



DEPARTMENT OF THE NAVY  
 HEADQUARTERS UNITED STATES MARINE CORPS  
 WASHINGTON, D.C. 20380

MCO 11320.22  
 LFF-2-ncs  
 22 Feb 1984

23 MAR 1984

MARINE CORPS ORDER 11320.22

From: Commandant of the Marine Corps  
 To: Distribution List

Subj: Fire Protection for Stored Quantities of Lithium Batteries

Ref: (a) CMC Washington DC msg R281402Z Mar 1983 (NOTAL)  
 (b) National Fire Protection Association Standard No. 10 (NOTAL)  
 (c) MCO P11000.8B (NOTAL)

1. Purpose. To provide detailed information on fire safety measures and firefighting procedures for lithium batteries.

2. Applicability. This Order is for use by all Marine Corps activities storing lithium batteries.

3. Information

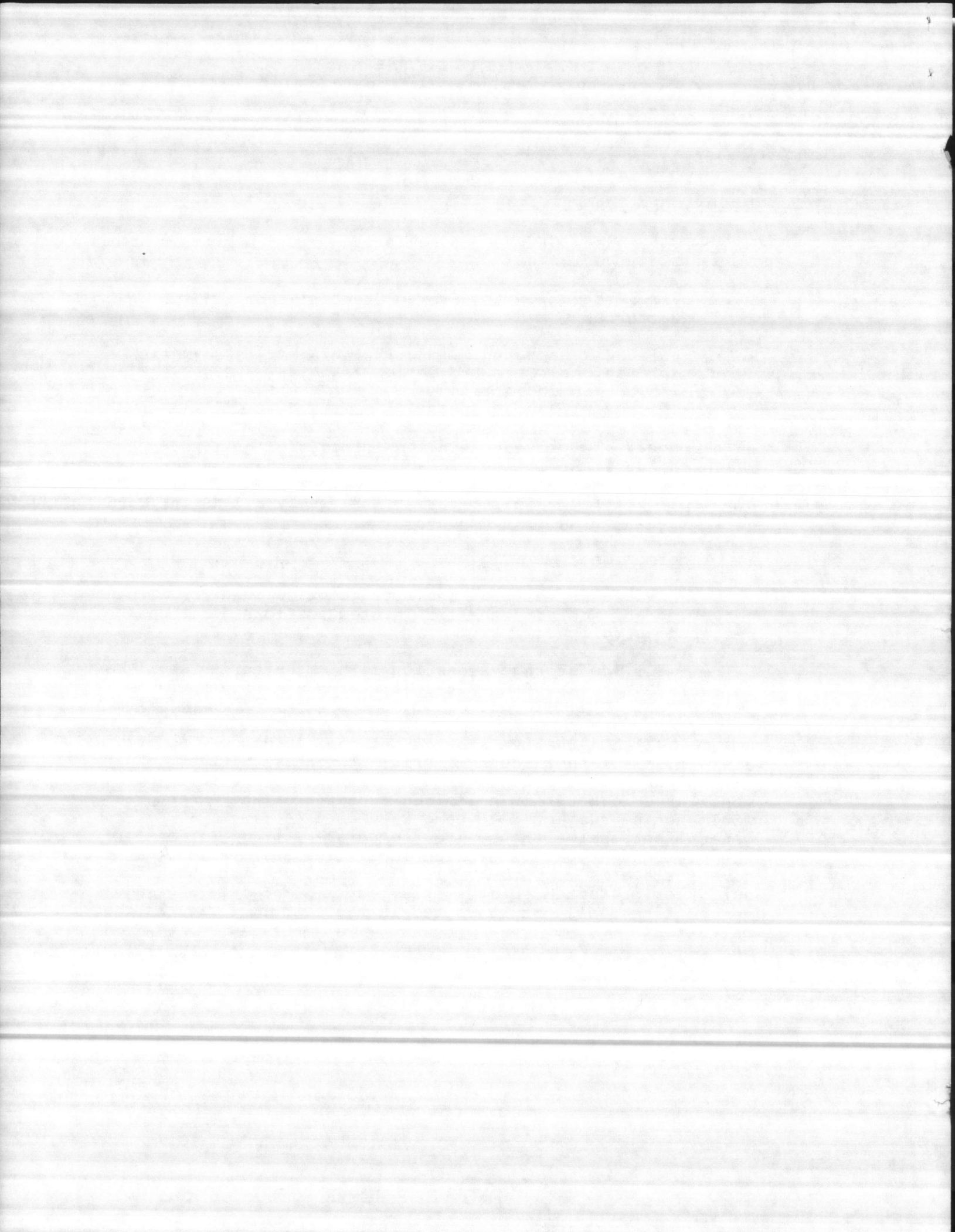
a. Reference (a) provided storage guidelines for lithium batteries and included the fire protection considerations restated as follows:

(1) The storage areas for lithium batteries shall be in a flammable/hazardous material storehouse with sprinkler protection, if available.

(2) Alternative storage options, in descending order are: flammable/hazardous material storehouse without sprinklers; outside storage in a general storage shed (or in ventilated lockers) in a limited access area where batteries would not be subjected to temperatures exceeding 130° F; or a general purpose warehouse (for temporary storage if none of the preceding types of storage facilities are available at the time storage is required). In all cases, when the area is not sprinkler protected, combustible material and more hazardous commodities shall not be stored in the same fire area as the batteries.

102 118776 00  
 PCN 102 118776 00  
 118776

RETURN TO CENTRAL FILE  
 WITHIN 48 HOURS



22 Feb 1984

(3) Smoking shall be strictly prohibited and "NO SMOKING" signs posted conspicuously in battery storage areas.

(4) The use of open flame devices shall be restricted to operations under proper supervision and with adequate fire prevention safeguards.

b. Reference (a) required all lithium battery storage areas to be equipped with a class "D" extinguisher, preferably Lith-X-type. Reference (a) further advised that in the event a class "D" extinguisher was not available, a class "A" extinguisher could be used.

c. Subsequently, it has been determined that class "D" fire extinguishers may be less than fully effective for lithium battery fires. This is because the quantity of lithium is small compared to other ordinary combustible battery components and the physical placement of the lithium deep within the battery. Therefore, the requirement of reference (a) for a class "D" fire extinguisher is changed to require a water extinguisher (class "A") with class "D" extinguishers as optional.

4. Action. Activity commanders shall:

a. Ensure lithium battery storage areas comply with this Order and are equipped with water fire extinguishers complying with reference (b).

b. Ensure the following procedures are complied with in the event of a fire involving stored lithium batteries:

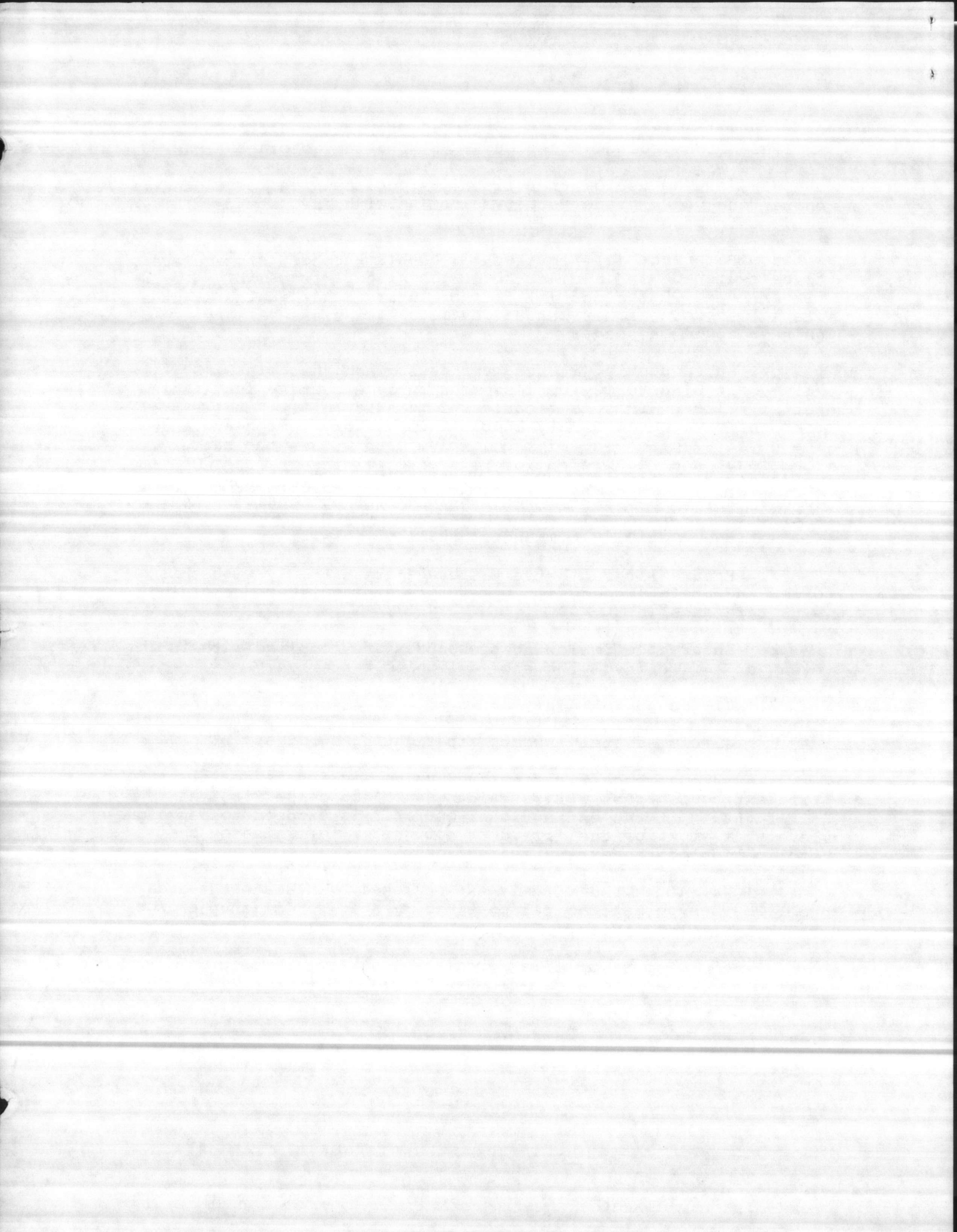
(1) Sound the alarm and evacuate personnel from the area.

(2) Immediately summon firefighting services.

(3) Commence firefighting, using a class "A" or class "D" fire extinguisher as a first aid measure and cease first aid firefighting if the extinguisher operator is exposed to dangerous levels of smoke or the fire does not quickly diminish by the application of the extinguishing agent.

(4) After the fire is extinguished, ventilate the area well, before permitting personnel to reenter for cleanup and/or resumption of activity.

(5) Dispose of fire debris as a hazardous waste in accordance with reference (c).



# STORAGE

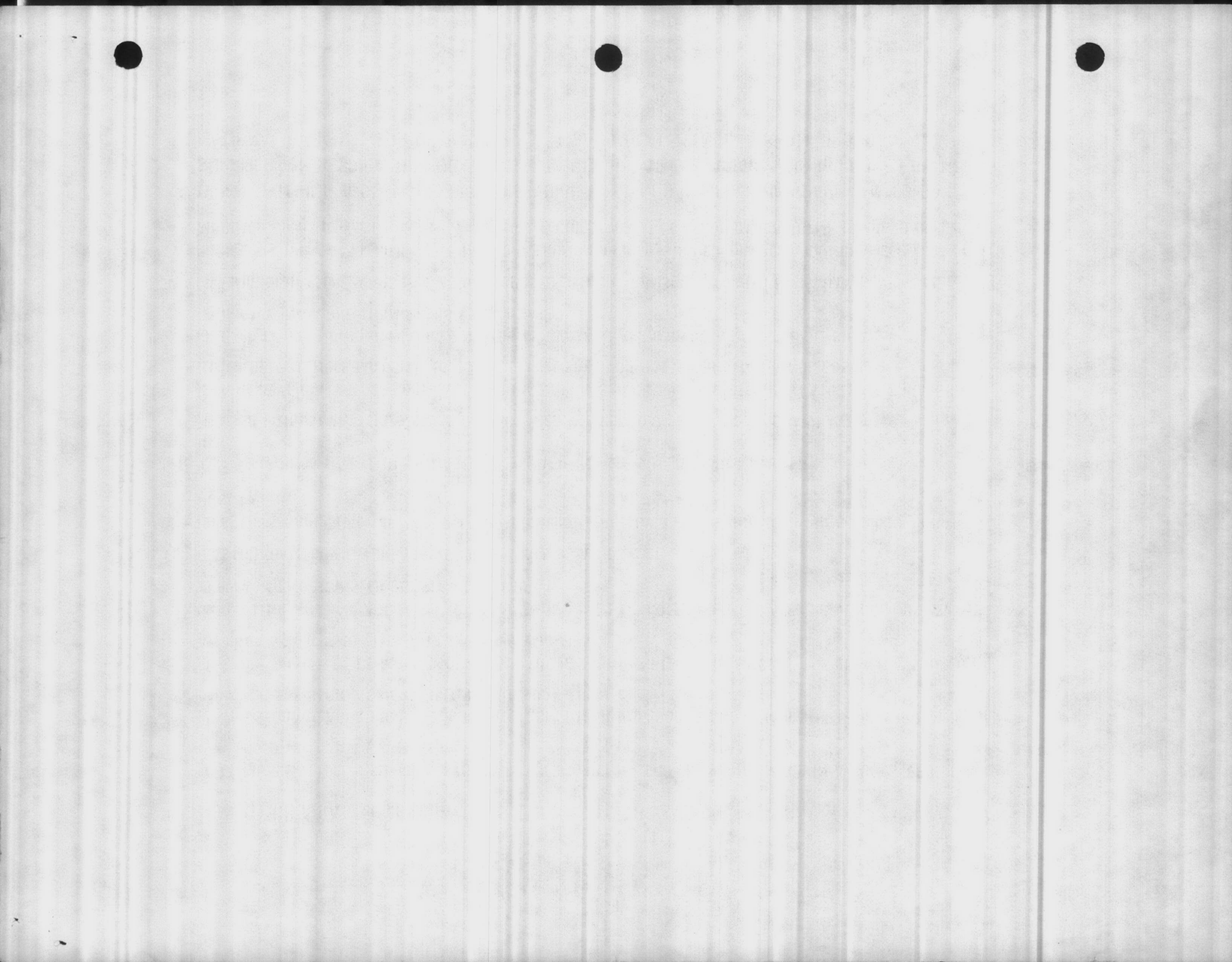
## A. NEW LITHIUM BATTERIES SHALL BE STORED AS FOLLOWS:

- (1) LITHIUM BATTERIES SHALL BE STORED IN THEIR ORIGINAL SHIPPING CONTAINERS IN A COOL, SPRINKLER PROTECTED VENTILATED SHELTER.
- (2) THE STORAGE AREA SHALL BE ISOLATED FROM OTHER HAZARDOUS AND COMBUSTIBLE MATERIAL AND USED ONLY FOR THE STORAGE OF UNUSED LITHIUM BATTERIES.
- (3) SINCE THE EFFECT OF MASS STORAGE ON THE HAZARD DEGREE IS NOT KNOWN, THE QUANTITY STORED IN AN AREA SHALL BE KEPT TO A REASONABLE MINIMUM.
- (4) BATTERIES IN STORAGE SHALL BE RETAINED IN UNIT PACKAGES, PREFERABLY SHIPPING CONTAINERS, TO PREVENT HEAT TRANSFER BETWEEN BATTERIES.
- (5) STORAGE TEMPERATURE ABOVE 130°F SHALL BE AVOIDED.
- (6) SPECIAL CARE SHALL BE EXERCISED IN HANDLING AND MOVING CONTAINERS TO PREVENT CRUSHING OR PUNCTURING.

## B. USED LITHIUM BATTERIES SHALL BE STORED IN THE FOLLOWING MANNER:

- (1) USED LITHIUM BATTERIES SHALL BE PACKAGED IN ACCORDANCE WITH PARAGRAPH 4C ABOVE.
- (2) A REMOTE COLLECTION POINT AND STORAGE AREA, SPRINKLER PROTECTED (IF FEASIBLE), SEPARATE FROM OTHER COMBUSTIBLE MATERIAL SHALL BE ESTABLISHED FOR BATTERIES AWAITING DISPOSAL.
- (3) USED LITHIUM BATTERIES SHALL NOT BE ALLOWED TO ACCUMULATE AND DISPOSAL SHALL BE EFFECTED PROMPTLY (NO MORE THAN 30 LBS OR 30 DAYS).
- (4) LITHIUM BATTERIES ARE NOT TO BE DISPOSED OF NOR TRANSPORTED WITH NORMALLY GENERATED REFUSE.
- (5) USED LITHIUM BATTERIES SHALL NOT BE PIERCED, CRUSHED, BURNED, DROPPED, CANNIBALIZED, DISMANTLED, MODIFIED OR OTHERWISE CARELESSLY HANDLED, NOR SHALL THEY BE SHORT CIRCUITED, CHARGED OR REUSED.

## C. WHEN ENTERING A STORAGE SPACE IN WHICH LITHIUM BATTERIES MAY HAVE VENTED GAS, SUPPLIED AIR RESPIRATORS OR SELF-CONTAINED BREATHING APPARATUS APPROVED BY THE NATIONAL INSTITUTE FOR OPERATION SAFETY AND HEALTH (NIOSH) SHALL BE WORN.



## *Storage*

The requirements set forth in this section are intended for designated user storage areas; however, it is important that temperature be controlled under 50° C and ventilation be provided in any area where batteries are handled or used.

Lithium cells and batteries shall be stored in their original shipping containers in a cool, dry location away from personnel or vehicular trafficways. If original shipping containers are not available, storage containers should be obtained. These containers should be of strong fiberboard, wood, plastic, metal drums, or other approved material. Individual cells and batteries shall be sealed in plastic and these inner containers shall be surrounded with a minimum of 1 in. of vermiculite on all sides. Containers shall also be equipped with nonconductive dividers to prevent cell-to-cell or battery-to-battery contact.

The storage area shall have adequate ventilation to pre-

vent buildup of sulfur dioxide fumes in excess of 5 ppm.

Storage areas shall be temperature controlled; temperatures above 50° C shall be avoided. No other materials commodity shall be stored in the same area with cells or batteries. Smoking shall be strictly prohibited in cell and battery storage locations with "No Smoking" signs posted in all prohibited areas.

It is desirable that the storage facilities and firefighting provisions be reviewed and approved prior to placement of lithium cells in any area. Once the storage area is approved and established, the quantity of cells and batteries that are added to or removed from storage must be monitored. Significant (more than 10 percent) increases in the volume of stored cells shall be noted so that any necessary additional provisions or alterations to the storage area or its firefighting equipment can be made.

## *Fire Protection*

A graphite-type compound or extinguisher such as Lith-X-type (class D) will extinguish burning lithium. Carbon dioxide and dry chemical extinguishers have been found to be ineffective in such fires and may, in fact, tend to compound the problem of extinguishing the fire. Special instructions on the use of class D extinguishers should be issued as the operating techniques differ from those associated with other types of extinguishers. "Hands on" instruction is necessary for a reliable safety program.

Although lithium reacts when water is applied, sprinkler systems are approved for areas where lithium batteries are stored and used. Should a fire involving lithium batteries generate sufficient heat

to activate a sprinkler system, it is considered the best course of action to let the lithium expend itself and allow the sprinklers to "flood" the surrounding area. This will cool the batteries and surrounding combustibles, thereby minimizing further cell venting and propagation of the fire to other areas.

All areas where lithium batteries are stored or used shall be equipped with a class "D" extinguisher. In the event that a class "D" is not available for any reason, a water extinguisher may be used, but efforts should be aimed at preventing the spread of fire to other combustibles and not directed on the burning lithium cells.

