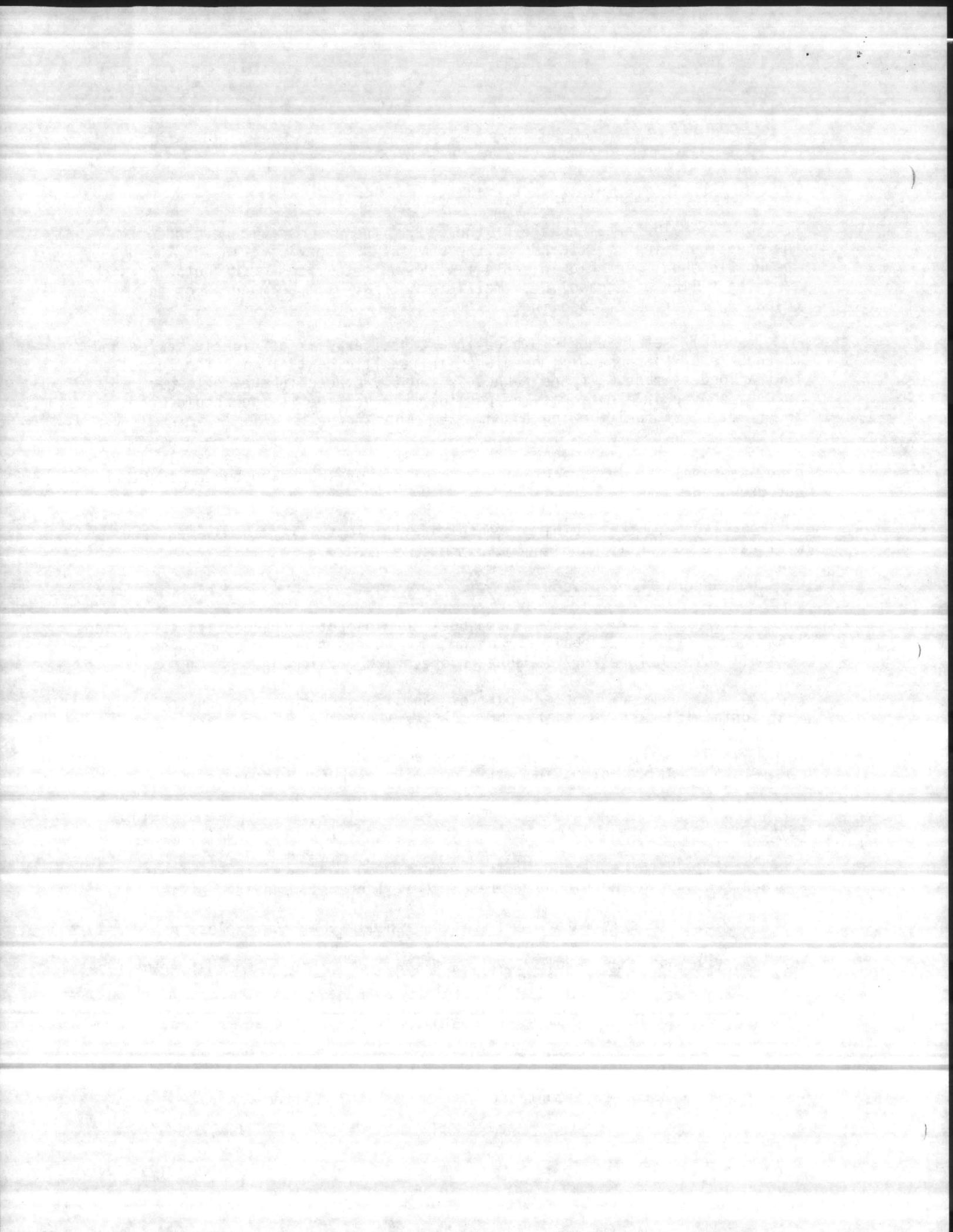
(5) No naked lights shall be permitted in the vicinity of gasoline storage tanks or dispensing equipment. (Oil lanterns, candles, etc.)

(6) Electric motors and switches shall be of the explosion proof type.

(7) Gasoline handlers will not wear shoes with exposed ferrous nails or taps. Sparks can be created this way.

(8) Joints and valves in piping shall be inspected frequently for leaks.

(9) Spilled gasoline shall be wiped up immediately and the rags deposited in closed metal containers. Area will be wetted down.



(10) No vehicle of any type will be refueled while the engine is running.

(11) Gasoline is prohibited in use as a cleaner for any purpose.

f. Toxicity

(1) Vapors of many petroleum products are highly toxic when inhaled or ingested. Petroleum vapors in a concentration of 0.1% by volume can cause vertigo at the end of 6 minutes. 0.1% can cause vertigo to the extent of inability to walk straight in 4 minutes. Longer exposure or greater concentration may cause unconsciousness or death. First symptoms of exposure to toxic vapors are headaches, nausea, and dizziness. At first signs get fresh air. If persons are overcome, get medical treatment immediately, prevent chills, and apply artificial respiration, if needed.

(2) Anti-knock additives in gasoline such as tetraethyl lead are very poisonous. Lead poisoning may result from repeated exposure to gasoline vapors. If operation personnel are exposed constantly or consistently to leaded gasoline, they should be rotated on the job, if possible, in order to limit the period of individual exposure.

g. Injury to Skin and Eyes

(1) Gasoline may cause skin irritation if allowed to remain in contact with the skin, particularly under soaked clothing or gloves.

(2) Gasoline soaked clothing, shoes and gloves should be removed at once.

(3) Gasoline should be washed from the skin with soap and water.

(4) Protective cream will be rubbed on hands before handling gasoline and each time after hands are washed.

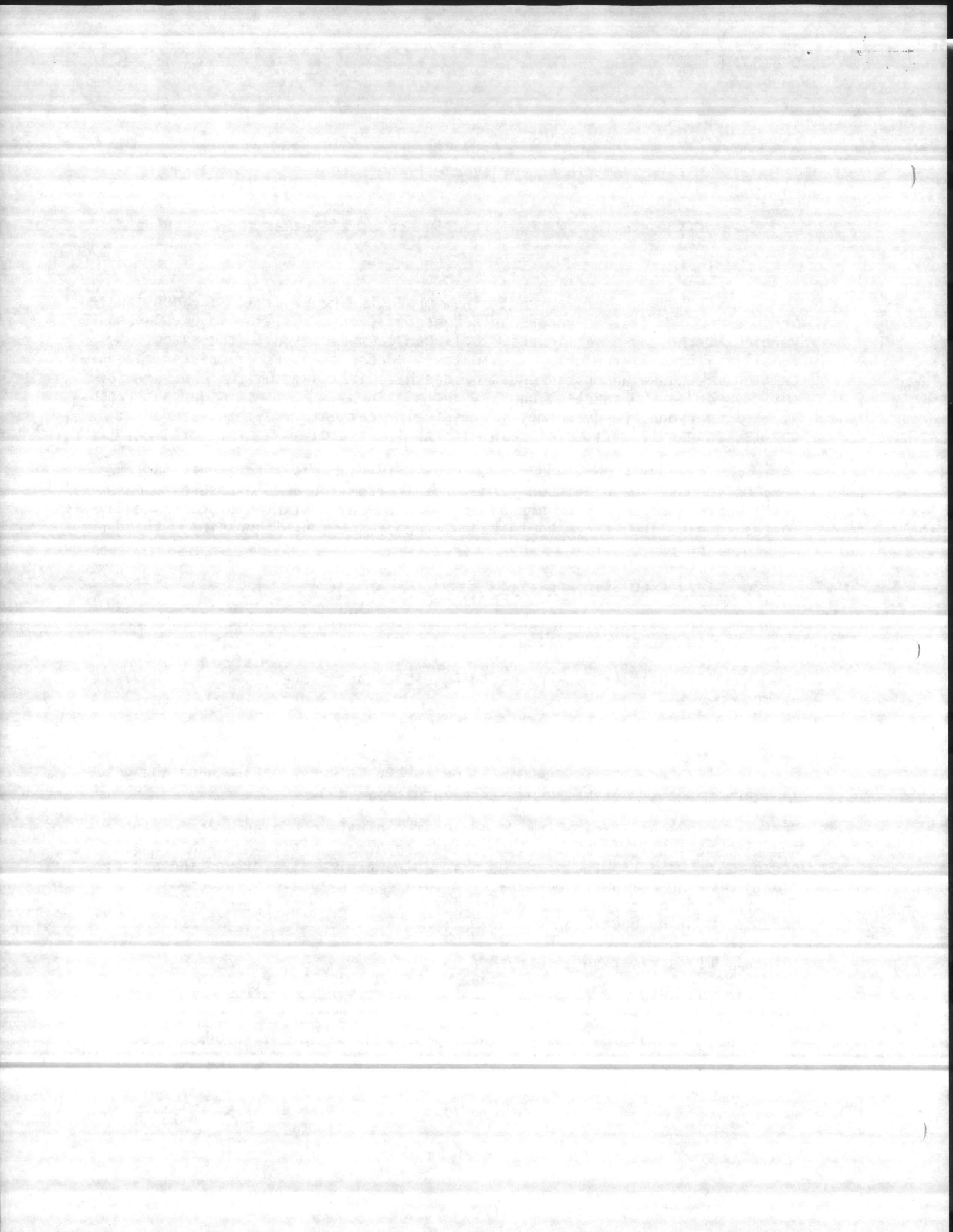
24. Principle of Fire. Fire is one of the greatest hazards met in almost any area particularly in gasoline or garage areas. It is desirable that personnel have a knowledge of the principles behind fire prevention and fire fighting. The following paragraphs explain the classification of fires and the treatment of them on the basis of removing at least one of the factors necessary for combustion.

a. Classification of Fires

(1) Class A fires are those involving wood, rubbish, etc.

(2) Class B fires are those involving oil or oil products, etc.

(3) Class C fires are those involving electrical equipment.



b. Cause of Combustion. Three factors are necessary for combustion, (1) fuel in the form of vapor; (2) oxygen, and (3) sufficient heat to raise a combustible material to its ignition temperature. All three must be present at the same time in order to have fire. When anything burns, it is not the actual substance which is being consumed by the flame, but the vapor of the substance in combustion with the oxygen in the air. A piece of wood held in a flame will not catch fire until it has heated to a point where vapor is given off. Therefore, highly volatile products, such as gasoline, which are vaporized at ordinary temperatures and pressures, present a most serious fire hazard.

c. Spontaneous Ignition. If large masses of certain combustible materials which have been soaked in oil are allowed to stand, and the heat generated by the slow oxidation process is not allowed to escape, the temperature of the mass rises. If this heating is allowed to proceed, the material reaches its ignition point temperature and starts to burn.

For this reason, paint soaked rags, gasoline soaked rags, and oily waste must be stored in a way least likely to accelerate oxidation, and most likely to cause any heat oxidation to be absorbed by the surroundings. Use only self closing metal receptacles for discarding oily rags, waste, and gasoline soaked rags, and dispose of such collections daily.

d. Extinguishing Fires. To extinguish a fire, one of three factors necessary for combustion must be eliminated.

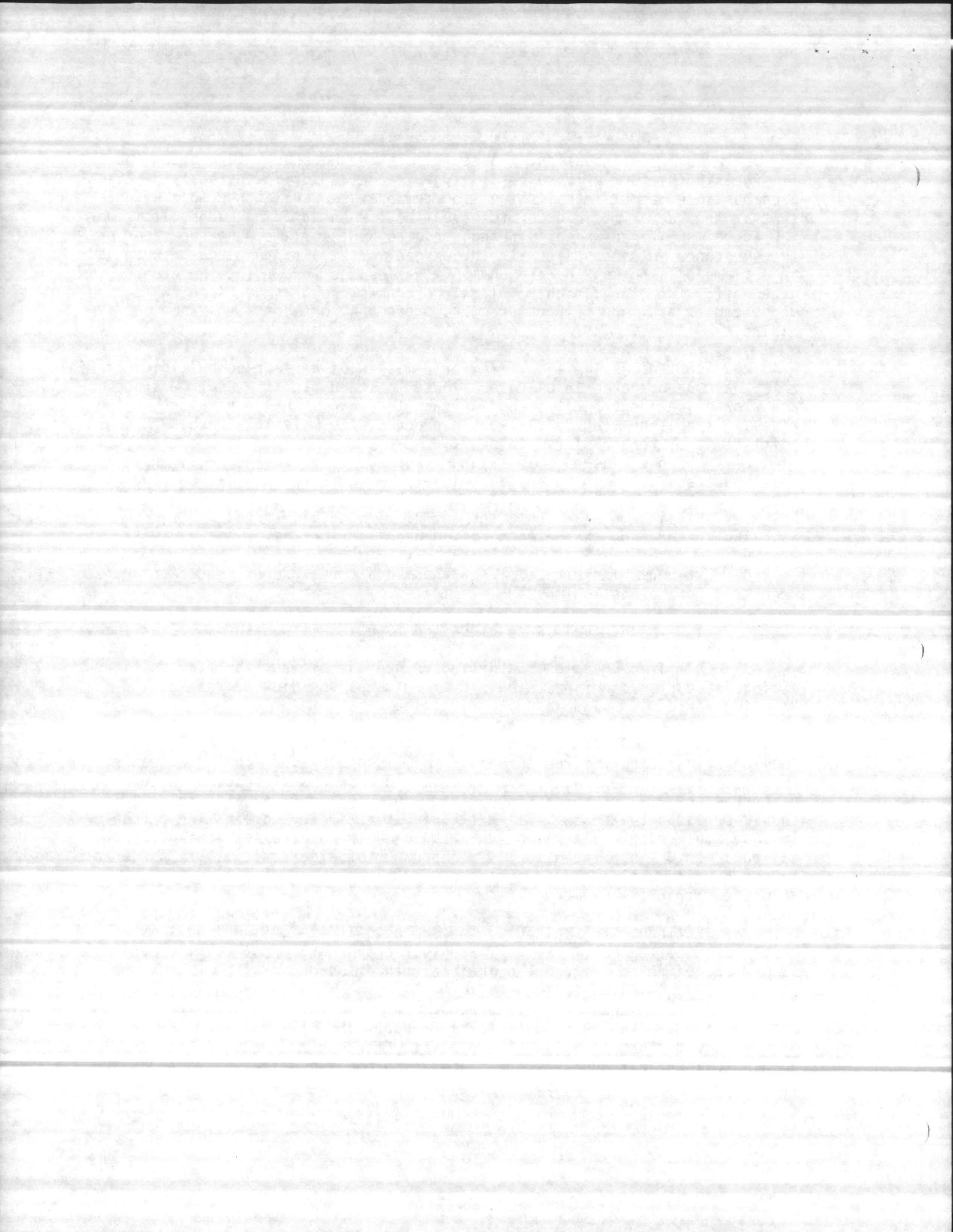
(1) If the fuel is removed, the fire is extinguished by starving.

(2) If combustion supporting oxygen is removed, the fire is extinguished by smothering. The use of foam, carbon dioxide, steam, and sometimes sand, is based on this principle.

(3) If heat is removed from a fire, the fire is extinguished by cooling. In ordinary fires this is normally done by application of water. In oil fires, however, water is not used alone because the jet of water disperses the oil and spreads the fire. In an oil fire a water fog nozzle should be used. Water fog will extinguish the fire by combination of cooling and smothering. Water should not be used in an area containing electrical equipment, since the water is a conductor of electricity. Dry powder or carbon dioxide extinguishing agents should be used for electrical fires or around electrical equipment.

25. Fire Extinguishing Methods. The subject of fire extinguishers is a highly specialized one. The following paragraphs are meant to give many a summary acquaintance with the principle methods used.

a. Foam extinguishers are used primarily for oil and gasoline fires. Foam is lighter than the lightest oil products and will float on the surface of the liquid, forming a flexible blanket which cuts off oxygen from the burning oil and extinguishes the flame. The cooling effect of water in the foam also helps to lower the temperature.



(1) A 2½ gallon foam extinguisher will chemically produce 20 to 22 gallons fo foam. Chemical foam extinguishers have an outer chamber containing bicarbonate of soda and a foam stabilizing agent dissolved in water; an inner chamber contains a water solution of aluminum sulfate. When the extinguisher is inverted the chemicals mix, creating carbon dioxide gas which permeates the liquid and forms a tough durable foam.

b. Carbon dioxide extinguishers are used effectively on oil and electrical fires. The liquid carbon dioxide upon contact with air turns into gas which blankets the fire by shutting off the oxygen supply.

c. Dry chemical extinguishers contain chemically processed bicarbonate of soda which is released when a turn of the hand wheel punctures an inner cartridge of carbon dioxide and nitrogen. The chemical releases smothering gas on the fire and at the same time releases a cloud of dry chemical which shields the operator from heat.

d. Carbon tetrachloride is prohibited for fire fighting because of the fact it is extrememly toxic. When it is heated, phosgene, a deadly gas, is liberated, and even a small amount may be lethal.

