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ARMY TM

60A-2-1-5

AIR FORCE TO

Revision 2

16 December 1987

TECHNICAL MANUAL

EXPLOSIVE ORDNANCE DISPOSAL PROCEDURES

FREEZING TECHNIQUES

This complete revision supersedes Revision 1 dated 16 September 1975

Published under authority of the Secretaries of the Army, Navy, and Air Force.
(Prepared by the Naval Explosive Ordnance Disposal Technology Division, 2008 Stump
Neck Road, Indian Head, MD 20640-5070)

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SAFETY SUMMARY

SAFETY PRECAUTIONS

Before applying the freezing technique, review the safety precautions for the applicable fuze/ordnance.

Do not move or jar the ordnance during application of the freezing technique unless permitted in the fuze/ordnance manual.

WARNINGS

Do not eject FIG 5 in confined areas. Large amounts of FIG 5 can cause oxygen depletion.

Wears gloves and face shield when preparing or using the FIG 5-alcohol slush. Body tissues could be damaged if the slush is allowed to contact the eyes or skin.

SECTION 1 INTRODUCTION

1-1. PURPOSE AND SCOPE. This manual provides the description, modification/assembly, procedures, and maintenance for the freezing technique. Two methods of applying the freezing technique, injection and hand are described herein.

1-2. GENERAL. The technique employs standard hardware items, and requires the application of carbon dioxide (FIG 5) snow or dry ice and alcohol in the form of slush. Both methods effectively cool ordnance to prolong the functioning time of chemical action fuzes, and reduce the potential of electric batteries, but may cause metal fatigue in springs and small parts, and may break seals and plastics.

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SECTION 2- DESCRIPTION

2-1. GENERAL. All of the components and material required to accomplish both methods of the technique are available through the supply system, and are designed to be modified/assembled in the field as required. Table 1 lists these components and materials.

2-2. MODIFICATION/ASSEMBLY/PREPARATION

a. Injection Method. Preparation involves the modification of a standard 15-pound FIG5 fire extinguisher and the fabrication of a slush sleeve. It is recommended that preparation be accomplished well in advance of the requirement for use.

- (1) Reinforce the fiber horn of the standard, 15-pound, FIG 5 fire extinguisher by placing a piece of hanger strap around the horn approximately 3.50 inches forward of the handle. Attach the strap with a bolt and nut (figure 1).
- (2) Drill a hole through the strap and the horn to accept the small threaded end of the adapter.
- (3) Fabricate an alcohol tank by drilling a hole in the side of a metal container(2-pint can) to accept the small threaded end of the adapter.
- (4) Attach an adapter to both sides of the valve. Use pipe-sealing tape to seal the connection.
- (5) Install the valve (inlet side) through the hole in the side of the metal container, and attach with a locknut. Use a fiber or rubber washer between the locknut and inside and outside of the container.
- (6) Remove the strap from around the horn, and attach the alcohol tank and valve assembly by inserting the adapter into the hole drilled through the strap, and secure with a locknut.
- (7) Insert the remaining end of the adapter into the hole drilled in the horn, and attach the complete assembly to the horn with the hanger strap.
- (8) To prepare a slush sleeve for large ordnance, select a piece of canvas, or strong cloth, approximately 6-feet square. Line the canvas with three layers of plastic (plastic bags), and attach the plastic to the canvas. Locate the approximate center of the canvas and cut a 4-inch diameter opening 6-inches from the center through the canvas and plastic. This opening will receive the modified extinguisher horn.
- (9) To prepare a slush sleeve for small ordnance, use a sandbag lined with three plastic bags. Cut a 4-inch diameter hole, for the FIG 5 extinguisher horn, approximately 6.0 inches from the bottom of the bag.

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b. Hand Method. The hand freezing method requires no special modification/preparation of equipment or material, other than the attachment of three layers of plastic to a piece of canvas for a slush sleeve.

SECTION 3 PROCEDURES

WARNING

Do not eject FIG 5 in confined areas. Large amounts of FIG 5 can cause oxygen depletion.

3-1. INJECTION METHOD. This is the preferred method when:

(1) Materials necessary for the preparation of the modified horn, alcohol tank, and valve assembly are available and have been assembled;

(2) The ordnance has small, hard-to-reach areas that the pressure-injected slush would reach. This method is particularly suited to a situation which required the ordnance to be transported to a safe disposal area.

a. Place the slush sleeve around the fused end of the ordnance (figure 2) so that the center of the slush sleeve covers the end of the fuze. Leave enough space for injection of slush. The opening for the horn should be over the fuze body.

b. Secure the sleeve to the ordnance with a piece of line ensuring a watertight seal.

NOTE

If the fuze will not permit forced injection, the slush can be injected into plastic lined sandbags. The bags of slush can then be applied to the ordnance and formed to the desired shape to cool the fuze. For transverse fuzes, sandbags filled with slush may be packed over the area of the fuze.

WARNING

Wears gloves and face shield when preparing or using the FIG 5-alcohol slush. Body tissues could be damaged if the slush is allowed to contact the body or skin.

c. Insert the modified horn of the extinguisher into the opening in the slush sleeve (figure 3).

d. Close the alcohol tank valve, and fill the tank with approximately 2 pints of methyl alcohol.

e. Open the valve to the alcohol tank and begin exhausting the extinguisher into the slush sleeve. Continue until both the alcohol and FIG 5 are exhausted.

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NOTE

When the valve to the alcohol tank is fully opened, the alcohol should mix with the contents of one, 15-pound, FIG 5 extinguisher. A dense fog appearing in the alcohol tank during injection indicates that the horn is clogged with FIG 5 snow. If clogging occurs, turn off the valve and stop exhausting the extinguisher. Move the horn to a vacant spot in the slush sleeve, and rap the horn with a stick to clear it of FIG 5 snow. When the horn has been cleared, begin dispensing alcohol and exhausting FIG 5.

- f. Transfer the modified horn from the exhausted FIG 5 bottle to a charged FIG 5 bottle.
- g. Continue to exhaust extinguishers into the slush sleeve using 2 pints of alcohol per 15-pound extinguisher until the sleeve is full of slush. Ensure that the slush is in full contact with the ordnance/fuze.
- h. Inject a minimum of four, 15-pound, FIG 5 extinguishers with alcohol. Add additional alcohol, if necessary, to form a thin watery slush.
- i. Apply the freezing technique for at least 30 minutes from initial application and until the fuze RSP can be performed.

NOTE

For extended freezing (more than 1 hour) additional FIG 5 and alcohol may be required.

3-2. HAND METHOD. This is the preferred method when:

- (1) the ordnance has large fins or other obstructing external fittings (making the injection method impossible) but could have the slush packed by hand on the ordnance in the critical areas;
- (2) the ordnance is in a relatively inaccessible position. This method is more convenient when modified extinguishers horn is unavailable. The hand method allows easier access to the fuze after freezing is completed.

NOTE

The modified horn, alcohol tank, and valve assembly are not required for this method.

- a. Using a heavy canvas or other suitable material, lined with three layers of plastic, form a dam around the fuze end of the ordnance.
- b. Attach the dam to the ordnance with a piece of line ensuring a watertight seal (figure 4).

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WARNING

Wear gloves and faces shield when preparing or using the FIG 5-alcohol slush. Body tissues could be damaged if the slush is allowed to contact the eyes or skin.

c. Place the nozzle of a 15-pound, FIG 5 fire extinguisher in a 2 1/2-gallon pail. Cover the pail and nozzle with a piece of canvas or cardboard, and discharge the contents of the fire extinguisher into the pail.

d. Mix approximately 2 pints or enough methyl alcohol with the FIG 5 snow to form a thin watery slush. If FIG 5 is not available crushed dry ice may be used to form the slush. If crushed dry ice is used, add it to the alcohol.

e. Pack the slush in the dam so that the slush is in contact with the fuze and the ordnance. Add additional alcohol if necessary.

f. Continue to prepare and apply the slush to the fuze and ordnance, exhausting a minimum of four, 15-pound, FIG 5 extinguishers.

g. Apply the freezing technique for at least 30 minutes from initial application and until the fuze RSP can be performed.

NOTE

For extended freezing (more than 1 hour) additional FIG 5 and alcohol may be required.

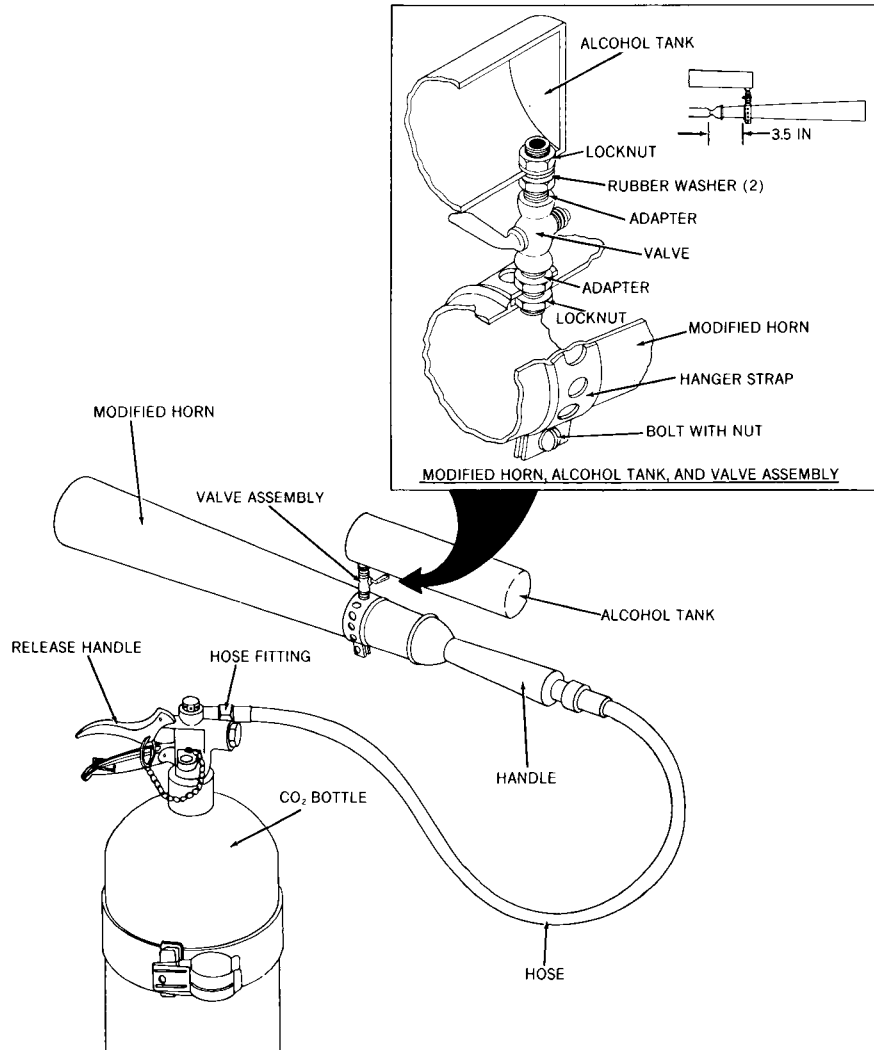
SECTION 4 MAINTENANCE

4-1. GENERAL. Other than keeping all components clean and serviceable, there is no maintenance or component repair required. While in storage, weight test and extinguisher seal checks are required for each FIG 5 fire extinguisher.

TABLE 1. Components and Materials Required for Freezing Technique.

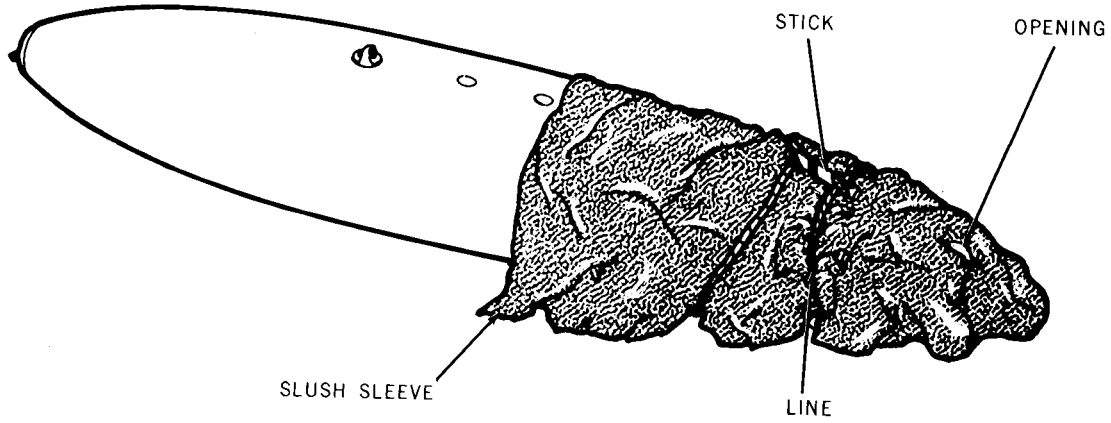
| <u>INJECTION METHOD</u> |
|---|
| ADAPTER (two), 3/8-inch NPT to 3/8-inch tubing. ALCOHOL, methyl, one gallon (minimum). BOLT (one), 1/4-inch x 2-inch with nut. CAN, cylindrical, two pint capacity. CANVAS or STRONG CLOTH (one piece), 6x6 feet. Note: Approximately six sandbags are to be used on small items in place of canvas. EXTINGUISHER (at least four), fire, 15-lb, CO ₂ -filled, complete with discharge and flexible hose. NUT (two), 3/8-inch flat to fit the tubing adapter. SEALING TAPE, pipe. STRAP, pipe hanger, approximately 1-foot, 3/4-inch. VALVE, STOP COCK, plug type, female thread 3/8-inch NPT. WASHER, 3/8-inch fiber or rubber (two). BAG, Plastic (three) LINE, 3/8-inch dia. 6-feet long. |
| <u>HAND METHOD</u> |
| ALCOHOL, methyl, one gallon (minimum). BUCKET (one), standard. CANVAS or OTHER SUITABLE MATERIAL, approximately 3x5 feet. EXTINGUISHER (at least two), fire, 15-lb, CO ₂ -filled. SHOVEL, or LARGE SPOON or SCOOP. BAG, Plastic (three) LINE, 3/8-inch dia 6-feet long. |

Table 1



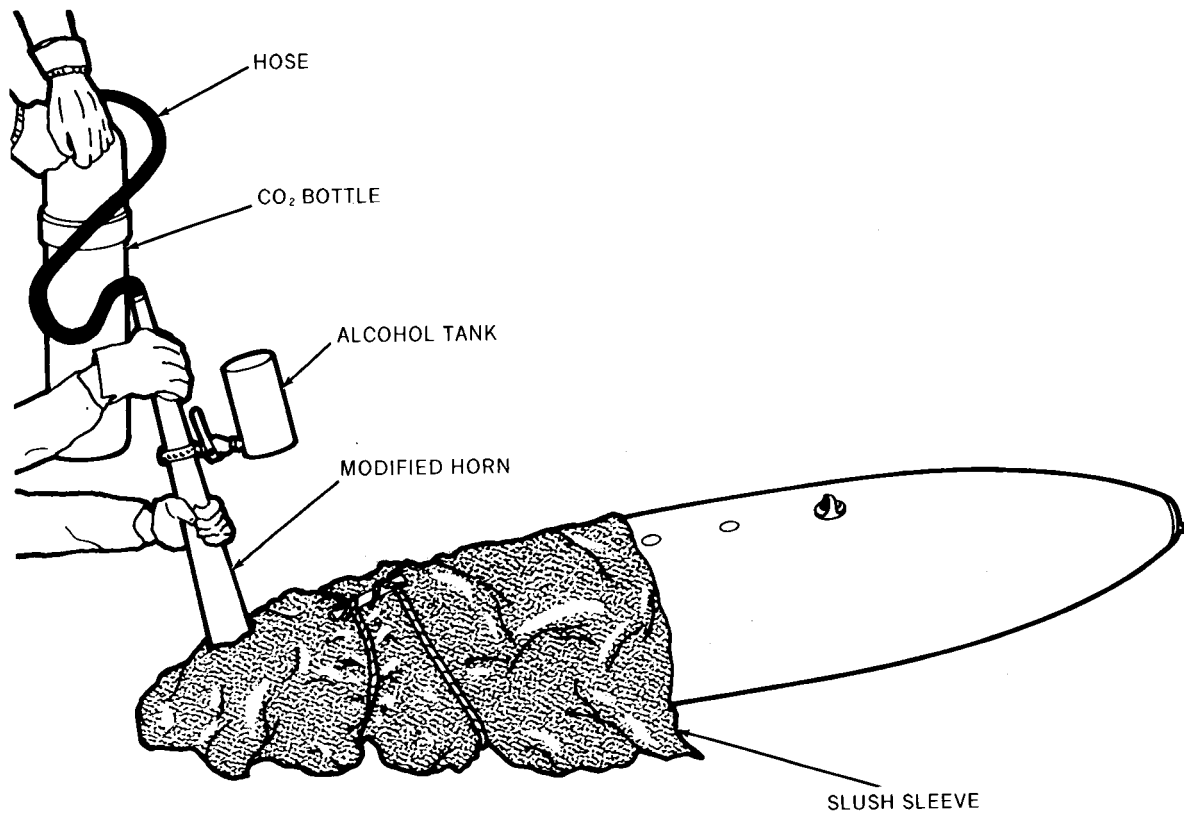
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Figure 1



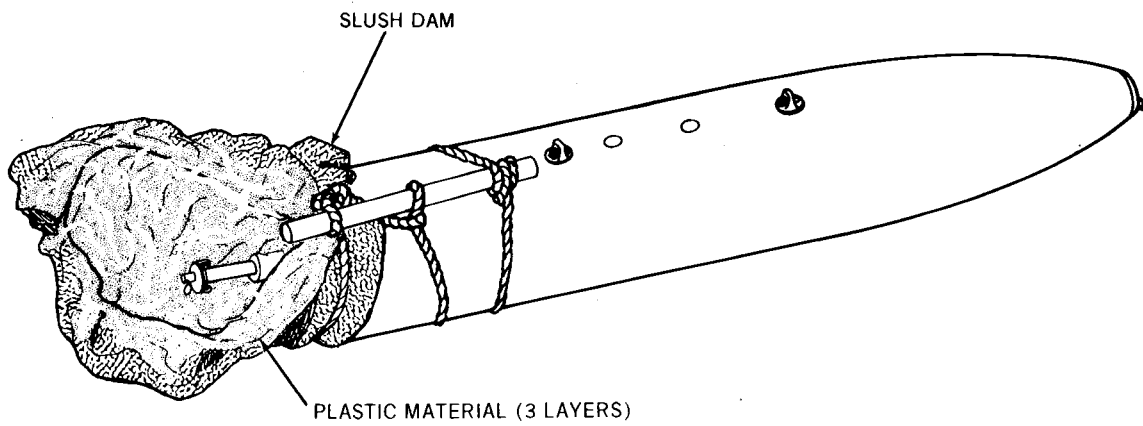
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Figure 2



1013-01/3

Figure 3



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Figure 4

CO₂
Figure 5